APEC Cooperative Energy Efficiency Design for Sustainability (CEEDS)

FINAL REPORT FOR CEEDS PHASE 2:

Building Energy Codes and Labeling

Workshop #3:
8-10 September 2010
Bangkok, Thailand

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APEC Energy Working Group

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Executive Summary

Background on CEEDS. Phase 2 of the APEC Cooperative Energy Efficiency Design for Sustainability (CEEDS) project, organized by the Asia Pacific Economic Research Centre (APERC), focused on building energy codes and energy labeling for construction materials and whole buildings. The previous CEEDS Phase 1 addressed appliance energy standards and labeling (S&L). Both appliance S&L and building energy codes are among the high-performance policies identified as having potential to help APEC economies achieve the energy savings goals adopted by APEC leaders in 2007.

For each phase of CEEDS, APERC invited APEC economies to participate in a series of two workshops. At the first workshop, each economy drew on a policy template provided by APERC to identify the current status of policies and programs, along with barriers and possible solutions to advancing appliance S&L (Phase 1) and building energy codes and labeling (Phase 2). Comments by invited international experts and from the other participating economies helped the delegates from each economy identify proposed next steps. Each delegate shared the workshop findings and proposed next steps with colleagues in the relevant ministries and agencies of that economy. At a second, follow-on workshop, the representatives from each economy reported back on progress in implementing the planned actions and any new issues or opportunities identified. Discussions among the economies and invited experts helped each economy refine its plan of action and the implementation steps and timetable to follow the second workshop.

Participation in workshops. For CEEDS Phase 2 on Building Energy Codes and Labeling, the first workshop was held in Bangkok, Thailand, on 8-10 September 2010. The workshop was organized by the Asia-Pacific Energy Research Center (APERC) and co-hosted by Thailand and by Hong Kong, China. (The agenda for "CEEDS Workshop #3" is shown in Appendix 1a.) The second workshop of CEEDS Phase 2, with the same co-hosts, was held in Hong Kong China on 26-28 January 2011. (The agenda for "CEEDS Workshop #4 is shown in Appendix 1b.)

Six economies[1] participated in person at the CEEDS Phase 2 workshop: the People's Republic of China, Indonesia, Malaysia, Mexico, the Philippines, and Vietnam. Chile was unable to participate as planned, but was able to join the follow-up workshop by videoconference. Of these participating economies, all but Indonesia and Mexico had also participated in the CEEDS Phase 1 workshops on appliance S&L. Two other APEC economies, Thailand and Hong Kong China,

[1] Indonesia, Mexico, and the Philippines participated in only one of the two workshops because of unavoidable causes.

offered to host the Phase 2 workshops, and provided special briefings on the implementation of building energy codes, labeling, and related programs in their economies. All together, more than fifty people attended one or both of the CEEDS Phase 2 workshops, including delegates from the participating economies, invited international experts, and senior officials and invited observers from the two host economies. The Alliance to Save Energy, with additional support from the Office of Building Technologies, US Department of Energy, assisted APERC in preparing a policy framework for building energy codes and a self-assessment checklist as background material for the economies participating in CEEDS Phase 2.[2]

Key findings on building codes and labeling. In terms of the potential for building code programs to help APEC economies achieve their energy savings goals, an APERC analysis found that applying state-of-the-art building energy codes to four major building – and just in urban areas – would have the potential to save up to 2,300 Mtoe cumulatively by 2030, for six APEC economies that participated in CEEDS Phase 2. This represents 3 to 11 percent of those economies' projected residential and commercial sector energy use in 2030.

Even though each participating economy differed significantly in their current level of effort to implement building energy codes, their amount of prior experience, and the degree of political support, the exchange of views at the CEEDS workshop showed that all economies faced similar challenges in pursuing common objectives such as:

- Tightening energy code requirements and incorporating renewable energy and other advanced technologies;
- Moving from voluntary to mandatory energy codes;
- Stepping up code enforcement and compliance; and
- Broadening the application of energy codes to all buildings, to rural as well as urban areas and to cover modifications of existing buildings as well as new construction.

These common challenges included:

- The need for top-level, sustained policy support from leadership in the national government and also in provincial and local governments;
- Development and maintenance of institutional capacity (legal authority, staff, and budget) in the face of government changes and staff turnover:
- Cooperation among Ministries and levels of government;

[2] "APERC Policy Template: Building Energy Efficiency Codes, Building and Component Energy Rating, and Complementary Programs."

- Lack of economy-specific data on building stocks and construction; and
- The need for technical training (periodically, due to staff turnover) for code officials and builders alike.

The economies also agreed on the value of developing a "Code Compliance Roadmap" to guide the transition from voluntary to mandatory energy codes, or to step up code compliance and enforcement. This Roadmap would ideally include:

- The "business case" (policy case) for codes, including both benefits and costs;
- Legal authority in place (or needed);
- Ministry and intergovernmental responsibilities;
- Realistic timeline for implementation, including lead time for training and other preparations;
- Code enforcement procedures and responsibilities, which might include both "carrots" (e.g., accelerated review of building permits or additional allowances for development density) and "sticks" (withholding or denial of an occupancy permit, or perhaps fines);
- Identification of the staff and resources needed, and sources of funding sources (e.g., developer fees, general revenues, or other);
- Public awareness programs, to help make compliance with the energy code a feature normally expected by a building buyer or tenant;
    - Stakeholder involvement and support, including business allies, electric and gas utilities, and leading "green" builders and developers; and finally
- Adoption, upgrading, and enforcement of the energy code in stages, both to limit the administrative burden, gain acceptance from industry and the public, and to help identify any errors or omissions in the energy code through regular feedback. Various methods for staged application of an energy code could include:
    - Public buildings first
    - Large buildings followed by smaller ones
    - Early implementation in selected building types (e.g., commercial offices, retail, then residential and other)
    - Pilot programs in selected regions
    - Urban areas first, then smaller cities and rural areas
    - Limiting energy code enforcement at first to a few of the most significant provisions, based on their potential for increased energy savings

Once again, despite the variations in each economy's approach and degree of experience with building energy codes, there was agreement on a number of key lessons learned:

- Energy codes, once adopted by law or regulation, are not "self-implementing" – they require considerable follow-up by the national or local agencies assigned the role of disseminating information to all major stakeholders and then taking steps to assure code compliance.
- "Compliance" should be the emphasis, not just enforcement. Once the codes are well understood, compliance should become the norm that buyers expect from builders and developers.
    - This process can be further supported by building energy rating and labels, to help inform market actors and make it worthwhile for a builder or building owner to show that the building meets or beats the energy code requirements.
    - Compliance can also be enhanced by making sure that the code requirements themselves are clearly stated, widely disseminated, and that the requirements are set at a level that designers, builders, and equipment or materials suppliers are able to meet.
- In other words, the necessary "infrastructure" must be in place within that economy or local area, including.
    - Information and training on the code requirements
    - Energy design tools for use by architects and engineers
    - Methods and systems for testing and rating the energy performance of building materials and equipment
    - Acceptance testing and building commissioning methods for construction quality
- In addition to the above actions to support code compliance, specific verification and enforcement actions will still be necessary. Typically, code enforcement occurs at several stages of a project: Initial plan review prior to granting a construction permit; on-site inspection during construction; and final inspection upon completion of construction but before granting a certificate of use or occupancy. In this regard, energy code enforcement is often integrated into inspection and enforcement for other code requirements (structural, health, and safety).
- Last, building energy codes will generally need periodic review & updating, to make sure they keep in step with changing technologies and market conditions, as well as feedback from experience gained with actually applying the codes to real buildings.

Areas for future work. Future opportunities identified by the CEEDS workshop participants for advancing energy codes and labeling within each economy included:

- Closer linkage between voluntary "market preparation" activities, such as voluntary building energy rating/labeling, recognition, and incentives, and the next update of the mandatory building energy code.

- Applying building energy code provisions to renovation, retrofits, and equipment replacement in existing buildings – and potentially developing a policy of "re-certifying" energy code compliance on a regular basis (e.g., every 10 years).
- Tracking actual energy performance of buildings after construction and occupancy, to provide feedback on which code provisions are being implemented and which measures achieve sustained energy savings.
- Exploring the possibility of combining building energy labeling with third-party (outsourced) services for code inspection and enforcement.
- Adding new provisions to building energy codes, which could include:
    - Requirements for additional metering, monitoring, and controls to support "active energy management."
    - Prescriptive or performance requirements focused on reducing electricity use during periods of peak demand.
    - Adding "outcome-based" code provisions for verifying energy performance during occupancy, in addition to codes that are enforced during the design and construction process only.
    - Requiring "future-proofing" building features at time of construction (or renovation) that may not save energy immediately but are designed to enable the future addition – at lower cost – of new, improved, or lower cost energy-saving technologies

Additional opportunities for regional cooperation on building energy codes and labeling that were identified during the two CEEDS workshops included:

- Networking and information-sharing, which could range from bi-lateral collaboration agreements among APEC economies to the creating of a "virtual codes community" building on the existing OCEAN website (www.bcap-ocean.com).
- Cooperative regional activities to enhance energy testing and rating of building products such as windows, cool roofing, and installed HVAC or lighting systems.
- The sharing of model code provisions among APEC economies, but with specific attention paid to differences in both climate and local design traditions or construction materials.
- Cooperating in developing a model code compliance Roadmap, including a sample "Business Case" for moving from voluntary to mandatory energy codes, and methods to estimate code compliance costs and identify revenue sources.
- Joint development and sharing of code-related training curricula, certification criteria, builder/installer "tip sheets," and code compliance software targeted to architects, engineers, building trades, and code officials themselves.

At the conclusion of the second CEEDS Phase 2 workshop, each participating economy was intending to move ahead with steps to implement the revised plan of action developed during the two workshops. In addition, the US Department of Energy, in cooperation with Thailand's Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy, was making plans to convene a follow-up workshop on energy testing and rating of building products, to be held in Bangkok in 2011. APERC planned to explore other areas for regional cooperation, including workforce training and development related to energy codes and labeling, and to consider ways to share the results of CEEDS Phase 2 with other APEC economies.

The following sections of this report review the main topics discussed at the workshop by the participating economies and invited international code experts. A series of appendices summarize the status, barriers and opportunities, and planned next steps for each participating APEC economy, based on materials presented at the two workshops. Presentations made at the workshop by the participating economies and invited building code experts are available online at the APERC website (http://www.ieej.or.jp/aperc/).

Why Focus on Energy Codes and Energy Labeling of Building Products and Whole-Buildings?

Workshop participants agreed that building energy codes represent an important element of economy-wide energy policy, for several reasons:

- Codes offer significant potential for both saving energy (including electricity peak demand) and reducing CO_2 emissions, especially in fast-growing APEC economies with high rates of new construction and rapidly rising energy intensity (kWh/m^2) – as discussed below.
- Codes can be a highly cost-effective way to help APEC economies achieve their energy efficiency goals.
- Given the long expected lifetimes of new buildings it is especially important to avoid "locking in" inefficient designs – and conversely, to lock in energy efficiency during initial design and construction, when it is much cheaper and easier compared with retrofitting a building once it is built.
- Building energy codes can reinforce other energy efficiency policies, and in turn can build on other policies such as:
    - Whole-building energy rating and disclosure (labeling), voluntary recognition programs, and government or utility incentives;
    - Energy testing, labeling, and standards for space conditioning equipment, lighting products, and other installed equipment; and
    - Government sector leadership to provide "proof of concept" before a new energy code is made mandatory, and also to establish a public sector entry-market for high-performance products and energy-efficient design practices.

Estimating Energy Savings from Building Energy Codes and Complementary Programs

A presentation by James Russell of the APERC staff addressed the modeling of estimated energy savings from building energy codes. Estimates from the literature of building energy code savings range widely, from about 30% up to 75%, depending on the assumed current practice and the effectiveness of compliance and enforcement. However, even in the high-growth APEC economies these savings will take time to accumulate, since most energy codes apply only to new construction (although some economies are also trying to use codes to upgrade energy efficiency in existing buildings during remodeling projects and equipment replacement).

APERC staff prepared a study on the savings potential from energy codes in the region, with a focus on the economies participating in Phase 2. The purpose of this APERC study was to:

- Provide key decision makers and stakeholders with information that they can use to prioritize building energy codes in the context of other goals, programs, and policies.
- Develop information on the building types and locations with the largest savings potential, to help guide the development or updating of codes.
- Establish a baseline to track the effectiveness of code compliance and enforcement.
- Provide a better understanding of what data are currently available, and what additional information may be needed to improve estimates of building code savings and to track the actual impact of codes once they are adopted.

APERC received comments from workshop participants on the study design and methodology, which used a the building energy simulation model (e-Quest 3.63)[3] to compare current practice with proposed new or strengthened energy codes in each of the CEEDS Phase 2 economies, as shown in Figure 1.

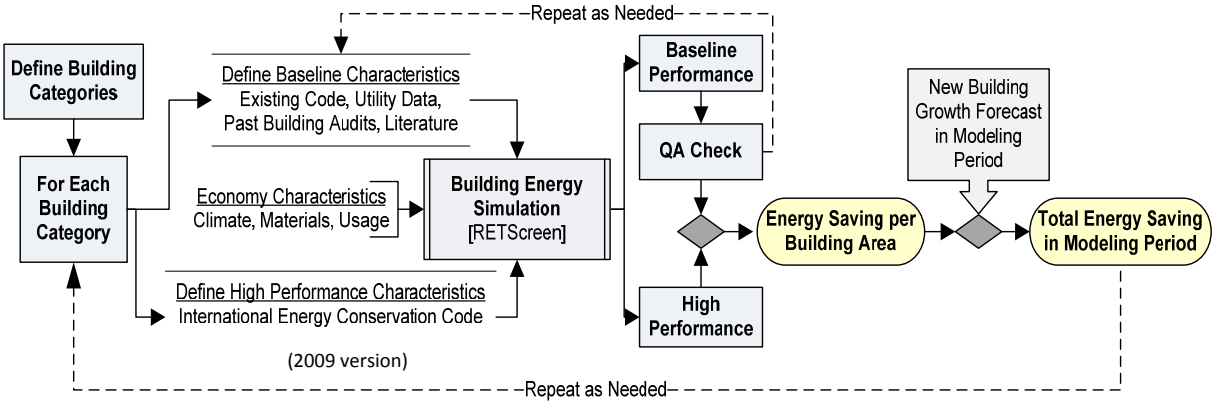


Figure 1. APERC Method for Estimating Savings from Building Energy Codes

[3] This simulation tool, developed by the State of California, is based on the US Department of Energy's DOE-2 model; see http://www.doe2.com.

The study developed prototypes of four common building types in each economy: office and retail, multifamily apartments, and single-family homes. APERC received feedback from several economies to tailor the building types and specifications to match typical design and construction practices in that economy, and to provide available data on measured energy consumption for new buildings and on construction volumes for both new construction and major modifications to existing buildings. Because current code provisions differed for each economy – and are subject to change as a result of the CEEDS process – this study chose a single point of reference to estimate the potential savings from improving energy codes in each economy. These common code provisions were based on the 2009 International Energy Conservation Code (IECC), as tailored to the climate of each APEC economy.[4] Typical efficiency provisions included wall insulation, air-tightness, window insulation, window solar properties, lighting power density, ventilation system efficiency, pump and fan controls (VSD), high-efficiency chillers and boilers, and efficient motors for fans and pumps.

Economy	Building Type	Energy Savings
China	Apartment	16%
China	Office	35%
China	Retail	36%
China	Small Apartment	16%
Indonesia	Apartment	13%
Indonesia	Office	44%
Indonesia	Retail	19%
Indonesia	Single Family Home	13%
Malaysia	Apartment	17%
Malaysia	Office	43%
Malaysia	Retail	45%
Malaysia	Terrace Housing	10%
Mexico	Apartment	6%
Mexico	Office	38%
Mexico	Retail	14%
Mexico	Single Family Home	15%
Thailand	Apartment	12%
Thailand	Office	29%
Thailand	Retail	28%
Thailand	Single Family Home	15%
Viet Nam	Apartment	13%
Viet Nam	Office	38%
Viet Nam	Retail	34%
Viet Nam	Single Family Home	19%

Table 1. Code Savings in Prototype Buildings

The APERC estimate also assumed very high rates of compliance with the energy codes, in order to better understand the potential for savings.

APERC presented the savings estimates from energy codes for each participating economy at the second CEEDS workshop in January 2011 (see Tables 1 and 2). For individual building prototypes, estimated code savings averaged 24%, and ranged from 6% for apartment buildings in Mexico to 45% for office and retail buildings in Indonesia and Malaysia, respectively. Economy-wide savings range from 3 to 11 percent of the economies' projected residential and commercial sector energy use in 2030, and on a cumulative basis represented primary (source) energy savings of 2,300 million tons oil equivalent Mtoe by 2030.

[4] The 2009 IECC is available at http://www.energycodes.gov/publications/code_books.stm.

Note that these estimates assumed that building-level savings are applied to 100% of the projected new office, retail and residential floor space – but only in urban areas and only for these selected building types. Thus, the total potential for energy savings from building energy codes would be even greater, assuming a strong energy code and effective code compliance.

Comparison with APEC Supply and Demand Outlook v4							
		Outlook v4, Other Sector		Estimated Building ESP, Site		Percent Savings	
Economy	Unit	2015	2030	2015	2030	2015	2030
China	Mtoe	567.4	805.8	13.93	87.79	2.5%	10.9%
Indonesia	Mtoe	69.9	83.7	0.41	2.56	0.6%	3.1%
Malaysia	Mtoe	9.2	15.4	0.19	1.04	2.1%	6.8%
Mexico	Mtoe	27.5	32.8	0.28	1.49	1.0%	4.5%
Thailand	Mtoe	21.1	34.4	0.60	3.84	2.9%	11.1%
Viet Nam	Mtoe	29.5	36.7	0.28	1.91	0.9%	5.2%

Table 2. Economy-wide Code Savings Estimates

Characteristics of an Effective Energy Codes Program

Drawing on their own experience, as well as the Policy Template prepared for this workshop by APERC and the Alliance to Save Energy, participants at the workshop discussed the characteristics most often associated with a successful building energy codes program. These included:

- *Legal authority:* It is essential to have clear legal authority for the building energy code, both in law and often in administrative regulations. This legal authorization should also assign clear responsibility for development (and updating) of the technical code provisions, for code adoption (where this is a process separate from code development) and – where the code is mandatory rather than voluntary – for code compliance activities including training, technical information, and review of plans and on-site inspection.
- *Coverage:* The energy code should ideally apply to all major building types that represent a significant share of new construction. For many APEC economies, the great majority of construction activity is in urban areas, although energy-efficient construction in rural areas and smaller cities can also be important to address. Codes should also cover the major determinants of energy use in new buildings, including the thermal envelope, lighting and daylighting, heating and cooling, mechanical ventilation (if any), and water heating.

- *Infrastructure:* An important theme of the workshop was the need for infrastructure of several types to support effective code compliance. Examples include: a) design tools and training for both architects, construction personnel, and code inspectors; b) performance testing and labeling of construction products like windows, insulation, and mechanical equipment; and c) energy rating and disclosure of whole-building energy performance to help reinforce buyer demand for energy-efficient buildings that meet or exceed the code.
- *Availability of products:* In developing APEC economies, in particular, it is difficult if not impossible to comply with building energy code requirements if the necessary products, both construction materials and mechanical equipment and controls, are not available domestically, or are available only by special order or with a long delay and added cost for importing them from abroad. Similarly, there must be **accurate, standardized energy testing and labeling of building materials and equipment in order for designers and builders to know which products will allow their buildings to meet the energy code requirements**. The availability of energy-efficient products should be taken into account in developing the energy code requirements. Conversely, providing lead-time to implement a new or updated energy code, and working closely with suppliers and installers of building materials and equipment, can give an early warning to those in the supply chain to prepare for an emerging market that may also offer the possibility of higher profits.
- *Compliance & enforcement:* One finding that was widely agreed on by workshop participants was that energy codes are not "self-enforcing," but instead require a concerted effort, often at the local government level where many jurisdictions may lack the staff and technical expertise needed to monitor and enforce compliance with the energy codes. To be effective, an energy codes program must address the resource and training needs of many local jurisdictions.
- *Regular code review & updates:* There was widespread agreement that energy codes need periodic review and updating to stay current with changing building practices, technology innovations, and evolving market conditions (including energy prices and construction costs).
- *Stakeholder involvement:* As noted above, a building energy code is more likely to be accepted by developers, builders, and suppliers of construction products if they have been included in the code development process, and kept informed of the code requirements with sufficient lead time to prepare for meeting new code requirements.
- *Public information:* Similarly, public support by building owners, buyers, and tenants, can be a very important factor in the long-term success of a building energy code, since this public awareness will in turn help to create and sustain political support by elected officials and by the key managers and staff of government agencies.

Developing a Compliance Roadmap and Business Case

A significant point of discussion by workshop participants was the need for an effective "roadmap" for achieving code compliance, especially in cases where there was a voluntary code in place and the objective was to make the code mandatory and reach high levels of compliance. The discussion of a roadmap for code compliance echoed some of the same points regarding effective codes programs (see above), as well as other elements that were considered important:

- *Business case:* To the extent possible, both benefits and costs of building energy codes should be clearly described and quantified. Direct benefits include energy cost savings to building owners and tenants, net of the added construction costs for energy-saving features (amortized over the life of the building or individual measure). Other types of benefits could include avoiding the need to construct new power plants or transmission and distribution facilities, reducing the chance of electricity blackouts due to the inability of the utility grid to keep up with demand growth, less reliance on imported energy, reductions in energy-related air pollutants and greenhouse gas (GHG) emissions, reduced costs to government where energy prices are subsidized, and net job creation as energy-efficient construction shifts money from the capital-intensive energy sector (including imports) to the job-intensive construction and building operations sector. In addition to any increase in construction costs for a building to comply with the energy code, there may be increased costs to government agencies charged with code compliance and enforcement. In many cases, these code compliance costs are covered by construction permit fees charged to developers and builders.
- *Legal authority and agency responsibilities:* As noted earlier, the compliance roadmap needs to address the responsibility for both code development/updating and code administration. Where these functions involve different ministries or different levels of government, it is especially important to clearly define responsibilities and provide for an orderly handover of jurisdiction for a newly developed or updated code.
- *Realistic timeline (lead time and phasing):* The compliance roadmap should allow sufficient lead time for building designers, construction firms and workers, code officials, and product suppliers to become familiar with the new or revised energy code requirements, and prepare to meet them. A staged implementation schedule for a mandatory code may be one practical approach. For example, the code might apply first to public buildings then become mandatory for private buildings. Or, code enforcement could begin with larger or more energy-intensive buildings in one or two categories (e.g., large offices, resort hotels, etc.), or

with new construction in certain pilot regions. This staged implementation can help the market actors "learn by doing," support the development of case studies, identify needed resources and tools, and also help to reveal any unintended errors or omissions in the code itself, before it is implemented on a nationwide scale.

- *Enforcement processes, staff resources, and fee structure:* The code compliance roadmap needs to provide for a well planned code training and enforcement effort, using both "carrots" (such as density bonuses or faster permit review and approval) and "sticks" (including fines where necessary, or the denial of a certificate of occupancy until energy code violations are fixed). These activities require adequate numbers of well-trained staff, depending on the volume of construction, the complexity of the code and, to a large extent, the degree of voluntary code compliance by builders and developers. Funding for code compliance can come from general revenues, from development and building permit fees paid by the developer of a new building (and ultimately by the owner), or from a combination of these sources. Where possible, the developer fees might be adjusted to match the quality of past compliance by that developer, as an added incentive to meet the energy code requirements voluntarily. Other incentives, such as floorspace or density bonuses, can be awarded to those developers who consistently meet or exceed the requirements of the energy codes.
- *Public awareness and stakeholder involvement:* As noted earlier, engaging stakeholders in the process of code development and in the design of compliance and enforcement activities can gain significant goodwill and cooperation when it comes time to enforce the code for a specific building project. It is important for policymakers to recognize that "the industry" should not be approached as a monolithic group. Not all developers and other business groups will necessarily be opposed to stronger building energy codes. Some, with greater willingness to innovate or with prior experience in "green" construction beyond the code requirements, may see a competitive advantage in adoption and enforcement of stronger codes. Others (especially small builders) may be concerned about their ability to understand the new technical requirements and need extra technical support or training to become comfortable with meeting the code. Finally, some utility companies may be convinced of the value of energy codes that slow the rate of growth in energy demand so that financing and construction of new utility capacity can more easily keep pace.

Relation of Building Codes to Other Programs & Policies

Participants in the workshop discussed at some length the relationship of building energy codes to other, complementary energy efficiency programs and policies. It was generally acknowledged by workshop participants that building energy codes may be essential to achieve energy savings in new or renovated buildings, due to the split incentives between builders and owners on the one hand, and between owners and tenants in rented commercial or residential buildings, on the other. At the same time, many of the workshop participants believed that **energy codes alone may not be sufficient to change business-as-usual construction practices**. Significant change also requires the infrastructure-development activities mentioned earlier: code training, software tools for building design and code compliance, and energy testing and rating of construction materials and installed equipment covered by the code.

It is also important to look at energy codes as a dynamic process, with each new update of the code preceded by market preparation activities. These may include government-funded demonstration projects of beyond-code buildings, incentives and recognition for buildings that meet (or exceed) code requirements earlier than required, and early code adoption by public agencies in their own new-construction projects. These market preparation steps can do a lot to make a building energy code both more politically acceptable and more feasible to implement.

This close relationship between energy codes and market-preparation activities is illustrated by Figure 2, based on the experience in Singapore with their code-leading “GreenMark” program of building energy labeling. The GreenMark label helps lay the groundwork for each new energy code update that represents a step toward higher efficiency requirements. Also, new public buildings in Singapore (and retrofits with over 5000 m^2 of air conditioned space) are required to meet the highest level GreenMark rating (Platinum). Other economies in the region have expressed interest in the GreenMark rating system.

China is developing a similar framework for code advancement, with its 5-star building energy labeling program, of which the top 4 levels are more stringent than current building codes and help prepare the market for future improvements in the China building energy code. Also, Thailand has a comprehensive program for rating and labeling green buildings with a strong emphasis on energy efficiency, among other green building criteria.

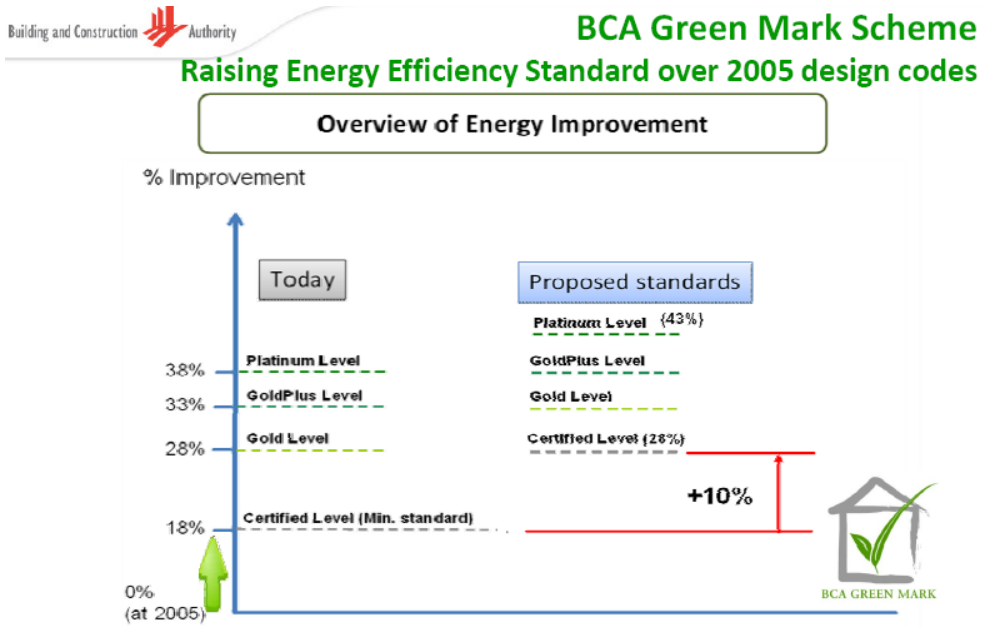


Figure 2. Labels and Incentives Prepare the Market for (Updated) Building Codes

Key Challenges in Implementing Building Energy Codes and Labeling

While current circumstances differ among participating APEC economies, the workshop participants together identified several common challenges they all face in developing and implementing energy codes. While the economy -specific challenges and proposed policy responses are described for each economy in Appendices 2-8; some elements in common included:

- The need for high-level support for strong, effective energy codes from both policy-makers and elected officials.
- The need for sustained investments to strengthen institutional capacity for code administration, including legal authority, staff, and operating budgets.
- The importance of mechanisms to assure ongoing cooperation in energy code implementation among Ministries and across levels of government, from national to local.
- The need for more and better economy-specific data on construction trends, energy-using characteristics of new and renovated buildings, and measured energy consumption.
- The need to strengthen provisions for energy testing and rating of building products and installed equipment – including many of the same issues raised in CEEDS Phase 1 regarding improved test-lab capabilities and certification procedures.

- The need for more staff training of code officials, including repeated training in light of normal staff turnover.

Lessons Learned

A summary of the discussion by workshop participants and invited code experts on lessons learned covered many of the same themes mentioned above:

- Since energy codes are not self-implementing they require a carefully planned, legally authorized, and adequately staffed compliance effort – not just when the codes are first introduced but on an ongoing basis.
- The program should emphasize "compliance first, then enforcement." The initial focus should be to encourage and enable code compliance by designers, builders, and product suppliers; with code enforcement as a final action to verify compliance and impose sanctions if needed.
- Compliance efforts should address both the demand and supply sides of the buildings market. On the demand side, it is important to get buyers and owners to expect an energy-efficient new building, and to develop building energy rating and labeling to better inform the market. On the supply side, it is a question of "tools, information, and training." Code compliance can be improved by making sure that the code requirements are clearly explained and widely publicized; that training is available to help designers, builders, and product suppliers to understand these requirements; and that they have available the software and other tools needed (including energy ratings of building components) to deliver buildings that meet the code.
- Enforcement of the energy code will ideally occur at several stages of a construction project: during the initial plan review prior to issuance of a building permit; through on-site inspection during construction, and as part of an acceptance testing or start-up commissioning process after completion but prior to building occupancy.
- Code enforcement can also be a means to identify which parts of the codes are not working well, either because they are not widely understood, because they are not practical in light of workforce skills or product availability, or for other reasons.
- All energy codes need periodic review and updating, preferably on a regular, pre-announced cycle to allow designers, builders, and equipment suppliers time to anticipate and prepare for the code changes. Involvement of all key stakeholders, including industry and energy efficiency experts and advocates, is an important part of the code development or updating process.

- When a new or revised energy code are first introduced, it may be useful at first to limit compliance and enforcement activities to a few of the most important code provisions – those with the greatest impact on energy savings for the least effort and cost, or where the most significant changes are needed in current design and construction practice. Accepting such "partial code compliance," however, should be offered only as a transitional strategy or a means to reward early-adopters of the code, rather than as a long-term policy.
- Finally, both training and enforcement of the energy code requirements should be linked wherever possible to the enforcement of structural, health, and safety codes, which often receive higher priority by both builders and building code officials.

Future Building Code Opportunities for APEC Economies

In discussing their plans for the future, representatives of the participating economies mentioned several common themes:

- The need for increased emphasis on "market preparation" activities such as whole-building and building component energy labeling, incentives for energy-efficient buildings, etc., to prepare for the next stage of mandatory building codes.
- More attention is needed to improving energy efficiency in existing buildings, including the application of building energy code requirements to renovation projects and equipment replacements.
- Efforts to measure and track the actual energy performance of buildings built (or renovated) to meet the energy code. Some economies are considering a policy of requiring monitoring and "continuous improvement in energy performance," for public buildings and perhaps others. Others are considering requirements for buildings to periodically re-certify compliance with the energy codes, for example once every 10 years (as in Hong Kong, China).
- One suggested idea was to outsource code inspection and enforcement to third-parties, and gain extra value by combining this with building energy rating and labeling.
- Some ideas for advanced energy code implementation included:
    - Code requirements to enable more "active energy management" through mandating installation of controls, improved submetering, and time-of-use metering with real-time feedback to building operators or homeowners.
    - Increased emphasis on code provisions that reduce on-peak electricity use and maximum peak demand; this can also help to engage electric utility companies as advocates for stronger codes and better enforcement.

- Moving beyond energy codes that address only design and construction decisions to "outcome-based" codes that also try to influence longer-term building operations.
- Code requirements that enable new technologies to be installed more easily or at lower cost at some future time, to make new buildings more adaptable to upgrading in the course of several decades of expected life.
- Integrating energy efficiency provisions into the broader sustainability criteria of "green" building codes, which may attract more support from policy-makers than energy savings alone.

Regional Cooperation on Codes & Labeling

In response to these challenges and opportunities, delegates from the participating economies developed draft proposals for next steps in their economy (see Appendices 2-8). These included opportunities for increased regional cooperation in several areas:

- *Business Case template:* Cooperatively developing a model "Business Case" (and "policy case") for energy codes, as described above, and including information on methods to estimate code compliance costs and identify revenue sources.
- *Compliance roadmap template:* Similarly, development of an example "compliance Roadmap," especially for those economies facing the challenge of a transition from voluntary to mandatory energy codes. This Roadmap should include a method for estimating the costs of code compliance and developing a program budget, including possible revenue sources.
- *Strategies for networking:* Creation of a "virtual codes community" for purposes of networking and information-sharing. Two suggestions here were: a) the use of the "OCEAN" website (www.bcap-ocean.com) as a forum for posting information and hosting web-based comments and information exchanges, and b) encouraging bi-lateral collaboration agreements among economies or major cities, to share ideas on problems and solutions in implementing energy codes.
- *Cooperative product testing and rating:* Regional cooperation in improving the infrastructure for energy testing and rating of building products, including development or harmonization of test methods, creation or expansion of test labs, and mutual recognition agreements among test labs in the region.[5]

[5] Similar recommendations were part of the outcome of CEEDS Phase 1, but in the context of regional cooperation for testing and rating consumer appliances rather than building products and installed equipment.

- *Model energy code provisions:* Development and sharing of model energy code provisions among APEC economies with similar climates (and taking into account differences in local architectural design traditions and construction practices).
- *Code compliance tools:* Cooperative activities to develop code compliance software that can be easily customized to match the specific requirements of each economy's energy codes. Similarly the development, as a shared resource, of a series of visual "tip sheets" to help construction workers and equipment installers understand some of the most important energy efficiency requirements in the code.
- *Workforce training and certification:* Sharing of information and model curricula for energy codes training courses and certification of trained code officials, architects and engineers, and workers in the construction trades.[6]
- *Cooperation on a common system for voluntary green building rating and labeling:* Economies in the APEC region might explore the possibility of a common rating system for green buildings, drawing on the best features of existing voluntary rating programs.

[6] It was also suggested that APERC might develop a set of common categories for job descriptions, including a summary of the energy code-related skills needed in each job category.

Appendix 1a: Workshop #3

APEC Cooperative Energy Efficiency Design for Sustainability (CEEDS) – Phase 2
"Building Energy Codes and Labeling"
8, 9 & 10 September 2010, Bangkok, Thailand
Agenda

First Day – Wednesday, 8 September 2010		
Venue: SCG Experience, Bangkok		
8:30 – 9:00	Registration, SCG Building Entrance (1st Floor)	
	I. Opening Session	
9:00 – 9:20 (20)	I-1: Welcome Words by - **Mr. Damri Tunshevavong**, President of SCG Investment - **Mr. Kenji Kobayashi**, President of APERC/ Designated Executant of CEEDS Project - **Mr. Shinji Kakuno,** Director for Natural Resources and Energy Research Agency for Natural Resources and Energy METI / Project Overseer	
9:20 – 9:30 (10)	I-2: Opening Remarks	**H.E. Mr. Wannarat Channukul** Minister of Energy, Thailand
9:30- 9:45 (15)	Photo Session	
9:45 – 10:10 (25)	- Quick Glance at SCG Experience - Coffee Break	
	II. Kick-off Session: Background on Building Energy Codes and Expected Outcome of CEEDS Workshop	
10:10 – 10:55 (45)	II-1: CEEDS and Energy Savings from Building Codes	Moderator: Dr. Weerawat Chantanakome, APERC
10:00 – 10:15 (15)	(a) Presentation on "The CEEDS Project – Phase 2 and Workshop Objectives"	Mr. Kenji Kobayashi, President, APERC
10:15 – 10:30 (15)	(b) Presentation on "Energy Saving Potential of Building Energy Codes"	Mr. James Russell, APERC
10:30 – 10:45 (15)	(c) Presentation on APEC EGEEC activities on Energy Efficiency programs in the Buildings Sector	Mr. Terry Collins, Chair, EGEEC (and EECA – New Zealand)

10:45 – 11:45 (60)	II-2: Building Energy Code Strategies	Moderator: Mr. Jeffrey Harris, ASE
10:45 – 11:00 (15)	(a) Presentation on "Policy Framework for Building Energy Codes"	Ms. Aleisha Khan, Alliance to Save Energy, Building Codes Assistance Project (BCAP)
11:00 – 11:15 *(15)*	(b) Presentation on "Developing, Adopting, and Implementing Building Energy Codes"	Ms. Meredydd Evans, USDOE/PNNL
11:15 – 11:30 (15)	(c) Presentation on "Building Code Compliance and Enforcement"	Mr. Feng Liu, World Bank
11:30 – 11:45 (15)	(d) Presentation on "Building Product Rating/Labeling."	Ms. Sherry Hao, Cool Roof Rating Council (US)
11:45 – 12:15 (30)	II-3: Panel Discussion and Questions from Participating Economies	Session Speakers
12:15 – 13:25 (70)	Lunch at Viva Café, Crystal Design Center, hosted by SCG Experience	
	III. Presentations by Participating Economies (Moderator: Dr. Weerawat Chantanakome, APERC)	
13:25 – 15:05 (80)	III-1: Presentations on the present status of "Building Energy Codes and Labeling," including barriers/challenges.	
13:25 – 13:45 (20)		(a) Ms. LIU Hong, P.R. China
13:45 – 15:05 (20)		(b) Mr. Ezrom Max Donald Tapparan, Indonesia:
14:05 – 14:25 (20)		(c) Malaysia: Ms. Aminah Bt. Abd. Rahman
14:25 – 14:45 (20)		(d) Mexico: Ms. Sylvia Trevino-Medina
14:45 – 15:00 (15)	Coffee Break	
15:00 – 15:40 (40)	III-2: Presentations on the present status of "Building Energy Codes and Labeling," including barriers/challenges.	
15:00 – 15:20 (20) 15:20 – 15:40 (20)		(e) Philippines: Mr. Antonio Nabong[7] (f) Viet Nam: Mr. Nguyen Ba Chien
	IV. Panel Discussion	

[7] The representative of the Philippines was unable to attend this workshop.

	(Moderator: Mr. Terry Collins, Chair, EGEEC/EECA, NZ)	
15:40 – 16:50 (70)	IV-1: Discussion of Common Barriers/Challenges and Possible Solutions	Participating Economies
16:50 – 17:05 (15)	Summary Remarks of the discussion on the First Day by APERC	
17:05 – 18:00 (55)	Work Sessions/Consultations with APERC staff and invited code experts, for participating economies to update presentations for Day 2	
19.00 – 21:30	Dinner at Ratchada Ballroom 6th Floor, SC Park Hotel, hosted by DEDE	
	End of the First Day	

Second Day – Thursday, 9 September 2010		
Venue: Crystal Ballroom 3-4, Crystal Design Center, Bangkok		
	V. Experience with Building Energy Codes in Other Economies (Moderator: Dr. Weerawat Chantanakome, APERC)	
9:00 – 10:30 (90)	V-1: Sharing Experience from Other Asia-Pacific Economies	
9:00 – 9:15 (15)	**(a)** Presentation host economy delegate	Mr. Sarat Prakobchart (Thailand)
9:15 – 9:30 (15)	(b) Presentation host economy delegate	Mr. Ken YEUNG (Hong Kong China)
9:30 – 9:45 (15)	**(c)** Presentation on "Building Design and Insulation Materials for Energy Efficiency" by Thai speaker	Mr. Phisanu Milintanush (Thailand)
9:45 – 10:00 (15)	(d) Presentation on "Green Building Initiative and Labeling" by Thai speaker	Ms. Sirinthorn Vongsouwasup (Thailand)
10:00 – 10:30 (30)	**(e)** Panel discussion by expert speakers, delegates and APERC researchers.	
10:30 – 10:45 (15)	Coffee Break	

10:45 – 12:30 (105)	V-2: Sharing Experience from Other Asia-Pacific Economies and Other Regions	
10:45 – 11:00 (15)	(a) Presentation on "status of energy efficiency building codes and labeling measures of Singapore" by Singaporean delegate	Mr. Jeffery Neng Kwei Sung (Singapore)
11:00 – 11:15 (15)	(b) Presentation on "status of energy efficiency building codes and labeling measures of Korea" by Korean delegate	Mr. Taehyun YEOM (Korea)
11:15 – 11:30 (15)	(c) Presentation by an invited expert speaker	Dr. Satish Kumar, ECO-III India
11:30 – 11:45 (15)	(d) Presentation by an invited expert speaker	Mr. Jens Laustsen, IEA
11:45 – 12:00 (15)	(e) Presentation on "Low Carbon Green Growth approach towards Sustainable Development" by an UNESCAP expert speaker	Mr. Rae Kwon Chung (UNESCAP)
12:00 – 12:30 (30)	(f) Panel discussion by expert speakers, delegates and APERC researchers.	
12:30 – 13:30 (60)	Lunch at Crystal Ballroom 2, Crystal Design Center, hosted by DEDE	
	VI. Brainstorming Session: "What are the next steps to develop Building Code and Labeling for each participating economy?" (Moderator: Mr. Terry Collins, Chair, EGEEC/EECA, NZ)	
13:30 – 13:55 (25) 13:55 – 14:20 (25) 14:20 – 14:45 (25)	(a) P.R. China: Ms. LIU Hong (b) Indonesia: Mr. Ezrom Max Donald Tapparan (c) Malaysia: Ms. Aminah Bt. Abd. Rahman	
14:45 – 15:15 (30)	Coffee Break	
15:15 – 15:40 (25) 15:40 – 16:05 (25) 16:05 – 16:30 (25) 16:30 – 16:55 (25)	(d) Mexico: Ms. Sylvia Trevino-Medina (e) Philippines: Mr. Antonio Nabong (f) Viet Nam: Mr. Nguyen Ba Chien Summary Remarks of the discussion on the Second Day by APERC	

16:55 – 18:30 (95)	Follow-up Group Discussion OR Work Sessions/Consultations with APERC staff and invited code experts, for participating economies to update presentations for Day 3
(Note) An APERC researcher will assist each participating economy by writing a summary report with experts' suggestions on the next steps/road maps to develop Building Code and Labeling for each economy in order to assist each delegate to make a presentation on the next steps/road maps at wrap-up sessions.	
19.00-21.00	Buffet Dinner at Ballroom 2, Crystal Design Center, hosted by DEDE
	End of the Second Day

Third Day – Friday, 10 September 2010		
Venue: Crystal Ballroom 3-4, Crystal Design Center, Bangkok		
	VII. Complementary Programs for Energy-Efficient New Construction (Moderator Jeffrey Harris, Alliance to Save Energy)	
9:00 – 9:15 (15)	(a) Opening Remarks	Mr. Jeffrey Harris (ASE) on behalf of Mr. Marc LaFrance, US DOE (US)
9:15 – 9:30 (15)	(b) Presentation by an invited expert speaker on product energy testing and rating	Mr. Bipin Shah (US)
9:30 – 9:45 (15)	(c) Presentation by an invited expert speaker on whole-building energy rating and labeling	Prof. Siew Eang LEE (Singapore)
9:45 – 10:00 (15)	(d) Presentation on experiences on integrating energy efficiency techniques and technologies: a case of Thailand	Mr. Dayin Kiatkwankul (Thailand)
10:00 – 10:30 (30)	(e) Panel discussion by expert speakers, delegates and APERC researchers.	
10:30 – 10:45 (15)	Coffee Break	

	VIII. Wrap-Up Session – Building Energy Code Action Plans (General Moderator: Dr. Weerawat Chantanakome, APERC)	
(a) Presentation by a delegate about draft proposal on the next step/road map for each participant's economy to develop Building Codes and Product Rating/Labeling (b) Discussion for identifying key points in the future proposal, which will be presented at the 4th CEEDS workshop. (c) Preliminary summary report by ASE – Mr. Jeffrey Harris		
10:45 – 11:10 (25)	P.R. China: (a), (b)	Ms. LIU Hong
11:10 – 11:35 (25)	Indonesia: (a), (b)	Mr. Ezrom Max Donald Tapparan
11:35 – 12:00 (25)	Malaysia: (a), (b)	Ms. Aminah Bt. Abd. Rahman
12:00 – 13:30 (90)	Lunch at Crystal Ballroom 2, Crystal Design Center, hosted by DEDE	
13:30 – 13:55 (25)	Mexico: (a), (b)	Ms. Sylvia Trevino-Medina
13:55 – 14:20 (25)	Philippines: (a), (b)	Mr. Antonio Nabong
14:20 – 14:45 (25)	Viet Nam: (a), (b)	Mr. Nguyen Ba Chien
14:45 – 15:15 (30)	**IX. Closing Session**	
	Closing Remarks Closing Remarks: Mr. Kenji Kobayashi (President, APERC) Closing Remarks: Ir. K. K. Li, Hong Kong China (Co-host economy) Closing Remarks: Mr. Krairit Nilkuha, Director General, DEDE, Thailand	
End of Workshop		

Appendix 1b: Workshop #4

APEC Cooperative Energy Efficiency Design for Sustainability (CEEDS) - Phase 2
"Building Energy Codes and Labeling"
26, 27 & 28 January 2011, Hong Kong, Hong Kong China

First Day - Wednesday, 26 January 2011		
Venue: The Palace Room, B1, The Royal Garden ***69 Mody Road, Tsimshatsui East, Kowloon, Hong Kong***		
8:15 – 8:45	***Registration (Foyer, The Palace Room, B1, The Royal Garden)***	
	I. Opening Session	
8:45 – 8:50 (05)	***Welcome Remarks --*** Mr. Kenji Kobayashi, President, APERC	
8:50 – 8:55 (05)	I-1: Opening Remarks	Mr. Shinji Kakuno, Japan (Through WebEx)
8:55 – 9:00 (05)	I-2: Opening Remarks	Mr. Edward YAU, JP (Host economy) Secretary for the Environment, HKSAR
9:00 – 9:25 (25)	***Photo Session (Rooftop, The Royal Garden, Tennis Court)***	
9:25 – 10:30 (65)	***II. Kick-off Session to share expected outcome of CEEDS workshops (General Moderator: Dr. Weerawat Chantanakome)***	
9:25 – 10:30 (65) 9:25 – 9:40 (15) 9:40 – 9:55 (15) 9:55 – 10:10 (15) 10:10 – 10:30 (20)	 (a) Presentation on Expected Output (b) Q&A on presentation (c) Presentation on Energy Saving Potential by APERC (d) Q&A on presentation	 Mr. Kenji Kobayashi, President, APERC Mr. James Russell, APERC
10:30 – 11:00 (30)	***Coffee Break: Daisy Room, B1, The Royal Garden***	
	III. Next Steps for each participating economy	
11:00 – 12:00 (60) 11:00 – 11:10 (10) 11:10 – 11:30 (20)	III-1: Viet Nam (a) Kick-off to highlight Key Challenges for Viet Nam to develop Building Code and Labeling by Moderator, Mr. Jeffrey Harris (b) Presentation on refined proposal on next steps "Building Code and	

	Labeling" by Mr. Nguyen Ba Chien
11:30 – 11:35 (5)	(c) Comments on the presentation by Moderator
11:35 – 11:55 (20)	(d) Discussion
11:55 – 12:00 (5)	(e) Summary by Moderator for Viet Nam to develop Building Code and Labeling
12:00 – 13:30 (90)	III-2: Philippines
12:00 – 12:10 (10)	(a) Kick-off to highlight Key Challenges for Philippines to develop Building Code and Labeling by Moderator, Mr. Jeffrey Harris
12:10 – 12:40 (30)	(b) Presentation on refined proposal on next steps "Building Code and Labeling" by
12:40 – 12:50 (10)	Mr. Ronaldo P. Parreno Jr.
12:50 – 13:25 (35)	(c) Comments on the presentation by Moderator
13:25 – 13:30 (5)	(d) Discussion
	(e) Summary by Moderator for Philippines to develop Building Code and Labeling
13:30 – 14:30 (60)	***Lunch at The Garden Room, 2/F, The Royal Garden***
14:30– 15:30 (60)	III-3: Malaysia
14:30 – 14:40 (10)	(a) Kick-off to highlight Key Challenges for Malaysia to develop Building Code and Labeling by Moderator, Prof. Siew Eang LEE
14:40 – 15:00 (20)	(b) Presentation on refined proposal on next steps "Building Code and Labeling" by Ms. Aminah Bt. Abd. Rahman
15:00 – 15:05 (5)	(c) Comments on the presentation by Moderator
15:05 – 15:25 (20)	(d) Discussion
15:25 – 15:30 (5)	(e) Summary by Moderator for Malaysia to develop Building Code and Labeling
15:30 – 16:00 (30)	***Coffee Break: Daisy Room, B1, The Royal Garden***
16:00 – 17:00 (60)	III-4: Indonesia (Through WebEx)
16:00 – 16:10 (10)	(a) Kick-off to highlight Key Challenges for Indonesia to develop Building Code and Labeling by Moderator, Mr. Terry Collins
16:10 – 16:30 (20)	(b) Presentation on refined proposal on next steps "Building Code and Labeling" by Mr. Ezrom Max Donald Tapparan
16:30 – 16:35 (5)	(c) Comments on the presentation by Moderator
16:35 – 16:55 (20)	(d) Discussion
16:55 – 17:00 (5)	(e) Summary by Moderator for Indonesia to develop Building Code and Labeling
17:00 – 18:00 (60)	III-5: PR China
17:00 – 17:10 (10)	(a) Kick-off to highlight Key Challenges for PR China to develop Building Code and
17:10 – 17:30 (20)	Labeling by Moderator, Mr. Feng Liu

17:30 – 17:35 (5) 17:35 – 17:55 (20) 17:55 – 18:00 (5)	(b) Presentation on refined proposal on next steps "Building Code and Labeling" by Dr. LIU Hong (c) Comments on the presentation by Moderator (d) Discussion (e) Summary by Moderator for PR China to develop Building Code and Labeling
18:00 – 18:45	***Discussion/Waiting Room --- Daisy Room, B1, The Royal Garden***
18:45 – 20:30	***Dinner at The Garden Room, 2/F, The Royal Garden***
	End of the First Day
Second Day - Thursday, 27 January 2011	
Venue: The Palace Room, B1, The Royal Garden ***69 Mody Road, Tsimshatsui East, Kowloon, Hong Kong***	
	III. Morning Session - Next Steps for each participating economy
9:00 – 10:00 (60) 9:00 – 9:10 (10) 9:10 – 9:30 (20) 9:30 – 9:55 (25) 9:55 – 10:00 (5)	III-6: Thailand (Special Presentation from a Co-Host) (a) Highlight Key Challenges and Thailand's successful experience in developing Building Code and Labeling by Moderator, Dr. Cary Bloyd, Pacific Northwest National Laboratory (b) Special Presentation on "*Progress of BEC implementation and developing building product testing infrastructure: a successful experience and lesson-learned",* by Ms. Sirinthorn Vongsouwasup, Director, DEDE, Ministry of Energy, Thailand. (c) Q&A (d) Conclusion by Moderator
10:00 – 10:30 (30)	***Coffee Break: Daisy Room, B1, The Royal Garden***
10:30 – 11:30 (60)	***Work Session***
	- Speakers and APERC researchers will assist delegate from each participating economy to work out fine-tuned proposal on the next steps for participating economy which will be presented in Session V
11:30 – 12:30 (60)	***IV. Expert Presentations*** ***Transitioning from Voluntary to Mandatory Codes – Lessons from Other Economies (General Moderator: Dr. Weerawat Chantanakome, APERC)***

11:30 – 11:45 (15) 11:45 – 12:00 (15) 12:00 – 12:15 (15) 12:15 – 12:30 (15)	(a) Presentation on "Moving beyond barriers to building codes" (b) Q&A on presentation (c) Presentation on "Code Adoption and implementation in the US – with emphasis on support from builders and manufacturers" (d) Q&A on presentation by Speaker	Mr. Jens Laustsen, IEA Ms. Aleisha Khan, BCAP
12:30 – 13:30 (60)	***Lunch at The Garden Room, 2/F, The Royal Garden***	
13:30 – 14:30 (60)	***IV. Expert Presentations (Continued)*** ***Transitioning from Voluntary to Mandatory Codes – Lessons from Other Economies (General Moderator: Dr. Weerawat Chantanakome, APERC)***	
13:30 – 13:45 (15)	(e) Presentation on "Needs and Strategy for Developing a Regional Building Product Test Capability and Center for Southeast Asia"	Dr. Cary Bloyd, Pacific Northwest National Laboratory
13:45 – 14:10 (25) 14:10 – 14:30 (20)	(f) Presentation on "Draft Plans for a Future Workshop and Training on Regional Building Product Testing" (g) Q&A on Presentation by Dr. Cary Bloyd and Mr. Bipin V. SHAH	Mr. Bipin V. SHAH, WinBuild Inc.
14:30 – 15:00 (30)	***Coffee Break: Daisy Room, B1, The Royal Garden***	
15:00 – 17:30 (150)	***V. Fine-tuned proposal on the next steps for participating economy***	

15:00-15:30 (30) 15:00 – 15:05 (5) 15:05 – 15:20 (15) 15:20 –15:30 (10)	V-1: Viet Nam (a) Introduction (Review of Key Points in discussion on the first day) by Moderator, Mr. Jeffrey Harris (b) Presentation on fine-tuned proposal on next steps by delegate Mr. Nguyen Ba Chien (c) Discussion/ Summary by Moderator
15:30-16:00 (30) 15:30 – 15:35 (5) 15:35 – 15:50 (15) 15:50 – 16:00 (10)	V-2: Philippines (a) Introduction (Review of Key Points in discussion on the first day) by Moderator, Mr. Jeffrey Harris (b) Presentation on fine-tuned proposal on next steps by Mr. Ronaldo P. Parreno Jr. (c) Discussion/ Summary by Moderator
16:00-16:30 (30) 16:00 – 16:05 (5) 16:05 – 16:20 (15) 16:20 – 16:30 (10)	V-3: Malaysia (a) Introduction (Review of Key Points in discussion on the first day) by Moderator, Prof. Siew Eang LEE (b) Presentation on fine-tuned proposal on next steps by Ms. Aminah Bt. Abd. Rahman (c) Discussion/ Summary by Moderator
16:30-17:00 (30) 16:30 – 16:35 (5) 16:35 – 16:50 (15) 16:50 – 17:00 (10)	V-4: Indonesia (Through WebEx) (a) Introduction (Review of Key Points in discussion on the first day) by Moderator, Mr. Terry Collins (b) Presentation on fine-tuned proposal on next steps by delegate Mr. Ezrom Max Donald Tapparan (c) Discussion/ Summary by Moderator
17:00 -17:30 (30) 17:00 – 17:05 (5) 17:05 – 17:20 (15) 17:20 – 17:30 (10)	V-5: PR China (a) Introduction (Review of Key Points in discussion on the first day) by Moderator, Mr. Feng Liu (b) Presentation on fine-tuned proposal on next steps by Dr. LIU Hong (c) Discussion/ Summary by Moderator
17:30 – 18:45	***Discussion/Waiting Room --- Daisy Room, B1, The Royal Garden***

19:15 – 21:30	***Dinner at Xiao Nan Guo*** ***10/F, One Peking Road, Tsimshatsui, Kowloon, Hong Kong*** ***(Delegates to be gathered at the hotel lobby of the Royal Garden at 18:45 and go to Xiao Nan Guo on foot together. It is expected that the Group to arrive at the restaurant at around 19:15)***
	End of the Second Day

Third Day - Friday, 28 January 2011	
Venue: The Palace Room, B1, The Royal Garden ***69 Mody Road, Tsimshatsui East, Kowloon, Hong Kong***	
	VI. Morning Session -- Next Steps for each participating economy
8:00 -9:00 (60) 8:00 – 8:10 (10) 8:10 – 8:30 (20) 8:30 – 8:35 (5) 8:35 – 8:55 (20) 8:55 – 9:00 (5)	Chile (Through WebEx) (a) Kick-off to highlight Key Challenges for Chile to develop Building Code and Labeling by Moderator, Mr. Terry Collins (b) Presentation on refined proposal on next steps "Building Code and Labeling" by Economy Participant, Ms. Carla Bardi (c) Comments on the presentation by Moderator d) Discussion (e) Summary by Moderator for Chile to develop "Building Code and Labeling"
9:00 – 9:30 (30)	***VII. Special Discussion***
9:00 -9:30 (30) 9:00 – 9:05 (5) 9:05 – 9:20 (15) 9:20 – 9:30 (10)	Thailand (Special Discussion from a Co-Host) (a) Introduction by Moderator, Dr. Cary Bloyd, Pacific Northwest National Laboratory (b) Recommendations on the keys of success in successfully implementing BEC from the Co-host Thailand (c) Conclusion by Moderator
9:30 - 10:30 (60)	***VIII.*** **Special Presentation Session** ***(General Moderator: Dr. Weerawat Chantanakome, APERC)***
9:30 – 9:45 (15) 9:45 – 10:00 (15)	(a) Presentation on "Energy Use Criteria for BEAM Plus" (b) Q&A — Ir. Cary Chan, HKGBC

10:00 – 10:15 (15) 10:15 – 10:30 (15)	(c) Current Feature of the International Codes Website" (d) Q&A	Ms. Aleisha Khan, BCAP
10:30 – 11:00 (30)	***Coffee Break: Daisy Room, B1, The Royal Garden***	
11:00 – 12:00 (60)	***IX. Discussion Session (Moderator: Mr. Terry Collins)***	
(a) 11:00 – 11:30 (30)	Opportunities for regional collaboration on codes	
(b) 11:30 – 12:00 (30)	Discussion/other topics of interest (based on discussions during Days 1 and 2) —the ways that the results of CEEDS Workshop could be shared more broadly with other interested APEC economies	
12:00 – 13:00 (60)	***Lunch at Dong Lai Shun, B2, The Royal Garden***	
13:00 – 13:45 (45)	***X. Closing Session***	
13:00 – 13:30 (30)	X-1: Summary Report by APERC and ASE (Through WebEx)	Mr. Jeffrey Harris (ASE)
13:30 – 13:35 (5)	X-2: Closing Remarks	Mr. Kenji Kobayashi President, APERC
13:35 – 13:40 (5)	X-3: Closing Remarks	Dr. Twarath Sutabutr (Thailand)
13:40 – 13:45 (5)	X-4: Closing Remarks	Ir. Stephen Chan Hung-cheung, JP, Director of Electrical and Mechanical Services, HKSAR Government (Host economy)
	End of Workshop	
14:30 – 17:00	***Site Visit to International Commerce Centre (ICC)*** ***(It is a 118 floor, 490 m skyscraper completed in 2010 in West Kowloon, Hong Kong, making it the tallest building in Hong Kong.)***	

Appendix 2: PEOPLE'S REPUBLIC OF CHINA

Priorities and Next Steps for Building Energy Codes:

1. Current Status of Building Energy Codes

Energy Consumption in China's building sector

- China has the biggest construction volume in the world, with 2 billion m^2 of floor area being constructed annually.
- Energy consumption of buildings rose from 10% of the national total in the late 1970s to more than 26% in 2009, and is expected to increase further to 35 % by 2020.

The Policy of Promoting Efficient Building

- The Chinese central government is concerned by the rapid growth in energy consumption in the construction sector and is now trying to promote low energy construction technologies for energy-saving buildings and green buildings.
- A program for energy savings in buildings is included as one of the 10 key programs targeting national energy efficiency improvement in the 11th Five-Year Plan (2006-2010). The buildings sector is expected to contribute 40% of the total energy-saving targets for the period.
- In 1980s, the Ministry of Housing and Urban-rural Development began to promote energy efficiency in buildings, starting with energy codes/standards for residential buildings in the north area.
- The building energy codes/standards system has been improved and enlarged step by step from north to south, from residential to public buildings, and from new buildings to existing buildings ever since.
- Up to now, the Ministry of House and Urban-rural Development has issued three energy efficiency design standards for residential buildings and one for public buildings.
- All four of these standards have two main parts. One is the thermal performance requirements for the building envelope. Another is the requirements for HVAC equipment and system efficiency.

- In addition, the Ministry of Construction has also issued one design standard for efficient lighting system.
- All of these codes include both mandatory and voluntary items or indexes.
- The mandatory items or indexes are mainly for energy saving purposes and must be complied with by all the buildings covered. The voluntary items are suggested for upgrading efficiency.
- For Severe Cold and Cold climate zones, the initial energy savings rate was 30% based on the average heating energy consumption of residential buildings with a centralized heating system in the early 1980s. In 1995 and 2009 this energy code had been modified to raise the energy saving rate to 50%-65%.
- For Hot Summer/Cold Winter Zone, new residential buildings conforming to the regulation of the energy efficiency design standard can save about 50% heating and cooling energy compared with residential buildings of the 1980s. In 2009 this energy code had been modified to enhance enforcement.
- For Hot Summer/Warm Winter Zone, both building envelope and cooling systems are covered by the standard. The cooling energy saving rate is about 50%. This energy code is under modification now to smooth the enforcement of the standard.
- For Public Buildings and for lighting in all zones, code requirements cover HVAC equipment and systems and lighting systems.
- The capability for professional energy building test procedure and relevant expertise are now being built up.

Building Energy Labeling

- A legal government document named “Civil Building Energy Saving Regulations” was issued and put into effect on Oct.1, 2008. It emphasized that government office buildings would be required to disclose their energy consumption to the public annually.
- “Technical Directive for Civic Building Energy Labeling Test and Assessment (Demonstration)” was issued in June 2008 by the China Academy of Building Research with other design institutes and stakeholders.
- The rating system establishes a series of ratings from 1 star to 5 stars, based on a third-party certification, corresponding to energy savings of 65% to 85% [compared with pre-code construction practice?]. Buildings with one star just meet the code requirements.

2. Challenges and Barriers for Energy Code and Labeling

- Lack of awareness and willingness of owners to promote EE/Green building
- Lack of incentive policies and measures to promote EE/Green Building
- Lack of technical expertise for EE/Green building
- Lack of sufficient investment in EE/Green buildings

3. Priorities and Next Steps

1) **To enhance the standard/code implementation and enforcement**

- Take energy building codes and labeling as very important measures and tools for the country's energy efficiency building program promotion.
- Enhance supervision of institutional innovation and form a regular and sustainable mechanism for standards/code implementation and enforcement.
- The supervisions of standards/code enforcement should not be only for new buildings, but also for existing buildings, and gradually including some township and rural construction (40% of the total).
- Further intensify supervision of conformity to the energy standards and codes at the buildings' construction stage.
- Reinforce energy management for government office buildings and other large public buildings.
- Urge the developers and owners of buildings to accomplish the tasks recommended by energy audits, and expose their energy data to the public in the designated labeling demonstration cities.

2) To establish a comprehensive incentive mechanism

- Research and adapt more effective economic incentive policies and measures to promote building energy efficiency.
- Encourage market-oriented mechanisms to promote building energy efficiency, such as ESCOs and Contract Performance Management, etc.
- Research and develop new regulations and norms by creating a better environment for building energy standards/code implementation and enforcement.

3) To improve and upgrade existing code system

- A dynamic and timely information collection system for building energy consumption should be explored and an integrated database for building energy use should be established and regularly updated on national or local level.

- Research and design a set of minimum energy consumption thresholds or indicators for all kinds of big public buildings or government buildings.
- Consider the costs and benefits to stakeholders in the process of standards and code development.
- Allocate more resources to support regular revising and updating of energy code requirements.
- Introduce more advanced tools for codes drafting, methods of verification, monitoring, and testing based on international practices.
- Extend the current building energy standards/codes system to cover more climate regions.
- Develop more local standards for building energy efficiency according to regional and local characteristics and conditions.

4). To promote building energy labeling and certification systems

- Promote the energy efficient building labeling and certification system by absorbing the experiences and lessons from the demonstration stage.
- Enhance and improve building energy labeling and certification.
- Improve the technical support system for building energy labels: identify, revise and publish relevant technical documents and guidelines.
- Build a national platform for a building energy labeling, certification, technical verification, and monitoring system.
- Establish test centers for energy labeling and certification on the provincial level and strengthening the institutional capacity for labeling, certification, and evaluation.

5) To enhance the standards/code information dissemination process

- Enhance information dissemination and increase public awareness of energy use in building.
- Information dissemination for codes and labeling needs to be popularized and emphasized for all stakeholders.
- Building energy efficiency education should be included in courses and training programs in all architecture and engineering schools.
- Launch a higher education initiative for energy-efficient buildings in universities and architecture schools.

Appendix 3: INDONESIA

Priorities and Next Steps for Building Energy Codes:

1. Current Status of Building Energy Codes

Technical Requirements

a) Building Energy Information

- National Electricity Company (PT. PLN) keeps information on energy consumption of government and commercial buildings
- Overall energy consumption data are obtained on a regular basis by the Central Statistical Agency (BPS).
- Other technical information provided by the regional offices of the Ministry of Public Works.

b) Existing Building Code

Indonesia National Standard (SNI) on Energy Conservation in Buildings – 4 components:

- Building Envelope (SNI 03-6389-2000)
    - Overall thermal transfer (OTTV) $\leq$ 45 W/m^2
    - Light color walls
    - Double glazing
    - Wall and Roof insulation
    - Reduced window area as a % of wall area
- Air Conditioning System (SNI 03-6390-2000)
    - Minimum COP as a function of capacity and system type (air- vs water-cooled; packaged AC unit vs chiller)
- Energy Audit Procedure (SNI 03-6196-2000)
- Lighting System (SNI 03-6197-2000)
    - Maximum lighting power (W/m^2 by space type)
    - Minimum illumination level (lux)
- National standards (SNI) were issued in 2000, they are not appropriate to the recent building technology.
- Revised BEC Standards are being drafted by the Technical Committee.

c) Code Development

- Code is appropriate to local materials and practices
- Most of the stakeholders (i.e., academicians, engineering association, non-governmental organizations, producers, and users) are involved in development of the building code.
- Single climate zone applies to all regions

Policies and Practices

- Series of laws and presidential regulations since 1982
- Law No. 28/2002 on Building – basis for building energy codes, issued by regulation in 2006.
- Government Regulation No. 70/2009
    - Assigned responsibilities for codes, labeling, training and technical assistance, etc.
    - Larger industrial facilities and commercial buildings (≥ 6000 TOE) required to have an energy manager, conduct energy audits and implement measures, report to government
    - Tax incentives for efficient appliances, low-interest loans, and free energy audits
- Practices
    - Type of code: single, unified code
    - Ministry of Energy and Mineral Resources and the local governments have responsibility for code enforcement.
    - Code compliance: complied to the full extent of code
    - Local building developers are encouraged to practice most of the standards
    - Awareness among equipment suppliers is created by conducting seminars/workshops and public advertisement through printed and electronic media, and dissemination of brochures.
    - Test methods and labs: PT. SUCOFINDO (Persero)

Education and Training Programs

- Energy efficiency curricula are available in most architecture and engineering schools.
- Training for builders is available from the Education and Training Centre, Ministry of Public Works. Training Centre for Electricity and NRE, MEMR conduct training on EE for officers of local governments.
- Partnership Program on Energy Conservation
    - Objective is to encourage industry and buildings to conduct energy efficiency measures through providing free energy audit services.
    - From 2003 to 2009, energy audits were done for 292 industries and buildings.
    - Mostly no-cost and low-cost recommendations have been implemented.
    - If medium and high cost recommendations were implemented greater energy savings would be obtained.
    - Lack of funding is the main barrier for implementing medium and high cost recommendations.
- Energy Efficiency in Industrial, Commercial, and Public Sectors (EINCOPS)
    - ENCOPSL Component 2 of Environment Support Program 2 (ESP2) in cooperation with the Danish government.

- 3 outputs: Clearinghouse, energy efficiency for large buildings, and operation and management of energy efficiency in industries and large buildings.
- Pilot project on low-energy/energy-efficient building (Green Building).
- Revised building code (SNI) on Energy Conservation in Buildings

2. Challenges and Opportunities

Barriers to building energy code and labeling implementation in Indonesia:

- Lack of commitment from Top Management/Building Owners
- Currently, no certified energy manager (certification & competencies of the energy manager/auditor is being drafted).
- Lack of awareness from energy users.
- Lack of a financing mechanism for medium and high investment.
- Although the regulations are mandatory, the level of compliance is still low due to insufficient supervision and no enforcement mechanism.

3. Priorities and Next Steps

a) Energy Code Development and Policy

- **Harmonizing Regulations**. Further coordination with the Central Statistical Agency (BPS), the Ministry of Public Works (MoPW) and PT. PLN (Persero) for the development of data collection mechanism which is conformable with the data structure in the Data Information Centre of MEMR.
- **Code Development and Enforcement**
  - Updating the Regulations. Revision of the existing BEC. Revised code should consider to the full extent the local availability and cost-effectiveness of construction materials and equipment. Need to get entry code to the stage where local authorities can adopt minimum requirements.
  - Regulations have to define clearly the incentives and disincentives for energy users.
  - Development of testing laboratories as well as their testing equipment.
- **Information Dissemination, Assessment and Supervision.** Development of adequate numbers of staff/counselors/auditors as well as trainings needed to support information dissemination (workshops, media advertisement, campaign, etc.), code enforcement and site inspection.

b) Code Implementation and Support

- **Code Implementation :**
  - Continue the energy audit partnership program.

  - Improvement of monitoring and evaluation program on the energy audit partnership program.
  - Development of building rating and labeling.
- **Increasing Awareness & Community Voluntary Participation :**
  - Coordination with the Ministry of National Education and leading universities to develop specific energy efficiency curriculum that can be adopted by local universities or engineering schools.
  - Extend the courses for builders and construction workers, while encouraging the developers to develop their own in-house training for their workers and supporting the initiatives from some companies that have been doing the EE training for freelance workers.

Appendix 4: MALAYSIA

Priorities and Next Steps for Building Energy Codes:

1. Current Status of Building Energy Codes

CODE DEVELOPMENT AND POLICY

Technical Requirements

1) Energy Information Collection and Availability

- National Property Information Centre (NAPIC) provides accurate, comprehensive, timely information on demand and supply of property.
- Public Works Department of Malaysia (PWD) keeps records of governmental buildings.
- 147 Local Authorities (planning authorities) keep records of buildings approved and constructed in their area. The number of local authorities is a challenge to implementing building codes in a coordinated way.

2) Existing Code

- Malaysian Standard MS 1525:2007 Code of Practice on EE and use of RE for non-residential buildings (1st Revision)

3) Scope of Code

- Optimizes local materials, practices, and climate.

4) Resources for code development

- Ministry of Energy, Green Technology and Water of Malaysia.
- Standards Department of Malaysia.

5) Stakeholders Participation

- Consensus through representations of producers, users, consumers, academicians, and others with relevant interest.

6) Climate Variation

- Single climatic condition applicable to all states.

Enforcement Policies and Practices

7) Type of Code

- Single unified code

8) Enforcement

- Ministry Of Energy, Green Technology and Water
- Local Authorities (Planning Authorities)

9) Estimated Level of Code Compliance

- Partially complied.
- Possible conflict in agencies' responsibilities.

10) Flexibility

- Standards set out only minimum requirements. Practitioners encouraged to design above standards.

11) Awareness among Equipment Suppliers

- Partial awareness
- Requires refresher courses and further trainings

12) Test Methods and Labs

- SIRIM QAS International

13) Commissioning and System Testing

- Initial stage of capacity building of facilitators and certifiers through the Green Building Index (GBI) initiative.
- Non-governmental initiatives

Education and Training

14) EE Curriculum

- Available in most architectural and engineering schools

15) Training for Builders

- Construction Industry Development Board of Malaysia (CIDB) conducts trainings with continuing professional development (CPD) points for builders and site workers.

16) Efficiency Professionals

- Recognized and accredited as a competent person.
- Certain scope of work (plumbing, wiring) only to competent persons.

Building Energy Rating and Disclosure

17) Building Energy Labeling Program

- Green Building Index (GBI) is a recognized green rating tools for buildings benchmarked against internationally recognized best practices and standards. Through detailed assessment and accreditation of building projects an accreditation panel will review and award GBI rating to qualified projects.

18) GBI Classification

Points	GBI Rating
86 + points	Platinum
76 – 85 points	Gold
66 – 75 points	Silver
50 – 65 points	Certified

19) Energy Efficiency in Building Appraisals (GBI)

- Non residential new construction 35 points
- Residential new construction 23 points
- Non residential existing construction 38 points

20) Recognition by Lenders

- EE building sends right message
- Improve overall quality of building stock
- EE considered as part of project's viability

Complementary Programs

21) Government Buildings

- Retrofitting government offices in Putrajaya towards green building.
- Mandatory 70% IBS content.
- GBI certification voluntary.

22) Financial Incentives

- Tax Exemption on statutory income for GBI certified building.
- Stamp duty exemption for 1st transfer of ownership for GBI certified building.

2. Challenges and Opportunities

POLICY / REGULATORY

- **No strong integrated energy policy or strategy**
- **EE code MS 1525:2007 still voluntary**
- **No regulation or mandatory legislation**
- **Subsidized energy prices skew the market**
- **No clear system to monitor, gather, analyze and disseminate information on developments and progress on EE.**

INSTITUTIONAL

- **EE section of Energy Commission lacks operational**
- **Research and educational institution dealing with EE in building few and under-resourced**
- **EE is dealt with by numerous agencies with little coordination efforts.**

TECHNICAL

- **Advanced building material imported. Limited demand in local market thus less attractive to start local production**
- **Technical capacity of local professionals limited. Niche market.**

INFORMATION AND AWARENESS

- **General lack of awareness of the importance of EE in buildings, among decision makers.**
- **Distinct lack of a sustained targeted effort towards decisions makers, professionals, financing institutions.**
- **No easily available regular and sufficiently detailed up to date statistics and energy performance information for buildings for comparison and benchmarking**
- **Few real life demonstrative building in EE in a cost effective meaner.**

MARKET

- **Energy Service Companies (ESCO's) remain small and financing institutions reluctant to provide stable financing**
- **Limited demand limited attractiveness to start local production**
- **Lack demand and stable market for EE, limit available expertise to a niche.**

3. Priorities and Next Steps

1) Government 2010 Approved Project (UNDP)

- Building Sector EE project (BSEEP)
- Goal: to reduce intensity of GHG emissions from the buildings sector
- Objective: to improve energy utilization efficiency in the buildings sector
- Program period: 2011 – 2015
- Implemented by Public Works Departments (PWD) Malaysia
- Comprised of activities aimed at improving EE and widespread adoption of EE technologies and practices.

2) Institutional Capacity Development

- Capacity Needs Assessment in government on building energy management (BEM)
- Development of Malaysia Federal Building Energy Management Program (MFBEMP)
- Preparation of EM guidelines for Government Buildings
- Monitoring and evaluation of MFBEMP Impacts

- Building Energy Reporting and monitoring program.

3) Policy Development and Regulatory Framework

- Conduct Building EE policy studies
- Formal/informal discussion with policy makers
- Review existing building code (MS1525 and UBBL 1984)
- Formulation, approval, and enforcement of policy on EE building design
- Capacity building on application of the building energy code
- Review of utility tariffs focusing on EE in the buildings sector
- Discussion on energy pricing for buildings
- Web-based monitoring of incentives scheme implementation.
- Development of EE code of practice in residential buildings
- Assessment of utility regulation to promote/support EE building technology applications
- Design of EE system incentives in buildings

4) EE Financing Capacity Improvement

- Streamline processes for financing applications
- Capacity building for banking/financial sector
- Development of action plan for EE building project financing
- Design of financing schemes for EE building project financing
- Promotion of EE building projects to ESCOS's
- Capacity building on EE building project financing
- Business development matching and strategic partnership established

5) Information and Awareness Enhancement

- Detailed study on current building designs and EE building applications
- Established of Centralized Building EE Database System (CBEED)
- Establishment of a comprehension guidebook on EE building design
- Development of a peer-reviewed, user-friendly building performance prediction software tool
- Design of Malaysian EE Rating for buildings (MEERB)
- Development of the institutional mechanism for MEERB scheme
- EE buildings advocacy and promotion
- EE buildings training needs assessment and planning
- Design and implementation of EE buildings training course
- Sustainable design training program
- Implement, monitoring and evaluation of MEERB

6) Building EE Demonstration

- Demonstration of EE buildings and EE building technology applications

- Demonstration project implementation
- Follow-up capacity building for local building industry

Appendix 5: MEXICO

Priorities and Next Steps for Building Energy Codes:

1. Current Status of Building Energy Codes

- México applies nineteen (19) obligatory Official Regulation Codes (**NOM**'s) in the field of Energy Saving. Three of them relate to buildings and apply nationwide:
    - Energy efficiency in buildings envelope for non-residential buildings.
    - Lighting systems energy efficency for non-residential buildings.
    - Thermal insulation for envelopes: levels and test methods.
- There is one (1) voluntary standard:
    - Thermal insulation ("r-value") regulation code for household envelopes zoned by Mexican thermal environment.
- Follow up on the application of **NOM'**s is the responsibility of the agencies involved in their creation and adoption.

INSTITUTIONS

- Mexico has significant resources as well as technical knowledge and expertise in Energy Saving projects:
    - The National Commission for the Efficient Use of Energy (**CONUEE**), has both experience and staff resources for the developing codes and standards.
    - The Private Fund for Electric Energy Saving Projects (**FIDE**), has specialized technical personnel with wide experience in diagnostics, evaluation, development and follow-up on electrical energy saving projects as well as the administrative experience in management of Federal Government energy saving projects.
    - The Electrical Sector Energy Saving Program (**PAESE**) is dedicated to promoting energy saving projects within the Mexican Electric Generation Company (CFE), for generation and distribution as well as within their own facilities.

PEOPLE INVOLVED

- Experts from different specialized sectors and fields such as suppliers, engineering colleges, specialized professional organizations, chambers, regulation and codes organizations, and associations of companies in the energy saving sector are part of the board that have an active participation in developing and adopting codes.

VOLUNTARY STANDARDS AND ELECTRICITY TARIFFS

Mexico has one voluntary codes, **NMX-C-460-ONNCCE-2009,** which refers to the characteristics that thermal insulation has to with for new construction, depending on the climate region. Electricity fees for residential consumption are also zoned according to six (6) temperature regions for the country.

SUPPLIERS

Suppliers found out the regulation codes have a great impact on their sales as well as success in saving energy for their customers.

LABORATORY TESTS AND PROCEDURES

Test methods and procedures are set up by the regulation codes themselves but there is an organization that certifies the test laboratories, the Mexican Acreditation Entity (**EMA**).

EDUCATION AND TRAINING

In Mexico universities now offer a master degree in energy saving and thermal specialties as well as professional training for careers such as mechanical, engineering design, and related areas. Also, institutions as **FIDE** and **CFE** offer workshops on energy savings at different levels, including programs for elementary school grades on energy conservation, university level seminars and workshops, as well as training on energy diagnostics for engineering companies to help promote the energy saving culture.

We have available related courses and seminars through colleges, which are aimed at architects, designers, engineers, and equipment and material distributors. Also FIDE and the National Chamber of Consulting Firms (**CNEC**) both promote growth and continuous education for certified specialists and training in energy efficiency management for the rational use of electricity. On the federal government side, the Ministry of Energy through **CONUEE** is developing a certification program for diagnosticians and experts.

LABELING

FIDE is the institution that grants certification for several construction materials and highly energy-efficient equipment. The “SELLO FIDE” certification has the aim of:

- **Identifying** in the market all those products that perform to a high level of energy efficiency.
- **Encouraging** customers to buy and use products that perform to high energy saving standards.

- **Recognizing** companies on their technical and economic efforts to produce highly energy-efficient equipment.
- **Promoting** competitiveness of Mexican products facing international competition.
- **Supporting** the use of high efficiency products with projects and programs that are promoted and financed by FIDE.

This FIDE certification is awarded to products that prove with technical documentation and test reports issued by credited laboratories (national or foreign), that they are outstanding in the efficient use of electrical energy or that their properties or attributes help reduce the consumption of energy.

PROGRAMS AND INCENTIVES

For the Residential Household Sector we have "The Green Mortgage," which is a federal government issued mortgage that incentivizes green construction so improve the quality of life; generating savings in operating costs from environmental technologies that reduce consumption of electricity, water, and gas; and contribute in this way to the efficient and rational use of natural resources and environmental care.

In the valley of Mexicali in the northwest of the country, we have summer temperatures that reach 33 ° C or more. A fund for Thermal Insulation for Housing in the Valley of Mexicali (**FIPATERM**) seeks to reduce the intensity of air conditioning usage. And in the very near future, a new voluntary certification program on equipment, process, and services will be issued for new construction.

REGULATIONS ON ENERGY EFFICIENT USE OF GENERAL PURPOSE LAMPS

- For the **RESIDENTIAL SECTOR**, conventional incandescent lamps will be eliminated from the Market on the following schedule:
  - 100 watts or higher from December, 2011
  - 75 watts from December, 2012
  - 60 and 40 watts from December, 2013
- For the **SERVICE AND COMMERCIAL SECTORS**, there are new minimum performance requirements for linear fluorescent lamps.
- For the **INDUSTRIAL SECTOR AND PUBLIC LIGHTING**, there are minimum efficiency values to be met by high intensity discharge (HID) lamps.
- The “National Program for Sustainable Use of Energy 2009-2012” estimates that these standards will lead to a drop of about 48% from projected baseline energy use in 2030, and reduce the required investments for new electrical generation capacity as well as reducing energy-related emissions to the atmosphere.

2. Challenges and Opportunities

BARRIERS TO BE OVERCOME

- Consolidation of working groups for the development of building energy codes (BEC)
- Achieve commitments of different stakeholders in order to extend the standardization (NOM´s)
- Financial and fiscal mechanisms for energy efficiency programs that may include data collection as well as retrofitting.
- Lack of long-term policy; change of administration that could stop or delay development of BEC.
- Information and dissemination of standards through education programs.
- Availability of information, data

  Strategy: Develop an efficient communication and data interchange system in order to share information among involved entities as the Energy Ministry, Chambers, universities and Institutes, associations, manufacturs, and others.
- Enforcement of building codes

  Strategy: Increase the number of stakeholders involved in energy code development.
- Lack of commitment or lack of capital

  Strategy: Enforce public campaigns to spread the idea of energy saving as well as work with commercial banks to prove to them that energy savings projects are economically feasible and very profitable to everyone involved, as well as to the nation's economy and the global environment.
- Vision of projects: from short-term to long-term

  Strategy: Follow-up of current projects through the change of government administration at all levels in order to help assure continuity of policies.
- The Institutionalization of the BEC

  Strategy: Keep working in planning to increase the number of energy efficiency codes, involving federal ministries, commissions, chambers and all groups interested in this issue.
- Collecting data for the implementation of BEC

  Strategy: Implement research to improve the understanding and quality of BEC
- Regulation for the implementation of BEC to have confidence in the market

  Strategy: It is important to built and promote trust and confidence among manufacturers in order for them to become confident in producing high-efficiency materials and equipment, trusting that the market will move in this direction as well.

3. Priorities and Next Steps

- New practices for collecting data by regions. The federal government is proposing to implement surveys of buildings owners in all sectors.
- Update of the current BEC that are in place. It takes a period of five years to upgrade any rule in Mexico (Federal Law on Metrology and Standardization - Article No. 51).
- Continuous promotion and enforcement of thermal insulation in new buildings. Mexico is now developing a voluntary certification for building envelopes.
- Promotion of best practices for building construction. This is one of the ongoing objectives of the National Energy Strategy.
- Develop mandatory efficiency standards for products other than lighting, insulation, and building envelopes, such as solar water heaters and [solar roofs?], among others. Mexico is working on this, starting with a mandatory rule setting the maximum power density (W/m^2) for lighting systems (NOM-007-ENER-1995).
- Transformation of the inefficient equipment market to a high-efficiency one. Voluntary and mandatory codes and standards, as well as labeling, help to move the market and manufacturers to a more energy-efficient mix of product sales.
- Certification of new products using the FIDE Label (Sello FIDE). Today, some insulating materials for construction are being certified. Mexico is also developing a new specification for thermal paint.
- Develop cost-benefit analysis for new BEC. Propose a methodology to estimate the costs and benefits involved in the implementation of new codes.

Appendix 6: VIET NAM

Priorities and Next Steps for Building Energy Codes:

1. Current Status of Building Energy Codes

Electric production and consumption in Viet Nam

- Growth rate 14-16%/year in electricity production (in the period 2005-2009)
- Structure of electricity consumption
    - Industry and construction: 49%
    - Commercial and Service: 4.8%
    - Public and residential: 40%
    - Agriculture, fishery: 1%
    - Other: 3.7%
- Consumption in construction field: 20-24%

Current Legal Framework

- Government Decree 102/2003/ND-CP dated 03/9/2003 on energy efficiency
    - Define energy efficiency and conservation in building construction
- Prime Minister Decision 79/2006/QD-TTg dated 14/4/2006 – approved National Strategy for Energy Efficiency
    - Define 6 main content groups
    - Ministry of Construction is responsible for 5th content group, for increasing Energy efficiency and conservation use in buildings
- Ministry of Construction Decision 40/QD-BXD dated 17/11/2005 approved the Vietnam Energy Efficiency Building Code
    - Describes technical requirements and solutions applied in the design and construction of buildings
- Law of Energy Efficiency and Conservation has just been approved by Viet Nam National Assembly dated 17/6/2010 and has just gone into effect as of 01 January 2011
    - Chapter III. Energy efficiency and Conservation in Construction and Public Lighting

Present status of energy use and energy management in buildings and construction

- In recent years, along with economic development in the country, the growth rate of enterprises in particular and the construction sector in general reached a high level, from 12-16% per year.
- Along with the growth of production, energy consumption in the construction sector increases more and more and is difficult to control. Based on recent research, total energy consumption in the construction sector is about 20-24% of the national energy consumption .

- At present, in Viet Nam energy use in buildings is still characterized by wasted energy. The causes include:
    - Building envelope design and materials don't satisfy the requirements of energy efficiency, the Overall Thermal Transfer Value (OTTV) coefficient required by code is not guaranteed.
    - Air conditioning system are often poorly matched and installed, COP performance is low, and temperature settings are too low, with little or no periodic maintenance.
    - Buildings still use a lot of [incandescent] light bulbs and [inefficient] T10 fluorescent lamps in lighting.
    - Solar water heater equipment is not yet widely used.
    - The energy efficiency and conservation (EE&C) awareness of staff and building owners is still limited.

Building Energy Standards and Labeling

- We are building the energy efficiency standards for building energy labeling (still in draft version).
- Currently we are building the roadmap for labeling green buildings, [to move] from a voluntary program to a mandatory program.

The potential for energy savings in building construction

- According to experts, the potential of energy saving in buildings in Viet Nam is quite big, not only in new buildings but also in existing buildings and building improvements.
- For new buildings: estimated saving are about 30-40% of energy consumption when combining energy efficiency measures with a good energy manager and a [motivated] building owner.
- For existing buildings and building improvements: estimated saving are about 15~20% when an energy audit is followed by implementation of the recommended energy efficiency measures.

Viet Nam Energy Efficiency Building Code

- The Vietnam Energy Efficiency Building Code was issued by Ministry of Construction according to Decision No. 40/2005/QĐ-BXD dated November 17th 2005.
- Objective: This code stipulates minimal technical requirements in order to use energy efficiently when designing and constructing or improving commercial buildings, research agencies, state administrative headquarters, residential blocks and hotel buildings, etc., which use air conditioners and energy-intensive equipment.
- Scope & Minimum requirements: This code introduces minimum requirements that require compliance in design and construction to the improve energy efficiency of:

    (a) New buildings, equipment, and systems;

(b) New components of buildings and accompanying equipment and systems;
(c) Systems and equipment in existing buildings;
(d) Improvement and upgrades of main equipment and systems in buildings.

- Regulations in this Code are applied to the building envelope and systems of lighting, air conditioning and ventilation together with other power-consuming equipment.
- Scope & Subject of Application: Application of the code is according to building size:
  - *Small scale buildings:* gross floor area from 300 m^2 to 2,499 m^2
  - *Medium scale buildings:* gross floor area from 2,500 m^2 to 9,999 m^2
  - *Large scale buildings:* minimum gross floor area of 10,000 m^2
- Application to building systems
  - The building envelope, excluding space for storage or warehouses without air conditioners;
  - Building equipments and systems include:
    - *Indoor and outdoor lighting*
    - *Ventilation*
    - *Air conditioner*
    - *Water boiler*
    - *Energy management equipment*

Main activities implemented and proposed next steps (preliminary)

- Coordinated with other stakeholder for developing efficiency standards and technical guidelines for applying EE technology and equipment in the building (for example: lighting, air conditioning, water heating).
- Investigated, evaluated, and summarized the experiences from other countries about EE&C policy and proposed policies suitable for the buildings sector in Viet Nam.
- Organize training workshops to disseminate and introduce the Viet Nam Energy Building Code for stakeholders and other relevant groups.
- Study and apply the architectural design solutions for energy-efficient buildings; develop technical guidelines for new highly energy-efficient equipment, such as solar water heaters.
- In 2008 and 2009, we started capacity building for 2 EE&C Advisory Centers at Ha Noi University of Architecture and Ho Chi Minh University of Architecture, to serve the design, consultant, and energy audit sectors and apply EE&C measures in buildings.
- Annually organize training workshops, introducing the documents, regulations, standards and technical guidance in energy saving for stakeholders, including building owners, enterprise managers, etc.
- Build some model energy-efficient and green buildings.

- Coordinate with the Ministry of Industry and other relevant organization to organize the energy efficient building contest.
- Coordinate with Ministry of Industry and other relevant ministries to draft a Law Implementation Decree, with clauses related to energy-efficient buildings.
- Improve the legal documents and technical regulations on EE in construction works
    - Create a guideline decree for implementing the Law of EE&C in buildings.
    - Organize for developing new efficiency standards and technical guidelines on energy audits and certificates for EE and green buildings.
- Implement a pilot program to apply the EE&C model in some designated buildings
    - Investigate, survey, and conduct energy audits in designated buildings
    - Set up the green architecture model for green construction demonstration buildings.
- Support the creation of an EE&C database for designated buildings
    - Establish a system for periodic reporting
- Strengthen human capabilities for the building energy code program
    - Support for establishing an examination qualification system for certified Energy Managers in buildings
    - Organize for developing training materials, a step by step approach to include EE measures in buildings into training at the University of Architecture and University of Construction
    - Set up a network among related agencies (MOC, MOIT, VSQC, local EE centers)
- Set up roadmap for making the building energy code mandatory

2. Challenges and Opportunities

Barriers in implementing

- **General Barriers:**
    - Lack of policy and management tools in construction; the policy documents for EE&C have not yet been synchronized
    - Lack of effective energy management systems
    - Lack of standards for implementing the labeling program
    - Lack of technical capacity in EE management in buildings (experts, energy management staffs, equipment, …)
    - The EE&C awareness of citizens is still limited
    - Lack of information and mechanisms for sharing among stakeholders
    - Lack of a good database about energy efficiency in buildings

- **Institutional Barriers:**
  - Lack of the enforcement of legal provisions for implementing the Building Energy Codes and Labeling (BECL) program
  - Lack of closer cooperation on enforcement mechanisms among stakeholders
- **Technical/Information/Data Barriers:**
  - Lack of the necessary tools for collecting and evaluating EE&C data in buildings
  - Lack of a certification system for labeling green buildings
  - Lack of efficient energy management systems in buildings
- **Human barriers:**
  - Lack of human resources (inspectors, energy managers, energy auditors) who have the knowledge and experience to carry out the BECL program
  - Limited awareness about EE&C by users, designers, builders and building owners
- **Financial Barriers:**
  - Lack of incentives for energy efficiency investments

How to Overcome Barriers

- Law enforcement policies framework
- Human capabilities
- Energy management system and green building model
- EE&C database system for buildings
- Standards and Labeling
- Promotion of EE technologies and equipment

3. Priorities and Next Steps

1) Law Enforcement policies and practices

Task: Improvement of the EE&C Law enforcement policies framework (documents under the Law)

- Build the Circular, Decree on assessment and certification for energy saving buildings
- Review the Vietnam Energy Efficiency Building Code
- Coordinate with the Ministry of Industry and Trade and other stakeholders to build and complete the documents under the Law; for guiding the EE&C Law, focus on implementation in construction and public lighting

2) Standards and Labeling

Task: Complete the regulation documents, standards and technical guideline

- Organize to build the standards for green buildings
- Develop the standards, technical guidelines on energy auditing, and certificate for energy saving buildings

- Develop the design guidelines for green building construction

Task: Building the EE building rating and labeling system for energy saving green buildings

3) Energy management system

Task: Demonstrate the pilot program for setting up the energy management system and green building models

- Continue to implement the pilot project for applying energy saving measures in designated buildings
- Carry out energy audits to evaluate the costs and benefits of applying EE solutions in green buildings
- Based on results of the energy audit reports, build the green architecture model and initially establish the energy management system
- Continue to organize the energy saving building contest annually

4) Workforce, Education and Training

Task: Capacity-building (policymaker, energy manager, architect, designer…) for implementing the BECL program

- ☐ Set up the collaboration mechanism with University of Architecture and University of Construction for bringing EE building content into the training framework
- ☐ Collaborate with some big EE&C centers (EE&C Ha Noi and EE&C Ho Chi Minh) to implement the Certification System for Energy Managers
- ☐ Organize training workshops for the Department of Construction in local provinces and for other stakeholders (policymakers, architects, designers…)

5) Code Implementation Support

Task: Set up a good EE&C database and benchmarking system for buildings

- ☐ Establish the data collection mechanism in periodic meetings between stakeholders (MOIT, MOC, GSO, DOC, PSO, building owners…)
- ☐ Set up the benchmarking system based on the database

Task: Develop and apply management solutions, technology, EE equipment, renewable equipment into the sector's production enterprises

- ☐ Continue to develop the market for highly energy efficient equipment and renewable energy equipment in the construction sector through the EE labeling program

Draft Roadmap for Implementing BECL Program

	Main incharge	2011	2012	2013	2014	2015
Improvement of the EE&C Law enforcememt policy framework	MOC, MOIT					
Complete the regulation documents, standards and technical guideline for energy efficiency building	MOC, VSQC					
Prepare for capacity of testing labs	MOC, VSQC					
Establish the baseline for the code by developing the energy database and analysis system	MOC					
Capacity building for people who are involved in energy efficiency buildings (policymaker, inspectors, energy auditors, designer, architecturer…)	MOC, MOIT, DOC					
Strengthen public awareness about EEC use in the buildings	MOC					
Prepare EE buildings rating and labeling system	MOC					
Demonstrate the pilot program for labeling energy efficiency designated building	MOC					
Step by step to move from voluntary to mandatory at broader national level	MOC					

Appendix 7: PHILIPPINES

Priorities and Next Steps for Building Energy Codes:

1. Energy Efficiency and Conservation Act

- Enactment of EnerCon Law this year
- Integrate the Building Energy Code into the National Building Code
- Salient Provisions:
  - Energy Efficiency and Conservation Projects for Buildings
    - Installation of Building Energy Management System
    - Installation of Variable Air Volume System
    - Variable Speed Motor Drives
    - Highly Energy Efficient Motors
  - Incentives for Energy Efficiency and Conservation Projects for Buildings
    - Tax and Duty-Free Importation of Capital Equipment
    - Tax Credit on Domestic Capital Equipment
  - Energy Efficiency and Conservation Fund
    - Contributions from Industrial, Commercial, and Transport establishments
    - Used for providing cash rewards to the most energy-efficient establishment for each year

2. Efficient-Building Initiative

- To accelerate the implementation of the building rating system by streamlining existing initiatives into a single nascent building rating system.
- This will be enforced through voluntary agreements and supported by developing awareness of the rating system.
- This subcomponent will focus on development and implementation of a building rating system which involves concepts and practices of Green Building.

3. Rating System Framework

Parameter	Purpose	Requirement
Lighting	To encourage the use of energy-efficient lighting system and achieve energy savings as well as proper lighting level.	Lighting Power Density in W/m^2 , Illumination Level, Efficacy and CRI e.g. Max LPD is 10 W/m^2 for most Office Areas
Metering	To measure voltage, current, power factor, max demand and energy consumption.	Feeder metering facility serving a particular group of loads e.g. Lighting load, Chillers, AHU, Other motor loads
Electric Motors	To encourage the use of energy-efficient motors with increased reliability, providing savings in reduced downtime, replacement and maintenance cost.	Motor's Performance shall equal or exceed the nominal full load efficiency levels.
Building Envelope	For air-conditioned buildings, to minimize external heat gain and reduce the cooling load of the AC system.	The Overall Thermal Transfer Value (OTTV) shall not exceed 45 W/m^2 .
Air Conditioning System	To encourage the use of energy-efficient air-conditioned equipment to minimize energy consumption.	Air conditioning equipment shall have a minimum performance corresponding to the rated conditions, e.g. Unitary AC units of greater than 120 kWr capacity shall have a Min EER of 0.48.
Steam and Hot Water Systems	To provide energy-efficient design and selection of steam and hot water systems to reduce energy consumption.	The system with the lowest overall energy usage shall be chosen. Use boiler with an efficiency rating of 85% and above. In the absence of steam, use a direct-fired hot water generator with an efficiency rating of 85% and above.

4. Target Output

- At least 200 new and 200 retrofitted buildings in each of the commercial and industry sectors;
- 10 upper-middle-class green residential projects of 200 units each; and
- 10 low-cost green residential projects of 1,500 units each are expected to be certified under the new efficient-building rating system over the next 5 years.
- In addition, all government buildings that have completed energy savings retrofits can apply for certification under the rating system.

5. **Work Plan for 2011**

- Organizations involved in this advocacy on Green Building shall be requested to submit Expression of Interest (EOI) for the evaluation of proposed program on rating scheme.
- Signing of MOA with Partner Organization
- Develop and Design Scoring Mechanism and Software
- Develop and design the accreditation requirement and procedures for implementation of the rating system
- Develop training curriculum for accrediting assessors
- Document Case Study of Demo Buildings
- Certify Buildings using the rating system

Appendix 8: CHILE

Priorities and Next Steps for Building Energy Codes:

Energy Consumption in the Buildings Sector - residential, public, commercial

- The building sector represents 25% of the final energy consumption in Chile; of this 81% corresponds to residential sector energy use.
- More than 50% of energy use in the residential sector is for heating.
- If wood is not considered, then sanitary hot water is the major energy consumer in the residential sector.
- If electricity consumption is considered, then appliances are the major energy consumers:
  - Refrigerator (28.6%)
  - Lighting (16%)
  - TV (12.4%)
  - Stand-by (10.3%)
- The commercial sector represents the highest growth rate

Definition of Standards

The energy/thermal international standards of buildings are supported by at least four tools:

1. **Mandatory regulation that force the base condition**
   - The Chilean mandatory standard is the Urbanism and Construction General Regulator (OGUC).
2. **Official energy calculation system**
3. **Regulation of installations (systems)**
   - Sanitary Hot Water system, Refrigeration, etc.
4. **Objective information**
   - Labeling of equipment, appliances, buildings

Periodic updates are made for all the tools

Energy Consumption in Public Sector

There are advances from studies, audits and implementation of showcases in public buildings; however there are no regulations.

- Roundtable on Energy Efficiency for Public Buildings:
  - Development of EE labelling
  - Development of new minimum standards for new buildings and major reconditioning

  - Inclusion of new mandatory requirements on the Chilean Building Code (OGUC)
- Energy auditing of representative buildings:
  - Hospitals, Schools, Government offices
- There are more than 17,000 public buildings
  - 35 energy audits and 28 energy diagnosis were made
- EE actions for existent building installations
  - Since 2007 energy efficiency measures for lighting and air conditioning were implemented
- MINVU / Chile GBC agreement:
  - To build at least 10 public buildings before 2014 with LEED Silver

Definition of Standards in Residential Sector

1. Mandatory regulation for base conditions

- Article 4.1.10 of O.G.U.C, 2007
- Chilean mandatory thermal requirements in comparison with international codes.

2. Official Energy Calculation System

- CCTE Software of thermal behaviour in Chilean buildings
- Available for free download:
- http://www.minvu.cl/opensite_20071214162133.aspx
- Last version, May 2009.

3. System Regulations

- Sanitary Hot Water Systems, Refrigeration, etc.
- The regulation of installations is made through Law 20.365 - Regulation of Solar Thermal Systems for Sanitary Hot Water

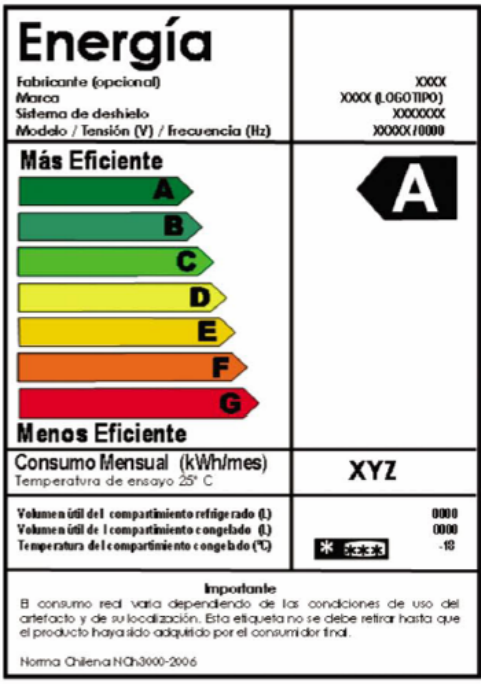
Regulate the quality of service and the quality of solar collectors

- In Arica, Iquique, Antofagasta and Copiapó, solar should provide 75% of energy per year.
- Santiago and La Serena, solar should provide 66% energy per year.
- Valparaíso and Concepción, 57%
- Temuco, Puerto Montt, Coyhaique, 48%
- Punta Arenas, 30%

4. Objective information

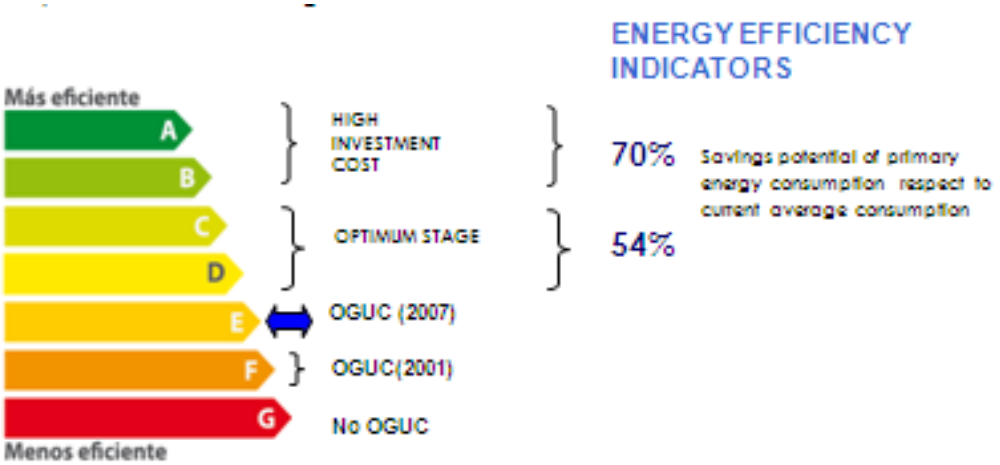
APPLIANCES: Certification and Labelling

- Since 2007, appliances with high energy intensive and widespread use started to be labelled:
  Compact Fluorescent Lamps,
  Incandescent Lamps
  Refrigerators
  Freezers
- Next appliances to be labelled:
  Microwave
  Air conditioning
  Fluorescent tubes
  TV and Decoders



CERTIFICATION AND LABELING OF NEW BUILDINGS (Housing)

- The Certification Energy System for new housing begins this year. (It is voluntary)
- The label shows the energy qualification of buildings, from more efficient (A) to less efficient (G).
- The rating is determined by the relationship between the energy requirements of a house compared to another reference house.



Next steps:

- Follow-up with the thermal reconditioning of existing buildings
- Encourage and follow-up the Voluntary Certification System
- Extend the Energy Certification of existing housing
- Update the current Thermal Standards
- Establish a major standard for public buildings and use it as a reference
- Define MEPS and labelling for new products, appliances and materials
- Regulation of thermal installations (air conditioning and refrigeration) and non-conventional equipment
- Analyze energy efficiency in the Life Cycle of residential construction

Updating the Thermal Code

- Air infiltration
- Control of condensation and thermal behaviour in buildings
- Control of overheating
- Control of thermal bridges
- Increase thermal transmittance requirements
- Replace thermal zones for climatic zones
- Adopt a policy for regular updating of standards
- Strengthen the implementation, evaluation and enforcement of standards
- Create a separate instrument for commercial and public/institutional standards

Institutional roles in certification and standardization of energy efficiency in the buildings sector

Ministry of Energy (MINENERGIA)

- Fixes the minimum EE standards of products, machines, instruments, equipments, appliances and materials that use any energy resource for its commercialization;
- Establishes the approval certification and labelling of energy consumption of products, machines, instruments, equipments, appliances and electrical, gas or liquid materials as well as any energy resource for its commercialization

Ministry of Housing and Urbanism (MINVU)

- MINVU creates and updates the Urbanism and Construction Standardization (OGUC) which has the current Thermal Residential Standard. Through the OGUC, standards of the National Standardization Institute (Instituto Nacional de Normalización - INN) can be forced to be applied

- MINVU creates and updates the register of materials and constructions systems of thermal conditioning
- Implementation and management of the Energy Certification Systems of Housing
- A National Software for residential energy calculation was published

Electricity and Fuels Superintendency (SEC)

- SEC is responsible to supervise the energy market and is linked with the Government through the Ministry of Energy

Chilean Agency on Energy Efficiency (AChEE)

- ACHEE is responsible for the articulation and implementation of public/private initiatives of different energy consumption sectors

National Standardization Institute (INN)

- INN is a technical organization with private rights that encourages the development and use of Chilean standards
- The organization has more than 90 standards for construction in general, as well as materials and installations
  http://www.inn.cl/html/Construccion/catalogo_const/001_construccion/termica.html