Electric Utility Restructuring and Its Impact on Energy Efficiency and Measurement and Evaluation: Two Unfinished Stories (California and South Korea)

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ABSTRACT

This paper describes the experience of electric utility restructuring and its impact on energy efficiency in California and the Republic of Korea (Korea). The California case study focuses on the legislative and regulatory response to electric restructuring in promoting energy efficiency. After describing the early regulatory history of utilities in California, we review key decisions affecting energy efficiency and measurement and evaluation (M&E) – e.g., the creation of a public goods charge (PGC), the administration and implementation of PGC-funded energy efficiency programs, the role of utilities and third parties in implementing such programs, and the role of M&E. We show how one event (the Energy Crisis of 2001) can have a major impact on the type of energy efficiency programs that get implemented (e.g., resource acquisition versus market transformation). We also describe how California's PGC-funded energy efficiency programs relate to the integrated resource planning activities recently reactivated for the investor-owned utilities in California.

The second part of the paper describes how Korea has restructured its energy industry, has created a PGC, and is developing programs for promoting energy efficiency, as well as setting aside funds for M&E. Korea will not be emulating the California experience, but will try to learn from California's experience in developing the necessary infrastructure for promoting energy efficiency in a country that has historically been supply-side oriented.

The Regulatory Policy Context for California's Energy Efficiency Programs

The history of California's energy efficiency programs and related M&E requirements can be divided into four distinct periods: the pre-Protocol era (1970s-1994), the Protocol era (1994-1997), the Restructuring era (1998-2000), and the current transition period (post-2000). While distinctive, these periods do have features that overlap (e.g., some of the M&E requirements for programs conducted under the M&E protocols in 1994-97 are still being implemented today for tracking the persistence of energy savings).

1970s-1994: The Pre-Protocol Era

For over thirty years, the California Public Utilities Commission (CPUC) has approved the use of ratepayer funds to promote energy efficiency activities, and authorized the major investor-owned utilities (IOUs) under its jurisdiction to administer a wide variety of energy efficiency programs. By the early 1990s, these programs began to be integrated into the Biennial Resource Planning Update (BRPU), an effort conducted jointly by the CPUC and the California Energy Commission (CEC). During the 1990s, energy efficiency programs and other demand-

side management (DSM) activities were officially identified by the CPUC and CEC as viable, cost-effective alternatives to supply-side energy generation projects (the resource acquisition perspective), although the supply side was treated as a more important and reliable resource than energy efficiency. Nevertheless, the goal of this activity was to provide a comprehensive planning, funding, and implementation regulatory scheme, in order to overcome the historical divisions among utilities, the CPUC, the CEC, and other stakeholders. There was some successful coordination and integration of demand and supply, as the CPUC used this information in their BRPU efforts and the CEC used similar information in the preparation of their Electricity Report.

A wide variety of programs was authorized by the CPUC and administered and implemented by the utilities in virtually all customer market segments. The programs primarily provided assistance to customers in the form of information services (energy management services or audits), or financial assistance (e.g., rebates or direct payments) to offset the high first costs of many energy efficiency measures. Load management programs were emphasized in the early to mid-1980s.

From the late 1980s until 2002, the CPUC allowed the utilities to recover from ratepayers the costs of shareholder incentive mechanisms. The terms and conditions under which the utilities were allowed to claim and recover these incentive payments (e.g., the basis for the incentive and the time of collection) varied greatly from utility to utility and year to year, especially in the 1990-1994 timeframe. The earnings claims were verified in separate proceedings, and each pre-1994 mechanism allowed for a very short earnings recovery period.

A variety of frameworks has historically been used in California to assess cost-effectiveness of energy efficiency programs. In the late 1970s, the CPUC implemented a least-cost planning strategy, whereby demand-side reductions in energy usage were compared to supply additions. The *Standard Practice Manual*, sponsored jointly by the CPUC and the CEC, provided several methodologies for conducting cost-benefit analysis of utility-administered DSM programs. This document was created to provide a standardized methodology and common tests for benefit-cost analyses of all utility programs in California, including load building, load shifting, load management, and energy efficiency. Prior to its development, no such official guidelines existed for these kinds of programs. A significantly revised version, published in 1987, incorporated numerous changes and clarifications that resulted from public workshops and comments and papers prepared by many participants in California's energy efficiency market.

In June 1990, the CPUC increased energy efficiency program funding, adopted shareholder incentives, and established a more rigorous M&E infrastructure. As part of this decision, the CPUC permitted the Division of Ratepayer Advocates (DRA, later changed to the Office of Ratepayer Advocates - ORA) to receive funds for independent consultants to review utilities' energy efficiency programs. During this period, utilities calculated the results of their programs through engineering estimates (often referred to as ex-ante estimates). In 1991, a Rulemaking/Investigation led to the establishment of measurement workshops conducted during the summer of 1992. In the spring of 1993, the CPUC adopted a comprehensive, thorough, and rigorous set of measurement requirements. They required that utilities should rely more on M&E than engineering and required that the evaluations of energy efficiency programs be based on ex-post measurement. The 1993 CPUC Decision adopted M&E protocols and formally established the California DSM Measurement Advisory Committee (CADMAC) to ensure the continuing development of these protocols and determine acceptable deviations from them. The protocols also included schedules for both earnings recovery and the performance of M&E studies.

Membership in CADMAC included staff from the four major investor-owned utilities, DRA, CEC, and the CPUC; other organizations could also join. Later the CPUC's Independent Reviewers, responsible for making recommendations to the Administrative Law Judge in cases of disputed evaluation studies, also participated in these meetings.

CADMAC worked though the protocols' technical issues and methods and tried to resolve them; unresolved issues were forwarded to the CPUC for resolution. CADMAC prepared semi-annual reports on the progress of the protocols and the subcommittees working on technical issues related to the protocols. CADMAC also hosted informal workshops where participants could freely discuss the technical issues of the protocols and their implications. As a result of the above activities, California had in place an infrastructure and process for conducting rigorous M&E, a standard that no other state has been able to achieve.

1994-1997: The Protocol Period

For the 1994-1997 years, statewide consistency was established for the shareholder incentive mechanisms, more rigorous terms and conditions for the measurement and verification of costs and benefits were established, and earnings claims were addressed in the consolidated Annual Earnings Assessment Proceeding (AEAP), with a relatively lengthy earnings recovery period of up to 10 years. In this period, shareholder incentives were tied to lifecycle net benefits (instead of first year energy savings): therefore, the M&E studies included retention and persistence studies, in addition to load impact studies. California's Measurement and Evaluation Protocols (CPUC 1998), adopted by the CPUC in D.93-05-063, provided the rules by which impact evaluations were done to determine the energy savings achievements of programs for which shareholder earnings were awarded. The protocols required first-year impact evaluations for most programs (emphasizing regression analysis and use of billing data) and persistence studies (4^{th} and 9^{th} year measure retention studies, and a secondary-source study of relative technical degradation). Since the eventual earnings depended on the measured persistence of savings, studies under these protocols are still occurring and are scheduled to occur until 2006.

Beginning in 1995, energy efficiency programs eligible for utility incentives (shareholder earnings) had to be cost-effective on a forecast basis. Each shared-savings program had to pass both the TRC and UC tests of cost-effectiveness as a condition for funding. General information programs were excluded from these tests because of the extreme difficulty in establishing meaningful estimates of load impacts.

In 1996, state legislation for restructuring the electricity industry in California was approved (Assembly Bill 1890 (AB1890)). AB1890 established electric public purpose energy efficiency funding (also known as the Energy Efficiency Public Purpose Program (EEPPP)), one of four public purpose programs funded from the Public Goods Charge (PGC)). The other programs funded by the PGC are: low-income programs, renewables, and research and development. [Initially, the PGC was established by the State Legislature for four years (1998 through 2001). In 2000, the State Legislature (Assembly Bill 995) extended the PGC for an additional ten years, from 2002 through 2011.] AB1890 set the funding levels for energy efficiency at the current budget level, rather than the higher historical levels, thereby affirming the status quo rather than changing the levels of spending. Nevertheless, without the PGC funds, California's energy efficiency programs would be significantly smaller in size and scope.

1998-2000: Energy Efficiency and Electric Industry Restructuring

The major terms of the State's restructuring law, AB 1890, began to be implemented in 1998 and dramatically impacted the CPUC's approach to energy efficiency funding and evaluation. Beginning in 1998, the EEPPP codified the mechanism for collecting and disbursing EEPPP funds.[1] Several significant program design and implementation changes occurred. First, funding for traditional rebates was reduced and supplemented by Standard Performance Contract (SPC) programs for the commercial and industrial sector, where savings and incentives were based on measured performance. Second, funding for upstream market transformation interventions was substantially increased. Annual funding for these efforts was expanded from very low levels at their inception to over $42 million by 2001. Third, utility performance awards were substantially de-linked from cost-effectiveness considerations for some programs (there were still significant savings goals for the large rebate programs which remained the mainstay of the portfolio's cost-effectiveness), and there were reductions in the earnings opportunities for the utilities. And fourth, there were significant increases in expenditures on M&E studies that attempted to quantify market effects and indirect benefits attributable to the expanded upstream market transformation programs, while total expenditures on evaluation were reduced.

Beginning in 1998, the CPUC moved to a market transformation goal for programs (see Eto et al. 1996). The CPUC codified a policy that emphasized removing barriers to energy efficiency in the market so that private sector entities would be able to provide energy efficiency services once public monies were no longer available to fund activities. Between 1998 and 2000, for new energy efficiency programs, short-term energy savings were de-emphasized relative to less quantitative goals of improving overall infrastructure and the ability of private sector entities to deliver energy efficiency (although resource programs remained the backbone of the portfolio of energy efficiency programs). In this context, market transformation was seen as a strategic effort by utilities and other organizations to "intervene in the market, causing beneficial, lasting changes in the structure or function of the market, and/or practices, leading to increases in the adoption of energy efficient products, services, and/or practices, and with the changes in the market being lasting changes, meaning that the changes last beyond any revision to or discontinuation of the intervention" (Schlegel et al. 1997). Market transformation is identified by the presence and relative strength of several characteristics of the intervention: a focus on energy efficiency, a strategic approach to understanding and working with the market, and a focus on opportunities for synergism with market actors resulting in leverage, with the overall result being a self-sustaining or lasting effect (Keating et al. 1998). For example, energy efficiency funds were spent on upstream market transformation activities (activities that focused on product developers and/or suppliers rather than end users/customers), including incentives to manufacturers to design and produce high efficiency products (e.g., high-efficiency refrigerators) and to promote and sell high efficiency products at other points in the delivery chain (e.g., incentives to retailers to stock and promote compact fluorescent lamps (CFLs)).

As a result of this move towards market transformation, a new set of expectations was established by an efficiency advisory board, the California Board for Energy Efficiency (CBEE). The CBEE provided advice to the CPUC on the types of programs to fund as well as the types of M&E requirements needed for evaluating market transformation programs. The CBEE could not do this alone – they worked with the key players (particularly the utilities and the California

[1] Prior to AB1890, the public purpose programs were funded via CPUC proceedings, primarily the utility general rate cases.

Energy Commission) in helping coordinate evaluation activities, particularly statewide efforts. During this period, the California Measurement Advisory Council (CALMAC) was formed to address issues related to programs conducted in 1998 onwards, particularly M&E efforts. The composition of CALMAC was similar to its predecessor, CADMAC. CADMAC still continued to meet, but only addressed issues related to programs started before 1998. In this period, shareholder incentives were tied to the number of energy efficiency measures performed or installed (milestones) and market effects metrics, as well as actual energy savings achieved, with key features such as lower earnings opportunities and short (one- to two-year) earnings recovery period, with earnings claims and associated disputes still addressed in the AEAP. Consequently, M&E efforts focused on verification of the number of energy efficiency measures performed or installed as reported by the IOUs, and the measurement of actual energy savings achieved was de-emphasized.

The CBEE examined the applicability of the existing cost-benefit analysis methodologies to market transformation and recommended a new test, the Public Purpose Test (PPT), be adopted as part of a revision to the CPUC's Policy Rules for Energy Efficiency Activities. The PPT is based upon the Societal Test; both tests adopt a societal perspective by accounting for non-energy benefits and positive/negative externalities. The PPT includes elements that were not traditionally included in the TRC calculations, such as spillover savings (which were accounted for in AEAP true-ups – i.e., adjustments to program savings during regulatory proceedings), non-energy costs/benefits, positive/negative externalities, and reductions in the cost of measures or practices caused by the program. Also, the PPT is applied at the portfolio level because legislation required the programs as a whole to be cost effective, while the TRC and Societal Tests are applied at the program level, and sometimes the measure level. The focus on the portfolio level was to encourage investment in interventions that may not produce measurable savings in the early years, but are more cost-effective over time as market effects compound in later years. In April 1999, CPUC Resolution E-3592 approved modifications to the Policy Rules and, in so doing, adopted the PPT as the standard for cost effectiveness. The CBEE was disbanded by the CPUC on March 31, 2000.

Post-2000: Transition Period

The current transition period has been a period of great uncertainty regarding the level of spending for energy efficiency programs, the administration and implementation of these programs, and M&E requirements, combined with a significant resurgence in interest in energy efficiency and dramatic increases in utility energy efficiency funding.[2] This uncertainty is not new – much of it existed in prior periods. But what was new was the urgency of trying to resolve these matters when a precarious energy situation confronted California – the Energy Crisis of 2001.

California's energy crisis. By almost any measure, the events surrounding the electricity situation in California in the 2000/2001-time period were simply extraordinary (Kushler and Vine 2003). Between the summer of 2000 and the early winter months of 2001, the California Independent System Operator declared over 70 days of system emergencies, and rolling

[2] Although Assembly Bill 995 provided some assurance of significant spending on energy efficiency for 10 years through the use of PGC funding, this type of funding is vulnerable to political and legislative "raids" (see Kushler and York 2004),

blackouts were actually initiated on several occasions. In January and February 2001, the CEC projected electricity supply and demand for the summer of 2001 under various temperature scenarios, and analyses suggested that the State could face a potential shortfall of 5,000 megawatts during the months of June through September (CEC 2001).

In reaction to this unprecedented electricity crisis, California responded with a series of demand-side policy initiatives that were truly historic. California policymakers and utility regulators established a substantial set of policies and programs that involved significant additional funding for existing energy efficiency programs and the development of a large number of new programs (Kushler and Vine 2003; Kushler, Vine and York 2003). In all, more than $1.3 billion in funding was authorized for demand reduction initiatives, representing a 250% increase over the spending in 2000. In particular, the degree of policy emphasis and the amount of funding provided for energy efficiency were unparalleled in U.S. history. Indeed, the estimated total funding allocated for energy efficiency in California for 2001 (over $900 million) was roughly equivalent to the total energy efficiency program spending in all other states combined. Most of this funding focused on resource acquisition activities, rather than market transformation.

Changing rules. In November 2001, the CPUC changed the rules for energy efficiency programs to allow other organizations to compete with utilities for certain portions of utility energy efficiency funding and to be assured of another portion of the funding in Decision 01-11-066 (CPUC 2001a). Of the $170.5 million available for statewide programs, the CPUC designated $10 million for marketing/outreach programs for competitive solicitation by utilities and third parties alike. In addition, the CPUC set aside $100 million of the PGC funds available in 2002-3 for third parties, which is about 20% of total 2002-3 funds. (While third parties were allowed to compete with utilities for an additional 35% beyond this level of dedicated funding, they were later awarded the dedicated total.) The decision also contained an *Energy Efficiency Policy Manual* that provided guidelines for statewide and local program proposals, as well as a scoring system on which program selection would be based (CPUC 2001b).

In 2002, the CPUC adopted a new Energy Efficiency Policy Manual (contained in CPUC Decision 01-11-066), and CPUC-regulated program evaluation and numerous other program activities are governed by this set of protocols. The manual contains the requirements for cost-effectiveness analysis, and requires measurement and verification using the U.S. Department of Energy's International Measurement and Verification Protocol (IPMVP). Other evaluation areas allowed include process evaluation and program theory testing and program effectiveness indicators. The goals of evaluation are to be balanced: between achieving reliable, long-term energy savings, and broadening program participation among hard-to-reach segments.

Starting in PY 2002, third-party implementers were eligible for incentives – a performance award of up to 7% of a program's approved budget. The award was at the discretion of the CPUC, and the amount depended upon the program's success. IOUs were not eligible for incentives.

Resource procurement and portfolio management. In September 2002, the Governor signed Assembly Bill 57 that provided the regulatory procurement framework for utilities to procure electricity and electricity demand reductions, as well as to develop procurement plans. Shortly thereafter, in October 2002, the CPUC required in Decision 02-10-062 that California's three electric IOUs take responsibility for resource procurement to maintain the reliability of

California's electric grid (CPUC 2002). The CPUC specified that energy efficiency would be a required and integral part of this plan as evidenced by the following statement in this decision: "Resource adequacy should first be met through all cost-effective energy efficiency and demand-response programs." In April 2003, the CPUC, CEC, and the California Power Authority jointly prepared the Energy Action Plan (CPUC et al. 2003). The Energy Action Plan was an unprecedented effort by the three energy agencies to create a unified policy in California that emphasized the use of energy efficiency for meeting the State's resource needs. To meet the CPUC mandate and in response to the Energy Action Plan, the utilities filed portfolio management plans in April 2003 which included $725 million in energy efficiency spending over the next five years (2004-8) in addition to current commitments through the PGC funds.[3] In December 2003, the CPUC approved in D. 03-12-062 the energy efficiency funding for 2004-5. These portfolios have a range of efficiency programs and options that have multi-year objectives, including longer-term strategies. In this decision, the CPUC also indicated that they might consider an energy efficiency portfolio standard similar to the renewable portfolio standard for renewables that is now state law. Finally, in April 2004, the CPUC issued an Order Instituting Rulemaking (OIR) to adopt long-term resource plans for IOUs. The OIR will also consider the development of procurement incentives for each utility.

A New M&E Framework

In November 2001, the CPUC ordered (D. 01-11-066) that a new Framework be established to guide the planning and conducting of California's PGC-funded energy efficiency and resource acquisition program evaluations. One of the underlying themes of the new Framework was to establish an evaluation approach that provided reliable information to help ensure California's energy needs while supporting continued program improvements and helping to meet the information needs of program managers. The California Evaluation Framework was published in March 2004 (TecMarket Works Framework Team 2004). The new Framework presented a systems approach to planning, conducting and funding evaluations of energy programs, instead of the more traditional program-specific or sector-specific approach (Brown et al. 2004). The Framework provided a structured decision process in which quality and reliability considerations directly influence evaluation designs for the following types of evaluations: impact, metering and monitoring efforts, process, market effects studies, non-energy effects research, and information-and-education program evaluations. The Framework also included a market-based perspective for calculating and using avoided costs and for conducting cost-effectiveness tests.

Korean Energy Policy

From supply planning to end-user pricing, the involvement of the Korean government in the energy sector has been extensive. In the past, it was generally accepted that maintaining a reliable national energy supply was best served by public ownership. One main objective of the Korean government's energy policy was to ensure that the energy sector was managed in such a way as to provide low-cost energy supplies to encourage and sustain economic development. This policy was apparently successful as shown by unprecedented economic growth, but the low

[3] These plans also include proposals for demand response programs, but this is not the subject of this paper.

energy prices discouraged investment in energy efficiency technologies, hindering the government's efforts to improve energy efficiency.

Korean Government and Energy Efficiency

Since Korea relies on imports for about 97% of its energy, the government has for many decades given high priority to energy efficiency, particularly after the two oil crises of 1974 and 1979. In December 1979, the Korean government began to implement comprehensive energy efficiency programs based on the Rational Energy Utilization Act of 1979; amended several times thereafter, this law provides the legal basis for the enforcement of the government's current energy efficiency policy.

In 1980, the Ministry of Commerce, Industry and Energy (MOCIE) established a non-profit government agency, the Korea Energy Management Corporation (KEMCO), to implement energy efficiency policy and programs designed by MOCIE. KEMCO has conducted DSM activities in the areas of electricity, gas, and district heating systems. Electricity DSM projects mainly focus on industrial audits for the estimation of DSM potential of large plants; electricity audits and surveys of DSM potential for large buildings and for small and medium-sized buildings.

The Law on the Rationalized Use of Energy and the Enforcement Ordinance (Nov. 23, 2000) form the basis of the country's energy efficiency policy. Its main articles are:

- Article 17 related to the designation by MOCIE of minimum efficiency standards and energy labeling of the most widely distributed products.
- Article 18 related to measures adopted by MOCIE in case of non-compliance with the energy efficiency standards by the manufacturer, importer or seller of the product concerned.

In 2000, MOCIE formulated the 2000 Blueprint to implement policies, harmonizing energy, economy, and environment. One of the objectives of the 2000 Blueprint is the transition to a low energy consumption structure, including the promotion of an energy efficiency policy. For 2001, the Korean government prepared a set of comprehensive energy policy objectives. MOCIE's two main offices (the Energy and Resources Policy Office and the Electricity Industry Restructuring Office) are responsible for energy policy.

The Korean government's energy efficiency efforts primarily consist of two programs: (1) an energy efficient lighting program, and (2) inverters for improving motor efficiency. In the lighting or "e" label program, KEPCO issues incentives for eligible e labels to the manufacturers of energy efficient lighting devices. Any customers who replace existing non-energy efficient lighting measures with KEPCO-designated energy efficient ones or newly install KEPCO-designated energy efficient lighting devices are eligible for incentives. The total energy savings should equal or exceed 2 kW. The motor efficiency program focuses on inverters that improve the power conversion efficiency of the motor, which accounts for about 60 percent of the total power consumption. Customers who save 10 kW or more by installing inverters on specified motors receive incentives. From 1994 to 2001, the lighting program saved 337 MW – this program hopes to save 565 MW by 2015. The motor program started in 2001 and saved 2 MW in 2001, 5 MW in 2002, and 6 MW in 2003 – this program hopes to save 1,004 MW by 2015.

Utilities and Energy Efficiency

The energy supply companies – KEPCO, Korea Gas Company (KOGAS), and the Korea District Heating and Cooling Corporation (KDHC) – have traditionally implemented load management programs, including peak clipping, peak shifting, load shaping and DSM tariff systems. They have been hesitant in promoting energy efficiency for fear of reducing their energy sales.

Korea in Transition

The Korean energy industry is at a turning point (Chang 2003). The industry model is shifting from government-directed central planning systems towards a decentralized market-oriented system. State-owned public utilities are being privatized (see below), and at the same time, vertically integrated monopoly structures are being dismantled and industry restructured in order to infuse competition where competition is possible. Market-based reform of the energy industry is expected to correct the inefficient use of energy. How energy efficiency will fare in this transition is unclear.

Electric Power Restructuring in Korea

The Korean government is committed to an overall restructuring of the electric power industry. The objectives of the reform are to deliver more efficient and sustainable use of the capital infrastructure and energy resources, and to improve performance (Chan 2003). The MOCIE announced the Electric Power Industry Restructuring Plan in January 1999, which would eventually lead to the privatization of the electricity market. The Plan includes unbundling the vertically integrated electric power industry in order to promote efficiency, security and reliability of supply, and customer choice.

The Plan lays out a gradual transition to wholesale competition over 4 years, with the introduction of retail competition after 2009. The plan is divided into four phases as seen in Table 1. The Korea Electric Power Corporation (KEPCO) will be divided into three categories: generation, transmission, and distribution. Electricity generation will be opened to independent electricity producers (IPPs), except for nuclear plants.

Table 1. Electric Power Restructuring Plan in Korea

Phase I: Preparation (1998)	Preparation, including legislation, valuation and separation of KEPCO's assets, formation of generation subsidiaries (Genco) and initial development of wholesale electricity pool
Phase II: Competition in generation (1999)	Privatization or divestment of KEPCO's generation subsidiaries; competition between Gencos in a wholesale electricity pool; formation of new distribution companies; initial privatization of distribution companies.
Phase III: Wholesale competition (2003-2009)	Preparation for retail competition
Phase IV: Retail competition (after 2009)	Gradual elimination of supply franchise.

Following this restructuring plan, the power-generation part was split from KEPCO in April 2001. Six subsidiary companies were formed, and six of these companies (excluding the

nuclear and hydro generation subsidiary) will be privatized. The Korea Power Exchange (KPX), which controls electricity transactions between the six subsidiaries and KEPCO, started on April 2, 2001. The privatization of the Korea South-East Power Company (KOSEPCO), the first of six generation companies to be privatized, has been confronted with several obstacles, such as the downturn of the Korean economic cycle and the withdrawal of foreign capital due to the collapse of Enron. These obstacles resulted in the postponement of Korea's privatization plan. For preparing wholesale competition, the separation of the distribution/retail and transmission functions from KEPCO also has been affected by critical obstacles, such as the serious opposition of the labor union and the hesitation of political leadership. As a result, these obstacles have caused a temporary suspension of Korea's restructuring and privatization plan. Currently, Korea is still in Phase II of the Electric Power Restructuring Plan. In sum, the Plan has not been as well-executed as originally planned.

Public goods charge. On December 2000, the Electricity Business Act laid out the public goods charge (Electricity Industry Infrastructure Establishment Levy) for ensuring the financial resources to develop the electricity industry and to secure the balance of the supply/demand of electric power. Ratepayers paid a total of $788 million in 2003: $28 million went to load management and $22.5 million went to energy efficiency (or about 3% of total PGC funding). The remaining PGC funds were spent on a diverse set of activities, such as: research and development, support for combined heat and power generation, anthracite generation, and electrical safety management.

The Impact of Restructuring on Utilities and Government

Before restructuring, KEPCO did not make a serious effort at promoting energy efficiency. Along with the creation of the public goods charge (PGC), the restructuring of the electricity industry in Korea has had a major impact on utilities. The role of utilities has changed from an all-round player involved in all aspects of energy to an administrator of energy efficiency programs. Because the source of funding has changed from private funds to public funds, the Korean government has assumed the major role in designing and evaluating energy efficiency programs. The Korean government expects that DSM programs will contribute in stabilizing the supply/demand balance and in acquiring demand/supply resources.

Measurement and Evaluation

The government's central role is in overseeing and supervising DSM programs in Korea, while the utility's (KEPCO) role has been in managing, implementing, and evaluating DSM programs. In some cases, energy audits and energy efficiency programs have been implemented by KEMCO and energy service companies (ESCOs). The evaluation of the performance of these programs has been done by research institute or universities.

Until restructuring, there was very little effort on M&E of energy efficiency programs. Traditionally, before implementing DSM programs, program administrators conducted ex-ante analysis using one of California's cost-effectiveness tests, such as the Utility test, Ratepayer Impact (RIM) test, and Total Resource Cost (TRC) test. Most administrators used the RIM test in determining which programs to implement. After the programs were implemented, the Utility test was most often used for evaluating its cost effectiveness. As a result, there are no real

measurement & verification activities for energy efficiency programs in Korea (KEMCO does a quick energy audit in some cases); savings are based on engineering estimates. Since restructuring, the Korea Electrotechnology Research Institute (KERI) has been assisting the government in evaluating energy efficiency programs' performance, and KERI has also been involved in establishing a M&E infrastructure in Korea.

Conclusions

In California and Korea, it is clear that regulatory bodies continue to play an important role in ensuring energy efficiency investments continue to be made without relying on market forces alone. Without the public goods charge and procurement funds, energy efficiency would be funded at significantly lower levels in California and Korea. California has in place an infrastructure and process for conducting rigorous M&E, but which was developed over many years and with the involvement of many stakeholders. Korea is in the process of developing its own M&E infrastructure. Two of the key M&E questions that Korea will need to address are (1) the extent to which energy savings will be measured versus calculated (based on engineering estimates), and (2) the level of rigor of M&E. California's M&E experience should help to resolve these issues.

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