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For:
Industry Canada
Energy and Environmental Industries Branch

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Note: This paper was written as a summer student work project and does not necessarily reflect the views of Industry Canada.

Table of Contents

1.0 Purpose.......................................................................................................................... 1

2.0 Background.................................................................................................................... 1

3.0 Methodology.................................................................................................................. 1

4.0 Country Green Building Evaluation Systems Table................................................. 2

5.0 Country Green Building Council & Related Organization Table......................... 7

6.0 Environmental Labeling Systems.................................................................................. 9
   6.1 Global Ecolabeling Network: Global Coverage....................................................... 9
   6.2 Green Seal: United States......................................................................................... 9
   6.3 EcoLogo: Canada & United States.......................................................................... 9
   6.4 EU EcoLabel: Germany & United Kingdom......................................................... 10
   6.5 The Blue Angel: Germany....................................................................................... 10
   6.6 Eco Mark: Japan....................................................................................................... 10
   6.7 Good Environmental Choice Label: Australia.................................................... 11

7.0 Country Green Building Initiative Summaries.............................................................. 11
   7.1 United States............................................................................................................ 11
   7.2 Canada..................................................................................................................... 12
   7.3 Germany................................................................................................................. 13
   7.4 Japan....................................................................................................................... 14
   7.5 Australia.................................................................................................................. 15
   7.6 United Kingdom....................................................................................................... 15

8.0 Conclusions Section........................................................................................................ 16
   8.1 Barriers..................................................................................................................... 16
      8.1.1 Education & Awareness.................................................................................... 16
      8.1.2 Costs & Funding............................................................................................... 17
      8.1.3 Technology, Products & Materials................................................................. 18
      8.1.4 Building Industry............................................................................................. 19
   8.2 Recommendations & Areas for Improvement......................................................... 20
      8.2.1 Education & Awareness.................................................................................. 20
      8.2.2 Programs, Initiatives & Government Action.................................................... 21
      8.2.3 Technology, Products & Materials................................................................. 24
      8.2.4 Business Case for Green Buildings................................................................. 25
      8.2.5 Building Industry............................................................................................. 25
Appendix A: Green Building Council & Related Organization In-Depth Descriptions. 26
A-1 United States................................................................. 26
A-2 Canada................................................................. 29
A-3 Germany............................................................. 30
A-4 Japan................................................................. 30
A-5 Australia............................................................. 32
A-6 United Kingdom....................................................... 33
A-7 World Green Building Council (WGBC)......................... 34

Appendix B: In-Depth Country Reviews.................................................. 35
B-1 United States................................................................. 35
• Green Building Tax Credits (GBTCs)............................. 35
• The Enterprise Foundation’s “Green Communities”........... 36
• City financial incentive examples.............................. 36
• Renewable energy generator incentives.................. 37
• Million Solar Roofs initiative & Solar America Initiative... 37
• Incentive example for water conservation............. 38
• Clean Energy States Alliance (CESA)......................... 38
• National Renewable Energy Laboratory (NREL).......... 38
• Sustainable Energy Coalition (SEC)......................... 39
• American Council for an Energy-Efficient Economy..... 39
• Alliance to Save Energy (ASE)................................. 40
• Consortium for Energy Efficiency (CEE).................. 42
• Energy and Environmental Building Association (EEBA)... 42
• energyhawk.com.............................................................. 43
• Energyguide.com............................................................. 43
• Energy Service Companies (ESCOs)......................... 43
• National Association of Energy Service Companies.... 44
• New Buildings Institute (NBI)................................. 44
• Regulatory Assistance Project (RAP)......................... 44
• American Energy Efficiency Alliances.................... 45
• Tax Incentives Assistance Project (TIAP).................. 45
• Advanced Technology Program (ATP).................... 45
• US Department of Energy’s (DoE) Office of Energy Efficiency and Renewable Energy (EERE).................. 46
• Department of Agriculture renewable energy grant..... 47
• Federal & Municipal green building requirements........ 47
• DoE’s Federal Energy Management Program (FEMP)..... 47
• Energy Star................................................................. 48
• Energy Policy Act tax incentives............................ 48
• NGO green building incentive example................ 49

B-2 Canada................................................................. 49
• Federal financial incentive programs by NRCan’s Office of Energy Efficiency (OEE) (CBIP, IBIP, FBI, etc)........ 49
• Federal House in Order (FHIO) initiative ................................ 51
• R-2000 .............................................................................. 52
• Scientific Research and Experimental Development (SR&ED) Program .................................................. 52
• Canada Mortgage and Housing Corporation initiatives .... 53
• Renewable Energy Deployment Initiative (REDI) .......... 53
• Technology Early Action Measures (TEAM) Project ....... 54
• Industrial Research Assistance Program (IRAP) .......... 54
• Sustainable Development Technology Canada (SDTC) ... 54
• Funding Guide for International Science and Technology Cooperation (FGISTC) ........................................ 55
• Office of Energy Research and Development (OERD) programs (PERD, T&I R&D, CES, BET) ...................... 55
• Canada Foundation for Innovation (CFI) ..................... 57
• SME-IDEA ..................................................................... 57
• Other government funding and service programs ......... 57
• Energy Star & various rebates ...................................... 58
• Green Municipal Fund (GMF) ......................................... 58
• Municipal green building initiatives .......................... 59
• Infrastructure Canada infrastructure improvement programs 59
• Company energy conservation & green building incentives. 60
• NGO & NPO programs and incentives ......................... 62
• Energy Service Companies (ESCOs) .......................... 62
• Sustainable Condo .......................................................... 62
• National Building Code & provincial building code updates 63
• Green Roofing industry & Canadian incentives .......... 63

B-3 Germany ............................................................................. 64
• German Renewable Energy Law (EEG) & information .... 64
• KfW Federal Bank CO₂ Building Modernization Program & CO₂ Reduction Program ........................................ 64
• Energy Service Companies (ESCOs) .......................... 65
• Deutsche Energie-Agentur (DENA) National energy labelling program & Energy Star ........................................ 66
• European Commission’s GreenBuilding Project ........ 66
• Green Roofing industry, policy & incentives ................. 67
• National Building Code (NBC) information ............... 69
• Roof-top leasing program for renewable energy systems... 69
• Federal Government green building promotion ............ 69
• Some past renewable energy & green building programs .. 70
• German Research Foundation (GRF) ......................... 70
• Baufritz green building company ............................. 70
• German ‘green districts’ – Freiburg .......................... 71
• German ‘green districts’ – Vauban ............................. 71
Japan

- Energy Conservation Center, Japan (ECCJ) ........................................ 73
- ECCJ reduced rate loans ...................................................................... 74
- ECCJ commendation programs ............................................................... 74
- Energy Conservation Days, Months, and general check-ups ............. 75
- Top Runner Program ............................................................................. 75
- ECCJ free energy audits ......................................................................... 76
- Energy Star ............................................................................................. 76
- Energy Saving Labeling Program ............................................................. 76
- ECCJ Energy Efficient Product Retailer Assessment System ............... 76
- Rebates for new water heating systems ............................................... 77
- Energy Service Companies (ESCOs) ..................................................... 77
- Home & Building Energy Management Systems .................................. 77
- ECCJ guidelines, building information & “Smart Life” ....................... 78
- ECCJ & METI ENEX Exhibition ............................................................ 78
- ECCJ Energy Conservation Education Program .................................... 78
- ECCJ Energy Conservation Republic Program ...................................... 79
- ECCJ appliance comparison website .................................................... 79
- Hybrid-Z homes & solar panel information .......................................... 79
- New Energy Foundation (NEF) programs ............................................. 80
- Building Centre of Japan (BCJ) ............................................................. 81
- MLIT Government Green Buildings Program ....................................... 82
- Overseas Performance Evaluation and Approval initiative .................. 82
- Japanese Building Research Institute’s Department of Environmental Engineering (DEE) .......................................................... 82
- Environmental Activity Evaluation Program ........................................ 83
- Yanepita Photovoltaic Systems .............................................................. 83
- Residential geothermal heat pumps ..................................................... 83
- Eco Families ......................................................................................... 84
- Lifuel cogeneration systems .................................................................. 84
- CO₂ calculator from Tokyo Gas ............................................................ 84
- LPG fuel cell systems ............................................................................ 85
- Biomass Town Program ........................................................................ 85
- METI Eco Town Program ................................................................. 86
- Friends of the Earth (FoE) Japan ......................................................... 87

Australia

- Australian Government’s climate change strategy ......................... 87
- Australian Climate Change Science Program (ACCSP) .............. 87
- Community Abatement Grants ............................................................. 88
- Greenhouse Gas Abatement Program (GGAP) ............................. 88
- Low Emissions Technology Demonstration Fund .......................... 88
• National Climate Change Adaptation Program ............... 89
• Australian Government renewable energy programs .... 89
• Low Emissions Technology and Abatement initiative ...... 90
• Commonwealth Scientific and Industrial Research Organization (CSIRO) .................................................. 90
• Keep Australia Beautiful (KAB) programs ................. 90
• Futureenergy.org ................................................. 91
• Government funding for HVAC system improvements .... 92
• WELS Scheme & water efficiency label ........................ 92
• Energy Star & Energy Rating Label ............................ 93
• Australian Business Council for Sustainable Energy .... 93
• Sustainability Victoria information & programs ........... 94
• Australian Building Energy Council (ABEC) ............... 96
• Mecu Bank goGreen Home Improvement Loan .......... 97
• Australian Building Codes Board (ABCB) ................. 97
• Australian Conservation Foundation (ACF) ............... 97
• Centre for Energy and Greenhouse Technologies (CEGT) ... 98
• Smart Housing, Research House and renewal projects .... 98
• Alternative Technology Association (ATA) ................. 99
• Your Home ....................................................... 100
• The Green Directory ........................................... 100
• Energyrating.gov.au ......................................... 101
• Top Energy Saver Award ...................................... 101
• Sustainable Living Foundation (SLF) ......................... 101
• Urban Ecology Australia (UEA) .............................. 101
• Ecological Homes .............................................. 102
• ecoMaster ....................................................... 102
• savewater! Alliance ........................................... 102
• Australian Government’s Sustainable Cities Program .... 103
• Office of the Renewable Energy Regulator (ORER) ...... 103
• Energy Efficiency Opportunities Program ................ 104
• Commercializing Emerging Technologies Program ...... 104
• Innovation Investment Fund (IIF) ........................... 105
• Pooled Development Funds (PDF) Program ............... 105
• North Lakes eco-friendly town ................................ 105

B-6 United Kingdom ....................................................... 105
• Ecotricity ....................................................... 105
• UK Green Building Press ...................................... 106
• Ecostruct ......................................................... 106
• Property Environment Group (PEG) ....................... 106
• Construction Industry Council (CIC) ......................... 107
• Sustainability Works software ................................ 108
• Chartered Institute of Building (CIOB) ...................... 108
• The Housing Corporation ........................................ 109
• Chartered Institute of Housing (CIH) ......................... 109
• Commission for Architecture and the Built Environment (CABE) ............................................. 109
• Home Builders Federation (HBF) ............................ 110
• Royal Institute of British Architects (RIBA) ............... 110
• Chartered Institute of Architectural Technologists (CIAT) .................................................. 111
• Other organizations supporting green building .......... 111
• Energy Saving Trust (EST) information & programs ..... 111
• Energy Star & Energy Saving Recommended Label .... 113
• Energy Service Companies (ESCOs) ....................... 114
• Construction Industry Research and Information Association (CIRIA) ........................................ 114
• Beddington Zero Energy Development (BedZED) ...... 115
• English Partnerships & Millennium Communities .... 116
• Norwich and Peterborough Building Society (NPBS) & Ecology Building Society .................. 117
• Waterwise ............................................................ 117
• The “London Plan” ............................................... 117

B-7 International Initiatives ........................................ 118
• Commission for Environmental Cooperation’s (CEC) green building advisory group ................ 118
• Super E House Program ....................................... 118
• United Nations Environment Program’s (UNEP) Sustainable Building & Construction Initiative (SBCI) ............ 118

Appendix C: Information Sources ................................. 119
C-1 United States Sources ........................................ 119
C-2 Canada Sources ................................................ 121
C-3 Germany Sources ............................................. 124
C-4 Japan Sources .................................................. 125
C-5 Australia Sources ............................................. 127
C-6 United Kingdom Sources ................................... 129
C-7 International Initiative Sources ......................... 131
C-8 Green Building Council, Environmental Labelling System and Green Building Rating System Sources ........................................ 131
1.0 Purpose:
The purpose of this paper is to examine the literature regarding current green building practices, strategies, policies, and technologies in Canada, the United States, Japan, the United Kingdom, Germany, and Australia so that barriers to green building can be identified and recommendations made to increase the uptake of green building in Canada.

More specifically, this report will conduct a comparison of the green building rating systems in place in each of the six aforementioned countries, review the state of their Green Building Councils (GBCs) and environmental labeling programs, and provide information on major green building initiatives of these countries.

2.0 Background:
Since global warming has become an undeniable fact, attention in the developed world has focused on reducing resource consumption and the release of greenhouse gases, and on the increasing conservation efforts and environmental protection. The realization that the building industry was a huge consumer of energy and resources and a huge producer of pollution, waste, and greenhouse gases meant that improvements needed to be made in this area. In Canada, there are presently about 12.5 million residential units and 430,000 commercial and institutional buildings. These structures account for 33% of total energy use, 50% of natural resource consumption, create 30% of Canadian greenhouse gas emissions and are the cause of 25% of the nation’s landfill waste.

The green building movement aims to reduce resource and energy consumption, increase the use of renewable energy, minimize environmental degradation and the production of waste, and maximize occupant health and comfort. These goals can be achieved through the use of sustainable building products and practices including modern building site environmental management techniques, utilization of recycled or locally-sourced building materials, efficient building designs to maximize daylighting, centrally controlled smart HVAC (heating, ventilation and air conditioning) systems, installation of green roofs and photovoltaic rooftop generators, application of non-toxic interior paints and finishes, use of water-conserving toilets, faucets and showerheads, improved insulation materials and techniques, building designs that maximize open space and promote air circulation, and numerous other techniques. Studies have shown that green buildings have longer lifecycles, lower maintenance and upkeep costs, reduced energy and water bills, and that they can attract higher rents, experience lower tenant turnover, and have higher rates of occupant satisfaction when compared to conventional buildings. The economic, social and environmental benefits of sustainable structures are numerous, and the increased construction and use of these buildings is a key component in maintaining the health of this planet.

3.0 Methodology:
The green building rating systems of Canada, the United States, Japan, the United Kingdom, Germany, and Australia were reviewed to gain a deeper understanding of how
sustainable buildings in these countries are evaluated and certified (see Table A). Following this, the Green Building Councils (GBCs) and similar organizations in place in these six countries were reviewed to provide a background of the state of green building coordination in these nations (see Table B). Then the environmental labeling systems in the studied countries were reviewed. Green Building Councils and environmental labeling programs serve as indicators of a country’s green building status and proficiency as countries with established GBCs and labeling programs are typically among the world’s most advanced sustainable building nations, compared to nations which do not have these organizations and labels. Subsequently, each of the six countries was thoroughly researched in order to determine how they promote the adoption of green buildings and green building technologies. The last part of the report is a conclusions section, which identifies general barriers to green building, and makes suggestions on how green development can be increased in Canada through programs, policies and other incentives.

4.0 Country Green Building Evaluation Systems Table:
The following table provides a comparison of the green building evaluation systems used in Canada, the United States, Japan, the United Kingdom, Germany, and Australia. The information used in the development of this table was primarily taken from each of the rating systems’ websites, although some information was obtained from previous studies and evaluations of these scoring schemes. Table A on the following pages reflects a wide range of qualitative information about each green building evaluation system.
### Table A: Comparison of Country Green Building Evaluation Systems

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<tr>
<td><strong>Countries Using Rating System</strong></td>
<td>USA, Canada, Spain, South Korea, China, Australia, Guatemala, India, Japan, Mexico, Puerto Rico, Sri Lanka.</td>
<td>UK, Canada.</td>
<td>Canada, USA</td>
<td>Australia</td>
<td>Japan</td>
<td>Argentina, Austria, Brazil, Canada, Chile, Denmark, Finland, France, Germany, Greece, Hong Kong, Italy, Israel, Japan, Netherlands, Norway, Poland, South Africa, Spain, Sweden, Switzerland, UK, USA, Wales. *These countries have all participated in the GBC and have had input on the GBTool.</td>
<td>Australia</td>
</tr>
<tr>
<td><strong>Total Costs/Fees</strong></td>
<td>Low-Very High $1,750-$22,500 Varies depending on level of certification sought, experience, availability of grants, size of building, membership in UGBC, etc. Adds anywhere from 1-25% to a project’s construction costs (not including certification costs).</td>
<td>High-Very High £5,000-£20,000 Varies depending on level of certification sought, experience, availability of grants, size of building, etc.</td>
<td>Low-Medium About $500 per self-assessment, $4,000-$5,000 for third-party assessment.</td>
<td>Medium-Very High $5,500-$17,825 Varies depending on level of certification sought, experience, availability of grants, size of building, membership in GBCA, etc.</td>
<td>Low-Medium The registration, which allows access to the CASBEE Microsoft Excel tool and technical manual, is free. Third-party assessments vary in costs based on building size and level of certification sought, but should cost under $5000.</td>
<td>Low GBTool is free for all iiSBE members. Yearly membership in the iiSBE costs $50 for CaGBC and USGBC members, $75 for individuals, $250-$1000 for organizations (depending on size), and &lt;$50 for students and people from developing countries.</td>
<td>Low-Medium A free online NABERS calculator exists for people to calculate their probable third-party assessment rating. Self-assessments are possible and are inexpensive, and third-party assessments are typically about $6,000. Cost depends on type of rating undertaken, building size, and difficulty of data gathering.</td>
</tr>
<tr>
<td>Levels of Certification</td>
<td>LEED</td>
<td>BREEAM</td>
<td>Green Globes</td>
<td>Green Star</td>
<td>CASBEE</td>
<td>GBTool</td>
<td>NABERS</td>
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<td>4: (69 pts = max)</td>
<td>4: (scoring system is complicated, many steps required before overall rating obtained)</td>
<td>4: (1000 pts available, calculated as a % of pts earned)</td>
<td>3: (100 pts = max, with an additional 5 pts for innovation)</td>
<td>4: (Based on BEE score, which is calculated as 'Building environmental quality &amp; performance')</td>
<td>8: (Each review category is assigned one of these ratings, and an overall building rating is then obtained after the category scores have been combined and weighted)</td>
<td>5: (Each category is rated on a scale of 1-5. To obtain Certification level, 3 score groupings are used: the Overall greenhouse score is an average of the energy and refrigerant use, the Overall water score is an average of water use, storm water runoff and sewage outfall volume, and the Site management score is an average of storm water pollution, landscape diversity, toxic materials and indoor air quality. The final NABERS score is set at the lowest of the 3 overall scores.)</td>
<td></td>
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<tr>
<td>Platinum: 52-69 pts</td>
<td>Excellent (more advanced than industry best practice)</td>
<td>Six Star: 75+ pts (World Leader)</td>
<td>S: Excellent (BEE &gt; 3.0)</td>
<td>5: Best technically achievable</td>
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<tr>
<td>Gold: 39-51 pts</td>
<td>Very good (industry best practice)</td>
<td>Five Star: 60-74 pts (Australian Excellence)</td>
<td>A: Very Good (BEE 1.5-3.0)</td>
<td>4: Above Best Practice</td>
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<tr>
<td>Silver: 33-38 pts</td>
<td>Good (significantly above industry average)</td>
<td>Four Star: 45-59 pts (Best Practice)</td>
<td>B+: Good (BEE 1.0-1.5)</td>
<td>3: Best Practice</td>
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<tr>
<td>Certified: 26-32 pts</td>
<td>Pass (above industry average)</td>
<td>*Note: 1-3 star ratings exist, but are not granted Green Star Certification</td>
<td>B-: Fairly Poor (BEE 0.5-1.0)</td>
<td>2: Very Good</td>
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<tr>
<td></td>
<td></td>
<td>C: Poor (BEE &lt; 0.5)</td>
<td>1: Good</td>
<td>1: Good</td>
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*Note: a score of 34% or less does not meet certification requirements

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<tr>
<th>Complexity</th>
<th>Medium</th>
<th>High</th>
<th>Low</th>
<th>Medium</th>
<th>Low</th>
<th>Low-Medium</th>
<th>Low-Medium</th>
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<tr>
<td>Flexibility</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low in terms of evaluation procedures, High in terms of what types of buildings can be evaluated using CASBEE.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>LEED</td>
<td>BREEAM</td>
<td>Green Globes</td>
<td>Green Star</td>
<td>CASBEE</td>
<td>GBTool</td>
<td>NABERS</td>
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<td></td>
<td>- LEED 2.0: 2000</td>
<td>- BREEAM for new and existing offices and industrial units: 1993</td>
<td>- Green Globes for existing buildings (Can, USA): 2004</td>
<td>- CASBEE for existing building: 2004</td>
<td>- The GBTool is modified during/after every GBC event, which occur every 2-3 years.</td>
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<td></td>
<td>- LEED 2.2: 2005</td>
<td>- Subsequent BREEAMs are built for specific building types/uses.</td>
<td>- CASBEE pre-design assessment tool: being revamped</td>
<td>- CASBEE for heat islands: 2005</td>
<td>- No, but technical support for the GBTool is provided by the iiSBE</td>
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<td></td>
<td>- LEED Online: 2005</td>
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<td>Other CASBEE progs:</td>
<td>- CASBEE for district &amp; region: 2005</td>
<td>- No, only a tool</td>
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<tr>
<th>Strength in Planning/Design</th>
<th>High</th>
<th>High</th>
<th>High</th>
<th>High</th>
<th>High</th>
<th>Strength in Construction</th>
<th>High</th>
<th>High</th>
<th>High</th>
<th>High</th>
<th>High</th>
<th>Strength in Operation</th>
<th>High</th>
<th>High</th>
<th>Medium</th>
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<tr>
<td>Program Training Available</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Program Training Available</td>
<td>Yes</td>
<td>Yes</td>
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<td>Program Training Available</td>
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<tr>
<td>Incentives for Use</td>
<td>-One of the most well-known rating systems.</td>
<td>-Basis for all rating systems, one of the most well-known. -BREEAM pro can be involved from the start and can provide tips -BREEAM is regularly updated as new research becomes available to ensure it represents current best practice. -BREEAM has captured over 25% of the new office building market in the UK.</td>
<td>-Low cost -Instant feedback -Generates links to relevant information and product sources.</td>
<td>-All Green Star tools are free to use</td>
<td>-Output provides results in two forms: absolute performance outputs, and performance relative to local benchmarks. -Updated every few years, after the Green Building Challenge (GBC). -Created from an international collaborative process, decisions made based on delegate consensus.</td>
<td>-Online NABERS calculator is free to use</td>
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<tr>
<td>Other Comments</td>
<td>-Designed based on BREEAM system -Evaluates buildings based on predictions of their lifecycle -System is performance-based rather than prescriptive -LEED is now available online</td>
<td>-BREEAM versions tailored to building type/use. -Adopted by Canada in 1996 -System is performance-based -Related to Green Globes -EcoHomes is the homes version of BREEAM, and is a little different. -There are 7 evaluation criteria for EcoHomes: each worth a maximum amount of credits. Total credits = 86 1. Energy = 20 credits 2. Water = 5 3. Pollution = 7 4. Materials = 31 5. Transport = 7 6. Ecology &amp; land use = 9 7. Health &amp; well being = 7 -Each category is then multiplied by the category weighting system as follows, to get a score out of 100: 1. Energy = 0.3 2. Water = 0.1 3. Pollution = 0.15 4. Materials = 0.15 5. Transport = 0.3 6. Ecology &amp; land use = 0.15 7. Health &amp; well being = 0.15 -Rating system is as follows: 70+ = Excellent 60-69 = Very Good 48-59 = Good 36-47 = Pass</td>
<td>-Online auditing tool, allows input changes to keep assessment up-to-date. -In Canada, Green Globes is known as Go Green Plus -Related to BREEAM</td>
<td>-Tools for building design, construction and operation. -Tools are free to use but certification requires a formal third-party assessment -Green first recently launched. It is a line of products that supports the Green Star rating tools.</td>
<td>-4 tools: CASBEE for pre-design, new construction, existing buildings, and renovation. -Excel-based tool</td>
<td>-Software designed to assess predicted or potential performance of a building before occupancy. -Little to no usefulness as an assessment tool during building operation. -Excel-based tool -Local benchmarks must be known and manually added to the tool. -Can and has provided the basis for the creation of a national building environmental rating tool. -Allows for comparison with LEED and Green Globes. -NRCan responsible for the initial development of the GBTool as well as a large amount of upstart funding.</td>
<td>-Designed to rate buildings on their operational impacts on the environment. -System is performance-based</td>
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5.0 Country Green Building Council & Related Organization Table:
The following table summarizes the activities and major accomplishments of each studied nation’s Green Building Council (GBC), as well as those of any related or comparable organization in the country. In Germany and the United Kingdom for example, no GBCs are currently in operation, although there are other organizations carrying out similar projects. GBCs are beneficial to their country because they act as a coordinator of green building efforts, run training programs and conferences, and offer a wealth of information on a variety of sustainable construction topics. Many similar organizations have related operations, but they tend to focus more specifically on one aspect of sustainability or green building, such as research or dissemination of information, as opposed to a more holistic approach. It should be noted that the World Green Building Council (WGBC) is included in the table and placed in the ‘Other’ column as it is a very important organization to the green building movement even though it does not apply to strictly one country. The information used to create this table was mainly taken from the websites of the respective organizations, but some was obtained from other websites describing the operations and accomplishments of these associations. Table B on the following page summarizes the key activities and accomplishments of each country’s major green building organizations. More detailed descriptions of these organizations can be found in Appendix A.
<table>
<thead>
<tr>
<th>United States</th>
<th>Canada</th>
<th>Germany</th>
<th>Japan</th>
<th>Australia</th>
<th>United Kingdom</th>
<th>Other</th>
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<td>US Green Building Council (USGBC):</td>
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<tr>
<td>-LEED building rating system</td>
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<td>-Greenbuild International Conference &amp; Expo</td>
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<td>-A world-leading GBC.</td>
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<td>Canada Green Building Council (CaGBC):</td>
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<td>-LEED-Canada building rating system</td>
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<td>-One of the world’s most advanced GBCs.</td>
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<td>Council for Sustainable Development (CSD):</td>
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<td>-Addresses ‘sustainability’ at a much broader scale.</td>
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<td>-Modernizing &amp; upgrading buildings</td>
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<td>-Spreading knowledge of sustainability and proper land-use</td>
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<td>-Campaigning for sustainable consumption &amp; environmental conservation</td>
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<td>-’German Strategy for Sustainable Development’ 2002</td>
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<td>-’Landmark Sustainability’ 2005</td>
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<td>Japan Green Building Council (JGBC):</td>
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<td>-Free Service Provider: energy audits, building design surveys, etc.</td>
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<td>-Promotion of Green Buildings</td>
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<tr>
<td>-Encouraging Japanese manufacturers to produce more green products &amp; greener products</td>
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<td>-Several national seminars</td>
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<td>-A developing GBC, participant role.</td>
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<td>Green Building Council of Australia (GBCA):</td>
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<tr>
<td>-Green Star building rating system</td>
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<td>-Training &amp; information programs</td>
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<td>-Promotion of Green Buildings</td>
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<td>-Integrate green practices into the construction industry</td>
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<td>-Networking opportunities</td>
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<tr>
<td>-One of the world’s most advanced GBCs.</td>
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<td>United Kingdom Green Building Council (UKGBC):</td>
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<td>-Development of the UKGBC is currently in progress. Expected to be like the USGBC.</td>
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<td>World Green Building Council (WGBC):</td>
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<td>-Network of national green building councils (GBCs).</td>
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<td>-Supports GBCs and helps develop new ones.</td>
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<td>-Promotion of Green Buildings</td>
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<td>-Information on green building</td>
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<td>-‘WorldGBC Toolkit’ for GBCs</td>
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<td>-Annual ‘International GBC Conference’</td>
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<td>Sustainable Buildings Industry Council (SBIC):</td>
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<td>-‘Energy-10’ software</td>
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<td>-‘Green Building Guidelines’</td>
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<td>-’Whole Building Design Guide’</td>
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<td>-Training &amp; information programs</td>
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<td>-Green Building research</td>
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<td>-Green Building tools and resources</td>
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<td>Centre for Sustainable Building (CSB):</td>
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<td>-Helps builders maximize their use of recycled and sustainable building materials.</td>
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<td>-Researcher &amp; information publisher</td>
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<td>Japan Sustainable Building Consortium (JSBC):</td>
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<tr>
<td>-CASBEE building rating system</td>
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<td>-Green Building research</td>
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<td>Australian Department of Environment and Heritage (DEH) &amp; New South Wales Department of Energy, Utilities and Sustainability (DEUS):</td>
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<td>-NABERS building rating system</td>
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<td>Building Research Establishment (BRE):</td>
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<td>-BREEAM building rating system</td>
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<td>-Research &amp; consultancy services</td>
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<td>-Involved in the development of building standards</td>
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<td>-Training &amp; information programs</td>
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<td>-Manages BREbookshop.com, one of the world’s largest online bookstores for building information.</td>
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<td>Ministry of Transport, Building and Housing:</td>
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<td>-’Guideline for Sustainable Building’ 2001</td>
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<td>Association for Environmentally Conscious Building (AECB):</td>
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<td>-Promotes awareness of green building throughout the UK construction industry</td>
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<td>-Involved in the development of building standards</td>
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<td>-Provides green building information</td>
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<tr>
<td>-Trains industry professionals in green building techniques</td>
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</table>
6.0 Environmental Labeling Systems:

6.1 Global Ecolabeling Network: Global Coverage
(http://www.gen.gr.jp/index.html)
The Global Ecolabelling Network (GEN) is a non-profit association of third-party, environmental performance labeling organizations founded in 1994 to improve, promote, and develop the “Ecolabeling” of products and services.

“Ecolabeling” is a voluntary method of environmental performance certification and labelling that is practiced around the world. An “ecolabel” is a label which identifies the overall environmental performance of a product or service within a specific product or service category based on life cycle considerations. In contrast to “green” symbols or claim statements developed by manufacturers and service providers, an ecolabel is awarded by an impartial third-party in relation to certain products or services that are independently determined to meet environmental leadership criteria.

The Global Ecolabeling Network coordinates the activities of its members to achieve more harmonized standards and certifications world-wide. It promotes the development of more national ecolabels, and encourages all manufacturers to apply for official certification under their national ecolabelling bodies, so that one day all products and services can be sustainable.

6.2 Green Seal: United States
(http://www.greenseal.org/index.cfm)
Green Seal is an independent, non-profit organization dedicated to safeguarding the environment and transforming the marketplace by promoting the manufacture, purchase, and use of environmentally responsible products and services.

Green Seal works with manufacturers, industry sectors, purchasing groups and governments at all levels to ‘green’ the production and purchasing chain. They utilize a life-cycle approach, which means they evaluate a product or service beginning with material extraction, continuing with manufacturing and use, and ending with recycling and disposal. Products only become Green Seal certified after rigorous testing and evaluation, including on-site plant visits. Once certified, products and services can be marked or stamped with the Green Seal to prove their sustainability.

6.3 EcoLogo: Canada & United States
(http://www.terrachoice.com/Home/Validation%20Products/Environmental%20Choice%20Program)
The EcoLogo is Canada’s (and, along with Green Seal, North America’s) most widely recognized and respected multi-attribute environmental certification mark. By certifying the environmental leaders in over 300 categories of products, EcoLogo helps environmental marketers win customers, and helps buyers - both consumer and corporate - find and trust the world’s most sustainable products.

By helping environmental leaders promote themselves and their products, EcoLogo helps move the entire marketplace toward sustainability. The EcoLogo belongs to the
Government of Canada, and is a founding member of the Global EcoLabelling Network (GEN). The EcoLogo program is stewarded by TerraChoice Environmental Marketing.

6.4 EU EcoLabel: Germany & United Kingdom
(http://ec.europa.eu/environment/ecolabel/index_en.htm)

The EU Eco-labeling program was launched throughout the European Community in 1993 to encourage the manufacture of less environmentally-damaging products. The European Union’s Eco-label, a flower with the EU’s star symbol, is awarded to products that have passed a life cycle analysis.

The program provides consumers with independent information to assist in the purchasing process, and the Eco-label is awarded to products which have a reduced impact on the environment. All EU member states participate in the program representing a market of 340 million consumers in Europe. The strength of this label is the European dimension. Once approved by one member state, a stamped product can be used throughout the other states, avoiding costly and redundant applications and evaluations. The European Eco-label clearly shows consumers which products are ‘green’, in an attempt to facilitate and increase sustainable consumption and production.

The EU Eco-label is administered by the European Eco-labeling Board (EUEB) and receives the support of the European Commission, all Member States of the European Union and the European Economic Area (EEA). The Eco-labeling Board includes representatives such as industry, environmental protection groups and consumer organizations. There are currently 23 different product groups, and already more than 250 licenses have been awarded for several hundred products. The EU Eco-label is a member of the GEN.

6.5 The Blue Angel: Germany
(http://www.blauer-engel.de/englisch/navigation/body_blauer_engel.htm)

When the Federal Minister of the Interior and the Ministers of the Environment of the Federal States first introduced the “Blue Angel” in 1977, Germany became the first country in the world to use an Ecolabel. The primary goals of the Blue Angel program are: 1) to guide the consumer into purchasing quality products with fewer adverse environmental impacts; 2) to encourage manufacturers to develop and supply environmentally sound products; and 3) to use the Ecolabel as a market-oriented instrument of environmental policy. Today, about 3,700 products and services of some 800 manufacturers at home and abroad have the right to bear Germany’s Eco-label – the “Blue Angel.” The Blue Angel is a member of the GEN.

6.6 Eco Mark: Japan
(http://www.ecomark.jp/english/)

The Eco Mark Program is the Japanese Environmental Labeling Program, operating in accordance with ISO14020 and ISO14024. This Ecolabeling program considers the entire lifecycle of a product, beginning with how the materials are obtained, through manufacturing and general use processes, to recycling or proper disposal. The Eco Mark is attached to products that pass a strict lifecycle examination. The Eco Mark Program is
coordinated administered by the Japan Environment Association (JEA), and is a member of the GEN.

6.7 Good Environmental Choice Label: Australia
(http://www.aela.org.au/)
Like many other Ecolabeling programs, the Good Environmental Choice Label is based on the performance of a product throughout its entire lifecycle. The label is awarded to products that meet voluntary environmental performance standards which have been created and assessed in conformance with international environmental labeling standards. On the program’s website, manufacturers can find information about the declaration requirements and how to apply for the official recognition of their products or services with Australia’s Good Environmental Choice Label. The Australian Good Environmental Choice Label is officially recognized by and a member of the GEN.

7.0 Country Green Building Initiative Summaries
7.1 United States:
Incentives, grants and tax credits undeniably play a large role in increasing the amount of green building projects in the United States. One of the main complaints about green buildings is the higher up-front costs, but these grants can help neutralize that argument. The American federal government, in partnership with the US Department of Health and Human Services, has created Grants.gov (http://www.grants.gov/); as a single access point for over 1000 grant programs offered by all Federal grant-making agencies. Grants.gov allows organizations to electronically find and apply for more than $400 billion in federal grants, in a wide variety of areas. This database makes applying for federal grants much easier, increasing the competition for and use of the numerous grants available from the American government.

There are also incentives for the installation of certain kinds of renewable energy generating systems, such as photovoltaic panels and geothermal heat pumps. The National Renewable Energy Laboratory (NREL) is the United States’ primary research laboratory for renewable energy and energy efficiency, receiving funding of over $200 million each year for these projects. In the US, there are also numerous establishments that promote energy efficiency, energy conservation and the increasing use of renewable energy in buildings. These organizations include the Consortium for Energy Efficiency (CEE), the Alliance to Save Energy (ASE), the Sustainable Energy Coalition (SEC), and the American Council for an Energy-Efficient Economy (ACEEE). It was also noticed that there are varying levels of support programs and incentives for green building from state to state. The ESCO business industry in the United States is still largely in infancy stages, but is growing steadily thanks to the coordination and leadership from the National Association of Energy Service Companies (NAESCO), which is one of only two coordinating units of national ESCOs in the world. Simply put, there are all kinds of incentives available by various organizations who promote green building and resource efficiency in the United States. With grants, resources, and other financial incentives available on top of the basic monetary savings green buildings have to offer, the American green building initiative is set to take off.
7.2 **Canada:**

Upon the review of Canada’s major initiatives supporting the green building movement and the development of green building technologies, it is clear that the Government of Canada and other program providers understand that money is one of the biggest issues and most effective incentives in increasing the use of green buildings. However, many of these financial incentives and programs focus only on energy efficiency improvements without considering various other aspects of green building, such as using locally-sourced products, minimizing construction waste and degradation of the building’s immediate surroundings, use of natural lighting, proximity to public transit, etc. Also, many of the financial incentive programs for technological R&D do not focus specifically on green building technologies, but on all technologies designed to reduce resource use, energy consumption, greenhouse gas emissions, pollutants, or some combination of these things in many other areas of society. There is no single program which specifically focuses on R&D solely for the purposes of green building, which means the actual number of green building projects supported by these R&D programs could be quite small, if there are any at all. This being said, there are certainly many good initiatives encouraging improvements in the energy efficiency of homes and appliances, as well as initiatives for commercial and industrial corporations to green their existing buildings or simply build green in the first place.

The New National Building Code is causing provinces and territories to update their building codes to reflect these changes, and begin to incorporate more guidelines for energy efficiency. The Canadian Government is undoubtedly doing its part to increase the prevalence of green buildings in Canadian society, but there is definitely room for improvement. A R&D incentive program specifically for green building technologies would likely increase the amount of work being done in terms of the development of the sustainable building industry and green technologies, and programs addressing green building issues other than energy efficiency would also have an overall greening effect on Canadian buildings. Another area Canada needs to begin addressing is the general public’s lack of knowledge and awareness of green buildings. Not enough people are aware of the amount of energy and resources consumed by buildings, the amount of greenhouse gases they release, and the numerous simple methods and technologies available in order to green buildings. If more people were informed, the concept would be better promoted and more widely used.

Despite these issues, the Office of Energy Efficiency (OEE) is doing a great job of supporting the greening of buildings through its Commercial and Industrial Building Incentive Programs (CBIP & IBIP, respectively). Additionally, the Federal Government is becoming a national leader in green buildings through its Federal House in Order (FHIO) initiative and the OEE’s Federal Buildings Initiative (FBI), which are resulting in major renovations of existing governmental buildings and the commitment that all new Federal Government facilities will be green. Numerous R&D support programs for energy efficient, renewable energy, and other innovative technologies are also available from the Federal Government. These Programs include the Program of Energy Research and Development (PERD), the Technology and Innovation Research and Development (T&I R&D) Initiative, the Renewable Energy Deployment Initiative (REDI), the
Technology Early Action Measures (TEAM), and the Scientific Research and Experimental Development (SR&ED) Program. Similarly, the Green Municipal Fund (GMF) is a $550 million funding incentive program in Canada which supports community projects that result in cuts to greenhouse gas emissions. Infrastructure Canada is also investing billions of dollars in projects to improve numerous areas of Canada’s infrastructure. Canada is also a user of the Energy Star standard, which labels energy efficient products to distinguish them from average appliances. The Sustainable Condo is a traveling exhibition of leading Canadian green building practice and green technology companies, and hopes to make more people aware of what is currently available in terms of green building. Green roofs are also becoming more prevalent in Canada due to recent changes in provincial building codes and small municipal incentive programs. Finally, the number of private companies offering financial incentives to customers interested in improving their homes’ energy efficiency or reducing its energy consumption is remarkable and among the highest levels of this kind of support in the world.

7.3 Germany:
Incentives seem to play a smaller role in the overall green building movement in Germany compared to North America. This may be because of the greater population density and comparable resource scarcity that exists in Europe, or because Germans take more pride and initiative in being world environmental leaders and do not need the extra push to take the environment into consideration. However, incentives for various green building initiatives do exist in the country, and probably convince more people to build green than otherwise would. Germany is world renowned for their prevalence of green roofs. This simple concept has numerous environmental benefits, and can also result in long-term cost savings and an improved living environment for building occupants. The German Government has taken measures to increase public knowledge and awareness of green building, and it seems to be helping the nation’s sustainability movements gain momentum. Germany is a world-leader in renewable energy generation and renewable energy technologies, with the world’s highest levels of solar and wind power generation, and the ability to sell its technology for use in other countries. The German Research Foundation continues to offer numerous grants for environmental R&D projects, and provides support in other non-fiscal ways as well. Germany has recently introduced the Energy Star labeling program, and is also working on its own national energy rating label to increase awareness of product electricity consumption. The German ESCO industry is the largest and most successful in the EU, and has served as the benchmark example for other fledgling European ESCO market systems. German green building design and construction firms, such as Baufritz, are among the most advanced and innovative in the world, with representatives from other planning firms coming from all over the planet to learn from their methods and observe their technologies. Local building codes in Germany are based on the National Building Code (NBC), and often include green requirements when a building exceeds a certain construction materials threshold or will cover too much ground area. The country’s sustainable city districts, including Freiburg and Vauban, are also of particular interest to the international community, which can take a lot away from the overall German approach to green building and sustainability.
Japan is one of the world’s leading countries in terms of green buildings because of its willingness to experiment with new technologies and practices and because of its commitment to sustainability and improving its environmental performance. Because Japan is an island and all fossil fuel must be imported, they are trying very hard to develop technology to harness the power available from renewable energy sources. Japanese firms conduct extensive R&D on alternative energy projects such as fuel cell technology, geothermal heat pumps, photovoltaic systems, and wind power generators to reduce their dependence on increasingly expensive fossil fuels. The Government of Japan creates policies and programs to promote energy conservation and efficiency through such measures as the ECCJ’s Smart Life Program, National Energy Conservation Days, National Energy Conservation Month, recognition programs for excellence in energy efficiency practices, the annual ENEX Exhibition, the publication of guidelines to improve residential energy efficiency, and more. There are also numerous initiatives in place to help consumers find and purchase energy efficient products, including the ECCJ’s Top Runner Program, the Energy Efficient Product Retailer Assessment System, and the ECCJ’s online database allowing consumers to compare the energy conservation performance of various appliances. Furthermore, Japan has two energy efficient product labeling programs (the international Energy Star Program and the national Energy Saving Labeling Program) to help consumers identify energy efficient products. So, it is clear how concerned the government is with its people’s energy consumption habits, and how strongly it is pushing for energy conservation and efficiency efforts in its country.

Subsidies and incentives for greening buildings also exist in Japan. Companies who perform energy efficiency upgrades on their facilities can receive loans at reduced rates, as can companies who install renewable energy generating systems. Home owners who install PV systems on their roofs are also eligible for some cost-offsetting subsidies. The Japanese Government also recognizes that they cannot effectively push for green buildings if they do not make efforts in green buildings themselves. Therefore the Government Green Buildings Program was developed by the MLIT to provide a plan for the greening of government structures. Sustainability and resource efficiency policies are also having an influence on schoolchildren. Through the Energy Conservation Education Program, the Energy Conservation Republic Program and the Fifty-Fifty Program, children are becoming aware of these issues and are becoming involved in efforts to address them. The government’s goal through their programs aimed at schoolchildren is to promote the development and maintenance of sustainable energy and resource consumption habits from a young age. The ESCO market in Japan is also growing rapidly due to the Japan Association of Energy Service Companies (JAESCO) and the increasing societal value of energy efficiency. Other Japanese green building initiatives include R&D on home and building energy management systems, free energy audits for SMEs and commercial buildings, and the availability of zero-energy houses. Japan’s technological expertise, innovation and concern for the environment make it one of the places where green building breakthroughs are likely to occur.
7.5 **Australia:**

Australia is certainly trying to show the rest of the world that it can significantly reduce its greenhouse gas emissions despite refusing to ratify the Kyoto Protocol. The Australian Government’s commitment of $1.8 billion towards their climate change strategy surely demonstrates this, and this funding has enabled the creation and maintenance of numerous multi-million dollar support programs for green buildings and related issues. Non-profit and privately run organizations are also playing a key role in supporting Australia’s green building movement. Organizations such as Sustainability Victoria, the Centre for Energy and Greenhouse Technologies, and the Sustainable Living Foundation all provide funding in various ways to green building initiatives. Other non-governmental organizations including Keep Australia Beautiful, the savewater! Alliance, the Australian Conservation Foundation, the Alternative Technology Association, and Urban Ecology Australia run programs aimed at preserving the Australian environment, increasing the use of renewable energy, conserving resources, promoting green building, and just generally supporting sustainability. In addition, numerous websites such as www.futureenergy.org, www.energyrating.gov.au, and www.thegreendirectory.com.au promote renewable energy, energy efficiency and the use of green products as well.

As with most other governments in leading environmentally-conscious countries, Australia offers its share of financial incentives and rebates for businesses and home owners that buy and install a renewable energy generator, or who purchase a new energy efficient appliance to replace an old one. Australia’s Energy Rating Label and WELS water efficiency rating scheme are also playing important roles in helping consumers compare the resource consumption of various appliances, and are increasing the care being taken when purchasing new appliances. These rating systems are also putting pressure on product manufacturers to produce appliances that consume the least amount of resources possible, as they know this is becoming a key concern of consumers. Recently, the Australian Building Codes Board has updated and raised the energy efficiency requirements for numerous types of Australian buildings and homes, meaning that Australia is pushing to raise the energy efficiency levels of its new buildings. Australian SMEs also have their share of support, with a handful of government programs designed just for them to encourage the development of their innovative products and help them compete more successfully in the marketplace. Finally, Ecological Homes and ecoMaster are two leading Australian providers of green construction and home renovation services, and offer a wide variety of residential upgrade procedures at considerably low costs.

7.6 **United Kingdom:**

Although they do not have a GBC just yet, the UK is still among the world’s leading countries in terms of its promotion of sustainable development. The number of UK organizations supporting sustainable building is very high, and includes notable organizations like the Construction Industry Council (CIC), the Home Builders Federation, the Royal Institute of British Architects (RIBA), the Commission for Architecture and the Built Environment (CABE), The Housing Corporation, and the Chartered Institute of Building (CIOB). The UK also has the Ecotricity Energy Company, which only produces energy through sustainable and renewable means. Recently, the
TrustMark scheme was introduced to help consumers find qualified contractors with good track records for home renovations, which increases the likelihood that homeowners will seek home improvements and also the likelihood that these improvements will be of the highest quality. The UK has the Energy Saving Trust (EST), which runs many incentive programs to help people increase their home’s energy efficiency, decrease its energy consumption, or increase its use of renewable energy. The EST is also the administrator of public campaigns to reduce energy waste, as well as the manager of the UK’s own energy labeling system, called Energy Saving Recommended. The UK also uses the Energy Star product rating system for energy efficient office equipment. As it does for energy, it does for water as well. The UK Waterwise initiative was designed to help people reduce the amount of wasted water. Although the UK has no official water efficiency labeling or rating system, Waterwise initiatives such as the provision of water saving tips and products are helping people reduce their water consumption.

The UK ESCO industry is also growing in size and popularity as more people become aware of the problem of wasted energy, and take measures to help regulate the situation. Like other leading sustainability-promoting nations around the world, the potential market for ESCO services is huge and activity is just starting to take off. Some sustainable communities are also completed and being built in the UK. The Beddington Zero Energy Development (BedZED) was completed in 2002 and has proven to be a huge success. Additionally, the UK Government’s Millennium Communities initiative has resulted in the creation of 7 sustainable developments across the country, which are currently under construction but have already produced promising results. Finally, several building societies including the Norwich and Peterborough Building Society (NPBS) and the Ecology Building Society offer green mortgages and loans at reduced interest rates to help homeowners interested in renovating their home improve its energy efficiency.

8.0 Conclusions Section:

8.1 Barriers:

Upon a review of world-leading green building countries, several main barriers to increasing the prevalence of green buildings have been identified.

8.1.1 Education & Awareness:
The first and probably the most important green building barrier is simply the lack of knowledge or awareness of the wide-ranging environmental problems caused by conventional buildings and the benefits of green buildings. Many people are unaware of the amount of energy and resources average buildings consume, as well as the amount of greenhouse gases they release. When people think about climate change, they generally focus on the transportation industry, its congested highways and its millions of vehicles, or the manufacturing industry with its processing plants and dirty smokestacks. However, studies have shown that the construction of buildings consumes 32% of the world’s resources, that the building sector consumes 12% of the fresh water and 40% of the energy consumed in OECD countries, and that 40% of the waste going to landfills is from the construction and demolition of buildings. Attention needs to be focused on improving construction industry practices and making the final products more sustainable, as well as making more people aware of green buildings.
An often cited problem with green buildings is that designers and developers are not capable or skilled enough to create a sustainable building. If these actors are unaware of sustainable construction or unfamiliar with how to go about implementing it in their work, they cannot be expected to produce a green building. Creating a green building often requires an additional set of skills among the designers, planners, and tradesmen, or an extra group of workers altogether. Many people interested in green buildings have stated that there is a shortage of qualified experts in their geographical area, which makes green building implementation an even greater challenge.

Additionally, the lack of publicly available, objective and statistically sound information outlining the benefits of green buildings over conventional buildings acts as a barrier because it maintains the general public’s lack of knowledge and awareness about green buildings. This barrier can be addressed by government, non-governmental organizations, environmental organizations, the media, and numerous other groups.

8.1.2 Costs & Funding:
Another barrier to green building uptake is the perceived higher cost of green buildings compared to conventional buildings. Due to the expense of construction, there is more focus on short term low-cost construction, rather than on the long term results and benefits possible through green building. This is partially a result of developers wanting to minimize construction time and costs, but also due to occupants not understanding the benefits from living in a green building and not wanting to pay slightly higher purchase prices or rents associated with sustainable buildings. In many cases, the group who would pay for and implement the green technologies has no incentive to do so, as the benefits of the technology accrue to other parties. This is often the case with condominium development, where the developer would pay but the owners would benefit (from lower energy and water bills, for example). In other scenarios, such as stormwater control measures or methods of controlling building pollution, the cost is exclusive to the property owner, while the benefits are diffused throughout society. So, the costs-savings relationship of implementing green buildings and green technologies is a considerable barrier.

Although the costs are often higher, studies have found that green buildings obtain higher retail values compared to conventional buildings of the same volume, and that customers interested in green buildings will go to great lengths in order to occupy these structures. Studies have also shown that green buildings save the owner and occupant money over the long term compared to conventional buildings as they are more energy and water efficient, have a longer life-cycle, and generally have lower maintenance costs. Green buildings also offer intangible benefits to occupants through improved comfort, health, and productivity. Through proper site and materials management practices, builders can also reduce the ecological footprint of their building activities substantially. Developers need to take a step back and look at the bigger, greener picture of their work. The longer the timeline, the more an owner of a green building will save compared to the owner of a conventional building, even with the tendency for green buildings to cost a little more upfront to build.
Along with the perception that green technologies are more costly and risky than conventional equipment, there is also the common perception that green development is more expensive because it takes longer to implement. From seeking qualified professionals, to obtaining approval for an unconventional design, to finding the right kinds of materials, many people see obstacles at every stage of the development process that can only lengthen the implementation period. The perception is that the implementation process for green development will be longer than for a standard building, and therefore costlier and less appealing.

Often, a barrier to green buildings is that there is insufficient support and leadership by various levels of government. This includes insufficient government incentives, inconsistent or uncoordinated regulation, or the simple fact that the government may not be adequately pushing for green development. Because governments are usually the largest single owner of buildings in a country, they need to be very supportive of green building and encourage this type of development in any way they can. Implementing green practices in their own buildings is a great way for governments to demonstrate leadership and environmental responsibility.

The lack of incentives and initiatives, both governmental and non-governmental, acts as a barrier to green buildings. Incentives and programs make the creation of green buildings more appealing to developers, who will then be more likely to build them. With more green buildings and homes available, more people will experience the benefits of these facilities. This helps increase awareness of the benefits of sustainable construction and green buildings. So, increasing incentives and programs to encourage the manufacturing of green buildings is likely to help increase public awareness, and begin to breakdown the knowledge barrier.

Lack of investment in green buildings is also a huge barrier to their widespread adoption. The building industry is a significant component of any national economy, but there is still very little Canadian investment in innovative building practices and green technologies. For instance, the European Union spends 6 times more than Canada on research concerning the built environment and new building technologies.

8.1.3 Technology, Products & Materials:
Uncertainty about new and emerging green technologies is another barrier to the widespread implementation of green buildings. Since many environmental technologies are relatively new, with less market history than conventional technologies, many property owners and developers are concerned that payback will not be as promised and that these technologies will end up not being as effective or reliable as the well-understood conventional equipment. Indeed, cost-benefit analysis of many green technologies is still being defined and the value in building green is often intangible, and is typically excluded from developers’ own cost-benefit analyses. Developers generally look for a payback period of between 3 and 7 years. However the payback period required with green technologies can be quite long, and considerably longer than many
people would find acceptable. For example, the payback period for some renewable energy sources, like solar and wind, can be around 15 and 30 years, respectively.

The construction of green buildings requires the use of locally produced materials, sustainable products, sustainably-produced products, reused or reuseable materials, or combinations of these materials. If these products are not available to the industry, then chances are green buildings will not be created. Having readily available or locally manufactured green building products reduce the time required by developers to find and obtain these materials, and would increase their use through convenience.

Slow market penetration is a major reason green building practices and technologies have not experienced extensive uptake. According to a study by the Partnership for Advancing Technology in Housing (PATH), it takes 10 to 25 years for a new housing technology to achieve full market penetration. This is due to lack of awareness of the new technology, or a resistance to change and preference of older, established methods.

8.1.4 Building Industry:
Outdated and inconsistent building codes can also be a barrier to green building because they can prevent or discourage the use of alternative and innovative building materials, methods and designs, which are essential in the creation of modern sustainable buildings. It is usually provincial or municipal governments who design and update these codes, so this is another area where regular governmental activity is key.

Another barrier to green buildings is the building industry’s resistance to change and innovation. Although the reasons behind this cannot be fully explained, it is partly due to established contractors and industry professionals designing and building structures the same way they did when they started in the business. So, there has been relatively little change in the building industry over the past couple decades, and buildings continue to be built essentially the same way they were 25 years ago.

The building industry itself is also structured so that information exchange is limited. The industry is largely dominated by SMEs and subcontractors, who often choose not to share new design techniques and technologies because these are what set them apart from rival firms. Additionally, the geographic spread of these firms across Canada does not help in making awareness of these practices common knowledge.

Another concern is about “green-washing,” which is marketing a technology or practice as being green when the actual environmental benefits may be negligible. Green development is a complex field, and it is difficult for consumers to be able to determine the true environmental impact of their properties and homes. Many people have noted the need for independent evaluation and standards for green technology, to reduce these perceived risks and to help purchasers choose amongst the growing number of green products.
8.2 Recommendations & Areas for Improvement:
From the review of green building policy and practices in the world’s leading countries, numerous recommendations can be made to increase the adoption of green buildings in Canada.

8.2.1 Education & Awareness:
The first and probably the most important suggestion would be to promote green building awareness more widely throughout society. People are still unaware of the amount of resources consumed by buildings and homes, and the quantity of pollution and greenhouse gases buildings emit. Efforts need to be made by governments, cities, organizations, and other groups to increase public knowledge of the problems with conventional buildings, and how green buildings and technologies can improve Canada’s building stock as well as save money and cause less environmental damage in the long run. If this type of information was more readily and easily available, it could result in the increased adoption of green building practices in new developments, as well as increasing amounts of building retrofits. As for a method of promotion, public information campaigns need to be directed at three types of people: people who would implement green building practices and technologies to save money and increase their building’s quality and value, people who would get involved to reduce the negative effects of their buildings on the environment, and people who would be drawn in for a combination of both previous reasons. Along with increasing public awareness of green building comes the need to increase public recognition of the support and resources available to them to build green or implement green practices or technologies in their buildings. This should also be a component of any public awareness campaign. Successful methods of educating the public on green building could include placing advertisements on bus shelters, billboards, television, radio, and other places of common public access, the creation of green building resource and information centres, design competitions, demonstration projects, informational brochures, information sessions and workshops, green building expositions and tours, webpages, and green labeling programs.

As an often-cited problem about building green is finding a qualified expert to do the job, the number of green building training programs should be increased. Governments can work with colleges, universities, architectural schools, and building organizations to begin various green building training programs to increase the number of skilled professionals in the industry. A gap analysis of the Canadian green building industry’s skills would be beneficial as it would provide a more detailed picture of where training improvement is required.

Many environmental, recycling, and physical activity programs are aimed at children so that they develop these habits and continue them throughout their lives. Sustainability and green building programs and concepts should be brought to schools to help students develop sustainable lifestyles for the future. Many of the countries studied have energy and water efficiency programs in place in schools where students have a significant amount of control over the programs and are responsible for how they are run. Fostering these concepts will help create a generation that is more aware of the problems and issues
in the building industry than its predecessor, and this could result in a much stronger push for sustainability in the construction industry in the near future.

As with most new ideas, there are always skeptics and people opposed to them. Green buildings are no exception. People argue that green technologies and practices do not result in measurable decreases in resource and energy consumption, that it is just a method to obtain higher lease rates, and that the most advanced green buildings are still comparable to conventional buildings. These skeptics need to be silenced by objective and statistically sound information so that the green building revolution can progress unhindered. One of the best ways to promote green development is to have satisfied occupants speak out about the value and benefits of using and occupying these structures. Public awareness campaigns can use successful case studies and personal experiences to significantly strengthen their message.

8.2.2 Programs, Initiatives & Government Action:
Governments in many of the nations reviewed are choosing to make their buildings more energy efficient, are conducting energy retrofits in older existing buildings and are increasing the use of green technology in their new buildings in order to promote green building and lead by example. As governments are among the largest single owners of buildings in a nation and because they set the policy and laws that must be followed by their regions’ citizens, their efforts to support the green building movement must be strong if other people and groups are expected to follow. By implementing green practices and equipment into their own buildings, governments demonstrate that they are willing to make a commitment to improve their buildings and reduce their environmental impacts, and that green technologies are both feasible and cost-effective. In Canada, the federal government is doing its part through the Federal House in Order (FHIO) initiative and the Federal Buildings Initiative (FBI), but there is always room for improvement, such as increasing the coverage or funding of these programs or developing a new federal green building scheme. However, action by provincial and local governments in terms of green building commitments is relatively weak, and could use some more attention and improvement.

Governments should begin encouraging banks, lenders, and building associations to offer loans at better rates to customers planning to use the money in building renovation, greening or improvement projects. Any help to people interested in greening their buildings is good help and can lead to more widespread home and building greening. Canadian Governments should also begin offering programs that specifically support green building research and development and the development of new green technologies. Currently, many Canadian programs exist to fund research and development projects, but these programs do not specifically address green building practices and technologies. While there are many funding programs available, most programs in the broad category of “green building programs” focus on energy efficiency, as this one of the most important aspects of green building and one of the easiest areas to make significant improvements without significant investment. Although these programs are beneficial, governments and organizations should begin to diversify the green building programs they offer so that they more wholly reflect the values of the green building movement.
Even in world-leading green building countries, there are very few programs and initiatives that focus on waste minimization, resource management (other than energy, so water, building materials, etc.), site selection and maintenance, management of stormwater, relationship to local transportation initiatives, etc. So, to maximize green building adoption, programs and incentives should be offered wherever possible, should focus specifically on green buildings and green technologies, and should be diversified to offer support over the entire spectrum of green building areas.

Programs covering aspects of green building other than energy efficiency include Keep Australia Beautiful’s (KAB) Clean Site Program which provides building industry professionals with environmental guidelines focusing on erosion and sediment control, waste management and resource conservation. The Program also focuses on maintaining the overall environmental quality of the building site throughout the building period, with particular emphasis on minimizing negative effects on local waterways, rivers, creeks and beaches, which can experience significant increases in pollution and sediment load during and after the construction phases. Another non-energy green building initiative is how the German and Japanese Governments are incorporating sustainability into their public education systems, and how they are running public awareness campaigns and open educational workshops to increase public knowledge of green building and sustainability. A final noteworthy green building initiative that is not energy-related is the UK’s Waterwise Program, which was launched to promote water efficiency. The Program recognizes that the key to water efficiency is in reducing waste, not restricting use, and has focused its efforts to reduce the amount of wasted water in the UK. These efforts have included repairing over 270,000 leaking supply pipes, distributing over 2 million cistern devices (which reduce the unnecessarily high amount of water used in toilet flushing), and the provision of 15 million self-audit packs to help customers take steps themselves to use water more efficiently. The Waterwise website also has a water saving tips and a list of water saving products.

Governments should begin offering rebates for the purchase, installation and use of Energy Star Appliances and labeled energy or water efficient products. This is done in several of the countries reviewed (including in certain provinces in Canada), and has increased the use of these efficient products. These rebates can be small, to simply encourage the original purchase, because often these efficient products are slightly more expensive upfront, but save money over time through their efficiency and conservation levels. Rebates should be made available on appliances for homeowners, but also on efficient building materials to encourage builders and developers to use efficient products during construction. Additionally, groups in some of the other countries studied simply give out small products such as water-saving showerheads and energy efficient light bulbs for free, because so much water and energy can be saved over time for each comparatively cheap product given away. The savings made by society vastly outweigh the costs felt by the donating groups.

Building codes and requirements denote the minimum standards developers must adhere to in order to legally create a building in a given country. Outdated standards are sometimes cited as hindering the development of green buildings because they can
prevent or discourage the use of alternative and innovative building materials and designs. Municipal Governments should be regularly reviewing the building codes for their jurisdictions to make sure they are up-to-date and to periodically raise the minimum standards for things like energy and water efficiency. This is a mandatory or regulatory approach to greening buildings and slowly raises the bar for all types of development. Governments need to be aware of their building codes to make sure they are functioning properly; delimiting minimum standards for all buildings and making sure new and innovative practices, designs and materials are included so they can be used legally and without problem in sustainable building.

Developers prefer and value a process that speeds up planning approvals over minor cash incentives for green development, which typically represent a very small percentage of total project costs. A faster approval process can reduce the financial risks and costs associated with project delays. A fast-track process for green building proposals also has the added benefit of developing greater in-house company expertise to negotiate and network with developers of green building features. Governments should make arrangements in the building permit process to allow for the faster processing of green building proposals, as this acts as an incentive to get developers to build green. This might require the training of employees in the approval process so that they become more familiar with the current state of green building, and can go through plans at a faster rate.

Another incentive for developers to build green is to provide relief of taxes and development charges. The rationale for providing this relief is in the acknowledgement of the additional private expense incurred by the developer for the public good, particularly where the town or city hosting the development may receive measurable benefits. Although it is not really possible to accurately quantify the public benefits of a green building to determine the appropriate level of reduction in taxes or development charges, there should be some amount of fiscal relief for the builders of green buildings.

In terms of fiscal relief, monetary grants are also used to encourage green building. Grants and funding programs are an obvious way to promote green development and are used to varying degrees in all the countries reviewed. In each country, however, almost all if not all green building funding offered was used up, meaning that it is a very effective method of supporting the green building initiative. Still, if grants are to be an effective incentive, they need to be large enough to constitute a sizable portion of total project costs, or at least be part of a package of incentives that would tip the property owner’s cost-benefit analysis in favour of green development. Also, finding sources of funding for these large grants is often very difficult, which explains why many green building grants are government-issued. Nevertheless, grants and funding remain powerful incentives for green development, and should be used to promote this type of building whenever possible.

When developers apply to have some land rezoned, the government responsible for the process should negotiate with the applicant to have them incorporate green building practices and technologies into the development. The idea is evidently to obtain a win-win situation between the building company and the overseeing government which
desires the greener development. Several Canadian municipalities have been successful in leveraging greener development in this way, including Vancouver and Toronto. As a variation of this recommendation, municipalities should also consider zoning desirable land strictly for green development.

8.2.3 Technology, Products & Materials:
A conclusion reached from the literature review is that the roofs of buildings are basically wasted space if they are not green or if they do not have a renewable energy generator or apparatus on them, such as photovoltaic panels or a solar water heater. The roofs of buildings are seldom used by people, so they should be put to use in some other beneficial manner. Green roofs reduce noise pollution, act as insulation, prolong roof life, control stormwater runoff, and create wildlife habitat among other things, and are clearly more advantageous than a conventional shingled or graveled roof. Solar panels and other equipment can be installed on most normal roofs and provide the benefits of electricity generation through renewable sources, or energy conservation by using nature to do a task that would otherwise require energy to do (such as drying clothes or heating water). Efforts should be made in Canada to reduce the amount of “wasted roof-space.”

If more products are rated in terms of their effects on the environment, more people will take this into account when making a purchase. As seen through the experiences of other leading world nations, when more information on product energy consumption, life cycle, components, and creation or production methods is available, more care is taken when choosing a product. The easiest way to display this information is through a standardized information tag, often called a green labeling system. These rating systems are being used in leading green building nations with success, but only cover a small percentage of products and materials available. It is recommended that these information labels, such as the Canadian EcoLogo, be applied to a greater number of products so that one day the environmental impact of all goods can be readily available on the package of each product. It is also recommended that the labeling programs seek to increase the amount product information they provide.

The introduction of smart meters for energy consumption has shown to be successful in reducing consumption in the UK. When placed in a heavily used area of a home, such as the kitchen or front hallway, these energy meters show how much energy is being used by the home, and also serve as a visual reminder to reduce energy consumption. These meters should be brought to Canada, and installed in all new homes. In the UK, these meters helped residences reduce their energy use by an average of 3.5%, and similar levels of savings should also occur in Canada.

As slow market penetration and uncertainty about new green technologies and methods is limiting the speed at which green development is occurring, Governments should begin applying new building materials, technologies and practices in their own structures to demonstrate that there are significant benefits in their early adoption and use. This would likely increase the rate of market penetration by these technologies, and reduce uncertainty about their effectiveness or reliability, leading to increasing amounts of green development.
The material requirements of green buildings are such that locally produced materials, sustainable products, sustainably-produced products, reused or reuseable materials, or combinations of these materials need to be readily and easily obtainable by developers. Governments need to support the development of firms supplying green materials, as the number of these companies and their proximity to building sites affects the extent to which these products are used in construction projects.

8.2.4 Business Case for Green Buildings: Buildings with green features, whether residential or commercial, have been shown to become occupied faster than conventional buildings, as well as lead to higher lease rates and lower tenant turnover. Green buildings also reduce energy and water consumption levels, which are sometimes covered by the landlord in tenancy agreements. The recommendation here is to strengthen the link between green buildings and the cost savings and other benefits, to make them more appealing to landowners. Additionally, developers should be aware of the benefits they can receive for building green, and tenants should be told about the occupancy benefits of a sustainable building over a conventional one. The business case for green development is very important, and should be pushed at all levels if the industry is going to take off.

Along the same lines, because green buildings offer considerable benefits that conventional buildings can not provide, valuers must learn to differentiate between green and non-green buildings. Valuers and appraisers’ present reliance upon capital and operating costs is no longer an adequate description of a building’s worth. If the green building industry is expected to mature, appraisers must develop a more rigorous evaluation method for buildings that takes into account the numerous benefits of green features when coming up with the final value of a structure.

Obtaining official certification through a green building rating system such as LEED, BREEAM, CASBEE, or Green Star adds credibility to a building’s ‘green claim.’ These rating systems exist to determine the extent to which a building is in fact green, and also act as an advertising method for the buildings themselves. Green building owners should apply to obtain official third party green building certification from their nation’s respective certifying bodies, as there are numerous benefits for doing so.

8.2.5 Building Industry: The Canadian construction industry is structured so that the flow of knowledge about green practices and products is severely hindered. Firms often choose not to share new design techniques and technologies because they feel these are the things that set them apart from rival firms and make them more of a unique and desirable company. Efforts should be made to increase general knowledge of green practices between firms and with the general public, as this will increase the number of firms capable of doing the work and also increase the demand for the services themselves.

Finally, people involved in green building need to be encouraged and feel like they are making a difference through their actions and choices. It is essential for these people to
know that they are not acting alone against climate change, and that they are part of the entire sustainability and anti global warming movement. Humans are social animals, and need to feel like they are part of something bigger. Each additional person may not accomplish much on their own, but together the results can be enormous. As the saying goes, ‘the whole is greater than the sum of its parts,’ and this is the attitude the green building and sustainability movements need to succeed.

Appendix A: Green Building Council & Related Organization In-Depth Descriptions

A-1 United States:
The United States Green Building Council (USGBC) (www.usgbc.org) was founded in 1993, becoming the first National Green Building Council in existence. It is a national non-profit organization which operates and makes decisions based on the consensus of its member organizations. Acting as the United States’ premier resource for green building news and information, the USGBC is a coalition of American building industry leaders working to promote buildings that are environmentally responsible, profitable and healthy places to live and work. The USGBC is also a member of the World Green Building Council (WorldGBC) (www.worldgbc.org).

USGBC membership operates by word of mouth, with members varying from one-man businesses to multinational corporations. Its policies focus predominantly on the commercial sector and not residential (although these policies do exist) because the commercial market is less resistant to change, with more activity and less diversity. In the United States, the commercial sector accounts for 50% of total energy use, which also makes it a great place to start. The key here is to start where success is most probable, and move on from there.

With nearly 6,000 member organizations, the USGBC brings together a diverse community of professionals from businesses that design, construct, manage, finance, insure, own, and occupy buildings as well as government agencies and nonprofit corporations. These leaders have learned that you can green the environment and green your bottom line, leading to benefits and cost savings in the long-run. The USGBC offers a community of professionals who share similar goals about advancing more sustainable building practices. Member committees help shape green building products and services, and with chapters in almost every state, support groups for networking education, and green promotion are easy to find. The educational tools available through the USGBC provide access to knowledge that can be used immediately to move forward in the world of green building. USGBC members play a vital role in promoting green policy initiatives, which are increasingly popular topics among federal, state and local governments. Members also provide industry leadership to accelerate market transformation as they are able to display the USGBC Member Logo on promotional materials to let clients know about their green commitments. The USGBC offers publications, research and other informational tools to keep its members informed of the latest developments in green building. Additionally, the USGBC produces numerous newsletters containing recent green building issues, updates and information. Membership in the USGBC also reduces costs for LEED reference guides, training workshops, accreditation exams, project registration and certification, and other USGBC events such as Greenbuild.
The largest accomplishment of the USGBC to date has been the development of the LEED (Leadership in Energy and Environmental Design) Green Building Rating System (www.usgbc.org/DisplayPage.aspx?CategoryID=19). Introduced in 2000, LEED is a voluntary national standard for developing high-performance, sustainable buildings. Representing every sector of the building industry, USGBC’s members developed and continue to refine LEED, and have completed standards for numerous types of building projects including homes, new commercial construction and major renovation projects, existing building operations, commercial interiors projects, core and shell projects, neighbourhood development projects, and application guides for schools, healthcare facilities, laboratories, commercial lodgings, multiple building projects (such as university campuses) and retail stores (currently in pilot).

LEED provides a complete framework for assessing building performance and meeting sustainability goals. Based on well-founded scientific standards, LEED emphasizes state of the art strategies for sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. LEED recognizes achievements and promotes expertise in green building through a comprehensive system offering project certification, professional accreditation, training and practical resources.

LEED’s main goal is to facilitate positive results for the environment, occupant health and financial return through sustainable buildings. LEED is a successful green building rating system because it defines “green” by providing a standard for measurement. It also helps prevent “greenwashing” (false or exaggerated claims of sustainability and “greenness”) and promotes an integrated design process involving collaboration between architects, civil and mechanical engineers, electricians, plumbers, and construction workers to maximize sustainability, process interconnectedness and efficiency. Other benefits of LEED include the availability of numerous design guidelines to aid in green building planning and development, recognition of green building leaders, the stimulation of green competition, the establishment of recognizable “green” products, and its ability to increase global awareness concerning green buildings.

Another main accomplishment of the USGBC is the Greenbuild International Conference and Expo (www.greenbuildexpo.org). Since 2002, this annual gathering of industry professionals, companies, media organizations, sustainable building sponsors and enthusiasts from across the globe has reflected the world’s increasing interest in sustainable building practices. In Greenbuild’s first year, it drew more than 4,000 attendees to Austin – more than double the number projected. Since then, Greenbuild has grown by almost 40% per year with almost 10,000 attendees at the most recent show in Atlanta.

Greenbuild’s mission is threefold: to provide an exciting annual meeting place for the rapidly expanding green building industry, to serve as the pre-eminent showcase for leading-edge green technologies worldwide, and to deliver an outstanding educational program that highlights benchmarks of sustainability across a broad array of issues including site location and development, water and energy use, building materials, indoor
environmental quality, health and productivity, financing and more. Greenbuild features three days of exceptional educational programs, workshops, tours and speakers alongside an expansive exhibit hall and numerous sponsors.

However, there is another significant organization promoting the development of sustainable buildings in the United States. The Sustainable Buildings Industry Council (SBIC) (www.sbicouncil.org/) is an independent, non-profit organization whose mission is to advance the design, affordability, energy performance, and environmental soundness of America’s buildings. While increasing the number of sustainable buildings is the desired outcome of the SBIC, they are mindful that this goal must be kept in context with other equally important design objectives, such as aesthetics, accessibility, cost effectiveness, flexibility, high productivity, and security.

The SBIC was founded by the major building trade associations in 1980 as the Passive Solar Industries Council. While continuing to be an association of organizations committed to high-performance design and construction, they have since changed the group’s name to more accurately reflect the full scope of their efforts in the allied fields of architecture, engineering, building systems and materials, product manufacturing, energy analysis, and “whole building” design. While still being strong supporters of passive solar strategies and technology-driven building solutions, the work of the SBIC has touched on all aspects of sustainable design and construction: energy efficiency, renewable technologies, daylighting, healthy indoor environments, sustainable building materials and products, and resource conservation, which are all components that make green and better buildings possible.

The SBIC also offers and encourages industry partnership opportunities. By combining their diverse expertise, SBIC members have joined together with the US Department of Energy, the US General Services Administration, the US Environmental Protection Agency, and many others to create products and resources that no single group could create alone. The result is a large portfolio of practical and user-friendly tools and resources put forward by the SBIC for building industry professionals and homebuilders. These include the “Energy-10,” which is a software design tool for all types of buildings which analyzes the cost and energy savings that can be achieved through more than a dozen sustainable design strategies, the “Green Building Guidelines,” which is an easy-to-read, builder-friendly text applicable to homebuilders across the nation, and the “Whole Building Design Guide,” (WBDG) which is a web-based portal providing government and industry practitioners with one-stop access to up-to-date information on a wide range of building-related categories from a ‘whole buildings’ perspective.

On top of their tools and resources portfolio, the SBIC also offer a wide variety of sustainable building programs. These programs gently encourage newcomers to the movement to consider getting greener while showing them the wide array of opportunities and benefits sustainable building offers. At the same time, for those who are more experienced with sustainable buildings, the SBIC offers the aforementioned support tools and customized guidance. All of this is designed to meet the green building needs of builders, design professionals, building managers and owners, and procurement
specialists, regardless of experience or familiarity. The SBIC is also very concerned with
providing training workshops and seminars. With multiple sessions per month, the SBIC
is committed to increasing public knowledge and awareness of sustainable buildings and
increasing the uptake of green building practices in the overall building and construction
market.

A-2 Canada:
The Canada Green Building Council (CaGBC) (www.cagbc.org) was founded in 2002
and is a national nonprofit coalition of public and private building industry leaders
advocating for green buildings. It currently has over 1,100 member organizations, with
membership growing at an average rate of 10% per month. The CaGBC exists because of
the growing recognition that business as usual conditions in the building industry are
leading to serious environmental consequences and also as a response to the enormous
demand from people in all sectors of the building industry who want to improve the way
things are done.

The vision of the CaGBC is to transform the built environment in order to create a
sustainable future. In order to achieve this, the CaGBC promotes buildings that are
environmentally responsible, profitable, and healthy places in which to live and work by
engaging a national coalition of industry leaders (i.e., CaGBC members) to accelerate the
mainstream adoption of green building principles, policies, practices, standards, and tools.
It is the belief of the CaGBC, based on a growing body of evidence, that all three of these
objectives can be combined and are not mutually exclusive. The CaGBC also believes
that its actions will lead to faster green building uptake in Canada, meaning that the
CaGBC will help Canada realize the benefits of sustainable buildings sooner.

The CaGBC is closely affiliated with the USGBC and is the license holder for LEED in
Canada. The CaGBC has created LEED-Canada by modifying the USGBC’s LEED
Green Building Rating System to suit Canadian climates and standards. LEED has proven
itself to be consistent and legitimate in the United States, so the CaGBC developed
LEED-Canada to take advantage of this pre-existing system. In developing LEED-
Canada, the CaGBC hopes to gradually green industry standards as uptake of its
educational tools and best practice guidelines increases, and as people in general become
more aware of the green building movement.

While the development of LEED-Canada is the main accomplishment of the CaGBC to
date, it has also invested in other areas in order to maximize interest in and uptake of
LEED. The CaGBC has developed various resources to help groups interested in green
building to get started. It conducts green building training and information sessions,
LEED workshops, and general research concerning green buildings. It also administers
the exams to certify people as Accredited LEED Professionals. Generally speaking, the
CaGBC promotes the overall green building initiative by increasing awareness, and
encourages companies to develop green products to cater to this emerging market.
A-3 Germany:
Currently, Germany does not have a green building council, as it appears that green building practices and initiatives are put forward by a variety of different organizations and levels of government in this country. Despite not having a green building council, Germany is considered to be a leading nation in the green building initiative because of its reputation as being an innovative and advanced country. For example, Germany has been a global pioneer in the renewable energy sector, boasting the largest wind power, solar thermal and photovoltaic (PV) markets in the world and is a frontrunner in biofuel and hydrogen fuel technologies.

Germany has a Council for Sustainable Development (established in 2001) (www.nachhaltigkeitsrat.de/english.html), but this council addresses sustainability on a much broader scale. Its four main projects – modernizing and refurbishing old buildings to increase energy efficiency, increasing the energy efficiency of federal property, transferring knowledge of sustainability and proper land-use to developing countries, and campaigning for sustainable consumption – do address certain aspects of the green building initiative, but due to the more general scope of this council, the focus is predominantly on energy efficiency with little on the many other aspects of green building.

In Germany, many companies are realizing that the green building market is beneficial without requiring encouragement from a national green building council. German citizens are also beginning to demand more sustainable housing on their own, which has had the effect of increasing the demand for green building products and companies to produce them. German firms and citizens have realized that sustainable buildings are feasible, and that although many green procedures are quite simple, they can still reduce a building’s ecological footprint while saving money and adding value (such as aesthetic, interior environmental conditions and increasing building lifespan) at the same time. The German Council for Sustainable Development is having a profound effect on the overall actions of the German population as sustainable thinking becomes an increasing part of everyday life. There are many opportunities for other countries to learn a great deal from Germany’s green building initiatives and general sustainability practices.

Germany opened the Centre for Sustainable Building in 2001. Financed by the Chamber of Trade, this centre focuses on helping builders use renewable and recycled materials in their projects. At the same time, the German Ministry of Transport, Building and Housing published the “Guideline for Sustainable Building,” which is a lengthy document outlining how sustainable design should be applied in each phase of building construction in order to minimize the building’s environmental impacts and maximize its value. With green building and sustainability initiatives coming from a variety of different sources, the German approach is quite different from that taken in North America, where sustainability and green building programs originate from far fewer organizations and where sustainability is much less of a public concern.

A-4 Japan:
The Japan Green Building Council (JGBC) (www.jgbc.com) was founded in 1998 with 83 members. The JGBC, with 126 members to date, is currently more of a service-based green building council compared to others such as the USGBC. It offers free services, such as energy audits and surveys measuring surface temperature, whether wood is properly engineered or not, water use and treatment, and lighting efficiency. The goal is to gather data in order to prove the validity of JGBC with this information in hand. The JGBC is also a member of the World Green Building Council (WGBC).

The Japanese green building movement is younger than initiatives in many other countries and Japanese architects continue to lack considerable interest in green building. Currently architects design for ecological resistance or modern attractiveness, but these styles are also changing to incorporate more green practices and procedures. To date, the JGBC does not have a rating system for green buildings. Additionally, the Japanese government is helping to increase green building awareness as it demands that new buildings be green and that older buildings be greened. Japanese materials manufacturers are also beginning to make green products, but this continues to be at a relatively low level. Cost-competition is very important among Japanese buyers because it is usually more expensive to obtain products from abroad. About a quarter of the companies registered under the JGBC are based outside of Japan, and want to sell their products to the growing Japanese green building market. So, while the main goals of the JGBC include the promotion of green building awareness and the provision of greening services, encouraging Japanese manufacturers to create more green products is also a large concern.

Theaim of the JGBC is to reduce the environmental impact of the nation’s buildings through improvements in planning, construction and waste disposal. Certified as a national nonprofit organization in 2003, its website already receives over 1,000 hits per month and membership is steadily increasing.

Apart from its building auditing and surveying services, the JGBC has not yet started many other green building projects or procedures. Apart from a handful national green building seminars, the JGBC has so far played the role of a participant in initiatives put forward by other countries. Such initiatives include the 1999 Green Building Tour in the United States and various World-GBC meetings. But for a country that looks to gradually build up its own green building council, participating in initiatives started by other leading countries and learning from them is certainly an effective approach that will make the JGBC a leader in the near future.

There is also another large green building organization in Japan. The Japan Sustainable Building Consortium (JSBC) was established in April 2001 as a joint framework between industry, government and academia, under the auspice of the Japanese Ministry of Land, Infrastructure and Transport. The research activities of the JSBC have already provided numerous positive outcomes, the most important being the Comprehensive Assessment System for Building Environmental Efficiency (CASBEE). CASBEE is designed to evaluate the environmental performance of buildings – similar to how the LEED and BREEAM (Building Research Establishment Environmental Assessment Method) systems function. The intent is for CASBEE (along with LEED and BREEAM in their
own jurisdictions) to be applied extensively by the building industry in each stage of building construction in the near future, and to gradually transform the market in favour of more sustainable development.

**A-5 Australia:**
The Green Building Council of Australia’s (GBCA) (www.gbcaus.org) mission is to develop a sustainable property industry for Australia and drive the adoption of green building practices through market-based solutions. Founded in 2002, the GBCA is a national, not-for-profit organization that is uniquely supported by both industry and governments across the country. The organization is funded by membership income and sponsorship only, and more than 125 organizations have joined so far. These members include building product manufacturers, building owners and operators, professional building service providers, property developers, construction companies, university groups, and all levels of government. The two key objectives of the GBCA are to drive the transition of the Australian property industry towards sustainability by promoting green building programs, technologies, design practices and operations, and to integrate green initiatives into mainstream building design, construction, and operation.

The development of a comprehensive, voluntary national green building rating tool has been the GBCA’s top priority since it was established. In order to achieve its key objectives, the GBCA developed the Green Star Environmental Rating System for buildings in 2003 by working from the UK BREEAM and the US LEED systems. Green Star rating tools help the property industry reduce the environmental impacts of buildings, improve occupant health and productivity and achieve cost savings while showcasing innovative sustainable building practices. Being the developer and administrator of the national green building rating system, the GBCA is also the main provider of sustainable building education. The Council runs Green Star Accredited Professional courses throughout Australia to expand industry knowledge and awareness of Green Star and general green building practices.

The GBCA now has four office rating tools – office design, office as-built, office existing building and office-interiors. These rating tools were developed under the Green Star system and were released as a pilot for industry and stakeholder feedback in 2003. These tools evaluate the environmental performance of the design of a new office building or a building refurbishment to demonstrate that even small changes to building design can deliver real environmental and economic benefits. The GBCA also has an ongoing program to develop more rating tools and other resources to get more people involved in the green building movement. It currently has three more tools in pilot stages – retail design, health as built and education as built to assess the environmental performance of shopping centres and retail stores, healthcare facilities and educational facilities respectively.

Since its establishment, the GBCA has had a significant effect on the property industry by changing the industry’s culture to embrace and achieve more sustainable outcomes. In addition to its Green Star system and related tools and education sessions, the GBCA also runs and participates in a wide range of events, including major conferences and industry
seminars. The GBCA also hosts regular member-only educational and networking forums around the country.

Another Australian building rating system is the National Australian Built Environment Rating System (NABERS). NABERS is a performance-based rating system for existing buildings, and rates a building on the basis of its measured operational impacts on the environment. By assessing areas that building owners, managers or occupants have the ability to control, NABERS is designed to demonstrate what areas specific buildings need to improve on. This information can result in changes to building practices which can increase its overall sustainability. Like many other rating systems, NABERS is voluntary, but third-party assessment by a NABERS accredited assessor allows a building to become publicly recognized as a leader in environmental sustainability, and enables the building and building owner/manager to obtain some positive publicity.

A-6 United Kingdom:
There is currently no green building council for the United Kingdom, but the development of the United Kingdom Green Building Council (UKGBC) (www.ukgbc.co.uk) is in progress, with a prospectus released in late February 2006. The UKGBC is expected to be modeled on and closely related to the highly successful USGBC in terms of its mission and structure.

Although there are similar organizations doing the same kind of work in the UK, the general belief in British industry is that the establishment of a GBC will be a good way to coordinate green building efforts, deliver a green message to the wider world, and make green building resources and information available in a single place. The key objectives of the UKGBC will be to act as a champion for green buildings and to optimize profit for business by developing and enhancing the UK’s world class position in sustainable building design. If it can also successfully consolidate the nation’s green building initiatives, the UK’s national green building initiative will be more effective and efficient.

In fact, the largest other sustainable building council in the UK – BRE (Building Research Establishment), creator of BREEAM – actively supports the development of a UKGBC as it believes it would provide focus and leadership for sustainable construction in the country. BRE Chief Executive Martin Wyatt believes a Green Building Council will be beneficial to the green building movement. “If real transformation is to take place on the scale required, a national coalition is essential to promote and champion the design and construction of sustainable buildings,” he says. The two organizations will have slightly different scopes and missions, making them able to support each other.

BRE (www.bre.co.uk) is a building sustainability advocate that provides a complete range of consultancy, testing and commissioned research services covering all aspects of the built environment and associated industries. It makes significant contributions to the development of national and international standards and codes for construction and fire safety, and manages BREbookshop.com, which is one of the world’s biggest online construction bookstores. Through BRE Certification, BRE provides training and certification for UK, European and international standards, as well as CE marking and
product approval (CE mark on a product declares that it meets relevant European health, safety, and environmental protection standards). BRE’s expertise and services are applicable to a wide range of industry sectors including: hospitals and healthcare buildings, homes, schools, retail and leisure properties, offices and transport & infrastructure. It also offers comprehensive research-based consultancy for each stage of the construction process, including materials testing. BRE offers numerous training programs in addition to its extensive information resources.

The Association for Environmentally Conscious Building (AECB) (www.aecb.net) is another major sustainable building association operating in the UK. It was established in 1989 to increase awareness within the construction industry of the need to respect, protect, preserve and enhance the environment: principles that have become known collectively as “sustainability.” The AECB is a network of individuals and companies with a common aim of promoting sustainable building. It is not an accrediting body and membership does not imply any level of either a trade, professional or environmental competence.

The Association includes local authorities, housing associations, builders, architects, designers, consultants and manufacturers, and is proud to have Professor Chris Baines, one of the UK’s leading independent environmentalists, as its Honourary President. This member list includes some of the leading authorities and activists within the environmental construction movement. The AECB is represented at the national governmental level and is routinely consulted on crucial industry matters such as changes to statutory building regulations and government green building strategies and initiatives. Collaboration with other environmental organizations currently includes work with Green Peace and the World Wildlife Fund (WWF). The Association’s website has a variety of green building resources including a public discussion forum as well as a private forum for AECB members, general information about green building practices and initiatives, a building energy standards guideline, and information concerning various training courses (with emphasis on AECB’s own SussEd Training Program). This program was established to inform the construction workforce, both in the office and on-site, about the importance of sustainability and how it can be applied in design and construction processes. Other training programs offered through the Association include how to make buildings more energy efficient, the use of renewable energy, and waste management techniques.

A-7 World Green Building Council:
The World Green Building Council (WorldGBC) (www.worldgbc.org/) was announced in 1998 by David Gottfried, founder of both the WorldGBC and the USGBC, at the kickoff meeting of the Japan Green Building Council. The WorldGBC held its founding meeting in November 1999 in San Francisco, USA, with the green building councils from seven countries in attendance, including: the United States, Australia, Spain, Canada, Japan, India, and Mexico.

The WorldGBC is a network of green building councils from around the world who are committed to making the property industry more sustainable. According to the WorldGBC, the property industry is defined as all those who produce, develop, plan,
design, build, alter, or maintain the built environment, and includes building materials manufacturers and suppliers as well as clients and end use occupiers. The vision of the WorldGBC is to be the peak global not-for-profit organization working to transform the property industry towards sustainability through its members - national Green Building Councils, and its mission is to provide a “federal union” of national Green Building Councils whose common goal is the sustainable transformation of the global property industry. To accomplish these goals, the WorldGBC will: establish common principles for green building councils, serve as a global voice on behalf of green building councils, support and promote individual green building councils, encourage knowledge transfer between green building councils, recognize global green building leadership, and encourage the development of market based environmental rating systems. The longer term objectives of the WorldGBC are to: create a global market for green building through the creation of successful national green building councils, be the peak global voice for green building issues, represent no less than 60% of the global property industry through countries with green building councils, have a dynamic web presence that serves as the preeminent portal for global green building news, and to have collaborative relationships with all other complimentary global organizations.

The WorldGBC website offers a “GBC Establishment Roadmap,” which outlines the basic steps for the creation of a GBC. The WorldGBC is committed to the promotion of programs, projects and activities related to green building design, construction and operations. Demands upon the WorldGBC primarily focus on fulfilling the need for education, information, model development and consulting activities. Based on these demands, the WorldGBC delivers the following three specific tools/resources. The first is a website capable of sharing green building information, case studies, government initiatives, construction projects, rating systems, and technologies. The website also includes a forum for members and non members to voice their opinions and knowledge of the latest green building practices. The second tool is a WorldGBC Toolkit to provide models and examples of green building council organizational structures, by-laws, officer and board responsibilities, funding opportunities, and products such as green building rating systems. The third is an annual International Congress with two goals: to share successful models of green building councils, and to provide a formal forum where members have input to guide the growth and operations of the WorldGBC.

Appendix B: In-Depth Country Reviews:

B-1 United States:

Green Building Tax Credits (GBTCs):
Being one of the leading countries in the green building movement, the United States is taking numerous steps to promote the uptake of green building rating systems, programs, and green buildings in general. One of these steps is the green building tax credit (GBTC), which has been implemented by several states. As green buildings can have higher material and design costs compared to normal or benchmark buildings, tax credits available to green building designers and builders can offset these higher initial costs, and help make green building planning and construction costs more comparable to those of average buildings. These credits allow early adopters in the market to overcome the early price barriers to new technologies and practices while increasing the market share of
green buildings and technologies. Equally as important, tax credits help validate green building practices through the state’s visible endorsement. The idea behind such tax credits is that as the market share for green buildings increases, the barriers to these practices and technologies will decrease and the credits will no longer be needed.

The American states that currently are using GBTCs are New York (the first state to do so [made law in 2000, implemented 2002]), Maryland (implemented 2002) Massachusetts, Oregon, and New Jersey. Other states currently looking into developing a state GBTC are Pennsylvania, California, and Rhode Island. The New York GBTC allows builders who meet energy goals and use environmentally preferable materials to claim up to $3.75 per square foot for interior work and $7.50 for exterior work against their state tax bill. To qualify for the credit, a building must be certified by a licensed architect or engineer, and must meet specific requirements for energy use, materials selection, indoor air quality, waste disposal and water use. Each state’s GBTCs are structurally similar, and although each operates a little differently, they all support the USGBC’s LEED green building rating system by offering tax incentives on a sliding scale that increases the tax benefits as the LEED certification level rises.

The Enterprise Foundation’s “Green Communities”:
The Enterprise Foundation, in partnership with the National Resources Defense Council, have also developed an incentive program called “Green Communities,” which assists green developers by providing grants, technical assistance, tax-credits, and flexible low-cost financing. Green Communities is a 5-year, $555 million initiative to build more than 8,500 environmentally healthy and sustainable homes for low-income families. The initiative is designed to transform the way America thinks about, designs and builds affordable communities.

City financial incentive examples:
Additionally, some cities and counties have developed their own financial incentives and tax breaks to promote the use of green buildings. For example, the City of Seattle, Seattle City Light and Seattle Public Utilities have teamed up to fund a program that provides financing for green building projects meeting some level of LEED certification. Through the “LEED Incentive Program,” applicants commit their projects to receive a minimum rating of “LEED Certified.” All these projects receive funding based on individual negotiations, but minimum grants for “LEED Certified” projects is $15,000 and for “LEED Silver” is $20,000. $10,000 of the funding will be paid when the agreement is signed, and the balance will be paid upon successful LEED certification of the building. These grants may only be used for soft costs, which include but are not limited to LEED third-party assessments and fees, and professional services such as energy audits. Hard construction costs cannot be covered by these grants. Finally, if a project fails to obtain LEED certification, the applicant must reimburse Seattle City Light for the funds received. In addition to this program, this Seattle trio also runs the “Built Green Incentive Program,” which is a similar type of program only instead of applying to commercial buildings and being related to LEED, it applies to residential development and requires certification by the Master Builders Association of King and Snohomish Counties. Another example of a city’s green building financial incentive is Portland’s Green
Investment Fund (GIF), which is meant to help offset the incremental costs of green building projects in the Portland area which meet high levels of environmental performance through multi-faceted and innovative designs, progressive technologies, and best practices. Both public and private projects can apply for a total of $500,000 in aid available per year, with a maximum of $150,000 available per project. A 3:1 cost share ratio is required, meaning that a $90,000 package of approved green building and site measures may be eligible for a $30,000 GIF grant award. To date, the GIF has distributed nearly $1.5 million to developments demonstrating innovation in green building technologies and practices in Portland.

**Renewable energy generator incentives:**
Incentive programs are also coming into place for buildings that use various new technologies to draw power from sustainable energy sources. For the first time in a generation, the federal government will offer income tax credits for new solar energy installations. The Energy Act of 2005 also clears a major obstacle to decentralized electric production by amending existing law to require every public electric utility to offer net metering. This means that utilities must purchase power from small-scale electric producers, such as photovoltaic and wind. The new solar tax credit covers 30 percent of the system cost up to $2,000, after taking into account state and utility incentives. Solar water heaters, except pool heaters, and photovoltaic systems installed in 2006 and 2007 are eligible. Arizona and Oregon have taken solar incentives a step further, with Arizona allowing residential customers who use solar power to receive a rebate of $4 per watt of solar electric power installed in a grid-tied application, and $2 per watt installed in an off-grid application. There is also a personal income tax credit for residents that install a photovoltaic power system on their property. This one-time credit applies to both on- and off-grid residences and amounts to 25% of the system price or $1,000, whichever is less. Oregon also raised its income tax credit for photovoltaic systems to an unprecedented $6,000 per installation. Starting in 2006 and for the next 10 years, Oregon citizens who install photovoltaic systems can receive $3 per watt. The total credit is $6,000, but it can be taken only $1,500 per year over four years. The United States currently generates 156MW of solar energy, which translates to approximately 7% of the global total.

**Million Solar Roofs initiative & Solar America Initiative:**
The Million Solar Roofs Initiative (MSR) had the American national government and various state governments teaming up to provide incentives to home owners for installing solar panels on their roofs. These rebates were approximately $2.80 per watt of generating power, and with the average home installing 3kW systems, the final result should have been an increase of about 3,000MW of solar generating power. However, the program was not finished as it was swept up into the Solar America Initiative (SAI). The goal of the SAI is to accelerate the development of advanced solar electric technologies, including photovoltaics and concentrating solar power systems, with the goal of making them cost-competitive with other forms of renewable electricity by 2015. The SAI has a budget of $148 million and will continue with the MSR installation incentives, as well as fund photovoltaic and solar power R&D at universities, government laboratories, and in the industry. Although the MSR incentives are the only part of the SAI currently in action,
the rest of the SAI program is set to commence in 2007. It is anticipated that by 2015, American solar power will provide 5-10 GW of new electric capacity (equivalent to the amount of electricity needed to power 1-2 million homes) to the U.S. grid, avoid 10 million metric tons per year of CO₂ emissions, and employ 30,000 new workers in the PV industry.

**Incentive example for water conservation:**
Various incentives also exist across the United States for conservation efforts concerning other resources. The East Bay Municipal Utility District (EBMUD) of eastern San Francisco offers a set of rebate programs to help and reward consumers for their water efficiency and conservation efforts. These programs include rebates of between $50 and $125 for the purchase and installation of certain efficient clothes washing machines, $125 for high-efficiency toilets (HETs), free water-saving showerheads and faucet aerators, and rebates for any hardware change that will result in predictable water savings. The ‘hardware change’ rebate covers up to half the cost of the equipment leading to the increased water efficiency. Any hardware change leading to water savings is eligible for this rebate. The EBMUD water-conservation effort also provides free technical assistance through informative workshops, on-site water surveys, water conservation studies, and waterwise self-survey toolkits.

**Clean Energy States Alliance (CESA):**
Additionally, 14 states across the U.S. with established clean energy funds or programs have banded together to promote clean energy technologies. The 14 states involved in this initiative are Arizona, California, Connecticut, Illinois, Massachusetts, Minnesota, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Washington and Wisconsin. These states are considered to be the most advanced in the country in terms of green building and resource conservation initiatives, and make up The Clean Energy States Alliance (CESA). CESA is a nonprofit organization comprised of members from the aforementioned 14 states, 16 clean energy funds and two state agencies. It provides information and technical services to its members and works with them to build and expand clean energy markets in the United States. The CESA also collects and disseminates information and analysis, conducts original research, and helps to coordinate activities of the state funds. In the process of assisting the state funds, they also hope to help other state officials, clean energy developers, and environmentalists who share an interest in developing cleaner energy markets. In addition, the CESA hosts a listserve for official representatives of state funds, issues a periodic e-newsletter about state funds, writes case studies on actual projects funded by the states, and hosts conferences to help the state fund officials develop their renewable energy programs. The main objective of the CESA is to increase the quality and quantity of clean energy deals to greatly expand the clean energy market in the United States. For a detailed listing of American federal and state incentives for increased energy efficiency, look in the Database of State Incentives for Renewable Energy (DSIRE) at http://www.dsireusa.org/.

**National Renewable Energy Laboratory (NREL):**
The National Renewable Energy Laboratory (NREL) is the nation’s primary laboratory for renewable energy and energy efficiency R&D. NREL is the principal research
laboratory for the Department of Energy’s (DoE) Office of Energy Efficiency and Renewable Energy which provides the majority of its funding. Other funding comes from DoE’s Office of Science and Office of Electricity Transmission and Distribution. NREL’s technical disciplines focus on development and characterization of renewable energy and energy efficiency technologies. They include: biological sciences, building technologies, chemical sciences, computational sciences, electrocatalysis, energy conversion and storage, materials sciences, nanoscience, optoelectronic technologies, solid state spectroscopy, and solid-state theory. In addition, NREL is developing a systems integration capability. The systems integration function will deliver independent and objective analyses, advice, and planning options that enable DoE to make informed program decisions that advance the goals of the DoE Hydrogen Program. NREL partners with international, environmental, and government agencies to find renewable energy and energy efficiency solutions. The Laboratory works with industry to transform NREL expertise and technology into commercially viable products. The Laboratory also licenses its technologies to promote commercialization of clean, efficient, and sustainable energy options. A significant portion of American energy R&D is done by the NREL, which is encouraging as this type of research is all focused on sustainable energy.

**Sustainable Energy Coalition (SEC):**
The Sustainable Energy Coalition (SEC) brings together more than 30 national business, environmental, consumer, and energy policy organizations to promote increased federal support for energy efficiency and renewable energy technologies and reduced federal support for unsafe or polluting energy resources. Coalition members advocate federal energy policies that will lead to a cleaner environment, safe reliable energy technologies, and a secure, prosperous future for all Americans. Areas of Coalition activity include policy decisions on the federal budget, electric utility restructuring, pollution prevention, climate change, and tax policies. Member organizations of the Sustainable Energy Coalition do not support every item or issue adopted by the Coalition and generally focus on their issue area within the Coalition recommendations and policy positions. SEC members include such notable organizations as the Alliance to Save Energy, the American Council for an Energy-Efficient Economy, and the World Wildlife Fund.

**American Council for an Energy-Efficient Economy (ACEEE):**
The American Council for an Energy-Efficient Economy (ACEEE) is a non-profit organization dedicated to advancing energy efficiency as a means of promoting both economic prosperity and environmental protection. The ACEEE fulfills its mission by: conducting in-depth technical and policy assessments; advising policymakers and program managers; working collaboratively with businesses, public interest groups, and other organizations; organizing conferences and workshops; publishing books, conference proceedings, and reports; and educating consumers and businesses. ACEEE projects are carried out by staff and selected energy efficiency experts from universities, national laboratories, and the private sector. The ACEEE’s program areas include: energy policy; buildings and equipment; utilities; industry; transportation; international development; and Communications and Conferences. Collaboration is key to ACEEE’s success. It collaborates on projects and initiatives with dozens of organizations including federal and state agencies, utilities, research institutions, businesses, and public interest
groups. The ACEEE is not a membership organization. However, it does send out notices of publications, conferences, and other activities to over 30,000 interested individuals. Support for the ACEEE’s work comes from a broad range of foundations, governmental organizations, research institutes, utilities, and corporations. The ACEEE is an important organization in the United States and abroad because while focusing their work in the US, it is also involved to varying degrees in projects from around the world.

Alliance to Save Energy (ASE):
The Alliance to Save Energy (ASE) promotes energy efficiency to achieve a healthier economy, a cleaner environment, and greater energy security. The website (http://www.ase.org/content/article/detail/2356) provides a great deal of information to the public, including a list containing descriptions of and links to state tax incentives for increased energy efficiency, a list of state energy efficiency programs, building codes, appliance standards, and much more.

The ASE also runs numerous programs promoting energy efficiency and conservation. For example, the ASE partners with the American Council for an Energy-Efficient Economy and the Natural Resources Defense Council in the Appliance Standards Awareness Project (ASAP) to help finalize standards and minimum energy performance requirements for everyday home and commercial appliances. Appliance and equipment efficiency standards reduce energy use, save consumers and businesses money, and cut power plant pollution that harms public health and the environment. The ASAP works to advance and improve standards at both the federal and state levels, so the energy consumption of common household appliances can be as small as possible across the United States. The BestPractices Steam Program teaches industrial plant managers about steam system efficiency improvement opportunities through a series of regional workshops that introduce audiences to BestPractices program resources. The workshops also feature presentations by industry experts from Alliance Associates, including Spirax Sarco, Armstrong Service, and the National Insulation Association. US industries spend more than $24 billion annually on energy to produce steam, yet research shows that energy-efficiency measures can easily cut that expense by 10 to 20 percent. This statistic alone shows the need for the BestPractices Steam Program.

The Renewable Energy and Energy Efficiency Partnership (REEEP) is an initiative managed by the ASE along with Alliance Associates American Council on Renewable Energy (ACORE). REEEP looks to reinforce the important work of energy efficiency and renewable energy across the globe (but specifically in North America). The ASE works in close cooperation with REEEP partner ACORE and its key stake-holders in the business, government, environment, education and consumer communities to lead a dialogue on the role of energy efficiency and its contribution to economic productivity, national security, social welfare, and environmental preservation. Operating specifically through its many unique and result-orientated programs and task forces, the ASE helps to address the following areas for REEEP: energy policy advocacy and awareness building; building codes and appliance standards; industrial and corporate energy management; energy efficiency programs in schools and universities; energy efficiency financing; market transformation; and energy efficiency outreach. The goal of REEEP is to
accelerate and expand the global market for renewable energy and energy efficiency technologies.

If only ten southern US states installed energy-efficient windows in all new buildings over the next twenty years, the resultant energy savings could prevent the emissions of 1.5 million tons of carbon. For some homeowners, upgrading to energy-efficient windows could cut annual energy costs by more than $500, yet, according to recent estimates, only 35 percent of US homes currently use Energy Star-certified windows. To help increase the use of energy-efficient windows, the ASE established the Efficient Windows Collaborative to promote energy performance rating and labeling among manufacturers. The Collaborative also educates builders, homeowners, and other consumers about the benefits of energy-efficient windows.

The Responsible Energy Codes Alliance (RECA) is another ASE initiative and is a consortium of energy-efficiency professionals, product and equipment manufacturers, and trade associations whose primary objective is to support and urge all states and local jurisdictions to adopt and implement the most recent International Energy Conservation Code (IECC) without substantive local weakening amendments. The RECA also works to improve the energy efficiency of homes through greater use of energy-efficient practices and building products. To accomplish these objectives, RECA is actively involved in discussions and processes of state and local jurisdiction code adoption.

When a manufacturer with a five percent profit margin achieves one dollar of net savings through energy efficiency, the impact on net income is equivalent to generating $20 of revenue. Despite this simple and direct relation between energy-efficiency and the bottom line, many plant managers struggle to convince top management that energy efficiency is a worthwhile investment. Therefore, the mission of the ASE’s Executives for Energy Efficiency (E4EE) Program is to motivate business leaders to improve business performance through energy efficiency. The project seeks a full understanding of the issues that compete with the implementation of energy efficiency. These issues include the uncertainties of deregulated energy markets, professional divisions between engineers and finance staff, the unforeseen impacts of new technology, and other potentially conflicting priorities. The project also develops strategies for promoting and implementing energy efficient practices in industry.

The Alliance to Save Energy also runs the Green Campus and Green Schools Programs, both of which try to reduce energy consumption and redirect money away from utility bills towards academics and other developmental areas. Through Green Campus, students are working to save energy on campuses by building general campus awareness, incorporating energy conservation and efficiency into course curricula, and implementing projects targeting energy use, student purchasing decisions, and operational changes. The Green Schools Program engages students in creating energy-saving activities in their schools using hands-on, real-world projects. Through basic changes in operations, maintenance, and individual behavior, Green Schools has achieved reductions in energy use of 5 to 15 percent among participating schools. In addition, Green Schools
encourages students to apply the lessons of energy-efficiency message in their homes and communities.

The ASE’s Federal Energy Productivity (FEP) program has been a leader in advancing energy efficiency within the Federal government for a decade now. The ASE supports the DoE’s Federal Energy Management Program (FEMP, described later in more detail) efforts to reduce federal energy use by providing training, private sector liaison, and research and analysis on financing options for energy efficiency projects and other issues. The ASE is uniquely positioned to develop and maintain liaison between private sector energy efficiency industries and organizations and the federal government. The Alliance brings these organizations together through the FEP Task Force to address barriers to advancing energy efficiency in federal facilities. The ASE also educates decision makers within the government on the importance of increasing energy efficiency in federal facilities, and, since the passage of the Energy Policy Act of 2005, has supported government agency efforts to implement the federal energy-saving provisions of the bill. The Alliance also develops and promotes new training for energy efficient technologies and energy management practices in partnership with the private sector. It hosts workshops in federal facilities, provides training seminars and sponsors peer-to-peer exchanges. In addition, the Alliance has a long history of researching, developing and promoting alternate financing mechanisms, such as Energy Savings Performance Contracting (ESPC), for undertaking federal energy improvement projects.

Consortium for Energy Efficiency (CEE):
The Consortium for Energy Efficiency (CEE) is a non-profit public benefits corporation that develops initiatives for its North American members to promote the manufacture and purchase of energy-efficient products and services. Their goal is to induce lasting structural and behavioral changes in the marketplace, resulting in the increased adoption of energy-efficient technologies. In today’s restructured utility market, some US states are continuing with utility administration of energy-efficiency programs while other states are designating public agencies for this work. The CEE serves the needs of both, providing a forum for the exchange of information and ideas. The CEE members include utilities, statewide and regional market transformation administrators, environmental groups, research organizations and state energy offices in the US and Canada. Also contributing to the collaborative process are CEE partners – manufacturers, retailers and government agencies. The US Department of Energy and the Environmental Protection Agency both provide support to the CEE through active participation as well as funding. The CEE encourages utilities and other partners to pool their market influence by voluntarily adopting common programs and efficiency specifications used in the creation of their products. The goal is a permanent increase in the supply and usage of energy-efficient products and services. The CEE has successfully used this approach to increase the availability of high-efficiency products including clothes washers, refrigerators, lighting systems, HVAC equipment, and motors in the United States.

Energy and Environmental Building Association (EEBA):
The Energy and Environmental Building Association (EEBA) provides education and resources to transform the residential design, development and construction industries to
profitably deliver energy efficiency and environmentally responsible buildings. The EEBA runs numerous events and training programs to help increase the skills of the US building industry so they can more implement sustainable design in their daily work. Its website has numerous building resources and publications on it, and even has an online bookstore where hard copy learning materials can be procured. The EEBA is directed mainly at industry professionals, but its online resources can be useful to the general public as well.

**Energyhawk.com:**
Energyhawk.com is an independent reference library of energy conservation tips for homes and businesses. The site depends on the contributions of thousands of individuals who publish information about energy conservation and develop new technologies that allow Americans to use less energy. It is a great place for Americans to find tips on reducing their energy consumption in all areas of their homes and daily lives.

**Energyguide.com:**
Energyguide.com is another website with information on how to reduce the energy consumption of homes and businesses. However, unlike energyhawk.com, this site focuses less on tips and more on how to change the way consumers use their energy and on how to switch to a greener energy provider. The site also offers a set of tools that can help people analyze their homes and businesses to identify areas that could see improvements in energy use and efficiency. Energyguide.com has a section to help customers locate contractors to help with home energy efficiency upgrades and suppliers of green and energy efficient products. While focusing less on tips and more on tools, Energyguide.com provides a different but still useful service compared to energyhawk.com.

**Energy Service Companies (ESCOs):**
The hiring of Energy Savings Performance Contractors (sometimes called ESCO businesses) is an effective way for companies to improve their energy efficiency and save money. The method is simple: first, a company decides it wants to improve the energy efficiency of their facility. They then hire an ESPC consultant to conduct an assessment of their building. Once the assessment is complete, the consultant makes recommendations where changes can be made to improve energy efficiency. Once the desired changes have been made, the ESPC is paid an amount equal to or less than the amount of the savings on the energy bill, until the costs of the assessment and any additional energy efficiency work or technology installation are covered. Then, the company realizes 100% of the benefits of the increased energy efficiency. ESCO agreements have two forms, “Guaranteed Savings Agreement” and “Shared Savings Agreement.” Guaranteed Savings Agreements are where the consumers cover the costs of the energy improvements, and Shared Savings Agreements are where the ESCO business covers these costs. What is important to note is that the repayment contract is longer or larger depending on the extent to which the ESCO business covers the improvement costs. The ESPC business strategy makes sense for both itself and the firms interested in the ESPC’s services because the ESPC is able to provide a valuable service and make a profit, while the receiving firm never pays more than it would have to under business as usual.
conditions, and eventually they are able to improve their energy efficiency and save money. The market for ESPCs has been growing steadily in the United States as more companies realize the size of the potential market, and as more firms experience the benefits of ESPC services.

**National Association of Energy Service Companies (NAESCO):**
The National Association of Energy Service Companies (NAESCO) has been the preeminent national trade organization in the energy services industry for 22 years, representing all key stakeholders and acting as the industry advocate for the delivery of cost effective energy services to all customer classes. It is the home of key industry players including ESCOs and ESPCs, distribution companies, distributed generation companies, engineers, consultants, and finance companies. NAESCO works collaboratively with allied trade groups, policy groups and customer representatives to accelerate the growth of the energy services industry, and improve their services. To do so, NAESCO runs accreditation and training programs, conferences and online seminars to build the capacity of the energy service companies.

**New Buildings Institute (NBI):**
The New Buildings Institute (NBI) is a non-profit public benefits corporation dedicated to making buildings better for people and the environment. The two approaches the NBI uses to achieve its goal are: the market-based approach, which utilizes education, technical information, design assistance, financial incentives, and other such devices to accelerate the voluntary adoption of energy efficient building practices; and the regulatory approach, through energy codes. Energy codes are arguably the most cost effective and permanent mechanism available for reducing building energy consumption over the long run. Changing energy codes can be considered the purest form of market transformation because they affect all buildings, give clear signals to manufacturers and distributors of energy efficient products about their requirements and responsibilities, and because they are permanent. The NBI works with national, regional, state, and utility groups to promote the basic understanding of this strategy amongst policy makers. It serves as a carrier and distributor of ideas between states and regions. The Institute also coordinates projects involving building research, design guidelines and code activities to make sure that all of the elements of this chain are available for use by energy efficiency programs in the Northeast, Midwest, Northwest and California.

**Regulatory Assistance Project (RAP):**
The Regulatory Assistance Project (RAP) is a non-profit organization formed in 1992 by experienced utility regulators that provides research, analysis, and educational assistance to public officials on electric utility regulation. The RAP runs workshops which cover a wide range of topics including electric utility restructuring, power sector reform, renewable resource development, the development of efficient markets, performance-based regulation, demand-side management, and green pricing. The RAP also provides regulators with technical assistance, training, and policy research and development. It has worked with public utility regulators and energy officials in 45 states, Washington D.C., Brazil, India, Namibia, China, Egypt, and a number of other countries. The RAP’s associates have also written and spoken extensively on energy policy and regulation.
RAP Issues Letters, published quarterly, and RAP’s many in-depth reports and conference presentations provide serious and thoughtful discussion of cutting-edge issues in utility industry restructuring (including market power, stranded costs, system benefits charges, customer choice, and consumer protection), and other current topics (including resource portfolio management, policies for distributed generation and demand-side resources, distribution system regulation, reliability and risk management, rate design, electrical energy security, and environmental protection). It is a very committed organization fostering regulatory and market policies for the electric industry that encourage economic efficiency, environmental protection, system reliability, and the fair allocation of system benefits to all customers.

American Energy Efficiency Alliances:
American Energy Efficiency Alliances are non-profit corporations supported by electric utilities, public benefits administrators, state governments, public interest groups and energy efficiency industry representatives that work together to make affordable, energy-efficient products and services available in the marketplace. Alliance stakeholders promote and achieve energy efficiency through program activities and education for a cleaner environment, more prosperous economy, and higher quality of life across the US. Current American Energy Efficiency Alliances and similar groups include the Northwest Energy Efficiency Alliance, the Midwest Energy Efficiency Alliance, the Southwest Energy Efficiency Project, the Northeast Energy Efficiency Partnership, the Northeast Sustainable Energy Association, and the Southeast Energy Efficiency Alliance.

Tax Incentives Assistance Project (TIAP):
The Tax Incentives Assistance Project (TIAP) is sponsored by a coalition of public interest non-profit groups, government agencies, and other organizations concerned about energy efficiency. It is designed to provide information about federal income tax incentives for energy and resource efficient products and technologies to the public, with the goal of increasing the use of these incentives and subsequently augment resource conservation. TIAP activities include: providing information to the public through its website; working with the Departments of Treasury, Department of Energy and other agencies on tax incentives and the rules of their implementation; providing information, presentations and technical assistance to state and utility program implementers who want to use federal tax incentives to compliment their local programs; and networking with various firms and associations that provide products and services eligible for these tax incentives. TIAP has been instrumental in helping people set up tax rebate programs for energy efficiency practices all over the United States.

Advanced Technology Program (ATP):
Another program that indirectly encourages new green building technologies is the Advanced Technology Program (ATP), which invests in risky, challenging technologies that have the potential for substantial improvement in the country’s economy or normal functioning. By reducing early-stage research and development risks for individual companies, the ATP enables industry to pursue promising technologies which otherwise would be ignored or developed too slowly to compete in rapidly changing world markets. Research priorities for the ATP are set by industry, not the government. For-profit
companies conceive, propose and execute ATP projects and programs based on their understanding of the marketplace and research opportunities. The ATP selection process, which includes both government and private-sector expert reviewers, identifies the most meritorious efforts from among those proposed by industry. The ATP does not fund companies to do product development. The ATP funds R&D to develop high-risk technologies up to the point where it is feasible for companies to begin product development, but that they must do on their own. With the importance of sustainable building growing in the United States, the ATP is likely to support and contribute to the development of new green building technologies.

**US Department of Energy’s Office of Energy Efficiency and Renewable Energy:**

The US Department of Energy’s (DoE) Office of Energy Efficiency and Renewable Energy (EERE) also provides a series of programs that encourage energy efficiency in all areas of American society. It promotes energy efficiency through two mechanisms: financial assistance and energy efficient procurement. Through financial assistance, EERE provides funding for renewable energy and energy efficiency research and development. Financial assistance awards transfer money, property, or services to a recipient so that it can accomplish a public purpose authorized by federal statute. In the fiscal year of 2004, the EERE awarded $506 million in financial assistance. Specific types of financial assistance directly funded by the EERE include grants, cooperative agreements (similar to grants but the federal government is allowed more control and involvement in the project), continuation awards (awarded after the initial budget period has expired to fund subsequent budget periods as necessary for the project's completion), and renewal awards (used to extend existing projects). In addition, financial assistance may be available through other organizations in the EERE’s funding stream. Examples of these types of funding mechanisms are subawards (financial support for businesses or organizations that work on a project but are not the primary awardee), laboratory subcontracts (competitive, research-oriented grants), and cooperative research and development agreements (partnerships in which a private sector partner and a national laboratory work together to further R&D). The EERE also works with businesses and outside agencies through energy efficient procurement. A procurement contract is used to purchase, lease, or barter property or services for the benefit of the federal government. For example, the EERE would use a procurement contract to purchase energy efficient computers for its employees. In the 2004 fiscal year, the EERE procured $44 million of energy efficient goods and services.

The DoE also manages the Building Energy Codes Program, which is an information resource on national energy codes and requirements for buildings. The DoE works with other government agencies, state and local jurisdictions, national code organizations, and industry to promote stronger building energy codes and help states adopt, implement, and enforce these codes. The Program recognizes that energy codes maximize energy efficiency only when they are fully embraced by users and supported through education, implementation, and enforcement. The Program’s website offers the REScheck and COMcheck software utilities, which help users evaluate their homes’ and businesses’ energy use to see if improvements in efficiency can be made. Additionally, the website
has links to the Building Energy Codes Resource Centre and an area where questions can be emailed directly to energy code experts.

Department of Agriculture renewable energy grant:
The United States Department of Agriculture (USDA) announced in May 2006 the availability of $14.3 million in grants for value-added agriculture business ventures, with priority consideration to applications that dedicate at least 51% of the project costs to biomass energy R&D. Already, the USDA has funded more than 80 energy projects through this program for biomass, wind power, biodiesel and ethanol. The grants are available for planning activities or to acquire working capital to operate a business venture, such as a biomass energy facility.

Federal & Municipal green building requirements:
The Federal Government and some Municipal Governments are now requiring that new government buildings must be green buildings. These requirements are based on executive orders from the Federal Government which state that new governmental buildings should be sustainable, and that existing government buildings should be greened through energy efficiency improvements. The results are already considerable, with more than 116 Federal buildings obtaining the Energy Star label for energy efficiency and more than 50 Federal buildings undergoing the LEED certification process, with 8 currently certified. There are also some notable Municipal Government results. For instance, all new municipal government buildings in the City of San José must now be designed and built using green building principles and technologies. Similarly in New York City, starting in 2005, all non-residential projects costing $2 million or more must be built to meet LEED Silver standards (although only schools must obtain official certification). Los Angeles is also requiring that all city-funded building projects be LEED certified. As governments are large employers and own a considerable number of buildings nation-wide, promoting the green building movement through direct application on their own building projects is a great way to lead by example.

In an even larger push toward sustainable building, the County of San Mateo, California, adopted a sustainable building policy in 2001 that requires all new buildings over 5000 square feet to be built to the highest practicable LEED rating and certified through the USGBC. This has the effect of greening a large amount of the county’s new development, and also promotes the use of the USGBC’s LEED rating system.

DoE’s Federal Energy Management Program (FEMP):
The American Federal Government is also leading by example in terms of its energy use and efficiency because of the DoE’s Federal Energy Management Program (FEMP). The goal of the FEMP is to reduce the cost and environmental impact of the federal government by advancing energy efficiency and water conservation, promoting the use of distributed and renewable energy and improving utility management decisions at federal sites. This includes the procurement of energy efficient equipment, the construction of efficient buildings and renovations to make older buildings more efficient, and the increasingly efficient management and operation of federal facilities. Under the Energy Policy Act of 2005 and because of recent presidential directives, federal agencies have
been called upon to reduce their energy use by 35% by 2010 in comparison to 1985 levels, and the FEMP is the way to make this happen. By promoting energy efficiency and the use of renewable energy resources at federal sites, the FEMP will help agencies save energy and taxpayer dollars, as well as demonstrate environmental leadership through responsible and cleaner energy choices.

Also starting in 2005 and for the first time, congressional office buildings will be required to meet the same energy performance requirements as other federal buildings. Most government buildings must cut energy consumption per square foot 20 percent below their 2003 levels. Agencies may then keep the savings as long as they invest in additional energy efficiency or renewable energy projects. Additionally, agencies will be required to buy energy efficient products. They must be either Energy Star labeled or designated as energy efficient by the Federal Energy Management Program. New federal buildings are included as well. They must be designed to use 30 percent less energy compared to the International Energy Conservation Code (IECC) or the appropriate standard form the American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE).

**Energy Star:**
The United States also encourages the use of Energy Star, a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions, while often saving the user money. Created in 1992 and only applying to computers and monitors, Energy Star now covers more than 40 categories of products, including heating and cooling equipment, lighting fixtures, and electronics. As Energy Star certified products are now widespread in the marketplace, and priced competitively with regular products, positive results are adding up. Americans, with the help of Energy Star, saved enough energy in 2005 alone to avoid greenhouse gas emissions equivalent to those from 23 million cars — all while saving $12 billion on their utility bills. In some cases, consumers are rewarded for purchasing Energy Star certified products. For instance, the Internal Revenue Service (IRS) has made an efficient window tax credit available to owners of existing residences. The rebate applies to the installation of new Energy Star certified windows, each window receiving a rebate of $25 for a maximum of $200.

**Energy Policy Act tax incentives:**
The *Energy Policy Act* of 2005 also offers tax incentives intended to promote greater efficiency in new and existing buildings. Residential buildings can receive the following incentives: $2,000 for solar water heaters and photovoltaic systems; $2,000 for new homes that save at least 50 percent compared to the IECC code; $500 for home improvements; $200 for windows (outlined above); $300 for water heaters, air conditioners and heat pumps; $50 for furnace blowers; $150 for furnaces and boilers; and $50 to $200 for energy efficient refrigerators, clothes washers and dishwashers. Commercial buildings can receive tax deductions up to $1.80 per square foot for new buildings designed to use 50% less energy than required by the 2001 ASHRAE 90.1 model commercial code. Business tax credits will also be available for the use of fuel cells and microturbines. Fueling facilities for ethanol, natural gas, compressed natural gas,
propane, hydrogen and biodiesel (minimum 20% bio-content) can also receive a 30% tax credit.

**NGO green building incentive example:**
Certain green building incentives apply only to non-profit organizations. For example, the Kresge Foundation Green Building Initiative offers special planning grants of $50,000 to $100,000 to promote green building projects by non-profit organization. It also includes bonus grants of $150,000 to $250,000 to projects that guarantee LEED certification through the USGBC.

**B-2 Canada:**
Federal financial incentive programs by NRCan’s Office of Energy Efficiency (OEE) (CBIP, IBIP, Industrial Energy Audit Incentive, EnerGuide for Houses Retrofit Incentive, High Efficiency Home Heating System Cost Relief Program, EnerGuide for Existing Buildings Program, FBI): The green building movement has also spread to Canada, and to encourage the uptake of various green building practices and programs, numerous incentives are being offered by the federal government and some other sources. Among the federal financial incentive programs are the Commercial Building Incentive Program (CBIP) and the Industrial Building Incentive Program (IBIP). These programs, offered by Natural Resources Canada’s (NRCan) Office of Energy Efficiency (OEE), encourage the design and construction of new energy-efficient commercial and industrial buildings by providing design assistance and funding (up to $60,000 for CBIP and up to $80,000 for IBIP) for eligible organizations based on building energy savings. An eligible building design must demonstrate a reduction in energy use by at least 25 percent when compared with the requirements of the Model National Energy Code for Buildings (MNECB). Simply, the more efficient a building is in terms of its energy consumption, the more funding will be provided by the OEE through CBIP and IBIP. In addition to these programs, the OEE also provides a financial incentive to help industrial companies identify ways to increase energy efficiency, improve production processes and cut costs. This program is called the Industrial Energy Audit Incentive, and is designed to help defray the cost of hiring a professional energy auditor to conduct an on-site audit at an industrial facility. Funding is available for up to 50 percent of the cost of an energy audit, to a maximum of $5,000. This is an exclusive service for companies that are registered as Industrial Energy Innovators, which are Canadian industrial firms that commit themselves to improving the energy efficiency of their operations. Joining this group of companies is free and simply requires a letter from the company’s management to NRCan. Companies must have their Industrial Energy Audit Incentive applications approved by NRCan before beginning their audit.

The OEE also boasts the ‘Energy Efficiency Incentives for Homes and Buildings’ group of programs, which includes the EnerGuide for Houses Retrofit Incentive, the High Efficiency Home Heating System Cost Relief Program, and the EnerGuide for Existing Buildings Program. The Government of Canada is investing an additional $170 million over five years to expand the successful EnerGuide for Houses Retrofit Incentive program. This funding is in addition to the $225 million extension announced in Budget
2005. The expanded program will help retrofit up to 750,000 homes and will include a new supplemental incentive for energy efficiency measures in electrically heated homes, averaging $250. Since its launch in October 2003, the EnerGuide for Houses Retrofit Incentive has paid out close to 30,000 grants totalling $20 million. Over 130,000 evaluations have been performed since the launch of the retrofit incentive and the average grant is about $750. On average, qualifying homeowners have reduced their energy use by about 30 percent, and reduced the GHG emissions by four tonnes. To be eligible for a grant, homeowners must have an EnerGuide for Houses evaluation of their home done before and after making energy-efficiency improvements. The amount of the grant will depend on the difference between the EnerGuide for Houses energy efficiency rating before retrofits and after they are done. The EnerGuide for Houses Retrofit Incentive was expanded to include owners of low-rise rental properties and assisted housing in June 2005.

In Canada, space heating accounts for 60 percent of household energy use. The High Efficiency Home Heating System Cost Relief Program, a five-year $105 million initiative, will provide incentives to Canadians to install modern, efficient heating systems to offset heating costs over the long-term. Incentives will average $150, ranging from $100 to $300. Using the latest high-efficiency furnaces can lead to significant energy and money savings. For example, the efficiency of most older gas heating systems is between 60 to 80 percent, while the efficient systems currently available are rated between 85 to 95 percent efficient. Potentially, energy use could be reduced by as much as 35 percent, which is the equivalent of saving $350 on an annual heating bill of $1,000. Details of the program will be developed in discussion with utilities and other partners to build on existing initiatives and explore the most cost-effective way to deliver the new incentive. This initiative complements an existing program, the Accelerated Standards Action Program, which seeks to have more energy efficient equipment in the market through a combination of promotion, incentives, standards and regulations. This program will be renewed for five years at a cost of $60 million.

Programs targeted at existing buildings are being renewed and expanded with a $210-million investment over five years. The Community and Institutional Buildings Program is a new component of EnerGuide for Existing Buildings (formerly the Energy Innovators Initiative). It will expand on existing initiatives aimed at community buildings and hospitals, schools, universities and other institutional buildings and help them reduce energy use and improve the energy efficiency of their facilities. A total of $157 million has been earmarked for the Community and Institutional Buildings Program, which will lead to energy saving retrofits in over 8,000 institutional buildings. EnerGuide for Existing Buildings (EEB) will also continue to target the commercial and industrial building sectors with Energy Retrofit Assistance (ERA), a component of the EEB program. A total of $53 million will renew this component for an additional five years, which is expected to result in retrofits to 2,600 commercial and industrial buildings. With both components, EEB financial incentives will help pay for energy saving retrofits. Eligible organizations will receive up to 25 per cent of the cost of the project to a maximum of $250,000 for retrofit measures that lead to verified energy savings. Training and information on energy efficiency are also provided. In total, EEB will leverage over
$1 billion in private and institutional sector investments, resulting in over $330 million in annual energy cost savings and greenhouse gas emission reductions of 2.25 megatonnes.

Finally, the OEE has also created the Federal Buildings Initiative (FBI) to assist federal departments and agencies in reducing the energy and water consumption of their facilities. The FBI is a voluntary program aimed at addressing three common barriers to improving the energy efficiency of buildings. They are: inadequate capital budgets for energy efficiency projects; the need for reliable information on current energy technology and practices; and the lack of required skills to manage retrofits. The FBI provides the products and services its clients need to identify and exploit energy efficiency opportunities. Under the FBI’s innovative saving financing arrangement, clients have the option of overcoming tight capital budgets by transferring the up-front expense and risk of projects to pre-qualified energy management firms. Following energy efficiency retrofits, departments or agencies pay the lower bills that result to utility companies and then pay their energy management firms the savings that result until project costs are recovered. Future savings are retained by the client. Through the FBI, retrofits of 7500 federal buildings and other facilities have been initiated and registered, reducing greenhouse gas emissions significantly and generating annual savings of $33 million. The FBI is an excellent program to encourage the federal government to green their buildings, and show that Canada is serious about the green buildings movement by leading by example.

Federal House in Order (FHIO) initiative:
The Federal House in Order (FHIO) initiative is also part the Government of Canada’s plan for reducing greenhouse gas emissions within its own operations. A total federal commitment of $500 million over 5 years was made to take action to reduce greenhouse gas emissions from all sectors of the Canadian economy. Of this investment, $44.2 million has been allocated to federal operations, including $30 million for the purchase of electricity from renewable resources and $1.2 million for on-site electricity generation demonstration projects in federal buildings. Through the FHIO initiative, the eleven departments and agencies which account for 95 percent of federal emissions have agreed to collectively meet a target of reducing the greenhouse gas emissions of their operations by 31% from 1990 levels by 2010. These government organizations include Agriculture and Agri-Food Canada, Correctional Services Canada, Environment Canada, Fisheries and Oceans Canada, the Department of National Defence, the National Research Council of Canada, Natural Resources Canada, Parks Canada, Public Works and Government Services Canada, the Royal Canadian Mounted Police, and Transport Canada. From 1990 to March 2003, a total reduction in greenhouse gas emissions of 24% was achieved within federal government operations through reductions in floor space and fleet size, a switch to less carbon-intensive energy sources, improvements in energy efficiency and fuel switching. Of the remaining 7%, approximately half of the target will be achieved through central purchases of emerging renewable electricity and the other half will be met through other measures such as energy efficiency and fuel switching in buildings and fleets. To encourage further emissions reductions within federal government operations, all departments, agencies and Crown corporations are challenged through the FHIO Leadership Challenge to undertake a GHG reduction program of their own design and
voluntarily report on results. The Government of Canada is also showing leadership by taking action to reduce emissions associated with employee commuting, business travel and taxi use.

In 2002, the Government of Canada expanded the mandate of FHIO under the Climate Change Plan for Canada. This plan announced that all new Government of Canada facilities would be built to be 25% more energy efficient than the Model National Energy Code and that all new federal housing units would meet R2000 guidelines. It was also announced that the Government would work towards completing energy efficient retrofits in a further 20% of its buildings, and that all of the goods and equipment purchased for federal operations would meet Energy Star standard. Additional commitments were made to increase the proportion of low-emitting vehicles in the federal fleet and for the government to be a first purchaser of next generation power technologies and energy sources. As a result of this expanded mandate, additional resources have been allocated to Federal Building Demonstration Projects, which showcase innovative emission reductions and renewable energy projects in federal facilities. Under this measure, some 60 federal building and housing projects have been enhanced to demonstrate leading-edge energy efficiency and renewable energy equipment. In addition, more resources are being allocated to longer-term funding for green power projects.

R-2000:
Developed in partnership with Canada’s residential construction industry, R-2000 is an initiative of NRCan’s Office of Energy Efficiency. Its aim is to promote the use of cost-effective energy efficient building practices and technologies. Since being introduced over 20 years ago, the R-2000 Standard has set the benchmark for home building in Canada. The Standard is continually upgraded to include new technologies as they become established in the marketplace, and is flexible enough to apply to any type of home. R-2000 homes are energy efficient (the energy standards are 40% above building codes), comfortable, environmentally-friendly, certified, and participation is voluntary. The R-2000 Standard is broad-based, innovative, and respected. In fact, R-2000 is even licensed for use in Japan.

Scientific Research and Experimental Development (SR&ED) Program:
The Scientific Research and Experimental Development (SR&ED) Program is another program put forward by the Canadian federal government, and while not directly encouraging green buildings, it has the potential to greatly aid in the development of green building technologies. Created by the Canadian Revenue Agency (CRA) and Department of Finance, the SR&ED program is a federal tax incentive that encourages Canadian businesses of all sizes and sectors to conduct research and development (R&D) in Canada that will lead to new, improved, or technologically advanced products or processes. The SR&ED program is the largest single source of federal government support for industrial research and development. Claimants can apply for SR&ED investment tax credits for expenditures such as wages, materials, machinery, equipment, some overhead, and SR&ED contracts. Generally, a Canadian-controlled private corporation (CCPC) can earn an investment tax credit (ITC) of 35% up to the first $2 million of qualified expenditures for SR&ED carried out in Canada, and 20% on any
excess amount. Other Canadian corporations, proprietorships, partnerships, and trusts can earn an ITC of 20% of qualified expenditures for SR&ED carried out in Canada. To qualify for the SR&ED program, work must advance the understanding of scientific relations or technologies, address scientific or technological uncertainty, and incorporate a systematic investigation by qualified personnel. So, this program indirectly encourages the green building initiative by absorbing some of the expenses involved in designing new or improved green building technologies.

**Canada Mortgage and Housing Corporation (CMHC) initiatives:**

For most people, the hardest part of buying a home — especially a first home — is saving for the necessary down payment. To help, CMHC offers lenders Mortgage Loan Insurance, which allows one to buy a house with as little as 5% down. More recently, CMHC has added environmentally friendly features to the Mortgage Loan Insurance it offers. If the home-buyer uses CMHC insured financing to buy an energy-efficient home, purchase a house and make energy-saving renovations, or renovate an existing home to make it more energy-efficient, a 10% refund on the Mortgage Loan Insurance premium may be available. There is also the added flexibility of a longer amortization (the period of time required to repay a mortgage) from 25 years to a maximum of 35 years, significantly reducing the monthly payments. NRCan developed the EnerGuide for Houses program to help homeowners make energy-saving choices when buying a home or renovating. For a fee, a qualified energy advisor will evaluate the house to determine its energy efficiency rating on a scale of 0-100. If the house rates below 77 on the EnerGuide scale, to be eligible for a 10% premium refund, the resident will need to obtain an EnerGuide for Houses evaluation and renovate using part of the CMHC insured funds based on an energy advisor's list of recommendations in order to increase the house’s score by at least 5 points and to at least 40 overall. After the recommended renovations are made, a second assessment is required to determine the energy-saving effectiveness of the renovations. To be eligible for the 10% premium refund, the second rating must show that the house has achieved an increase of 5 points to a minimum overall rating of 40. This initiative encourages the purchase of energy efficient homes, and also the retrofitting of residences to make them more efficient. Additionally, this same process may also make the resident eligible for an additional federal energy efficiency grant through NRCan.

**Renewable Energy Deployment Initiative (REDI):**

NRCan’s Renewable Energy Deployment Initiative (REDI) was announced in December 1997, and came into effect on April 1, 1998. It is a 9-year, $51-million program designed to stimulate the demand for renewable energy systems for water heating, space heating and industrial process heating. Under REDI, NRCan undertakes market development activities and provides an incentive to encourage the private sector, federal departments and public institutions to gain experience with active solar and efficient biomass combustion systems. Corporations are eligible for a refund of 25 percent of the purchase, installation and certain other costs of a qualifying system, to a maximum refund of $80,000 per installation and a maximum of $250,000 per corporate entity. Some incentives are also provided on a pilot project basis. In remote communities, business, institutions and other organizations may be eligible for a refund of 40 percent of
the purchase and installation of a qualifying system, up to a maximum refund of $80,000. REDI also offers architects and designers an incentive of up to $10,000 to offset the cost of the incremental design time associated with the inclusion of renewable energy technologies in building designs.

Technology Early Action Measures (TEAM) Project:
The Technology Early Action Measures (TEAM) Project is an interdepartmental technology investment program offered by the Government of Canada. TEAM supports projects that are designed to demonstrate technologies that mitigate greenhouse gas (GHG) emissions nationally and internationally, and that sustain economic and social development. The TEAM program follows a unique approach that is built on incremental financing and extensive networking, and brings together industry, community, and international partners to encourage additional investment. TEAM operates under the leadership of Natural Resources Canada, Environment Canada, and Industry Canada, and TEAM project partners include large and small companies in Canada and around the world, provincial and municipal agencies, and foreign governmental organizations. As of March 2004, TEAM has supported 98 projects in 64 Canadian cities (representing 10 provinces and 2 territories). Internationally, TEAM-supported projects can be found in 13 other countries: Argentina, Brazil, Chile, China, Costa Rica, Cuba, Egypt, India, Pakistan, Panama, Poland, Romania, and Russia. TEAM investments are aligned with the federal government's Climate Change Technology and Innovation initiative. As a result, TEAM provides project support in five major priority areas: cleaner fossil fuels, energy-efficiency technology, biotechnology, hydrogen economy, and decentralized energy production. To receive TEAM support, a project must result in, or lead directly to GHG reductions, removals, or both. This initiative supports the green building movement by encouraging the development of new energy and resource-conserving technologies.

Industrial Research Assistance Program (IRAP):
For Canada’s small and medium-sized enterprises (SMEs, defined for the purposes of this program as businesses with fewer than 500 employees), the National Research Council (NRC) runs the Industrial Research Assistance Program (IRAP), which provides a range of both technical and business oriented advisory services along with potential financial support. IRAP’s services are fourfold: technology expertise and advisory services, financial assistance for R&D activities, networking opportunities, and partnerships. Like the TEAM program but on a smaller scale, IRAP supports Canada’s SMEs in conducting R&D projects.

Sustainable Development Technology Canada (SDTC):
Sustainable Development Technology Canada (SDTC) is a not-for-profit foundation that finances and supports the development and demonstration of clean technologies which provide solutions to issues of climate change, clean air, water quality and soil, and which deliver economic, environmental and health benefits to Canadians. Established by the Government of Canada in 2001 and beginning operations in November of the same year, SDTC’s mission is to act as the primary catalyst in building a sustainable development technology infrastructure in Canada. However, SDTC does much more than fund research leading to groundbreaking technologies. It works closely with an ever-growing
network of stakeholders and partners to build the capacity of Canadian clean-technology entrepreneurs, helping them form strategic relationships, formalize their business plans, and build a critical mass of sustainable development capability in Canada. SDTC draws from an investment fund of $550 million to finance approved projects.

Funding Guide for International Science and Technology Cooperation (FGISTC): The Funding Guide for International Science and Technology Cooperation (FGISTC) is run by the Government of Canada and is a database of various programs and incentives that promote scientific and technological R&D. With increasing globalization and international opportunities for research, the process of identifying potential sources of funding for a project can be a time consuming exercise. In an attempt to mitigate this problem, the FGISTC is designed to encourage, facilitate, and promote basic and applied research by Canadian researchers and scientists through the provision of a simple, thorough, one-stop guide outlining the various support mechanisms for Canadian R&D. The Guide is divided into three sections: Grants and Bursaries; Post-doctoral fellowships; and Major international prizes. The grants and bursaries can be accessed directly by research scientists, and indirectly, such as by project partners or university applicants. This section is the one which supports green building R&D to the greatest extent, because like many other federal government initiatives, it provides financial support for emerging technologies that have the potential to revolutionize not only the green building movement, but the entire sustainability initiative as well.

Office of Energy Research and Development (OERD) programs (PERD, T&I R&D, CES, BET): The Office of Energy Research and Development (OERD) is an initiative by NRCan which manages and funds two main energy R&D programs, the Program of Energy Research and Development (PERD) and the Technology and Innovation Research and Development (T&I R&D) Initiative. The Program of Energy Research and Development (PERD) funds research and development designed to ensure a sustainable energy future for Canada in the best interests of both our economy and our environment. It directly supports energy R&D conducted in Canada by the federal and provincial governments, and is concerned with all aspects of energy supply and use. PERD currently funds 26 energy R&D programs. Please visit http://www2.nrcan.gc.ca/ES/OERD/english/View.asp?x=1318 for a complete list of PERD-funded programs. The Technology and Innovation Research and Development (T&I R&D) Initiative was established in 2003 to advance promising greenhouse gas (GHG) technologies through R&D. The T&I R&D budget is $115 million over five years. The OERD provides T&I R&D funds directly to partner departments and agencies, which then team up with provinces, the private sector and/or universities. To achieve significant GHG reductions in the near term, T&I R&D aims to ensure that clean technology options which provide incremental advances are brought into the energy economy as quickly as possible, e.g. vehicles with reduced fuel consumption, energy-efficient buildings. In the medium to longer term, bridging technologies will pave the way for the transition to a low-emission energy future but will need financial support for bringing them to the market-ready stage, e.g. hybrid vehicles, technologies to access unconventional oil and gas supplies. Transformative or “next generation” technologies will eventually take us
into a clean energy future and require science and technology (S&T) investments now, e.g. hydrogen fuel cells and production, and carbon dioxide (CO₂) capture and storage. The T&I R&D initiative balances support between projects that are meant to achieve short-term GHG reductions immediately, and projects aimed at changing industry and society for reductions in the future. T&I R&D currently funds 11 energy R&D programs. Please see http://www2.nrcan.gc.ca/ES/OERD/english/View.asp?x=1321 for a complete list of T&I R&D-funded programs.

Another smaller program run by the OERD is the Community Energy Systems Program (CES). The CES program helps Canadian communities meet their energy needs more efficiently and cost-effectively. The program identifies and develops opportunities for the use of district heating and cooling, combined heat and power (co-generation), waste heat recovery, thermal storage, and local sources of renewable energy, particularly biomass. Interests include: planning and implementing projects in both urban centres and remote communities; developing software for system design; improving performance of district cooling systems; and promoting and fostering the adoption of integrated energy systems. CES operates a laboratory to test and develop district energy technologies. This enables systems to be simulated and quick responses to clients’ problems. In addition to serving all three levels of government, the CES’s clients also include engineering firms, energy equipment manufacturers and utilities. Clients use the program's capabilities to: develop community energy plans; conduct feasibility studies; design district heating and cooling systems; help with project management; conduct trouble-shooting that requires specialized expertise; develop system-design software; develop innovative enhancements to new and existing equipment; develop new district cooling technologies; write technical and promotional manuals; and help link system suppliers with potential adopters. The CES initiative also provides project funding, with the funding criteria being: technical merit; leveraging; Canadian content; innovativeness; community impacts; economic considerations; and environmental considerations.

The Buildings Energy Technology Program (BET) is another program put forward by the OERD, and is meant to accelerate the development and use of energy-efficient residential and commercial building technologies, from R&D and field trials through to technology transfer and commercialization. Working domestically and internationally with associations, governments and industry, BET advances the design, construction and operation of buildings for superior energy efficiency and environmental performance. The program funds projects that involve research and development, dissemination and deployment related to building technologies and tools that increase energy efficiency, lessen overall environmental impacts, and projects that are replicable in the Canadian housing and commercial building industry. Companies with projects that they believe are eligible for support are encouraged to contact the BET for a preliminary project assessment. Interested parties must complete a submission form. This assessment requires a project description, estimates of impacts, estimates of project costs, as well as the total amount of financial support sought. A project is evaluated on, amongst other things, its own merits in terms of: potential energy savings; technological uniqueness; potential for widespread adoption in Canada; and leveraging of funds. If the initial assessment is positive, and funds are available, a full project submission is requested e.g. a detailed
statement of work, detailed schedule. Total funding varies from $150,000 to $300,000 per fiscal year (hence why it is not one of the OERD’s major programs). When funding assistance results in the generation of profits or the increase in value of a business, the business must repay the amount received or share the resulting financial benefits with the government commensurate with its sharing of the risks.

**Canada Foundation for Innovation (CFI):**
Yet another Government of Canada program promoting research and technology development is the Canada Foundation for Innovation (CFI). The CFI is an independent corporation created by the Government of Canada to fund research infrastructure. Its mandate is to strengthen the capacity of Canadian universities, colleges, research hospitals, and non-profit research institutions to carry out world-class research and technology development that benefits Canadians. With funding a major issue of all R&D projects, the CFI exists to resolve this problem. Since it was created in 1997, the CFI has been entrusted with $3.65 billion by the Government of Canada. The CFI normally funds up to 40 percent of a project’s infrastructure costs which are invested in partnership with eligible institutions and their funding partners from the public, private, and voluntary sectors who provide the remainder. Based on this formula, the total capital investment by the CFI, the research institutions, and their partners, will exceed $11 billion by 2010.

**SME-IDEA:**
The SME-IDEA program is a SME support program run by the Government of Canada. It offers financial advice and assistance for the demonstration and commercialization of environmental technologies, and caters to SMEs of fewer than 200 employees as well as SME support groups, associations and agencies in the environmental industry in Quebec. Eligible projects include: strategic studies and plans to develop environmental technologies; adapting new technologies to meet market demands; technology demonstrations; identifying and evaluating new technologies; studies on technology trends/evolution; communicating results; and developing and implementing technology marketing plans. Cost areas eligible for SME-IDEA funding include: consultant service fees; direct payroll costs; certification and patent fees; rental costs for equipment and premises; and event-organizing fees. Ineligible costs consist of capital expenditures and expenses eligible for income tax credits and other research and development assistance programs. SME-IDEA can finance up to 50% of a project’s total costs deemed coverable by the program, up to a maximum of $1 million. All financing by the program must be fully repaid within 5 years of project completion, although there is a grace period of 2 years following the completion of the project where payments need not be made.

**Other government funding and service programs:**
Other funding and service programs offered by the Canadian Government and not described in detail in this report include programs from the Natural Sciences and Engineering Research Council (NSERC), the Industry Energy Research and Development (IERD) Program, the Atlantic Innovation Fund (AIF), EcoAction, the Atlantic Canada Opportunities Agency (ACOA), and the Federal Economic Development Initiative for Northern Ontario (FedNor).
Energy Star & various rebates:
The Energy Star labeling system is also used in Canada and tells consumers the energy efficiency and usage of various appliances, buildings, etc. Promoted by the OEE in Canada, Energy Star certified products are energy efficient and can save users money on utility bills, as well as reduce greenhouse gas output and energy consumption in the places where these products are used. As well as the savings obtained through the efficiency of the products themselves, certain companies and provincial governments offer financial incentives for the purchase and use of Energy Star certified products. For example, Hydro Québec is offering a 50$ mail-in rebate on the purchase of a new Energy Star qualified refrigerator of at least 8.5 cubic feet. The program runs from April 1 2006 to December 31 2006, and the refrigerators must be purchased and delivered in Québec. Another Energy Star incentive is the Ontario government’s “Every Kilowatt Counts” program, which will provide a $500 cash rebate when homeowners replace their outdated central air conditioner with an Energy Star qualified unit. There is also a $50 rebate available for a tune-up and a $75 rebate on the supply and installation of a programmable thermostat. All work has to be done by a contractor registered with the Conservation Bureau of the Ontario Power Authority to be eligible for the rebate. The Energy Efficiency Fund (FEE) is a program run by Gaz Métro and provides financial incentives for a variety of energy conservation practices. In terms of incentives for the use of Energy Star certified products, the FEE will offer owners of residences supplied by Gaz Métro for heating purposes a $5 per square feet rebate with the purchase of high energy efficiency Energy Star windows and sliding doors, up to maximum of $500. The Province of Saskatchewan started offering a Provincial Sales Tax (PST) exemption for Energy Star qualified appliances on April 1 2005. Appliances eligible for the PST rebate are Energy Star approved refrigerators, freezers, dishwashers and clothes washers. The tax exemption applies to the sale or long-term lease (rentals for a continuous period of at least one year) of a new qualifying appliance. Combined clothes washer/dryer units are eligible for an exemption of 60% of the PST payable when the unit is sold for a single price. Saskatchewan also started a similar PST exemption program for household furnaces and boilers on November 8 2005. Correspondingly, the BC provincial government eliminated provincial sales tax from the purchase of qualified Energy Star high efficiency furnaces, boilers and heat pumps between February 16 2005 and April 1 2007. For a complete list of the various financial incentives for the purchase and use of Energy Star products in Canada, see http://oee.nrcan.gc.ca/corporate/incentives.cfm?attr=0.

Green Municipal Fund (GMF):
The Green Municipal Fund (GMF) is an initiative from the Federation of Canadian Municipalities (FCM) and the Federal Government, and consists of a $550-million endowment from the Government of Canada to stimulate environmental projects by municipal governments and their partners that generate measurable environmental, economic, and social benefits. Cutting greenhouse gas emissions is a priority of the Fund, as is improving local air, water and soil quality, and promoting renewable energy. Since its inception in 2000, the GMF has been operating as an interactive granting and lending fund with a strong focus on helping municipalities develop and maintain innovative environmental projects within their communities. To do this effectively, the
Fund supports a range of activities leading up to and including the physical implementation of an environmental infrastructure project. The Fund distinguishes four types of project activities: planning, feasibility studies, field tests, and capital installation/implementation. Funding from the GMF is available in the form of loans, grants, and a combination of the two. Based on the potential environmental benefits of the capital project, the funding option ranges from a loan of up to 25% of Total Eligible Costs to a loan and grant combination of up to 80% and up to 50% of the Total Eligible Costs, respectively. The funding caps for eligible capital implementation projects are loans of $50-70 million a year and grants of $7-10 million a year. The funding option available to applicants for feasibility studies, field tests and sustainable community plans is a grant of up to 50% of the Total Eligible Costs to a maximum of $350,000. The funding cap for eligible feasibility studies, field tests and sustainable community plans is grants of $8-12 million a year. The GMF website (http://kn.fcm.ca/ev.php?URL_ID=2825&URL_DO=DO_TOPIC&URL_SECTION=201&reload=1096488899) can be consulted for eligibility criteria and a list of projects that can receive funding by the GMF.

Municipal green building initiatives:
Certain municipalities are also offering incentives for green building, and some are even mandating green requirements for new buildings. For example, Toronto has introduced the Green Development Standard, which integrates existing city guidelines and targets with standards from green building rating systems such as LEED and Green Globes. The intent of this report is to describe what has been done by other cities, and to encourage the actions that were successful. The Green Development Standard is also being applied to all new city-owned and affiliated projects, helping the city promote its own green development package and lead by example. The Green Standard is helping make green building more appealing in the Toronto area because it is a “made-in-Toronto” approach and because it takes some of the uncertainties out of the development process. In Vancouver, the municipal government is amending existing building codes and bylaws to include more green features. These new bylaws state that a building rating of LEED-certified or equivalent is the mandatory minimum level of achievement for all new buildings, and that the standard for civic buildings greater than 500m² is LEED-Gold certification, with energy efficiency levels 30% better than the MNECB.

Infrastructure Canada infrastructure improvement programs:
Infrastructure Canada is also funding several programs to improve the country’s infrastructure. The $4 billion Canada Strategic Infrastructure Fund awards funding to projects of major federal and regional significance in areas that are vital to sustaining economic growth and enhancing the Canadian quality of life. This means areas such as central business districts, urban green spaces and parks, and areas of unique importance will see improvements. The goals of this fund are the safer and faster movement of people and goods on Canada’s major land transportation routes, reduced production of greenhouse gases and airborne pollutants, more-effective and sustainable urban development, increased economic activity including tourism, and the use of innovative technologies and practices to increase the overall sustainability of the country. The Municipal Rural Infrastructure Program (MRIF) was announced in 2003 to support
smaller-scale municipal infrastructure projects that improve the quality of life, sustainable development and economic opportunities of smaller Canadian communities. The budget for this program is $1 billion and it seeks to improve and increase the stock of core public infrastructure in areas such as water, wastewater, cultural preservation and recreation, and improve the quality of life and economic opportunities for smaller communities and First Nations settlements. Finally, the Infrastructure Canada Program (ICP) was created in 2000 to enhance infrastructure in Canada’s urban and rural communities and to improve quality of life through investments that protect the environment and support long-term community and economic growth. Virtually all of ICP’s $2.05 billion budget has already been committed and more than 3,500 ICP-funded projects have been announced.

Company energy conservation & green building incentives:

Certain companies are also doing their part to promote energy conservation and green building in Canada. For instance, Manitoba Hydro has created a Power Smart Program, with the intention of meeting energy needs through efficiency improvements rather than through new sources of generation. Apart from the educational materials available, ranging from how to retrofit a home to energy efficient products and practices, financial assistance in the form of loans and grants are also available to customers making home efficiency improvements. Loans of between $500-7,500 are available per residence, with the maximum term being 5 years. Minimum monthly payments are $15, and are included on the residence’s energy bill. Grants can be of varying amounts and are made at Manitoba Hydro’s discretion. Buyers of new Power Smart homes can receive up to $600 toward their electricity bill or $1,000 toward a front-loading washing machine. The Power Smart Program is also available to commercial and industrial customers, but most of the incentives apply to residential buildings. Terasen Gas, BC’s largest natural gas provider, offers customers the Efficient Boiler Program in order to help them save money and decrease the demand for natural gas through financial incentives for energy efficient heating systems. For all participants, the purchase price incentive applies to the incremental purchase price of a natural gas near-condensing or condensing boiler over the purchase price of a standard-efficiency boiler. Purchase price incentives are based upon space-heating and ventilating load. They will be calculated as follows: $4,000 for near-condensing boilers plus $3 per MBH plant input (MBH means Thousand BTU’s per Hour, a measure of heat used), and $6,000 for condensing boilers plus $9 per MBH plant input. The purchase price of a standard-efficiency boiler will be estimated using $7 per MBH of the input required to meet the space-heating load and ventilating load. Terasen Gas will also contribute 50% of a consultant’s fees to a maximum of $1,500 toward the cost of analyzing the annual gas usage for space heating using a standard-efficiency boiler system versus a higher efficiency boiler system. Furthermore, the company will pay a contractor up to a maximum of $400 for performing an estimate of the annual weather-normalized peak space heating load. Terasen will pay 50% of the cost of necessary venting modifications up to a maximum of $2,000. They will also pay a monitoring incentive of $1,500 during the first year of operation plus $1 per gigajoule of energy saved. Purchase price incentive payments are limited to a maximum of 50% of the purchase price premium over a standard-efficiency boiler.
Similarly, Quebec’s Gaz Métro encourages energy efficiency for natural gas users through financial incentives that reward users of high-efficiency natural gas appliances. A grant of $1,200-20,000 is given to companies using a condensing boiler and direct contact water heater with an efficiency rating of over 90%, $600 for high-efficiency warm air furnaces with efficiencies of 90% or greater, $600-6,000 for intermediate energy-efficiency boilers with at least 85% efficiency, $1,200-20,000 for the use of condensing water heaters running at a minimum energy efficiency of 90%, and $600-6,000 for intermediate energy-efficiency water heaters with efficiency ratings of at least 85%. Several other grants are offered for the use of various appliances, but the sum depends on the amount of heat released by the unit per hour of run-time.

BC Hydro offers some incentive programs to its customers as well. It provides incentives and tools to help developers and owners of new large buildings and their design teams create better, more energy efficient buildings through the High Performance Building Program, and offers eligible organizations the opportunity to partner with BC Hydro and gain access to a variety of tools and resources to become more energy efficient via the Power Smart Partner Program. Power Smart Partners can also submit proposals to request funding from BC Hydro to implement energy-saving projects. BC Hydro’s Product Incentive Program is available to businesses that plan on purchasing newer appliances in order to reduce their energy consumption. The company has a list of eligible products on its website, and if the products to be purchased are on the list, then a cheque will be mailed to the energy-conscious company from BC Hydro.

Vancity, in the Vancouver area, is encouraging its customers to green their homes and buildings through two programs. The Bright Idea Loan is available to any home owner who receives an EnerGuide for Houses home evaluation and conducts renovations to raise the home’s EnerGuide Efficiency Rating by at least 5 points. The loan can be issued for a minimum of $3,500 or a maximum of $20,000, and the low interest rate saves money compared to a conventional loan. It must be paid back with regular monthly payments. The second program from Vancity is the Bright Idea Cashback. If a home owner carries out renovations costing at least $3,500, pays for it using a Vancity card, and meets the other aforementioned renovation requirements, they will receive a grant of $170. The contribution is $170 because this is the approximate cost of EnerGuide for Houses evaluation. Starting in 2004, Vancity began the Green Building Grant Program along with the Real Estate Foundation of British Columbia. The Program was started to minimize the impacts of climate change and improve sustainable land use practices by supporting green building initiatives in BC. The overall goal of the funding program is to reduce CO₂ emissions resulting from settlement activity. Each year, the Program provides one or more grants (up to $50,000 each) to qualified recipients, totaling at least $100,000. Applications are accepted from not-for-profit organizations, including charitable organizations and cooperatives. A list of other Canadian companies offering incentive programs for energy efficiency can be found at http://oee.nrcan.gc.ca/commercial/financial-assistance/regional.cfm?attr=28. In addition, numerous governmental incentives and rebates for green practices are listed at http://incentivesandrebates.ca(gc Fi_search.asp?jurisdiction=0&actionArea=0&keyword= &submit=Search&lang=en.
NGO & NPO programs and incentives:
Many non-governmental organizations (NGOs) and non-profit organizations (NPOs) offer green building programs and incentives across Canada as well. The BC Sustainable Energy Association’s (BCSEA) Solar Hot Water Program is meant to increase the awareness of the potential for solar hot water systems in British Columbia by facilitating rebates and by providing information. “Household hot water is the second most expensive energy cost in most homes,” said Dawson Creek mayor Wayne Dahlen. Under the Program, roof-mounted solar collectors will capture the sun's energy and transfer the heat to water, reducing the use of conventional energy, such as natural gas or electricity. Homeowners will be further rewarded by taking advantage of up to $900 in government subsidies (a combination of a Renewable Energy Deployment Initiative [REDI] grant and a provincial rebate). Commercial businesses can also qualify for grants covering up to 25% of the cost of purchase and installation of solar hot water systems from REDI. The numerical goal of the program is to work with 3 or 4 communities to facilitate the installation of 100 solar hot water (SHW) systems in BC over 2 years, while monitoring a percentage of these systems. The greater goal, however, is to promote public awareness of these systems through media, websites, articles, homeshows, and simple observation, but also increase installer expertise and produce a final report to serve as a guide for other communities interested in starting a similar program. The BCSEA also established a working group to create and implement a ‘100,000 Solar Roofs Initiative’ in BC, the basic model coming from the American ‘Million Solar Roofs Program’ and the German ‘100,000 Solar Roofs Program.’ BCSEA’s solar roofs program is expected to start sometime in 2007.

Energy Service Companies (ESCOs):
Energy Savings Performance Contractors (ESPC) are also available in Canada to help companies become more energy efficient and save money. Although this industry is still developing, rising energy costs and the increasing financial value of energy efficiency is causing the demand for these services to grow steadily. For more thorough explanations of ESPCs and ESCOs, please see the United States ESCO section.

Sustainable Condo:
The EcoSmart Foundation in Vancouver, British Columbia, has developed the Sustainable Condo: a full-sized display suite that demonstrates how human comfort and environmental responsibility can be achieved by combining smart, innovative design with state-of-the-art green building technologies, materials and products that are available and affordable now, from local Canadian suppliers and manufacturers. Built in British Columbia, the project is the result of an outstanding collaboration effort by more than 40 Canadian sponsors and partners including government officials, architects, engineers, manufacturers, contractors and suppliers. The project reinforces Canada’s position as a world-leader in green building design and technologies. The five focal topics of water, energy, materials, land-use, and well-being provide the framework for understanding the benefits of the various green innovations that are showcased within the Sustainable Condo. The goal of the Sustainable Condo is to transform current thinking about how housing is created, but also to showcase Canadian green building practices and technologies and perhaps influence the housing built in the Olympic Village for the 2010
Vancouver Winter Games. Because the 3 pillars of the Olympic Movement are Sport, Culture and Environmental Protection, the Vancouver Organizing Committee for the 2010 Olympic and Paralympic Winter Games has decided that these Games will be as sustainable as possible, incorporating clean transportation, waste minimization, clean energy, and green buildings.

National Building Code & provincial building code updates:
The Government of Canada last updated the National Building Code (NBC) in 2005. The NBC outlines the basic requirements and guidelines that apply to the construction of buildings in Canada including extensions, additions, new construction, renovations, etc. It is prepared by the Canadian Commission on Building and Fire Codes, and is published by the National Research Council of Canada. The NBC requirements are all linked to one or more of the four top-level objectives, which are safety, health, accessibility, and fire and structural protection of buildings. Under Canada’s Constitution Act, building regulation is the responsibility of provincial and territorial governments. The NBC is in the form of a model code to permit adoption by the appropriate authority. Most provinces and territories adapt the model NBC to better-suit their province. With the new NBC just released, provinces and territories will likely make changes to their building codes in the near future. For instance, Ontario introduced its new building code on June 28, 2006. The code is written in an objective-based format to promote innovation and flexibility in design and construction. The new 2006 Ontario Building Code includes over 700 technical changes which include significant increases in the energy efficiency requirements for buildings, increased accessibility requirements for buildings, more flexibility in the design and construction of homes, and updating and simplifying the requirements for small buildings, including houses. Most of the new requirements will come into force on December 31, 2006, with the transition period intended to give building officials, builders, designers and product manufacturers time to become familiar with the objective-based format and new technical provisions. Some further Code changes related to energy efficiency will be phased in at later dates. Effective December 31, 2008, the Code will require that new houses be constructed with near-full-height basement insulation, and as of December 31, 2011 new houses will have to substantially comply with EnerGuide 80 and new non-residential and larger residential buildings will have to meet energy efficiency levels that are 25% higher than the Model National Energy Code for Buildings. Other provinces and territories updating their building codes include British Columbia and Manitoba, with others likely to update their codes in the near future to reflect the NBC changes and to begin incorporating higher standards for energy efficiency.

Green Roofing industry & Canadian incentives:
Green roofing is another sustainable technology that is becoming used more frequently in Canada. Provincial building codes that have been recently updated, such as Ontario’s and British Columbia’s, now include sections on green roof standards, meaning that they can now be officially regulated. Additionally, some Canadian cities, such as Toronto and Vancouver, now have the option to require them on certain new development projects. Incentive programs are now becoming available in certain cities for the installation of green roofs. For example, under Toronto’s new Green Development Standard, the city
council has said that the municipal water department will pay developers $10/m² of green roof installed. This is likely to cover between 10 and 20% of the total green roof costs, which is not much but at least it is something. This pilot project has a meager fund of $200,000, which is not likely to cover more than a few dozen buildings. However, this is still progress, and is one of the reasons North American installations of green roofs are increasing at a rate of more than 70% a year.

B-3 Germany:

German Renewable Energy Law (EEG) & information:
In terms of its overall concern for the environment, Germany is one of the leading countries in the world for several reasons. The German Renewable Energy Law (EEG) was passed in 2000 and updated in early 2004. Above-market revenues are charged for green power sales and the cost is spread among all consumers, to minimize the overall effect of the cost increase. All renewable energy produced is consumed at a higher price to encourage the development and generation of more renewable power. The goal is that technological improvements will gradually drive prices down, slowly reducing the tariffs paid to the producers of renewable energy, but that by then, renewable energy production will be increasingly possible, prevalent and affordable. The EEG is a medium- to long-term strategy designed to increase the amount of renewable energy produced in Germany, and make it more affordable and widespread over time.

As a result of the EEG, Germany is the fastest-growing market for photovoltaics in the world, worth over 800 million euros in 2003 (about $1.15 billion Canadian) and 1.8 billion euros in 2004 (about $2.55 billion Canadian). The German solar power industry grew 53% to 837 megawatts of energy in 2005, representing 57% of total world solar energy output. In late 2004, Germany began operating the world’s largest solar power plant in Mulhausen. The plant generates 6.3 megawatts of power, and is part of a set of facilities in Bavaria which will produce a total of 10 megawatts of power using 57,600 silicon solar panels upon completion. Another 10 megawatts of solar power generation will be coming online soon in another four-location project. Beyond solar, Germany is also the world’s leading producer of wind power, with over 16,000 windmills. Power generation capacity from wind amounted to 14,609 megawatts in 2003, up from 334 megawatts in 1993. Renewable sources currently produce more than 10% of the nation’s energy, a level which is supposed to double by 2020 and reach 50% by 2050. However, at the current pace of development, it will likely reach this goal sooner than that; as of projections from 2000, the 10% mark was not supposed to be obtained until 2010.

KfW Federal Bank CO₂ Building Modernization Program & CO₂ Reduction Program:
Germany is considered to be among the leaders of the global green building initiative because of its “can-do” attitude and demonstrated ability to set environmental goals, provide flexibility, and offer incentives for homeowners, builders and developers to build greener buildings. One of Germany’s largest financial green building incentives is the KfW Federal Bank’s ‘CO₂ Building Modernization Program.’ Introduced in January 2001 as part of the Government’s Climate Change Program and revamped in 2003, the KfW offers loans at preferential rates to home owners, housing authorities, local authorities, etc
for improvements on residential buildings built before 1979. The low-interest loans issued by the KfW Federal Bank will now be made more flexible, and the new funding will target the replacement of heating systems and boilers, the installation of solar panels and building renovation to meet high energy efficiency standards.

The KfW also offers another energy saving loan program, called the ‘CO₂ Reduction Program,’ which applies to investments made in individual energy savings measures in existing buildings such as boilers, CHP units, insulation, renewable energy or heat pumps. It also applies to the construction of new, low-energy homes (defined as 60 kWh for heating and water warming per square meter of living space per year). These loans are capped at 5 million euros (approximately $7.1 million Canadian).

Both programs have a payback period of up to 20 years with 3 repayment free years. They can be combined with other loan programs, provided the loan does not exceed the total investment. The nominal interest rate for the ‘CO₂ Building Modernization Program’ is variable and currently at 2.10% (or 3.10% for low-energy houses). However, if the building achieves the newly set standard for low-energy houses upon completion of the renovation, only 80% of the loan needs to be repaid. Also, to qualify for a loan to meet the investment, applicants must demonstrate that the modernization will result in a CO₂ reduction of at least 40 kg/m²/year. Loans will be capped at 250 euros($350 Canadian)/m² of living space. Smaller loans are available for improvements that achieve a 30 kg/m² CO₂ reduction. The size of these smaller loans has been increased since the 2003 revamp. Interest rates for the ‘CO₂ Reduction Program’ are currently at 3.15%.

Energy Service Companies (ESCOs):
Germany is also the largest and most mature Energy Service Company (ESCO) market in the European Union. By the end of 2000, more than 70,000 contracts for energy services had been concluded, which have resulted in total investment exceeding 5 billion Euros (about $7 billion Canadian), more than 50,000 generation units, a total installed thermal capacity of 46 GW, and a total installed electric capacity of 8 GW. Presently, about 500 ESCOs are active on the German market and accumulate a total annual turnover of about 3 billion Euros (about $4.25 billion Canadian). ESCO services in Germany are primarily used in public buildings and by the commercial sector, with about 120,000 sites having received these services over the last 5 years. Berlin, for example, has truly embraced ESCO services, with 750 public buildings upgraded since 1995. One of the reasons for the ESCO industry’s strength in Germany is because the financial and technical support ESCO projects receive is shared between nongovernmental programs (e.g. credit programs by eco-banks [e.g. UmweltBank], efficiency checks by energy agencies, and boiler replacement by utilities), and government programs (e.g. loan /funding schemes, R&D programs, and incentive programs for renewable energy). Another reason is that the Deutsche Energie-Agentur (German Energy Agency, Dena) played a crucial role in publicly promoting ESCO services in the late 1990s and applied great pressure on the federal government to begin using these services. For these reasons, Germany is – together with Austria – the ESCO pioneer in Europe.
Deutsche Energie-Agentur (DENA) National energy labelling program & Energy Star:
The Deutsche Energie-Agentur and the German Electricity Association (VDEW) are currently working on the implementation of a national electricity labeling program as required under the new EU law and incorporated in the amendment to the Energy Industry Act (EnWG). The goal of this labeling system is to make products more transparent to the consumer with the idea that the consumer will take energy efficiency into account when purchasing a new product. Also, in 2002, the American Energy Star Program was officially introduced into Europe as a voluntary label for energy-efficient office equipment. The Energy Star Labeling Program provides unified labeling for energy-efficient office equipment throughout Europe for the first time. In Europe it applies to computers, monitors, printers, fax machines, scanners and multifunction devices. The aim of Energy Star is to help private consumers and bulk buyers from businesses and the public sector select energy-efficient equipment and motivate them to buy such equipment. At the same time, the manufacturers of office equipment are encouraged to give energy efficiency a higher priority in both the development and the distribution of their products. The European Commission set up the European Commission Energy Star Board (ECESB) to ensure the successful implementation of the Energy Star System in Europe. This Board consists of national representatives from EU Member States and relevant interested parties. Germany’s national representatives at ECESB meetings are the Ministry of Economics and Technology (BMWi) and the Deutsche Energie-Agentur. Additionally, there has been recent discussion of implementing a German “Top-Runner” program for electrical and electronic appliances, based on the Japanese Top-Runner Program. However, the Program is still being discussed, without any recent major steps towards putting it into practice. The DENA’s well-known slogan “EnergieEffizienz lohnt sich!” (or “Energy Efficiency pays off!”) is also leading to an increase in personal energy efficiency practices as more people realize the long-term benefits – personal and public – of these initiatives.

European Commission’s GreenBuilding Project:
The European Commission’s program to improve energy efficiency in non-residential buildings was put into force in early 2005. The two-year (2005-6) pilot phase of the GreenBuilding project is supported by the Intelligent Energy Europe (IEE) Programme and will be carried out by 13 European partners in 10 countries. DENA is responsible for the program’s coordination in Germany. The aim of the project is to improve the energy efficiency of non-residential buildings, with a focus on upgrading existing buildings. Current obstacles to energy efficiency are to be addressed with particular emphasis on dealing with the lack of information, awareness and knowledge of builders, building owners and managers which discourages investment in energy-efficient building services. The organizations and companies who take part in the Project do so on a voluntary basis, and will be provided with an analysis of their building’s energy consumption and the identification and implementation of measures to improve its energy efficiency. The ideal candidates for the pilot project are buildings which are to be subjected to model refurbishment over the next two years. Non-residential buildings such as office and administration buildings or schools which have already been refurbished or have only just been built can also be put forward as “Best Practice” GreenBuilding projects.
The DENA is also responsible for promoting and financially contributing to German R&D concerning renewable energy sources. Wind, solar and fuel cell projects can receive funding from DENA, which is supporting these projects to help decrease German use of fossil fuels. Apart from its renewable energy, and green building and infrastructure programs, DENA also manages energy efficiency programs for the transportation sector and is active in promoting energy efficiency on the international stage.

Green Roofing industry, policy & incentives:
Germany is well-known around the world for its widespread use of green roofs. Green roofs involve growing plants on rooftops, thus replacing the vegetated footprint that was destroyed when the building was constructed. Germany is widely considered the global leader in green roof research, technology and usage. It is estimated that presently 10-15% of all flat roofs in the country are green and that the German green roof industry has been growing at a rate of between 10 and 20% per year since 1982. Green roofing has been promoted in Germany for quite some time now, well before the accepted start of the green building movement in the early 1990s. For example, the Deutscher Dachgartner-Verband (German Roof-Gardening Association) has been advocating green roofs since 1984, and provides up-to-date information on new developments in vegetated roof cover design in Europe as well as connecting green roof contractors with interested home and building owners.

Green roofing is a relatively simple practice with significant environmental benefits. Establishing plant material on rooftops provide numerous ecological and economic benefits including storm water management, energy conservation, mitigation of the urban heat island effect, increased longevity of roofing membranes, as well as providing a more aesthetically pleasing environment to work and live. The mitigation of storm water runoff is considered by many to be the primary benefit because of the prevalence of impervious surfaces in urban areas. The rapid runoff from roof surfaces can exacerbate flooding, increase erosion, and may result in raw sewage that is discharged directly into our rivers. The larger amount of runoff also results in a greater quantity of water that must be treated before it is potable. A major benefit of green roofs is their ability to absorb storm water and release it slowly over a period of several hours. Green roof systems have been shown to retain 60-100% of the storm water they receive. In addition, green roofs have a longer life-span than standard roofs because they are protected from ultraviolet radiation and the extreme fluctuations in temperature that cause roof membranes to deteriorate. They also reduce interior heating and cooling costs by as much as 50%, and can provide habitat for various nesting birds. Furthermore, the construction and maintenance of green roofs provide business opportunities for nurseries, landscape contractors, irrigation specialists, and other green industry members while addressing the issues of environmental stewardship. Green roofs are aesthetically pleasing, quieter, healthier, more energy and resource efficient, and more sustainable overall when compared to conventional shingled or gravel-covered flat roofs.

Were it not for specific conditions found in Germany, the higher costs associated with the initial construction of green roofs may have precluded their widespread application. Federal environmental laws require mitigation or compensation for the destruction of
natural open space caused by development. Because of high urban density to real estate values, Germany provides indirect and direct subsidies and ordinances for the installation of green roofs. In 1996 a survey done by Zentralverband Gartenbau e.V. (ZVG), The Gardening Central Association, revealed that approximately 50%, or over 80 cities in Germany offer incentives to building owners utilizing green roofs, or have regulations in place that support green roof implementation. It is also estimated that about 1 in every 10 flat roofs in these cities is green. The green roofing industry has also become a highly competitive market. For instance, in Nurnberg, a city of about 200,000 people, more than 40 companies install green roofs and related green infrastructure projects.

Taxes are also collected on anticipated storm water control or usage fees, and are used to cover constructing, maintaining and replacing storm water management facilities. A 100% utility surcharge is levied against owners of impervious roof covers, and thirteen German cities allow a reduction between 50% and 80% of the utility fee for using a green roof. In the 1996 ZVG study, it was also found that over a 36-year period, the reduction in the usage fee alone can compensate the building owner for as much as 50% of the green roof’s capital cost. Another type of indirect subsidy lets developers use green roofs as mitigation for the provision of open space. Depending on the type of proposed plant material, local land development ordinances allow green roofs to compensate for lost open space at a ratio of .50 to .70. This creates a very attractive alternative in areas of high real estate prices. Alternatives for mitigation include the restoration of existing impervious surfaces to create open space or improving the biodiversity of existing open space.

Twenty-nine German cities provide a direct monetary subsidy to developers who use green roofs. The amount of the subsidy varies widely, ranging between $0.51 to $6.20 per square foot ($5.5 to $67/m²). Most cities have adopted a financial aid ceiling for individual projects, ranging from $280 to $11,250 per municipality. The subsidies are based on estimates of the avoided costs associated with infrastructure maintenance and replacement. The subsidy structure provides the greatest incentive to residences and small building owners, as they have more roof area per volume of interior space.

It is anticipated that the German Government will soon call for all new flat roofs to be fitted with green roof systems, as it becomes more and more possible to do so. In 1989, 27 German cities had already established zoning districts that required green roofs to be installed on flat roofs, so this prediction is not completely out of the question. Since 1984 Munich has included green roofs in its building ordinance, and in the subsequent 15 years approximately 4.2 million square feet of rooftops have been greened. In 1992 a direct subsidy program was started, providing $3.13 per square foot ($33.70/m²), paying up to 50% of the capital cost of installing a green roof. In 1996, it is estimated that over 10 million square meters of green roofing was constructed in Germany alone. The 1996 ZVG green roofing study has estimated that the lifetime cost of an extensive green roof (based on a 36 year service life) in Germany is 15% lower than a comparable bituminous roof with gravel ballast. This estimate includes savings achieved through the elimination of storm water detention basins, and takes into account the higher construction costs.
National Building Code (NBC) information:
In Germany each city has its own construction requirements based around the National Building Code (NBC). The NBC includes basic standards for such areas as building energy use, fire safety, security, and environmental effects among other things. In many areas, municipal governments have introduced new by-laws and programs to increase minimum sustainability requirements in their urban areas. In Berlin for example, when a building is deemed to pave over too much ground, planning and building permission is granted only if green roof infrastructure is to be used (a mitigation and replacement measure.

Evidence from German policymakers (published in the German roofing magazine Das Dachdecker-Handwerk) suggests that strict regulatory approaches can result in green roof systems prone to neglect in contrast to voluntary, incentive-based approaches that result in better-maintained roof systems. The combination of incentives and moderate regulations is the cornerstone of success for the German green roof industry, which has become a model for the world. Due to the legislative and financial support of German and other European state and municipal governments, the green roof industry has grown into a vibrant, multimillion-dollar market in Germany, France, Austria and Switzerland among others. It is also estimated that the roofing industry in Germany employs approximately 12,000 people, and that if all flat roofs were to be greened, this figure would increase to approximately 100,000.

Roof-top leasing program for renewable energy systems:
German society seems to generally be more accepting of change than many others. One of the major ways this affects the green building movement is the relative ease and short time span it takes for new technologies and practices to infiltrate society. For example, German cities are increasingly turning to green roofs, porous pavement, drainage swales, rain gardens, and other green infrastructure to minimize, adsorb and cleanse their storm water runoff and reduce its ability to distribute waste and pollutants. These practices also save energy and capture water so it can be used for other purposes. As previously mentioned, Germany is a world-leader in the production of energy from sustainable sources. Although green roofs are encouraged in the country, if a green roof is deemed undesirable by the occupants, a program exists in which the occupants can lease their roof-top space to local power companies so that it can be fitted with photovoltaic panels connected to the local electricity grid.

Federal Government green building promotion:
The German Government understands that education and knowledge about sustainable buildings is critical in their construction and use. To deal with this “lack of knowledge and awareness” issue, the German Government has developed various domestic educational programs targeting audiences from professionals to schoolchildren outlining the economic, social and environmental benefits of sustainable construction. Sustainability is working its way into the public school curriculum, while adults can attend free half-day conferences which outline and promote renewable energy and energy efficiency measures. Also in the field of education, the federal government has launched a program encouraging schools to increase their energy efficiency in exchange for the
government covering a portion of the school’s energy bills so funding can be redirected and used elsewhere. So far this program has been quite successful, with 200 of 1000 schools in Berlin participating.

Some past renewable energy & green building programs:
Past German incentives in various areas of the green building movement include the 1998 ‘100,000 Solar Roofs Program,’ which provided 10-year loans with reduced interest rates to buyers of photovoltaic (PV) systems. It ended early, in 2003, when all targets were met. The Renewable Energy Sources Act Feed-in Tariff was designed to encourage customers to begin generating their own solar electricity. Under this program, started in 1999, customer applications received approximately 56¢ per kWh from local power companies for solar-generated electricity sold back to the grid. This program was set for termination once the combined capacity of Germany’s solar power plants reached 350 MW, so the program was concluded mid-2003.

German Research Foundation (GRF):
The ‘Deutsche Forschungsgemeinschaft’ (German Research Foundation [GRF]) is the central, self-governing research funding organization that promotes research at universities and other publicly financed research institutions in Germany. The GRF serves all branches of science and the humanities by funding research projects and facilitating cooperation among researchers. It has numerous funding programs available (which can be viewed under the ‘Research Funding Programs at a Glance’ tab), including its Individual Grants Program, to which any organization conducting R&D can apply. Given their significant environmental concern, the development of technologies and practices that reduce harmful environmental effects have a very good chance of receiving some type of funding or support from the GRF.

Baufritz green building company:
Baufritz is one of Germany’s leading design companies, specializing in sustainable buildings. Its slogan is German, but basically means “experience the buildings of tomorrow, today!” Baufritz, a 108-year-old German company, prides itself in catering to customer design requests, while minimizing the building’s ecological footprint at the same time. Its homes use integrated climatic design concepts including proper orientation, heavily insulated walls, door and window glazing, thermal mass, summer shading and heat recovery ventilation to reduce heating bills to only $150 per year. Hot water solar and photovoltaic electricity systems are also installed to reduce impacts from energy production and to take advantage of the generous federal subsidies. Other low-maintenance and durability features include self-cleaning windows which have a special film to facilitate cleaning by rain water and a paint and coating system for exterior siding that never needs repainting. The healthy, streamlined interiors offer efficient floor plans, attractive built-ins, lots of natural day-lighting, and feature nontoxic materials and finishes to achieve superior indoor air quality. Extensive decks and balconies extend the living area and create sunny, wind-sheltered outdoor spaces. The company also offers a compact modular greywater treatment system called AquaCycle, which cleanses the wastewater from cooking, dishwashing and bathing and reuses it for toilet flushing, laundry, landscaping and similar purposes where drinking water is not needed. The
company estimates that an average household of four to five people could save up to 25,000 gallons of water each year. By taping into greywater sources, consumers can save significantly on water and sewer bills and reduce the demand on fresh water resources. Baufritz’s concern for the environment extends to their manufacturing operations with their comprehensive resource reduction, reuse and recycling initiatives, waste heat utilization, and maximum day-lighting. Baufritz specializes in building high-quality, low-impact houses that are custom made for each individual. As such, Baufritz typically designs and builds approximately 240 homes a year.

German ‘green districts’ – Freiburg:
Germany promotes its environmental concern, technological prowess, and energy and resource conservation methods to the world so that other countries can learn from them and begin encouraging sustainability in the same manner. To do this, Germany has created a couple “showcase settlements” which demonstrate the country’s environmental leadership and technological expertise. Freiburg is a city of approximately 215,000 people and is located in South-Western Germany, very close to France and Switzerland. In the 1970s, plans to set up a nuclear power station not far from the city caused widespread resistance from the population which included farmers, wine growers and students. The protest eventually prevented the nuclear power plant from being built. Shortly after the nuclear power plant debate, the Institute of Solar Energy Systems (ISE) was set up in Freiburg. It was ridiculed at the time but it is now the largest institute of its kind, with more than 600 staff. The ISE encourages the use of solar energy throughout the city through education on sustainability and renewable sources of energy, and also by promoting the solar energy initiative to help build the city’s unique identity, while saving inhabitants money in the long-run. In 1992, Freiburg was nicknamed ‘Solarsiedlund’ (Solar Village) and the ‘Solar Capital of Europe’ because of the ISE and its effects on the city, Freiburg’s sunny microclimate, and because it is generally regarded as Germany’s warmest and sunniest city. Freiburg now has one of the highest amounts of solar power generation per capita in the world, which should not be too surprising considering that Germany generated 57% of the world’s solar energy in 2005. Because the city was virtually leveled in World War II, it had to be largely rebuilt and is now quite modern. Freiburg districts now have some very innovative housing developments. Mixed-density land use is common and includes mixed-use shops and houses, public green spaces and other environmentally-oriented construction techniques. Photovoltaic panels are everywhere, explaining why Freiburg is called the Solar Village. However, the Valois development district is especially notable because it features about 400 high-energy efficiency homes, each powered entirely through individual mini-solar power stations.

German ‘green districts’ – Vauban:
Vauban is a new neighborhood of 5000 inhabitants and 600 jobs located 4km south of Freiburg. It is located on the site of a former World War 2 French military outpost, which was abandoned in 1991. Planning for Vauban started in 1993 and the discussion of the development plan started in 1995, with major decisions being made in 1996. The development was to have three phases, and would cover 38 hectares when complete. Detailed plans for special issues, such as the “living without a car” project, were completed between 1997 and 1999. The detailed planning of the first public green spaces
took place in 1998 and 1999 together with the new residents. In the summer of 1999, the City of Freiburg began the sale of properties in the second development section. The building process there started late summer 2000. In the year 2001 the first development section of the new district was completed, and 2000 people moved in. When completed in 2006, Vauban was already a vibrant community which was prospering due to the shared environmental concern of its inhabitants.

Vauban has set its own high standards for environmental performance. Vauban buildings have a compulsory low-energy standard, where all new buildings are built to use 65 kWh/m²a or less, with the average energy standard for new German houses built between 1995 and 2000 being about 100 kWh/m²a and the standard of older houses about 200 kWh/m²a. This is a huge decrease in energy use. Additionally, about 100 houses have been built to the passive house standard (15kWh/m²a). ‘Passive Houses’ do not need conventional heating systems: their heat requirements are almost entirely covered using solar power generation, heat recuperation systems, and southern-facing windows which allow maximum penetration from the sun’s rays. However, several ‘Improved Passive Houses’ (plus energy houses) have also been built in Vauban by an investor. These houses produce more energy than they need, and represent the cutting edge of energy efficiency. The investor hopes to build between 100 and 200 more of these houses in the Vauban area. The Vauban development plan also includes some regulations for the design of the houses: for example, ‘single houses’ are prohibited which leads to a compact urban building structure and the characteristic mixed land-use. Finally, as the whole settlement can not depend solely on solar power for all its energy needs, a high-efficiency power plant operating on wood-chips has been built and connected to district’s power grid.

As transportation is one of modern society’s largest consumers of fossil fuel and producers of greenhouses gases, Vauban has tried to minimize the use of personal motorized vehicles in their settlement. It has done this through two approaches, “car-free” and “parking-free” living. Cars are only permitted in the district for pick-up and delivery purposes, and must be parked in one of the community car parks on the outskirts of the development as Vauban prohibits the building of parking space on private property. Only families who own cars must pay for parking space in the car parks. Car owners must walk a short distance to reach their vehicles, which means travel within Vauban is typically not done using a car as it would take more time to get to the car, drive to another car park, and park there compared to simply walking or cycling to the destination. The speed limit on the district’s main road is 30km/h, and in the residential areas cars are not supposed to drive faster than “walking speed,” which is about 5km/h. By planning Vauban to be predominantly car-free, it has been designed and built to be a district of short distances, wherein most daily destinations (such as businesses, shops, schools, and recreation areas) are all within walking or cycling distance. Car-sharing initiatives have also sprung up in Vauban, where the vehicle is parked in one of the car parks, and where costs are divided between participants based on how often they use the vehicle. Public transportation to Freiburg exists in the form of two buslines and a tramway.
In terms of water, Vauban has a system that collects rainwater that has infiltrated deep into the soil, below the range of plant roots. The system cleanses this water and then adds it to the normal potable water lines that are connected to each building. Also, the district has a new ecological sewage system where feces and solid wastes are transported to a biogas plant via vacuum pipes. There they ferment anaerobically together with organic household waste, thus generating biogas to be used for cooking. Remaining greywater is cleaned in biofilm plants and other cleansing operations and returned into the community’s water cycle.

Vauban is a small community whose main goal is to implement a city district in a co-operative, participatory way which meets ecological, social, economical and cultural requirements. To continue the mentality that led to the creation of the settlement, the “Forum Vauban” (Vauban’s governing body, which has obtained NGO-status) organizes educational workshops which are free to attend. There are about 40 workshops a year and they cover such topics as: green building, sustainability, energy saving technologies and solar energy; green roofs and the uses of rainwater; building with local wood; information concerning new sustainable technologies and environmental practices; greening public areas; and many more.

**B-4 Japan:**

**Energy Conservation Center, Japan (ECCJ):**
The Japanese realized long ago that energy efficiency and conservation were crucial in saving money and in slowing global warming. In 1978, the Japanese Government created the Energy Conservation Centre in order to address the looming energy crisis. The mission of the Energy Conservation Center, Japan (ECCJ) is to promote the efficient use of energy, protect the planet from global warming and encourage sustainable development. It employs 128 people (as of April 2005), and has a physical presence in 8 cities throughout Japan. The activities of the ECCJ are numerous and include: energy conservation audit services for all kinds of buildings; education and training on energy conservation; examinations for energy managers; the distribution of information (successful case studies; new energy conserving technology, etc); technological research and development; evaluations of energy efficient appliances; implementation of the Energy Star labeling program; energy efficient product retailer assessments; energy education and primary and middle schools; energy conservation campaigns and exhibitions; recognition of industry leaders; record keeping; survey work; and international work with other governments and NGOs. Currently there are 2,834 Japanese companies that belong to the ECCJ, with expertise from a wide variety of different sectors and fields. The ECCJ outlines current requirements under the Japanese energy policy and recommends ways that various groups (ie. home owners, factory managers, building supervisors, etc) can act to conserve energy. It has special criteria for factories, houses, commercial buildings, and other specified equipment. The ECCJ also has a section describing Japan’s current policy to deal with global warming, for reference purposes.
ECCJ reduced rate loans:
The ECCJ also organizes financial assistance initiatives to accelerate the introduction of energy efficient technologies and equipment into the industrial and commercial sectors. The Development Bank of Japan along with the Okinawa Development Finance Corporation will offer loans at reduced rates to companies for the following projects: installing additional equipment for the collection of non-used energy, such as waste heat, or the installation of equipment which raises the energy efficiency of the facilities by 20% or more; repair projects contributing to improvements in energy conservation; and projects that will introduce cogeneration facilities with a minimum 60% efficiency rating and a 50kW or more output level. The Japan Finance Corporation for Small and Medium Enterprises, the National Life Finance Corporation and the Okinawa Development Finance Corporation also offers some incentives to SMEs for the following kinds of projects: projects which will result in the improved energy efficiency of the facilities (including renovations and updates of existing facilities); projects which will replace obsolete industrial furnaces and boilers or projects that will install additional equipment which will increase the efficiency of this equipment (such as appliances that run on waste-heat); and projects that will install equipment that uses alternative energy sources as fuel.

ECCJ commendation programs:
There are also numerous commendation and recognition programs from the ECCJ to promote awareness of the importance of efficient energy use. In the Commendation Program for Excellent Energy Managers, a commendation certificate is given to individuals who have long been pursuing energy management and who have made an outstanding effort in efficient energy management. The Commendation Program for Excellent Energy Management Factories gives a commendation certificate to factories or business facilities that have made prolonged efforts to rationalize energy use, have long been pursuing energy management, and who have made an outstanding effort in efficient energy management. Both of these programs are sponsored by the Ministry of Economy, Trade and Industry (METI). The ECCJ runs the National Contest for Successful Energy Conservation Cases, where the winner is decided based on how well the technology or methods used can apply more generally to energy conservation. The Commendation Program for Meritorious Energy Management Performers gives a commendation certificate to individuals who have long been playing a central role in energy efficiency and who have made an outstanding contribution to promoting efficient energy management. The Commendation Program for Excellent Energy Management Engineers offers a commendation certificate to engineers who have incorporated efficient energy management techniques in their work and who have made an outstanding contribution to promoting energy efficiency. The Energy Conservation Grand Prize is awarded to the creators of equipment, facilities or systems with excellence in energy conservation, which have already been launched or are soon to be launched. The prize has three genres: home-use, commercial use, and automobiles, and entries are judged based on energy efficiency, originality, marketability and environmental effects. The previous 4 programs are all administered by the ECCJ, which runs an award ceremony every February in Tokyo and Osaka to publicly honour the recipients and give them their certificates of excellence. The Japan Machinery Federation (JMF) also runs a commendation program, called the
Commendation Program for Excellent Energy Conservation Equipment. Under this program, a commendation certificate will be given to companies or teams for creating energy-efficient equipment and for the group’s general commitment to promoting the efficient use of energy. On top of these commendation programs, the ECCJ also sponsors contests for students in order to encourage energy conservation practices in younger generations. Among these programs are the Energy Conservation Poster Contest and the Energy Conservation Essay Contest for elementary and junior high school students.

Energy Conservation Days, Months, and general check-ups:
In order to promote energy conservation as a nationwide activity, the Japanese government has established “Energy Conservation Day” on the 1st of every month (starting in 1980), “Energy Conservation Month” in February (starting in 1976) and “General Check-up Day for Energy Conservation” on the 1st of August and December (starting in 1980). The hope is that people will take steps to reduce their energy use in all areas of their daily activities on Energy Conservation Day and during Energy Conservation Month, and that people will be able to identify areas for improvement in energy efficiency on the General Check-up Days for Energy Conservation and make these changes soon.

Top Runner Program:
To diffuse appliances and vehicles that are highly energy efficient, the revised Japanese Energy Conservation Law makes it obligatory for manufacturers and importers to ensure their products meet energy-saving standards. The Japanese government launched the Top Runner Program based on the revised Law in 1999, under which the standards are set based on the efficiency level of the most efficient product commercially available in a given category. For each manufacturer and importer, the weighted average efficiency of all units shipped within the same category must meet the standards for that category by the time established for each category. The targeted products are ones designated as machinery and equipment which are commercially used in large quantities in Japan, consume a significant amount of energy when used and require increases in energy efficiency. As for the designated products, manufacturers and importers are obliged to meet the target standard values concerning the “energy consumption efficiency” of those products. Target standard values are set on the basis of the value of the most energy efficient products of the same category in the market. An acceptable energy conservation amount is established and products may not be sold in Japan if their energy conservation is below this amount by the specified date. Target standard values are set in classifications considering a variety of models with different sizes and functions for each product. For example, larger refrigerators obviously consume more energy than smaller ones, and freezers consume more energy than refrigerators, which is why the standards are in the form of “percentage of energy conserved” and why there are different standards for different products. The Top Runner Program covers a variety of different products including: passenger vehicles, air conditioners, fluorescent lights, TV sets, Video Cassette Recorders (VCRs), copying machines, computers and their accessories such as screens, magnetic disk units, freight vehicles, electric refrigerators, electric freezers, electric toilet seats, space heaters, gas cooking appliances, gas water heaters, oil water heaters, vending machines, and transformers. Examples of Top Runner Program
standards would be that computers must conserve 83\% more energy than they did in 1997 by 2005, and that fluorescent lights must conserve 16.6\% more energy than they did in 1997 by 2005. For a complete list of the Top Runner Program standards, visit http://www.eccj.or.jp/databook/2003-2004e/04_08.html.

ECCJ free energy audits:
The ECCJ also arranges free energy audits for SMEs and commercial buildings. Eligible SMEs are firms whose capital is less than 100 million yen or whose total number of employees is less than 300. In energy audits of these firms, one or two auditors will spend one or two days analyzing the facility, and then make recommendations for improvements in the use of heat and electric energy. Virtually all commercial buildings are eligible for ECCJ energy audits. In these audits, two or three audit experts make an interview with the people in charge of the management standards for the building. Then, they conduct an on-the-spot survey of how the facilities in the building are operated. After the survey (which usually takes between 2 and 4 days), the auditors draw up a list of areas which need improvement and give advice for energy conservation and efficiency.

Energy Star:
The international Energy Star Program, established in the US in 1992, is a voluntary energy-efficiency labeling program designed to promote energy-efficient products. Japan reached agreements to promote certain Energy Star qualified products in 1995. The products currently covered by Energy Star in Japan are personal computers, monitors, printers, fax machines, copying machines, scanners, upgradeable digital cameras, and multifunction printer-copier-faxes. Japan’s Energy Star initiative is directed by the Ministry of Economy, Trade and Industry (METI).

Energy Saving Labeling Program:
Another labeling program in Japan is the voluntary Energy Saving Labeling Program (also known as the Energy Saving Label). Launched on August 21 2000, the program provides consumers with information on energy consumption and efficiency that is easier to understand. This can lead to consumers comparing energy efficiencies so that they can select more energy-efficient products when making a purchase. As of August 2004, there were 13 product categories under the voluntary labeling program. The original 5 categories established in August 2000 were air conditioners, fluorescent lights, TVs, refrigerators, and freezers. An additional 5 categories were established in June 2003 and include space heaters, gas cooking appliances, gas burning heaters, oil burning water heaters and electric toilet seats. In May 2004, the final 3 product categories were added. These products were computers, magnetic disk units and transformers, bringing the number of product categories to 13 and to the present amount.

ECCJ Energy Efficient Product Retailer Assessment System (EEPRAS):
The Energy Efficient Product Retailer Assessment System (EEPRAS) was started by the ECCJ in order to recognize retailers that actively promote energy efficient products or those who provide appropriate energy conservation information. The System’s logo is displayed on the storefront of any shop deemed to meet the requirements of the System. The EEPRAS targets large home appliance retailers with a floor space of at least 1,000
square meters, where at least 50% of total sales come from home appliances. Top “Energy Efficient Product Promotion Stores” are selected each year and publicized along with their rankings. The System began in 2003 and exists to let consumers know which stores sell energy efficient appliances. The goal is to have consumers recognize the value in energy efficient products, and enable them to make educated decisions when choosing a home appliance.

Rebates for new water heating systems:
The energy required to heat water represents about 30% of the total energy consumption of a household. For this reason a rebate system has been introduced in Japan to promote the proliferation of energy efficient hot-water systems. The program covers CO₂ refrigerant heat-pump boilers, latent-heat recovery boilers, and gas engine boilers because they offer energy savings of approximately 30%, 15% and 10% respectively compared to conventional combustion-type boilers. This results in savings of 3 to 9 percent on a home’s overall energy bill. Rebates are granted from the federal government and the size of the rebate depends on which type of water heater is purchased.

Energy Service Companies (ESCOs):
There are also numerous ESCO businesses that exist throughout Japan (ESCO stands for Energy Service Company). An ESCO Business is one that offers comprehensive services on energy efficiency and conservation to clients, who in return will offer a portion of their energy savings gains to the company for an agreed time period. In 1996, Japanese society was deemed fit for ESCO business services, and 13 companies began operations with others looking to join them in the near future. The Japan Association of Energy Service Companies (JAESCO) was established in 1999, around the same time as the Kyoto Protocol’s emergence from COP3 and the government’s formulation of the Law concerning the Promotion of the Measures to Cope with Global Warming. This led to the creation of a large market for ESCO services, which continues growing based on rising energy costs and the increasing benefits for energy conservation and efficiency practices. The market for ESCO business currently focuses on hotels, hospitals, office buildings, and government facilities, although home assessments are possible and done on occasion. Through the creation of JAESCO and its ESCO business components, the private sector has taken notice of the energy consulting and improvement market. The demand for ESCO services is certainly increasing, from being a 17.0 billion yen (approximately $162 million Canadian) market in 1998 to being a 51.5 billion yen (approximately $491 million Canadian) market in 2002, and it is estimated that the potential market for ESCO services in Japan could be as high as 2,470 billion yen (approximately $23.5 billion Canadian). The role ESCO business will play in Japanese climate change countermeasures is expected to continue its expansion into the future.

Home & Building Energy Management Systems:
The Japanese are also working towards the development of a home energy management system (HEMS) for residences and a building energy management system (BEMS) for commercial and office buildings. The idea behind these systems (also called intelligent buildings) is to use various monitoring and communications technologies to optimally manage energy demand at home and in the workplace. For example, the HEMS would
ensure that lights are not on and that the air conditioner is not running on high when people are not home through the use of a motion-sensor. It would keep track of open doors and windows, cut off stand-by power for such devices as VCRs and digital cable units, and know to decrease the amount of energy consumed by a refrigerator when it is unlikely to be opened (i.e. during the night and during the day when residents are at work or at school). The BEMS would operate in a similar fashion. It would turn off the lights, heat or air conditioning in rooms that are used infrequently, automatically turn off printers, copiers, fax machines and scanners mid-evening when employees are not around, and reduce the amount of energy used by the communal refrigerators during non-working hours. Information displays would be available around the building, which could be enabled to accept manual control. These systems require various motion and sound sensors to function, and could be controlled externally or in a different area of the building. Although these systems are not completely feasible at the present, many of the required advances in technology have already been made, which could make them available in the near future. The energy-saving potential of such systems is huge, and they would have a considerable impact on a building’s energy costs if installed.

**ECCJ guidelines, building information & “Smart Life”:**
The ECCJ publishes various guidelines to help builders make their buildings more energy efficient. These guidelines include information on insulation, building frames and supports, ventilation, heating and cooling, cold- and hot-water supplies, interior airflow, and interior open areas. The guidelines outline the national standards, and then provide additional information to improve the area for optimal energy efficiency. The ECCJ also promotes “Smart Life,” which is a new lifestyle based around the efficient use of energy. The ECCJ conducts a variety of activities promoting Smart Life and provides information on energy-saving products for realizing “Smart Life.” The goal of the EECJ with the Smart Life initiative is to make it seem trendy so that people voluntarily take up the challenge, as forcing people with regulations is ineffective.

**ECCJ & METI ENEX Exhibition:**
The ENEX Exhibition is run by the ECCJ with support from the METI every February (Energy Conservation Month) and is one of the largest and most comprehensive exhibitions in Japan regarding energy efficiency and conservation. It features various kinds of energy conservation measures and new energy technologies to provide the public with a broad range of information concerning energy-saving subjects across all sectors. The most recent ENEX Exhibition, the 2006 “Changing and shifting the energy diet of our life-style” (translated from Japanese) was held in two locations, Tokyo and Osaka, to mark the Exhibition’s 30th anniversary and to allow more people to attend. 40,148 visitors attended the Tokyo Exhibition, and 23,523 attended in Osaka. Organizers of ENEX 2006 felt the Exhibition helped raise visitor awareness of energy conservation, new sources of energy, and global environmental thinking.

**ECCJ Energy Conservation Education Program:**
In April 2001, the ECCJ started the Energy Conservation Education Program at selected primary and middle schools to promote energy conservation activities in each community. The role of the program is to educate the children in energy conservation, and to establish
leadership in the community through interactive collaboration on energy conservation activities. The Program ran for 3 years and provided the following support: construction of a network between participating schools, homes and communities; promotion of energy conservation education in the classroom (provided textbooks and brochures, and advertised the Energy Conservation Poster and Essay Contests); training sessions for school teachers and community inhabitants and general capacity building for the spread of energy conservation practices; and publication of various energy conservation activities. The Energy Conservation Education Program lasted until 2003, and was run in 540 primary schools and 90 middle schools across Japan.

**ECCJ Energy Conservation Republic Program:**
Along the same lines as the Energy Conservation Education Program, the ECCJ has developed the Energy Conservation Republic Program to be run mainly in primary and middle schools. The aim of the program is to get children involved in the creation and running of their school’s energy conservation policies so it becomes natural to them. Targets are set and programs are developed for energy conservation, and then actions are taken to reach these goals. The number of republics has grown steadily since the Program was started in 1998 and by 2002 there were already 69 established republics across Japan. Although the majority of the republics have been set up in schools, they can also exist in community centres, clubs, sports teams, and other neighbourhood associations. To enhance the nation-wide activities of the Energy Conservation Republics, the ECCJ has held Energy Conservation Republic Summits since 2001. At the summits, republic delegates come together to share their experiences, the results of their activities, and learn from each other about how to improve the effectiveness of their own republics. At the end of the summits, the attendees leave with new ideas and rekindled inspiration for their own republics. The attendees of these summits have also recently been given the opportunity to run a booth at the annual ENEX Exhibition, where the republic delegates come together to promote the Program to the public. The ECCJ hopes that other countries will adopt the Energy Conservation Republic Program, and plans to extend the summits to the international level when this happens.

**ECCJ appliance comparison website:**
The ECCJ has also developed an information website that allows users to compare the energy conservation performance of electric, gas and kerosene household appliances. The database can be found at [http://www.eccj.or.jp/seihin-kensaku/index.html](http://www.eccj.or.jp/seihin-kensaku/index.html) (Japanese only). The 13 product categories currently registered in the database include TV sets, refrigerators, washing machines, lighting fixtures, electronic bidets, personal computers, gas heaters, kerosene heaters, gas cookers, gas water heaters and kerosene water heaters. The site also explains how to choose eco-friendly products that meet the user’s needs or conditions, and briefly outlines the benefits of increased energy efficiency.

**Hybrid-Z homes & solar panel information:**
Japan is heavily dependent on imported fossil fuel, so efforts to move to renewable sources of energy are increasing. To promote solar power, the government spends about three billion yen a year, about $29 million Canadian, to help companies develop more efficient solar technology. Since 1994, it has spent 116 billion yen ($971 million) on
rebates for homeowners who install photovoltaic panels. These subsidies are now being phased out, but falling prices for solar generating systems may help the industry despite these lost subsidies. The cost of residential solar power systems has dropped by about 80 percent in the last decade, to around $6,000 US for each kilowatt of generating capacity.

Since 1999, Japanese home buyers have been able to buy a home that requires almost no outside energy and that results in a near-zero electricity bill (also known as a zero-utility-cost house or a zero-energy house). The Hybrid-Z home is built by Misawa Homes, one of Japan’s largest homebuilders, and MSK Corporation, the Japanese distributor for Solarex Photovoltaics. The Hybrid-Z home features 20 distinguished and comfortable living designs and offers either a 6 or 12.5 kilowatt solar electric array that covers the house’s entire roof. The homes use no natural gas or oil, so all energy use is electric, including household appliances, cooking facilities, and a water heater. Because of national net-metering, the grid-connected home sells power to the electric utility at retail rates when the system generates more than the house uses. The solar modules are assembled at MSK Corporation’s facility in Nagano and are integrated into the roof at Misawa’s factory. While it takes three days for Misawa to build the modular home, it takes only eight hours to fully install it on site. Misawa Homes sold approximately 1,500 Hybrid-Z homes in 1999, and expects these strong sales levels to continue. The Hybrid-Z home is the first residential structure in the world to achieve energy self-sufficiency, although other manufacturers have since become involved in the zero-utility-cost house industry. These houses only emit about 1/5 of the CO₂ emitted by a conventional house, and are also subsidized by the New Energy Foundation in accordance with the subsidy program for residential PV systems. The subsidy ratio of this program is approximately 1/3 of the total installation cost of the solar roof, which works out to about 3 million Yen (about $25,000 US).

New Energy Foundation (NEF) programs:
The New Energy Foundation (NEF) of Japan also runs some other subsidy and incentive programs for the installation of residential photovoltaic power generation systems. From 1994 to 1996, the NEF carried out the “Residential Photovoltaic Power Generation System Monitor Project” with a fund from METI. The purposes of the project were: to promote the mass production of PV systems and cost reduction by creating initial demand for the system, and to establish PV systems best suited to consumer’s needs based on the operation data collected by monitoring. Initially a subsidy covered about 50% of the total cost of the PV systems. Under this program, 3,590 PV systems were installed with a total power output of 13MW, averaging 3.7kW per system.

In 1997, in place of the above monitoring system, the “Program for Infrastructural Development of Introduction of Residential PV Systems” was started by the NEF. It aimed for the large-scale introduction of solar power generation systems for private residences. This program had its budget increased from 4.1 billion yen in 1996 to 11.1 billion yen in 1997. With the expansion of the budget, applications for the subsidy increased substantially and installations reached 8,329 in 1997. Owing to the reduction in PV system prices, the subsidy was reduced to about one third of the actual cost, and the selection was switched from lot-based one to first-come-first-served basis, so as to accept
as many applications as possible. In 1998, the subsidy was expanded to cover the installation of PV systems for local government buildings and housing complexes. This caused more demand, and the subsidy fund had to grow accordingly, from 11.1 billion yen in 1997 (about $105 million Canadian), to 23.5 billion yen in 2001 (about $222 million Canadian). The value of the subsidy depends on the maximum capacity of the solar battery module making up the system. It was approximately 100,000 yen/kW of solar generating capacity in 2002, although this is likely to have decreased since then due to the continually falling prices of PV systems.

The NEF started the “Subsidy Program for Residential Solar Thermal Advanced Utilization Systems” in 2002 with the fund from METI. The program budget for 2002 was approximately 5.8 billion yen. A Solar Thermal Advanced Utilization System is constructed from a heat accumulator, a heat collector and a circulating pump which circulates antifreeze through the unit. The heat collector should be installed adequately on the roof to obtain the subsidy, and the system works for heating, cooling and water heating. The purpose of this program is to reduce the cost of the system so that it becomes more affordable and widespread. The gross area of this system (total area per heat collector x number of units) must be less than 25m², and the subsidy grants a maximum of 150’000 yen per system.

The 2001 “Interest Subsidization Program” gives companies installing renewable energy generation systems lower interest rates when borrowing from financial institutions to cover these costs. The energy systems covered by this program include geothermal heat, waste heat, thermal energy conservation, power generation using waste heat, wind power generation, waste power generation, solar power generation, and hydro power generation systems. The NEF subsidizes the financial institutions, which then provide the companies with reduced interest rates.

Building Centre of Japan (BCJ):
The Building Centre of Japan (BCJ) is self-described as an incubator of new building technologies and helps their growth and acceptance into society. The BCJ performs a wide range of activities including evaluation, research and development of new building technologies, and international cooperation and dissemination of information. The BCJ contributes to the advancement of building technologies and the building industry, while improving the quality of life for Japanese people and people around the world. The BCJ has been involved in research involving many new building technologies and ideas, including hyper-buildings (a structure capable of housing 100,000 people that could stand for 1,000 years), arcologies (a term describing the merging of architecture and ecology, usually used in context with hyper-building or to describe a sustainable hyper-building), and sustainable building practices. Recently the focus of the BCJ has been on green building, assessment of the ISO 9000 and 14001 standards, globally disseminating building information, the review of various Japanese building codes and laws, research into prefabricated houses, green roofs, research into sick building syndrome, and innovative building technologies (recycling building materials, sound-insulated floors and walls, building materials with low VOC content, heat-insulating materials that are not easily ignited, etc). When conducting evaluations of various building materials, each
product is stamped with the BCJ mark of approval to show it has passed rigorous testing. The stamp is also used as an advertisement and in improving brand image.

MLIT Government Green Buildings Program:
The Government Buildings Department of the Ministry of Land, Infrastructure and Transport (MLIT) is responsible for the greening of government buildings. As with most other federal governments promoting the increasing use of green building, the Japanese federal government is greening its buildings to show what can be done to reduce the environmental load of a building from its planning stage through its construction, use, and eventual disposal. This governmental effort includes the building of brand new green buildings, as well as the renovation of older buildings to incorporate new technologies and to make them more sustainable. In July 2004, the Government Buildings Department established the “Environmental Load Reduction Program on Government Facilities (Government Green Buildings Program).” The program was established based on a thorough evaluation of the measures that need to be taken to ensure that environmentally-friendly practices are promoted comprehensively in government facilities and to demonstrate that the government can play a leading role in the field of public buildings. To promote the program to the public, the Government Buildings Department will actively publish information relating to the progress of this program and environmental load reduction, through means such as websites. The department will also create and publish an annual environmental report.

Overseas Performance Evaluation and Approval initiative:
While Japan has its own green building rating system (CASBEE), the MLIT’s Housing Bureau runs an applications program for the recognition of Overseas Performance Evaluation and Approval Organizations in Japan. For a system like LEED or BREEAM to become recognized in Japan, a representative from these rating systems must apply to the Housing Bureau and have them review the standards and performance measures of the system. If the system is deemed valid by the Housing Bureau, then it becomes officially recognized by the Government of Japan as an applicable green building rating system.

Japanese Building Research Institute’s Department of Environmental Engineering (DEE):
The Japanese Building Research Institute’s Department of Environmental Engineering (DEE) is developing various methods and technologies to efficiently build resource- and energy-saving, healthy, and comfortable buildings. It also studies the life styles of people, which is directly related to energy consumption, and develops methods for evaluating and examining the environmental performances of buildings. Current projects by the DEE include experimental research for residential cross ventilation, sun shading design, sound-insulation, and efficient heating, ventilation and air conditioning (HVAC) systems. The Department of Building Materials and Components (DBMC) analyzes the basic physical properties of building materials and components, investigates methods for maintaining and repairing buildings, and examines new materials, such as composite materials. To meet present public demand, the Department conducts basic studies, interdisciplinary studies, and pioneering studies such as development of new materials of high quality and high performance to meet public demand in the future. The DBMC is presently
conducting research and experiments concerning waste minimization during building and dismantling stages, advanced building material recycling techniques, long-term durability studies, and environmental assessments of various building materials.

**Environmental Activity Evaluation Program:**
The Japanese Ministry of the Environment has released its *Environmental Activity Evaluation Program* guidelines and made them available online to help people conduct environmental self-assessments of their homes, businesses and activities. Although there is no quantitative aspect to the guidelines, they are fairly comprehensive and if the assessment is done properly, it can lead to the identification of areas needing improvements in order to save resources, reduce pollution, increase energy efficiency, etc. The assessment takes the form of a plan-do-check-act procedure and promotes continual improvement. The guidelines are available online at [http://www.env.go.jp/policy/j-hiroba/PRG/pdfs/e_eco_action.pdf](http://www.env.go.jp/policy/j-hiroba/PRG/pdfs/e_eco_action.pdf). The Ministry of the Environment’s website has more specific guidelines and assessment standards available for a variety of green building areas including noise pollution, recycling and waste management, air quality, transportation, site characteristics such as heat islands, etc. They can be found at [http://www.env.go.jp/en/](http://www.env.go.jp/en/) through the navigation bar on the bottom left of the page.

**Yanepita Photovoltaic Systems:**
Japan also has numerous initiatives being carried out by private companies. In 2003, as one of its series of “Sunbest” photovoltaic systems, Matsushita Electric Works Ltd. of Japan launched sales of the “Yanepita,” a PV power generation system that is specially designed for installation on the slate tile roofs of existing houses. When installing a PV system on slate roofs using conventional methods, it was difficult to overcome problems of the systems developing rain leaks and being blown off by the wind. To overcome these problems, Yanepita involves installing special bases on the existing slate roofing and then the ultra-thin solar modules, only ten millimeters thick, on top of the bases. Since its height above the tiles is only 40 millimeters, the system has no negative effect on the appearance of houses. In addition, the system excels in durability, waterproof and windproof qualities. The company says that the system can be easily installed on already-built houses. The outer dimensions are 1,191 x 792 millimeters, and as each panel is independent, installation of the system can be flexible depending on the shape of the roof.

**Residential geothermal heat pumps:**
Sunpot Co., a heating appliance maker in Japan, and Hokkaido University have co-developed a geothermal heat pump unit and in 2004 became the country’s first manufacturer to start mass-production of residential geothermal heating units. The system involves digging a hole in the ground about 10 centimeters in diameter, 75 to 100 meters deep, and inserting a polyethylene pipe filled with an antifreeze solution. The system absorbs ground heat as a thermal source for the heated water system. Ground heat is a stable natural energy source that takes advantage of ground temperatures consistently two degrees Celsius warmer than the local average annual air temperature, unaffected by heavy snow or variations in surface air temperatures. The new heat pump can produce the equivalent of four times more heat energy than the electricity the system consumes. The system is not only energy efficient but also helps reduce fossil fuel consumption,
resulting in about one-third the carbon dioxide emissions compared to a kerosene heater.

**Eco Families:**
In 2005, the Japanese Ministry of the Environment began inviting families to make declarations of eco-friendly lifestyles in order to promote environmental education and eco-friendly lifestyles at home. Participating families will register themselves as “Eco Families,” and try to conserve energy through activities such as promoting recycling and refraining from using air-conditioners and private cars as much as possible. A representative of each family, who will be designated as the Family Environment Minister, will record and report the family's activities and results. Each Eco Family will be given its own web page, where its activity data can be displayed graphically and the amount of energy used and carbon dioxide emitted calculated, so that the family can use the data in its ecological activities. Tips for environmental activities and eco tour information will also be provided to the families. The ministry is also considering an award system to honor Eco Families that make outstanding efforts for a better environment.

**Lifuel cogeneration systems:**
In 2005, Tokyo Gas Co., the largest city gas supplier in Japan, began installing “Lifuel” residential fuel cell cogeneration systems in pre-built private homes. This is the world’s first commercial application of stationary fuel cells in private houses. The systems were installed in three new pre-built family houses in Hachioji City, Tokyo, by Sekisui House Ltd, a leading Japanese housing manufacturer. The two companies also installed the Lifuel system in seven houses in Kichijoji, Musashino City, Tokyo, which went on sale in September 2005. The Lifuel system is an energy-efficient cogeneration system that generates electricity through the reaction of hydrogen with city gas and oxygen from the air and also supplies hot water using exhaust heat. Standard equipment for the houses includes a floor heating system and a dishwasher/dryer that also utilizes this system. This system can reduce CO₂ emissions by about 40%, and reduce primary energy consumption by about 26% compared to conventional systems. Houses with the Lifuel system are expected to contribute to environmental conservation while providing residents with utility bill savings.

**CO₂ calculator from Tokyo Gas:**
Tokyo Gas Co. also began providing an environmental accounting service on its website in March 2006 that calculates the total CO₂ emissions from each household. Users can determine their monthly household CO₂ emissions by entering data on the natural gas, water, electricity, and heating oil they consume. The service is available at no charge to registrants on the company’s website, where customers can also make inquiries about their monthly gas consumption and charges. By entering data on their type of housing and number of family members, the users can compare their CO₂ emissions to the average emissions of the same type household in 1990, allowing them to see whether or not they have attained a reduction of 6 percent from 1990 levels, the Japanese target for emissions reductions under the Kyoto Protocol. The program also offers a small prize to encourage users to utilize the service and become more aware of CO₂ reduction. When users accumulate certain points by entering consumption data periodically or answering a
monthly quiz, they can win an environmental picture book on animals endangered by global warming. The company aims to promote participatory approaches for environmental communication and contribute to solving global environmental problems through the program.

**LPG fuel cell systems:**
Soon after the Tokyo Gas Corporation had made its Lifuel initiative public, the Japan Energy Corp., a Japanese refiner and energy producer, announced that it started installing an LPG reforming stationary fuel cell system in typical households. The company began promoting the system mainly in the Kanto area (surrounding Tokyo), installing 30 units in the first year, and a total of 150 units within the next three years. The home fuel cell system has an electricity generation capacity of 700 watts and a hot water tank capacity of 200 liters, with a 65 percent or higher combined efficiency (higher heating value standards). Liquefied petroleum gas, or LPG, is used as fuel. The company concludes what it calls the “JOMO Smile L Contract,” a three-year contract for fuel cell maintenance, with users, asking them to provide data and answer questionnaires on the system usage. The company covers installation and maintenance costs for the fuel cell system, while users only bear LPG fuel costs. This undertaking utilizes subsidies from the Stationary Fuel Cell Extensive Demonstration Project of 2005, promoted by New Energy Foundation, which encourages technical development and practical applications of fuel cell systems.

**Biomass Town Program:**
In 2006, the Japanese Ministry of Agriculture, Forestry and Fisheries (MAFF) released a comprehensive evaluation report to examine progress made to date with its policies under the Biomass Nippon Strategy, which promotes the nationwide use of biomass, during the base years of 2002 through 2005. According to the evaluation from the nationwide perspective, the overall utilization of waste biomass increased from 68 to 72 percent (carbon equivalent), and the recycling rate of food waste improved from 10 to about 20 percent. Meanwhile, the utilization of unused biomass such as wood thinned from forests and rice straw remained unchanged at about 20 percent since the launch of the strategy, and the commercial use of energy crops, such as sugarcane and rapeseed, was negligible. From the regional perspective, as of February 2006, 35 municipalities had announced plans for comprehensive and appropriate use of biomass based on the Biomass Town Program. From the technological perspective, the production efficiency of biomass-derived plastics showed a year-on-year increase of 20 percent, exceeding the initial goal of 10 percent. The report, calls for positive efforts to realize the goals of Biomass Nippon, and suggests five specific actions: promoting reductions in the volume of food waste and greater efforts to sort this waste; enhancing the use of forest residues as unused biomass for product materials and energy sources; realizing the stable and low-cost production of energy crops and cultivating them on abandoned farmland; fostering human resources for the development of the Biomass Town Program; and establishing production systems for biomass-derived plastics similar to those for oil-derived plastics. On March 31, 2006, the Japanese Cabinet approved a revision of the Biomass Nippon Strategy, with the view that it is important to promote the use of biomass energy for transportation fuels. Other
initiatives proposed include acceleration of the Biomass Town Program and the promotion of biomass energy in Asian countries.

Also in 2006, Minamata City of Kumamoto Prefecture in southern Japan announced its plans to attain a high rate of biomass resource utilization in the city. Aiming to become a “Biomass Town,” the city plans to use more than 92 percent of waste biomass and more than 40 percent of unused biomass, focusing on the utilization of wood biomass and livestock waste. The city has been collecting household waste sorted by citizens into 21 categories since 1993, composting all food waste, and has achieved a 20 percent reduction in waste volume. According to the announcement, the city plans to start biomass power generation in fiscal 2006-07, and livestock waste treatment in fiscal 2009.

Since Minamata City’s announcement, MAFF has added biomass utilization plans by three more municipalities -- Shikaoi Town in Hokkaido, Maniwa City in Okayama Prefecture and Yusuhara Town in Kochi Prefecture -- to its Biomass Information Headquarters website. This website had been set up to provide a variety of information relating to the Biomass Nippon Strategy, Japan’s strategy for biomass utilization. Since 2004, MAFF has been inviting municipalities to submit plans for promoting comprehensive and effective use of biomass based on this program. Shikaoi Town aims to produce and efficiently apply high-quality compost derived from waste biomass, establish systematized technologies to utilize biomass by using biogas energy, foster collaboration between farming and stockbreeding operations, and create a sustainable community with fewer impacts on the natural environment. Maniwa City seeks to organize a system for collecting, transforming and using waste biomass derived from wood processing, livestock manure, food waste and unmarketable lumber products. The city aims to raise its waste biomass utilization rate to 90 percent or more. Yusuhara Town plans to effectively use its rich wood biomass resources and establish a cyclical use system for waste biomass such as kitchen garbage, human wastes and agricultural effluent sludge. This brings the number of Japanese “Biomass Towns” to 39.

METI Eco Town Program:
The Eco Town Program is another METI initiative whose objective is to promote local economic stimulation through fostering environmental businesses that utilize the strengths of local industries, and to create resource-recycling socio-economic systems by promoting local approaches for recycling and suppressing the generation of waste. Local governments play a central role in activities under this program, by linking local citizens and industries in order to achieve innovative approaches to urban development that are environmentally friendly and do not duplicate existing frameworks. More specifically, a local government first creates an “Eco Town Plan” that takes advantage of the region’s local characteristics. Then, if the basic concepts and concrete projects written into the plan are judged by METI and the Ministry of the Environment as meeting a certain standard of originality and innovativeness, and judged to have the potential to serve as a model for other local governments, the two ministries jointly approve the plan. They then provide financial support for projects by local governments and private organizations to improve physical recycling facilities, and to implement “soft” (institutional/organizational) projects that can contribute to the realization of a recycling-
oriented society. Currently Japan has 24 Eco Towns, with the first being Iida City in 1997 and the most recent being Osaka in 2005.

**Friends of the Earth (FoE) Japan:**
Friends of the Earth (FoE) Japan is an international environmental non-governmental organization (NGO), and has been working since 2004 to encourage local governments nationwide to join the FoE “Fifty-Fifty” Program, in which public schools can receive half of the money they save through reducing electricity, fuel and water costs. More than 2,000 public schools in Germany have already started with this program. Students, teachers and school facility managers work hand in hand to promote energy efficiency - without making any new investments in energy-saving equipment or installations - and local governments partially reimburse schools for these reduced energy costs. In 2004, FoE Japan compiled a how-to manual for this program as a model CO₂ emission control project that involves community cooperation and promotes energy saving activities in schools, resulting in reduced public expenditure. Between September 2004 and January 2005, six public schools in Suginami Ward, Tokyo, participated in the program as a model project, and achieved a 0.77 percent reduction of CO₂, or a decrease of 1,880 kilograms compared to average emissions over the same time period during the previous three years. Encouraged by these results, a total of 62 elementary and junior high schools in Suginami started this program starting with the second semester of 2005. As in the previous year, the ward office distributed posters encouraging energy saving to all the schools. The school children work to save energy, reviewing the use of energy and water in schools on their own initiative, using an “Eco-audit” manual. Other than these examples in Suginami, five elementary and junior high schools in Oita City, Oita Prefecture started this program in 2005 as a pilot project. The local government is supposed to refund to schools half the amounts they save and appropriate from its Environmental Section budget a sum equal to another one-fourth of the savings, for tree planting and school yard greening.

**B-5 Australia:**
Australian Government’s climate change strategy:
The Australian Government’s climate change strategy is centered on five key areas – emissions management; international engagement; strategic policy support; impacts and adaptation; and science and measurement. The strategy also recognizes that society is more likely to embrace climate change countermeasures if there are support programs and incentives available to help them, as the costs of becoming more sustainable can be quite high. A division of the Australian Department of the Environment and Heritage, the Australian Greenhouse Office (AGO), delivers numerous programs under the Australian Government’s $1.8 billion climate change strategy.

**Australian Climate Change Science Program (ACCSP):**
The Australian Climate Change Science Program (ACCSP) aims to improve our understanding of the causes, nature, timing and consequences of climate change so that industry, community and government decisions can be better informed. The program is conducted in partnership with leading science agencies, notably the Commonwealth Scientific and Industrial Research Organization (CSIRO), the Bureau of Meteorology and
the Australian Academy of Sciences. In May 2005 the Australian Government announced renewed program funding of $30.7 million over four years. The effect of this funding is magnified by contributions of equal value from CSIRO and the Bureau of Meteorology. Australia is already recognized internationally for the quality of its climate change science, and has the most comprehensive climate research program in southern hemisphere.

Community Abatement Grants:
Community Abatement Grants of $28,000 are available to groupings of three or more Cities for Climate Protection (CCP) Councils. Groups of CCP councils are required to work in partnership to deliver projects that work with local households, businesses, schools or community groups on greenhouse abatement initiatives to be able to obtain this funding. The grants are designed to provide councils with access to specialist services to prepare an emissions inventory and estimate emissions growth.

Greenhouse Gas Abatement Program (GGAP):
The Australian Government’s Greenhouse Gas Abatement Program (GGAP) is playing an important part in helping Australia meet its emissions reductions target. The GGAP aims to reduce Australia’s net greenhouse gas emissions by supporting activities that are likely to result in substantial emissions reductions or activities to offset greenhouse emissions, particularly in the period between 2008 and 2012. The most recent emission projections show that the GGAP will deliver an abatement of 6.1 million tonnes (Mt) of carbon dioxide in 2010, which is equivalent to taking up to 1.2 million vehicles off the road. The Program leverages private sector investment in activities or technologies through projects. Examples of GGAP projects are based on co-generation (the use of waste heat or steam from power production or industrial processes for power generation), energy efficiency, travel demand management, alternative fuels, coal mine gas technologies and fuel conversion. The three funding rounds of the GGAP have been concluded, and no further funding rounds are being offered at this time.

Low Emissions Technology Demonstration Fund:
The $500 million Low Emissions Technology Demonstration Fund is a flagship initiative of the Australian Government’s Energy White Paper: Securing Australia’s Energy Future. The Fund will support the commercial demonstration of technologies that have the potential to deliver large-scale greenhouse gas emission reductions in the energy sector; it is designed to leverage $1 billion in additional private sector investment. Use of low emissions technologies is a substantial element of the Australian Government’s climate change strategy, enabling Australia to reduce the cost of meeting future greenhouse gas emissions constraints without harming the competitiveness of its energy and energy-dependent industries. The Fund is designed to address the risk and capital costs of demonstrating low emissions technologies to ensure they are commercially viable in the longer term. The Fund will operate from 2005-06 to 2019-20, with the first competitive funding round in 2005-06. Subject to the outcome of round one, there may be further funding rounds in 2008-09 and 2012-13. The Minister for the Environment and Heritage and the Minister for Industry, Tourism and Resources are responsible for the Fund, and will jointly approve grants. The Department of the Environment and Heritage and the
Department of Industry, Tourism and Resources share policy responsibility. AusIndustry will manage the day-to-day administration of the Fund. Renewable and fossil fuel energy supply technologies, and energy efficiency in both stationery and transport energy sectors will be eligible under the Fund. The technology must be commercially available by 2020 to 2030 and have the potential to reduce Australia’s energy sector emissions by at least two per cent per annum over the longer term.

**National Climate Change Adaptation Program:**
A key element of Australia’s greenhouse response is preparing Australia for unavoidable climate change impacts. The National Climate Change Adaptation Program is a $14.2 million program which aims to commence preparing Australian governments, vulnerable industries and communities for the unavoidable impacts of climate change.

**Australian Government renewable energy programs:**
The Australian Government also offers a host of renewable energy programs. The 5 year, $20.4 million, Advanced Electricity Storage Technologies (AEST) Program was announced in June 2004 in the Australian Government’s Energy White Paper, Securing Australia’s Energy Future. The program will identify and promote strategically important advanced storage technologies in order to increase the ability of renewable energy-based electricity generation to contribute to Australia’s electricity supply system. Advanced storage technologies for electricity applications include, but are not limited to, batteries, electro-mechanical, chemical and thermal storage technologies in either on-grid or off-grid situations. The Australian Greenhouse Office, in the Department of the Environment and Heritage, will deliver the program with policy advice provided by the Department of Industry Tourism and Resources. The Renewable Energy Development Initiative (REDI) is a competitive merit-based grant program supporting Renewable Energy innovation and its commercialization. REDI was announced in 2004 as part of the White Paper. It provides grant funding up to $100 million in competitive grants to allocate to Australian businesses over seven years. It offers grants of between $50,000 and $5 million for research and development (R&D), proof-of-concept, and early-stage commercialization projects with high commercial and greenhouse gas abatement potential.

In those areas of Australia not serviced by a main electricity grid, electricity generated from renewable sources is often an effective way of reducing reliance on fossil fuel for electricity generation. The Renewable Remote Power Generation Program (RRPGP) provides financial support to increase the use of renewable generation technologies in remote parts of Australia that presently rely on fossil fuel for electricity generation. Increasing the uptake of renewable energy technologies in remote areas of Australia is expected to: help in providing an effective electricity supply to remote users; assist the development of the Australian renewable energy industry; help meet the energy infrastructure needs of indigenous communities; and lead to long term greenhouse gas reductions. The RRPGP is expecting to pay over $200 million in grants through the program’s lifetime. Various examples of projects funded by RRPGP can be found at http://www.greenhouse.gov.au/renewable/rrpgp/index.html. The Renewable Energy Equity Fund (REEF) is designed to provide venture capital for small innovative renewable energy companies. This includes companies which are commercializing direct
or enabling renewable energy technologies and services, such as manufacturers of photovoltaic cells or the inverters to convert this to useful electricity, providing there is an innovative development being commercialized. REEF has a funding pool of $26.6 million.

**Low Emissions Technology and Abatement (LETA) initiative:**
The Low Emissions Technology and Abatement (LETA) initiative is a $26.9 million measure to reduce greenhouse gas emissions over the longer term by supporting the identification and implementation of cost effective abatement opportunities and the uptake of small scale low emission technologies in business, industry and local communities. Finally, Solar Cities is a $75.3 million initiative also announced by the Prime Minister in the Energy White Paper. Solar Cities will be implemented by the Department of the Environment and Heritage through trials in Adelaide and at least three other electricity grid-connected urban areas around Australia. Solar Cities is an innovative program which is designed to demonstrate how solar power, smart meters, energy efficiency and new approaches to electricity pricing can combine to provide a sustainable energy future in urban locations throughout Australia. It is a partnership approach that involves all levels of Government, the private sector and the local community. The Solar Cities program will run from 2004/05 to 2012/13, with the focus on program design and site selection in the first year. The Program aims to support at least four Solar City projects in grid-connected urban centres across Australia. In late 2005 it was announced that eleven consortia from across Australia have been short-listed at the Solar Cities expression of interest phase. Proponents from Adelaide, Perth, Kalgoorlie, Alice Springs, Townsville, Newcastle, Sydney, Melbourne and Bendigo will be invited to submit a detailed business case and compete to host a Solar City. Final selection of the Solar Cities is expected late summer 2006. To assist with the costs of developing a detailed business case, the Australian Government has offered each of the short-listed consortia a $50,000 grant.

**Commonwealth Scientific and Industrial Research Organization (CSIRO):**
The Commonwealth Scientific and Industrial Research Organization (CSIRO) is Australia’s national science agency and one of the largest and most diverse research agencies in the world. It conducts experiments and R&D in a wide variety of areas relating to green building including energy efficient buildings, HVAC systems, renewable energy, climate change, sustainable construction, and more. Although CSIRO does not run any of its own incentive programs, it often contributes funding to help boost the possibilities and effectiveness of other support programs.

**Keep Australia Beautiful (KAB) programs:**
Keep Australia Beautiful (KAB) is expanding the Clean Site Program that was initially developed in South Australia by KESAB Environmental Solutions. The Clean Site Program is now licensed and operating in New South Wales, Victoria, Western Australia, Queensland, and South Australia. Run in conjunction with the Master Builders Association, the Program provides builders, contractors and handymen with environmental guidelines focusing on erosion and sediment control, waste management and resource conservation. With its partners in the building and construction industry,
KAB has identified actions to change long-standing and unacceptable construction practices and to meet new standards ensuring a cleaner environment. The Program will focus on maintaining the overall environmental quality of the building site throughout the building period, with particular emphasis on minimizing negative effects on local waterways, rivers, creeks and beaches, which can experience significant increases in pollution and sediment load during and after the construction phases. This is an important Australian green building program because the majority of green building initiatives deal with energy efficiency, with very few focused on the other aspects of green building such as site sustainability.

KAB’s Sustainable Cities Program is one of the leading community and environmental awards programs for metropolitan communities in New South Wales. The projects carried out not only enhance the environment, but also improve the standard of living and quality of life for urban communities. More than any other metropolitan based environmental program, the Sustainable Cities Awards inspire communities to make a genuine and lasting contribution to their area, working in partnership with local government and local businesses. The Program incorporates two levels of awards, category-specific awards and an overall award. These two levels acknowledge individual aspects (such as litter and graffiti minimization) or entire project results respectively. Local councils, community groups, businesses, schools, or individuals can enter the Sustainable Cities Program, which is free of charge. Awards for excellence in each area will be given to entries regardless of who nominates the program or project. Each submission will be considered on its merit and alongside similar entrants.

The Green & Healthy Schools Program is run by KAB primarily in Queensland schools but also in selected schools in other Australian states. Thousands of students and their teachers from about 450 schools (one in five Queensland schools) participate in this leading-edge, curriculum-based program which promotes health, safety and the environment through elementary and middle-school classrooms. Green & Healthy Schools encourages schools to develop a green and healthy philosophy and to tackle a range of issues at the school level, including nutrition, waste minimization, energy usage, litter and recycling. The program gives students, teachers, parents and friends the chance to take part in a range of initiatives that develop the educational, personal and social benefits that come from caring for self, the community and the environment. Schools that register for the program are provided with a comprehensive resource kit covering everything from school environmental audits to curriculum-based classroom activities. Registration is free and open to all schools. The program also features a competition element to recognize and reward schools for their Green & Healthy endeavours.

Other KAB programs include ‘Keep Australia Beautiful Week,’ the ‘Tidy Towns Program,’ and the ‘Clean Beach Challenge.’

Futureenergy.org: www.futureenergy.org is an Australian website which coordinates action promoting the use of renewable energy. The site provides a wealth of information about how to live more sustainably, and among this information is a section about various ways to make a
home more energy efficient. It can be found at [http://www.futureenergy.org/infohouse.html](http://www.futureenergy.org/infohouse.html). The GBCA website also has some information on rebate and incentive programs available to home owners who take steps to reduce their home’s energy usage. State governments provide rebates of $1,200-1,500 to residents, non-profit groups and farms who set up a solar water heater. Solar hot water units also come with a booster for times when there is not enough sun. This can be gas or electric. Gas-boosted systems cost between $4,000 and $4,500 installed (including the rebate), while electric-boosted units cost between $3,000 and $3,500. To put things into perspective, the equivalent figure for a conventional water heater is around $1,400. Certain state governments also offer rebates for the purchase and installation of residential rainwater collection tanks. Currently, the government of the Australian Capital Territory (ACT) is giving $400 rebates for these home improvements. The State of Victoria offers $600-1,000 rebates for people who buy a 5 Star gas space heater or ducted system, and a rebate of $500-900 for those who buy a 4 Star gas space heater. Victoria also offers $400-700 rebates for people who buy 5-Star gas water heaters.

**Government funding for HVAC system improvements:**
Funding is also available from various sources to increase R&D for green technologies. For instance, the Department of Infrastructure, Planning and Natural Resources (DIPNR) is offering up to $1 million to fund innovative HVAC Technologies which demonstrate energy use reductions in high rise commercial buildings. Improvements in HVAC systems are being funded by the government as it realizes interior air quality enhancements can increase occupant comfort, productivity and morale in business settings.

**WELS Scheme & water efficiency label:**
The federal government has also launched a mandatory water efficiency scheme. Rebates of varying amounts were available to people who purchased new water-conserving showerheads, washing machines, dishwashers, toilets, some types of taps, and urinals before July 2006. These rebates were cancelled when the new Water Efficiency Labeling and Standards (WELS) Scheme became mandatory across Australia. It was introduced to assist consumers in purchasing more water-efficient household products. It also provides incentives for manufacturers to improve the water efficiency of these products to maintain sales. On July 1 2006, it became mandatory across Australia for showers; clothes washing machines; dishwashers; toilet equipment; urinal equipment; and tap equipment intended for use over kitchen sinks, bathroom basins, laundry tubs or ablation troughs, to carry a WELS Water Rating label when they are being sold. The WELS Water Rating label has two main features: a 6-star rating that gives a quick comparative assessment of the model’s water efficiency, and a water consumption figure that provides an estimate of the water consumption of the product based on its tested water consumption.

By simply choosing more efficient products, by 2021 Australia stands to save more than $600 million through reduced water and energy bills. It is also estimated that by 2021, water efficiency labeling will cut domestic water use by five per cent or 87,200 megaliters per year. A total of 610,000 megaliters - more water than in Sydney
Harbour - is projected to be conserved by 2021. Nearly half the water savings will come from more efficient washing machines, about 25 percent from showers and 22 percent from toilets. The WELS Scheme will also deliver substantial energy savings and greenhouse gas abatement through a reduction in hot water use. The reduction in greenhouse gas emissions for Australia is projected to reach about 570 kilotonnes of carbon dioxide equivalent per annum by 2021, with a cumulative total of around 4,600 kilotonnes of carbon dioxide equivalent by 2021. Thus, choosing a water-efficient product will both conserve water and save householders money through reduced water and energy bills. A water-efficient washing machine may use only one-third the water of an inefficient model. An old-style single-flush toilet may use up to 12 liters of water per flush, but standard dual flush toilets use only 3 liters on a half-flush. A standard showerhead may use up to 25 liters of water per minute but a water-efficient showerhead can use as little as 7 liters per minute. The program is drawing upon the experience of the mandatory energy efficiency labeling system in place across Australia, which has seen an energy efficiency improvement for refrigerators and freezers of 50 percent over a 13 year period, and projected improvements of 70 percent over 25 years. Similar improvements may be possible for some water-using products over time.

Energy Star & Energy Rating Label:
In terms of an energy efficiency product rating system, Australia also uses the United States’ Energy Star Scheme. However, Australia has developed its own Energy Rating Label which enables consumers to compare the energy efficiency of domestic appliances on a fair and equitable basis. It also provides incentive for manufacturers to improve the energy performance of their appliances. The Energy Rating Label was first introduced in 1986 in NSW and Victoria. It is now mandatory in all states and territories for refrigerators, freezer, clothes washers, clothes dryers, dishwashers and air-conditioners (single phase only) to carry the label when they are offered for sale. The Energy Rating Label has two main features: the 6-star rating gives a quick comparative assessment of the model’s energy efficiency, and the comparative energy consumption (usually kilowatt hours/year) provides an estimate of the annual energy consumption of the appliance based on the tested energy consumption and information about the typical use of the appliance in the home. Air-conditioners show the power consumption of the appliance (kW or kWh/hour). Following several years of negotiation between government and industry, the familiar red and yellow Energy Rating Label was revised in 2000. Energy efficiency is now measured against a tougher standard. This change encourages improved technology and more efficient products, which will save consumers money and help reduce harmful greenhouse gas emissions. The energy labeling scheme was reviewed again in 2003, but no significant changes to the system were made. It is important to note that the Australian labeling systems for energy and water efficiency have very similar structures and label appearances, which is beneficial as it promotes consumer familiarity with the rating schemes.

Australian Business Council for Sustainable Energy (BCSE):
The Australian Business Council for Sustainable Energy (BCSE) is a member based industry association representing the sustainable energy industry in Australia. The BCSE represents the broader sustainable energy industry - covering renewables, waste-to-
energy, gas-fired generation and energy efficiency. They have over 280 organizations as members, including installers and designers of renewable energy systems; large project developers and project service providers - including consulting engineers, economists, financial and legal advisors; equipment and component manufacturers and suppliers; researchers and academics; energy retailers, and energy service providers. The common feature of BCSE membership is the shared interest in meeting Australia’s energy needs with lower greenhouse emissions. The BCSE was formed in 2002 through the merger of the Australian EcoGeneration Association (AEA) and the Sustainable Energy Industry Association (SEIA). Predecessors of these organizations date back to as far as 1976. The BCSE is the leading advocate for sustainable energy in Australia and undertakes many activities and programs to build on and support the sustainable energy industry in Australia. These activities are aimed at building industry capacity and capability; addressing obstacles; and promoting the benefits to potential customers. The overall goals of the BCSE are: to ensure that sustainable energy makes a significant contribution to meeting Australia’s future energy needs, to help the sustainable energy sector grow so as to ensure that greenhouse emissions from the stationary energy sector to be half of the 2001 level by 2040, and to continue to be the leading industry association representing sustainable energy sector in Australia. The BCSE is also actively involved in a large number of government and regulatory processes and is working heavily with governments on issues affecting industry development. The BCSE chairs a Group that is working to implement the Renewable Energy Industry Action Agenda, which is a joint industry-government strategy to expand the renewable energy industry to annual sales of $4 billion by 2010.

Sustainability Victoria information & programs:
In late 2005, Sustainable Energy Authority Victoria and EcoRecycle Victoria joined forces to become Sustainability Victoria. Sustainability Victoria will act as a catalyst for change by: providing a vehicle to support the tangible delivery of the Government's Framework for Environmental Sustainability; focusing on changing behaviour by providing advice and assistance to inform decision-making by individuals, businesses, governments and communities to act in a more environmentally sustainable way; and facilitating innovation through supporting the development and application of technologies and processes that will produce change that may not otherwise garner support. The activities of Sustainability Victoria will continue to support the goals of the Environmental Sustainability Framework, which are to reduce everyday environmental impacts and use resources more efficiently. Sustainability Victoria is committed to achieving outcomes with their partners and honouring the existing Sustainable Energy Authority and EcoRecycle Victoria contracts, funding initiatives and grants. The central funding initiative from Sustainability Victoria is the Sustainability Fund. The Fund embraces the concept that caring for the environment is not a barrier to economic and social development, but a catalyst for the development of innovative new markets, products and services. The Fund is helping build the capacity of all Victorian’s to use resources more efficiently and incorporate environmental sustainability into their everyday actions. The Fund, which is jointly administered by the Minister for Environment and the Treasurer, provides financial support for a broad range of
environmental initiatives. Round One of the Fund saw 26 successful applicants share in $6.9 million for their innovative projects to use resources more efficiently.

The FirstRate software was created by Sustainability Victoria to be a powerful design tool which takes the guesswork out of energy efficient design. It enables users to evaluate the energy performance of each part of a house and, by testing the effects of design changes instantly, makes designing for energy efficiency easy. The house energy rating measures the energy efficiency of a house by allocating a point score for various design features (such as building fabric, window design, insulation, orientation and other features) and provides an overall rating on a scale from 0 to 6 stars, with half star increments. The house energy rating is independent of the size and type of housing. This means that both large and small houses, attached and detached dwellings each have the potential to achieve a good energy efficiency rating. The original FirstRate house energy rating software was developed by correlating the energy use predictions of the CSIRO’s Nationwide House Energy Rating Software (NatHERS) with building element properties. FirstRate is based on the results of around 55,000 simulations in each Australian climate zone. Builders, designers, architects, building surveyors and planners, or indeed anyone who is interested in energy efficient house design should use the FirstRate software. FirstRate is currently undergoing a major upgrade to align with the national benchmark software, AccuRate. Developed by CSIRO, AccuRate is the next generation of the NatHERS energy rating software. The updated FirstRate – to be known as FirstRate5 – will use the AccuRate calculation engine and introduce a number of new features such as the ability to zone the house according to how each room will be used. FirstRate5 is scheduled for release mid 2006. Training will be available from a variety of training organizations to assist current FirstRate users to use the upgraded software.

The Victorian Government has set a target that by 2010, 10% of Victoria’s electricity consumption will be from renewable sources. The $8 million Renewable Energy Support Fund (RESF) is a key initiative of the Victorian Greenhouse Strategy, and Sustainability Victoria will be managing the fund and projects. The objective of RESF is to encourage innovative applications of medium-scale proven renewable energy technologies in Victoria, such as energy generated from farm waste or mini-hydro projects. By demonstrating successful application of renewable energy, the Fund will help reduce the barriers to future projects, enabling widespread replication. The Fund is able to provide up to 20% of the capital costs of medium-scale renewable energy projects.

Sustainability Victoria is also supporting the solar energy generation movement through its Victorian Solar Innovation Initiative (VSII). The VSII is a new Government initiative offering $3 million over 4 years, which aims to encourage the innovative use of solar energy design and technology, and demonstrate their application in buildings which are widely used by the community. Community facilities provide excellent opportunities to showcase innovation in sustainable energy. Facilities such as schools, kindergartens, childcare units and community health centres will benefit from the VSII by improving their amenity and comfort. The initiative will also demonstrate how solar technology and design can reduce energy consumption and energy costs. The VSII will support the design and documentation of solar energy building features, as well as the installation of
active solar technologies and passive design components (innovative building alterations to make the most of passive heating or lighting from the sun).

As well as the VSII, the Photovoltaic Rebate Program (PVRP) has made the installation of a solar electric system even more affordable. The PVRP is funded by Sustainability Victoria and the Australian Greenhouse Office, and aims to reduce greenhouse gas emissions, strengthen the Australian photovoltaic industry, and encourage the wider application of photovoltaics throughout Australian society. Under the Program, cash rebates of up to $4,000 are available to householders who install photovoltaic systems on their homes. Rebates of up to $4,000 are also available for photovoltaic systems installed on schools and community buildings. Housing developers and display home builders can make applications of up to $50,000 for multiple dwellings, with a maximum rebate of $3,500 per dwelling. The rebate is available for both grid-connected and stand-alone systems. The PVRP also covers upgrades, where the rebate is calculated at $2.50 per Watt of generating capacity added and is capped at $2,500 (for new residential systems the rebate is calculated at $4 per Watt and is capped at $4,000, as previously mentioned).

Sustainability Victoria also offers a unique place for businesses, government and the community to come together to discuss and debate strategies for advancing the sustainable energy initiative. The Sustainable Energy Centre showcases leading sustainable energy designs, technologies and products developed by some of their partners. Government, business and community organizations who are committed to the development of sustainable energy in Victoria can register their interest in becoming a partner of Sustainability Victoria and the Centre. Centre staff can also provide visitors with sustainable energy information and free publications, helping them make sustainable energy choices and reduce their energy use.

Sustainability Victoria and the Government of New South Wales’ Department of Energy, Utilities and Sustainability have set up a website: www.greenhousegases.gov.au/, designed to provide free tips, tools and resources to help Australians use less energy, save money and reduce greenhouse gas emissions. The information provided includes numerous easy ways to reduce home energy consumption, guidelines on how to set up residential renewable energy generators, a greenhouse gas calculator, a section on how to properly read electricity bills, and more.

Australian Building Energy Council (ABEC):
The creation of the highly anticipated Australian Building Energy Council (ABEC) is currently underway. ABEC will come into being to act as a peak strategic body articulating the views of the building and construction industry on energy related matters which will foster an industry-driven move towards developing world best practice in the management of building greenhouse gas emissions. The mission of ABEC is to ensure the better economic performance of the industry through the introduction of a range of energy related programs which produce measurable outcomes in the reduction of greenhouse gas emissions. To achieve their mission, ABEC plans to: focus activities on industry-driven energy performance standards for both the commercial/industrial and residential sectors of the industry through the production of a voluntary code of practice
for reducing industry greenhouse gas emissions (ABEC Code of Practice); provide governments with a better appreciation of the optimum energy standards which will be acceptable and achievable by industry; promote awareness within the industry and with clients and consumers of the benefits of lifecycle costing so that the concept of constructing well performing buildings is accepted as the norm; promote a holistic approach to minimizing greenhouse gas emissions and ensure that there is consistency between the Federal Government’s greenhouse gas policy and its broader policy agenda relating to Australia’s taxation legislation and other industry-related policy; prepare, approve and accredit an appropriate energy related education regime within the industry; raise the profile of ABEC’s activities by showcasing pilot projects which will demonstrate the feasibility of innovative energy systems and practices; in collaboration with other organizations, formulate a methodology for measuring reductions in greenhouse gas emissions resulting from the various industry initiatives; provide a greater interchange between the research community and industry so as to ensure that the research work which is undertaken is of greater relevance for the community's requirements; formulate an agreed industry awareness program to engender greater industry familiarity with energy-related issues; consult widely with government, supporting organizations and the industry in the implementation of campaigns and activities; provide Code of Practice compliance guidance to the industry; and demonstrate to the community that Industry building practices meet Code of Practice requirements. With all this in mind, ABEC is likely to become one of Australia’s central pro-green building organizations in the near future. Their website will be http://www.abec.com.au/.

Mecu Bank goGreen Home Improvement Loan:
The Mecu Bank of Australia offers their goGreen Home Improvement Loan to help people interested in greening their homes. The loan is extremely flexible, and offers very low interest rates, no monthly account fees, and the $595 loan establishment fee for normal loans has been waived. The goGreen Loan must be for at least $3,000, and the repayment period can be up to 30 years.

Australian Building Codes Board (ABCB):
The Australian Building Codes Board (ABCB) has recently updated the Energy Efficiency Regulation Documents for Class 5-9 Buildings and 5 Star Houses. These amendments introduce higher energy efficiency requirements for many new homes, as well as non-residential buildings such as offices, retail stores, wholesale stores, factories, and health care and aged care facilities. Starting in February 2006, all new buildings of the previously mentioned types had to begin meeting higher energy efficiency standards. Assessments of the national impact expected through the introduction of these measures – in terms of cost and benefit – were conducted with the finding that the benefits in present value terms will be 4.9 times the expected costs.

Australian Conservation Foundation (ACF):
The Australian Conservation Foundation (ACF) is Australia’s leading national non-profit environment organization and is committed to inspiring people to achieve a healthy environment for all Australians. Funded almost entirely through donations and membership dues, the ACF is involved in a variety of projects aimed to decrease the
ecological footprint of Australian society. For 40 years it has been a strong voice for the environment, promoting solutions through research, consultation, education and partnerships. One of the ACF’s main areas of concern is greening buildings, and it has recently started its GreenHome Campaign. The Campaign aims to help people green their homes through the use of the ACF’s do-it-yourself guides to home greening. The guides offered include guidelines on energy, water, waste, transportation, food, gardens, shopping, non-toxic homes, and renovations. The ACF also runs information workshops with content relating to local conditions, such as Sydney’s water crisis and local waste removal regulations, and hosts a ‘your tips’ section on their website where people can share innovative ways to reduce the environmental impacts of their daily activities. The ACF website, www.acfonline.org.au/, also has an online eco-calculator which shows people their personal ecological footprints and outlines areas and activities where sustainability can be incorporated to a greater extent.

Centre for Energy and Greenhouse Technologies (CEGT):
The Centre for Energy and Greenhouse Technologies (CEGT) is a privately run investment and service provider focusing exclusively on the development of new sustainable energy and greenhouse gas reductions technologies. It is a private company offering investment funding and support services, and manages a pool of funds allocated to it by the Victorian Government. The aim of the Centre is to facilitate investment in new sustainable energy and greenhouse gas reduction technologies and capitalize on Australia’s specific energy sector requirements and the existing clear global export opportunities. Technology applications can be from across the entire energy spectrum from generation, transmission and distribution, to end use applications - focusing on energy efficiency and greenhouse gas reduction outcomes. While the Centre’s investments are across the entire Research, Development, Demonstration and Commercialization (RDD&C) spectrum, the main focus is on the Development to Demonstration phase, bridging the gap between R&D and Commercialization. Research has shown that a significant gap exists in investment in this area as it rests between the well-funded R&D stage and the focus of industry and investors on the commercialization of proven new technologies and market opportunities. By bringing expertise and knowledge from its board members and staff to the energy, greenhouse gas, technology and investment sectors, the Centre aims to increase the prospect of viable new technologies becoming a commercial reality. The Centre accepts funding applications from large and small organizations as well as individuals – it all depends on the idea and its feasibility. Organizations interested in co-investing in new energy technology development either within their own business or as a commercial investment are welcome to provide their details and areas of interest by contacting the Centre.

Smart Housing, Research House and renewal projects:
Smart Housing is an initiative from the Queensland Government’s Department of Housing (DoH) which promotes good practice in designing, planning and building homes to make them more socially, environmentally and economically sustainable. Smart Houses are safe and secure for the occupants, resource efficient and save owners money compared to conventional houses. The Queensland Government promotes Smart Houses to better suit the housing needs of Australians, but also to help them save money and help
preserve the environment. The DoH also ran the Research House Project, which is Queensland’s first ever house to test and demonstrate new and innovative technologies, building practices and products in a single, living sub-tropical environment. The aim of the project was to investigate ways to improve housing for Queenslanders. Supported by contributions from sponsors and research partners, the Research House was officially opened in December 2001 and put on public display until the end of April 2002. In October 2002, a family of two adults and two teenagers moved into the Research House. The family provided qualitative information about the comfort of the house, with quantitative data being generated from their day-to-day lives and the surrounding environment. The Research House was monitored for an initial period of two years from November 2002 to November 2004. This research helped shape the direction of the Smart Housing Initiative, and served as a real example of a sustainable home for the community and the building industry. The research was meant to assist people in making choices that effect how safe, comfortable and affordable their home is over its lifespan, and ensuring cost savings and value for their investment over the longer term. More importantly, the Research House demonstrated that comfortable living can be achieved while protecting the natural environment.

The DoH also runs Urban Renewal Projects to revitalize large public housing estates that have been disadvantaged by poor urban planning, poor social planning and over concentration of public housing. Through a combination of housing realignments and refurbishments and physical and social enhancement, the Urban Renewal process aims to transform these areas into attractive, sustainable neighbourhoods that offer an improved quality of life for current and future residents. By encouraging close tenant and community involvement in renewal processes, local pride, self esteem and a sense of community belonging is increased. The Program also trains local unemployed people in the process of upgrading and improving public housing and community infrastructure. Finally, and along the same lines as the Urban Renewal Projects, the DoH also manages Community Renewal Projects. These projects are delivered in partnership between State and local governments, business, residents and the community sector to improve the quality of life in selected Queensland communities. Community improvements include the construction of community centres, public parks, reforestation projects, and sports facilities. The DoH has been running Community Renewal Projects in selected communities since 1998.

Alternative Technology Association (ATA):
The Alternative Technology Association (ATA) is Australia’s leading not-for-profit organization promoting sustainable technology and practices. The ATA provides services to members who are actively walking the talk in their own homes by using good building design, conserving water and using renewable energy. The Association advocates in government and industry arenas for easy access to these technologies as well as continual improvement of the technology, information and products needed to change the way we live. With branches and members from across Australia and New Zealand, the ATA provides practical information and expertise based on our members’ hands-on experience. The ATA also offers advice on conserving energy, building with natural materials, and reusing, reducing the use of and recycling natural resources. The Association promotes
sustainable living and technologies through its policy and advocacy, research projects and publications.

The ATA has a very practical approach to achieving change. It takes the feedback it receives from people active in renewable energy, energy efficiency, sustainable building and water conservation, and works to overcome the barriers that prevent or slow down the uptake of sustainable technologies in these fields. Some barriers require a change in government policy, others different methods of implementation and some require ongoing education and training to make an impact. The ATA conducts a number of demonstration projects on renewable energy, energy efficiency, water conservation and sustainable building with partners from the government, industry or welfare sectors. Projects are determined based on feedback from ATA members and consumers. The selected projects road test new and evolving technologies and practices to see how they perform in ‘real life’ and to ensure they provide the best environmental outcome. Projects currently underway include greywater trials, home energy conservation practices, and how to get more people involved in greening their homes both nationally and abroad.

For over 25 years now, the ATA has published a range of magazines, books and CD Roms to help thousands of Australians live sustainably. The ATA information booklets cover solar electricity, solar hot water and wind power. They provide an overview of the technology in question, information about leading manufacturers, prices, guidelines on how to install the systems, how to properly clean and care for the equipment, and other important information for anyone interested in these technologies. The ATA CD Roms simply contain dozens of issues of the ATA’s magazines, for those who prefer electronic copies. ‘ReNew: Technology for a Sustainable Future’ is Australia’s premier magazine on practical sustainable living. Published quarterly, ReNew features the latest in sustainable building practices and renewable energy technologies. It demonstrates the technology in action and provides practical information for people who would like to live more sustainably. ReNew also covers environmental issues, the conservation of resources, recycling, and sustainable transportation. ‘Sanctuary: sustainable living with style’ magazine is looking for Australia’s most sustainable homes and apartments to feature in its 2006 annual publication. Sanctuary showcases Australia’s leading sustainable architects and building designers and their cutting edge and inspiring houses that are designed for style, comfort, health and the environment.

Your Home:
‘Your Home’ is a joint initiative of the Australian Government and the design and construction industries. A web-based project, Your Home provides a suite of consumer and technical guide materials and tools developed to encourage the design, construction or renovation of homes to be comfortable, healthy and more environmentally sustainable.

The Green Directory:
The Green Directory is Australia’s leading online eco-directory listing products and services which are eco-friendly and promote sustainability. To be listed, businesses must sell environmentally responsible products or services, or help encourage sustainability in some other significant way. The site also acts as a small incentive to manufacturers and
service providers because eco-friendly consumers represent a constantly growing percentage of the market, so being on this list can result in higher demand for a business’ services. The Green Directory is the number one place for green consumer choices because of their wide variety of listed green products and services, extensive numbers of retailers and service providers in a given field, and because their email helpdesk can help lost searchers find the products they are looking for. Once the desired product is found, the company’s information is provided so the customer can contact the business in the manner of their choice.

Energyrating.gov.au:
The Australian Government has also launched www.energyrating.gov.au/, which is Australia’s most comprehensive guide to choosing an energy efficient appliance. The website allows users to search and compare many aspects of competing appliances, and provides a great deal of information on each product to help convince consumers of the benefits of an energy efficient appliance. The site also offers information on Australian minimum energy performance standards for appliances, and contains links to other energy efficiency- and sustainability-promoting websites.

Top Energy Saver Award:
The Top Energy Saver Award is an award system that Australian governments have created to recognize the most efficient star rated products on the market. It applies to both electric and gas products that carry a star rating energy label, and is an award system that helps consumers quickly identify the most efficient products on the market. The award is updated every year to keep up with improvements in appliance energy efficiency.

Sustainable Living Foundation (SLF):
The Sustainable Living Foundation (SLF) is a community based not-for-profit organization committed to promoting, celebrating and practicing the principles of sustainable living. Established in 2000, the SLF brings together values, expertise and resources to inform and inspire the wider community about sustainable living and increase the uptake of these principles. The Sustainable Living Foundation was established to bring together committed individuals, expertise, funding and the resources needed to achieve sustainability. It provides assistance to community as well as individual projects. People interested in greening their buildings can apply for SLF funding, and may receive grants to help them achieve their project goals. The SLF obtains its resources and funds through membership fees, fundraising initiatives and donations, and helps support sustainability projects through financial grants but also with the hands-on help of its numerous volunteers.

Urban Ecology Australia (UEA):
Urban Ecology Australia (UEA) is a non-profit, community based organization promoting people- and nature-friendly urban settlements. UEA is committed to the transforming of human settlements into EcoCities - vibrant, equitable, ecologically sustaining and economically viable communities. UEA membership is open to anyone with a genuine interest in ecological cities. Its members include individuals, businesses and other community groups, who contribute via membership fees, donations, and unpaid
work. As a non-profit association, donations from supporters can increase the scope of the work done by Urban Ecology Australia. The activities done by the organization include tours of paths and greenspaces; independent information, referral and advisory services for business, industry and government and the general public; short courses for schools, community groups and professional organizations; lobbying for attitudes and policy change at all levels of government and industry; ecological regeneration projects; campaigns for renewable energy, bioregional planning, traffic free environments, and ecological development generally; and consultancy work.

Ecological Homes:
Ecological Homes is an Australian-based company that acts as a one-stop shop for Australians wanting to make their homes more sustainable. The organization arranges for and provides resources on every aspect of sustainable building from the first-hand purchasing of green homes and energy efficiency retrofits, to rainwater storage, solar utilization projects and innovative heat pump systems. By providing customers with accurate information and affordable solutions to home greening, and by working closely with leading sustainable architects, builders and developers, Ecological Homes is an organization worth looking into for any Australian interested in green building.

domaster:
domaster is an Australian residential renovation company which makes it possible for existing homes to be upgraded to meet 5 star energy efficiency standards. domaster wanted to demonstrate that energy efficient homes could be achieved through renovations and not only through the construction of new housing. Its products combine the best technology from around the world and are available directly from the company for do-it-yourself projects. domaster products and renovation services challenge the commonly held wisdom that existing homes cannot be economically retrofitted into top-of-the-line energy efficient homes.

savewater! Alliance:
savewater! Alliance’s aim is to accelerate water conservation behaviour change and water saving product purchasing in line with government and water industry needs. savewater! also aims to support innovative product and service suppliers by increasing community awareness of their product solutions. savewater! currently has Victorian and New South Wales regional and metropolitan water businesses as members, and are working towards a national membership base. The savewater! Alliance works with member water businesses, government agencies and product companies to deliver water conservation programs throughout Australia. savewater! offers a combination of informative web resources and practical programs to help all Australians change the way they use water. The savewater! Efficiency Service for businesses involves an on-site water efficiency appraisal from an accredited assessor, who will provide a comprehensive report with recommendations on how to improve water efficiency. Once the recommendations have been completed by the business, the auditor is paid for their services with the money saved of the business’ water bill so that the fees will never be higher than the water bill before the improvements. Over time, the audit and improvement costs pay for themselves, and after this point any savings on the business’
water bill remains with the company. This type of pay arrangement is called “payment by savings.”

For the first time in 2006, savewater! sponsored the Melbourne International Flower and Garden Show. As a great deal of water is used on maintaining the outside of people’s properties, the savewater!/Our Water Our Future exhibit at the show offered visitors insight into being water efficient and still having a beautiful garden. The interactive exhibit showcased innovative water saving products, great ideas and practical information that can be applied in a home and garden to reduce water use and help save this precious resource now and for future generations. The display was developed by savewater!, with the support of “Our Water Our Future’s” Water Saver Garden Centres and a wide range of product suppliers. The savewater! team and partner organizations will return to the show next year, with loads of new ideas to show that water conservation and gorgeous gardens are not mutually exclusive. Since 2000, the prestigious annual ‘savewater! Awards’ have recognized and rewarded achievement in the sustainable management of Australia’s water supplies. The Awards provide a positive and credible platform to show Australians how businesses, schools, individuals, community groups and government departments or agencies are making significant contributions to water sustainability. The savewater! Awards raise awareness about people’s impressive efforts to conserve water and inspire others to follow their lead. The introduction of the savewater! Awards has certainly led to reductions in water consumption. At the 2005 Awards, for example, the 21 finalists collectively helped save a massive 832 Olympic sized swimming pools worth of water over 18 months.

**Australian Government’s Sustainable Cities Program:**
The Australian Government’s Department of the Environment and Heritage has developed the Sustainable Cities Program to help make Australian cities and towns cleaner and more sustainable. Announced in May 2003, the Sustainable Cities Program will receive $40 million over five years. $24.2 million will be spent on a package to improve our understanding of environmental pollutants, and to develop standards that minimize the impact of buildings and some household appliances. A new green buildings program that includes the National Buildings Environmental Ratings Scheme (NABERS) will ensure that future building projects are more environmentally-friendly. Another component of the Program will be to develop and strengthen national standards and enforcement of regulations to improve air quality, fuel quality, ozone protection, and waste and chemicals management. The Sustainable Cities Program will also extend the Australian Greenhouse Office’s successful Photovoltaic Rebate Program (PVRP) for another two years, and will start the Cycle Connect Program, which will enable cyclists to use public transport with new bicycle facilities at bus and train stations. Finally, Sustainable Cities will put some funding aside to help develop and improve the WELS Scheme (described earlier). The Sustainable Cities Program will be implemented by directly funding projects with national strategic benefits.

**Office of the Renewable Energy Regulator (ORER):**
The Office of the Renewable Energy Regulator (ORER) is a statutory authority established to oversee the implementation of the Australian Government’s mandatory
renewable energy target (MRET). This target is to increase renewable electricity generation from Australia’s renewable energy sources by encouraging the generation of an additional 9,500 GWh of renewable energy per year by 2010. MRET applies nationally, with the majority of electricity retailers and wholesale electricity buyers on liable grids exceeding 100 megawatt (MW) in all states and territories contributing proportionately to increase Australia’s renewable energy sources. The ORER also offers Renewable Energy Certificates (RECs), which can be created when residents replace electric water heaters with solar water heaters, or when small renewable energy generators are installed and begin producing power. The ORER is like an overseer of other energy initiatives, and encourages other people to do their part to save energy, switch to renewable sources of energy and begin generating their own sustainable energy.

Energy Efficiency Opportunities Program:

The Australian Government’s Department of Industry, Tourism and Resources runs the Energy Efficiency Opportunities Program, which encourages large energy-using businesses to improve their energy efficiency. It does this by requiring businesses to identify, evaluate and report publicly on cost effective energy savings opportunities. Energy Efficiency Opportunities is designed to lead to: improved identification and uptake of cost-effective energy efficiency opportunities, improved productivity and reduced greenhouse gas emissions, and greater scrutiny of energy use by large energy consumers. Participation in Energy Efficiency Opportunities is mandatory for the estimated 250 corporations in Australia that use more than 0.5 petajoules (PJ) of energy per year. This is approximately equivalent to the energy used by 10,000 households.

Commercializing Emerging Technologies (COMET) Program:

Australia is also very supportive of the work done by its SMEs, and runs numerous programs designed to increase or at least maintain their market exposure and competitiveness. The Australian Government is providing a further $100 million over the next six years to continue and expand the highly successful Commercializing Emerging Technologies (COMET) Program. COMET provides innovators with advice, services and financial assistance to plan their commercialization, to attract capital for their project and to establish strategic partnerships to take the innovation to the market. Advice is provided through a network of private sector business advisers and financial assistance is available to subsidize access to service providers in marketing, commercialization, intellectual property and business planning. A 2002 survey of firms assisted by COMET showed that the program was very successful in encouraging entrepreneurs and enabling firms to achieve their business goals. The network of business advisers is a unique and valuable feature of COMET, and leads to long-term and beneficial changes to firm behaviour. The COMET program has been extended to June 2011, and will continue to support entrepreneurial firms in planning the commercialization of their innovations. This means some 200 companies per annum can be supported with mentoring and commercialization management advice. COMET will also expand the network of private sector business advisers with commercialization expertise by 30% so that COMET can reach a wider range of businesses, particularly in outer metropolitan and regional areas. COMET assistance is targeted to small Australian firms who have high potential to grow rapidly through the production of innovative products, processes and services. The regional
of AusIndustry will ensure that businesses outside of major metropolitan areas can access the program as well. The COMET Program can provide small Australian green technology or green building companies the advice and support they need to properly position their products in the marketplace to experience maximum exposure.

Innovation Investment Fund (IIF):
The Innovation Investment Fund (IIF) is a Venture capital program that invests in nine private sector venture capital funds to assist small companies in the early stages of development to commercialize the outcomes of Australia’s strong research and development capability. Funded by the Australian Government, the IIF is an important initiative supporting the cutting-edge work of Australia’s small businesses. Another innovation support program from the Government of Australia is the Industry Cooperative Innovation Program (ICIP), which is a $25 million commitment announced in ‘From Strength to Strength: the Coalition’s Policy for Australian Industry’ on October 8 2004. The Program has funding until 2011 and aims to encourage business-to-business cooperation on innovation projects within a sector that enhances the productivity, growth and international competitiveness of Australian industries.

Pooled Development Funds (PDF) Program:
The Pooled Development Funds (PDF) Program, established in 1992, encourages investment in pooled development funds (PDFs) which in turn provide funds that specialist managers invest in eligible Australian SMEs with total assets of not more than $50 million. Patient equity capital, including venture capital is an important source of funding for innovative, fast-growing Australian companies, especially for those experiencing difficulties in accessing equity capital for early stage development and expansion. The Government announced in the 2006-07 Budget that the PDF program will be closed to new registrations after 31 December 2006. The PDF program will be progressively replaced by a new initiative - the early stage venture capital limited partnership (ESVCLP) Program, also announced in the Budget.

North Lakes eco-friendly town:
In 1999, an agreement was signed between CSIRO and residential developers to build a new $2.2 billion eco-friendly town for 25,000 people at North Lakes near Brisbane. North Lakes is to be created on a 1,000-hectare site adjacent to the Bruce Highway at Pine Rivers. Approximately 8,500 new homes, a major town centre, a business park, and supporting community services are proposed to be built over a 15-to-20 year period. The urban design is intended to provide a new model for subtropical housing in Australia and demonstrate leading innovations in the housing industry.

United Kingdom:
Ecotricity:
The green building movement has just recently reached the UK, which may explain why they do not yet have a GBC. However, the UK has numerous green building programs and strategies worth noting. Ecotricity is a UK electricity company dedicated to changing the way electricity is made. Since 1996, Ecotricity has been building wind turbines and selling clean electricity across the UK. They take the money consumers spend on
electricity and invest it in clean forms of power, with a focus on wind energy. Ecotricity is the world’s first renewable energy company, and the only green energy company that actually builds renewable energy sources. In 2006, the company plans to invest £7 million (just under $15 million Canadian) in wind energy. People in the UK can now choose who supplies their electricity, and therefore choose to have their home or business supplied by clean energy. Switching to Ecotricity from a conventional electricity provider is simple, but it is the largest single step a person can take to reduce their greenhouse gas emissions and protect the environment.

UK Green Building Press:
www.newbuilder.co.uk is the website for the UK Green Building Press. The Green Building Press publishes green building information in many mediums to help people create healthy and ecological homes, offices and other buildings. Their information is presented in a user-friendly manner to appeal to both professionals and the general public. The UK Green Building Press has also launched a free online newsletter service called ‘Green Building,’ which provides the latest in UK green building information on a monthly basis. The Green Building Press should be one of the first stops people in the UK make in order to find reliable and accurate green building information.

Ecostruct:
Ecostruct is a UK building company aiming to promote the concepts of sustainable development and environmental awareness within the construction industry. It is their intention to prove that ecologically friendly construction techniques can be used on a commercial basis to produce mainstream houses. Originally specializing in barn-to-house conversions, Ecostruct has integrated this post and beam frame design into their new projects. Constructed from eco-friendly materials, these new dwellings offer modern living standards combined with exceedingly high levels of insulation and a wealth of exposed timber beams. Ecostruct takes great care with site selection, waste minimization, material reuse, and proper waste disposal so as to reduce the negative environmental effects of its construction activities.

Property Environment Group (PEG):
The Property Environment Group (PEG) assists its members in the challenging task of improving their property’s environmental performance by providing them with the necessary information, tools, training and contacts. More importantly, the Group aims to start breaking down misconceptions which have developed within the property industry as a key obstacle to the development of a more sustainable built environment. While occupants would like to have environmentally efficient buildings to save money, the environment, and show their companies in a positive light, contractors say developers do not ask for energy efficient buildings, developers maintain that investors will not pay for them, and investors claim there is insufficient demand for sustainable buildings. So, what PEG largely focuses on is networking and spreading information as freely as possible to ensure effective communication between all four groups of ‘sustainable building actors.’ The Environmental Update Information Service is PEG’s information service tailored specifically for the property industry. Through Environmental Update, the information of greatest relevance to PEG members is presented in an interesting and accessible format,
highlighting crucial issues and interpreting their implications for the property industry. Members of PEG also have online access to bi-monthly email newsletters which keep members up to date with the latest news and initiatives, focus articles, which are in-depth research articles on pertinent issues, as well as the Environmental Update Information Service. PEG members range across the entire property spectrum and include investors, developers, contractors, managing agents, consultants and occupiers. PEG also has a number of observers and advisors including government departments, key industry bodies and specialist technical consultants. By bringing all of these different parties together, PEG has become a key forum for discussion on environment and sustainability issues within the property industry.

Construction Industry Council (CIC):
The Construction Industry Council (CIC) is the representative forum for the professional bodies, research organizations, and specialist business associations in the construction industry. It provides a single voice for professionals in all sectors of the built environment through its collective membership of 500,000 individual professionals and 25,000 firms of construction consultants. The goals of the CIC are: to serve society by promoting quality and sustainability in the built environment; to give leadership to the construction industry, encouraging unity of purpose, collaboration, continuous improvement and career development; and to add value and emphasis to the work of its members. In terms of green building, CIC recognizes that the protection of the environment and the pursuit of sustainable development are amongst the greatest challenges facing humanity. CIC and its members have an individual and collective responsibility to advise clients on strategies that are consistent with their immediate needs, and with the longer term benefits of a sustainable approach. CIC recognizes the importance of continuous improvement through management of their own businesses, and the associated impacts of their activities. CIC’s approach and policy towards sustainability in construction and the built environment is translated through the work of its Sustainable Development Committee, whose mission is to add value for all stakeholders in the built environment through the provision of information, advice, and encouragement on sustainable development. The Committee works with Government, industry groups, CIC members, and the related research community to be as up-to-date and involved in sustainable development issues as possible. The objectives of the CIC’s Sustainable Development Committee are to: promote the value of sustainable development in the UK construction industry to meet economic, social, safety and environmental challenges; provide leadership for construction professionals on sustainable development; provide a forum for debate and use its influence to facilitate change; provide advice for Government on national and European policy formation; influence the development of an industry wide strategy on sustainable development; act as a link to key organizations; encourage research and promote adequate levels of support; encourage improved awareness of sustainability in the education of all construction professionals and their clients; raise awareness of funding opportunities; promote best practice initiatives; encourage collaborative projects; and encourage the promotion and application of research results. The CIC and its SD Committee are also responsible for the publication of numerous papers and articles concerning sustainable development. The CIC occupies a unique role within the UK construction industry. The breadth and depth of its membership means that CIC is the
only single body able to speak with authority on the diverse issues connected with construction without being constrained by the self-interest of any particular sector of the industry.

**Sustainability Works software:**
Sustainability Works is an online software package which helps deliver sustainable housing development efficiently, from policy level to project delivery. A joint development by such organizations as the Building Research Establishment (BRE), the Housing Corporation, the Peabody Trust, and the World Wildlife Fund (WWF), the Sustainability Works software helps users to deliver the key agenda of sustainable development which is increasingly demanded by planning authorities, regulators, funders and consumers of housing. BRE EcoHomes standards are also fully integrated into the software. Sustainability Works can be used for urban and rural situations, new buildings, and rehabilitation and regeneration projects. It covers the whole spectrum of sustainable development from the land usage and social aspects to technical details of building construction, water and energy use. Whether a newcomer to sustainable development or an experienced practitioner, Sustainability Works can help one write robust sustainable development policies, set and monitor realistic sustainability targets for projects, and make rapid BRE EcoHomes predictions on specific developments. Sustainability Works now has over 1400 registered organizations from both the private and public sectors. Initially designed for the housing association sector, it is now in day to day usage by architects, surveyors, house builders and local authorities. The complete integration of BRE EcoHomes standards makes it increasingly useful, as increasingly funders and regulators require EcoHomes compliance. Accessible from anywhere in the world as long as the computer has basic internet access, Sustainability Works combines an extensive reference database with interactive software. This unique combination allows users to write, edit and store their own sustainable development policy and project development details with the benefit of Sustainability Works’ expert research and guidance.

**Chartered Institute of Building (CIOB):**
The Chartered Institute of Building (CIOB) is the international voice of the building professional, representing an unequalled body of knowledge concerning the management of the total building process. The CIOB has over 42,000 members, all of them being skilled managers, building professionals, or building program students with a common commitment to achieving and maintaining the highest possible standards in the building industry. Chartered Member status, represented by the designations MCIOB (member) and FCIOB (fellow), is recognized internationally as the mark of a true professional in the construction industry. Membership includes access to its range of publications, admission into events and activities, the right to use the CIOB’s library with more than 15,000 articles and publications, career advice, assistance from the Benevolent Fund which supports members and their families in times of crisis or difficulty, and a range of additional offers including financial services, deals on insurance, training courses, and reduced-priced software. With its increasing international membership and growing profile in the UK, the CIOB is making a very influential contribution to one of the world’s most important industries.
The Housing Corporation:
The Housing Corporation is the national Government agency that funds new affordable housing and regulates housing associations in England. It helps develop and implement regional and national housing strategies, using public subsidy to procure affordable housing which provides quality homes in the places where help is most needed. The Housing Corporation is the statutory regulator for housing associations. It drives improvements in housing association efficiency and performance, and helps to ensure that associations continue to attract private finance at competitive rates to build and improve affordable homes. The Housing Corporation is also influential in helping to shape housing, community and regeneration policy nationally, regionally and locally. There are over 1,500 housing associations in England, currently managing around 2 million homes and housing at least twice that many people. The Housing Corporation provides advice and support to these housing associations, to help them provide the best and most cost-efficient services, and assesses their performance against agreed standards. The Housing Corporation also oversees the injection of private finance into the affordable housing sector. Since 1989, private sector lenders have invested almost £20 billion in housing associations, dwarfing any other private sector lending initiative into social programs. This has allowed thousands more homes to be built than would have been possible using public subsidy alone.

Chartered Institute of Housing (CIH):
The mission of the Chartered Institute of Housing (CIH) is to maximize the contribution that housing professionals make to the well being of communities. Its objectives are to promote the art and science of housing, its standards and ideals, and the training and education of those engaged in the profession of housing practice. Through the CIH’s Good Practice Unit, the CIH collects and disseminates information on good practice across all housing sectors in the UK. This role includes the promotion of green building practices by industry professionals to increase the sustainability and resource efficiency of the UK’s buildings. The CIH provides a comprehensive lineup of training courses, seminars, specialist workshops and conferences for housing professionals. It also provides in-house training specially tailored to the needs of individual organizations. Annual membership fees range from £42 for students to £121 for Fellows, not including the one-time registration fee of £68. The CIH operates all throughout the UK, and also in the Asian Pacific.

Commission for Architecture and the Built Environment (CABE):
The Commission for Architecture and the Built Environment (CABE) stands for an improvement in people’s quality of life through good building design. Established in 1999, CABE influences and inspires the people making decisions about the UK’s built environment, so that they choose good design. CABE champions well-designed buildings and public space. It runs public campaigns, and provides expert, practical advice. It works directly with planners, designers, clients and architects, offering them guidance and assistance. As one of its main services, CABE provides free design reviews and advice on new projects and public spaces to promote high standards in architecture and urban design. CABE channels public money into initiatives that promote the best in architecture, urban design and public space all across England.
Other CABE initiatives and awards include the Prime Minister’s Better Public Building Award, which recognizes excellence in design quality and procurement practices and is awarded annually to a new building project of any size, commissioned by or on behalf of central or local government or by a grant-aided organization. CABE also provides funding to a network of 19 Architecture and Built Environment Centres in England through its Regional Funding Program. This Program seeks to fund activities which increase awareness, understanding, opportunity and aspiration amongst the public and young people in issues relating to design quality in the built environment. The funding program supports Architecture and Built Environment Centres operating in each region throughout England. For the period of 2006-08, a total of £1.86 million has been allocated to these 19 organizations.

CABE also publishes all of its research information and runs awareness campaigns. It commissions a broad range of research, sometimes in partnership with other organizations, into the value of good design, the impact of design on the users of buildings and spaces, and what makes a well-designed neighbourhood. CABE also conducts consumer research into issues such as housing or the design of parks.

Home Builders Federation (HBF): The Home Builders Federation (HBF, previously known as the House Builders Federation) has become the voice of the housebuilding industry, representing its views and interests to Government and other important bodies on planning, technical, and other issues. The HBF provides information to members on key developments and offers the opportunity for all members to be involved in policy formulation and wider industry activity. The aims of the HBF are to: represent private sector house builders and provide them with support and guidance on political, planning and technical issues; advise government and non-governmental organizations on industry issues; exert pressure for necessary changes to national, regional and local policy relating to the housebuilding industry; help key decision-makers deliver the needs of additional households in England and Wales over the next two decades; assess the impact of housing on society, the economy and the environment and reinforce the links between jobs and homes; provide consistent, expert information to members, central and local government, the media and the public on housebuilding and housing issues; and work with and maintain strong relationships with all bodies concerned with housebuilding related issues. The HBF’s website has a significant amount of information available on it. This information covers things such as industry and housing market research, technical support information, building regulations and guidelines, codes for sustainable homes, innovative design practices, and various news pieces and articles.

Royal Institute of British Architects (RIBA): The Royal Institute of British Architects (RIBA) is a member organization with 30,000 members, and runs an extensive program of lectures, exhibitions and events, work in schools, and community architecture projects and schemes. Its mission is to advance architecture by demonstrating benefit to society and promoting excellence in the profession, and its vision is to be a champion for architecture and for a better environment. It follows that RIBA is a strong supporter of sustainable design practices
and minimizing the negative effects of buildings on the natural environment. To advance the knowledge base of the profession, RIBA promotes research and innovation by encouraging interaction between practitioners and researchers, by facilitating debate, and by helping disseminate research outcomes through its R&D department. For its members in the UK and abroad, RIBA provides specialist information and advice, practice promotion, professional support, commercial products (via RIBA Enterprises) and many social and cultural events. To maintain competence in the profession, the institute validates courses in schools of architecture, both in the UK and overseas through its Education department. All RIBA members have access to the world’s finest source of architectural data – the British Architectural Library – containing 2,000 journals, 135,000 books, 800,000 photographs, and over a million drawings, manuscripts and portraits.

RIBA also runs a large awards program to encourage and recognize design excellence. The RIBA Awards Office delivers the awards program, with the most significant awards being the RIBA Awards and the RIBA Stirling Prize. The RIBA Awards are given for buildings that have high architectural standards and make a substantial contribution to the local environment.

Chartered Institute of Architectural Technologists (CIAT):
The Chartered Institute of Architectural Technologists (CIAT) is the professional Institute representing over 7,000 professionals working and studying in the field of Architectural Technology in the UK and overseas. It promotes green buildings and the use of sustainable technologies in design projects in a manner very similar to RIBA, with the idea that modern best building designs involve sustainability.

Other organizations supporting green building:
Numerous private groups directly and indirectly supporting sustainable development and promoting green building exist in the UK. These groups include Design for Homes (tied to RIBA), Constructing Excellence, SITRA, The Civic Trust, Peabody Trust, The Royal Town Planning Institute, and the Design Council. See the ‘Information Sources: United Kingdom’ section for each organization’s website addresses.

Energy Saving Trust (EST) information & programs:
The Energy Saving Trust (EST) is a non-profit organization funded by UK governments and the private sector. Set-up after the 1992 Rio Earth Summit, its two main objectives are to achieve the sustainable use of energy and to cut down on carbon dioxide emissions. The EST encourages energy efficiency and the integration of renewable energy sources into the economic fabric of UK society. To achieve this goal the EST promotes the use of cleaner fuels for transport and better insulation and heating efficiency for buildings and homes and champions small-scale renewable energy systems, such as solar and wind power. In May 2006, the EST hosted a roundtable on Smart Metering. Following the release of new smart energy meters in Northern Ireland homes, which provide customers instant feedback on how much energy they are using, a program was started to offer households tariff savings if they switch their energy use to off-peak times. This has helped to reduce demand on the ‘dirtiest’ power stations, which come on stream at peak times, and customers have on average cut their energy use by 3.5%. One estimate is that
these Smart Meters could help users save up to 15 pence in every pound off their electricity bills (about 15¢ off every Canadian dollar), and result in an overall decrease in greenhouse gas emissions from the power generators. With the results of the roundtable, the EST has called on the government to establish a UK-wide program to give all households smart meters by 2012. Initially, these smart meters would be required for all meter replacements and new connections. The EST has also put pressure on the government to raise home and building energy efficiency standards, and to increase incentives available to people for home greening.

The EST also runs several incentive programs aimed at increasing energy efficiency, decreasing energy consumption, increasing the use of renewable energy, or combinations of these three things. Community Energy Program funds the refurbishment of existing community energy or heating schemes, and the installation of new ones. Community energy schemes provide heat and/or power from one central source to multiple buildings, and result in increased energy efficiency and decreased energy consumption as less heat or energy is wasted. The Scottish Community and Householder Renewables Initiative (SCHRI) is a program specifically for Scotland and is funded by the Scottish Executive and managed jointly by the Energy Saving Trust and Highlands and Islands Enterprise (HIE). Under the SCHRI Program, Scottish homeowners can qualify for grants worth up to 30% of the cost of installing a renewable technology system, up to a maximum of £4,000. The energy systems covered include biomass, heat pumps, small scale hydro turbines, solar water heaters, solar space heaters, wind turbines, and photovoltaic generator systems. A household can qualify for up to two grants, provided they are for different technologies.

The Low Carbon Buildings Program, launched in Spring 2006, will run for three years and covers the entire UK. This is to continue on from where the government left off when it terminated its Solar Photovoltaics Major Demonstration Program in March 2006. The government program ran from 2002 to 2006, and covered between 40% and 50% of a PV system’s installation costs. Since 2002, the program has provided £26 million of funding for 1,200 domestic and 180 commercial installations. As a result, it is estimated that 20,000 tonnes of carbon will be saved over the lifetime of the installations, thereby making an important contribution towards reaching the UK’s climate change targets as well as the Government’s target of 10 percent of energy generated to be from renewable sources by 2010. The EST’s Low Carbon Buildings Program will now cover photovoltaic systems, as well as wind turbines, small hydro generators, solar water heaters, heat pumps, biomass systems, fuel cells, and renewable and micro combined heat and power systems. A total of £28.5 million is being made available through this program, £10.5 million for householders and community organizations, and £18 million will be made available to public, not for profit and private sector organizations.

The EST’s Innovation Program provides funding and technical support to local authorities, housing associations and their project partners for innovative energy efficiency projects across the UK. Since 2001, the Program has issued around £9 million of funding to over 270 projects, saving thousands of tonnes carbon dioxide emissions along the way. Now that direct program funding has ended, the focus has turned to
helping organizations replicate earlier successes. To enable this replication, the EST continues to provide a range of advisory support services to local authorities and housing associations across the UK through a number of initiatives such as their Practical help service which offers two hours of free expert research and a free online guide. The EST’s 22 local energy support teams provide face to face support to local authorities and other housing providers. Last year, the teams contributed to over 100 local regional sustainability strategies and sourced £13 million of funding for local organizations to develop their own energy efficiency projects. It is estimated that in the last 10 years, the Energy Saving Trust’s energy saving initiatives and grant programs have resulted in lifetime savings of more than 44 million tonnes of carbon dioxide.

Apart from these funding and incentive programs, the EST runs a network of advice centres located across England, Scotland, Wales and Northern Ireland. These centres can provide consumers with expert impartial advice about saving energy in their homes, as well as answer questions. The centres can be located through the EST website, and also contacted directly from the site through an email form. The EST also runs the Energy Certification for Schools Program to help schools manage their energy more efficiently. Students and teachers can participate, and the EST can provide funding through the provision of curriculum resources. The Energy Savings Trust also runs the “Save your 20%” campaign, which is aimed at consumers and provides information and resources to help them save money and 20% more energy in their homes. The EST also helps disseminate knowledge and information through the events and training programs it runs. These training programs consist of ones focusing on sustainable energy use practices in transportation, as well as those looking at these practices in the construction industry.

Energy Star & Energy Saving Recommended Label:
Additionally, the EST is the administrator of the UK’s energy efficiency rating label. Officially called the “Energy Saving Recommended” label, it clearly shows consumers the energy efficiency of a product and allows for easy comparisons between competing appliances. As with all other national energy labels, the goal of the UK label is to inform buyers about the energy consumption of a product so they can take this into account when deciding on a purchase. The label is aimed at the production side as well because less energy efficient products will be less desirable to the consumer, making it less likely that a particular product will be purchased over a more energy efficient one. With this label, producers are encouraged to create more energy efficient appliances in order to benefit from the “free advertising” of the labeling system. Many appliances and products are covered by the Energy Saving Recommended label include fridges, freezers, dishwashers, washing machines, tumble dryers, light bulbs, light fittings, gas boilers and heating controls. There is also a section on the EST website that allows prospective buyers to compare different products in an online database before even going out to the store, so they can have a good idea of which products they are interested in before they even leave the home. The Energy Saving Recommended label is the UK division of the EU EcoLabel.

Like the other leading green building nations in this report, the UK also uses the American Energy Star labeling program on certain appliances. UK products labeled
under this system include office equipment such as personal computers, monitors, fax machines, scanners, photocopiers and printers.

Energy Service Companies (ESCOs):
Although commonly referred to as ESCOs or ESCO businesses in the UK, other titles for companies performing these energy audit and efficiency services include Contract Energy Management (CEM) companies, Energy Savings Performance Contracting (ESPC) companies, and Technology Performance Contracting (TPC) companies. In the UK, there are currently about 20 established ESCOs in operation. The major players in this sector are subsidiaries of large international control equipment companies, oil companies, and electricity utilities. Commonly, these major players deal only with customers whose annual energy bill exceeds £50,000. Smaller ESCO companies focus their attention on smaller clients, such as SMEs or individual homes. Also, many new small companies offering more than one of these services (e.g. consulting plus finance) consider themselves to be ESCOs. In the UK, popular ESCO service customers are located both in the private sector (commercial buildings and industry generally excluding processing aspects) and in the public sector (large state owned hospitals, prisons and defence establishments, and local housing authorities). There are no current support mechanisms for ESCOs in the UK. The only favorable tax regime is that an ESCO can claim capital tax allowances on the investment it makes, and pass this on to the customer in whole or in part. To date, the ESCO industry in the UK is a reasonable size and has the potential to grow substantially in the future. (For more a more detailed explanation of how ESCOs work, see the ESCO part in the United States section.)

Construction Industry Research and Information Association (CIRIA):
The Construction Industry Research and Information Association (CIRIA) is a non-profit company owned by other companies, universities, government departments and other public sector agencies, organizations and regulators. CIRIA’s owners include representatives from all parts of the supply chains of the modern built environment, covering building and civil engineering as well as transport and utilities infrastructure. The Association presents a way in which the many different stakeholders in the modern built environment can work together to identify, codify, publish and promote the emerging best practice in the industry. In this way, CIRIA continually seeks to raise the standard of excellence in the overall construction sector. CIRIA’s primary aims are to improve the quality, efficiency, cost-effectiveness and safety of both the provision and operation of the modern built environment. In pursuit of these aims, it seeks to be the leading provider of performance-improving products and services to organizations involved in procuring, delivering, owning and maintaining the modern built environment. CIRIA is a not for profit company, and its 4 main areas of activity are research, publishing information, training, and networking between industry professionals. CIRIA has approximately 50 projects or task groups in progress at any one time, organizes about 100 events and conferences each year, and produces around 25 new publications each year on top of its back catalogue of around 600 publications, many of which are still in print and are relevant to today’s industry.
Beddington Zero Energy Development (BedZED):  
The Beddington Zero Energy Development (also known as BedZED) is the UK’s largest carbon-neutral eco-community – the first of its kind in the country. BedZED was developed by the Peabody Trust in partnership with Bill Dunster Architects and environmental consultants from the BioRegional Development Group. Beginning in 2000 and completed in 2002, BedZED is a mixed-use, mixed-tenure development that incorporates innovative approaches to energy conservation and environmental sustainability. It is built on reclaimed land owned by the London Borough of Sutton, sold to the Peabody Trust at below market value due to the planned environmental initiatives. The BedZED design concept was driven by the desire to create a net ‘zero fossil fuel energy development,’ one that will produce at least as much energy from renewable sources as it consumes. Only energy from renewable sources is used to meet the energy needs of the development. BedZED is therefore a carbon neutral development, resulting in no net addition of carbon dioxide to the atmosphere. The design is to a very high standard and incorporates numerous green building practices such as roof gardens and green roofs, sunlight management, solar energy generation, reduction of energy consumption, and waste water recycling. The development is comprised of 82 homes of varying sizes and also includes buildings for commercial use, an exhibition centre, a children’s nursery, and a show flat so that visitors may see what it is like to live at BedZED. The buildings are well-insulated and are arranged in south facing terraces to maximize heat gain from the sun, known as passive solar gain/heating. Each unit is backed by north facing offices, where minimal solar gain reduces the tendency to overheat and the need for high-energy air conditioners. Other key green features of the BedZED community include the use of renewable and locally-sourced building materials whenever possible, minimal use of space heating due to the development’s orientation and design, use of low energy lighting and energy efficient appliances, triple glazed windows, smart energy meters mounted in a central place in each unit, use of photovoltaic generators and solar water heaters, and wood (biomass) heat and energy generators (wood is considered to be a carbon-neutral fuel as the amount of carbon dioxide released when the wood is burned is equal to the amount absorbed by the tree as it grew).

There is also a green transportation plan in place at BedZED to minimize the use of private vehicles and the carbon dioxide released. This plan promotes walking, cycling and the use of public transit, and includes the opportunity for residents to sign-up for a local car-pool system. BedZED is perfectly situated to make its green transportation plan work because of the site’s good public transport links, which include two railway stations, two bus routes and a tramlink. The community also has a vehicle-sharing plan available to its residents. Parking areas for private vehicles exist at BedZED, but residents with this convenience must pay a monthly fee to maintain their space. Additionally, the speed limit on BedZED roads is ‘walking speed,’ which increases street safety and reduces the use of the interior roads and the resulting noise from traffic. Peabody and BioRegional are monitoring the performance of BedZED’s features as well as resident satisfaction with the development. The surrounding community was consulted during the development process and the new sustainable community has integrated well. New BedZED residents are proud of where they live, have developed a strong sense of community, and consider
themselves to be living somewhere special. Energy and water consumption levels of the
development are also way below UK averages. Overall, the project has enabled residents
to live a sustainable lifestyle without making severe demands on daily routines. Although
it has no plans to develop further eco-schemes on the same scale as BedZED, the
Peabody Trust remains committed to sustainability in its social housing projects. With
good reason, the BedZED development has received widespread acclaim in the media,
and to date has won 10 building excellence and industry best practice awards. More
information about the Beddington Zero Energy Development and its awards can be found

English Partnerships & Millennium Communities:
English Partnerships is an English national agency aiming to create high-quality, well-
designed, sustainable places for people to live, work and enjoy. It does this through
development projects that increase the amount of sustainable buildings, reduce the
amount of abandoned and run-down buildings, and that make the best use of England’s
scarce supply of land. English Partnerships was asked by the English Government in 1997
to establish a series of Millennium Communities to demonstrate the value of mixed-use
and sustainable development as a model for communities across England, encourage
innovation in building technologies, and help promote sustainable development that
addresses energy, resource, and construction issues. There are currently 7 Millennium
Communities being developed: Greenwich in London; Allerton Bywater near Leeds;
New Islington in Manchester (formerly the Cardroom Estate); South Lynn in King’s
Lynn; Telford; Oakgrove in Milton Keynes; and Hastings. The Greenwich Millennium
Community was the first of such communities, and English Partnerships has invested
over £200 million in acquiring, reclaiming and developing the 300 acre site. Additionally,
a state-of-the-art integrated school and health centre funded by English Partnerships was
opened in the community in 2001. As of January 2006, approximately 700 homes had
been built and occupied in the community, with some residents moving in as early as
December 2000. Based on the early success of the Greenwich Millennium Community,
planning permission has recently been sought to increase the development from 1,277
homes to about 2,950. It is very likely that this proposal will go through and if it does,
200 more homes will be built in 2006, with the project due for completion in 2012. The
Greenwich Millennium Community has won more than 30 awards for excellence so far,
and with the community only about half way completed, this tally is expected to grow.
For more information on the Millennium Communities Program, or about any of the 7
communities currently under construction, visit the English Partnerships – Millennium
Communities website at http://www.englishpartnerships.co.uk/millcomms.htm.

English Partnerships has also recognized that many town centres need to be revitalized
through regeneration programs that will create better places for people to live and work.
Along with their partners, they are helping to fund the Town Centre Regeneration
Program, which will offer advice and support on design and funding programs that will
deliver benefits such as higher quality and more modern shopping facilities, new public
space, town-centre housing, enhanced public transport and a better planned and designed
environment. Revitalizing town and city centres is a vital component in supporting
government plans to build more new, sustainable and affordable homes across the
country. Many new towns are in high growth areas and will be the focus for larger populations that will need to be served by vibrant, well-thought-out town centres offering modern job opportunities as well as being at the heart of the local community. Currently, Town Centre Regeneration Program proposals are being processed for Basildon, Crawley, Harlow, Hatfield, Peterborough, Skelmersdale, Stevenage, and Telford.

Norwich and Peterborough Building Society (NPBS) & Ecology Building Society:
The Norwich and Peterborough Building Society (NPBS) offers financial support and advice to people interested in doing home improvements. In 1998, the NPBS began offering green mortgages to encourage homeowners to make their homes more energy efficient. Now, for every green mortgage taken out, the NBPS plants 40 trees. The NBPS offers loans as well as their green mortgages, and both have reduced interest rates. The Ecology Building Society is another organization offering loans and mortgages at reduced rates to people planning to do home renovations. Additionally, many local housing authorities and associations offer grants of varying sizes to people who want to clean up and use an abandoned building, or people who want to tear down an abandoned building to make way for new sustainable buildings.

Waterwise:
Since 1996, water companies in England and Wales have had a duty to promote water efficiency and help customers manage demand. In September 2005, Waterwise, an industry-funded conservation initiative, was launched with the specific aim of promoting water efficiency. Waterwise is promoting a collective effort by industry, consumers, Government, regulators, and others to save water and to ensure a sustainable water supply for the future. The key to water efficiency is in reducing waste, not restricting use. Consumers can help reduce waste by making small behavioural changes and by choosing more water efficient products. Waterwise and its website provide all sorts of information and resources to help people save as much water as possible. These resources include water saving tips, a list of water saving devices, extensive research projects, a free online library of water saving resources, and links to other sites promoting water efficiency. So far, results have been promising. In the past 5 years, over 270,000 supply pipes – connecting a property to the water main – were repaired, 2 million cistern devices were distributed (to reduce unnecessarily high use of water from toilet flushing), and 15 million self-audit packs were provided to help customers take steps themselves to use water more efficiently.

The “London Plan”:
On June 1 2006, London released a new plan to drastically cut carbon dioxide emissions. Under the revised ‘London Plan,’ all new buildings in the city will have to generate 20% of the energy they consume through onsite renewable sources, way up from the 10% level previously required. Other revisions to London’s development plan include statutory carbon cut targets of 20% by 2015 and 60% by 2050, from the 1990 base level, and radical changes to the city’s development, energy and transport policies. This marks the first time that legally binding energy and emissions targets have been set for London. To help existing buildings and developers deal with these new requirements, incentives will be provided by local governments and will cover things like building retrofits and new
energy-saving technologies. With London’s housing stock set to grow substantially over the next 15 years, regulating new development is important. The number of households is expected to increase from 3.1 million in 2001 to 3.4 million by 2016 to provide for an estimated 800,000 new inhabitants, according to the Mayor’s Office.

B-7 International Initiatives:
Commission for Environmental Cooperation’s (CEC) green building advisory group: The Commission for Environmental Cooperation (CEC) is an international organization created by Canada, Mexico and the United States under the North American Agreement on Environmental Cooperation (NAEAC). The CEC was established to address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the effective enforcement of environmental law. The Agreement complements the environmental provisions of the North American Free Trade Agreement (NAFTA). In July 2006, the CEC announced the formation of a 20-member advisory group that will guide its study into the challenges and opportunities for green building in North America. The advisory group is a multidisciplinary body composed of distinguished experts drawn from developers and architects of green buildings, green building trade associations, financial institutions, and real estate appraisers and brokers, and includes participants from all three countries. The CEC study, ‘Green Building in North America: Opportunities and Challenges,’ will seek to encourage the growth of this important practice by profiling the current status and prospects for green building, highlighting factors behind notable successes or difficulties, and identifying the potential for environmental benefits.

Super E House Program:
Canada is also doing its part to provide green buildings to other countries through partnerships with Canadian experts. NRCan initially developed the Super E House Program to provide comfortable, energy efficient homes to the Japanese market. Since the program started in 1998 over 30 Japanese companies have partnered with 10 Canadian companies to build sustainable homes all over Japan. Now, the program has expanded to match qualified UK, Irish and Chinese builders with Canadian experts, who facilitate the building process in these countries. CMHC, Canada’s national housing agency, has recently joined NRCan to bring high quality Super E houses to UK home buyers. Following the energy shortages of the 1970s, Canada initiated intensive efforts to develop energy-efficient housing. In the process, other benefits emerged, improving indoor comfort and creating a healthy living environment. The resulting technology advancements, construction techniques, performance testing and quality assurance are an integral part of every Super E house. The Super E Program is a great way for leading Canadian firms to share and refine their skills, while overseas builders benefit from the guidance and gain the ability to erect more sustainable buildings.

United Nations Environment Program’s (UNEP) Sustainable Building & Construction Initiative (SBCI):
A new international effort to green the multi-billion dollar global building and construction sector was launched in Paris in early 2006, involving some of the biggest names in the industry. Construction giants Lafarge, Skanska and Arcelor are among the
found members of the Sustainable Building and Construction Initiative (SBCI), which aims to promote environmentally-friendly practices across the vast industry. The work of the SBCI will help ensure that buildings are routinely designed, constructed and maintained from an environmentally sustainable point of view over their entire life-span. Other goals of the SBCI are to influence legislation and building standards to include sustainability considerations and requirements, and to help create policies and incentives provided by national governments to support sustainable building and construction practices. The SBCI has been created as a neutral and worldwide platform, in partnership with leading international companies and others working in this area. As such, it will be able to provide direct input to other initiatives, governments and global bodies making recommendations and decisions affecting sustainable development in the industry. The SBIC aims to complement on-going efforts in various countries that are designed to assess and compare the environmental performance of buildings such as LEED in the United States and BREEAM in the UK.

Appendix C: Information Sources:

United States Sources:


C-2 Canada Sources:


128


C-3 Germany Sources:


C-4 Japan Sources:


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Japan for Sustainability Information Centre – Tokyo Gas programs information. Accessed August 2006,

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**C-5 Australia Sources:**


C-6 United Kingdom Sources:


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Low Carbon Buildings Program website. Accessed August 2006,

National Housing Federation website. Accessed August 2006,
http://www.housing.org.uk/.

Norwich and Peterborough Building Society website. Accessed August 2006,
<http://www.npbs.co.uk/>.


Royal Institute of British Architects website. Accessed August 2006,

Royal Town Planning Institute website. Accessed August 2006,
<http://www.rtpi.org.uk>.


Sustainability Works Software website. Accessed August 2006,


C-7 International Initiative Sources:


C-8 Green Building Council, Environmental Labeling System and Green Building Rating System Sources:


