Financing Energy Efficiency and Implementation Models in Developing Countries

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Why is EE important?

- Global energy demand will grow 45% by 2030, requiring ~US$26 trillion investment
- 87% of this growth will occur in developing countries
- Increased volatility in oil and gas prices and supply
- By 2030, greenhouse gas (GHG) emissions will also grow 45% to 41 Gt
- EE can:
  - Reduce new infrastructure investments while easing bottlenecks
  - Lessen country’s dependence on imported/fossil fuels
  - Enhance industrial/commercial competitiveness
  - Ease public expenditures for energy creating fiscal space for other socioeconomic priorities
  - Reduce environmental footprint, both locally and globally
Barriers to Energy Efficiency Investments

Policy/Regulatory
- Energy pricing and collections
- Procurement policies favor lowest cost
- Import duties on EE equipment
- Unclear or underdeveloped institutional framework for EE
- Lack of appliance standards and building EE codes, lack of testing, poor enforcement

Equipment/Service Providers
- High project development costs
- Limited demand for EE goods/svcs
- Diffuse/diverse markets
- New contractual mechanisms (ESCOs)
- Limited technical, business, risk mgmt skills
- Limited financing/equity

End User
- Lack of awareness of EE and high disc rates
- Higher project dev and upfront costs
- Ability/willingness to pay incremental cost
- Low EE benefits relative to other costs
- Perceived risks of new tech/systems
- Concept of energy savings is “virtual” – can not “see”
- Mixed incentives
- Behavioral biases
- Lack of credible data

Financiers
- New technologies and contractual mechanisms
- Small sizes/dispersed widely→high transaction costs
- High perceived risks as these are not traditional, asset-based proj
- Other higher return, low risk projects are more attractive
- Behavioral biases
Why has progress been so slow?

- Numerous informational, technical, financial and behavioral barriers across a diverse range of stakeholders

- Institutional challenge – need for appropriate deliver mechanisms to identify, package, finance and implement EE projects across sectors and end users in an effective and efficient manner

- Other challenges include:
  - Lack of international consensus on approaches (e.g., regulation vs. incentives vs. information) – i.e., appropriate role of government
  - Overreliance on Western models - local markets require local solutions
  - EE is invisible, hard to measure – need for consistent, credible data
  - Poor incentives - mixed institutional incentives, low prices, behavioral inertia
EE scale-up challenges

- **EE Retrofits vs. New Systems**
  - How to accelerate retrofits?
  - How to better influence new systems (factories, buildings, urban development, new infrastructure)?

- **Regulation vs. Incentives**
  - How to foster improved regulatory, enforcement regimes?
  - How to best complement regulatory measures with voluntary programs with incentives?

- **Global Trade**
  - How can international community help address developing country disincentives?
  - What approaches should be used for equipment importers vs. exporters?
  - How can the private sector help address these issues?
Int’l experiences – delivery models

- Utility demand-side management (DSM)
- Energy service companies (ESCOs)
- Financing programs
- Market transformation
- Incentives, subsidies and grants
Utility DSM

- Utilities have many advantages for pursuing DSM but also mixed incentives
- Load management vs. energy conservation
- Recent proliferation of utility CFL programs
- Post DSM models – DSM bidding, standard offer, EE power plant

Examples
- Argentina
- Bangladesh
- Brazil
- India
- Mexico
- Pakistan
- Philippines
- South Africa
- Sri Lanka
- Thailand
- Uruguay
- Vietnam
Utility DSM

- **Results**
  - *Thailand* (1993-2000) invested **US$60 million** and saved **566 MW; 3,140 GWh/yr**
  - *Brazil* (2000-04) invested **$200 million** which saved **500 MW; 1,500 GWh/yr**
  - *Uganda* (2006-08) distributed **800,000 CFLs** at a cost of **$1.3 million** and saved **30 MW**.

- **Key success factors**
  - Proper regulatory and financial incentives
  - Adequate and dedicated funding source
  - Utility management commitment
  - Strong program planning, implementation and evaluation functions
  - Strong customer outreach
ESCOs

- ESCOs can bundle projects, mobilize financing, offer turn-key services, assume performance risks
- But ESCOs are complex, requiring strong legal, financial, accounting, business infrastructure

**Examples**
- Brazil
- Bulgaria
- China
- Croatia
- India
- Poland
- Thailand
- Tunisia
- Turkey
- Uruguay
- Vietnam
ESCOs

- **Results**
  - **Germany** (1992-2005) initiated about $5 billion in ESPC contracts with some 40+ active ESCOs
  - **Japan** (1998-2007) invested $406 million in ESPC projects and has some 130 registered ESCOs
  - **China** established 3 pilot EMCs in 1997 and now has 400 EMCs which transacted $2.8 billion in projects in 2009

- **Key success factors**
  - Supportive policies and enabling environment
  - Introduction of simpler business models first
  - Appropriate financing schemes
  - Early market development through public sector projects
  - Development of PPP models (e.g., public ESCO, super ESCO, ESCO agents, ESCO financing windows) to kick-start market
ESCO business models

Full service ESCOs designs, implements, verifies and gets paid from actual energy saved (aka “Shared Savings”)

Energy supply contracting, takes over equipment O&M and sells output at fixed unit price (aka “Chauffage”, “Outsourcing”, “Contract Energy Management”)

ESCOs w/third party financing, designs/implements project, and guarantees minimum level of savings (aka “Guaranteed Savings”)

ESCO w/variable term contract, act as full service ESCO, but contract term varies based on actual savings (aka “First Out Contract”)

Supplier credit, equipment vendor designs, implements and commissions project and is paid lump-sum or over time based on estimated savings

Equipment leasing, similar to supplier credit except payments are generally fixed (based on est. energy savings)

Consultant w/performance-based payments, agent assists client to design/implement project and receives payments based on project performance (fixed payment w/penalties or bonuses)

Consultant w/fixed payments, where consultant helps the client design and implement the project, offers advice and receives a fixed lump-sum fee

World Bank, 2005
EE financing programs

- Need to bring commercial banks into market and demonstrate the high returns
- Many tools – credit lines, revolving funds, special purpose funds, credit guarantees, special purpose vehicles
- Still need to develop delivery mechanisms
- **Examples**
  - Bulgaria
  - China
  - Egypt
  - Hungary
  - India
  - Lithuania
  - Philippines
  - Romania
  - Russia
  - South Korea
  - Thailand
  - Turkey
  - Uruguay
  - Tunisia
EE financing programs

- **Results**
  - **Bulgaria** (2006-09) created an EE Fund which has financed *75+ projects* valued at *$22 million*
  - **Hungary** (1997-2007) established a loan guarantee program which initiated *$93 million* in EE projects
  - **India** (1999-08) credit line (IREDA) completed *$36 million* in EE projects saving *90 MW, 249 GWh/year, 9.4 million tonnes CO₂*

- **Key success factors**
  - Holistic upfront market assessment
  - Proper design of financing schemes and products
  - Careful selection of financing partners
  - Standardization to lower transaction costs
  - Appropriate and intensive marketing to ensure strong pipeline
  - Flexible schemes that can evolve with markets
Market transformation

- Targeting of products rather than end users
- Many tools – utility DSM, standards & labeling, market aggregation, marketing, technology transfer, financing, rebates, manufacturer negotiations, or a combination
- Main issues are overcoming higher costs and changing purchasing behaviors

**Examples**

<table>
<thead>
<tr>
<th>Bangladesh</th>
<th>Cuba</th>
<th>Mexico</th>
<th>Sri Lanka</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolivia</td>
<td>Ethiopia</td>
<td>Philippines</td>
<td>Thailand</td>
</tr>
<tr>
<td>Brazil</td>
<td>Ghana</td>
<td>Rwanda</td>
<td>Uganda</td>
</tr>
<tr>
<td>China</td>
<td>India</td>
<td>South Africa</td>
<td>Vietnam</td>
</tr>
</tbody>
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Market transformation

- **Results**
  - *CFL Programs* around the world have been able to significantly shift market and now bring <$1 for large purchases
  - *European Union* (1993-2007) achieved a 45% reduction in energy use of refrigerators through S&L efforts

- **Key success factors**
  - Strong upfront market research
  - Effective public campaigns
  - Incentive schemes preceding mandatory ones have worked better
  - Careful selection of financing partners
  - Judicious use of subsidies can help
  - Effective and efficient enforcement
## Market transformation

### Examples of Cost Reduction from Bulk Procurement for CFLs

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Procurement Size</th>
<th>Bulk Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vietnam – Phase I</td>
<td>2004</td>
<td>300,000</td>
<td>$1.07</td>
</tr>
<tr>
<td>Phase II</td>
<td>2005</td>
<td>700,000</td>
<td>$0.98</td>
</tr>
<tr>
<td>Uganda</td>
<td>2006</td>
<td>800,000</td>
<td>$1.10</td>
</tr>
<tr>
<td>Rwanda</td>
<td>2008</td>
<td>200,000</td>
<td>$1.00</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>2009</td>
<td>4,500,000</td>
<td>$0.87</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>2009</td>
<td>3,300,000 (13-14 W)</td>
<td>$0.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,200,000 (20-23 W)</td>
<td>$1.04</td>
</tr>
<tr>
<td>Philippines</td>
<td>2009</td>
<td>5,000,000</td>
<td>$0.87</td>
</tr>
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Incentives, subsidies and grants

- Use of public funds to demonstrate new technologies or models, overcome initial high costs, lower perceived risks, jumpstart nascent market.
- Can be used where credit barriers is too high, banks are unwilling to lend, help address low priority of EE among consumers.
- Can be used with other schemes as long as subsidies do not undermine market-based approaches.
- Example: *Vietnam* (2005-09) supported 111 ESCO projects with total investment of $5+ million with <$1 million in small grants.
- Success factors: effective administration, targeted use, sunset provisions, intensive dissemination.
What have we learned?

- EE requires a long-term and dedicated focus
- Western models can serve as reference points, but need to carefully adapt to local situations
- Holistic market assessments are critical
- Programs should be commercially-oriented, demand-driven and flexible
- Balance policy frameworks, institutional arrangements, training, and implementation
- Show results within 1-2 year to create credibility
- Create strong incentives for all actors to actively participate
- Launch marketing campaigns to ensure high participation
- Follow-up technical support to address implementation hurdles and program/market evolution
Accelerating EE

- Enact EE legislation and supporting regulations
  - Signals government commitment
  - Provides institutional mandates and funding mechanisms

- Develop EE programs and set targets
  - Creates lines of accountability
  - Brings stakeholders together for common purpose

- Build local capability
  - Often most effective when “learning-by-doing”
  - Includes successful marketing and education campaigns

- Replicate and scale up
  - Builds upon successful pilots, demos, models on a large, commercial scale
  - Gov’t shifts from implementer to market organizer, advocate
New emerging models

- Foster voluntary agreements through global EE PPPs – e.g., incandescent/T-12 phase out, greening supply chains, discounts, commercial bank EE financing targets
- Issuance of country-wide or regional standard offers
- Global or regional certification agencies
- Bundle public facilities for large-scale ESCO projects
- Improved urban planning and design
Thank you!

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