Achieving Energy Efficiency in Buildings in Developing Countries

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by
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Achieving Energy Efficiency in Buildings in Developing Countries

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6. Next Steps
1. Introduction
This paper originated from the Critical Mass Initiative, a partnership of the World Economic Forum, International Finance Corporation and United Nations Foundation, in association with the Institutional Investors Group on Climate Change and the Investor Network on Climate Risk. Critical Mass aims to answer how private investment in low-carbon infrastructure in developing countries can be accelerated. To design financing solutions, the initiative convened a community of institutional investors, asset managers, development banks, donor agencies, government officials, infrastructure project developers and climate finance. Through a hands-on approach, the initiative works to accelerate investment in low-carbon infrastructure transactions in developing countries. The primary objective is to be a market catalyst and to reduce transaction costs and other market barriers by developing replicable transaction models.

The first Critical Mass Initiative report, published in January 2011, focused on three separate low-carbon infrastructure laboratories: India Solar, the South African Renewable Initiative (SARi), and Energy Efficiency. Collaborations among private investors, project developers, bilateral and multilateral development agencies, and government officials identified independent opportunities, lessons-learned and next steps for each laboratory. Three laboratories were structured to go beyond the already large amounts of existing research and begin creating real financial transactions between the appropriate public and private players.

The International Finance Corporation (IFC) and the United Nations Foundation (UNF) agreed to lead the Energy Efficiency (EE) laboratory and convened a group of international financiers actively working in energy efficiency. The goal of the group was to identify energy efficiency projects and explore different financing methodologies for those deals in order to overcome barriers in the private sector and isolate barriers which require public sector solutions. The first step towards resolving barriers and finding projects was to determine a focal market sector and geography. Research from McKinsey and Co. pointed to energy efficiency in buildings as the most promising area for private sector investment, a sector where very few of the working group participants had investment successes previously.

Since only few of the working group members previously worked on energy efficiency in buildings, we decided to conduct an analysis of the market. We used the information collected from databases, tracking initiatives, studies compiled by various organizations, third party expertise, and primary research through interviews with stakeholders in the market. This report summarizes our findings and provides high level recommendations based on analysis of the most promising countries. We attempt to define the common barriers to profitable investments, and provide sample solutions for establishing a flow of projects, suitable financing mechanisms, and identify the key stakeholders. As part of this report, we’ve presented an in-depth look at the Indonesian market, the one on which we chose to focus.

Stemming from this research, IFC, UNF, and Accenture (who recently joined the project) are collaborating on a project in Indonesia that can bring together property developers, government representatives, funders, and technical experts to find out how a sustainable deal flow can be created. Furthermore, the project looks at how those deals, once developed, can be aggregated and financed.

1.1 Background on Green Building
Green Building, which can be defined as the practice of increasing the efficiency in the way buildings use resources, such as energy, water, and materials, are important simply because buildings are going to be in increasing demand. Reducing the resources required to power and operate buildings will have long term effects on sustainability and climate change. With the global population projected to reach 9 billion by 2050 (United Nations, 2010), improving the energy efficiency in buildings, industrial processes, and transportation has been at the forefront of the discussions to find achievable solutions for addressing the problems of pollution, climate change, and energy security. McKinsey analysis estimates a total of over 5600 TWh of global energy savings could be achieved through improving energy efficiency (McKinsey & Company, 2008); with buildings representing the single largest category of carbon reduction for developing nations as identified by the Intergovernmental Panel on Climate Change (IPCC) (Metz, 2007).
Achieving Energy Efficiency in Buildings in Developing Countries

At present, it is estimated that the global building stock is responsible for over 40% of the world’s energy consumption and global greenhouse gas emissions.

<table>
<thead>
<tr>
<th>Sectors</th>
<th>China</th>
<th>India</th>
<th>Middle East</th>
<th>Rest of developing Asia</th>
<th>Brazil</th>
<th>Mexico</th>
<th>Rest of Latin America</th>
<th>South Africa</th>
<th>Rest of Africa</th>
<th>Rest of Eastern Europe</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Transport</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Buildings</td>
<td>249</td>
<td>62</td>
<td>97</td>
<td>58</td>
<td>2</td>
<td>12</td>
<td>11</td>
<td>38</td>
<td>48</td>
<td>-</td>
<td>589</td>
</tr>
<tr>
<td>Iron and Steel</td>
<td>382</td>
<td>36</td>
<td>9</td>
<td>13</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>463</td>
</tr>
<tr>
<td>Chemicals</td>
<td>156</td>
<td>26</td>
<td>34</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>242</td>
</tr>
<tr>
<td>Waste</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Petroleum and gas</td>
<td>33</td>
<td>18</td>
<td>41</td>
<td>25</td>
<td>5</td>
<td>6</td>
<td>13</td>
<td>0</td>
<td>9</td>
<td>15</td>
<td>165</td>
</tr>
<tr>
<td>Cement</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>Other Industry</td>
<td>546</td>
<td>68</td>
<td>12</td>
<td>34</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>690</td>
</tr>
<tr>
<td>Forestry</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Agriculture</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Grand total</td>
<td>1491</td>
<td>236</td>
<td>209</td>
<td>159</td>
<td>50</td>
<td>37</td>
<td>55</td>
<td>28</td>
<td>58</td>
<td>86</td>
<td>2409</td>
</tr>
</tbody>
</table>

Table 1. Potential Energy Efficiency Savings by Industry (Unit: MtCO2e by 2020)

Demographic and urbanization trends mean that buildings will continue to consume more resources. The world population is projected to reach 9 billion by 2050, an increase of 34% from where it is today. Many developing countries will double their populations by 2050 and with that new population will come the increased demand for residential homes. By 2050, it is estimated that 70% of the world’s population will live in urban areas (a 20% increase from today). An emerging middle class is growing by 90 million people a year. To meet these demographic changes, increased employment opportunities will have to be created, requiring the development of new commercial office space. Countries are increasingly seeing their building stock as necessary long-term infrastructure and therefore an area for deeper investment.

Climate change is the area of deepest impact. Buildings currently account for at least 15% of the global greenhouse emissions and are one of the fastest growing sectors. IPCC estimates that building related greenhouse gas emissions will double by 2030 under a high-growth development scenario, and increase which would take place almost entirely in the developing world. Simultaneously, McKinsey’s cost curve shows that some of the lowest cost abatement measures are in the building sector. This is because making improvements in the building sector can be done at low, no, and even negative cost.

As a result, energy efficiency improvements in buildings present a tremendous opportunity for carbon abatement and private sector returns. Research shows that for the next 20-30 years the majority of the projected global building stock has already been constructed (Figure 1 Pike Research, 2011). Many standard energy efficiency projects in existing buildings utilize proven technological upgrades and renovations with high payback periods of 2-5 years. Despite these favorable characteristics many projects remain unimplemented due to perceptions of high risk, missing technical expertise, and a lack of available finance mechanisms (Taylor R., 2008). This is especially prevalent in developing countries and emerging markets. The goal of Energy Efficiency laboratory is to bring together key stakeholders to develop energy efficiency financing models that can be replicable, scalable, and self-sustaining for upgrading existing building stock.

1.2 Methodology
The Energy Efficiency Working Group first met in London in November 2010. At the time, the group was comprised of members of the financial community that were actively engaged in large scale energy efficiency transactions, or were ready to enter the market, both in taking equity stakes, or holding debt. The goal of the group was to identify sectors and regions that were ripe for “market making” in energy efficiency. In the first session led by the experts from McKinsey, the group analyzed the potential for increased investments in energy efficiency in developing countries globally and determined that they were fairly successful investing in most sectors, but successful large scale energy efficiency projects in buildings were elusive. Specifically, participants felt they understood the market around industrial energy efficiency. Although a significant potential for a strong demand for energy efficiency exists in the building sector, none of the participants felt they were positioned to be successful in that space on their own. As a result, the Critical Mass process was established to help introduce investors to the market to fully explore the potential for sustained financial returns.

Following this session, IFC, UNF, and Accenture began work to leverage previous projects to identify several critical geographies and funding mechanisms to create projects that can be financed through bringing together key stakeholders. This report presents the results of the initial research conducted to identify a geography and market sector from which a deal, or several deals, can be selected for deeper investigation. While participants from the initial group have been consulted throughout this process, the market research and transaction typologies present here were gathered and compiled by the facilitation team to serve as both background and a guide for future project development with the working group.

1.3 The Process
We launched our study by creating an evaluation framework to identify the key factors necessary to analyze, evaluate and compare markets. By better understanding the market participants and developing geographic market intelligence, we surmised that we would be able to identify a set of barriers that have previously stymied investment in this area, select a specific market segment for closer scrutiny, and identify potential energy efficiency solutions, and also identify financing vehicles for further investigation. See Figure 2 for the evaluation framework used.

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2 Pike Research, Global Building Stock Database, Total Commercial and Residential Building Floor Space by Country and Building Category: 2010-2020
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To develop a better understanding of the potential for energy efficiency growth and the barriers for adoption, we first initiated an extensive literature review. The literature review was followed by a series of interviews to better understand how market participants see the market and its potential. Engaging market participants, developers, and property managers also provided a window into specific market barriers as well as potential solutions to those issues.

We identified a set of key factors which we then used to compare the target geographical and market participants, local and multinational development companies. Our preliminary research, included reports from UNEP, IEA, The World Bank, World Business Council for Sustainable Development (WBCSD), McKinsey and Co., Pike Research and other preliminary research allowed us to narrow down to five prospective geographies where socio-economic demographics revealed the greatest demand for advancing energy efficiency investment.

The result of our study and interviews was a focus on developing projects that aligned local and multinational organisations to produce large ($30+ million USD) energy efficiency projects in East Asia. On the basis of the portfolio created from the methodology the goal is to address financing challenges through new investment vehicles and remove technology uncertainty through close partnership with service providers. Although only a few selected case studies will be highlighted in this report, the group hopes the framework outlined below will be beneficial to future teams to help identify additional project opportunities. The process of coming to that conclusions illuminated many of the challenges to the global market and helped our project team understand why so little money is moving into what, according to the all the factors, is potentially a very lucrative marketplace.

![Figure 2. Transaction Typology](image)

2. Market Segmentation of Real-Estate (Service Providers, Financiers, Aggregators)

Capital size of energy efficiency projects is small. Furthermore the market is complex and highly segmented.

To understand how to make a market for energy efficiency in buildings, we first needed to understand how all the players worked together. To determine best-fit opportunities for energy efficiency improvements at least three categories of stakeholders will be involved.
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When constructing EE transactions it is important to evaluate each market participant based on their financial interests, capability and required incentives. The framework for evaluation of potential partners must also account for contractual precedents, experience, and ability to scale both vertically in projects and laterally across borders, as detailed below.

<table>
<thead>
<tr>
<th>Market segment</th>
<th>Sub-segment</th>
<th>Owner – tenant relationship</th>
<th>Energy bill payer</th>
<th>Equipment owner</th>
<th>Low complexity scenario for EE (preferred)</th>
<th>High complexity scenario (most common)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial</td>
<td>Mixed use</td>
<td>Owner-occupied</td>
<td>Owner (usage based)</td>
<td>Owner</td>
<td>Existing</td>
<td>New construction</td>
</tr>
<tr>
<td></td>
<td>Office</td>
<td>Tenant-occupied</td>
<td>Tenant (usage based)</td>
<td>Tenant</td>
<td>Large</td>
<td>Collection of small to medium mixed-use facilities</td>
</tr>
<tr>
<td></td>
<td>Retail</td>
<td>Tenant-occupied under variety of lease structures</td>
<td>Tenant (fixed price or pre-negotiated rate)</td>
<td>3rd party (e.g. maintenance contractor)</td>
<td>Owner owns and maintains HVAC equipment</td>
<td>Multiple tenants under varied leases</td>
</tr>
<tr>
<td></td>
<td>Hospitality</td>
<td>Owner-occupied</td>
<td>Owner</td>
<td>Owner pays energy bills</td>
<td>Owner pays energy bills</td>
<td>Owner owns and maintains common space equipment, tenants own some of the equipment</td>
</tr>
<tr>
<td></td>
<td>Industrial</td>
<td>Tenant-occupied under variety of lease structures</td>
<td>Tenant</td>
<td>3rd party (low pre-negotiated rates for energy)</td>
<td>Operator maintains tenant HVAC equipment</td>
<td>3rd party maintains tenant HVAC equipment</td>
</tr>
<tr>
<td>Residential</td>
<td>Multi-unit</td>
<td>Property owners association</td>
<td>Owner (usage based)</td>
<td>Building owner, tenant, property owner’s association (for multi-unit)</td>
<td>Existing buildings</td>
<td>Existing buildings</td>
</tr>
<tr>
<td></td>
<td>Single unit</td>
<td>Owner-occupied</td>
<td>Tenant (usage based)</td>
<td>Building owner, tenant, property owner’s association (for multi-unit)</td>
<td>Large multi unit residential complex</td>
<td>Collection of single unit houses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tenant-occupied under variety of lease structures</td>
<td>Tenant (fixed price or pre-negotiated rate)</td>
<td>Building owner, tenant, property owner’s association (for multi-unit)</td>
<td>Owner-occupied</td>
<td>Mixed ownership and leased properties</td>
</tr>
<tr>
<td>Government</td>
<td>Municipal buildings</td>
<td>Primarily owner-occupied</td>
<td>Primarily usage based (often at preferential rates)</td>
<td>Owner</td>
<td>Existing</td>
<td>New construction</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td>Also some tenant-occupied under variety of lease structures</td>
<td>Owner (usage based)</td>
<td>3rd party (e.g. maintenance contractor)</td>
<td>Large</td>
<td>Collection of small mixed-use facilities</td>
</tr>
<tr>
<td></td>
<td>Health care</td>
<td>Owner-occupied</td>
<td>Tenant (usage based)</td>
<td>Owner</td>
<td>Owner-occupied</td>
<td>Tenants are varied government ministries with separate energy budgets</td>
</tr>
<tr>
<td></td>
<td>Municipal buildings</td>
<td>Also some tenant-occupied under variety of lease structures</td>
<td>Tenant (fixed price or pre-negotiated rate)</td>
<td>Office building</td>
<td>Owner owns and maintains HVAC equipment</td>
<td>Owner owns and maintains common space equipment, tenants own some of the equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Owner-occupied</td>
<td>Owner pays energy bills</td>
<td>Owner pays energy bills</td>
<td>Owner pays energy bills</td>
<td>3rd party maintains HVAC equipment</td>
</tr>
</tbody>
</table>

Table 2. Market Segmentation of Energy Efficiency projects for buildings

Different stakeholders will participate in the transaction, depending on the sub-market segment. For example, owner occupied buildings may only require a service provider to complete a financially attractive energy efficiency project. On the other hand, a multi-unit residential community may need an energy services company, a grant from the government or a development organization, a local bank and maintenance service provider to create a suitable energy efficiency improvement project.
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A common challenge in developing and emerging markets is that individual stakeholders may not be able to fully meet project requirements. Careful attention should be paid to properly evaluating and matching participants for every transaction. One example could be that financial regulation requires a local bank to hold a large portion of a capital asset as collateral for a project loan. In this situation, a building owner may not be able to provide such collateral due to heavy allocation of existing assets to new construction projects. In this case, a credit risk facility may need to be established to help local bank comply with regulatory requirements.

The following sections detail our findings for developing geographies, including barriers to investments in and potential solutions to address respective barriers.

### 2.1 Country Selection

The first component of the framework was developed to assess market potential in select geographies. Examination included favorability of current government incentives, ease of doing business and market penetration by existing multinational energy service providers, financiers, and aggregators.

### 2.2 Market Potential

Based on McKinsey’s research of potential markets, fourteen developing countries were initially highlighted for additional market potential research. The projected population and economic growth trends of the Southeastern Asian countries were identified as having many potential opportunities; although research was expanded to include a few Central developing countries. Specific metrics identified to measure the market indicators for each country were identified.

| Building Stock – Potential for extensive market growth and replication of successful projects exist in countries containing large amounts existing building stock. |
| Urban Population Growth – The current urban population and projected urban growth rates help indicate the density of the current building stock in urban areas. Fewer barriers exist in countries with established urban populations. |
| Energy Cost – Average electricity cost is a key factor in calculating the potential rate of return for many projects. Countries with heavily subsidized energy have lower incentives to adopt energy efficiency upgrades. |
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### 2.3 Legal & Contracting Environment

The participants in the Energy Efficiency Working Group identified the quality of the formal and informal contractual agreements of countries as a critical element of their risk assessment. In developed countries where contractual agreements are strong, many examples of energy efficiency investment guarantee vehicles exist. However, in countries with developing economies, these vehicles either do not exist or lack the institutions and reliable regulation to enforce contracts and protect investors. This lack of regulation and increased exposure for investors means such vehicles fail to gain traction among participants.

The World Bank Group analyzes and publishes the Ease of Doing Business Index ranks of 183 economies on a yearly basis. A country with a regulatory environment that is conductive to business operation will receive higher ranking. The index uses the average of nine categories determined by

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### Table 4. Geographic Market Institution Framework

<table>
<thead>
<tr>
<th>Country</th>
<th>Building Stock</th>
<th>Growth Projections</th>
<th>Energy Cost</th>
<th>Existing Industry Players</th>
<th>Policy and Incentives</th>
<th>Financial Industry</th>
<th>Service Providers</th>
<th>Aggregators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quality of Formal Contractual Agreements</td>
<td>Quality of Informal Contractual Agreements</td>
<td>Other Investment Risks</td>
<td>Ability to Do Business</td>
<td>Government Regulation</td>
<td>Interest in Developing Market Presence</td>
<td>Existing Market Presence</td>
<td>Reliance on Outsourced Expertise</td>
</tr>
</tbody>
</table>

Even though China fit the criteria for large urban population and existing building stock, large amounts of investment in many energy efficiency programs already exist or are being developed. Thus, a project in this geography would not have as much impact. Evaluating the current building stock, urban growth trends, and current electricity consumption along with key indicators including energy cost, the initial list of geographies were narrowed down to five key target countries: India, Indonesia, Malaysia, Philippines, and Vietnam.

### Table 5. Select Country Market Potential Assessment

<table>
<thead>
<tr>
<th>Country</th>
<th>Urban Population 2010 (thousands)</th>
<th>Urban Annual Growth Rate 2010 – 2015</th>
<th>Building Stock - 2010 (Million m²)</th>
<th>Projected CAGR (10 years)</th>
<th>Building Stock - 2010 (Million m²)</th>
<th>Projected CAGR (10 years)</th>
<th>Electricity Consumption - 2008 (MWh/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belize</td>
<td>161</td>
<td>2.80%</td>
<td>0.05</td>
<td>1.90%</td>
<td>4.3</td>
<td>2.50%</td>
<td>200,000</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>357</td>
<td>5.00%</td>
<td>0.5</td>
<td>2.50%</td>
<td>3.5</td>
<td>4.00%</td>
<td>N/A</td>
</tr>
<tr>
<td>LPDR</td>
<td>2,048</td>
<td>4.80%</td>
<td>3.4</td>
<td>3.20%</td>
<td>18</td>
<td>4.60%</td>
<td>1,111,000</td>
</tr>
<tr>
<td>Cambodia</td>
<td>3,470</td>
<td>4.48%</td>
<td>6.8</td>
<td>3.00%</td>
<td>34</td>
<td>3.60%</td>
<td>1,559,000</td>
</tr>
<tr>
<td>Honduras</td>
<td>3,680</td>
<td>2.92%</td>
<td>10</td>
<td>2.30%</td>
<td>54</td>
<td>2.30%</td>
<td>4,903,000</td>
</tr>
<tr>
<td>Paraguay</td>
<td>3,973</td>
<td>2.54%</td>
<td>4.1</td>
<td>1.60%</td>
<td>70</td>
<td>1.60%</td>
<td>5,698,000</td>
</tr>
<tr>
<td>Guatemala</td>
<td>7,111</td>
<td>3.41%</td>
<td>18.4</td>
<td>2.00%</td>
<td>116</td>
<td>2.40%</td>
<td>7,108,000</td>
</tr>
<tr>
<td>Myanmar</td>
<td>16,973</td>
<td>2.70%</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>4,630,000</td>
</tr>
<tr>
<td>Malaysia</td>
<td>20,150</td>
<td>2.44%</td>
<td>38</td>
<td>2.30%</td>
<td>461</td>
<td>3.40%</td>
<td>88,702,000</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>26,191</td>
<td>3.02%</td>
<td>48</td>
<td>2.10%</td>
<td>321</td>
<td>2.20%</td>
<td>62,603,000</td>
</tr>
<tr>
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<td>57</td>
<td>2.60%</td>
<td>400</td>
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<tr>
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<td>152</td>
<td>1.80%</td>
<td>1,172</td>
<td>6.10%</td>
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<tr>
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<td>638</td>
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<td>13,664</td>
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<td>19,482</td>
<td>5.50%</td>
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</tbody>
</table>

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### Table 6. Select Country Market Potential Assessment

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various regulatory and reform indicators. Select categories important to energy efficiency industry are identified in Table 6 below.

<table>
<thead>
<tr>
<th>Country</th>
<th>Ease of Doing Business Rank</th>
<th>Starting a Business</th>
<th>Getting Credit</th>
<th>Protecting Investors</th>
<th>Enforcing Contracts</th>
<th>Dealing with Construction Permits</th>
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<tr>
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<td>Myanmar</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 6. Ease of Doing Business Rankings

3. Barriers

Through research of previous publications, market analysis, stakeholder discussions and project experience in energy efficiency markets, we have identified five major barriers along with potential solutions that span borders and industries.

Central to understanding energy efficiency investments is the idea that value is created from averted expenses rather than expansion of revenue. This concept is essential to understanding the bias of many developing countries, companies, and individual investors who look toward short-term growth. They assign high risk to the opportunity costs of medium and long-term efficiency investments. This thinking results in little capital allocation toward energy efficiency projects.

Energy efficiency projects can vary greatly in scope and cost. Generally, individual initiatives are small and involve a number of different stakeholders. To create an investment-grade scale energy efficiency project, robust aggregation of energy efficiency initiatives and stakeholder management is essential to achieve success.

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Market participants have a distinct role to play in the aggregation and distribution of energy efficiency finance. The number of participants decreases as the size of working capital goes up.

In the figure 5 below, we have organized the common barriers into five distinct categories, which describe the challenges that energy efficiency projects face in developing countries.

**3.1 Lack of Information and High Perceived Risk**
In developing and transition economies, energy-cost-saving initiatives tend to be a lower priority than production-growth or new-market-capturing initiatives. Outputs of energy efficiency are less tangible and less immediate. This perception failure is due to the fact that most banks, and businesses prioritize capacity expansion over operational improvements. Interviews and research findings suggest that energy efficiency improvements are systematically overlooked due to a lack of knowledge of the benefits such
Achieving Energy Efficiency in Buildings in Developing Countries

Improvements could bring. Another contributing factor is the belief that energy efficiency projects are outside of a financier’s scope of operation and, therefore, must be financed by building owners.

Our recommended solution involves creating a program to educate investors and building owners. This program should explain the benefits, costs, and risks of energy efficiency projects. A notable example of a widespread awareness campaign for energy efficiency is the European Union energy label program for buildings (Directive 2002/91/EC). Now ubiquitous, the intuitive energy label is present on items from appliances to office buildings. Energy label allows end customers to make educated decisions and encourages all stakeholders to strive for energy efficiency in the most cost-effective way.

3.2 Lack of Local Technical or Managerial Expertise

Developing countries may lack professional capacity to appraise, design, and deliver energy efficiency projects. Private organizations also lack necessary knowledge and skills to manage the delivery of energy efficiency projects. Lack of expertise forces reliance on costly external consultants.

Ability to build local capacity is critical. Governments have an important role to play by establishing certification programs, engineering guidelines, and information clearing houses. Alternative to government efforts, a local skills-development entity can be established by a group of financiers interested in reducing long-term costs of delivering energy efficiency projects. This development entity should have a clear roadmap to train and transition skills and operating models to the local market.

3.3 High Transaction Costs

The market for Energy Efficiency Projects in buildings is segmented (Please refer to Table 4). Targeting projects in each sub-segment requires significant customization of transaction models and separate contracting negotiations with diverse stakeholders. Furthermore, financing institutions are reluctant to offer loan products that do not fit into established procedural frameworks.

To execute each energy efficiency transaction, a lot of time is spent resolving complexities of preparation and execution of projects, resulting in high transaction costs. A possible way to reduce costs may be to focus on one market segment. This approach allows project developers to work with a consistent group of stakeholders, reuse proven financing models, and established legal constructs. In addition, project developers need to have an understanding of the local market, build relationships with financing institutions, and maintain strong skills in project assessment and project aggregation. The above responsibilities are well suited for a dedicated development entity that can specialize in a particular market segment and, as a result, reduce the amount of time necessary to execute each successive energy efficiency project.

3.4 Mismatch of the Incidence of Investment Costs and Energy Savings

Energy efficiency projects can be upwards of four years. The term of the engagement poses a challenge of uncertainty of financial and regulatory environment in developing countries. Contributing factors that concern funding institutions include currency risk, government reliability in public debt repayment, which is used as comparison point for determination of risk for financial instruments, and enforcement of formal and informal agreements.

To help manage these risks, institutions reported that an operating entity could be established to focus on maximizing savings, maintaining repayment cash flows, and continuously managing vendors and stakeholders throughout the life of the contract. While such an entity would not remove the risks inherent to currency or government reliability, it would help provide project management expertise and consistency and ultimately reduce delivery risks.

3.5 Regulatory Biases or Absence of Regulation
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Many countries lack an effective policy and regulatory regime to incentivize investments in energy efficiency. Policies are critical to aligning the interests of all actors around implementing cost-effective energy efficiency improvements. Effective policy can serve as a bridge over other barriers, while absent or ineffective policy can undermine a conducive environment for investment by creating reverse incentives. Regulatory biases, such as subsidized energy prices, have the greatest impact on stakeholders as they remove the economic incentives for making investments. Without effective regulation, energy efficiency may go against the general interest of multiple stakeholders. For example, conserved energy can be perceived as lost sales and reduced revenue for utility companies. While the utility regulations are country and even municipality specific, a lack of regulation often negatively impacts both suppliers and consumers of energy.

Confusing, conflicting, misaligned policies, or policy that is not enforced can be just as damaging as no policy at all. Stakeholders often migrate towards inertia when they are not driven to action by the threat of regulatory enforcement, even if there are incentives in place. This is often the result of a lack of awareness of the value increasing energy efficiency can have on the bottom line. Clarity and predictability are the most important aspects of good policy. Stakeholders want to know that they will benefit from their investments. Without clarity in the regulatory environment, it is impossible to know whether stakeholders will be able to fully recoup their outlays.

In contrast, when effective regulation is in place, both suppliers and consumers have a higher level of awareness and are more likely to pursue energy efficiency projects, even where the regulation would not have required an improvement. An example of successful utilities regulation can be seen in California. In 1996, Assembly Bill 1890 established a Public Goods Charge that California electricity consumers pay to subsidize energy efficiency and renewable technologies.

Government or industry regulators have the ability to provide encouragement for both utilities and customers to adopt energy efficiency programs. However, such incentive programs may be difficult to employ in developing countries and emerging markets where focus is access and lowest possible near-term cost of energy.

To increase the market demand for energy efficiency, a long term comprehensive policy assessment and new policy development is necessary. Policies need to be tailored to the market they are intended to affect; different policies are needed depending on whether the focus is on new buildings or retrofitting existing construction. This is particularly important in developing countries where rapid population growth and urbanization are motivating new generations of building stock. Increasing awareness remains one of the most important types of policy. Government incentives and regulations, combined with a cohesive education program, should aim to provide awareness and compliance demand in the market. Decoupling volume of electricity consumption from utilities profits or providing consistent funding for utility energy efficiency programs will further increase energy efficiency measures available for consumers.

In addition to the above barriers, resolving market complexities, as outlined in Table 4, is difficult. The core economic functions are critical to enable scalable energy efficiency investment and ensure sufficient flow of capital. Specifically, once initial deal flow has been established, large and efficient investment markets and fine-tuned vehicles for delivering investments for energy efficiency will help grow investments in the sector. However, establishing such markets, and indeed a sustainable volume of projects will require that every stakeholder is enabled with sufficient incentives to remain active in the implementation and operation of the improvements. In our interviews and review of past studies, the split incentives, or situations where some stakeholders lack incentives to ensure the project success, were identified as the most common reason for energy efficiency project failures.
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4. Financing Models

After a thorough review of the target markets and the common barriers, we considered a variety of financial structures and products that could help resolve the identified challenges. We also discussed which market segments would be most appealing to financers in which to test deals. Below is a review of financing models with the most promise to work in developing countries.

4.1 Energy Performance Contract

4.1.1 Description: Energy Performance Contracts (EPC) are typically delivered by Energy Service Companies (ESCOs) and have seen moderate success resolving entry barriers for local markets in developed countries. ESCOs provide complete energy solution services, including in-depth analysis, project designs, implementation and financing.

4.1.2 Advantages: An EPC allows an ESCO to guarantee the energy savings from implemented building retrofit will meet or exceed annual energy payments. Otherwise, ESCO will cover the difference in project costs. To offset project costs and performance risk, ESCO will receive a large portion of the total energy savings for the duration of the project.

4.1.3 Disadvantages: Providing finance for performance projects is difficult in developing markets. Energy performance contracts can run upward of 5 years. As the number of concurrent projects increases, ESCOs will face capital liquidity issues preventing them from financing additional projects on their own. To overcome this hurdle, a large startup capital is necessary to achieve sufficient aggregation of projects to fund 3-5 year capital cycles. However obtaining startup capital is especially difficult in developing countries where financers lack proven legal constructs and knowledge of performance contracting.

4.2 On-Bill Financing

4.2.1 Description: Through the on-bill financing, the utility company or a third party financier covers the upfront cost of an energy efficiency upgrade and the customer repays the investment through a charge on their monthly utility bill. On-bill repayment overcomes program setup barriers by leveraging the existing billing relationship utilities have with customers, and builds on the information utilities have about customers’ energy usage and payment history. Most utility-administered on-bill financing programs offer low or no interest loans and short repayment periods (e.g. no more than 36 months). Two types of on-bill financing are commonly employed: loans tied to the customer and loans (tariff) tied to meter. With loans tied to the customer, the customer retains the obligation to pay even in the event of relocation, while loans tied to meter require the current occupant of the building to make payments (Kats, 2011).

4.2.2 Advantages: Energy savings from efficiency improvements and the cost to achieve those savings are displayed on the same bill, making it easy for customers to compare savings to loan payments. Allowing customers to make energy efficiency loan payments on their utility bill reduces customer engagement barriers and promotes program participation. Numerous utility-administered on-bill financing programs offer 0% interest financing, expanding the range of feasible efficiency projects. Some utility programs offer increased incentives to participants who implement multiple EE measures, which would encourage greater savings (Kats, 2011).

4.2.3 Disadvantages: Capital providers are sometimes leery of structures in which the utility collects the funds and distributes collections to the lenders. These reservations are due to the fact that the collection practices of utilities may differ from those of lenders, and, in the case of partial bill payment by a customer, utilities might pay themselves before paying the lender. It is difficult and expensive for utilities to change their billing system, creating barriers to adoption. Many utilities are reluctant to serve the role of loan originator and collector. Utilities and their regulators are reluctant to take on any risks associated with making loans to customers using their own capital or ratepayer funds. Utilities are concerned about the potential of servicing customer complaints about failed EE equipment. The preferred method of on-bill financing is when a loan is tied to a meter. However, such legislation is difficult to implement due to
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complications associated with transfer of loan responsibilities during a change of property ownership. Nonetheless, successful programs are typically oversubscribed due to program inefficiencies and lack of funding (Kats, 2011).

4.2.4 Market Enabling Measures: To successfully implement on-bill financing, we recommend funding programs with public capital or providing credit enhancements (e.g. loan guarantees, loan loss reserves, etc.) to reduce risks to financier and attract private capital. Also, Public Utility Committees can mandate that utilities allocate a portion of utility capital funds for efficiency investments and establish dedicated public purpose surcharges to finance efficiency loans (Kats, 2011).

4.2.5 Successful Implementation: On-bill financing has deployed on a small scale in the U.S. Utilities in Connecticut, Rhode Island, and Massachusetts have offered on-bill financing for more than 10 years. Most recently, California also began offering this financing option.

4.3 Energy Efficient Mortgage
4.3.1 Description: Mortgage-backed EE financing such as an Energy Efficient Mortgage (EEM) provides additional borrowing capacity and better terms to borrowers buying a new energy efficient home or investing in energy improvements in their existing home.

In the case of an EEM, the financing is rolled into the home mortgage. In effect, the mortgage is extended to provide a single low cost source of capital to finance cost-effective, energy saving measures as part of a refinanced or new mortgage. Mortgages provide repayment periods that are typically between 10 and 30 years, thus amortizing the costs of the energy efficiency improvement over the typical mortgage term. An EEM can be obtained when purchasing a home or refinancing an existing mortgage. Additional borrowing capacity is provided to the borrower under an EEM based on the assumption that the energy savings exceeds the amortized cost of the energy efficiency improvements, resulting in an net operating income positive investment that improves the borrower’s ability to pay, hence lowering default risk. This reduced risk can potentially justify a lower interest rate, which in turn, further reduces the default risk. Energy Star Mortgage programs in Maine, New York, and Colorado inject capital into mortgage products to buy down the interest rates charged to borrowers as an incentive to finance energy improvements (Kats, 2011).

4.3.2 Advantages: The long duration of mortgage terms allows the spread of energy efficiency costs, resulting in low monthly payments. The cost of energy efficiency measures can be combined with existing home refinancing or home purchase, reducing transaction costs otherwise associated with pursuing a separate loan for efficiency improvements. In majority of cases, interest on loans is tax deductible to the borrower. Energy efficiency measures typically enhance a borrower’s ability to pay since the monthly energy bill reductions typically exceed the additional monthly payments associated with the energy efficiency improvements. Enhanced ability to pay may warrant preferential interest rates (Kats, 2011).

4.3.3 Disadvantages: Homebuyers are often overwhelmed with other issues and unable to think about energy improvements at time-of-sale or refinancing. Many lenders are not knowledgeable about or skeptical of the net operating income-positive impact of efficiency measures. Therefore, they are reluctant to offer EEMs or provide preferential terms for EEMs. High transaction costs can make smaller projects unfeasible. (Kats, 2011).

4.3.4 Market Enabling Measures: Municipalities can provide capital to reduce interest rates or end-user transaction costs. The Federal home lending institutions can offer loan loss reserves for EEMs. Obtaining more data on the risk profile of investments in energy efficiency and the improved effects of EEM on the borrower’s ability to pay will enable more mortgage-backed EE financing. Mortgage lenders could offer a property-secured EE loan as part of refinanced mortgages for gross-leased and owner occupied commercial properties within pension fund and Real Estate Investment Trust portfolios. These refinanced mortgages could be securitized into a green mortgage backed security.(Kats, 2011)
4.3.5 Successful Implementation: Countries with experience using energy efficient mortgages include the U.S., Germany, France, UK, and Canada (Thornton, 2009).

4.4 Green Leases
4.4.1 Description: Green leasing can be defined as the integration of energy and water efficiency, emissions reduction, waste minimization and other sustainability objectives throughout the entire commercial leasing process (Supple, 2010).

A growing body of research and data show that green (or energy efficient) buildings have lower operating costs, yield higher operating income, possess lower risk of default and have higher asset values than conventional, non-green buildings. As a result of their integrated design process, green buildings typically have less risk of building system failures, which reduces the risk of uninsured events or work shut downs due to system failures. Additionally, green buildings have broadly documented health and productivity benefits, including reduced employee sick days and enhanced worker productivity. These benefits broadly improve tenant’s operating margins and appear to create a valuable brand for property owners that can drive occupancy and rents.

Despite this information, mortgage lenders and insurance providers largely do not recognize the lower risk/higher return attributes of investments in green buildings. Convincing lenders that green buildings warrant preferential terms involves developing and delivering robust data on the performance of green properties and mortgages as compared to non-green properties and mortgages. Sufficient data would presumably serve as rationale for offering lower cost financing and insurance premiums. Preferential terms would, in turn, drive expanded green building investment. Being a first mover in this area could be attractive to institutional investors to receive positive PR benefits and gain access to a high-quality demographic with substantial opportunities for add on services and brand loyalty (Supple, 2010).

4.4.2 Advantages: Green Leasing utilizes existing and efficient market channels to deploy capital to energy efficient building owners and does not involve public institutions. Green Leasing involves no new program structure or bureaucracy.

4.4.3 Disadvantages: Few banks currently recognize or are developing data to quantify the risk reduction characteristics of green buildings.

4.4.4 Market Enabling Measures: Conduct rigorous studies on the costs and benefits of green buildings. Making this information publicly accessible will help investors and building owners better understand the risks and returns of green building projects. Current studies could also serve as rationale for preferential leasing terms (Kats, 2011).

4.4.5 Successful Implementation: Countries where green leasing has been used include Australia; the U.S. Canada, Sweden and other countries are in the process of developing green leasing models (Fletcher, 2008)

4.5 Dedicated Development Company
The development company’s primary role is to find and aggregate energy efficiency projects. We propose that to be effective the development company must maintain a localized expertise and a narrow specialization within building sector sub-market (see Table 4) thus lowering transaction costs and execution risk of performance-based contracts.

A dedicated local development company is adept at balancing stakeholder interests, navigating local institutional environment and efficiently originating projects. The major functions of a self-sustaining development company include aggregation, technical assessment, marketing, education and deal shaping. An effective development company should work at expanding the market and evaluating project participants based on sufficient knowledge of project requirements, delivery methods and target results. It will also customize financing models while negotiating and balancing financial and non-financial...
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benefits among stakeholders. The development company should understand the institutional environment in which energy efficiency service transactions will take place. Policy and regulatory frameworks and market positioning of project participants are best navigated with deep localized knowledge.

Efficient utilization of local skills is particularly important in developing countries, where an effort will be required to establish and develop local resources. Skilled local resources provide the ability to effectively and sustainably deliver projects at lower costs. A local development company can have multiple positive effects on the energy efficiency market. It can help foster local economy, stabilize nascent markets, help institutionalize new operating models, and grow cost competitive local capacity.

5. Financing Energy Efficiency in Indonesia

Following the study of the five most promising markets, the team determined that Indonesia presented the best learning environment. Given its size and growth trajectory, what works in Indonesia could provide a model for how to make similar markets in other countries.

Despite having been the focus of many international energy efficiency initiatives over the past 20 years, Indonesia has yet to embrace energy efficiency improvements as a model for economic returns. Contrary, Indonesia is representative of a small group of developing countries which will have a profound effect on global greenhouse emissions over the long term. Indonesia is poised for rapid economic growth and urbanization in the near term and has a government that professes a desire to curb its emissions by moving towards a more sustainable model of economic growth but lacks the policies and regulatory framework to mitigate critical levels of risk. In short, Indonesia stands out as a country perfectly positioned to take advantage of the potential for economic returns and greenhouse gas reductions that energy efficiency improvements can offer. Further, unlocking the market for these improvements in Indonesia could have a substantial impact on other countries.

Indonesia emerged very strong from the global financial crisis. For the past 10 years its gross domestic product (GDP) has grown over 4.5 percent per year. However energy consumption also grew at an average 5.2 percent annually. Indonesia electricity generation is predominantly fossil-based which has helped put Indonesia in the top 10 of carbon emitting countries in the developing world. The energy sector is the second largest source of carbon emissions in Indonesia. If Indonesia continues on its current trajectory the emissions will triple by 2025 from 2010 levels (Asian Development Bank, 2010). Simultaneously, developers are anticipating rapid growth in Indonesia’s urban population over the next 10 years. Literally, every large developer in Asia is accessing the Indonesian market. Deep pools of capital are being assembled to invest in the country, especially in its built environment.

At the same time, being “green” is becoming increasingly popular in Indonesia. New green commercial buildings in Jakarta are commanding higher rents and are filled much more quickly than others. Investigation into this phenomenon reveals that renters are motivated by a belief that it is fashionable to be green, not due to concerns over the cost of energy. Due to the low cost of electricity, neither individual businesses nor major conglomerates are price sensitive when it comes to office rent. However, the Government of Indonesia has a different perspective and sees increased energy efficiency as a prerequisite for future energy security. The Indonesian Government has been actively speaking with energy efficiency experts to better understand how it can promote energy efficiency.

The visit to Indonesia reconfirmed that developers and professional associations are very willing to consider including energy efficiency in their scope. However, several factors play a significant role in limiting energy efficiency in the building sector:

- Lack of the right kind of capital for EE projects
- Mechanism to recover the EE investment in most market segments
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- Confusion around the regulatory environment. Regulation and implementation need to be issued at the local level. The national law on energy efficiency is not clear on whether or not it is mandatory.

5.1 Summary of Findings
The Asian Development Bank (ADB) estimates commercial buildings in Indonesia provide a $1 billion USD potential market for electrical system retrofits, system efficiency improvements, poly-generation and waste heat recovery. These efficiency improvements could result in $254 million annual savings in electricity and fuel costs (Varkay, 2011).

Energy efficiency policy in Indonesia ranges from weak to ineffective. As noted above, there is a national law on energy efficiency, but it is unclear as to its impact. Work on the regulatory side will be most effectively focused at the local level, especially on governments in large municipalities.

Thus far, most of the energy efficiency results can be attributed to the industrial sector. According to ABB 2010, Indonesia’s energy efficiency report, steel manufacturing has improved nearly fivefold (ABB, 2011). The improvement comes primarily from the strong influence of overseas manufacturers (i.e. from Japan) that retained long term perspective when considering factory design, plant equipment selection and retrofits.

In the building sector, the main incentive to construct green buildings comes from multinational corporations that demand certified real estate due to corporate social responsibility programs. Property developers are aware of the appeal of green buildings and attempt to classify some projects as green development to target upper middle-class segment. Unfortunately, marketing is often stronger than implemented efficiency measures. In some cases, the basic facts of construction counteract the claims in the advertisement.

Our assessment is that the Indonesia real-estate market can currently support, and a business case can be made for, two narrow industry segments for energy efficiency:

- Large commercial owner occupied buildings
- Commercial space rented under gross lease (where the owner pays the utility bill which is not transparent to the tenant)

In both cases, the primary stakeholder and beneficiary is the building owner. To unlock potential for funding scalable energy efficiency projects in other industry segments, several market mechanisms must be developed.

5.2 Indonesia Energy Efficiency Market Conditions
Local market conditions for energy efficiency in Indonesia reflect our broad study of barriers. Below we look into how specific challenges from policy to general awareness may affect the opportunity and structure of energy efficiency projects.

5.2.1 Jakarta Municipal Regulations for Energy Efficiency, Audit and Capped Consumption
IFC is developing a set of energy efficient building codes that will be implemented in municipal districts of Jakarta. The IFC team analyzed a large number of efficiency measures and recommended feasible efficiency improvements with rapid payback. This is a very promising initiative that has potential to transform the current state of new construction.

Below is an example of in-depth cost benefit assessment conducted by IFC for buildings in Jakarta. This type of localized investigation is necessary to create effective, relevant building codes.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Category</th>
<th>% Saving</th>
<th>Cost Increase</th>
<th>Payback Period</th>
<th>Policy Recommendation</th>
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</table>

18
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<table>
<thead>
<tr>
<th>Measure</th>
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<th>Retail</th>
<th>Hotel</th>
<th>Hospital</th>
<th>Apartment</th>
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<tr>
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<td>Include</td>
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<tr>
<td>Reflectivity - Roof</td>
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<td></td>
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<td></td>
<td>Include</td>
<td>Include</td>
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<td>Thermal Conductance - Roof (U-Value)</td>
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<td>Glazing Assembly Properties (U-Value, SHGC, VLT)</td>
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<td>Window to Wall Ratio</td>
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Table 7. Payback Assessment for New Large Offices in Jakarta

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## Achieving Energy Efficiency in Buildings in Developing Countries

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<th>Estimate Net Energy Savings</th>
<th>&gt; 25%</th>
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Table 8. Implementation Matrix Summary for Proposed Building Regulation in Jakarta

Based on analysis above, IFC cost-benefit analysis work in Jakarta suggests that the capital cost of construction for 30% more efficient building could increase by as little as 2%.

### 5.2.2 Electricity Price

Electricity prices in Indonesia are heavily subsidized and therefore do not reflect true life-cycle cost. In the past the Indonesian Government has chosen to subsidize domestic electricity prices to spur economic growth. Common opinion in the private sector is that significant increase of electricity price is inevitable in the near future as artificially low domestic energy prices have presented a challenge of maintaining domestic energy supply. Blackouts and gas shortages are frequent in Jakarta region. Furthermore, electricity is not measured by the hour or minute, which makes it difficult to implement the efficiency of smart grid technology to manage peak loads.

Electricity is supplied by a single state owned utility provider, removing any price and service offerings competition. Maintaining low energy intensity is “encouraged” with peak time pricing and poor grid reliability. In some ways, working with a single provider to deliver energy efficiency programs can be easier and more effective. Energy Efficiency feed-in tariff (payment for electricity saved) or on-bill financing mechanism remain highly attractive avenues for further investigation. Targeted electricity tariff increases may also be considered.

### 5.2.3 Awareness and Understanding of Energy Efficiency and Green Buildings

Detailed awareness of the benefits of energy efficiency is missing throughout Indonesia. For new construction, developers are more concerned about speed of construction and keeping the price in line with competition. Developers are not well versed in the cost-benefit analysis of energy efficiency measures in buildings. Property developers focus on the short term returns, in part because they do not have viable examples of the steady long term returns which can be attributed to energy efficiency improvements. Consequently, Indonesia’s real estate industry is focused on capturing rapid growth of relatively new middle class market segment. For single unit and multi unit residential properties the utility bill is the responsibility of the owner and not the developer. Therefore, educational efforts should be focused on the individual buyer. Financing mechanisms to offer energy efficient mortgages or property assessed clean energy (PACE) will also need to be made available in the market.

The commercial buildings situation is much different. For large malls and office buildings where developers retain ownership, some basic energy efficiency measures are implemented. Progressive building owners and developers (i.e. Summarecon) are putting tested EE measures such as gas generators, heat reclaim and absorption chillers to reduce reliance on the main grid. Unfortunately, natural gas supply is even less reliable than electricity. Property developers are considering including EE
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measures in reference designs or performing a building retrofit, however they require a financing mechanism without stringent collateral requirements on loans. Property developers usually have all assets allocated to secure loans for new construction and therefore have little or no room on the balance sheet for additional asset backed debt.

Many Indonesian banks lack the ability to properly assess risks of energy efficiency investment. Following the Asian financial crisis in 1998, local banks have significantly reduced the amounts of project financing, instead opting for traditional loans for infrastructure projects. Delivering energy efficiency with pay back through savings falls under an atypical project based financing category. Local banks do not have the expertise to assess risks and returns thus limiting available funds or increasing the interest rate on the loan.

Another serious challenge identified by chairman of the GBCI is that local architects have very little understanding of energy efficiency best practices. They design buildings with concerns for aesthetics rather than function. Even basic green or energy efficient concepts are not incorporated into design. Development of new energy efficient building codes, such as those supported by IFC, should greatly help improve this issue.

5.2.4 Local Expertise

Even though current professional capacity is in nascent stages, excellent efforts are underway to train local professionals. The Green Building Council of Indonesia recently had their certification program officially recognized by the government. GBCI will have over 150 green building professionals by the end of 2011. The American Society of Heating Refrigeration and Air-conditioning Engineers (ASHRAE) has an active local chapter in Indonesia. ASHRAE administers educational seminars, trainings courses and exchange of best practices from the entire South East Asia region.

Many other agencies and institutions also have invested resources into local capacity building projects. Most notably, DANIDA, the International Development Agency of Denmark, is helping design the voluntary Jakarta municipal building standards and mandatory building codes. DANIDA also has a number of programs that support Indonesian government to design the incentive program for retrofits, create an energy efficiency clearing house in the Ministry of Energy, design certification program for energy auditors and develop EE retrofit projects. Success was achieved through subsidizing initial energy audits, working with private sector to educate and obtain commitment.

Finally, the Ministry of Energy and Natural Resources is starting an energy audit company certification program. Currently MENR works with a state owned technical assistance company to deliver basic energy audits. The certification program will help bring necessary qualified alternatives to the state owned ESCO.

5.2.5 Contract Terms and Duration

Energy Performance Contracting is a little known concept in Indonesia as the ESCO industry does not currently exist in the country. Historically, ESCOs in developed countries were particularly successful by fulfilling government contracts. However, in Indonesia accepted contract structures for the government procurement are defined by the presidential decree. EPC is not one of the approved contract structures, thus eliminating the single largest market that accounts for up to 40% of ESCO revenues in developed countries. Introducing EPC to government clients is crucial for unlocking a healthy ESCO industry. An additional reason for lack of ESCOs is due to the government paying significantly below market prices on energy consumption. Currently, the Indonesian government pays lower rates for electricity than private or commercial sector. Without lifting government electricity subsidies, strong mandates for EE in government buildings may be one of the few available courses of action.

5.2.6 Transaction Costs

Aggregation is a major challenge in Indonesia energy efficiency projects. The size and return of individual project transactions are very small compared to the cost of new buildings. Projects must be effectively assessed and aggregated to provide sufficient incentives to gain the attention of financial
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groups. Utilization of the Development Company model could allow for aggregation early in the project development process.

The capital flow and project financing in Indonesia are constrained by very conservative banking regulations implemented after the 1998 Asian financial crisis. Banks must maintain high levels of liquidity and loans must secure 100% to 120% collateral for financing. These conditions prevent developers from taking out asset backed loans. Also developers and private corporations must consider returns on investment for EE, as returns are typically lower than projects aimed at growing revenue.

A third party finance vehicle without collateral requirements from the receiving party may unlock the necessary flow of affordable capital and lower transaction and borrowing costs.

In the section below, we would like to discuss sector specific findings in accordance with our analysis of the barriers and market segmentation.

5.3 Sector Specific Findings

5.3.1 Market Segment Commercial, New Construction

Sub-Market: Mixed Use and Office Buildings
Leased commercial buildings with multiple tenants: Currently, no mechanism exists for recovering additional investment for energy efficiency measures in new buildings without raising the property cost or the rental cost. Government approved Green Building Rating System administered through FBCI exists in Indonesia; however developers are not convinced that green building rating raises the property value enough to offset the increased costs of construction and certification.

Recommendation: Gross lease, Green lease or utility on-bill financing

Under a most prevalent office lease structure in Indonesia the tenant pays for energy used and, therefore, would retain any benefit from reduction in energy consumption. On-bill Financing or a Green Lease in the revenue realization cycle is a critical component of the deal model (Fig. 5). Without a similar
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mechanism, the building owner responsible for capital equipment improvements has no recourse to retain portion of energy savings.

5.3.2 Market Segment: Residential, New Construction

Sub-Market Segment: Single Unit, Multi-Unit
The primary challenge for energy efficiency projects in this sub segment is contracting with a high number of individual buyers. Construction cost and the resulting sale price is a key driver. Property developers defer selection and installation of energy consuming equipment to the owner. Homeowner selection is frequently governed by upfront cost rather than cost of ownership, which incorporates utility bill payments.

Recommendation: Three feasible options:

1. Partnering with local banks and developers to offer energy efficient mortgages (EEM) similar to IFC experience in Mexico or the Energy Efficiency Mortgage (EEM) in the United States. The EEM program was developed in 1995 as a partnership between the national mortgage industry, energy raters, and the National Association of State Energy Officials. The EEM program enables new home buyers or current homeowners to add the cost of home energy improvements into their mortgage.

2. Energy performance certificates. Similar to the EU program where an objective letter grade is assigned to each building, indicating expected energy cost and relative performance to similar buildings. This rating system allows customers to envision total ownership cost of homes.

3. On-bill financing for energy efficiency improvements through national utility would allow additional construction cost to be recovered through a standard, universally accessible mechanism.

Figure 7: Transaction Model for Energy Efficient Mortgage

In this model, the investment is facilitated and recovered through a local bank. A critical component of this model is articulation of value of energy efficiency to the prospective homeowner. The EE mortgages are typically structured so that an increase in principal is offset by lower energy bill.

5.3.3 Market Segment: Commercial, Existing Building Retrofits
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**Market Sub-Segment: Retail**

**Large Retail:** This sector is performing reasonably well for energy efficiency retrofits because owners are directly incented to operate at lower cost.

**Small Retail:** Similar to residential, small retail requires contracting with a high number of individual tenants. Gross leases offer direct incentive to implement energy efficiency.

Recommendation: For net leases, where tenant pays the utility bill, on-bill financing is the preferred method. That allows energy efficiency improvements that benefit the tenant to be paid for directly by the tenant. However, due to the size of the market segment, a large number of qualified energy professionals will be needed to perform energy audits and technical assessments.

**Market Sub-Segment: Office Buildings, Mixed Use**

**Office Buildings and Mixed Use Facilities:** Lease structures in commercial office space are typically a combination of terms from gross lease and double net lease. That allows some flexibility in passing on surcharges to the tenant. However, for spaces rented under a net lease (double or triple net) new lease mechanic must be created where energy efficiency savings are passed on as a line item charge (i.e. service charge, infrastructure improvement charge). Cushman Wakefield, Colliers International, and other members of AMPRI will be a good channel to work through the property managers and facility managers to reach broad spectrum of office leases.

Recommendation: Develop new lease structure or lease clause that allows energy efficiency surcharge to be passed onto the tenant. Similar to green leases, the goal is to lower the total energy bill, including the EE loan payment surcharge, than prior to EE improvements.

**5. 3.4 Market Segment: Residential, Existing Building Retrofits**

**Market Sub-Segment: Single Unit, Multi Unit**

**Single and Multi Unit Residential** – Residential retrofits on large scale may only be feasible through education and offering loans through local bank. Individual performance contracts are not practical due to challenges of contracting with each individual owner.

Recommendation: Develop a revolving fund for residential retrofits that provides low cost financing to local banks. For rented properties, institute green leases. The most direct way to reach residents, however, is through on-bill financing.

Studying the local market conditions indicates that one financing model will not work universally. Delivery mechanism and financial return method will vary by market segment, and potentially by municipality as the different regions develop different levels and types of regulation and enforcement. Regardless of the model, the critical component effectively delivering energy efficiency financing is the mechanism for recovering the initial investment. Such a mechanism already exists for:

- Owner occupied buildings
- Buildings where the owner is responsible for paying energy bills and building has large common areas (e.g. malls)
- Office buildings with gross lease
- Green developments where EE is inherent in the property value (e.g. BSD Green City)

New mechanisms will still need to be developed for residential and office buildings where tenants do not want a gross lease or where the utility payment is proportional to consumption.
6. Next Steps

Initial investigation of Indonesian market for energy efficiency in buildings revealed strong demand for reduction of energy intensity of buildings. Basic awareness and demand for energy efficiency services is present among key market participants in financial sector, government, energy efficiency service providers, and the Indonesian property developers. However a number of market barriers remain unresolved thus preventing sufficient flow of capital into energy efficiency projects in the building sector. Compound barriers require close cooperation between the private sector, development agencies and Indonesian government. Immediate progress can be made on creating energy efficient mortgages, green leases and 3rd party finance for owner occupied commercial retrofit projects. However, energy efficiency investment at scale will be achieved only with government support and innovative policy decisions. Focusing on one or several specific projects will allow market-based due diligence to occur, which will serve as proof of concept for above recommendations and as a necessary detailed investigation for policy creation.

The recommendation for specific actions:

- Increase awareness and understanding within the Indonesian Government and local governing bodies, property developers, local funders, and the international financial community about the feasibility of significant investments in this sector.
- Educate government officials in ministry offices and targeted municipal offices on the business environment necessary to attract investments in energy efficiency in buildings and how to translate private sector requirements into effective policy measures and/or government initiatives.
- Following the above recommendations, establish a mechanism by which future energy efficiency projects can be developed, funded, and implemented.
- Focus at first on the following industry segments:
  - Energy Efficiency in new commercial buildings
  - Energy Efficiency in new single and multi-unit residential buildings
  - Energy efficiency in existing large commercial buildings
- Facilitate the dialogue to develop solutions to the identified barriers and validate with decision makers and stakeholders.
- Determine market based mechanisms that drive private sector decisions: financial requirements for each stakeholder, ROI, length of required contract, and size of investment.
- Prepare government policy discussions on mechanisms for capturing energy savings through an Energy Performance Contract. The mechanism may be a revolving fund, utility on-bill financing, and energy efficiency mortgage.
- Define high level transaction structure and parameters for policy surrounding each mechanism.
- Obtain commitment to take further steps toward setting up commercial investment vehicles and government policy committees for resolving barriers according to recommendations.
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Works Cited


Fletcher, L. (2008). The “green” lease-how concerns about sustainability are being reflected in contractual arrangement. UK.


Energy Efficiency Policy and Incentives

Governments in the selected developing countries began implementing supportive policy measures with varied effectiveness. Policies are targeted at addressing the barriers identified in the previous section. The high level overview below describes the most impactful policies that can be used as a guide in addressing barriers for energy efficiency.

Philippines

The Government of the Philippines established a National Energy Efficiency and Conservation Program. This program updated the National Building Code with reference guidelines for energy efficiency in 2007. Under the Government Energy Management Program (GEMP), government buildings are required to submit a Monthly Electricity, Optimize Free Cooling, and overall reduce consumption by 10% from 2004 levels (Administrative Orders 103, 110, 126). GEMP also covers communication, requirements on air-conditioning cooling parameters, improved lighting efficiency and minimum appliance energy certification.

Outside of government buildings, the current measures are limited to guidelines and recommendations which are aimed at increasing awareness of building owners, architects and construction companies. Efforts to increase public knowledge and awareness are undertaken by Asian Development Bank (ADB). ADB is providing conditional funding for Philippines Energy Efficiency Project (PEEP). Notable project goals for building energy efficiency are (Philippine Department of Energy, 2011):

- Retrofit 42 government Buildings with efficient lighting systems (ELS).
- Install 13 Million CFLs for residential consumers.
- Conduct efficiency testing on a wider range of appliances and the accreditation of the certification laboratory to ISO 17025.
- Establish an efficient building rating system in the Philippines for new and retrofitted buildings.
- Successful operation of a Super ESCO including capacitated staff and energy service models for implementing EE projects in public and private sectors.

The Philippines is a great example of multilateral development agency providing low interest funds for implementation and administration of energy efficiency projects aimed directly at addressing major barriers in the local market.

Indonesia

Although the president of Indonesia announced an ambitious plan to reduce carbon emissions of Indonesia by 26% by 2020, most of the abatement is expected to come from forestry projects like REDD+ which received 1 billion dollar commitment from Norwegian Government. From the private sector perspective, little has been done at the national level to define comprehensive energy efficiency policy that can span multiple ministries.

Currently the Electricity Tariff in Indonesia is significantly below market price. With no mandates by the government to reduce energy consumption of the private building sector blackouts are common in many regions. Several regulations are aimed at reducing overall energy consumption, however corresponding market mechanisms still need to be developed (Asian Development Bank, 2010).

- National Action Plan on Climate Change delivered 30% energy tariff increase that took place in 2010
- Clean Technology Fund – ADB proposed 400 million fund targeting renewable energy and energy efficiency. EE target is to save 30% from business as usual by 2025.
- Presidential Regulation No. 5/2006 and Presidential Instruction No. 10/2005 specifies the objective of reaching energy elasticity less than 1 in 2025 and significantly increasing renewable
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energy in the mix. Follow up Presidential Instruction No. 10/2005 Ministerial Regulation 31/2005 are focused on enabling EE investment opportunities.


National Energy Policy (KEN) set to last from 2003–2020 provides an annual country goal of energy reduction of 1 percent.

Presidential Decree No. 10/2005 requires the government owned buildings to execute EE measures in buildings and transport facilities.

Ministerial Regulation No. 31/2005 outlines procedures and guidelines of energy conservation implementation.

Malaysia

Energy efficiency policy in Malaysia is currently focused on building guidelines, successful showcases awareness and voluntary green building certification. Notable showcase projects include Low Energy Office (LEO) and Zero Energy Office (ZEO). The Voluntary “Green Building Index” program, ranks commercial and residential buildings according to six criteria with one of the six criteria focusing on energy efficiency (Sinsukprasert P. , 2011).

The Ninth Malaysia Plan focused on resolving many of our identified barriers for energy efficiency (The Institute of Energy Economics, Japan, 2010):

- Ensure more efficient use of electricity among large users
- Promote the use of highly energy-efficient appliances and equipment
- Develop local expertise in the manufacture of energy-efficient appliances and equipment
- Improve energy efficiency in government buildings by 10%
- Develop skills and capability in the area of energy efficiency

Energy Efficiency projects are eligible to receive 100% Investment Tax Allowance (ITA) for capital expenditures. Companies undertaking EE projects are also able to claim Import Duty EE equipment and materials. For locally purchased machinery and materials full sales tax exemption is given. Ministry of Energy is close to releasing a National Energy Efficiency Master Plan to accelerate the development of EE&C in the 10th Malaysia Plan and beyond. The Master Plan will be focused on energy efficiency of the industrial, commercial and building sectors

Vietnam

Vietnam has enacted several programs to enhance the competitiveness of industrial products and to reduce about 950,000 tons of GHG and energy savings of 140,000 TOE during the period of 2006-2010 (Sinsukprasert P. , 2010). These programs include:

- DSM Policy Framework and Pilot DSM funded by World Bank and Sida.
- Utility DSM funded by GEF and World Bank.
- Commercial EE Pilot Program funded by GEF/World Bank, and EE&C Promotion in SMEs funded by GEF/UNDP.

Vietnam National Energy Efficiency Program (VNEEP) seeks to improve local skills and capability and increase awareness and understanding about energy efficiency for professionals in the building sector

Specifically Component 5 of VNEEP covers Energy Efficiency and Conservation in Buildings:

- Project 9: Improving capacity in Energy Efficiency & Conservation (EE&C) and conducting EE&C in building design and management
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- Project 10: Develop pilot models and disseminate EE&C management activities in building operation

**Thailand**

EE&C policies in Thailand are aimed at establishing energy efficiency as a facet of both the national economy and culture. Primarily through the Energy Conservation Promotion (ENCON) Act & Fund, Thailand has addressed a majority of the previously discussed barriers to EE&C adoption. The Energy Efficiency Improvement Program within the ENCON Act aims to promote understanding of the importance of EE&C by developing SMEs in the industrial sector through formal personnel training programs, as well as create an “energy-saving conscience” in the demand side (household, business and government) sectors via television and print campaigning (Kobayashi, 2010). The financial barriers to EE&C have been addressed by the following mechanisms within the ENCON fund: Venture capital funding for ESCOs, tax incentives for EE project owners, and a revolving fund that enables banks to lend to EE projects and ESCOs at sub-market interest rates (Sinsukprasert P., 2010). Within the National Energy Policy Council (NEPC)—the organization which manages the ENCON Fund—there is a policy-making unit and a policy-regulating/implementing unit, allowing for strategic and efficient development, implementation and on-going assessment of current policies. Recent critique has indicated that Thailand’s EE policies and programs are in good condition and that the financial support system provided by the ENCON fund is particularly effective. Recommendations have focused rather on improving efficiency in the institutional structure—in particular, clarifying the roles and responsibilities between the functional units of the NEPC and maintaining close collaboration among them. Select key policies include:

**Energy Conservation Promotion Act (effective since 1992, currently in Phase 3):** Established to stimulate EE&C improvement, R&D of renewable/alternative energy, the creation of SMEs in the industrial sector and public awareness of EE&C in the demand side sectors, with capital, grants and subsidies provided to investors through the ENCON Fund.

**Royal Decree on Designated Buildings (effective since 1995, under ENCON Act):** Outlines the standards, criteria and protocol for measuring, reporting and improving upon the energy efficiency of designated buildings.

**Royal Decree on Designated Factories (effective since 1995, under ENCON Act):** Outlines the standards, criteria and protocol for measuring, reporting and improving upon the production, consumption and conservation of energy in designated factories.

**India**

Development of energy efficiency policy in India has focused primarily on addressing the financial barriers facing adoption. While the Bureau of Energy Efficiency (BEE) has provided the structure necessary to develop, regulate and continuously assess the impact of implemented policies in general, policies have nonetheless been targeted at lowering the barrier to EE&C investment. Primarily, this has been under the two prongs of the Framework for Energy Efficient Economic Development (FEEED): the Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE) and the Venture Capital Fund for Energy Efficiency (VCFEE). The PRGFEE aims to make lending to EE&C initiatives a common practice by banks by offering partial guarantees on otherwise-too-risky EE&C performance contracts. The VCFEE, which by providing government venture capital, aims to expedite the development cycle of EE&C ventures so that the findings from initial successes may be leveraged to develop a formal framework for assessing new opportunities and attracting co-investors. It appears that the adoption barrier of “Lack of Information and High Perceived Risk” is not being addressed formally through, for example, efforts to promote public awareness of EE&C or develop SMEs in industry (Dube, 2011). Rather, it appears that these are the expected result of full adoption and integration of the financial mechanisms under FEEED. Accordingly, suggested next-steps have focused on further development of PRGFEE and VCFEE frameworks and the introduction of additional financial incentive mechanisms rather than on further development of the institutional structure. Select key policies include:

**Energy Conservation Act, (effective since 2001, amended in 2010):** Defined key elements of EE&C and expresses commitment to the cause. Identified energy intensive industries as
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designated consumers, issued EE&C building codes and standards and labeling for equipment and appliances. Led to establishment of the Bureau of Energy Efficiency (BEE), which develops and self-regulates policies and strategies in conjunction with market feedback.

Integrated Energy Policy of India (effective since 2008): Established DSM measures for EE&C with estimated energy savings of 15%.

National Mission for Enhanced Energy Efficiency (NMEE) (effective since 2008: Further promoted strategic development and regulation of EE&C policy, financing mechanisms and operations strategies to create and sustain a market for EE&C.


Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE): Established to mitigate the risk faced by banks when lending to EE&C initiatives by guaranteeing a portion of the loan in the event of default, with the aim of encouraging adoption of such lending into the general business models of financial institutions.

Venture Capital Fund for Energy Efficiency (VCFEE): Established to provide government venture capital for EE&C initiatives, allowing for the identification of success factors for use in developing opportunity assessment metrics and attracting co-investment from outside sources.