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Promoting Energy Efficiency in Reforming Electricity Markets: A Guidebook for Stakeholders

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PROMOTING ENERGY EFFICIENCY IN REFORMING ELECTRICITY MARKETS: A GUIDEBOOK FOR STAKEHOLDERS

Final Report

Prepared for:

Center for Environment
Office of Energy, Environment, and Technology
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This report is the second in a three-part set devoted to the topic of the impact of power sector reform on energy efficiency around the world. The first two reports are:

1. *Bibliography: The Impact of Global Power Sector Restructuring on Energy Efficiency,* March 1998.

2. *Case Studies of the Effects of Power Sector Reform on Energy Efficiency,* March 1998.

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EXECUTIVE SUMMARY

ES.1 BACKGROUND

Many developing countries are initiating reforms of their power sectors to stimulate private investment, increase operation and management efficiencies, and lower the costs of power. The impetus for reform is emerging from a host of power sector problems, including insufficient or unreliable generating capacity, mounting government and sector debt, and constrained economic growth as a result of poorly managed power sectors. To address these problems, many countries are unbundling vertically-integrated utilities into distinct generation, transmission, distribution and retail supply companies; introducing commercial management principles to government-owned monopolies; and in many cases transferring operation or ownership to private companies.

At the same time, most developing countries are experiencing rapid economic and population growth that will have critical ramifications for the future demand for electricity. There is substantial opportunity to significantly improve the end use efficiency of power consumption -- perhaps as much as 30% from a consumer perspective or even more from a societal economic perspective. Yet there are a number of questions surrounding how power sector reforms might affect a country's efforts to improve the efficiency of its power consumption:

- Have reforms reduced or increased barriers to improving energy efficiency?
- Is there a public policy reason to give energy efficiency special attention?
- What mechanisms can stimulate energy efficiency investments in a reformed system?
- Should power sector reforms include specific mechanisms to support energy efficiency?
- Are there better mechanisms outside the power sector to address efficiency?
- When, and how should efficiency be addressed in the deliberations on reform?
- What kinds of market infrastructure and capabilities are required to deliver energy efficiency in a reformed power market?

ES.2 PURPOSE OF THIS REPORT

This report is one of a set of three reports designed to illuminate the realized interaction between power sector reform and energy efficiency. The companion reports are *Bibliography: The Impact of Global Power Sector Restructuring on Energy Efficiency* (July 1997), and *Case Studies of The Effects of Power Sector Reform on Energy Efficiency* (February 1998). USAID also recently undertook a related assessment of the effects of power sector restructuring on the environment, in the report *The Environmental Implications of Power Sector Reform in Developing Countries.*

There is a synopsis of that report later in this summary. For information on the magnitude of trade and business opportunities that have been estimated for energy efficiency in developing countries, readers should see the USAID report "*The Energy Efficiency Market in Developing Countries: Trends and Policy Implications*" (Business Focus Series, November 1997).

This efficiency report is primarily targeted to key decision-makers in developing countries who can use it to make more informed decisions about efficiency initiatives in their countries. These decision makers include government officials, utility executives, technical managers in national legislatures, government energy agencies, power sector organizations, energy service industries, and consumer and environmental nongovernmental organizations. Other audiences include international financial and development aid institutions, and consultants and staff to these organizations.

This report reviews the main opportunities and barriers to energy efficiency, summarizes the major types of power sector reforms, analyzes the implications of power reform models and regulations for energy efficiency, summarizes the experience of six case-study countries, and presents conclusions and recommendations for other countries contemplating power sector reforms.

ES.3 OBSERVATIONS FROM SIX CASE STUDY COUNTRIES

Those countries that have first embarked upon the path of reform can provide helpful lessons regarding what types of reforms and policies have worked to promote energy efficiency, which have not, and why. Using criteria that there be at least 3-5 years of post-reform experience to document, we selected five case study countries (Argentina, Chile, New Zealand, Norway, and the United Kingdom). The United States was included as a sixth case study, although its reforms have been bifurcated between generation competition launched in the 1980s and retail competition that is just in its pilot or beginning stages. The following general observations can be made:

- Price competition has been paramount during the early years post-reform, and in many of these countries average retail prices have declined as much as 15%.
- End-use energy efficiency was ignored in the deliberations on power reform structure and rules in most countries, and has been an afterthought in two countries.
- Power generation, transmission and distribution organizations are motivated to promote peak load management, via time-of-use rates and other mechanisms, that can manage demand relative to capacity constraints.
- Pre-reform utility energy efficiency activities have largely diminished under reforms.

- Only the largest commercial and industrial energy users seem to attract the attention of energy service companies (ESCOs) and other private energy services providers.

- Hoped-for end use efficiency markets for small and medium-size users, served by equipment manufacturers and service companies, generally have failed to materialize due to residual market barriers unrelated to power sector reform.

- The only case of power organizations voluntarily offering efficiency services is in New Zealand, where regulations that all retailers buy from a single power pool dictate that power suppliers compete on the basis of service, and not price.

- Subsequent efforts to append efficiency mechanisms after reform structures and rules are decided are politically unpalatable, and institutional options become more limited.

There are three common explanations why end use efficiency failed to be addressed in four of the case study countries:

- Ineffective policy attention (to issues of efficiency market barriers, short-term transition strategies, sustainable development, or climate change action plans)

- Inadequate legal or regulatory framework (with the authority or staff resources to review market response to price changes and competitive service offerings)

- Insufficient institutional capability and public constituency support (lacking in organization, political access, technical capabilities or timing by those in government and outside constituencies)

In the two countries where efficiency was addressed, all three of these factors were solved.[1]

After reforms were in place in four of the six countries, governments undertook remedial actions to preserve or initiate energy efficiency services.[2] These actions took four forms:

- Enabling laws to permit power organizations to participate in energy services, generators/ distributors and energy suppliers to collaborate on activities, or joint ventures to occur between technology manufacturers and distributors

[1] Efficiency was addressed in 1996-97 in the U.S. in the State of California through a mechanism that is parallel to the power sector reform structure. In New Zealand efficiency has been addressed both internal to reform (via a mandate to publicly-owned utilities) and external to reform (through policy for government-funded efficiency programs).

[2] This was the case in Argentina, Norway, the U.K., and New Zealand.

- Wires charges or sales surcharges to create a fund to support efficiency programs
- Mandatory requirements for power distributors to offer (free) efficiency services
- Publicly-supported programs for special constituencies (low income, elderly, etc.)

Four additional areas of initiatives may warrant future consideration to bring the level of efficiency achievements closer to that which might be socially desirable. These are:

- Policy assessment of the merits of possible transition or longer-term public initiatives for efficiency
- Development of stronger constituencies and public support for efficiency via greater visibility, coalition-building, marketing consortiums or branding strategies by manufacturers and suppliers, expanded authority for government agencies, and energy codes and standards for new buildings, appliances, and equipment
- Legal and business enabling initiatives to support market-based efficiency
- Financing mechanisms that can support efficiency services in the public interest, ESCO business start-up or incubation, or other ways to manage the higher first-costs to consumers of energy efficient products

ES.4 CONCLUSIONS: THE IMPLICATIONS OF POWER SECTOR REFORM FOR ENERGY EFFICIENCY

Many developing countries will approach power sector reforms from a different vantage point than many of the case studies reported on in this report. Most typically, new reform efforts in developing countries may see prices *increase* with the elimination of price subsidies and certain cost protections. If so, this could stimulate a market demand for efficiency. On the other hand, many developing countries will not have the benefit of a pre-existing infrastructure of trained energy auditors, efficient equipment suppliers, consumer information and protection resources, or commercial finance instruments.

The degree of achievement of a country's societal cost-effective potential for efficiency improvement will be affected by the reform system selected. As represented in Exhibit ES-1, the extent to which this potential is achieved is determined by the respective actions and investments taken by different market actors -- end use customers, the electricity industry, and private energy service companies. The set of energy efficiency improvements made by each market actor is determined by their respective determinations of cost effectiveness. The middle circle in ES-1 represents the total energy efficiency potential from society's perspective. Each of the three outer

circles represents a set of actions and investments deemed cost effective by the three market actors, resulting in the achievement of some portion of the energy efficiency potential. The

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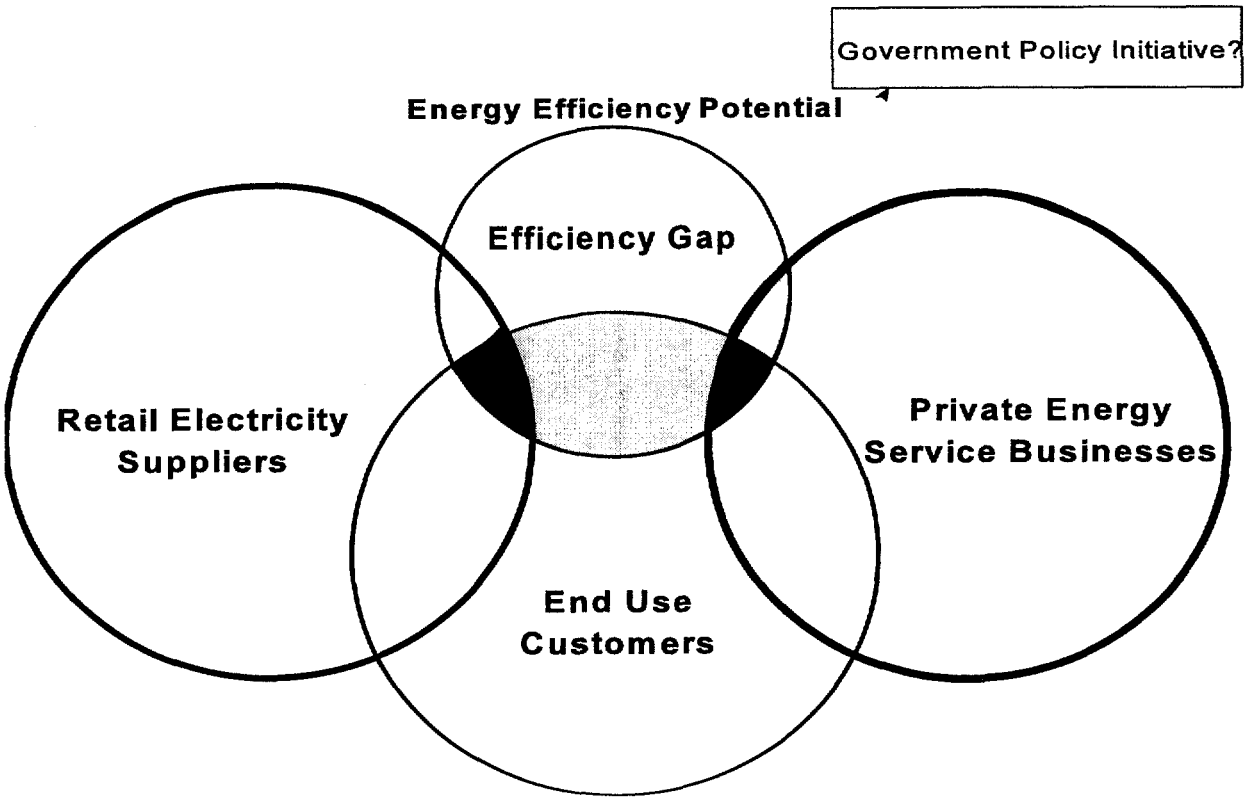
Exhibit ES-1: The Post-Reform Efficiency Market



unshaded portion of the middle circle represents the efficiency gap, which might justify some public policy initiative to reduce the size of the gap.

The case studies revealed that the nature of power sector reform structure and regulations do alter the degree that each outer circle actor overlaps with the middle circle of efficiency potential. In thinking about the possible need for a public policy initiative, the questions to be asked are "What is the size of the efficiency gap?" and "How much of this gap might be reduced through refinements in power pricing, changes in structural or regulatory rules for the power sector, or other public initiatives that could influence the size of market response to efficiency?".

Based on the literature reviewed and case studies evaluated, the report nonetheless identifies several characteristics of a reformed power sector that would enhance the incentive of market actors to undertake energy efficiency measures. For *electricity suppliers*, these occur when:

- energy efficiency improvements they promote do not reduce net revenues;
- retail pricing rules decrease the importance of maximizing kWh sales;
- retail competition exists and its focus shifts from low prices to value-added services; or

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- government regulation mandates them to do so.

End-use customers do respond to price changes, given enough time for the replacement of electricity-consuming appliances, equipment, and processes. Reforms can enhance *end-user* price signals when:

- customer electricity use is accurately measured and revenues systematically collected;
- system-wide and customer class subsidies are eliminated;
- tariff structures reflect time and location specific costs; and
- future electricity prices are relatively predictable.

Finally, the factors that encourage the emergence of *private energy services providers* in a reformed power sector are as follows:

- price signals that are predictable and reflect true costs of service;
- unrestricted business environment that enables new forms of energy services;
- access to customer information for marketing purposes;
- introduction of retail power supply competition to profitable market segments;
- market rules that allow the same firm to offer both supply- and demand-side energy services; and
- sources for consumers to get independent comparative information to assess the claims of efficiency products and services.

Efficiency incentives and disincentives within reform models. The single characteristic of retail competition provides one of the most distinguishing characteristics affecting power sector interest in energy efficiency. Following are profiles of reform model features that either discourage or encourage efficiency under two sets of reforms -- the first without retail competition (whether under commercialization, privatization, unbundling, or wholesale-only competition reform schemes) and the second with a retail competition reform model.

Non-competitive Retail Power Market

Features which **discourage** efficiency include:

- an unbundled structure
- price cap regulation
- absence of regulatory requirement for efficiency
- cross-ownership between generation and distribution entities
- heavy competition among generators that drives down power prices
- either a low retail power prices or little change from pre-reform prices

Features that tend to **encourage** energy efficiency are:

- vertical integration where generation, transmission, and distribution marginal costs are born by one organization
- removal of price subsidies
- price regulation that minimizes the total revenue gained from increased sales

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- regulated efficiency performance requirements and surcharges on all suppliers
- independent ownership between generation and distribution functions (where unbundled)
- no or little supply competition
- high retail prices or
- a noticeable increase in retail prices from pre-reform levels

Competitive Retail Power Market

Features which **discourage** efficiency include:

- competition primarily based on price
- concentrated ownership of generation and energy supply entities
- a limited number of suppliers

Features which can **encourage** efficiency are:

- competition regulated on the basis of service, and not price
- varied ownership of and between generators and power suppliers
- allowance of dual business lines or joint ventures between power suppliers and services firms
- greater numbers of power suppliers that need to differentiate themselves

Two observations merit note. First, many of the "discouraging" features for efficiency, such as price competition, low or lowered prices, and an unbundled structure, are *exactly* the features that most economists and reform specialists would argue are the fundamental principles in power sector reform objectives. This is not to say these are undesirable -- just that they can have an effect that slows down the rate of investment in end use efficiency. If so, some mitigating actions could be considered.

Second, the "encouraging" features of a non-competitive retail market can be completely opposite the "encouraging" features for a competitive retail market (as in the case of the numbers of competing suppliers). Thus *it is not the features themselves*, but how they function in a larger reform model, that determines the degree of incentive for efficiency. If it is public policy to encourage efficiency, the *reform mechanisms or other initiatives will have to be customized to address efficiency in the specific reform model chosen, and its regulations.*

Efficiency initiatives possible outside the reform models. Even if power sector reforms were to reduce the size of the efficiency gap, significant barriers to achieving potential efficiency improvements will remain regardless of which reform model is chosen. Totally independent of the power sector reform structure and operating rules, the general business climate can also determine the degree to which economic levels of energy efficiency will be achieved. Exhibit ES-2 displays market factors that can discourage or encourage efficiency actions. Other factors that can help or hurt the development of this market include comparative information on technology performance and professional capabilities, perception by vendors and service companies of the potential market, and the general culture for entrepreneurial initiatives. To overcome or reduce some of the residual market barriers, some public policy initiatives may be necessary.

Exhibit ES-2
Factors Outside the Power Sector that Affect Energy Efficiency Market Response

Market Factors	Discourages Energy Efficiency	Encourages Energy Efficiency
Manufacturers	Few, local only, old designs or production equipment	Many, multi-nationals represented, newer global technology designs
Equipment distributors	Limited numbers of large distributors, small single proprietors	Chains, networks with volume buying power, good technical support
ESCOs	Barriers to: performance contracts, service business, access to working capital, or foreign partnerships	Past market development via utility or government programs; foreign partnerships
Energy efficiency talent pool	Limited local technology training, limited international exposure	Good educational and training programs, foreign exposure
Consumer finance and credit facilities	Not offered; or high interest, short term	Available, affordable interest, terms match payback periods
Import taxes & duties	High	Low

Public policy initiatives can be applied external to the reform framework to overcome some of the residual market barriers to efficiency. Types of initiatives include:

- voluntary efforts such as public information campaigns
- market transformation initiatives targeted at end use equipment suppliers and consumers
- direct public investment in end use efficiency measures
- energy efficiency codes and standards for buildings and equipment

A hybrid approach may be the best solution. Experience across the case study countries suggests that regardless of the power reform model used, a hybrid strategy eventually unfolds, combining three elements:

- *Competitive service* offerings under reform models and rules that permit power suppliers, distributors, and/or private energy service companies to provide commercially viable and profitable services (typically to large or medium-size customer segments and for well-established, common technologies).

- *Market transformation* services guided by collaborative constituencies that build greater efficiency market participation by power companies, equipment vendors, customer segments and/or technologies that do not yet meet the market hurdle for commercial viability.

- *Public purpose efficiency programs* supported by government taxes, "wire charges", or electric account fees that pay for general public information and implementation services

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that have a public benefit, but no possibility of commercial viability. Examples are energy information centers and public funding of efficiency for low income or senior households.

The specific reform model chosen, interests of constituencies, and local capabilities are likely to dictate the proportion of effort and timing of each strategy element, but are not so likely to rule out the advisability of any element of the hybrid approach.

ES.5 RECOMMENDATIONS: ADDRESS ENERGY EFFICIENCY IN REFORM DELIBERATIONS

1.	Include treatment of efficiency as an issue in the reform deliberations
2.	Establish an *explicit process* to address how cost-effective improvements in energy efficiency can thrive in a reformed power sector
3.	Select the best options for addressing efficiency based on country circumstances and the preferred reform model
4.	Ensure that competent organizations and individuals participate in and have the ability to contribute to the deliberations on efficiency and environment

1. Include treatment of efficiency as an issue in the reform deliberations.

Due to the similar sets of issues and considerations for both energy efficiency and environmental policy goals, any country contemplating power sector reforms is advised to incorporate explicit treatment of *both energy efficiency and the environment* in deliberations on the reform process. In many cases constituencies will be the same, while in others tradeoffs may need to be made in setting priorities for attention. Exhibit ES-3 on the following page summarizes the findings and recommendations from the companion study on the environmental implications of power sector reform.

2. Establish an *explicit process* to address how cost-effective improvements in energy efficiency can thrive in a reformed power sector.

Each country contemplating power sector reform, or seeking to fine-tune the effects of reforms already underway, needs to assess the size of its own efficiency gap and what rules or policies might be appropriate to reduce this gap. Chapter 5 outlines a process that can be used by parties with a stake in either power sector reform or energy efficiency to:

- determine the extent to which end-use efficiency considerations need to be included in the deliberations on reform
- select strategies for addressing efficiency either within or outside reforms
- assess the best mechanisms and parties to implement the selected strategies.

This process is depicted in Exhibit ES-4.

Exhibit ES-3
Conclusions: The Implications of Power Sector Reform for the Environment

There are distinct parallels in the treatment of both energy efficiency and the environment in the context of power sector reform. The following table summarizes the implications for the environment of the major types of reform, as described in the counterpart environmental study which focuses on consequences for generation mix, supply-side efficiency, and air emissions.

Reform Model	Environmental Implications of Reforms
Commercialization	Reduction of waste and better cost accounting (+) Reduction of energy losses (+)
Privatization	Boost for off-grid renewable generation (+) Assets upgraded by private capital (+)
Unbundling	Distributed generation depends on ability to capture system-wide benefits (0) Equal access to transmission depends on contract terms (0) Energy losses reduced due to profit incentive (+)
Wholesale Competition	Low capital cost, dispatchable generation rather than renewable generation favored by short-term markets (-) Highly efficient fossil generation technologies favored (+) Nonrenewable generation favored (-)
Retail Competition	Low-capital-cost generation favored (-) Incentives to invest in environmental technology R&D reduced (-) Retail supplier could seek competitive advantage based on environmental attributes of generation mix (+)

Key: (+) = positive; (-) = negative; (0) = depends on implementation

As a result of this study, several essential steps are recommended to be taken in conjunction with reform for an environmentally-successful outcome:

- Creating an independent regulatory body that can monitor and influence environmental performance through tariffs, licensing, funding, and promotion activities
- Encouraging involvement of environmental stakeholders, through mechanisms ranging from creating environmental ministries to holding public hearings
- Creating and enforcing emissions standards
- Eliminating policy and market barriers to the use of clean fuels and technologies.

Even basic operational and maintenance improvements created by commercialization can play a significant role in reducing emissions per kilowatt hour of electricity generated and thus improving environmental performance of the power sector.

Source: ***The Environmental Implications of Power Sector Reforms in Developing Countries,*** **March 1998.**

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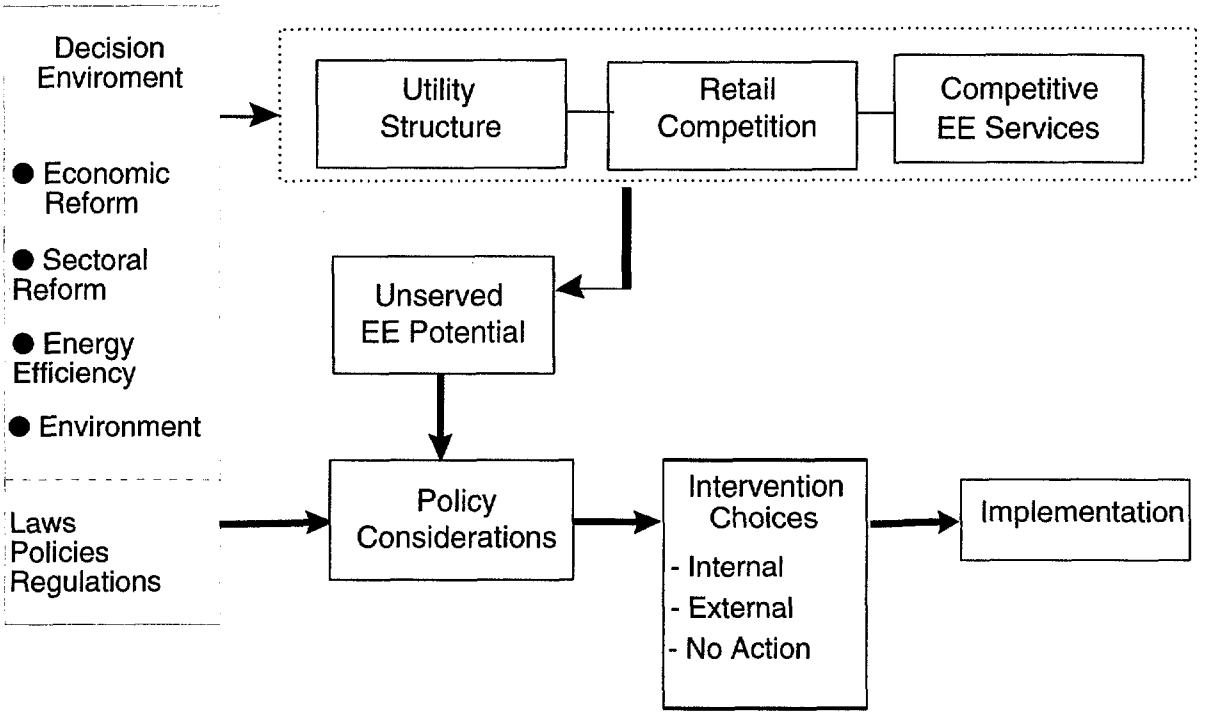
Exhibit ES-4

Overview of the Policy Process for Addressing Energy Efficiency and Reform



The outcome of the process will of course be dictated by considerations of politics, the degree of development of relevant organizational and market infrastructure, and the level of capabilities and resources that can be devoted to achieving efficiency.

3. Select the best options for addressing efficiency.

Efficiency can be addressed internal or external to decisions on the structure and rules of power sector reform. Exhibit ES-5 summarizes some of the initiatives that could be considered *internal* to reform under each of three generic reform models.

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Exhibit ES-5
Regulatory Options for Addressing Energy Efficiency Within Reform Models

Reform Rule Topics	Bundled, Commercialized Model	Unbundled Model, No Retail Competition	Unbundled Model, with Retail Competition
Generation	Encourage utility to study load management	Allow generators to enlist end users in load management	Allow agreements across G/T/D to capture benefits of EE & load management
Distribution	Require utility load management to minimize G/T/D capacity investment	Require distributors to analyze load management impacts on capacity, and justify capacity investments	Require capacity and TOU elements in tariffs
Retail power supplier	not applicable	Allow distributors or power suppliers to offer (for-profit) EE services	Permit DSM to compete with resource acquisition
Wholesale supply competition	Permit DSM to compete with IPP contracts	Permit DSM to compete with G/T resources	Encourage longer term supply/ service contracts that can to amortize energy efficiency services
Power expansion plans	Require IRP or equivalent	Require distributors to consider EE and DSM in least cost supply purchase and investment plans	Require distributors to file IRP plans that consider EE and DSM
Retail tariffs	Increasing blocks Eliminate subsidies TOU pricing	If retail prices regulated: increasing blocks, eliminate subsidies, use TOU prices, structure tariffs to minimize gain/reward from new kWh sales. If prices not regulated: market will dictate prices	If prices regulated: increasing blocks, eliminate subsidies, use TOU prices
Cost recovery for EE/ load management	Allow recovery of approved expenses, possibly with profit incentive	If retail prices regulated: Allow recovery of approved expenses, possibly with profit incentive. If not regulated: May recover via wires charge or account charge	If prices regulated: Allow recovery of approved expenses, possibly with a profit incentive If not regulated: May recover via wires charge or account charge
Energy Efficiency	Require utilities to offer specified EE services	Require retail competition on basis of service, not price.	Promote idea of suppliers' offering free or low-cost services bundled with power supply contracts.
Load management	Require TA to customers on TOU, load management at recovered expenses	Apply price caps and time and location-based charges to T&D. Promote wholesale power contracts with TOU terms	Apply price caps and time and location-based charges to T&D. Promote wholesale power contracts with TOU terms.

Exhibit ES-5
Regulatory Options for Addressing Energy Efficiency Within Reform Models

Reform Rule Topics	Bundled, Commercialized Model	Unbundled Model, No Retail Competition	Unbundled Model, with Retail Competition
Customer service	Require utilities to offer free public information on EE	Require distribution companies to supply free public information on efficiency	Require all retail suppliers to offer free public information on EE
Financing mechanisms	Encourage utilities to offer or arrange customer EE leasing or loan programs	Shareholder/owner funds may be used to support competitive services.	Shareholder/owner funds may be used to support competitive services.

Exhibit ES-6 presents examples of initiatives that could be undertaken *external* to reform under each of four intervention strategies. Any of these initiatives could be viewed as short-term (while waiting for a self-sustaining market), transitional public facilitation of deeper market transformation (short-to-medium term), or longer term publicly-funded activities (where markets are not expected to materialize). The time frame will depend on the size of the efficiency gap, importance of narrowing this, and the relative development of the market and infrastructure. In all cases, the initiatives should be selected and designed to overcome specific, identified market barriers.

Exhibit ES-6
Sample Initiatives External to Reform

Initiatives	Voluntary	Market Transformation	Public Investment	Codes & Standards
Information & Awareness	Public campaigns Workshops	Joint programs, funded by power & product vendors	Targeted community promotion	Public relations to support implementation
Technology Promotion	Promotion	Demonstrations	Direct installation of no/low cost items	Privately-advertised compliance
Innovation	Market-driven	Design competitions Life-cycle costs	Group buying high efficiency products	Standards set ahead of product designs
Labeling & Branding	Appliance energy use information labels	High performance branding	none	Permit for minimal compliance
Education	Energy audits	Model performance contracts	EE included in school curriculum	Training for professionals
Risk Reduction	none	Private certification	Government certification	Materials qualification
Financing	none	Dedicated investment funds with guarantees	Tax credits, grants, no-interest loans	none

4. Ensure that competent organizations and individuals participate in and have the ability to contribute to the deliberations on efficiency and environment.

It is critical that many view points be represented in the deliberations on whether and how to address efficiency in the context of power sector reforms. Organizations that should participate include government (energy policy, research, regulatory organizations), the efficiency market infrastructure (manufacturers, designers, ESCOs, product vendors), and non-governmental organizations (representing consumer, energy conservation, and environmental issues). These stakeholders must have sufficient background and understanding of the reform models, the likely impacts on efficiency, and public policy options for encouraging the achievement of energy efficiency.

Developing this knowledge can be accomplished through studies, workshops, and dissemination of reports and other forms of technical assistance. Much of this information is in the public domain, as reported in the *Bibliography* companion document prepared for this project. To the extent that specialized assistance may be needed from sources outside the country, multilateral development banks and bilateral donor aid organizations can help. The most commonly recognized forms of assistance are:

- information and awareness at both policy and technical levels
- training & workshops
- analysis tools and supporting technical documents
- technical assistance customized to unique situations or providing in-depth support.

CHAPTER 1
ENERGY EFFICIENCY OPPORTUNITIES AND BARRIERS

The opportunity for developing countries to leapfrog to highly efficient use of electricity is great. Developing countries are experiencing both rapid population growth and economic development. As a result of economic growth, many major types of appliances and equipment are beginning to penetrate new markets and building construction is booming. Massive, future private investment to expand the use of electricity-using equipment and processes will determine a country's energy intensity for decades to come.

However, the barriers to achieving the benefits of improved energy efficiency are equally high. Relative to OECD countries, electricity price signals in developing countries are more distorted, information about energy efficiency measures is less available, and investment capital to take the measures is more scarce and costly. As a result, market actors such as residential, commercial, and industrial consumers do not take energy-conserving actions that are in their respective economic interests. Other potential market actors (e.g. suppliers of electricity-using products and services, government agencies, and utilities) similarly do not act to help end-users bridge the "efficiency gap".

Electricity consumption patterns have critical ramifications for a society's economic development, resource use, and environmental health. Developing countries are contemplating or implementing a variety of power sector reforms, some of which affect the extent to which the opportunities for end-use efficiency improvements are realized.

1.1 THE IMPETUS FOR POWER SECTOR REFORM IN DEVELOPING COUNTRIES

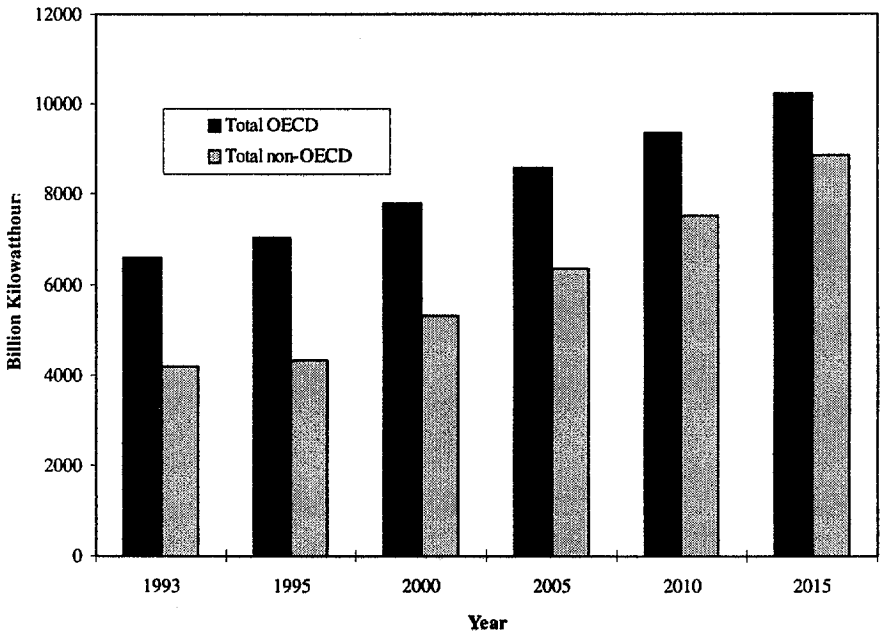
Many developing countries' power sectors have traditionally been publicly-owned and often dominated by a central planning philosophy. In some countries, the government controls or owns both upstream sectors (fuel extraction and transport) and downstream sectors (major industries). Governments also have viewed power as a public service. Universal electrification is frequently a national policy objective, as is the provision of electricity services to rural and low income customers at subsidized rates. These prevailing structural characteristics and management philosophies have contributed to several problems in many countries' power sectors. Two of the most critical problems are the following:

- Countries have been unable to attract private investment because of managerial inefficiency, political interference, and inadequate cost recovery.

- Infusions of cash to shore up foundering public utilities have contributed to government deficits and international debt.

Many developing countries have also faced problems of power shortages resulting from poor reliability of the power systems or because demand has simply outstripped supply. Electricity demand has grown rapidly and demand growth rates are projected to exceed OECD growth rates over the next several years or decades (see Exhibit 1-1). In countries where demand has outstripped supply, electricity consumers are forced either to self-generate their own power or to reduce their consumption of electricity. Self-generation, in fact, constitutes an average of 13% of total (public utility plus self-produced) generation in the 75 developing countries for which such data are available, and its proportion is over 25% in 12 (mostly African) countries.[1] The gap between supply and demand is widening in several countries.

Exhibit 1-1
Projected Total Net Electricity Consumption, 1993-2015
OECD vs. Non-OECD



As a result of these and other problems, pressure from within developing countries and by international lenders is mounting to implement far-reaching reforms. Policy makers' objectives

[1] Heidarian and Wu. December 1994. *Power Sector Statistics for Developing Countries, 1987-1991.* The World Bank, Washington, D.C.

are to free up public capital for other social uses, promote managerial accountability, improve customer service, and stimulate private investment. Many developing countries are now reforming the way that electricity services are provided. They are opening generation to private investment, further privatizing transmission and distribution, and even restructuring the sector to introduce competition and independent regulation. (Chapter 2 discusses the various types of power sector reforms being pursued in different countries.)

1.2 THE BENEFITS OF EFFICIENCY IMPROVEMENTS

Exhibit 1-2
Optimizing Electricity Use in Developing Countries

The use of electricity in developing countries can be optimized in several ways even while overall consumption is growing:

- More end-use services can be provided with the same level of generation by improving end-use efficiency.
- Fuel switching allows the substitution of other energy sources for electricity where their thermal and cost characteristics are better matched to the end-use.
- Load management reduces demand at peak times or shifts loads to a different time of day while leaving overall consumption unchanged.

Changes in consumption patterns can be brought about by using more efficient end-use equipment, changing energy-using behavior, or by optimizing the use of existing equipment through process controls. The changes may be made directly by electricity customers, or stimulated through the activities of the power sector, government agencies, ESCOs, and end-use equipment suppliers. The roles that can be played by these actors are discussed further in Chapter 4.

Developing countries can significantly reduce their requirements for electricity generation capacity and achieve economic benefits from improving the efficiency of electricity use. Different ways of managing electricity use are defined in Exhibit 1-2.[2]

The benefits of energy efficiency are substantial, and are summarized in Exhibit 1-3. Energy efficiency to cost effectively reduce consumption and peak demand by *up to 10 percent of total forecast energy consumption, net of any price elasticity effect* USAID, World Bank, and Asian Development Bank assessments of efficiency and load management potential in Andhra Pradesh (India), Indonesia, Morocco, Poland, Ukraine, and Viet Nam reveal the potential for a range of 1.0 - 10.7% reduction in total generation production requirements, and 1.5 - 9.1% in peak

[2] The term "energy efficiency" will be used in this report as shorthand for the broader set of energy use improvements (efficiency improvements, energy conservation behavior, and load management) where such distinctions are unnecessary.

demand. This potential translates into an average of 5% reduction in capacity, equivalent to 220 GW totaled over non-OECD countries, with the potential for as much as 10% reduction or 440 GW of capacity. This savings can be achieved at the rate of 10-20 GW per year within 1-2 years, and reaches its maximum potential over 15-20 years.[3]

Exhibit 1-3
The Potential for Energy Efficiency in Developing and Restructuring Countries

Energy efficiency has the potential to reduce total forecast demand for power in developing countries and CEE/FSU by 5% to 10%, equivalent to:

- 220 - 440 GW new installed capacity
- 1000 - 2000 billion kWh/year
- 750 million - 1.5 billion tons CO2 reduction per year[4]

Efficiency costs less than half that of new supply, equivalent to:

- *initial* cost savings of at least $140-280 billion in capital investment[5]
- significant savings in avoided *operating* costs

The estimated business opportunities for energy efficiency investments are substantial:[6]

- energy efficiency business in developing countries was an estimated $9.5 billion in 1996
- conservative growth estimates place this at $30.7 billion annually by the year 2015
- the potential may be as high as $66.7 billion annually if policy support and market-based promotion can increase market penetration rates

These benefits accrue to at least four distinct groups: the power sector, electricity consumers, businesses that sell energy efficient equipment and services, and society as a whole. The benefits reaped by each of these groups are described below.

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[3] Jeff Seabright, "Power Sector Reform and Energy Efficiency", USAID, presentation at *International Climate Change Conference*, Baltimore, Maryland, June 13, 1997.

[4] CO2 emissions impacts are based on a mid-point assuming oil as the fuel at 160 pounds CO2 per mmbtu (equivalent to 1.5 pounds per KWh). Gas is 120 and Coal is 200 pounds/mmbtu. Emissions would be 25% higher for coal.

[5] Capital cost savings are calculated as 50% of new supply at $1,250 per kW for generation, transmission, and distribution investment. (Generation investment alone is $1,000 per kW.)

[6] These estimates are reported in *The Energy Efficiency Market in Developing Countries: Trends and Policy Implications*, prepared for U.S. Agency for International Development, Office of Energy, Environment and Technology, November 1997.

Power sector. Energy efficiency improvements reduce the power sector's need for investment capital, which is often expensive in developing countries. End-use improvements can slow the rate of investment needed in expansion of generation, transmission, and distribution facilities. Moreover, each kilowatt hour saved at the point of end-use translates into more than a kilowatt hour of generation saved because energy losses in the transmission and distribution system can easily be as high as 20%. Thus, investment capital is made available for other uses because there is less need to invest in expanding and upgrading the power sector's physical infrastructure. The financial health of the power sector also is improved by reducing sales to customers whose payments do not cover the cost of services, and expanding sales to fully paying customers.

Electricity customers. Energy efficiency improvements can reduce customers' electricity bills. For electricity-intensive businesses in competitive markets, savings can result in increased profits and/or expanded market share. As less investment is required for the power sector, capital can be allocated to economic and social development, which in turn should create greater employment and improve the economic living standards of a country's citizens. Moreover, energy efficiency reduces overall system peak demand, which in turn reduces capacity shortfalls and unserved customer demand.

Energy efficiency equipment manufacturers and service companies. The degree of market penetration that will be achieved for energy efficiency will reflect supply and demand conditions in the market. Energy-efficient equipment will be supplied by manufacturers of such products as lighting, motors, process controls, building materials and systems, heating and air conditioning equipment, household appliances, cogeneration equipment, and large boilers and furnaces. Highly efficient equipment will be specified by engineering and design professionals, installed by building and construction companies, and maintained and serviced by technicians.

Society. There are three important benefits for society of improving energy efficiency. First, dependence on imported fuels is lessened. Second, the environmental costs associated with health effects of pollution, cleaning, and compliance with international obligations are decreased (see Exhibit 1-3). Finally, wasteful resource consumption associated with inefficient electricity use (i.e. excessive groundwater depletion from inefficiently operated electric pumps) may be reduced.

1.3 BARRIERS TO EFFICIENCY IMPROVEMENTS

Potential benefits from energy efficiency measures are not fully realized because of various barriers. Perhaps the largest single barrier to improved energy efficiency in developing countries is caused by distorted price signals. Such distortions may take several forms (see Exhibit 1-4):

- electric tariff subsidies to selected user classes
- national pricing of generation fuel supplies at below market cost

- transportation subsides for generation fuels
- absence of time and location-specific costs of service
- environmental costs not reflected in tariffs.

Exhibit 1-4
Electricity Tariff Distortions

Electricity tariff structures do not provide appropriate price signals for efficient electricity use when they do not reflect marginal costs of new supply. According to World Bank data, the mean 1992 electricity revenue in 89 countries was US$0.087/kWh and the median was only US$0.0623/kWh. While actual costs differ, as a benchmark these tariffs are about 60% of the average revenues among OECD. Moreover, average real tariffs declined in many countries during the 1980s when costs were actually rising.

Although many developing countries have reduced electricity subsidies, tariffs are still often based on political sensitivities and social programs imposed on the power sector. In India and Pakistan, for example, rates are often highly subsidized for agricultural water pumping, whereas rates for large industrial customers reflect full costs. In Indonesia, customers in Java subsidize customers on other islands. In Brazil, large electricity-intensive industries are given subsidized rates. In Ukraine, most residential consumption is subsidized.

Consumption patterns are also distorted when tariff structures do not reflect the time and location-specific costs of service. Few utilities use tariff structures that accurately reflect such temporal or locational costs even though such costs can vary widely.

As a significant component of electricity costs, fuel costs affect power consumption. In many developing countries, fuel extraction and transport is a public enterprise or a quasi-public corporation that is protected from international competition. Subsidies to natural gas and coal consumption for power generation in nine countries alone totaled an estimated US$21.65 billion and US$16.25 billion respectively. Moreover, a public utility buying coal from a public enterprise may not actually repay the full costs. Similarly, fuel transport, off-loading, and storage costs may be subsidized where such facilities are public enterprises.

Distorted price signals, however, are not the only way that improved energy efficiency is inhibited. Revenue collection is often poor and subject to bribery. Customers will respond to tariff structures based on their expectations regarding the effectiveness of revenue collection. Electricity prices by themselves induce efficient electricity use patterns only if the power sector has effective metering and revenue collection practices that are not subject to corruption. Otherwise, it may be less expensive for a customer to bribe the meter reader than to invest in energy saving measures. Revenue collection problems are endemic in many developing countries. The ability to illegally connect to the system (electricity theft) only compounds the problem.

Other non-price barriers are caused by imperfections in the market for goods and services. These barriers include (See Exhibit 1-5):

- inadequate information,

- inadequate local availability or high import cost of efficient equipment,
- high cost of capital,
- "non-convergent" interests

1.4 HOW BIG IS THE EFFICIENCY GAP?

Exhibit 1-5
Market Barriers to Efficiency Improvements

Electricity users lack information about potential efficiency opportunities, equipment options and costs, and how to implement them. Obtaining this information constitutes a hidden but real cost of improving energy efficiency. Even when this information is readily available, however, consumers implicitly trade off risks and returns in deciding whether to make an investment in improved energy efficiency. Risks include the following:

- Will the equipment perform as expected over its lifetime?
- Will future monetary savings be affected by unexpected changes in electricity tariffs, electricity consumption levels, or period of ownership of the electricity-using equipment (i.e. dwelling)?

With respect to availability of energy efficiency technologies, markets are typically fragmented, making it more difficult for suppliers to identify attractive market segments. Suppliers of energy efficiency equipment may face investment hurdles because of an uncertain market size. The building industry, for example, is fragmented among many different trades and firms who are often unaware of efficiency improvement opportunities in new construction, or how to install them properly.

Electricity end-users may face capital constraints for investing in equipment, processes, appliances, and buildings and financing is often expensive. This gives them an incentive to select end-use equipment options that minimize first costs as opposed to life cycle costs.

Other government policies can also distort electricity demand, such as by subsidizing indigenous industries. In Brazil, the government has had a policy of encouraging and subsidizing metals production and export. In some states in India, priority for limited electricity supplies is not to those customers with the highest willingness to pay (e.g. industry) but rather to those that pay very little for electricity services but have political clout (farmers).

Finally, some potential efficiency improvements are not achieved because the individual who has the incentive to achieve the savings is different than the individual with authority over the relevant investment decision. Examples of decision makers that may have nonconvergent incentives with respect to energy efficiency are landlords and tenants, branches within an organization responsible for capital improvements and building operations, and even sometimes individual members of a household.

In the United States and several other OECD countries, the market barriers and failures mentioned above have given rise to a wide range of government and utility sponsored programs. This response, however, has been much less common in developing countries. While the opportunities to optimize electricity use are thought to be large relative to similar opportunities in

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OECD countries, to date there has been little organized demand management activity in developing countries by government ministries or utilities. The few exceptions include Brazil, Pakistan, Thailand, Mexico, Jamaica, and Philippines.

The gap between the level of energy efficiency determined to be optimal from society's perspective and the level actually achieved in the economy is sometimes called "the efficiency gap."[7] Conceptually, the efficiency gap consists of two components: potential energy efficiency gains that would result from price reforms, and those that could be realized through the removal of market barriers.

In terms of price reform, there is substantial econometric evidence that electricity price elasticities are lower in developing countries than in the US. That is, consumption does not respond as strongly to price changes in developing countries as in the US. Several factors account for the lower elasticity, including greater difficulty in substituting capital, other fuels or something else for electricity. This suggests that the barriers that inhibit price response are stronger in developing countries (see Exhibit 1-6).

Exhibit 1-6
Electricity Price Elasticity in Developing Countries

Price elasticity measures the sensitivity of use to changes in price. Factors that determine price elasticity include:

- the availability of substitutes for electricity or the end-use equipment (greater availability means higher elasticity),
- electricity's share of a household's or firm's overall budget (higher share means higher elasticity),
- whether electricity is a luxury good or a necessity (luxury means higher elasticity), and
- time (long-run elasticity is greater than short-run elasticity).

In general, estimated electric price elasticities across all customer classes are lower in developing than industrialized countries. According to one review of several such estimates, electricity price elasticity in Latin America is about half that of the United States, in part due to the lower availability of substitutes.

At the same time, price distortions are often greater in developing countries than in the US. Although price distortions have been reduced in recent years, there remains greater divergence in many developing countries than in the US between actual costs of service and what people pay for electricity.

Other causes of the efficiency gap are classic market failures such as external environmental costs, missing risk markets, distortions due to government subsidies or other policies, monopoly power, and principal/agent behavior. Often simple market characteristics make energy efficiency investments less attractive but do not necessarily warrant government intervention (e.g. high

[7] From society's perspective, an end-use efficiency measure is cost effective if the benefits (avoided electricity supply costs including environmental costs) are at least as large as the combined government, utility and customer costs of implementing the measure, including marketing costs.

implicit discount rates, high up-front costs, transactions costs, and inertia). In such cases, intervention depends on the value that society places on foregone energy efficiency relative to other social goals.

Because developing countries cannot afford to allocate managerial and capital resources to projects where the gains are small, the size of the efficiency gap determines whether it warrants the attention of public and private decision makers. Estimates vary widely (0%-20% for the United States, and as much as 20-40% for some developing countries) as to the size of the energy efficiency gap, partly because of differing definitions of the efficiency potential. For example, some analysts argue that fully accounting for the transaction costs of adopting energy efficiency measures would substantially reduce the set of measures deemed cost effective by market actors.[8]

To give a rough estimate of the efficiency gap in one power sector's service area, we examined the Indian state of Andhra Pradesh. Average tariffs for different customer classes range from covering less than 5% of the embedded costs of service to about 90%. However, these tariffs cover a smaller share of the marginal costs of service, given the need for new, more expensive capacity. The estimated long run price elasticity of demand for India is low (about 0.20), even relative to Latin America. That is, changes in prices are estimated to have only modest effects on consumption.

Even at the low assumed price elasticity, rationalizing electricity tariffs to recover the Andhra Pradesh utility's costs would have a substantial impact on consumption, reducing it by as much as 24% once ample time had elapsed for long run adjustments to be made (all electrical end-uses are replaced).[9] Of course, not all of this reduction in electricity use would be due to efficiency improvements, but would also include income effects and switching to other energy sources. Still, the overall percentage consumption reduction would be even greater if it were as easy for end-users to substitute other end-use equipment (larger price elasticity) as in industrialized countries.

For comparison with this price effect, an analysis of just sixteen end-use efficiency measures determined to be cost effective for the Andhra Pradesh utility estimated that annual power consumption would be reduced by over 10% in ten years from implementing those measures

[8] Energy Modeling Forum, 1996. Markets for Energy Efficiency." *EMF Report 13,* Volume 1, Stanford University, September.

[9] This estimate is a result of applying customer class elasticities to the existing and reformed tariff levels.

alone.[10] Analyses of the potential electricity savings from DSM measures in other developing countries show similar results.

The above comparison between price-induced and non-price-induced reduction in consumption, crude as it is, confirms that both price and non-price barriers contribute to the large efficiency gap in developing countries.

[10] *Integrated Resource Plan for Andhra Pradesh.* Prepared for USAID/New Delhi by Hagler Bailly Consulting, Inc. Arlington, VA, May, 1996. The potential efficiency measures for commercial and industrial users were intentionally de-emphasized to avoid significant revenue attrition from the SEB's higher-tariff customers. The potential for cost-effective efficiency thus is much higher.

CHAPTER 2
A REFERENCE FRAMEWORK TO ASSESS THE EFFECTS OF REFORMS ON ELECTRICITY DEMAND AND USER EFFICIENCY

Governments typically implement a package of reforms. Their decisions regarding specific reforms, however, are separable and often occur at different points in time. Both the benefits from and barriers to energy efficiency are affected by individual reforms. In particular, reforms may:

- move retail prices closer to or further from the social costs of electricity production
- move the level of investment in energy efficiency closer to or further from that which is appropriate from society's perspective
- make it easier or more difficult for organizations outside of the power sector to promote energy efficiency

By understanding the implications of individual reforms, policy makers in developing countries can make more informed decisions about what types of reforms to adopt.

Successful power sector "models" pioneered in one country have been widely observed and emulated among developing countries. In the 1940s and 1950s, developing countries generally modeled their power sectors on that of their main economic partner among industrialized countries (Britain, France, or the United States). In the 1980s and 1990s, the Chilean and Argentinean models have been sweeping Latin America (Guatemala, Bolivia, Colombia, Peru). Also in the 1990s, independent power development has been spreading across Asia, Central America and the Caribbean, although with less competition than in the United States. Francophone Africa has been experimenting with privatizing utility management using French models.[1] Some Eastern European countries have adopted the UK model and some states in India are considering adopting it.

This chapter summarizes the major categories of reform and provides a framework for discussing the implications of reform features for electricity demand and utilization efficiency.

[1] Besant-Jones, John. 1996. "The England and Wales Electricity Model — Option or Warning for Developing Countries?" Viewpoint, The World Bank Industry and Energy Department, Washington, DC, June.

Exhibit 2-1
Common Power Sector Reforms

Power sector reform, broadly defined, includes a broad range of changes in the power sector. These changes can include one or more of the following:

- corporatizing and commercializing the management of public utilities, which might include full cost recovery through subsidy removal;
- introducing private sector ownership of generation, transmission, and distribution assets and private sector management of operations;
- creating wholesale power markets in which independent power producers sell to the grid either through bilateral agreements or compete for sales to a power pool;
- functional unbundling of generation, transmission, distribution, and retail services; and
- creating retail markets in which private entities compete to supply electricity services to end use customers.

2.1 MAJOR POWER SECTOR REFORMS

A country's reform process results in one or typically more of the following changes in the power sector: commercialization, privatization, unbundling, and competition. These changes (especially privatization) are typically associated with the creation of an independent regulatory body. Moreover, they require new laws, regulations, or changes in administrative procedures to accomplish the reforms. It is important to recognize that most reforms occur over a period of years, and thus tend to occur in stages over across a continuum of policy and structural changes. The features of each reform model, and how it differs fro its preceding stage, are discussed below.

Commercialization

Commercialization involves introducing commercial objectives into the management and operation of a state-owned enterprise. Subsidies, including state guarantees for borrowing, are removed and the enterprise becomes subject to the same tax laws, prices, and accounting rules as other private sector companies. To make the company more attractive to future private investors, the government may assume past debts and provide new operating capital. The enterprise may also reduce its staffing. Commercialization also imposes separate cost accounting for generation, transmission, and distribution services. Decisions regarding investments in new assets are based on commercial principles rather than planning targets.

Improved cost recovery — often required as a condition to receive concessionary loans from multilateral development banks — is an important component of broader managerial change. Cost recovery is improved by changing tariff structures to reflect better the true costs of service to various customer classes, by upgrading revenue collection through more effective metering and billing practices, and by reducing non-technical energy losses. A few countries have begun to

differentiate tariffs for a given customer class according to the time of day at which power is demanded.

Most countries view commercialization as an intermediate step toward privatization and other reforms. Other countries have commercialized their power sectors and introduced private management, but the government retains majority public ownership over the sector. Countries in this latter category include Cote d'Ivoire, Ghana, Senegal, Thailand, Singapore, and Malaysia.

Privatization

Privatization means transferring publicly-owned power sector assets to private ownership. In addition, a country may decide to allow private development of some or all new power sector infrastructure. While privatization of public enterprises in various economic sectors has been a widespread phenomenon among both OECD and non-OECD countries over the past decade, the electric power sector is typically one of the last enterprises to be privatized because politicians consider its functions to be vital to the state. When a monopoly utility is privatized, the government assumes the role of regulator in order to protect the public interest and balance social objectives with the financial health of the utility. Although regulatory institutions should be established prior to privatization, this is not often the case.

The traditional method of assigning new projects for private development is for the utility to draw up expansion plans and assign specific projects for private financing. Another approach is to identify capacity requirements and let the private sector identify least cost sources. Several models exist for private participation in power generation, including build-own-operate (BOO), build-own-operate-transfer (BOOT), build-maintain-transfer (BMT), and build-lease-transfer (BLT). Developing or emerging economies that allow private generation include Argentina, Bolivia, Brazil, Chile, China, Colombia, Costa Rica, Cote d'Ivoire, Dominican Republic, Guatemala, Guinea Bissau, Honduras, India, Indonesia, Jamaica, Kenya, Laos, Malaysia, Mauritius, Mexico, Morocco, Nepal, Pakistan, Panama, Peru, Philippines, Poland, Russia, South Africa, Tanzania, Thailand, Turkey, Ukraine, and Viet Nam.

Unbundling

When the electricity sector is restructured in this way, vertically-integrated utilities are unbundled into legally and functionally distinct companies providing generation, transmission, distribution and retailing services. The United Kingdom (England and Wales) and Chile pioneered unbundling models in the 1980s. Since then, countries that have separated or are in the process of separating generation, transmission, and distribution assets include Argentina, Australia, Bolivia, El Salvador, Hungary, the Indian state of Orissa, New Zealand, Nicaragua, Pakistan the Philippines, Poland, Portugal, Sweden, the Ukraine, and the United States.

Country variations exist within the overall framework of unbundling. In some unbundled power sectors, the distribution sub-sectors have also been horizontally divided according to geographic

franchises. In some countries, independent generators sell to a single power procurement business, which is also responsible for dispatch. Such "single buyer" models are appropriate for smaller systems, such as Northern Ireland, where the potential gains from competition are too small to offset transactions costs.[2] Also, some countries have separated the physical aspect of distributing electricity to final customers from retail services (marketing, bill collection, customer information, demand side management, etc.), while others have kept them within the same entity.

Competition

Although the "wires" portion of the electricity sector (transmission and distribution services) is still considered a natural monopoly, competition may be introduced into the system for selling power to the grid (wholesale competition) and providing electricity to end use customers (retail competition). Wholesale competition may take the form of independent power producers (IPPs) bidding for long-term contracts with power purchasers. Although there are almost as many different styles of bidding as there have been solicitations, in most cases, the utility issues a solicitation seeking bids from project sponsors for capacity and energy, with the award going to the lowest cost supplier without regard to fuel source. The selection emphasizes lowest fixed costs and the winning bidder receives payment sufficient to cover levelized capital and operating costs. Purchasers tend to award contracts on the basis of capacity and energy costs in the first few years of a multi-year transaction, rather than levelized life cycle costs.

As an alternative to long-term contracts, some countries (such as Chile and Argentina) are creating spot or short-term markets for wholesale power. Under this model, multiple generators bid to be dispatched by an "independent system operator" (ISO). The ISO purchaser relies on competition to ensure that bids approximate marginal costs. (If individual generators constitute too large a share of the market, they can manipulate output or availability to increase profits.) Generation projects that depend on spot markets for most of their revenues are called "merchant plants".

In addition to wholesale competition, a few jurisdictions (i.e. Norway, England, Wales, and California) are experimenting with retail competition for some or all customer classes. Initiating retail competition is most feasible in areas where there exists a significant market of industrial and large commercial customers, which are typically more attractive targets for competing firms than residential customers. Consequently, competition may first be opened up for large customers and then phased in for smaller customers over time.

Retail competition can be introduced through different mechanisms. In one, multiple power generators have direct access to the transmission and distribution networks (for a charge), allowing them to compete to supply final customers regardless of their location and who owns

[2] Bacon, Robert. 1995. Appropriate Restructuring Strategies for the Power Generation Sector: The Case of Small Systems. *Industry and Energy Department Occasional Paper No.3,* The World Bank, Washington, DC.

the wires. In another model, independent retail service providers (which do not own any generation facilities) buy power from generators, contract for use of transmission and distribution facilities, and sell the power to final customers. Where distribution and retail functions remain within the same entity, the service provider buys from wholesale power producers and contracts only for transmission access.

Regulation

When ownership of power sector assets is transferred to private investors and managers, regulatory oversight is needed to protect the public interest. The creation of a regulatory agency often follows enabling legislation that outlines its responsibilities and powers.

With respect to energy efficiency, tariff regulation is a key function of the new agency. Independent tariff regulation over those components of the power sector that remain in monopoly control is commonly associated with any package of reforms that includes privatizing monopoly services. Full privatization of a vertically-integrated utility requires that the private sector operator take its revenue from final customers; thus, formal tariff regulation is required (this is the situation that has prevailed for the last several decades in the United States). If the utility is also unbundled and wholesale competition introduced, then generation is not regulated.

By allocating ownership and management functions to the private sector and the regulatory function to a public agency that is at least partially independent of political pressure, prospects for tariff reform are enhanced. Although tariff reform may be implemented as part of a commercialization package, the incentives to fully recover costs become even stronger when a private owner takes over. While tariff subsidies are common in developing countries, tariff reform does not necessarily mean price increases — depending on pre-reform customer class cross-subsidies, tariffs could go up or down.

Even before reforms, different forms of rate regulation have prevailed in different countries. In the United States, private utilities have traditionally been allowed to earn a return on their "rate base" (consisting of primarily of capital assets). In some other countries, "price cap" regulation is used. A price cap fixes allowed electricity prices for longer periods than with rate of return regulation. Price caps often include an upward adjustment each year to account for inflation, but also a downward adjustment to provide an incentive for the utility to improve productivity. In still other countries, "revenue targets" are used. They are based on the same general approach, but focus on controlling revenues rather than prices. Regulators set an allowed level of revenues based on actual costs for a test year. Over time, this level can also be adjusted for inflation and productivity. One key difference from price caps is that the allowed level of revenues may change to reflect increases or decreases in kWh sales levels.

2.2 IMPLICATIONS OF REFORMS FOR ECONOMIC INCENTIVES TO IMPROVE ENERGY EFFICIENCY

Power sector reforms affect energy efficiency incentives among various market actors through multiple pathways. Some reforms enhance economic incentives to improve energy efficiency while others discourage it. An economy's overall level of efficiency in the use of electricity is a function of actions taken by end-use customers, the power sector, government, and the private sector.

In any economy, the implementation of energy efficiency measures does not depend on whether such measures are cost effective from society's perspective, but rather from the perspective of the various market actors. Because each actor faces a different set of benefits and costs for the same measure, a given reform may enlarge or contract the basket of energy efficiency measures that each finds attractive. When a given reform either increases a measure's monetary benefits or decreases its costs to an electricity supplier, consumer, government agency, or ESCO, then it enhances energy efficiency incentives for the relevant actor, all else being equal. Conversely, when the benefits are decreased or costs increased to the actor, efficiency incentives are decreased.

Implications of Commercialization

Relative to a "no-reform" base case, commercializing a public utility improves the utility's and end users' incentives to implement energy efficiency measures. (See Exhibit 2-2) Because cost accounting is improved and government transfers to cover deficits are reduced, utilities pay greater attention to cost recovery (minimizing costs and increasing revenues). Customers may find their electricity costs rising if commercialization leads to the removal of tariff subsidies.

A commercialized utility has an incentive to reduce sales (improve efficiency) whenever the marginal costs of supplying a kilowatt hour are greater than the revenues received. In some countries, the tariffs that commercialized public utilities can charge are still restricted for social or political reasons, and some customer cross-class subsidies may remain. Energy efficiency may offer opportunities for improving the utility's financial balance sheet. For example, a utility could in principle invest in efficiency measures that reduce consumption by highly subsidized customers and use the saved kilowatt-hours to sell to other customers that pay the full cost of service. The utility should be willing to pay an amount equal to the cost differential to not have to supply the energy. When demand for power outstrips supply, utility investments in end-use efficiency do not necessarily result in "lost revenues".

To the extent that subsidies are reduced and revenue collection improved, customers have stronger incentives to adopt efficiency measures due to higher bill savings from reducing

consumption. If upstream sectors (fuel extraction and transport) are also commercialized, the utility's fuel costs may increase. This would increase the energy cost component of rates, further enhancing the customer incentive to adopt energy efficiency measures. To the extent that tariff reform and better cost recovery increase the potential bill savings from adoption of efficiency measures, they would also create new market opportunities for firms providing energy efficiency products and services.

Exhibit 2-2
Implications of Commercialization for Energy Efficiency

Market Actor	Probable Effect of Reform	Positive /Negative
Utility	Separate cost accounting and attention to cost recovery increase incentives	+
	Tariff reform reduces foregone revenues from subsidized kWh sales	–
Customer	Subsidy reduction and improved revenue recovery increase incentives	+
Private ESCO	Tariff reform and revenue recovery increase market opportunities	+
Government	Government-sponsored DSM might be implemented to dilute burden of tariff increases	+
	Net Effect	**Positive**

Implications of Privatization

In contrast to a commercialized public utility, a private utility requires full cost recovery *and* a return on investment. (See Exhibit 2-3) The need for cost recovery strengthens the price signal received by customers to use electricity efficiently. The profit motive could also make the utility more interested in reducing peak demand to the extent that the cost of doing so is less than the cost of adding new capacity and/or running high cost peaking plants.

At the same time, when ownership is transferred from the public sector to the private sector, the discount rate used in making investment decisions is likely to increase. As a result, efficiency measures will yield a lower rate of return than they would under public ownership because costs are incurred in the near term, while benefits accrue over a period of years. The set of end-use efficiency measures attractive to the utility becomes smaller.

Similarly, transferring ownership from the public to the private sector may be accompanied by decreased attention by the utility to achieving social goals (such as resource conservation, universal service and environmental improvement) unless these goals coincide with the utility's

profit incentive. However, there are few, if any, cases of developing country public utilities with significant DSM programs that have been privatized. Thus, the impacts are still uncertain. Thailand's utility, EGAT, might be privatized and the fate of its DSM programs bears watching. Similarly, the conservation program of the Brazil electricity supplier (PROCEL) is likely to be affected by privatization.

Aside from energy efficiency incentives, privatization is likely to increase overall electricity consumption in countries that otherwise (in the base case of public ownership) would have continued power shortages. If privatization is successful in stimulating increased investment in generating capacity (a primary objective), supply constraints on demand may be reduced or eliminated. Thus, privatization could both increase a nation's overall electricity consumption while improving the efficiency of electricity use, that is, decrease kWh/GNP.

Exhibit 2-3
Implications of Privatization for Energy Efficiency

Market Actor	Probable Effect of Reform	Positive /Negative
Utility	Stronger attention to cost recovery than under commercialization	+
	Decreased attention to social objectives	–
	Higher cost of capital may reduce cost effectiveness of efficiency	–
Customer	Stronger tariff reform and revenue collection increases incentives	+
Private ESCO	Tariff reform and revenue recovery increases market opportunities	+
Government	Separation of investment and regulation may increase role of government in promoting social objectives including efficiency	+
	Net Effect	**Positive**

Implications of Regulation

The form of tariff regulation affects the economic incentives of privatized utilities to undertake end-use efficiency programs. Regulation in which profits are based on total sales (price caps) creates disincentives to reduce kilowatt hour sales. Under these conditions, few DSM measures are deemed cost effective. (Load management measures are more likely to pass the cost effectiveness test.) Price caps discourage investments in DSM, while revenue targets offer a more neutral environment for utility-sponsored DSM.

Although price caps and revenue targets may be considered forms of "performance-based" regulation, the United States and a few other countries have also experimented with regulatory

incentives for the utility to achieve other objectives. For example, some US regulators have decoupled profits from kWh sales in an effort to make the utility neutral between acquiring supply- and demand-side resources.

In addition to tariffs, the regulatory agency may have other mandates that affect energy efficiency. It may determine the extent to which energy efficiency goals and incentives are incorporated into the privatization process, such as through provisions in licensing agreements that require some percentage of a power supplier's or distributor's revenues to be allocated to efficiency activities. It may also require that the privatized utilities meet demand growth on a least cost basis and create regulatory incentives for energy efficiency. Finally, the regulatory agency may determine the extent to which demand side management can be integrated into competitive markets at the wholesale or retail level.

Implications of Unbundling

When a commercialized private utility is unbundled into separate entities, the actual costs of providing generation, transmission, distribution, and retail services may not change, but each cost is assessed separately. Whether unbundling results in stronger or weaker incentives for energy efficiency (compared to when services are "bundled") depends on how these costs are passed through to the various market actors. (See Exhibit 2-4.)

Exhibit 2-4
Implications of Unbundling for Energy Efficiency

Market Actor	Probable Effect of Reform	Positive /Negative
Generation & transmission companies	No direct contact with customer to manage load	–
Distribution company	May not receive full benefits of reducing generation and transmission requirements through efficiency improvements	–
Distribution or retail supplier	Type of regulation affects strength of incentive to maximize kWh sales	–
All	DSM incentives depend on how demand-related costs passed through	0
Customer	Depends on how upstream costs reflected in bills	0
Private ESCO	Depends on how upstream costs reflected in bills	0
Government	Plays a critical role in specifying rules for monopoly pricing of transmission and distribution	---
	Net Effect	**Indeterminate or negative**

One key example is how unbundling affects the treatment of demand-related costs. Energy efficiency can help avoid investments in generation, transmission, and distribution infrastructure necessary to meet local or system peak demand. When generation is separated from retail functions, generation investments are no longer controllable by retail suppliers. Avoidable demand-related costs are further reduced if the retailing function is also unbundled from transmission and distribution services.

In general, the more closely that retail electric bills reflect the actual cost components of providing service, the more accurate the signals that customers receive to undertake energy efficiency measures. At one extreme, customers could see fully unbundled rates based on area and time-specific energy, transmission system capacity, and distribution capacity costs. Relative to a simpler structure, such rates could improve ratepayers' economic incentives for managing their demand and reducing consumption. A key factor is whether regulators allow retail suppliers to charge time and area-specific rates. The cost of installing time-of-use meters, especially for small customers, affects whether demand-related costs are passed on directly. (Regulators may also allow retailers to pass through fuel cost adjustments.)

At the other extreme, retailers could roll demand-related costs into fixed charges or energy charges, in which case the customers' energy efficiency incentives are weakened. If unbundling causes fixed charges to constitute a greater share of total electric bills, then potential bill savings accruing to customers from making energy efficiency investments are reduced. Under this scenario, the retail supplier, however, would have a stronger incentive to manage customer load. Combined distribution and retail supply companies would be particularly sensitive to reducing load in locations where the marginal costs of service are high due to network constraints, inefficient use of distribution assets or other reasons. (Some forms of performance-based rate-making create incentives for retail suppliers to profit from demand side investments that reduce distribution system costs.[3])

To the extent that unbundling shifts customers' bills toward fixed charges, opportunities for ESCOs decrease. On the other hand, if unbundling causes customers' bills to reflect separate energy and demand charges with the latter differentiated by time of day and location, market opportunities for ESCOs may be enhanced.

Vertical unbundling also affects the power sector's capability to implement DSM measures. Vertically-integrated utilities have had advantages in undertaking DSM programs because the entity that is responsible for supply side decisions is the same one that has frequent customer contact and knowledge of customer demand patterns. If the distribution function and retail supply function remain in the same organization under unbundling, the distribution company is unlikely

[3] Nimmons, John et al. 1996. *Legal, Regulatory, and Institutional Issues Facing Distributed Resources Development.* National Renewable Energy Laboratory, USDOE, NREL/SR-460-217891

to be allowed to collect billing data for all customers, a key type of information to target DSM investments. If the retail supply business is legally separated from the distribution business, the distribution company could retain access to billing data but is unlikely to maintain its marketing force.[4]

When the distribution function is also horizontally unbundled, incentives for each distribution company to manage load are decreased due to a "free rider" effect. That is, any load management efforts undertaken by an individual electricity distributor will reduce distribution, transmission, and generation costs related to peak demand. The distributor can capture the full benefits related to reduced distribution system costs. Depending on how the distributor pays for generation and transmission services, however, it may not receive the full benefits of reduced generating and transmission capacity requirements. Other distributors would enjoy this benefit as well, regardless of whether they engaged in load management. Investments in dispatchable load management (such as direct real time control of specific end-uses) might have benefits that are easier to capture than other load management measures.

Implications of Competition

The net effect of introducing *wholesale* competition on end-user incentives to adopt energy efficiency measures is negative. Wholesale competition, particularly in spot markets, creates wholesale price signals based on short-term costs rather than levelized life cycle costs. End-users weigh expected future costs in deciding whether to adopt energy efficiency measures whose costs must be recovered over a period of several years. If only short-term generation costs are passed through to them, end-users have a weaker incentive to invest in those measures. One risk facing end-users considering an investment in energy efficiency is the future dollar savings over the life of the measure. When volatile spot markets increase expected variability in future electricity rates, these savings become more uncertain. As a result, consumers discount the stream of future benefits more heavily than when rates reflect levelized generation costs.[5]

Introducing *retail* competition to a fully unbundled power sector generally increases the retail supplier's incentive to maximize kilowatt hour sales up to the point where marginal costs equal marginal revenues. Whether retail competition is introduced to a vertically-integrated or unbundled model, in both cases electricity suppliers become concerned with having the lowest rates to retain and attract customers. In the case of an unbundled sector with a spot market, independent competitive retailers pass generation costs through to final customers. Under such

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[4] Ait-Laoussine, Taj et al. 1997. *Developing Country Case Studies in Energy Efficiency and DSM.* Unpublished paper. Hagler Bailly Services, San Francisco, CA

[5] Large customers might be able to pay a premium for future rate stability In the United Kingdom, many larger end-users and some retail suppliers sign long term delivery contracts to ensure rate stability, despite the spot market.

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scenarios, electricity suppliers have little incentive to engage in any DSM activities that raise rates to non-captive customers. (See Exhibit 2-5 for a summary of these effects.)

Exhibit 2-5
Implications of Competition for Energy Efficiency

Market Actor	Probable Effect of Reform	Positive /Negative
Generator	Wholesale competition, especially spot markets, increases the incentive to maximize generation from individual units.	–
Retail Service Provider	DSM services may be offered to stand out from competitors	+
	DSM services that increase rates (and jeopardize competitiveness) are avoided	–
Customer	Competition may increase uncertainty over future stream of benefits and force rates down, while offering an alternative to reducing bills by reducing use	–
Private ESCO	Lower and more uncertain future rates decrease market opportunities unless ESCOs offer combined energy supply and demand management	–
Government	Lack of private incentive to conduct market transformation activities may lead to greater government involvement	+
	Net Effect	**Negative**

Deviations from the generalization that competition discourages DSM may, however, result from other combinations of unbundling and retail competition. One combination is when generation companies have direct access to retail customers. Under this scenario:

- Generation companies have, at a minimum, an incentive to maximize their generation units' capacity factors, which they can promote through load management. Direct access with unbundling also has the potential for creating full marginal cost-based price signals.

- Retail wheeling access charges (in principle) require the estimation of area-specific marginal costs. If these costs get charged to those customers incurring them, their incentive to control load is enhanced; if not, absorbing these costs creates an incentive for the generation/retail supplier to invest in location-specific load management.

- The generator/retailer could create kWh savings among some customers (such as through a shared energy efficiency investment) at a low cost per saved kWh, maintains the same total system-wide generation, and sells the conserved kWh to customers currently being served by another retailer. This scenario requires that the cost of saving energy is

sufficiently low that the saved energy can be sold at a greater profit than generating additional power for sale to these customers and still underprice the other.

- Where a continued "obligation to serve" (at an unprofitable tariff) is imposed on an otherwise competitive sector, the retail supplier may have an incentive to reduce kWh sales to less profitable customers by introducing efficiency measures, as long as the incremental costs to the supplier are less than the losses from selling power below its cost.

- When price/kWh among competitors is close, retailers may find it profitable to retain or attract customers by offering a package of services as a means of differentiating themselves from competing suppliers, even though demand side management (DSM) services may reduce sales. Under such conditions, the DSM measures being offered are likely to be different than if offered by a noncompetitive vertically-integrated utility. To retain large customers, who tend to be most at risk of finding a competing supplier, retail suppliers may offer customized energy management services that combine fuel switching, load management, energy conservation, and other services that may increase or reduce total kWh sales.

From the end users' perspective, retail competition affects efficiency incentives in several ways. First, overall prices may decline relative to a commercialized, privatized, and unbundled power sector.

Second, competitive pressures may affect how utility-sponsored DSM services are funded. Partial retail competition (such as competition for large customers) may, for example, cause the retail supplier to avoid cross-subsidizing DSM services for captive customers through rates charged to non-captive customers.

Third, customers that previously had only one way to reduce bills (reduce consumption or load) now have the additional and perhaps easier option of shopping around for a lower cost supplier. The competing and often confusing claims of various suppliers regarding rates and special services they are marketing may further reduce interest in making efficiency improvements.

Fourth, retail competition may stimulate the emergence of ESCOs that market both electricity supply and demand management to serve non-captive customers who want to optimize their combination of end use services and total electricity costs.

Finally, power sector activities that may have been targeted at trade allies such as end use equipment manufacturers to improve the equipment's efficiency may be reduced. Implementing such initiatives is most attractive to a power sector when it is assured that the benefits of such market transformation initiatives are concentrated among its own customers. Under retail competition, however, some energy or peak load savings might accrue to competing retail suppliers in the same area.

Overall, whether competition results in greater or fewer actions to improve energy efficiency depends heavily on:

- the structure of charges for power purchases, and transmission and distribution services,
- the ability of retailers to combine kWh sales and DSM services,
- the share of wholesale generation sold through a spot market, and
- how hotly contested the retail market is.

These decisions rest in the hands of regulators and the various market actors.

2.3 THE NET EFFECT OF REFORMS ON ELECTRICITY CONSUMPTION

The effects of reform on energy efficiency levels can only be understood in comparison to some specified no-reform scenario. In general, power sector reforms have a positive impact on energy efficiency incentives when compared to the case of an inefficient, publicly-owned utility charging highly subsidized rates. Because electricity price distortions are prevalent in developing countries, reforms can be expected to have a beneficial effect on energy efficiency. Since governments craft policy reforms (sometimes with pressure from multilateral lenders), they can also determine the extent to which energy efficiency objectives are incorporated into reforms or addressed in other ways.

Several generalizations can be made about how the various reforms are likely to affect the different market actors' incentives.

- ***Some combinations of reforms strengthen energy efficiency incentives, while other combinations weaken them.*** Taking account of the cumulative effects on all the market actors, commercialization and privatization reforms generally strengthen incentives. The effect of unbundling depends on how the retail supplier passes through upstream costs. Both wholesale and retail competition tend to weaken efficiency incentives, at least in during the transition period when supplier do are unwilling to risk damaging their competitiveness.

- ***Reforms affect the incentives of individual market actors differently.*** For example, the more directly and accurately retail suppliers pass through upstream costs to end-users, the greater the incentive users have to reduce demand and consumption, and the lower the incentive that suppliers have. The net effect depends on whether the end-user or the retail supplier is more likely to implement efficiency measures in response to their respective economic signals.

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- ***Reforms are generally more favorable toward some demand management actions than others***. Suppliers have greater incentives to reduce peak load than to reduce total consumption.

- ***Reforms do not overcome all barriers to energy efficiency.*** While commercialization and privatization help reduce some barriers to energy efficiency, power sector reforms leave untouched other daunting barriers to implementation of end-use improvements (such as inadequate information and capital, and environmental externalities). To the extent that the presence of these barriers justified government intervention in the pre-reform situation, they still do.

Because power sector reforms adopted in a given country may increase energy efficiency incentives among some market actors while decreasing them among others, the net effect on adoption of end-use efficiency measures could be positive or negative. If the gap is narrowed between a level of energy efficiency justified on the basis of costs and benefits to society as a whole and the level actually achieved, then policy measures may not be needed to offset the reform's effects. Alternatively, if the gap increases, then policy measures may be justified.

These general findings are further explored in the context of specific case study countries in Chapter 3. Chapter 4 then draws together the experience to date regarding how energy efficiency can be promoted in a reformed power sector. Chapter 5 proposes a strategy for legislation, tariff principles and other regulatory actions within the reform process. To the extent that an efficiency gap still exists, public initiatives to be implemented outside of the reforms are proposed as well.

CHAPTER 3
OBSERVATIONS FROM SIX COUNTRIES' EXPERIENCE WITH REFORM

Many developing countries hope that a power sector based on market principles will be sufficient to create the right economic conditions to stimulate power consumers to undertake energy efficiency actions on their own. The belief is that, provided the right economic incentives, including unsubsidized prices, consumers would investigate and adopt technology and operational measures available from manufacturers, product vendors, energy efficiency specialists and other service providers to improve the energy efficiency of buildings, equipment, and appliances so as to reduce the total cost of energy services.

Although the potential for this to happen is still largely unknown, some observations can be made from the experiences of those countries that have reformed their power sectors. These countries have pursued reforms in order to put in place market incentives for the production and consumption of power. There is interest world-wide in learning from the lessons of these countries to understand how their reform processes have affected the incentives for energy efficiency and to understand what additional steps, if any, were taken to address energy efficiency in the post-reform period.

This section presents a synopsis of an investigation of six countries that have undertaken power sector reform: Argentina, Chile, New Zealand, Norway, the United Kingdom, and the United States.[1] These countries were chosen for several reasons. First, the reform process is sufficiently far along to provide ample evidence of utility and market responses (with respect to energy efficiency) to the reform process. Second, these countries represent different models of reform, and it is therefore possible to compare the impacts of different reform models on energy efficiency. Third, the degree of public intervention in support of energy efficiency differed among the six countries. Exhibit 3-1 summarizes key features of the reform structure in each country in terms of commercialization, unbundling, private ownership, and wholesale generation and retail market competition. (See the Appendix for a detailed breakdown of each country's reforms and the impacts on energy efficiency.)

The experiences of these six countries can potentially illuminate the opportunities for and challenges to energy efficiency in a reformed power sector. It is also recognized that developing countries will have some circumstances and institutional considerations that will be quite

[1] For a more detailed report on the case study investigation, please refer to the companion report, *Case Studies of The Effects of Power Sector Reform on Energy Efficiency,* prepared for this same USAID project.

different from the situations of the six case study countries. For example, the impetus for power sector reform in developing countries is quite different than OECD countries' motivations. Developing countries approach reform to generate sufficient revenues from power sales to attract private capital to significantly expand system capacity. OECD countries are driven to reform their power sectors by the desire to lower electricity costs through competition in a sector that is static or growing only slowly. Thus, the applicability of the observations presented below has limitations.

Exhibit 3-1
Reform Features of Case Study Countries

Country	Type of Reform				
	Commercial	**Unbundled**	**Management or Ownership**	**Wholesale Power Market**	**Retail Competition**
Argentina	✔	✔	Predominantly private	✔	Over 100 kW only
Chile	✔	yes, with cross-ownership	Predominantly private	✔	✔ (limited competition)
New Zealand	✔	yes, with cross-ownership	Mixed private and public	No	On service, not price
Norway	✔	✔	Public	✔	Yes, with residential in 1997
United Kingdom	✔	✔	Predominantly private	✔	Above 100 kW 1997, totally in 1998
United States	Pre-existing	✔	Predominantly private, some public	✔	Initially large consumers, eventually all

The UK and Norway pioneered the current era of power sector reform. Both countries had previous experience with government or utility energy efficiency programs and hoped that end-use efficiency would occur naturally in a competitive market. Chile and Argentina did not have a history of government or utility efficiency programs. Power prices were high in both countries. New Zealand had a history of some government and utility-sponsored efficiency programs and initiated a reform plan that addressed both utility and government (government-budget supported) responsibilities for continued efficiency initiatives. New Zealand had average power prices prior to reforms.

Reform efforts in the U.S. are less well advanced, but offer a very different history. The base-case situation in the 1990's presents a combination of commercialized public utilities (some distribution-only) and private bundled utilities (some with wholesale competition from IPP's). Current reforms stem from a base of 15 years of extensive utility IRP, DSM, and efficiency services as well as government efficiency programs imposed by legislation and regulation; occur in an advanced marketplace for efficiency product and service providers; and hold expectations that many efficiency services can be incorporated into competitive market offerings. It appears the U.S. state-by-state reform plans will include provisions in the reform plans for funding public-benefit efficiency programs, a situation driven largely by an active government, environmental, and consumer constituency.

3.1 OVERVIEW

Overall, the experience of the first five countries (all but the U.S.) reveals that energy efficiency at best was an afterthought, and in many cases was simply ignored in most countries' initial power reform efforts. In the first few years of reform the impacts on energy efficiency are mostly negative. The development of a competitive retail market makes price the paramount factor in selecting suppliers. Pre-existing utility energy efficiency activities largely diminish. In addition, hoped-for efficiency markets generally fail to materialize, and only the largest commercial and industrial energy users seem to attract the attention of ESCOs and other private energy services providers. Subsequent efforts to append efficiency mechanisms after reform structures and rules are underway have had some beneficial effects. Nevertheless, these efforts were implemented with grudging political support and the institutional options were restricted or difficult to implement.

The single exception is the U.S., where there is a long history of mandated utility involvement in demand side management activities, and the regulatory agencies and public constituencies have the benefit of viewing the experiences in other countries over the last five to ten years. The U.S. is still developing its plans for the next reform era, and the market responses are yet to be seen.

In those case study countries where there was previous utility involvement with energy efficiency programs and services, the initial effect of reforms has been to push efficiency investment decisions outside the power sector investment framework, into a market of individual consumer decisions about power suppliers, prices, services, and alternatives. Consumer decisions are inherently shorter-term than governments or industry, and with larger discount rates on investments. (This is true for efficiency as well as any other home, facility, or industrial process improvements.) In some countries the effect has been one to place consumers back into a different but still "imperfect" marketplace that in several countries had spawned the earlier assignment of DSM and energy efficiency responsibilities to the government or utilities. Some observers hold a disappointed view that despite all the past expenditures by governments and utilities, there is little apparent evidence of permanent market transformation for efficiency yet occurring.

The effects of reform are evolving, however, albeit slowly. After three to five years, some reformed markets are beginning to show signs of increased efficiency markets, largely driven by power sector organizations in search of new profit-making opportunities. New Zealand utilities are forming joint ventures with equipment manufacturers (some promoting energy efficient products), and one or two UK utilities are exploring options for efficiency services to help further differentiate their services. In anticipation of reforms, several US utilities purchased UK utilities to gain first hand experience with reformed markets, while others are acquiring energy service companies or creating new energy services business units. Power sector "reform" continues to be a "work-in-progress." It is quite possible that an expanded market for energy efficiency could emerge over 5, 10 or 15 years - possibly aided by some policy initiatives.

3.2 THE EFFECTS OF REFORMS ON ENERGY EFFICIENCY MARKET ACTORS

Power sector reform has changed the market environment in each of the case study countries; these changes have in turn affected the level of energy efficiency activities and the motivations for energy efficiency. Based on the detailed review of each country's experience with power sector reform, several general observations can be made about the effects of reforms on energy efficiency. The observations focus on three primary issues:

- how reforms changed retail power *prices* and the effect of price changes on consumer electricity consumption and demand for energy efficiency services
- the effects of reforms on *power sector* interest in delivery energy efficiency services
- how reforms have affected the market environment for *non-utility* energy service providers.

The observations are summarized in Exhibit 3-2, and described below.

Exhibit 3-2
Summary of Observations: Effects of Reforms on Energy Efficiency in Six Case Study Countries

Market Actor	Main Driver(s) Affecting Behavior	General Observations
Electricity customers	Retail price of electricity	Real prices have decreased resulting in reduced motivation to invest in energy efficiency.
Utilities	Competition among utilities	Generation utilities in competitive situations have no incentive to promote energy efficiency. Power suppliers facing non-price retail competition view energy efficiency as a service to offer to retain customers.
	Government regulation	Utilities offer energy efficiency services to the extent required by regulations.
Non-utility service providers	Changing market environment	There are limited large-scale, commercial ESCO operations possibly due to small number of customers interested in energy efficiency. Lower retail electricity prices are constraining the range of profitable projects.

Effects of Changes in Retail Prices on Consumers' Electricity Consumption and Demand for Energy Efficiency Services

In almost all countries real prices paid for power by most, if not all, customer classes have decreased as a result of power sector reform. Prices have decreased as much as 15% in several instances because of gains in supply efficiency and greater competition. In Chile prices have dropped, but are still relatively high compared to international averages. Nevertheless, electricity customers generally perceive power to be less expensive than before.

The few exceptions to declining prices are for customer classes that had been heavily subsidized. In these cases, electricity prices have held constant (Norway's residential customers) or have increased (New Zealand's residential customers). Both suppliers and distributors have increased their use of time-of-use rates to reflect the investment costs of expanding system resources to meet peak demand and to encourage users to buy power during off-peak periods. These rates are made more affordable because of improvements and cost reductions in metering and monitoring technologies.

The case study countries generally do not have data to characterize changes in consumption in response to reform-prompted price changes. One exception is New Zealand, where price increases appear to have caused residential average consumption to decline by about 4%. Most other countries report that under reform it is harder to encourage customers to address efficiency.

Most consumers faced with retail competition are selecting suppliers primarily based on price considerations, and are not seeking energy efficiency services in a package with well-priced commodity. All of this would suggest that, except for classes where significant subsidies have been removed, there is certainly no more motivation to improve efficiency compared to the period prior to reforms, and, in most cases, it appears there is less motivation.

In countries contemplating reforms where substantial subsidies currently exist for residential, agricultural, or large industrial consumers, reforms would likely *increase* the price of electricity. This should motivate some level of reduced consumption, depending on consumers' price elasticity, which is in turn partly affected by alternatives available for reducing power use.

Effects of Reforms on Power Sector Interest in Delivering Energy Efficiency Services

In instances where competition is introduced primarily at the generation level, there is virtually no interest in efficiency services by either generators or distributing utilities. This is certainly the case for Norway, Chile, and to some extent in Argentina for distributors serving smaller customers. Generators in this situation place great emphasis on cutting costs to minimize prices by reducing labor levels, improving operating efficiencies, reducing system losses, and increasing generation utilization ratios. The one exception may be Argentina: utilities have expressed an interest in offering profit-oriented energy efficiency technology sales — possibly through joint ventures with manufacturers with customer lease payments incorporated into the electric bill.

In New Zealand, Norway and the UK, distribution utilities were required by regulators at the outset of reforms or subsequently to perform a specified level of efficiency services. Some of the services offered are simple information services, offered only upon request. The tendencies are for the distribution utilities to minimize the costs spent on these compulsory services, or to channel them (as in Norway) into other customer service and marketing activities unrelated to efficiency. In the UK, an independent organization (the Energy Savings Trust) was assigned responsibility to oversee the effectiveness of the mandatory efficiency services offered by the distribution utilities. So far there has been a limited amount of rigorous evaluation of the actual energy efficiency impacts being achieved in the UK; initial efforts suggest efficiency costs the equivalent of $0.02 per kWh.

Faced with non-price retail competition in a fairly sophisticated consumer market, New Zealand power suppliers are voluntarily offering technology promotion, advisory services, and other efficiency services for customer segments subject to retail competition. Alliances are being formed between energy efficiency providers and generators and distributors, or between energy efficiency distributors and product manufacturers. U.S. utilities appear headed on a related path, with greater emphasis on packages of related services. According to some industry observers, one or two UK energy suppliers and distributors are expected to experiment with energy services as a way to offer customers a lower total bill, and there may be joint ventures with ESCOs.

In New Zealand, the UK and the U.S., there is growing recognition that some larger customers may be willing to pay for a variety of energy services (e.g., energy management software, informative billing, technical advisory services) and related financial services if the services help lower the total energy bill. There are few competitive service offerings to residential power consumers.

The net effect of competition on levels of power sector-offered energy efficiency activities varies for each country, depending on the before and after conditions. Norway and the US have shown the most immediate drop in power sector-supported efficiency activities and associated system impacts. There is some speculation that efficiency services could increase again in the US among power suppliers once retail competition is fully in place. In the UK and New Zealand, efficiency activity appears to be on the decline, with the exception of those programs funded through the UK four-year surcharge on franchised consumer accounts, and the New Zealand government's national budget (much of which is awarded to utilities to implement innovative programs). Chile and Argentina exhibit no change so far — very little was happening before and very little is happening now.

Changes in the Market Environment Affecting Non-Utility Energy Service Providers

With the exception of the U.S., there is very little evidence of large-scale commercially-offered energy services, whether by ESCOs, energy efficiency companies, or local contractors. In the UK some ESCO activity is occurring on a limited scale for industrial facilities with cogeneration potential and large commercial and industrial users. Estimates are that in the UK some 20 ESCOs may generate $300-$500 million in annual revenue, which observers report as relatively small compared to the potential market size. In Norway some private services are succeeding with large commercial facilities. In Chile, ESCOs have succeeded on a very small scale with savvy public sector institutions (municipalities, universities, hospitals). Argentina has seen private services on a small scale: local companies offering technical audits, or manufacturers offering leasing and contract programs for lighting and motors. There is discussion about forming ESCOs, but no activity has yet appeared. In New Zealand these services are offered on a very limited scale, either on a contract basis for government-funded residential services, or to help local businesses reduce site emissions from energy consumption to meet local air quality regulations.

The reasons that ESCO activities appear confined to large power consumers is due to the high transaction costs for entering into these services — both for the consumer who has to become informed about the details of performance contracting, and for the ESCO that has to bear the costs and risks of finding prospective clients and performing the technical and financial analysis necessary to propose contract terms. With a typical sales cycle for an ESCO project taking up to 18 months, the carrying costs for project development dictate that a project pass some minimum threshold of energy bills (and thus expected efficiency gains). A number of U.S. ESCOs have reported a customer needs energy bills of at least $60,000 per year, and many projects target large

consumers with bills of $600,000 to $1 million per year.[2] Because ESCOs effectively guarantee energy savings in a performance contract, the ESCO must take actions and incur costs to insure these savings occur — a degree of performance obligation that was not present in most utility efficiency programs carried out prior to reforms. An analysis of US ESCOs that participated in utility DSM bidding programs revealed that the costs to ESCOs for marketing, administrative and transaction costs (project management, performance monitoring, maintenance activities, etc.) amounted to the equivalent of $0.005 to $0.025 per kWh.[3]

Among the large user client base, the business effects on US ESCOs are both positive and negative. Where retail power prices have been dropping in recent years (in areas with pilot projects with retail competition) this has made it harder for ESCOs to find projects that meet their expectations for financial return. On the other hand, some ESCOs and energy management companies are adding electricity commodity sales or power brokering to their energy efficiency services to offer clients one lower combined bill for total energy services. An existing long-term performance contract can be easily amended to add other services.[4]

Perhaps the most surprising observation in most countries is the absence of vendor[5]-supported promotional and leasing programs targeted directly at consumers. The most plausible explanation for this is that under the reform framework and with their emphasis on price reduction, most consumers do not view energy efficiency and reducing bills via efficiency as a priority. The few exceptions occur in the U.S. with its history of appliance efficiency labeling, evidence of some joint ventures by generators and distribution utilities with equipment manufacturers in New Zealand, and the promise of potential joint ventures in Argentina if legal issues can be clarified.

3.3 TYPES AND AMOUNTS OF ENERGY EFFICIENCY COMPARED TO THE PRE-REFORM ERA

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[2] Shippee, Glenn E., "The Future for Energy Service Companies: Changes and Trends," *The Electricity Journal*. Vol. 9, No. 6. July 1996.

[3] Wolcott, David R. and Goldman, Charles A., "Moving Beyond Demand-Side Bidding: A More Constructive Role for Energy Service Companies," *ACEEE 1992 Summer Study on Energy Efficiency in Buildings*, Vol. 8.

[4] Shippee, 1996.

[5] By vendors we mean the manufacturers and retail outlets for energy efficiency technologies such as lighting, air conditioning, refrigerators, and motors.

Although the opportunities for energy efficiency gains are substantial, actual progress is highly varied across countries. This section summarizes the current situation with regard to energy efficiency potential, trends in load management, and sectoral trends in energy efficiency.

Energy efficiency potential. There is no uniform data available to estimate efficiency achievements relative to the economic potential. U.S. utilities estimate the annual impact over the past twenty years from a variety of utility, government, and private sector programs and services will amount to 71 billion kWh and 51 GW of peak load reductions by 1999. Norway estimated the potential for efficiency improvements in 1988 as 19% of consumption, but has no data on progress to date. Norway acknowledges that more progress was made in the early 1990s when public policy mandated that utilities play a role in promoting energy efficiency, and that achievements have declined in the last few years. Chile has estimated its potential for energy efficiency at 10-13%, but no significant progress toward achieving this has been made to date. Most evidence of efficiency in the UK comes from the programs run by the government or mandated upon distribution utilities. These are producing savings at one-third the retail cost of power, and target residential consumers more than C/I facilities. New Zealand is achieving efficiency improvements primarily in the residential sector through its government grants program. Argentina is accomplishing little efficiency, due to significant market barriers and the lack of government support.

Load Management Trends. In almost all countries, power suppliers and distributors are promoting customer load management where there is a clear economic rationale for suppliers or distributors to avoid peak production or delivery costs. These services involve time-of-use rates, signing contracts for large customer voluntary load reduction during identified peak periods, and automated equipment duty-cycling for smaller consumers with small A/C or electric water heaters.

Sectoral Trends. The industrial and commercial sectors are the primary targets for market-generated energy efficiency improvements, both now and in the future. Most efficiency gains in the UK have come from increased use of industrial cogeneration. Chile estimates most of its potential exists in the industrial sector. Norway's ESCO companies report that the best market for their business is large commercial facilities. In the U.S., for the few states where retail competition has begun, energy suppliers are still evaluating which sectors to target with efficiency offerings. ESCOs are expected to continue to target large commercial and industrial facilities.

New Zealand is the only country that has targeted the residential sector, primarily by publicly-owned distribution companies that are mandated to serve the needs of their owner/customer base. In most countries historically subsidized prices have made efficiency investments by residential consumers unattractive, but it is possible this could change over time under power sector reform, particularly, if manufacturers and vendors undertake promotion of high-efficiency products.

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3.4 HOW SPECIFIC REFORM FEATURES AFFECT ENERGY EFFICIENCY

Although it may be the case that the four generic models of reform (commercialization, privatization, unbundling, and competition) each foster greater or lesser interest in energy efficiency on the part of power suppliers and energy efficiency service providers, the type of model itself is not the only influence on the degree of power sector interest in efficiency. There are important *features of each reform model* that can affect the magnitude of efficiency actions that may occur. These include the structure of the power sector, the form of regulation (if any) for prices and efficiency obligations, the type of ownership, the degree of change in wholesale supply prices, and the level and degree of change in retail prices.

These features are illustrated below in Exhibits 3-3 and 3-4 for two cases of utility reform — distinguishing between reform models without retail competition (which can apply to commercialization, privatization, some unbundling, and wholesale-only competition models) and with retail competition. This single characteristic of retail competition provides one of the most distinguishing characteristics affecting power sector interest in energy efficiency.

For the non-competitive retail market, features which *discourage* efficiency include an unbundled structure, price cap regulation, absence of regulatory requirement for efficiency, cross-ownership between generation and distribution entities, heavy competition among generators that drives down power prices, and either a low retail power prices or little change from pre-reform prices. Conversely, if there is a policy objective to *promote* the level of energy efficiency likely to be achieved, any one or more of the following features can be helpful: vertical integration, removal of price subsidies, price regulation that minimizes the portion of revenue gained from increased sales, regulatory provision for efficiency through performance requirements and surcharges applied to all supplier sales, independent ownership between generation and distribution functions, no or little supply competition, high retail prices, or a noticeable increase in retail prices from pre-reform levels.

In a competitive retail power market the unique characteristics that can *discourage* efficiency include competition primarily based on price, concentrated ownership of generation and energy supply entities, and a limited number of suppliers. A competitive retail model can *promote* efficiency though such features as regulation that ensures competition will be based on service and not price, varied ownership of and between generators and power suppliers, allowance of joint ventures between power suppliers and services firms, and greater numbers of power suppliers who will seek to differentiate themselves.

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Exhibit 3-3
Features of Non-Competitive Retail Power Markets Affecting Efficiency

Power Sector Features	Discourages Energy Efficiency	Promotes Energy Efficiency
Sector Structure	Unbundled	Vertically integrated
Regulation - Retail pricing	Price cap regulation (encourages unit sales increase, reducing expenses, including for energy efficiency)	Subsidies removed Formula minimizing share of revenue from variable unit sales, weighted toward number customers, not sales
- DSM cost and revenue adjustments	Price cap regulation	Fixed surcharge on all supplier sales to support efficiency; cost recovery mechanism
- DSM/ energy efficiency mandate	No mandate	Performance requirement
Ownership	Cross-ownership	Independent ownership, sometimes public ownership
Supply competition-induced price change	Heavy competition among generators	No or little generation competition
Retail price level, and change from previous price	Low price, little change or decline	High prices, noticeable change

Exhibit 3-4
Features of Competitive Power Markets Affecting Energy Efficiency

Power Sector Features	Discourages Energy Efficiency	Promotes Energy Efficiency
Sector Structure	Unbundled	Bundled
Regulation - Retail pricing	Price-oriented	Service-oriented
- DSM cost and revenue adjustments	Price cap or competition on price only — pressure to reduce costs of efficiency activities	Fixed surcharge on all supplier sales for energy efficiency activities;
- DSM energy efficiency mandate	No mandate	Performance requirement, funding public purpose efficiency activities
Ownership	Concentrated ownership	Varied ownership, joint ventures with services firms
Supply competition — entities	Limited number suppliers	Greater number of suppliers — seeking differentiation

Exhibit 3-4 (cont.)
Features of Competitive Power Markets Affecting Energy Efficiency

Supply competition — wholesale pricing	Severe cost-cutting from wholesale competition	Limited supply competition
Retail price level, and change from previous price	Low price, little change or decline	High prices, noticeable change

Power reform does not occur in a vacuum, and the level of efficiency likely to occur depends on other factors of the non-utility energy efficiency market itself. Some of these can be addressed by public policy measures, while others are affected by the general business environment and how attractive the opportunities are to deliver energy efficiency products and services. A summary of these factors is displayed in Exhibit 3-5.

Those factors *inhibiting* efficiency include limited numbers of local manufacturers of electrical equipment protected by high import duties or regulations, limited competition among equipment distributors, legal and financial barriers to forming ESCOs, limited labor pool of technically trained people and/or with limited international contacts, and an absence of (or unfavorable terms for) consumer credit.

To achieve *greater* efficiency irrespective of the particular reform model being considered, other factors can help. These include easy entry for international manufacturers with new product designs, low import duties or easy terms for local assembly by foreign manufacturers, greater competition and technical support among equipment distributors, a track record of local ESCO businesses or allowance of foreign partnerships to commence new ESCOs, good technical education programs or foreign exposure for technical personnel, and consumer credit that is both available and on affordable terms.

Exhibit 3-5
Factors of Non-Utility Market Affecting Energy Efficiency Response

Energy Efficiency Market Factors	Discourages Energy Efficiency	Promotes Energy Efficiency
Manufacturers	Few, local only, old designs or production equipment	Many, multi-nationals represented, newer global technology designs
Equipment distributors	Limited numbers of large distributors, small single proprietors	Chains, networks with volume buying power, good technical support
ESCOs	Barriers to: performance contracts, service business, access to working capital, or foreign partnerships	Past market development via utility or government programs; foreign partnerships
Energy efficiency talent pool	Limited local technology training, limited international exposure	Good educational and training programs, foreign exposure
Consumer finance and credit facilities	Not offered; or high interest, short term	Available, affordable interest, terms match payback periods
Import taxes & duties	High	Low

3.5 INATTENTION TO EFFICIENCY IN REFORMS — EXPLANATIONS AND LESSONS LEARNED

It is instructive to look at some of the reasons that efficiency received insufficient attention during the efforts to design power sector reforms, which remedial actions have subsequently been chosen to undertake to preserve some level of efficiency implementation, and what additional initiatives might still warrant consideration.

Explanations Why Efficiency Initially Received Insufficient Attention

There are three common reasons why end use efficiency failed to be addressed in four of the six case study countries:[6]

[6]Efficiency was addressed in two countries. In the U.S., the State of California has addressed efficiency internal to reform, through a mechanism that is parallel to the power sector reform structure. In New Zealand efficiency has been addressed both internal to reform (via a mandate to publicly-owned utilities) and external to reform (through policy for government-funded efficiency programs). A general framework for the options under which efficiency can be

- Ineffective policy attention
- Inadequate legal or regulatory framework
- Insufficient institutional capability and public constituency support

Ineffective policy attention. During most reform deliberations there simply was no policy attention to the evidence that an absence of significant market-based activity for efficiency was due to market barriers and imperfections, and not to power sector pricing. (It is possible the evidence in some countries was masked by earlier public mandates to utilities to offer customer energy efficiency services and/or government-supported conservation programs.) The policy considerations that were absent were those that could have addressed the relationships between energy efficiency and such broader considerations as:

- Surmounting latent market barriers to end use efficiency that were not caused by power utilities
- Arranging a transition strategy to mitigate the short-term economic consequences of power reforms on certain consumer segments (low-income households and institutional users)
- Fostering national sustainable development, and attention to the potential environmental effects of power sector reform (producing faster load growth and supply system expansion)
- Meeting goals of national climate change action plans to mitigate the effects of greenhouse gases

Inadequate legal or regulatory framework. Perhaps due to the optimism of policy analysts, legislators, regulators, and economists that energy-user price response and the workings of a "natural market" would achieve an economically rational level of investment in end use efficiency, there was no effective legal or regulatory framework to address whether efficiency warranted special attention. Then when the average retail power prices went down as much as 15%, and both wholesale and retail power suppliers focused mostly on reducing costs so as to compete primarily on price, both the demand for and supply of energy efficiency services diminished. There was no initial back-stopping legal or regulatory framework to address the possible need for efficiency services. Some of the deficiencies that were revealed in the case study countries included:

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addressed is presented in Chapter 4.

- Total absence of a legal or regulatory framework to address efficiency considerations

- Limited scope or authority of existing organizations to the point that they were constrained in
  - participating in the reform deliberations
  - performing relevant analyses
  - going beyond policy studies to initiate alternative solutions for efficiency services
  - settling for sub-optimal mitigation actions

  In some cases legislative action to provide this authority simply had not yet occurred. In other cases active lobbying by the power industry or the business community insured this authority would not be granted.

- Insufficient staff and budget resources for executive or regulatory government agencies that had the authority to carry out oversight or initiatives for efficiency issues

- Uneven legislative and regulatory focus, such as mandating the provision of efficiency services by publicly-owned distribution utilities, but not for privately-owned distribution utilities

Insufficient institutional capability and public constituency support. Energy efficiency and environmental constituencies (whether government, private, or non-governmental organizations) simply were not "voices at the table" during the deliberations on power sector reforms. Absent from the table, they were not present to advocate consideration of the societal value of efficiency investments that were not explicitly addressed through the economic interests of parties to the reforming power market. Some of the contributing factors to this situation were:

- Insufficient technical analysis capability within government agencies, research institutes, or advocacy organizations.

- Inadequate access to or effectiveness in communication with the political process that drove many reform deliberations

- Lack of formal organization of constituencies that could have demanded attention to efficiency issues

- Late timing of the efficiency constituency

Lessons Learned — Remedial Actions Countries Have Undertaken to Address Efficiency

After reforms were in place in four of the six countries, governments undertook remedial actions to preserve or initiate energy efficiency services.[7] These actions took four forms:

- Enabling laws to permit power organizations to
  - participate in business enterprises that offer (profit-oriented) energy services
  - collaborate between generators and distributors or energy suppliers to capture potential economic benefits of efficiency that would not sufficiently accrue to just one organization
  - form joint ventures with equipment and technology manufacturers and distributors
- Wires charges or sales surcharges to create a fund to support efficiency programs
- Mandatory requirements for power distributors to offer (free) efficiency services
- Public programs supported with general government tax revenues to deliver efficiency measures to special constituencies (low income, elderly, etc.)

Lessons Learned — Additional Initiatives That May Still Warrant Consideration

Even after case study countries have initiated some remedial actions, it is apparent there are many other initiatives that might be warranted to narrow the efficiency gap. These remaining options fall into four categories:

- Assessment of the merits of further policy intervention - either of a transition nature or longer-term
  - Analyses of the potential public benefit from expanded energy efficiency services, and identification of alternative action strategies (e.g., mandates on the power sector, market transformation, publicly-supported programs)
  - Assessment of energy efficiency potential to mitigate local air pollution (via industrial sector efficiency, or demand-lowered generation)
  - Review of energy efficiency in relation to national climate change policies and action plans
- Expanded constituencies and public support for efficiency

[7]This was the case in Argentina, Norway, the U.K., and New Zealand.

- Quantifying the potential value of higher visibility public policy toward efficiency
- Coalition-building among potential constituencies for efficiency
- Formation of marketing consortiums or branding strategies for manufacturers and suppliers of energy efficient equipment
- Expanded authority for government agencies to analyze efficiency issues, and/or undertake implementation efforts
- Codes and standards for minimum efficiency levels in buildings, appliances, and equipment

▸ Legal and business enabling initiatives to support market-based efficiency
- Legislative initiatives for business, financial, or legal changes that can facilitate private sector energy service businesses
- Separation of efficiency information and service centers from hostile power sector organizational environments (which may result from legislative or regulatory mandates)
- ESCO business development advisory services
- Changes in electricity billing practices to provide informed feedback to consumers on energy use and costs
- Energy efficiency labeling programs for appliances and equipment
- Development of lower-cost and creative mechanisms to deliver efficiency services to small and medium-sized consumers

▸ Financing mechanisms
- Funding support (wires charges, sales surcharges, resource depletion funds, general tax revenues, etc.) for transitional and longer-term efficiency services in the public interest
- Investment funds for ESCO business start-up or incubation
- Consumer finance instruments to manage higher first-costs of energy efficient appliances, equipment, or housing

Drawing upon the valuable lessons learned from the case studies, Chapter 4 discusses how the details of alternate reform structures and rules can enhance or diminish the potential for achieving energy efficiency. Chapter 4 also presents a framework for considering public policy choices for further intervention in the efficiency market as this continues to evolve under reform structures and rules.

CHAPTER 4
CONCLUSIONS

This chapter moves away from the specific case studies and discusses how specific features of power sector reforms affect incentives and behaviors of key market actors — end-use customers, the reformed power sector, and other providers of efficiency services — with respect to end-use efficiency. Once a country reforms its power sector, each of the actors considers its own benefits and costs and acts accordingly. The public policy question then becomes how has the efficiency gap changed from the pre-reform era, and is there a sufficient gap to warrant any intervention by government. The chapter concludes with a review of intervention options that governments might take if they choose to reduce the remaining efficiency gap.

4.1 CUSTOMER INCENTIVES FOR ENERGY EFFICIENCY

The single most important effect that reforms have on customer efficiency incentives is price change. End-use customers do respond to price changes, given enough time for the replacement of electricity-consuming appliances, equipment, and processes. Reforms can enhance end-user price signals under several conditions:

- when customer electricity use is accurately measured and revenues systematically collected;
- when system-wide and customer class subsidies are eliminated;
- when tariff structures reflect time and location specific costs; and
- when future electricity prices are relatively predictable.

Reforms that improve revenue collection give consumers incentives for more efficient electricity use. Commercialization could result in paying market prices for fuel that get passed along to consumers in the form of higher electric prices, and greater rigor in utility revenue collection efforts.

The adoption of retail tariffs that reflect the costs of service to customer classes will alter prices from those experienced prior to reform. Commercialization and privatization will take tariffs out of the domain of political decisions and eliminate the effects of past political influence in suppressing overall tariff levels, or awarding subsidized power to favor customer groups (such as households, farmers, and/or large industries). The effect may result in increased or decreased average tariffs (the latter for customers previously paying high tariffs needed to cross-subsidize

other customers). Where tariffs increase, there will be greater economic incentive to adopt efficiency measures.

As power generators and suppliers design tariffs to reflect time and area-specific variations in cost, some consumers will be motivated to adopt efficiency or load management practices. If power generation or transmission costs vary by time of day or season due to peaks and valleys in power demand, wholesale or retail tariffs may be based on time-of use. Similarly, if distribution utilities are required to invest in more infrastructure to deliver power during peak periods, the distribution investment may be passed on in the form of tariffs (e.g. TOU tariffs that vary by time of day, and voltage-based tariffs that are higher for those taking power at lower voltages) or specialized charges to reflect the investment cost to serve new customers, (e.g. front-end "hook-up" charges that reflect the level of demand for network capacity, and "line extension" charges based on the length of the distribution line that must be erected to serve new customer locations distant from the existing network). These tariffs and charges can motivate power users to modify their power use or electrical designs to minimize the financial impact of power demand.

Tariffs based on independent regulation or a stable commercial power market provide a predictable level of power prices and enhance the ability of customers to make efficiency investment decisions. The expected level of future prices will inform the consumer's investment decision for efficiency options. Politically-established tariffs (both subsidized and those at premium levels) may have been more volatile; the early years of wholesale and retail competition may drive prices down through cost-cutting measures by utility generators and distributors. In both cases the uncertainty of likely future power prices complicates a consumer decision on efficiency, and may have encourage deferral of all but the shortest-payback investments in efficiency. As prices become more predictable, the consumer can have a higher confidence in the likely financial outcome of any efficiency expenditures.

4.2 FACTORS ENCOURAGING ELECTRICITY SUPPLIERS TO PROMOTE ENERGY EFFICIENCY IN A REFORMED POWER SECTOR

In a reformed power sector, electricity suppliers will promote energy efficiency in several instances:

- when retail competition exists;
- when government regulation mandates them to do so;
- when retail pricing rules decrease the importance of maximizing sales; or
- when energy efficiency improvements do not reduce overall net revenues.

Retail competition can create incentives for power suppliers and distributors to promote energy efficiency. When retail competition is introduced, electricity suppliers will likely focus on load management and target large industrial and commercial customers. Power suppliers or distributors will invest in load management to the extent that the investment saves a greater

capital investment in the distribution system. If utilities are permitted by the regulatory system to enter the market for efficiency services, their target customers will most likely have power demands of 100 kW or more. Below this threshold (e.g. residential customers, small- and medium-scale commercial and industrial enterprises), efficiency services are less likely to be profitable. Exhibit 4-1 describes how several utilities are preparing for future retail competition.

In order for electricity suppliers to view efficiency improvements as attractive investments, the power supply contracts with end users must be long term. Short-term (one year) contracts will severely constrain the ability of a power supplier to recover expenses for efficiency activities.

Efficiency services will not necessarily be immediately packaged with electricity sales and heavily marketed. There may be a time delay of several years in offering a full package of services. Additionally, efficiency services may be reserved for individual customers or customer segments where the value added by total energy management or technical assistance with efficiency measures is essential to securing the customer contract for power supplies.

Distribution utilities or power suppliers will promote energy efficiency if the regulators require them to do so. Utilities can be required to undertake a minimal level of energy efficiency services by the government or regulators. Governments may impose such requirements in order to address the efficiency needs of franchised or small (under 100 kW) customers. Typical energy efficiency services that a utility might be required to undertake include providing general public information, making assistance services available upon request, or providing some minimal level of performance-based energy savings programs. In some developing countries the power organizations may be ill-prepared to undertake these activities directly, and may choose to arrange these through third-parties.

Exhibit 4-1
Anticipating Retail Competition in the United States

The anticipation of retail competition in the United States has prompted U.S. utilities to take various actions that they hope will position them to retain current customers and win new customers. For example, two Californian utilities, Southern California Edison and Pacific Gas and Electric, have initiated "fee-for service" programs. Commercial and industrial customers are asked to pay for the services received. The range of services includes energy audits, facility electrical planning, economic analysis, equipment selection, and verification of savings from efficiency equipment.

Other U.S. utilities have established unregulated subsidiary businesses that will offer efficiency and related services to commercial and industrial customers. The subsidiary can offer these services at a higher profit than was possible under the regulated programs and it provides a means for the utilities to promote customer service. Such activities can provide utilities during the transition to competition with valuable market intelligence to develop a competitive strategy, and thus may be justified as "loss leaders". The continuation of these services will depend on customer demand and profitability.

Utilities have an incentive to promote energy efficiency when retail pricing rules decrease the importance of maximizing electricity sales. Different pricing rules can increase or decrease the importance of maximizing sales. Revenue caps, which provide incentives to seek operational efficiencies, focus utility attention away from maximizing sales. Similarly, price formulae that assign a large component of revenue from fixed charges, rather than variable charges, improve the incentives for energy efficiency. Pricing rules may or may not be addressed through regulation of power suppliers and distributors.

Electricity suppliers will promote efficiency when system-wide net revenues are increased. In developing countries, electricity suppliers have opportunities to promote end-use efficiency that are not common in industrialized countries. First, some customer classes are so heavily subsidized that the supplier actually loses money with each kWh sold. In such cases, it may be possible to increase net revenues by reducing the electricity use among such customers through efficiency improvements. Second, in systems with unmet demand due to generating capacity constraints, electricity suppliers can promote efficiency among less profitable customers and sell the saved electricity to more profitable customers in their service area who are currently constrained in how much electricity they consume. This situation may be a short-term phenomenon if prices eventually evolve to market rates, or could endure if social policy dictates continued cross-subsidies of selected customer classes.

4.3 FACTORS ENCOURAGING THE EMERGENCE OF AN ENERGY SERVICES MARKET IN A REFORMED POWER SECTOR

Price signals alone will not be sufficient to overcome market barriers, especially for residential users and small and medium commercial and industrial facilities. Similarly, power companies (generators, transmission and distribution companies, and power suppliers) will have limited incentives to promote energy efficiency in a reformed power sector. Consequently, the availability and capacity of energy service providers will play a determining role in the provision of energy efficiency. The factors that encourage the emergence or growth of an energy services provider market in a reformed power sector depend on two sets of circumstances:

- Relative development of the pre-existing market infrastructure for building and energy equipment services
- Response of this market infrastructure to power reforms

The Pre-existing Market Infrastructure

There are seven essential elements of energy efficiency services. To the extent that these have been developed prior to power sector reform, there is a greater probability that energy services will be witnessed post-reform, whether market-based or publicly-provided. These elements are:

- Basic educational skills in achieving energy efficiency (education and training)
- Product availability (commercial suppliers, no barriers to imports or import taxes)
- Efficiency performance information about products (testing, labeling, standards)
- Information about qualified professionals, such as engineers, architects, and technicians (certification, licensing)
- Entrepreneurial business capabilities to create energy services businesses, including marketing and delivery (business skills, access to capital for business formation, management capability)
- Perception of market demand, or potential market, to attract businesses to offer energy efficiency products and services
- Financing mechanisms to facilitate purchase of higher-first cost solutions by end-users

Some or all of these capabilities may have developed prior to reform by one or more of three parties:

- Private sector companies
- Utilities under mandated obligations
- Government programs and services

Post-reform, the personnel capabilities of utilities and/or governments could migrate to private energy services companies.

The absence of several or more of the essential elements may mean there are no or few efficiency suppliers ready to serve local markets. In this case government and private business development strategies may be advised in the short-term to promote the development of an energy services market and industry as part of a longer-term strategy of market transformation and market-based efficiency goals.

The Market Response to Power Reforms

The response to reforms will depend on:

- Price signals that are predictable and reflect true costs of service;
- Unrestricted business environment for offering new forms of energy services;
- Access to customer information for marketing purposes;

- Introduction of retail power competition among profitable market segments;
- Market rules that allow the same firm to offer both supply- and demand-side energy services; and
- Sources for independent comparative information that end users can rely upon to assess claims of product or service offers.

Power sector reforms that improve customer price signals create positive conditions for energy service markets to emerge. Energy service providers can be expected to emerge where power is expensive. Among large commercial and industrial organizations, their greater total cost for power services is sufficient to capture attention to pursue efficiency measures with fast pay backs (under 1 or 2 years). This may occur through ESCO and product manufacturer marketing initiatives, or through efficiency services acquired in total energy management contracts in competitive retail power markets.

An unrestricted commercial business environment ensures the latitude for energy service companies to design and operate new energy supply and management services in competitive electricity markets. Business laws and regulations must exist to facilitate performance contracting, leasing, and other time-based forms of equipment and maintenance transactions. In some countries the energy efficiency market must await parallel reforms in legal and financial business conditions to ensure the availability of credit, loan guarantees and contract enforcement and collection. Until that happens, the financial returns may not be sufficient to attract management skills and capital to efficiency businesses.

Reform regulations that permit energy service businesses to have access to sales information contained in energy supplier or distributor records will be valuable for guiding energy services business to prospect customers. Consumption information can be used to screen potential clients for energy services, identifying those customers whose total consumption levels or daily demand profiles offer the greatest prospects for selling profitable energy management services. The information contained in billing records for commercial, industrial, and institutional users can simplify the time and costs to find a contact person for sales efforts.

Introducing retail competition among profitable customer segments will encourage the emergence of energy service companies. To the extent that efficiency services will be paid for by private transactions, and not through ratepayer funds or government funds, the market will focus on the most profitable sectors first. In the short-term, large-to-medium-sized non-residential customers will be the most promising market segments for efficiency services. The market is least likely to serve residential customers (especially those with low incomes) and small and medium commercial and industrial enterprises. Services for middle and upper income residential consumers can be achieved through outlets for major home appliances if 1) efficient models are heavily promoted by manufacturers or retail outlets, and 2) financing or credit terms

are easily available for those who view the higher first costs of efficient models as a barrier. These efficiency services are unlikely to be met through ESCOs.

Reform rules that allow the same organization to offer both supply- and demand-side energy services will produce hybrid energy supply/management services. If permissible, some ESCO and other efficiency businesses may combine their services with energy supply arrangements for power and gas. At first, there may be an emphasis on getting the lowest-priced commodity, to be followed later by other options to optimize on total power expenditures. The profitability of both power commodity and efficiency services can be enhanced by the ESCO's long-term relationships with clients and use of a monthly payment system for combined commodity and service functions that promises "least cost total energy services". In the obverse, it is also possible that services emphasizing "total energy management" could identify opportunities for industries to switch from petroleum fuels to electro-technologies. This could result in greater total economic efficiency and improved environmental impacts, but might actually increase the demand for electricity.[1]

Independent sources of comparative information to assess the claims and likely performance of product and service businesses can reduce the risks that end users face when considering efficiency initiatives. Such information as ratings, testing, labeling, performance, qualifications, model contracts, etc., may be provided by private businesses, professional accreditation organizations, non-profit consumer organizations, or government agencies. In addition, model performance contracts and equipment efficiency labels may reduce the decision time or transaction costs for adopting efficiency measures.

4.4 OUTLOOK FOR THE POST-REFORM ERA

The outlook for energy services in the post-reform era depends a great deal on power price level, market scale-economics, and the degree of likely competition for retail customers.

Price Level

Absolute price level. In countries *where power prices are perceived to be expensive*, the energy efficiency market can emerge if there is sufficient promotion of efficiency options, commercial availability of efficiency technologies, and financing mechanisms to mitigate the deterrent of the higher first cost of much efficient equipment. In countries *where power prices are perceived to be inexpensive* efficiency is unlikely to occur without some form of government intervention. Such options are discussed in Section 4.5

[1] Swinden, D.J. "Energy Efficiency and DSM in a Fully Competitive Energy Market," Fourth International Energy Efficiency & DSM Conference. Berlin: SRC International, October 12, 1995.

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Price will not be sufficient to overcome market barriers at least for residential users and small-medium commercial and industrial facilities where the absolute level of electric bills may not be a significant monthly expense. Among large commercial and industrial organizations, their greater total cost for power services is usually sufficient to capture their attention to pursue efficiency measures offering fast returns (under a 1 or 2 year simple pay-back).

Short-term versus long-term effects. Because most energy users make short-term buying decisions and demand fast returns on investment in efficiency, it is likely that market response will fall far short of the economic potential for efficiency (defined against power supply costs). Over time, if a qualified and competitive market of energy services providers emerges, these players may be able to encourage end-users to contemplate longer-payback efficiency measures.

Market scale-economics

Type of customer. Over time, most reformed power sectors can expect private energy services will target the larger commercial and industrial sectors, and exclude the smaller residential and small-to-medium size users. Some countries may want to sponsor transition services that help develop innovative solutions to offer services to existing small and medium-size end users, and/or public funding support for markets where barriers to these users will be more long-lasting. Alternatively, new appliances, equipment, and buildings can be effectively targeted over a period of years through minimum efficiency standards, that eliminate the need to secure individual decisions.

Type of technology. Simple technologies (such as lighting, motors, and refrigerators) will have more success than technologies that are more complex or are part of process systems.

Competition

The degree to which market competition emerges for efficiency services depends on reform structure and rules, energy prices being sufficiently high to capture end user attention, the ability of services to make a profit, and business laws and regulations that facilitate performance contracting, leasing, and other time-based forms of equipment and maintenance transactions. To the extent that efficiency services will be paid for by private transactions, and not through ratepayer funds or government funds, the market will focus on the most profitable sectors, and move to other sectors as the prospects for profit manifest.

During the initial period after reform (perhaps up to three years) the greatest emphasis by end-users may be on getting the lowest-priced commodity, without regard to the potential for energy efficiency services. Additionally, for many developing countries the energy efficiency business must await parallel reforms in legal and financial business conditions that can ensure the availability of credit, loan guarantees and contract enforcement and collection. Until that

happens, the financial returns may not be sufficient to attract management skills and capital to efficiency businesses.

In the long run, some ESCO and other efficiency businesses may combine their services with power supply arrangements to offer end-users the ability to optimize on total power expenditures. Power suppliers may follow suit to remain competitive and differentiate their services from others. Over time product manufacturer marketing initiatives also could increase. The overall outcome in competitive markets for commercial/industrial measures with pay backs longer than 1-2 years will most likely depend on the degree of innovation for financing mechanisms or total energy-cost contracts.

4.5 OPTIONS FOR FILLING THE EFFICIENCY GAP

Each of the market actors discussed so far — customers, electricity suppliers, and other efficiency service providers — plays a role in achieving potential end-use efficiency improvements in a reformed power sector. Still, some improvements that are desirable from a societal perspective will remain unachieved after power sector reforms are implemented. Exhibit 4-2 conveys three types of external agents that can work with the end user to tap some of the energy efficiency potential that remains cost-effective from the perspective of the larger society. These agents are private energy service businesses, the power supply/delivery system, and public policy mandates.

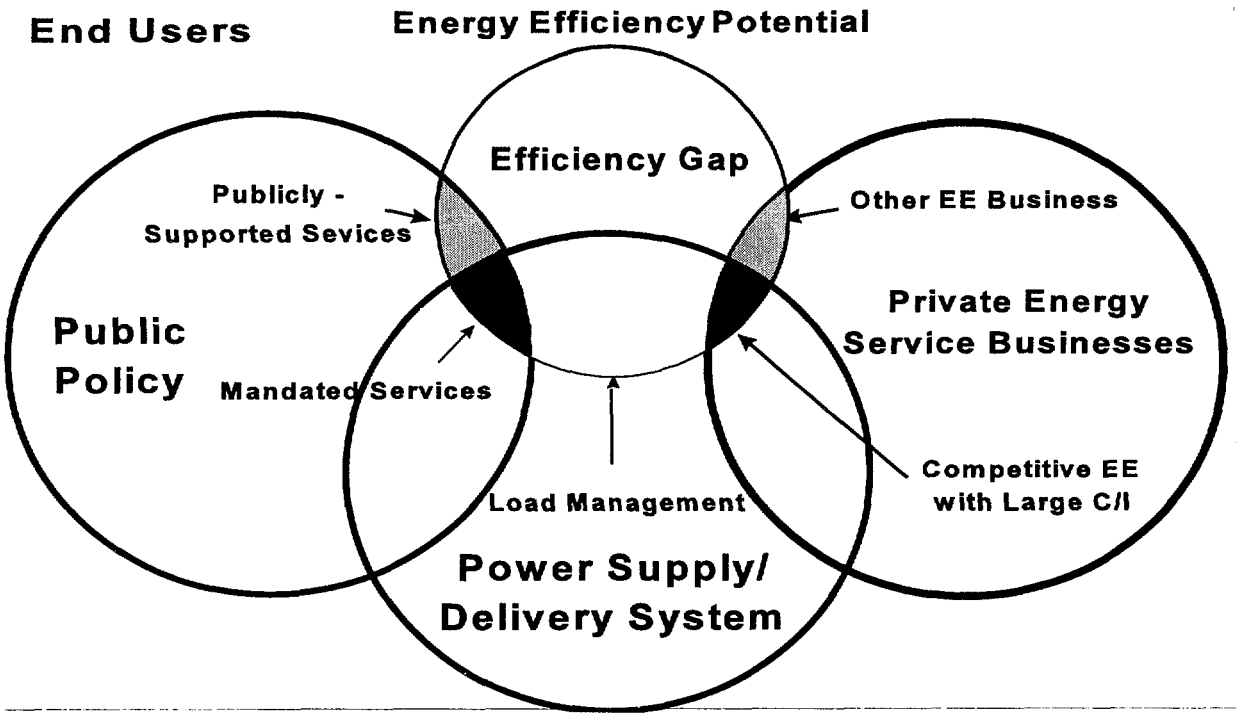
The societal-optimal pool of efficiency potential is represented by the entire upper middle circle of the diagram. Examples of those efficiency opportunities that are likely to occur without public policy intervention are labeled as:

- Load Management (customer response to power company time-of-use pricing)
- Competitive Energy Efficiency for Large C/I (ESCO and other service businesses targeting these large users)
- Other Energy Efficiency Business (price-induced actions by customers adopting higher efficiency technologies, such as lighting, refrigerators, air conditioners, motors)

Other efficiency services may be provided only with some form of public policy intervention. These are represented in the diagram as:

- Mandated Services (efficiency services mandated upon power suppliers or distribution companies as a condition of being licensed for business)
- Publicly-Supported Services (services provided via government or non-profit initiatives)

Exhibit 4-2
The Market for Energy Efficiency Services



The unshaded portion of the energy efficiency potential circle designates the "Efficiency Gap" -- that portion of the efficiency potential that is not undertaken through the other agents. The relative size of this will be affected by the type of reform system adopted and its rules, the level of retail power prices, the relative development of private business services that can offer energy efficiency, and economic considerations such as trade policies, import duties, local manufacturing infrastructure, and availability of financing mechanisms. The societal objective, of course, is to enlarge the amount of efficiency potential tapped by the external agents, to some point of optimum cost-effectiveness. The extent to which government policy or regulatory interventions are warranted to reduce the efficiency gap depends on several factors, including the cost of closing the gap, the competition for public resources, and the size of the benefits expected from realizing more of the efficiency potential. Chapter 5 presents a process that countries can undertake to reach these threshold decisions.

Where there is a policy goal to address mandated services or publicly-supported services, or to fill some of the remaining efficiency potential, there are two basic intervention strategies available. These are intervention "internal" to power sector reforms, and/or intervention that is "external" to the reforms. Exhibit 4-3 displays these two points at which governments can promote increased energy efficiency. Intervening at either or both points may in fact be

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necessary, at least for a transition period, to overcome barriers to efficiency among different customer segments.

Internal intervention. Any intervention within the reform process should seek to either enhance the incentives of power sector actors to promote efficiency (dubbed "integral to reforms") or use the power sector as a vehicle for collecting funds to be used by others to carry out energy efficiency (dubbed "parallel to reforms").

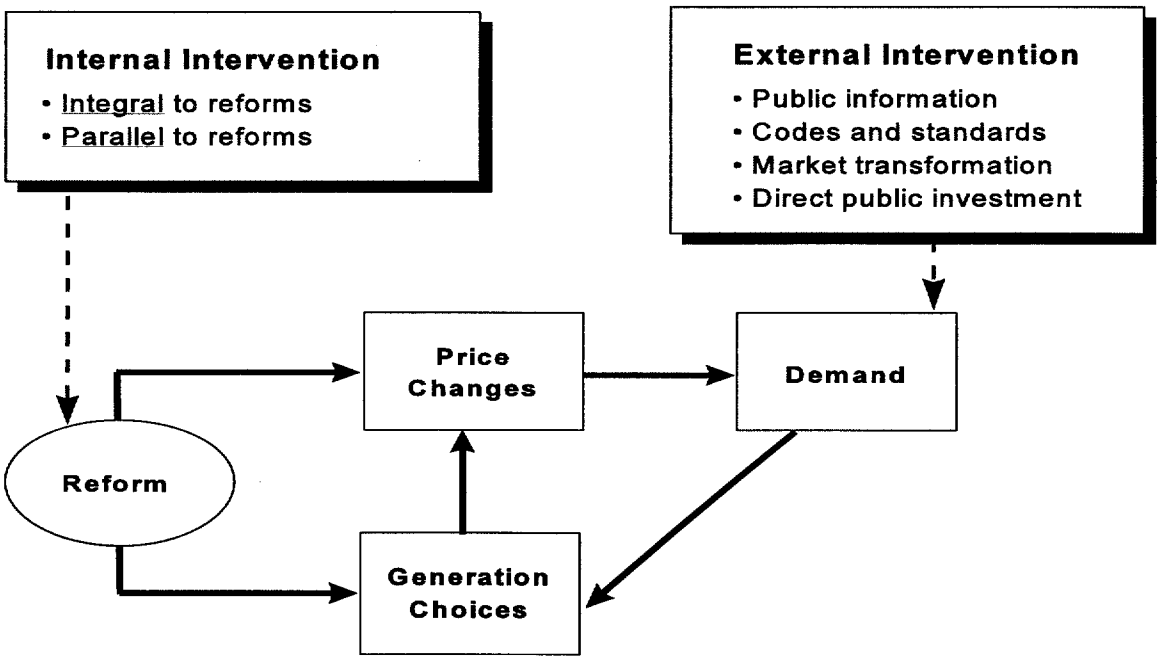
Within an *integral* reform strategy, the following actions might be taken:

- Ensure that tariff reforms cause end-use customers to be faced with price signals that accurately reflect the true costs of providing service, ideally including time and location specific costs.

- Require all electricity distributors to achieve a target level of efficiency improvement among the customers they serve. Each distributor must fulfill these regulatory requirements using whatever means it deems most cost effective. The cost of service is absorbed by each distributor.

Exhibit 4-3

Potential Points of Intervention for Energy Efficiency



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- Require competitive wholesale power markets to allow providers of energy efficiency and load management services to participate directly in meeting the demand for power. This is known as "DSM bidding" or "all-source bidding". Two key issues are how to allow some energy efficiency resources to bid as long term resources, rather than hourly priced resources, and how to verify the persistence of the efficiency measures over the term of the contract.

Parallel reforms do not rely on mandating efficiency or creating incentives for the power sector to promote efficiency. Rather, they use the presence of the power sector as a vehicle for funding efficiency via a:

- "Wires charge," surcharge, or "public benefits charge" on all power accounts or designated sales to fund specified electrical efficiency activities.(Corollary charges could be contemplated on gas and other fuels to support "total-energy" efficiency services.)

Funds may be reserved for the exclusive use of the distributing utility, flow to the national government for its allocation, or flow to a regulatory body or independent organization for competitive award to service providers (which could include electricity retailers or distributors).

Three illustrative models for addressing energy efficiency internal to a reform system are presented below in Exhibits 4-4 through 4-6. Model 1 addresses a first-stage reform for a commercialized or privatized bundled utility, while Model 2 presents a more advanced model for an unbundled power structure without retail competition. Both models 1 and 2 apply to countries *not yet ready* for competitive retail markets. In both cases transmission is not addressed because there is almost no instance where changes in transmission ownership, operational rules, or pricing can affect end use efficiency. Model 3 presents an illustrative strategy for countries that are *ready for competitive* retail markets.

Exhibit 4-4
Addressing Energy Efficiency *Internal* to Reform System
Model 1: Commercialized and Privatized Bundled Utility

Ways to Address Energy Efficiency Within the Power Sector	
- Generation	Vertical integration of G/T/D to capture all benefit levels of energy efficiency and load management
- Distribution	Analyze load management impacts on capacity investment
- Wholesale supply competition	Permit DSM to compete with resource acquisition
- Laws (ownership)	No particular requirement
- Regulations	
Retail tariffs	Increasing blocks, eliminate subsidies, TOU prices
Energy efficiency/ load management cost recovery	Allow recovery of approved energy efficiency and load management expenses, possibly with a profit incentive
- Power expansion planning	Require equivalent of IRP or least cost planning
- Customer service	Free public information on energy utilization and efficiency
- Benefits determination	Utilities required to offer energy audits
- Energy efficiency	Free or low-cost services
- Load management	Technical assistance to customers on use of TOU tariffs, interruptible rates; Consider load control
- Financing mechanisms	Require utilities to offer leasing or loan programs

Exhibit 4-5
Addressing Energy Efficiency *Internal* to Reform System
Model 2: Unbundled Power Structure

Ways to Address Energy Efficiency Within the Power Sector	
- Generation	Possibility generators may pay for load control and load management to shape buyers' loads to best match generation output
- Distribution	Require distributors to analyze load management impacts on capacity investment, and justify capacity investment plans
- Retail power supplier	Retail competition may stimulate services to selected customers
- Wholesale supply competition	Permit DSM to compete with resource acquisition
- Laws (ownership)	Prevent vertical cross-ownership to ensure more competition, and lessen incentive for sales
- Regulations	
Retail tariffs	If retail prices regulated: use increasing blocks, eliminate subsidies, TOU prices, structure tariffs to minimize gain/reward from new kWh sales. If prices not regulated: market will dictate prices
Energy efficiency/load management cost recovery	If retail prices regulated: Allow recovery of approved energy efficiency and load management expenses, possibly with a profit incentive
- Power expansion planning	Could require combined distributors/suppliers to show efforts to acquire least cost resources, including load management or efficiency
- Customer service	Require distribution utilities to supply free public information on energy utilization and efficiency (costs to be reflected in regulated distribution charges, possibly paid via wires charge or customer account charge)
- Benefits determination	None
- Energy efficiency	Require retail competition on basis of service, not price.
- Load management	If distribution charges have price cap, distributors will seek cost reductions from distribution system, including load management. If distributors buy power for re-sale, wholesale contracts with TOU terms may encourage TOU tariffs, interruptible rates.
- Financing mechanisms	Wires charge or account surcharge to fund energy efficiency services and programs. May be assigned at transmission level, or only to non-competitive customer base. Proceeds may be used by utility or remanded to a public benefits administrator. Shareholder/owner funds may be used to support competitive services.

Exhibit 4-6
Addressing Energy Efficiency *Internal* to Reform System
Model 3: Retail Competition

Ways to Address Energy Efficiency Within the Power Sector	
- Generation	Vertical integration of G/T/D to capture all benefit levels of Energy efficiency and load management
- Distribution	Analyze load management impacts on capacity investment
- Wholesale supply competition	Permit DSM to compete with resource acquisition
- Retail power supplier	Encourage longer term supply/service contracts to give suppliers chance to include and amortize energy efficiency services
- Laws (ownership)	Explicitly allow power suppliers to offer other customer services
- Regulations	
Retail tariffs	If prices regulated: encourage increasing blocks, eliminate subsidies, use TOU prices
Energy efficiency/ load management cost recovery	If prices regulated: allow recovery of approved energy efficiency and load management expenses, possibly with a profit incentive
- Power expansion planning	Require equivalent of IRP or least cost planning
- Customer service	Require all providers to offer free public information on energy utilization and efficiency
- Benefits determination	Requires suppliers or distributors to offer energy audits
- Energy efficiency	Encourage and promote suppliers' offering free or low-cost services bundled with power supply
- Load management	If transmission or distribution charges have price cap, operators will seek cost reductions on their portions of T&D system, including some load management. If they reflect time-varied costs in T&D charges, could motivate power suppliers to consider load management also. Wholesale power contracts with power suppliers may have TOU terms that also encourage TOU tariffs, interruptible rates.
- Financing mechanisms	Wires charge or account surcharge to fund energy efficiency services and programs. May be assigned at transmission level (to capture high voltage users), or to all retail sales by energy suppliers (may enable high voltage users to by-pass). Proceeds may be assigned to a public benefits administrator. Shareholder/owner funds may be used to support competitive services.

External Intervention. Some policy interventions are better directed at market actors outside the power sector to address those barriers that the power sector itself is not well suited to address. An external strategy might include the following initiatives:

- Allocate public funds (general government budgetary funds, or an energy tax on all forms of energy) to conduct "public benefit" efficiency programs. These can be programs based on one or more of several intervention strategies:
  - voluntary public information and other services
  - market transformation services
  - direct public investment

- Institute mandatory energy efficiency codes & standards for new building construction, equipment, and appliances. (Voluntary standards are essentially voluntary information services.)

Each of these is summarized below, and followed by a table of illustrative initiatives.

Voluntary Services. Voluntary services attempt to address various persistent market barriers by making available information or financial services programs. Consumers can choose to take advantage of or reject these programs, relying upon whatever market-based products and services emerge. Typical voluntary public services are displayed in Exhibit 4-7.

Exhibit 4-7
Voluntary Services

Type of Initiative	Illustrative Activities
Information and Awareness	Public information campaigns Appliance efficiency labeling Workshops to help do-it-yourself conservation Energy audits
Technology Promotion	Promotion of efficiency features of new equipment and appliances Public demonstrations of new technologies
Risk Reduction	Certification of equipment, or installation companies that meet voluntary standards
Financing	Dedicated loan funds for efficiency at market-rate interest, possibly re-paid through routine utility or property tax payments

Market Transformation Services. The primary objective of any market transformation program is to permanently alter the market environment for efficiency by institutionalizing favorable financial mechanisms, by stimulating the emergence of higher-efficiency products, or by shifting the market toward "best practice" services. For example, government procurement programs can

encourage market transformation by adhering to life-cycle cost procurement policies for equipment and services. This stimulates manufacturers to raise their technical standards for efficiency. Market transformation services are differentiated from other types of government activities by the existence of a cooperative relationship among efficiency advocates in both the public and private sector. The government, non-governmental organizations, manufacturers, lenders and others cooperate to catalyze a permanent shift in the efficiency market place. Exhibit 4-8 summarizes various examples of market transformation initiatives for end user market segments.

Exhibit 4-8
Illustrative Market Transformation Initiatives

Type of Initiative	Market Segment		
	Large Commercial & Industrial	**Small & Medium C/I & Agriculture**	**Residential**
Technology R&D	Gov'ts, manufacturers, and energy associations share in R&D funding	Both shared funding and voluntary agreements	Gov'ts and manufacturers cooperate in voluntary agreements
Design Competitions	Key technology via manufacturers or energy associations	Typical technology: display lighting Life-cycle cost analysis for government purchases	Typical technology: refrigerators
Technology Introduction & Promotion	Demonstration projects	Volume-purchase arrangements (by gov'ts, associations)	Harmonized regional technical standards Reduced import duties on efficient equipment
Branding/Labeling	"Energy Star" type labeling programs	Both types of labeling programs	Green or "Eco" labeling programs
Educational Advertising	Appeals to executives	Performance contracts ESCO business advice	Life cycle cost principles, leases
Risk Reduction	Credit enhancements	Loan pools, performance contract guarantees	Pooled loan risks, insurance
Financing	Credit enhancements	Dedicated investment funds, package for secondary markets	Mortgage loans with energy efficiency "adders"

Direct Public Investment. Governments may find it necessary to undertake direct public investments in efficiency for certain consumer segments or technologies that do not respond to other types of initiatives. For example, low-income households in private housing may lack both capital and access to credit that would allow them to take advantage of equipment leasing

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programs or other efficiency programs. Elderly citizens living on pensions may resist making long-term investments in efficiency improvements. Consumers from all segments may not take advantage of technologies that have long pay backs (4-5 years) because of consumers' short investment horizons. Yet if these technologies offer long-term efficiency and environmental benefits, governments may choose to invest public resources to lower the effective cost of these technologies to consumers. Examples of possible initiatives are shown in Exhibit 4-9. The delivery or administration of many of these services could be awarded to private organizations on a competitive basis.

Exhibit 4-9
Direct Public Investment Initiatives

Type of Initiative	Illustrative Activities
Information and Awareness	Target audience promotion of conservation measures
Technology Promotion	Free, direct installation of no-cost and low-cost conservation measures
Risk Reduction	Free inspections of completed conservation installations.
Financing	Grants (rebates, tax credits) or no-interest loans for qualifying households

Codes and Standards. Many governments have found mandatory building codes or equipment and appliance efficiency standards to be a cost-effective means of achieving substantial efficiency gains. Codes and standards set a minimum level of efficiency to be achieved either in buildings or by new appliances and equipment. Codes have resulted in efficiency improvements of 10-15% in some cases. By instituting codes or standards affecting builders or manufacturers, efficiency can be achieved at a lower cost and also avoid costly promotional or marketing programs that would otherwise be necessary to encourage the adoption of efficiency measures by individual consumers.

Codes and standards do not automatically achieve the highest possible degree of efficiency, but they raise efficiency to a higher level than is being achieved without codes or standards. The primary benefit is a level of market penetration that is virtually 100% within a period of years because all buildings or appliance sales are affected by the standards.

This chapter has presented a wide range of possible market and government responses to efficiency, which will be determined by the structure and rules of power sector reform, the underlying state of the market for energy efficient equipment and services, and public policies towards potential government intervention in the market (either on a temporary or longer-term basis). Each country contemplating power sector reform, or seeking to fine-tune the effects of reforms already underway, needs to assess the size of its own efficiency gap and what rules or

policies might be appropriate to reduce the size of this gap. The most specific form and operational feature of most all the intervention options can be designed to remain consistent with the overriding reform philosophy of economic efficiency, private capital investment, and the beneficial effects of competition (price and diversity of choice). Chapter 5 offers a three-phased process to guide countries in making these decisions.

CHAPTER 5
RECOMMENDATIONS

From the preceding chapters, it is clear that an efficiency gap is likely to remain in the wake of power sector reform. This chapter outlines a process that can be used by parties with a stake in either power sector reform or energy efficiency to:

- determine the extent to which end-use efficiency considerations should be included in the deliberations on reform;
- select strategies for addressing efficiency within or outside reform;
- assess the best mechanisms and parties to implement the selected strategies

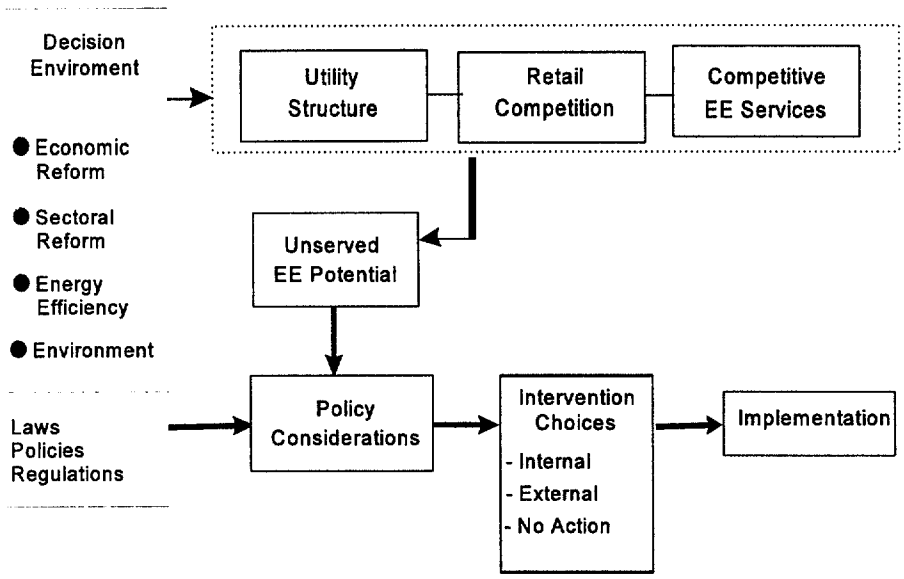
Exhibit 5-1 summarizes a process suggested to develop and implement energy efficiency policy. The left, vertical box represents the decision environment affecting power structure, economic reforms, enviromental considerations and other relevent laws, policies, and regulations. The top frame of the diagram focuses on restructuring and introducing retail competition as the two most critical decisions affecting energy efficiency activities that will develop by the power sector and by private sector energy service providers ("Competitive EE Services"). The most critical element of restructuring and competition questions that will affect the incentives for end-use is tariff reform. The enter box labeled "Unserved EE Potential" represents the potential for efficiency improvement that is not achieved by the cumulative actions of the power sector, private energy service providers, and customers. The decision process outlined in this chapter, corresponds to the bottom row of three boxes which address how this potential is to be achieved. There are three major components:

- considering the need for a policy to address efficiency in reform deliberations;
- choosing intervention strategies for addressing efficiency within and outside reform; and
- implementing efficiency and reform initiatives.

5.1 CONSIDER THE IMPORTANCE OF A POLICY FOR INTEGRATING ENERGY EFFICIENCY INTO THE POWER SECTOR REFORM PROCESS

The threshold question is, "how important is it to integrate energy efficiency into the process of reform for the power sector?". Addressing this question is necessary since policy interventions to promote energy efficiency could be directed at the power sector as well as other market actors. A decision to incorporate energy efficiency in power sector reform implies that policy makers have determined that the power sector has an important role to play in efficiency. Although the

Exhibit 5-1:
Overview of the Policy Process for Addressing Energy Efficiency and Reform



overallclimate of institutional change brought about by sectoral reform offers an opportunity to address energy efficiency, it is not a foregone conclusion that the reformed power sector will play a key role in executing a goal of increased efficiency.

Policy Recommendations:

1. Assess advantages of including efficiency in reform plans
2. Identify potential actors to overcome market barriers to efficiency
3. Engage key stakeholders in the discussion of efficiency and reforms
4. Secure analytic resources to support deliberations

Recommendation 1: Identify the size of the "efficiency gap" and assess the advantages of incorporating energy efficiency in the development of power sector reforms.

The first step should be to undertake an investigation to answer the following questions:

- How large is the estimated "efficiency gap"? What kinds of potential efficiency improvements are being ignored and by what customer segments?

- From a national policy (or "societal") perspective, what are the likely benefits of improving energy efficiency versus creating new power supplies? E.G.,:

    - cost of a saved kWh compared to generating, transmitting and distributing a kWh
    - national energy costs as a percent of GDP, compared to other countries
    - percent of household income devoted to energy services

- What are the market barriers, market failures, and policy distortions that inhibit efficiency improvements?

- Of these, which are likely to be affected by the contemplated power sector or economic reforms?

- Do existing barriers to greater efficiency warrant government intervention?

- How important are the benefits to society from efficiency improvements?

    - Does the policy objective of achieving national or local environmental benefits warrant government intervention to achieve environmental benefits from efficiency? National policy objectives might include meeting international commitments for climate change.[1]
    - Local environmental benefits such as air pollution management might be another important objective (benefits accrue from reduced emissions from local generation of power).

The suggested investigation needs to take into consideration the options, stakeholders, and analytic resource requirements identified in Recommendations 2-4.

[1] Energy efficiency falls under such commitments through the Global Environment Facility's Operational Programme 5 (Reduction of Barriers to Energy Efficiency) or plans to conduct projects under the rules for Activities Implemented Jointly (AIJ).

Recommendation 2: Identify potential roles for those who could promote energy efficiency.

Given the assessment in Recommendation 1 of the benefits of achieving potential efficiency improvements, the nature of the barriers to doing so, and other market characteristics, policy makers should determine the comparative advantages of alternative market actors who could overcome some of the barriers to efficiency improvements. While some barriers may be more effectively addressed by the power sector, others may be better addressed by ESCOs, equipment suppliers, other market actors, or the government. For example, the power sector clearly has the key role in overcoming distorted price signals received by end-use customers. Once appropriate roles for each actor are identified, government policy or regulatory guidance may be needed to ensure that each actor has incentives to carry out its roles.[2]

The following considerations may assist policy makers in deciding the most advisable roles to achieving greater efficiency. These considerations are not mutually exclusive.

- *If policy makers are counting on distribution utilities to offer efficiency services* to customers in an unbundled power structure (with or without competitive retail markets), then it is *essential that this expectation be made explicit in the reform deliberation, so that appropriate rules and mechanisms can be chosen to facilitate such an outcomes.*

- *Where there is little economic incentive for utilities* to administer efficiency programs (as for an unbundled non-competitive retail structure, or for small and medium-sized customers in a competitive retail structure) there should be more affirmative actions taken to address the customers that will be ignored by the market. This is especially warranted if the manufacturer/ retailer/ service provider market is not well developed or organized. The *government might pursue a set of voluntary programs designed to overcome market barriers* and/or undertake an aggressive market transformation strategy. To fund such efforts, the government could impose some form of *energy surcharge and/or support the program from tax revenues.*

- Where power sector reform includes *retail competition* (with an uncertain degree of efficiency services), then public benefits programs and services may not be needed as much as in the case of simply unbundled and non-competitive power

[2]While some may suggest that the "market" should sort out these inclinations and roles, this report has shown that the early- to mid-term experiences of power sector reforms in many countries suggest that the "market" will leave considerable portions of the economic potential for energy efficinecy unserved. This report describes a process in which countries might be able to reduce the size of this unserved potential or accelerate its diminishment through decisions that are taken in tandem with those about power sector structure and rules.

structures. *Public benefit programs of voluntary services programs should be considered for non-commercially viable market segments* (households, small & medium businesses and institutions). *Funding could begin modestly* and increase over time if experience dictates that a higher level of activity would be in the public benefit.

Recommendation 3: Identify and engage key stakeholders to discuss how and to what extent end-use efficiency should be addressed by power organizations and thus within deliberations on power sector reforms, or handled by non-power organizations and addressed outside these deliberations.

In finding appropriate stakeholders to engage in this discussion, it is important to examine the authority of existing government organizations and the capabilities of outside constituencies. Determine if:

- national or state government energy policy, research, or regulatory organizations have sufficient authority, funding, and experience to propose a case for addressing efficiency, and its alternative strategies, as power sector reforms are formulated;
- private sector organizations provide an "infrastructure" of efficiency goods and service delivery (such as manufacturers, ESCOs, energy service companies). If so they may view efficiency as an important business objective and may be sufficiently organized and willing to advocate the adoption of efficiency policy and implementation arrangements;
- local non-governmental organizations offer a constituency having both the ability and political access to address the issue of treating efficiency (or not) in reforms; and
- the international donor or NGO community could offer an advocacy or technical assistance role to supplement the knowledge and suggestions of local stakeholders in the reform deliberations.

Recommendation 4: Secure the information and analytic resources needed to specify how energy efficiency might be integrated into reform deliberations.

A certain amount of knowledge is essential if end-use efficiency stakeholders are to gain a "seat at the table" in reform deliberations. The following activities can help these stakeholders to gain this knowledge.

- Assign explicit authority to government or independent organizations to address the issues raised above.

- Request technical assistance or guidance from multilateral development banks, other multilateral donors, bilateral donors and trade associations.

5.2 CHOOSE STRATEGIES TO ADDRESS EFFICIENCY WITHIN OR OUTSIDE THE REFORM PROCESS

With the stakeholders and analyses assembled in Step 1-4, decisions can be made regarding if efficiency policies and roles should be addressed and with what timing, whether inside or outside of the power sector reforms, with exactly what strategies and whether a staged strategy might be applied that could evolve over a period of years. The articulation of this strategy could proceed in four steps:

Strategy Recommendations:

5. Determine if and when efficiency will be addressed.
6. Decide whether to address efficiency inside or outside the reform process
7. Identify and assess the specific strategies available for closing the efficiency gap
8. Establish priorities and staging for the available strategies

Recommendation 5: Determine if efficiency will be addressed and at what time.

These two issues go hand-in-hand. Experience suggests that if there is a desire to address the effects of reform on motivating end use efficiency, then it is best to consider this issue to some degree from the beginning. However, the details of implementation and its timing need not all be worked out simultaneously with deciding the basic structure of the power sector model. Reforms typically occur over a period of several years, and depending upon the former structure, might unfold in several stages.

In making the timing decision, stakeholders should consider politics, constituencies, capabilities, and practicalities.

Politics. The political context for reform affects the ability to incorporate efficiency into the reform process and the schedule for doing so. Although reform drivers may vary from country to country, improving end-use energy efficiency is not usually a high priority. Consequently, the decision might be to address efficiency outside the power sector framework, and to do so on a schedule dictated by other considerations. The politics of government majority parties may also

dictate the path.[3] A change in government may permit efficiency issues to be revisited, and with more information in hand from the experience to date.

Constituencies. Outside constituencies that support end-use efficiency must assess their strength and ability to affect the reform deliberations themselves. If they are strong and well-organized (not common in developing countries), it may be possible to address efficiency issues as integral parts of the reform deliberations.[4] Stakeholders have to gauge the timing question based on when their constituencies will be best organized and have their most leverage – in the initial debate, or later when it may be easier to point to the deficiencies of whatever system reform was established.

Capabilities for policy dialogue. To be effective in the policy dialogue, government and non-government representatives need to be well-armed with assessments of the local situation, able to identify strengths and weaknesses of the market infrastructure for efficiency services, and prepared to cite the experiences and lessons from other countries. The capability for the policy dialogue must reside in government agencies with stature and authority, supported by outside constituencies. If these agencies lack stature or authority, it may be difficult to focus attention on end-use efficiency. Without an organized efficiency services constituency, leaders of the reform deliberations may be less willing to integrate efficiency into the debate.

Practicalities. There is no uniformity in the consequences of deferring action on efficiency until a later time. On one hand, Argentinean observers believe they lost a critical opportunity to make efficiency part of the debate and will have a much harder time now trying to re-open the question of how the power sector structure and system should relate to efficiency. There is little perceived likelihood of being able to tinker with the reform system now that is it underway. On the other hand, the UK succeeded in putting efficiency back onto the agenda several years into the reform process.[5]

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[3] In the UK, reform was initiated under the Conservative party when the clear political desire was to pursue only free-market policies and strategies.

[4] This appears to be the case in the US, and was partly so in New Zealand. In the latter case the constituencies do not seem sufficiently powerful with national legislative leaders to gain strengthened government codes and standards provisions for efficient buildings and equipment, as an alternative to relying on utility or government delivery of services.

[5] This took the form of a patched-on obligation for distribution utilities prior to the introduction of retail competition and is supported only by temporary funding. The primary difference between Argentina and the UK may be that the UK had two capable and reputable organizations in OFFER, assisted by the Energy Savings Trust, that also had the authority to initiate additional measures when it realized that efficiency was being ignored.

Recommendation 6: Decide whether to address efficiency inside or outside the reform process

Capability for Implementation. Government-owned utilities in most developing countries will have their hands full with operating on a commercial basis, and have a limited history of customer relations. As a result, it may be impractical to think that these reformed systems would either see it as a priority, or have the abilities, to administer efficiency programs. These newly commercialized or privatized utilities might be able to manage limited scale load management activities at a later date once technical operations and communications systems are able to handle more modern metering and telemetry equipment. If this is the case, the primary responsibility for addressing barriers to efficiency may be better placed outside the power sector.

If a power sector is already at a commercial or privatized stage, and is contemplating unbundling, then efficiency might be best addressed in the context of reform. In this case the reform process will most likely be significantly altering the economic motivation for power sector organizations to address the level and efficiency of consumption by its end users. The reforms may even extend power organizations an opportunity to offer certain energy efficiency services on a for-profit basis. If the economic motivations and/or contractual mechanisms for power purchases and sales will undergo change, this also may be the most opportune time to address a plan for funding desired efficiency activities, regardless of who will carry them out.

Typical outcomes that have emerged. Experience to date suggests that regardless of the power reform model used, a hybrid strategy eventually unfolds, combining three strategies:

- **Competitive service** offerings by power suppliers, distributors, and/or private energy service providers of commercially viable and profitable services (e.g., to large or medium customer segments and for well-established, cost-effective technologies).

- **Market transformation** services guided by collaborative constituencies that build greater market participation by customer segments or technologies that are not yet commercially viable.

- **Public purpose programs** supported by government taxes, "wire charges", or electric account fees that pay for general public information and implementation services that have a public benefit and no possibility of commercial viability (e.g., information centers and public investments in efficiency measures for low income or senior households)

The specific reform model chosen, interests of constituencies, and local capabilities are more likely to dictate the proportion of effort and timing of each component strategy, but are less likely to rule out the advisability of any single strategy.

Recommendation 7: Identify and assess the specific strategies available for closing the efficiency gap.

Chapter 4 presented many possible strategies that can be used to pursue efficiency. These vary with how well developed the energy efficiency market is, the specific power reform model being selected, the past experience of stakeholders in developing or implementing efficiency services, and the change in electric rates accompanying reform. These can provide an initial set of ideas for strategies, as can the Case Study and Bibliography reports prepared for this USAID project that were identified in the Executive Summary and Chapter 3.

To best assess the likely impacts of optional strategies (in terms of cost, efficiency gains, market penetration, environmental impacts, etc.) certain analytic tools may be advised. These range from simple spreadsheet models to integrated models, from rule-of-thumb greenhouse gas impacts to more sophisticated generation dispatch models that calculate specific emissions, and from educated guesses on market penetration to price elasticity models and market tracking tools. The choice of analytic tool will depend on the data available, the magnitude of the decision being made, and the skills and experience of the stakeholders performing the analysis. Further insights on the tools available can be found in literature on capacity expansion models, integrated resource planning (IRP), demand side management (DSM), environmental analysis of power generation and dispatch, and greenhouse gas calculations.

Recommendation 8: Establish priorities and staging for the available strategies.

Some strategies are more cost effective than others. For example, regardless of any other policy initiative that might be implemented to promote end-use efficiency, ensuring that electricity tariffs reflect marginal costs of service (including location and time related costs) and that revenue collection is improved should be given high priority.

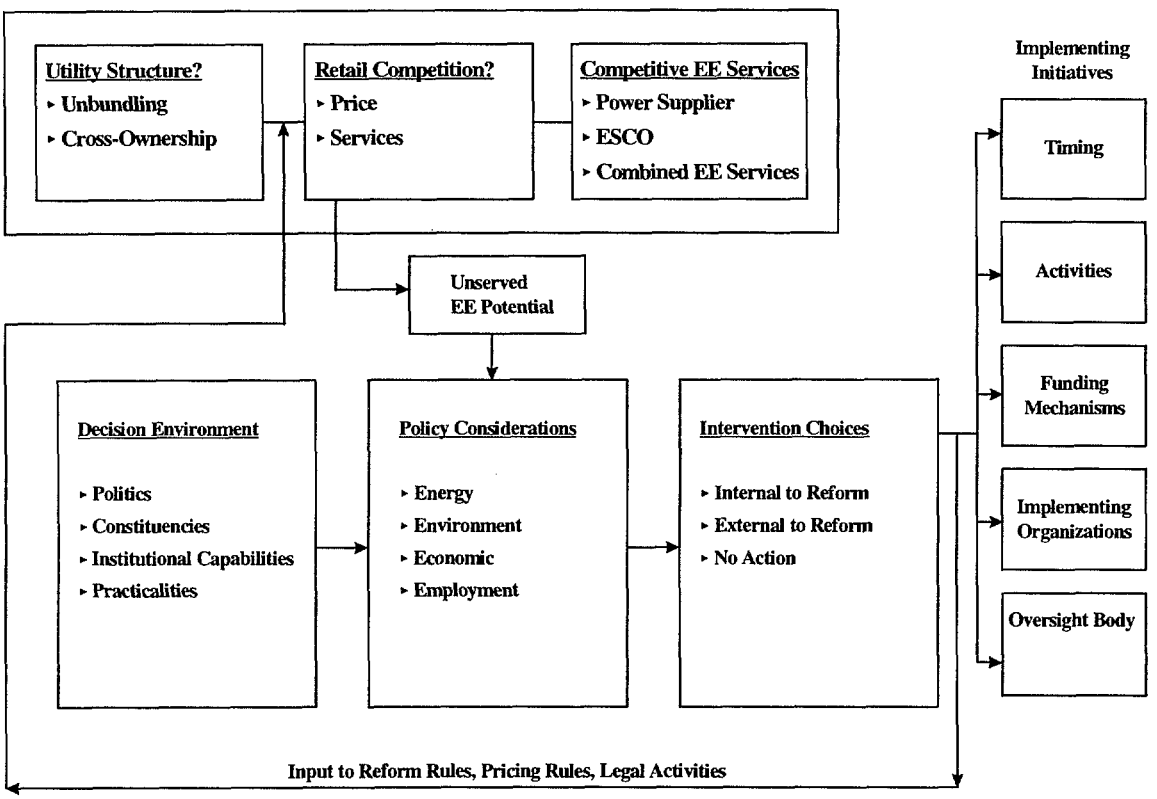
Once price distortions have been removed, it will be easier to evaluate remaining needs for initiating more costly measures to overcome other barriers. Where power tariffs have been historically low, or utility revenue collection has been difficult, the lack of past economic motivation for efficient power use may mean that few suppliers of efficiency goods and services ready to serve local markets. In this case, government programs might first help local businesses develop their capability to enter the market for energy efficiency, especially among previously subsidized customer groups, and stimulate informed demand for these services, before trying to structure motivations for the power market to deliver efficiency services.

The establishment of priorities among alternative strategies also depends on which reforms are being proposed (as was discussed in Chapter 4), and the degree of natural financial motivations that will ensue for power market participants.

5.3 IMPLEMENTATION ISSUES FOR COUNTRIES UNDERTAKING REFORMS

Once the threshold policy and strategy questions have been decided for promoting end-use efficiency in the context of reforms, many implementation issues remain to be resolved. Exhibit 5-2 presents an expanded version of Exhibit 5-1. The box at the top right marked "Timing" corresonds to Recommendation 8. The remaining boxes along the right side identify implementation issues that must be resolved regarding specific activities, funding mechanisms, implementing organizations, and the responsibilities of an oversight body. All these issues are discussed in Recommendations 9-13.

Figure 5-2
Public Deliberation Process for Public Policy Toward Energy Efficiency (EE)



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Implementation Recommendations:

9. Remove legal barriers to market entry by providers of efficiency services
10. Identify sources of funding for efficiency initiatives
11. Create an oversight body to ensure cost-effective use of publicly-mandated or directed funds for energy efficiency
12. Match specific initiatives to specific barriers
13. Identify appropriate organizations to carry out specific initiatives

Recommendation 9: Ensure there are no legal barriers to market entry by providers of energy efficiency services.

Private energy service providers or even equipment manufacturers and retail representatives are often limited in their legal authority to undertake certain business services, such as loans, leasing, access to customer power consumption records, or third-party handling of utility bill payments. These barriers need to be removed in order for a market for end-use efficiency goods and services to emerge.

If power suppliers or distribution utilities are to participate in the delivery of efficiency services, then national or state laws and regulations must permit them to undertake such activities as: leasing equipment, selling equipment, promoting specific brands or models of equipment, offering maintenance/management/repair services, and other types of business services which are essential components of full scale efficiency service delivery. This may require amending or expanding legal, finance, contract, or other business authority or regulatory oversight for the business activities necessary to perform energy services.

Recommendation 10: Identify sources of funding and expenditure rules for publicly-directed efficiency initiatives.

Sources of funds. Funds for non-market driven initiatives could be supplied by ratepayers, taxpayers, or service beneficiaries. There are advantages and disadvantages of each mechanism, a discussion of which is beyond the scope of this report. A list of possible funding sources is as follows:

- Power supplier's own funds

If the reformed system in some developing countries persists in requiring power suppliers or distributors to serve some customer classes at subsidized retail rates, then there might be a financial motivation for the power suppliers to invest in efficiency measures targeted at these subsidized groups. If there is unserved energy demand in the region, the utility would be better off to spend its own funds on the most inexpensive efficiency measures for subsidized customers, and to sell the saved energy to customers willing to pay higher rates (see Chapter 2).

Other funding sources could include:

- Mandatory account surcharges or wires charges collected by power suppliers
- National energy tax (all fuels, not limited to electricity) or special energy fund
- National budget funds
- Market transformation strategy, that leverages one of the fund sources above with additional funds of private parties, such as manufacturers, lenders, etc.

Expenditures of funds. In addition to defining mechanisms for collecting funds, policy makers will have to decide how to disburse them. If there are multiple organizations with the abilities to deliver services, then energy surcharge funds or government funds can be awarded on a competitive basis. Some situations may dictate that utilities be prohibited from competing for these funds, such as cases where there is no retail competition and/or a distributor is incented to maximize sales. In these situations utilities may be suspect in the sincerity or effectiveness of their efficiency activities. In situations where distribution utilities or competitive retail suppliers have other motivations than simply maximizing sales – such as building good customer relations, differentiating their services and identities, or potentially operating efficiency programs at a profit – there is no reason to exclude power sector entities from competition for efficiency funding.[6]

Recommendation 11: Create an independent oversight body to ensure that expenditures of publicly-mandated funds are cost-effective.

Regardless of how funds are awarded and to whom, it is advisable to establish an oversight organization to manage the awards, set monitoring and reporting requirements, ensure independent program evaluation occurs, and use this information in assessing the effectiveness of programs and organizational delivery. This oversight organization could be the regulatory agency by itself, or an independent expert efficiency organization that reports its findings to the regulatory agency.

If there is no non-power sector organization (public, private, or non-profit) with the ability to deliver efficiency services, then any public policy in favor of efficiency may have no choice but to mandate a minimum level of efficiency services as an obligation of distribution utilities (as in the UK) or to create new organizations to deliver services (e.g., the regional efficiency centers in Norway). For these services to be effective, they must be monitored, include good accounting of expenditures, and require evaluation and reporting of program effectiveness. Either the regulatory agency (or an independent efficiency oversight organization charged with reviewing the utility

[6] In a least one U.S. jurisdiction the state regulator has indicated that utilities may be best positioned to offer the "public benefits" funds because they have historically had a close relationship with the end-use customers.

experience and reporting any problems to the regulatory agency) must have authority to ensure utility compliance.[7]

Recommendation 12: Match specific initiatives to specific barriers.

As was discussed earlier in this report, policy interventions may be needed to address barriers to efficiency both in the context of power sector reform and outside of it. Each country will vary in this respect; thus, it does not make sense to specify policy interventions that should be undertaken by all countries. In assessing intervention options, government agencies need to ensure that each intervention is targeted to a specific barrier. For further discussion, see Chapter 1 which introduced the subject of barriers, and Chapter 4 that contains illustrations of many initiatives that could be used to overcome these barriers.

Recommendation 13: Identify appropriate organizations to carry out specific initiatives.

Depending on the specific barriers to efficiency in a given country and the interventions available to overcome them, short-term assignments may be required and could include:

- crafting national policy for the power sector and energy efficiency
- promulgating energy codes and standards
- equipment testing & labeling
- assisting manufacturers to identify efficient technology designs and production methods
- program planning, monitoring and evaluation
- implementing public awareness campaigns
- quantifying end-use efficiency opportunities and markets
- designing ESCO programs and services
- developing industrial efficiency financing mechanisms
- enhancing the market infrastructure for energy efficient goods and services
- designing electricity tariffs
- designing energy efficiency and load management programs
- designing regulatory incentives for electricity suppliers to promote energy efficiency.

A Final Word to Reforming Countries

[7] Examples are the Energy Savings Trust of the UK and the California Board for Energy Efficiency in the U.S.

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This report has identified key considerations regarding the impacts on end user energy efficiency as policy makers and other stakeholders address the framework and details of power sector reform. Experience from six case study countries suggests there are advantages to including discussion of efficiency objectives in the deliberation process. This is true regardless of subsequent decisions that must be made on whether to treat efficiency within or outside the power sector, the degree of reliance that will be placed on market response to power sector prices and competition, or to the specific institutional roles that might be chosen for implementing efficiency. The companion bibliography and case study reports from this investigation can assist stakeholders to identify and evaluate the specific approaches and mechanisms that may be best suited to each country.

5.4 ROLES AND INITIATIVES RECOMMENDED FOR MULTI-LATERAL DEVELOPMENT BANKS AND BILATERAL DEVELOPMENT ASSISTANCE AGENCIES

The final draft of this report was completed in December 1997 and distributed for review and comment to a number of organizations whose missions ranged from energy research, energy policy and multi-lateral bank energy sector lending, to the delivery of power and ESCO services. Out of this review came a consensus on the roles and future initiatives that might be advised for multi-lateral development banks (MDBs) as well as international and bilateral development assistance organizations. These recommendations are presented below as a starting point for identifying future research, assistance, and promotion initiatives that might be offered by the Banks and donor communities.

Roles

Four roles were identified as primary areas of need by countries contemplating power sector reforms and needing to address how to achieve end use efficiency and environmental protection goals. These are presented in a sequence of recommended "next steps" that can support deliberations about energy sector reforms:

- Awareness-building within the Banks and donor organizations
- Promotion to and training for assisted countries on the principles and options discussed in this report
- Provision of models and tools that can be used to perform analysis, drafting of legislation and regulations, and decision-support
- Targeted technical assistance with the application and execution of efficiency and reforms

Initiatives

The following initiatives were recommended as effective approaches to fulfill these four roles:

Awareness-building

- Prepare a short-version policy-makers booklet for 1) donor organization senior management and 2) country counterpart policy-makers and executives as to why and how the issues of energy efficiency and the environment should be considered in the process of undertaking power sector reform. Reviewers mentioned two possibilities:
  - One combination booklet that integrates the issues from the environment and energy efficiency reports on the implication of power sector reforms. This approach was heavily recommended by many of the external reviewers who recognize that potential audiences might relate to one but not both issues, which are closely linked.
  - Two integrated documents that are produced for different audiences — the donor policy community, and the client country policy audience. It was suggested the donor booklet should help donor staff perceive clearly how changes in energy sector reform policy and strategy might affect the outcomes on energy efficiency and the environment.
- Actively promote both the short document and longer technical documents.
- Recognizing that the reports are part of a bigger issue of how to make private capital flows more environmentally friendly, write something to tie these issues to sector investment requirements, and other financial measuring instruments.
- Make information on models, options, etc. readily available. A "web" page could be set up to inform country professionals of the information and experts available.
- Consider a "road show" to raise awareness of the issues among "key client countries".

Training and Workshops

- Use regional workshops to present the issues and findings to client countries in more detail.
- Apply the case studies in training courses on reform.
- Identify new audiences for the reports, such as professionals addressing urban development, water and air resources, and promotion of micro-enterprises.

Tools and products

- Provide an explicit "road map" that describes very specific and explicit examples of what energy efficiency and environment outcomes might be associated with specific reform packages. Offer this to help reform policy makers look at their sets of reform options and to decide how to best proceed toward their end goals for reform.

- Develop or provide tools that can quantify trade-offs between economic development and the environment, and to make the trade-offs transparent. Doing this requires some way to apply or integrate multiple sets of analytic tools.

- Provide practitioners and consultants with access to primary source documents, such as copies of documents for the legislation, regulations, and implementation activities from the case study countries. It would be good to also have technical details (e.g., funding formulas) that could be considered by other countries' decision makers.

- Develop guidance material for regulators on the energy efficiency implications of alternative wholesale and retail pricing approaches.

- Prepare additional case studies of reform, such as in Peru or El Salvador.

Technical Assistance Activities

- Arrange a considerable level of specific technical assistance and advisory services, carefully tailored to each client country's situation.

- Recognizing that many ESCOs view the current policy environment in many countries as unfavorable, direct attention to other types of reforms in business law, financing, etc. that may be needed for ESCO businesses to succeed.

- Do not forget to give attention to building demand for energy services from end users.

APPENDIX
SUMMARY TABLES OF CASE STUDY COUNTRIES

UNITED KINGDOM	
Reform Measures	Unbundled generation companies, single transmission company operating a power pool, regional electricity distribution companies. Most privately owned, with some cross-investment between RECs and IPPs. Competitive power supply to users > 100 kW now, and for all customers by 1998.
Post-Reform Retail Prices and Consumption	Retail prices have declined 15% for domestic, and 15-21% for C/I users, in real terms over 8 years.
Effects of Reforms on Energy Efficiency	
Utility Interest in Energy Efficiency	Certain level of EE activities mandated by regulation. Beyond this, limited interest, except where necessary for retail competition. One supply company may offer EE services with electricity supply. Many supply and distribution companies have ESCO subsidiaries where EE services may be offered on fee-for-service or performance contract basis.
Non-Utility Provider Response	Limited to larger industrial markets for cogeneration, large C/I for some 20 ESCOs ($300-500 million annual revenue).
Government and Public Programs (e.g. information services, codes & standards, transformation)	Government support had declined in 1980s. Rekindled in 1990s via information programs, technology promotion and minimum efficiency standards for new housing insulation and heating controls, and commercial lighting in new buildings. Some assistance for low income household EE. Government facilities set target of 15% energy savings. Reluctant implementation of European Union EE labeling and minimum standards for refrigerators and boiler heating. New initiatives stress (market transformation) including residential ESCO pilots.
Types and Amount of EE (efficiency, load management, sectors)	There was little utility EE/DSM programs prior to reform. Evidence of substantial attention to peak load management and industrial cogeneration. Most EE comes from recently-mandated role for distribution utilities, or government. Cost of save energy is $0.027/kWh, compared to domestic retail price of $0.082 (of which 52-65% is generation, 25-29% distribution).
Framework for Energy Efficiency	
Policy	1989: EE was not explicitly addressed. Hoped to rely on market. Near-term climate change targets will be met on supply side. Mandated REC responsibilities in 1994 when saw no utility efficiency services offered.
Legal / Regulatory	Power sector reform regulatory office added responsibilities for distribution utility EE activities, and small tax on energy supplier accounts for 1994-98 to fund government-administered activities. Distribution price formula revised to reduce incentive to increase sales.
Institutions	Exist to address policy, implementation, technology issues

UNITED KINGDOM (cont.)	
Framework for Energy Efficiency	
Financial (funding level, sources, use, change from before)	$1 surcharge per account for energy suppliers for 1994-98 to fund operation and oversight of government-directed programs of distribution utilities. Possible extension to 2000. Supplemental government funds for low-income programs.
Assessment of Market Infrastructure for Energy Efficiency	
Product Availability	Good
Service Suppliers	Good
Know-How	Good
Financing	Residential customers skeptical about performance contracts.
Marketing	Substantial by government
Delivery	Available
User Response	Mostly large C/I
Technology	Lighting, boilers, cogeneration fare best
Outlook for Energy Efficiency	
Will price be enough?	No. Consumers view as low and falling. Labor government considering levy on distribution prices to pay for EE programs, or prescribed EE targets for distribution utilities.
Providers	Should not be a problem
Segments and Technologies	Challenge will be reaching small & medium commercial, residential consumers. Outsourcing trend may help C/I.
Recommendations	Longer-term plan for EE, whether market transformation, government-supported, or mandated on distribution utilities. Review merits of expanded mandatory codes and standards for minimum efficiency.

NORWAY	
Reform Measures	Unbundled generation (a number of companies, 85% publicly owned), one transmission company (government-owned), and over 200 distribution utilities (most owned by local governments). Highly competitive generation sold both to pool and to Discos in 3-part market. Full retail competition, although prior to 1997 transactions costs effectively limited this to C/I. 90% residential users still served by local distribution utility.
Post-Reform Retail Prices and Consumption	Residential prices have remained constant. C/I prices are lower. Still, the level of prices (7 cent average) is perceived to be low. Greatest problem is lack of feedback for residential consumers who receive bill for actual consumption at end of year, with quarterly estimated bills only. No data on change in consumption. Most competition on price alone.
Effects of Reforms on Energy Efficiency	
Utility Interest in Energy Efficiency	Local utilities both supply and distribute. IN 1980s utilities were mandated to perform IRP and DSM. Sine restructuring there is virtually no EE activities beyond upon-request information, and staff shifted to marketing. Required surcharge for information programs, administered by utilities and/or regional EE information centers, at utilities' choice.
Non-Utility Provider Response	Limited to some services trying to succeed with large commercial. Legal and regulatory barriers to performance contracting to public facilities and procurement.
Government and Public Programs (e.g. information services, codes & standards, transformation)	Government public information campaigns. Government grants for EE improvements peaked at $62 million in 1993, then discontinued due to high level of "free-riders". City of Oslo has more active local EE program and grants. Not part of EU, but adopted EU refrigerator labeling scheme, and likely to continue to adopt EU initiatives. New building code in 1997 strengthens already-strong EE building code.
Types and Amount of EE	Technical potential of 19% savings identified 1988. No data on what has/has not been achieved. Opinions suggest very little
Framework for Energy Efficiency	
Policy	Reform policy evolved 1990-97. Efficiency and DSM were removed in 1994. Small surcharge for information services.
Legal / Regulatory	More than 200 distribution companies (local, regional and vertically-integrated), most owned by municipalities. Makes it hard to supervise/regulate.
Institutions	Norwegian Water Resources and Energy Administration (NVE) seeking greater authority. Utilities were perceived to misuse EE information surcharge funds. Regional EE centers established, but many owned by municipalities and/or utilities. Limited to information-only services.

NORWAY (cont.)	
Framework for Energy Efficiency	
Financial (funding level, sources, use, change from before)	Now limited to information only programs. Previously was more generous.
Assessment of Market Infrastructure for Energy Efficiency	
Product Availability	Good
Service Suppliers	Knowledgeable
Know-How	Good
Financing	Not an issue except in public sector, where government procurement regulations work against performance contracting and life cycle cost analysis (considering operating costs of equipment) in bid evaluations.
Marketing	Not evident among manufacturers or providers; see no demand
Delivery	No demand
User Response	Perceive electricity to be cheap and from renewable source (hydro).
Technology	Available
Outlook for Energy Efficiency	
Will price be enough?	No. Residential consumers need feedback on more frequent bills
Providers	Available
Segments and Technologies	Large commercial may pick up energy management services
Recommendations	Billing. Authorize independent service providers that can go beyond information-only. Link government EE policy to Climate Change policy. Increase authority of NVE.

CHILE	
Reform Measures	Unbundled to generation (11 generation companies, plus IPPs), single transmission company, regional pooling & dispatch committees, 25 distribution companies. All privately owned except small amount of generation. Competitive wholesale and retail markets, except no rule against cross-ownership permits one investment group to control most generation, the largest distribution company, and the transmission system.
Post-Reform Retail Prices and Consumption	All subsides have been removed, yet efficiency gains have lowered the real price of power. The reduced retail prices average $0.08 in the south, $0.10 -.12 In the north, and 2-3 times higher in remote rural areas. Despite relatively high prices, little evidence of EE actions.
Effects of Reforms on Energy Efficiency	
Utility Interest in Energy Efficiency	None beyond load management and TOU rates.
Non-Utility Provider Response	Some ESCO activity with savvy users — municipalities, universities, hospitals; promise with some large industries.
Government and Public Programs	Limited to public information campaigns that emphasize sacrifice, not technical efficiency. Voluntary EE standard for refrigerators. Municipalities taking some initiatives — with own facilities. Some investigation into a regional EE building code.
Types and Amount of EE	There was essentially no EE activity pre-reform. Studies estimate 10-13% efficiency opportunities.
Framework for Energy Efficiency	
Policy	No EE policy at all; thus none included in reform policy. Assumes market forces will address economic efficiency.
Legal / Regulatory	None
Institutions	Energy Commission does studies. Local office of US-based NGO performs assessments and advocates EE policy and strategies, including work on regional EE appliance standards.
Financial (funding level, sources, use, change from before)	No explicit funding for EE implementation, just studies by government agency.

CHILE (cont.)	
Assessment of Market Infrastructure for Energy Efficiency	
Product Availability	Limited
Service Suppliers	Some
Know-How	Limited, but talent pool has promise once trained
Financing	Market driven by first-cost mentality; IFC developing EE and renewable fund that may help
Marketing	Little evident
Delivery	Limited, but possible
User Response	Little response beyond some savvy municipalities, universities, hospitals
Technology	Little evidence beyond lighting; CFLs not engineered for voltage fluctuations
Outlook for Energy Efficiency	
Will price be enough?	No. Need promotion of EE products and technologies available, plus financing mechanisms to manage higher first cost of EE equipment.
Providers	Need to marshall equipment and services providers to promote EE to end users, including financing terms
Segments and Technologies	Best prospects are new industrial motors, residential appliances, and existing and new commercial/institutional buildings
Recommendations	Government policy to support market transformation activities for EE implemented outside the power sector. Develop financing mechanisms. Marshall equipment manufacturers and suppliers to provide and promote EE technologies. Connect EE to local air quality policy in Santiago.

ARGENTINA	
Reform Measures	Unbundled system of mostly privately-owned generators (>30), 6 transmission companies, one pool operator, and 22 regional distribution companies with private stock ownership but under local/regional government jurisdiction. No cross ownership allowed and no generator can own more than 10% of all generation. Wholesale spot market and long-term contract market for transcos, discos, and medium-large C/I users. No retail competition for consumers <100 kW.
Post-Reform Retail Prices and Consumption	Subsidies gone except low-income pensioners, and large electric- intensive users. TOU prices. Many prices lower. Prices regulated via price cap for users < 100 kW, competitive for larger.
Effects of Reforms on Energy Efficiency	
Utility Interest in Energy Efficiency	Mostly only if profitable — a) T&D peak avoidance (geography, peak end uses), b) if competition requires differentiation, c) if leasing with repayment on bills is allowed. No government mandate. Isolated cases of localized EE services. Support government standards.
Non-Utility Provider Response	Small, local companies offer audits, considering forming ESCOs, for industrial users. Some manufacturers targeting leases and contracts for lighting and motors.
Government and Public Programs (e.g. information services, codes & standards, transformation)	No Info on EE technologies. No appliance standards or building codes; voluntary regulations under study for appliances, motors, buildings. Sec. Energy trying to stimulate ESCOs and utility bills as collateral for consumer leasing. Want to support market transformation.
Types and Amount of EE (efficiency, load management, sectors)	No utility programs pre-reform. Load management evident in some localized areas. Maybe more EE where prices higher. Market not really materializing due to remaining barriers and lack of government policy support.
Framework for Energy Efficiency	
Policy	Distributors allowed to offer EE services. Broad authority available to utilities. No policy for climate change.
Legal / Regulatory	No regulation
Institutions	SE and URE doing studies and pilot projects.
Financial (funding level, sources, use, change from before)	No government incentives; government surcharge for renewables not now applied to EE (was prior to 1989)

ARGENTINA (cont.)	
Assessment of Market Infrastructure for Energy Efficiency	
Product Availability	Good for street lighting and CFLs; otherwise poor due to low import taxes and lack of standards that produce a flood of inefficient imports
Service Suppliers	Some
Know-How	Some
Financing	No cheap loans for SME, problems with credit, guarantees
Marketing	Limited
Delivery	Some
User Response	Limited awareness of EE or performance contracting; public facilities
Technology	Public sector: streetlights and CFLs
Outlook for Energy Efficiency	
Will price be enough?	Prices perceived to be low; action will require legislation to use NEF funds for EE.
Providers	Depends on legal authority for joint action by manufacturers and distribution utilities for leasing via bills
Segments and Technologies	Depends on possible standards for equipment, buildings.
Recommendations	Policy, legislation to support more market-based services; codes and standards; allocation of public funds (NEF) to support government policy, research & analysis, demonstration programs.

NEW ZEALAND	
Reform Measures	Unbundled structure. One generator has 75% of capacity, with a few others. One transco, 42 discos, and "energy retailers" (comprised of discos, gencos, traders, and combinations of ownership emerging). Most generation and the transco are government-owned; discos are either municipal or privately owned and heavily regulated. No effective competitive generation beyond bids into wholesale pool, but offered highest accepted price. Retail competition based on service; lack of generation competition hinders retail price competition.
Post-Reform Retail Prices and Consumption	Real C/I prices have dropped, residential have increased. Average prices low by international standards. Household average use has dropped slightly, in response to price increases and government programs. Price response seen during bad hydro year when power prices increased seven-fold.
Effects of Reforms on Energy Efficiency	
Utility Interest in Energy Efficiency	Publicly-owned retail suppliers promote EE more than private suppliers. Activities focus on information services, and in some cases partnerships with wholesale suppliers to promote selected technologies (heat pump, cogeneration). EE services (advice, software for energy management, building design) are viewed as good for customer retention and supplier differentiation in the unfolding competitive retail market. Receive public funding for residential EE programs that produce savings that would not otherwise occur.
Non-Utility Provider Response	Limited scale, serving mostly residential customers through government funding, or C/I facilities seeking local emissions reductions.
Government and Public Programs (e.g. information services, codes & standards, transformation)	There were pre-reform EE building standards. Studies are underway for possible harmonized building and appliance standards between NZ and Australia, but this is not a high priority for NZ. Grant funds for organizations operating programs that achieve residential EE improvements. Information and training programs targeting C/I sectors..
Types and Amount of EE (efficiency, load management, sectors)	There was little utility activity in EE prior to reform, limited to information programs, administering insulation loans, and water heater load control.
Framework for Energy Efficiency	
Policy	Government believes non-utility market barriers are suppressing EE, and allocates national budget funds for agency to promote EE. Climate Change policy will not target the hydro-dominated power sector.

NEW ZEALAND (cont.)	
Legal / Regulatory	Law requires publicly-owned utilities to offer EE (but not privately-owned utilities). End user efficiency encouraged to reduce site-level emissions for air quality. Limited opportunity for bidding DSM into the hourly wholesale market. No apparent legislative interest in building and equipment standards.
Institutions	Many constituents for EE in consumer, environmental, industry, and government circles.
Framework for Energy Efficiency	
Financial (funding level, sources, use, change from before)	Government funding amounts to equivalent of 0.2% of electric revenues.
Assessment of Market Infrastructure for Energy Efficiency	
Product Availability	Good, with EE labeling
Service Suppliers	A number of small firms, many delivering government-funded residential programs. Profit potential not sufficiently high to attract expanded business investment. Expected retail power competition focus on C/I likely to ignore residential.
Know-How	Adequate
Financing	Need mechanism to overcome incremental cost
Marketing	Driven by government and some energy suppliers
Delivery	Sufficient to meet demand
User Response	Reluctant to pay incremental cost for EE technology; large response to dramatic price increase during hydro crisis; little evidence of behavioral changes (vs. hardware changes)
Technology	Residential electric water heaters, lighting;

NEW ZEALAND (cont.)	
Outlook for Energy Efficiency	
Will price be enough?	No. Possibility of DSM and load management having chance to bid into wholesale supply market. Retailers may see EE as one way to differentiate service offerings for users > 100 kW..
Providers	Seem readily available if demand manifests and profit potential sufficiently high.
Segments and Technologies	Market may drive C/I users to seek EE services ahead of residential. Energy suppliers already promoting certain technologies (see above)
Recommendations	Business advisory services to attract more providers, possibly with special business investment funds; revised building and appliance standards; greater legislative support for EE policy and legislation.

UNITED STATES	
Reform Measures	Most states will endorse competitive generation markets of utilities, IPPs and merchant plants bidding into or contracting with a transmission system/dispatch operator. Retail competition will commence with larger consumers, and eventually add smaller consumers. Retailers can include distribution companies, generator subsidiaries, traders, and others including energy service providers and unrelated businesses. Ownership is predominantly private, with pockets of public sector ownership.
Post-Reform Retail Prices and Consumption	Reform just underway. Pilot experience suggests prices fall 5-15% with retail competition. 48 of 50 states considering some form of power reform.
Effects of Reforms on Energy Efficiency	
Utility Interest in Energy Efficiency	Most utilities involved in reform are reducing traditional rate-payer supported DSM programs. Some may retain services for competitive advantages to niche markets (where customer segments value EE services, or EE necessary in package to secure a customer by ensuring lowest total energy bill). Many utilities buying or creating ESCO subsidiaries, or forming joint ventures for packages with financial services, energy management, new rates, advanced billing, information, automation, etc. Energy services now will be funded by provider fully at-risk, compared to earlier regulation of DSM expenses in rates.
Non-Utility Provider Response	Many existing ESCOs and other firms (product manufacturers, commodity traders, telecommunication firms, etc.) are packaging power commodity with EE services for large C/I users, and some residential markets.
Government and Public Programs (e.g. information services, codes & standards, transformation)	Extensive history of state and national information, technical assistance programs; building codes and appliance and equipment standards; and required IRP and DSM programs (many with financial rewards for utilities) in dozens of states. Now governments in reform states likely to sponsor market transformation and EE targeted to niche markets, such as low income consumers. National government targets 30% efficiency in its facilities, plus procurement policies to promote "best practice EE products and stimulate scale of production (with reduced price) for increased volume of EE product manufacturing.
Types and Amount of EE (efficiency, load management, sectors)	Substantial EE achieved over past 20 years from utility, government, private sector programs and services. Utilities estimate annual impacts by 1999 at 71 billion kWh and 51 GW peak load reduction. Under reform, expect lower levels of EE than during IRP/DSM era for utilities, when utilities spent 2-3% of total revenues on DSM.

UNITED STATES (cont.)	
Framework for Energy Efficiency	
Policy	Set at individual state level, not national level. Leading states will provide "wires charge" or "public benefits charge" assessed on all customers (based on kWh sales, equivalent to 1-2 percent) to pay for EE services to overcome market barriers. Services may be delivered by non-utility providers, or to be competitively bid, including distribution utilities (who typically contract out many services to private firms). Plan for transition away from publicly-supported EE to market-based over 3-5 years.
Legal / Regulatory	EE issues are getting mostly state regulatory attention. Uncertain if public funding will be for all EE services, or just those with widespread public benefits unlikely to be attained in private market.
Institutions	Experienced state regulatory commissions, consumer and industrial user groups, environmental organizations involved in policy and regulatory developments. Some debate about surcharge to support national government activities, but no apparent support.
Framework for Energy Efficiency	
Financial (funding level, sources, use, change from before)	Public benefits or wires charges expected. Level of funding of 1-2% of revenues, slightly below previous 2-3% for utility DSM expenditures.
Assessment of Market Infrastructure for Energy Efficiency	
Product Availability	Extensive and competitive
Service Suppliers	Abundant infrastructure established over 20 years
Know-How	Well-established, with much of early experience paid through utility and government programs; utilities developed from engineering experts to marketing experts
Financing	Spotty; small-scale financing continues to be a problem for some consumers (especially low income); payback gap between consumers (short) and utility generators (long), and discount rates (high for private consumers, lower for utility investments)

UNITED STATES (cont.)	
Marketing	Well-established at retail levels, though less emphasized in recent years; government mandated EE product labeling widespread on consumer appliances
Delivery	Varies by state
User Response	Home-owners more likely to respond than owners of rental housing. C/I facilities look for fast pay backs (1-2 year maximum)
Technology	Technology efficiency driven by history of mandatory standards qualifying levels for utility rebates, strengthened over time
Outlook for Energy Efficiency	
Will price be enough?	Not for next 3-5 years, if ever. Persistent market barriers endure after 20 years of government and utility intervention. Market transformation and selected publicly-funded activities critical.
Providers	Likely to be plentiful, creative, and seeking any market with profit potential.
Segments and Technologies	Highly promising, with exception of low-use, low-profit users. Advance metering and monitoring equipment with lower costs will enhance EE and competitive service offerings.
Recommendations	Continued government support for product labeling on EE, and testing creative low-cost mechanisms to secure EE.

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U.S. Agency for International Development
Bureau for Global Programs, Field Support, and Research
Center for Environment
Office of Energy, Environment, and Technology

The Center for Environment of the Bureau for Global Programs, Field Support, and Research houses the environmental programs of the U.S. Agency for International Development (USAID). One of five *Centers of Excellence* within the Agency, the Center for Environment, provides field support to U.S. bilateral assistance efforts, manages global environmental program activities, oversees USAID's environmental research efforts, and is USAID's principal liaison on technical environmental issues to the rest of the U.S. Government, non-governmental organizations and universities, and other bilateral and multilateral donors.

The Office of Energy, Environment, and Technology is a part of the Center for Environment and helps developing countries and emerging economies find market-oriented solutions to their energy and environment problems. The Office helps set the energy policy direction for the Agency and responds to the short-term needs of USAID's field offices in assisted countries.

A lack of energy is seriously curtailing economic growth in developing countries and countries in transition. Expansion of energy supplies imposes a huge financial burden while increasing environmental threats in these countries. In addition, many countries lack the institutional capability and appropriate technology to operate and manage energy systems efficiently. These factors contribute to the role energy development plays as a leading contributor to global climate change and regional and local environmental problems.

To address these problems, the Office of Energy, Environment, and Technology leverages the financial resources of multilateral development banks, such as The World Bank and the InterAmerican Development Bank, the private sector, and other bilateral donors to increase energy efficiency and expand energy supplies, enhance the role of private power, and implement novel approaches through research and adaptation. These approaches include improving power sector investment planning ("integrated resources planning") and encouraging the application of cleaner technologies that use both conventional fossil fuels and renewable energy sources. The Office's promotion of greater private sector participation in the power sector and a wide-ranging training program also help to build the institutional infrastructure necessary to sustain cost-effective growth.

Further information regarding Center for Environment and Office of Energy, Environment, and Technology activities can be requested by contacting the Office of Energy, Environment, and Technology at the following address.

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