Integrating Risk Assessment into Energy Efficiency Program Portfolio Design

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ABSTRACT

Although some utilities with mature energy efficiency program portfolios include risk analysis in their portfolio management activities, a utility with an immature or new portfolio is in a unique position to avoid a great deal of economic and performance (savings) risk by integrating formal risk analysis into the portfolio design process.

This paper describes ICF's process of integrating risk analysis into program portfolio design (which included energy efficiency potential studies) conducted for Commonwealth Edison. Illinois state law mandates that IOUs meet certain savings goals by 2010 or lose administrative control of their energy efficiency portfolios. Given these high stakes and the high degree of uncertainty over portfolio performance, ICF integrated risk analysis into the portfolio design process.

First, ICF used its energy efficiency potential model to develop a portfolio of potential programs that could meet the targets. Next, using the potential model as the platform, key uncertainties impacting kW and kWh savings were inputted into Monte Carlo simulations using @Risk software. Simulation results were used to adjust program portfolios. This process was iterated until the risk results and the portfolio were satisfactory. Programs with measures contributing the most to utility risk were scaled-back and less risky, though less cost-effective, programs were scaled-up; the cost of risk reduction was estimated as the change in portfolio cost due to this scaling-back and up process. Results of the Monte Carlo simulations were also used to develop risk mitigation strategies in the utilities' business plans.

Key uncertainties used in the risk analysis were unit incremental savings, projected measure installations and measure net-to-gross ratios (NTGR). The analysis shows that uncertainties around evaluated NTGR, especially for important measures like CFLs, are the greatest contributors to the risk of the utilities not meeting their 2010 savings goals.

Background

In 2007 enactment of Illinois Public Act 95-0481 created a new Section 12-103 of the Illinois Public Utilities Act, and, among other things, set forth new energy efficiency and demand response goals. Section 12-103's goals vaulted Illinois into the top-tier of states with respect to required investment in energy efficiency. By 2011, ComEd is projected to be within the top ten utilities in the country in terms of absolute dollar spending on customer energy management. The estimated net benefit over the lifetime of the demand-side measures implemented under this Plan, including the Department of Commerce and Economic

Opportunity's (DCEO) programs[1], is $155 million. ComEd's statutory goals are shown in the following table.

Table 1. Statutory Portfolio Goals

Annual Goal	2008	2009	2010	Totals	
Spending Screen ($M)	$ 39	$ 82	$ 127	$ 248	
Energy Efficiency Goal (MWh)	188,729	393,691	584,077	1,166,497	
ComEd Goal (MWh)	148,842	312,339	458,919	920,100	79%
DCEO Goal (MWh)	39,887	81,352	125,158	246,397	21%
Demand Response Goal (MW)	12	11	10	33	

And Table 2 below documents the legislative goals of the portfolio.

Table 2. Legislative Portfolio Goals

	Year commencing June 1							
Legislative Goals	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Energy efficiency: Incremental % of energy delivered	0.20%	0.40%	0.60%	0.80%	1.00%	1.40%	1.80%	2.00%
Demand response: % of prior year eligible retail peak demand	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Spending screen: Max increase in "per kWh rate"	0.50%	1.00%	1.50%	2.00%	2.02%	2.02%	2.02%	2.02%

The immediate challenge for ComEd and ICF was developing a portfolio of programs that will meet the first three-year set of savings goals within the spending screen. Unlike the California utilities that have had over two decades of experience in energy efficiency program design, ComEd must achieve these levels of energy efficiency investment in less than one-quarter the time, beginning from a cold start. The practical challenges are obvious and include the following:

1. Rapidly building a scalable program management and delivery infrastructure;
2. Delivering programs efficiently so that ComEd meets their goals within the spending screen;
3. Immediately engaging customers in a robust initiative addressing the value inherent in their active management of energy use;
4. Managing multiple risks associated with program performance; and
5. Establishing an effective process for ongoing stakeholder participation and input.

Working with DCEO, ComEd and ICF prepared a Demand Side Management Plan (the Plan) that addresses these challenges. We drew upon our review of national energy efficiency best practices and the input of national energy efficiency experts. We also met with stakeholders collectively four times over three months, and briefed and solicited input from many of these

[1] The Act requires that 20 percent of program savings must be produced by public sector programs administrated by DCEO.

stakeholders individually on the proposed composition of the portfolio. These stakeholders included the Building Operators and Managers Association, Center for Neighborhood Technology, Citizens Utility Board, City of Chicago, Environment Illinois, Environmental Law and Policy Center, Illinois Attorney General's Office, Illinois Commerce Commission Staff, Illinois Industrial Energy Consumers, Metropolitan Mayors Caucus, Midwest Energy Efficiency Alliance and the Natural Resources Defense Council. Stakeholder recommendations led to several significant improvements to the Plan.

Portfolio Summary

ComEd developed a portfolio of energy efficiency and demand response programs designed to meet Illinois' statutory requirements and that is consistent with ComEd's commitment to energy efficiency. The portfolio as a whole is cost-effective with a Total Resource Cost (TRC) test benefit-cost ratio of 1.43. The portfolio is projected to meet annual energy reduction goals in each year of the implementation period while not exceeding the estimated spending screen. The portfolio also is designed to meet the statutory demand response goals within the spending screen.

Figure 1 describes the final portfolio, including both the ComEd and DCEO portions. The portfolio is built around five broad Solutions programs, each of which contains several program elements intended to provide a diverse range of energy efficiency options for all customer classes. These programs rest on several crosscutting initiatives designed as a foundation for market transformation.

Figure 1. Portfolio Structure

ComEd Portfolio			**DCEO Portfolio**		
Residential Solutions		**Business Solutions**	**Public Sector Solutions**	**School Solutions**	**Low-Income Solutions**
Lighting	Appliance Recycling	Prescriptive	Prescriptive	Prescriptive	New Construction & Gut Rehab
Multifamily	HVAC Diagnostics & Tune-UP	Custom	Custom	Custom	Energy Efficient Moderate Rehab
New HVAC w/ Quality Installation	Single Family Home Performance	Retrocommissioning	Retrocommissioning	Retrocommissioning	Single Family Remodeling
Advanced Lighting Package	AC Cycling	New Construction	New Construction	New Construction	Direct Install
		Small C&I Intro Kit		Lights for Learning	

The Challenge of Understanding and Managing Program and Portfolio Risk

There are many types of risk that must be accounted for in portfolio design and management. These risks fall roughly into two categories, those the utility is largely in control of and those they aren't. Risks mostly within utilities control involve *program performance* (getting measures installed and achieving savings) and the mix of *technologies* delivered by programs. Those largely outside utilities control involve *market fluctuations* (i.e., the general state of the economy, the price of oil), the *state and national energy efficiency environments* (i.e., state and Federal legislation) and *program evaluation*.

Because programs deliver savings by achieving installations, utilities can hedge against a large chunk of program and portfolio risk through using best practices in program design and implementation, such as instituting practices that filter free-riders. That being said, no plan or manager is perfect so all programs engender some degree of *performance risk*: the risk that, due to design or implementation flaws, the program does not deliver expected savings. This risk is common to all program types. Some programs have measures mixes with proven track records for delivering savings, prescriptive lighting programs, for example. Others are more cutting-edge and include emerging technologies: *technology risk* is the risk that technologies targeted by a program fail to deliver the savings expected. This risk is greater for programs that target emerging technologies or individual technologies. Ultimately technology risk is highly dependent on performance risk, as program managers are responsible for delivering savings using the best possible measure mix.

Unlike performance and technologies risks, program planners and managers don't exert much control over *market risk* and *evaluation risk*. *Market risk* is the risk that, either because of a poor economic climate or the availability of better investments, customers choose not to participate in a program. *Evaluation risk* is the risk that program evaluators will attribute, with a high degree of statistical confidence, lower savings than those assumed in the planning model. This is more a short- than a long-term risk. In the short-run, a low NTGR means ComEd may not achieve the savings targets for the year. In the long-run, ComEd will adapt a program in response to evaluation and raise its NTGR.

The *energy efficiency policy environment* in the state in which utility programs operate obviously has tremendous influence on the chances of a portfolio's success. Policy decisions such as the length of the program cycle, how net-to-gross is defined, whether savings and NTGR are deemed and the size of evaluation budgets are examples of policy decisions that impact program success. A program's ability to achieve installations is key, but this is often constrained by short program cycles imposed on program managers by regulators that might not correspond to the operation of the markets programs are trying to influence. In addition, whether policy defines the net-to-gross ratio only as the rate of free-ridership, or if this definition fully incorporates spillover effects as well is critical. Finally, larger evaluation budgets allow evaluators to use more robust methods of estimating savings and providing well-informed feedback to program managers.

Contrary to evaluation, market and policy environment risks, program performance and technology risk can be better managed forward by the utility in real-time. As information is collected with respect to program performance, adjustments can be made to portfolio and program element design and implementation to move away from the risks or correct design or implementation flaws. In the process of designing its portfolio, ICF and ComEd went beyond simply acknowledging these risks, and prepared a formal analysis of the impacts of uncertainty that lead to these risks on its portfolio. Specifically, ICF assigned subjective probabilities to certain key assumptions regarding technology performance, participation and program NTG ratios, and then simulated the impacts on ComEd's ability to achieve its savings goals using Monte Carlo analysis.

Portfolio Risk Analysis Results Summary

Recognizing that this risk analysis was based on subjective probabilities rather than empirical data, the results of the analysis showed that the portfolio was most at risk from an evaluator concluding that the NTG ratios are different than was assumed when preparing the Plan. However, the combined effect of performance and market risk (represented by the ratio of actual, or verified gross savings to planned gross savings) also has a major impact. ComEd has made several adjustments to its portfolio to better manage these risks:

1. ICF and ComEd reduced the planned contribution from residential lighting measures (the single largest contributor to program savings). This action is consistent with recommendations from stakeholders, and reduces our exposure to performance and evaluation risk with this single set of measures (CFLs). However, given the challenges of program ramp-up and the aggressive goals, the portfolio cannot achieve its goals and stay under the spending screen without a significant contribution from this technology.[2] ICF and ComEd built the portfolio around program elements that, for the most part, can be ramped up or down quickly as necessary based on performance.
2. ComEd is making an investment in program elements such as commercial new construction that cannot be expected to generate significant savings in the first three years, but that will significantly enhance technology and program diversity in the subsequent Plan.
3. ComEd and ICF have used program designs that reflect best practices and that afford the ComEd the best opportunities to achieve expected savings.

Essential to this risk management strategy is retaining sufficient flexibility to reallocate funds across program elements, including the ability to modify, add or discontinue program elements within approved programs as dictated by additional market research and actual implementation experience.

Risk Analysis Process

Summary

The explicit objective of the portfolio analysis process was to design a portfolio that met savings goals, and the portfolio proposed by ComEd inclusive of the DCEO programs does this. However, there are a number of uncertainties that characterize the analysis. For example, if the values that we used to represent energy efficiency measure savings are incorrect, if program participation is not what we estimated, or if the NTG ratios calculated by the independent evaluator vary from those that we have used in our analysis, the verified net savings estimated by the evaluator could be different than planning estimates.

[2] New federal standards for light bulbs, which become effective in 2012 and will effectively outlaw incandescents over time and make CFLs standard technologies, will clearly have a major impact on all energy efficiency portfolios in the U.S. However, this legislation does not pose a significant risk to ComEd in the short run for the simple reason that there is no *uncertainty* around this change in the market. In the short run, ComEd is far more concerned with meeting statutory savings goals, as defined by the state of Illinois.

Because of this uncertainty, we performed a risk analysis of the portfolio. The statute prescribes both hard energy efficiency savings goals and penalties for failing to meet those goals. The most significant penalty for ComEd for not meeting these savings goals is having administrative control of their portfolio shifted to a third party or the State. ComEd therefore required a portfolio that is sufficiently robust and flexible that it can meet its goals even if one or more programs do not deliver as expected. To determine how to create this robustness, we needed to examine how overall portfolio performance would be affected by program- and measure-specific performance that did not match expectations. In addition, identifying key portfolio uncertainties allows ComEd to target its efforts going forward more efficiently by focusing on improving the design of the programs that contribute the most to portfolio risk, and by designing away from the risk; that is, focusing on those programs for which we have greater confidence in key assumptions.

There always will be a trade-off, however, between minimizing risk and minimizing cost. As is often the case, the least expensive options often carry the greatest risk. CFLs are a case in point. A large majority of energy efficiency portfolios across the country lean heavily on CFLs because they are so cost-effective, yet persistent CFL savings is difficult to verify. Monitoring based commissioning programs, on the other hand, are low risk in terms of the level and persistence of verified savings, but they are too expensive to run on a large scale for most utilities in regulatory environments that emphasize short-term savings goals and program cycles. Thus, designing away from the risk very often imposes a cost on the portfolio.

For this analysis, an *uncertainty* is defined as a measurement of the quality of information about an event or outcome. For example, although some future events are uncertain, there is a significant amount of information about their likelihood, such as for non-weather sensitive measure savings. Other future events are less certain, such as program participation. The higher the quality of information we have about a future event, the more precisely we can estimate its outcome.

A *risk* is defined as a measure of bad outcomes associated with a given plan.

A *Monte Carlo simulation* is defined as a technique used in computer simulations that samples from random number sequences to simulate outcomes with multiple possible values.

The risk analysis was performed using the Excel-based ICF portfolio analysis model workbook as a platform and @RISK software, an Excel based product, to run Monte Carlo simulations.

Key Analysis Variables

ICF, in its risk analysis of ComEd's portfolio, built on work by the California Public Utilities Commission (CPUC) and Pacific Gas and Electric (PG&E) on energy efficiency portfolio risk.[3] The CPUC and PG&E identified three key uncertainties associated with energy efficiency measure savings claimed by programs: measure energy savings, projected measure installations and net-to-gross ratios (NTGR). ICF added a fourth uncertainty to the analysis, the engineering verification factor.

Measure (unit) energy savings is the difference in annual energy consumption between the baseline and efficient technologies. *Projected measure installations* are the count of measures the program expects to install. *The NTGR* in the model is defined as one minus the free-ridership rate plus the spillover rate, where the free-ridership rate is the percentage of

[3] Richard Ridge et al, 2007.

program participants that would have installed the measure in the absence of the program, and spillover is the fraction of program savings attributable to customers who were influenced by, but did not formally participate in, a program. The *engineering verification factor* adjusts the tracking estimate of gross savings (after the application of the evaluated installation rate), to create verified gross savings; it is the estimated ratio of verified gross savings to tracking gross savings corresponding to measures actually installed. The estimated energy use reduction for a measure in the portfolio model is the product of these four variables.[4]

There is uncertainty around the values for each of these variables for every measure in the portfolio. Since there is a distribution of probable values for each of these variables, there is also a distribution of probable portfolio savings. The risk analysis identifies the uncertainties that contribute most to variance in probable portfolio savings.

The first step in estimating probability distributions around uncertainties in the portfolio was analyzing each uncertainty at the program or measure level, depending on the uncertainty. For every program or measure in the portfolio, ICF analyzed key factors contributing to the uncertainty of each variable. Based on that analysis, ICF set probability distributions around each uncertainty (unit savings, projected installations, NTG ratio and engineering verification factor) at the program or measure level. Ideally, these probability distributions would be based on observations of many actual values. Unfortunately, consistent data sets do not exist that would enable us to base the distributions on observed variation of values for identical programs. Therefore, the distributions were based on subjective evaluation (similar to a Delphi process) of the relative uncertainty associated with the source of the initial values.

Unit energy savings. Unit savings uncertainty was analyzed largely at the measure level. The key factors used in analyzing unit savings uncertainty were the source of the unit savings estimate and the measure's weather sensitivity. Generally, non-weather sensitive measure savings estimates where the savings source was California's Database of Energy Efficient Resources[5] were assigned the lowest levels of unit savings uncertainty.

Project installation uncertainty. There were three key factors used in analyzing project installation uncertainty. The first and most important factor is uncertainty around each proposed program's ability to get measures directly installed. The key to this process is to think about how measure savings are influenced by the programs they are rebated through. That is, a measure's installation probability distribution needs to be informed by what the program is doing, how it's delivered. For example, a CFL giveaway program is going to achieve fewer installs than a CFL in a direct install program. ComEd's C&I New Construction program element was ascribed a low degree of uncertainty in its ability get measures directly installed because of the high degree of installation verification required for participants to receive rebates.

Given that some program elements, such as Residential Lighting, are projected to contribute more to portfolio savings than other programs, and that more evaluation dollars will be spent researching the most important programs, ability-to-install uncertainty was weighted

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[4] For a given measure, verified gross savings may be higher or lower than the tracking estimate of gross savings for a variety of reasons, including that the wrong data were entered in the program tracking database; survey responses indicating differences in the quantities installed, equipment efficiencies, and/or operating hours; and mistakes in the calculation of the tracking estimate. (The engineering verification factor includes any correction to the numbers of units installed for a particular measure.)

[5] DEER

proportional to each program's projected contribution to total portfolio savings. Other key factors considered in the analysis of installation uncertainty were the program participation rate, and the source of the baseline usage rate. The program participation rate and the baseline usage rate were hardwired into the ICF portfolio model.

Finally, we considered the applicability of the baseline usage rate estimate, based on its source; for example, residential baseline usage rates applied in the ICF model were published in a study by the Midwest Energy Efficiency Alliance (MEEA), so ICF ascribed a low level of uncertainty to the study's applicability to the Illinois market.

NTG ratio uncertainty. NTG ratio uncertainty was estimated largely at the program level, and was based on ICF's confidence in the source of the NTG ratio estimate, the applicability of the NTG ratio to ComEd's program and the local market, and the uncertainty around an evaluator's ability to conduct robust impact studies on the program. Because ComEd's evaluation budget is small compared to budgets in other states (around three percent), we generally ascribed modest levels of confidence in an independent evaluator's ability to conduct robust impact studies. However, because some program elements, such as Residential Lighting, are projected to contribute more to portfolio savings than other programs and since more evaluation dollars will be spent researching the most important programs, evaluation uncertainty was weighted proportional to each program's projected contribution to total portfolio savings.

After the initial Monte Carlo runs, some CFL NTG ratio uncertainty bounds were set at the measure level, based on recent evaluation research on CFLs in California. The engineering verification factor was not considered a key uncertainty in this risk analysis because most of the evaluation risk is captured in NTG ratio uncertainty.

The ICF team reviewed their assumptions about these uncertainties and made adjustments to some distributions based on professional judgment. These adjustments typically reflected program evaluation research findings or the team's experience with the performance of particular measures or programs in other markets. Three rounds of such adjustments occurred during the course of the risk analysis. The first round of adjustments took place before the first Monte Carlo simulation was run. The second and third rounds took place after the first and second Monte Carlo runs, respectively.

Monte Carlo Simulations

Once the uncertainties were established in the risk model, ICF ran a Monte Carlo simulation using @RISK software. The simulation calculated 1,000 iterations of the portfolio to arrive at a distribution of probable energy savings over three years. Following the simulation, ICF used

@RISK's sensitivity analysis function to analyze the data. The sensitivity analysis function regresses the input data (uncertainties) against the output data (energy savings). The regression coefficients reflect the sensitivity (responsiveness) of the output variable to each input variable.

The first simulation showed portfolio savings highly sensitive to NTG ratio and installations of CFLs in the residential and commercial sectors. The projected number of recycled refrigerators was also a statistically significant uncertainty. Following the simulation, ICF conducted a round of adjustments to uncertainties, including adjustments to NTG ratio uncertainties for residential CFLs based on recent evaluation findings on lighting programs in California.

Results of the second simulation still showed that savings were most sensitive to residential and commercial lighting NTG ratio and installations, primarily low and medium wattage CFLs. The projected number of recycled refrigerators was also still an important uncertainty. Following the second simulation, ICF conducted a final round of adjustments to uncertainties.

Monte Carlo Results

Based on the output of the third Monte Carlo simulation, the critical uncertainties that remained included those associated with residential and commercial CFL NTG ratios and projected installation counts (participation). Other important uncertainties were the potential number of recycled refrigerators, and occupancy sensors rebated through DCEO's Public Sector Prescriptive program.

Table 3 shows the results of the sensitivity analysis using data from the third Monte Carlo Simulation.[6]

Monte Carlo Analysis

The results of the Monte Carlo simulations showed that uncertainties contributing the greatest amount to portfolio risk are the NTG ratios for CFLs in the residential and commercial sectors. This is not surprising for several reasons. First, CFLs constitute a large portion of energy savings in ComEd's portfolio, as they do in many portfolios around the country.[7] Second, it is very difficult to predict the value that an evaluator will assign to the program NTG ratio based on ex post analysis. Using NTG ratios from similar programs around the country is a reasonable approach and one that is consistently used. Presumably, the independent evaluators will estimate NTG ratios for ComEd's programs, although given the low evaluation budget and the high cost of developing NTG ratio estimates, it is unclear if the evaluator will develop such program-specific estimates or not. There is a correlation between the precision of NTG ratios and the evaluation budget – less precision means more uncertainty.

This risk does not materially affect whether ComEd's Plan is designed to meet the statutory goals.

Although CFL NTG ratio uncertainty contributes the most to ComEd's portfolio risk of all of the variables examined in the risk analysis, this particular risk can be mitigated, as discussed in the next section. Under any reasonable set of circumstances, ComEd must be able to realize substantial energy savings from the CFLs incented through its programs if it is to achieve

[6] @RISK uses multivariate stepwise regression in the sensitivity analysis to test the statistical significance of each input variable on the output variable. The uncertainties shown in the table are listed in descending order of statistical significance, and the R-squared value indicates the degree to which the, inputs (uncertainties) in the model explain the output variable (kWh savings). A regression coefficient of zero indicates that there is no significant relationship between the input and the output, while a coefficient of one or minus one indicates a one or minus one standard deviation change in the output for a one standard deviation change in the input. An R-squared of one would indicate that the inputs, fully explain the output variable. The R-squared value for this analysis, 0.86, indicates that inputs in the model explain a large majority of the variance in kWh savings.

[7] CFLs have accounted for 80 percent of verified gross kWh savings for the Focus on Energy portfolio in Wisconsin.

its savings goals, as there are no other measures that can reach significant market share so rapidly and inexpensively.

Table 3. Sensitivity Analysis Results

Rank For Risk Input	Uncertainty: Program, Measure	Subsector	kWh Risk Output Regression coefficient
#1	NTG: C&I Prescriptive, 36 Watt Integral CFL	Retail - Small	0.36
#2	NTG: C&I Prescriptive, 23 Watt Integral CFL	All Residential	0.26
#3	NTG: Residential Lighting, 13 Watt Integral CFL	Retail - Small	0.25
#4	INSTALLATIONS: Residential Lighting, 13 Watt Integral CFL	All Residential	0.25
#5	INSTALLATIONS: C&I Prescriptive, 36 Watt Integral CFL	Retail - Small	0.24
#6	NTG: Residential Lighting, 25 Watt Integral CFL	All Residential	0.22
#7	INSTALLATIONS: Residential Lighting, 25 Watt Integral CFL	All Residential	0.21
#8	kWh: Appliance Recycling Program, Refrigerator Recycling	Education	0.21
#9	NTG: DCEO Public Sector Prescriptive, Occ-Sensor - Wall box	Retail - Small	0.20
#10	NTG: C&I Prescriptive, 18 Watt Integral CFL	Assembly	0.19
#11	NTG: Residential Lighting, 13 Watt Integral CFL	All Residential	0.16
#12	INSTALLATIONS: C&I Prescriptive, 23 Watt Integral CFL	Retail - Small	0.16
#13	NTG: DCEO Public Sector Prescriptive, Occ-Sensor - Wall box	All Residential	0.15
#14	INSTALLATIONS: DCEO Public Sector Prescriptive, Occ-Sensor - Wall box	All Residential	0.15
#15	INSTALLATIONS: Residential Lighting, 18 Watt Integral CFL	Assembly	0.14
#16	kWh: Residential Lighting, 13 Watt Integral CFL	All Residential	0.13
#17	INSTALLATIONS: DCEO Public Sector Prescriptive, Occ-Sensor - Wall box	Single Family, Detached	0.13
#18	NTG: Residential Lighting, 18 Watt Integral CFL	All Residential	0.13
#19	INSTALLATIONS: DCEO Public Sector Prescriptive, 25 Watt Integral CFL	Assembly	0.12
#20	INSTALLATIONS: Residential Lighting, 13 Watt Integral CFL	All Residential	0.12
#21	NTG: C&I Prescriptive, 36 Watt Integral CFL	Single Family, Detached	0.11
#22	INSTALLATIONS: Appliance Recycling Program, Refrigerator Recycling	Retail - Small	0.11
#23	kWh: Residential Lighting, 25 Watt Integral CFL	Education	0.10
#24	kWh: Residential Lighting, 18 Watt Integral CFL	Assembly	0.10
#25	NTG: DCEO Public Sector Prescriptive, 25 Watt Integral CFL	Food Service	0.09
#26	kWh: Residential Lighting, 13 Watt Integral CFL	Retail - Small	0.09
		R-Squared	0.86

Managing Risk Going Forward

ComEd has three options for managing risk. The first is to ensure that programs that include CFLs are appropriately designed to reduce the likelihood of free-ridership. ComEd has done this by emphasizing designs that require participants to pay some fraction of the cost of the bulbs or take some affirmative action to receive the bulbs. Second, ComEd can plan to move a greater number of CFLs through its program than it otherwise would, such that the net savings from the CFLs (after accounting for the NTG ratio) are sufficient to enable ComEd to meet its targets. ComEd has done this, although the number of CFLs envisioned by the Plan remains well within the range of what other utilities have accomplished. Finally, ComEd can accelerate (as much as is prudent) the introduction of other programs and measures that are not as susceptible to the NTG ratio uncertainty. ComEd has done this by planning to accelerate the level of activity under its proposed Custom Incentive program element. In addition to these three options, assurance that the independent evaluator will calculate the NTG ratio as defined above, that is, including both free-ridership and spillover, substantially reduces risk since those two factors tend to offset one another.

Deemed Savings and Risk

Although there are a number of tools ComEd can use to manage performance risk, evaluation risk remains not only large, but is largely unmanageable for the Company. Applying deemed savings values to unit energy savings and NTGR, where there is sufficient evidence to deem, on a prospective (ex ante), rather than retroactive (ex post) basis is a reasonable policy decision state energy regulatory bodies take that reduces uncertainty around evaluations. Prospective application of deemed savings allows better information to be factored into the program planning process, but does not retroactively penalize parties for the conclusions of an evaluator; conclusions that could not be anticipated. In California, DEER is used by IOUs for prospective application of deemed savings and NTGR. As evaluations produce more precise NTGR and metering studies, etc. result in better energy savings estimates, DEER is updated and IOUs use this new information in their program planning, reducing uncertainty around evaluations (because the deemed values are agreed upon by all stakeholders). This is win-win situation for utilities, shareholders and rate-payers.

The Company recommended to the Illinois Commerce Commission that certain measure savings values and NTGR be deemed. This was important for hedging ComEd's portfolio risk for a couple reasons, in addition to the rationale discussed above. First, Section 12-103(f) of the Illinois Public Utilities Act limits the budget that can be allocated to evaluation of utilities' energy efficiency and demand response measures to three percent of portfolio resources. This budget is very small by current standards in the industry, and is in fact one of the lowest allocations in the country; 5 percent is a more typical level. At the high end, the California utilities that will constitute ComEd's peer group will be spending closer to eight percent of their total budgets on evaluations of 2006-2008 programs. This low allocation effectively would mean that an evaluator will not be able to conduct the level of analysis required to independently determine the savings values for the over 1,000 measures included in the ComEd programs as well as calculate NTG ratios for all programs including both free-rider and spillover effects using ComEd program data. Under such a scenario, ex ante application of deemed savings and NTGRs does little to reduce evaluation risk because the deemed values are not robust enough to sufficiently reduce the uncertainty during planning.

(As a post-note, the Illinois Commerce Commission accepted the Company's arguments for deeming savings of key non-weather sensitive measures, including CFLs and T8s. NTGR were not deemed on a prospective basis.)

Conclusion

In the end, the *process* of conducting the risk analysis served as rich a purpose as the quantitative results. That is, carefully thinking though the key uncertainties in the portfolio forced ICF and ComEd to re-evaluate program design and savings allocations and imbed realistic risk mitigation strategies into the Plan. It allowed ComEd to recognize which risks it controls and those it doesn't. In the short-run this sharpened ComEd's presentation of its Plan before the Commission; in the long-run it will save time and money by focusing program administrators' attention on uncertainties they are in positions to reduce. It can also flag the key program performance indicators to for managers to watch in order to determine when or if a reallocation of measures and resources might be required.

Finally, there's always room for improvement. The next time ComEd (of ICF) performs a risk assessment of its portfolio, other variables it should strive not to omit from the analysis should include, at a minimum, measure incentive cost uncertainty and program process uncertainty. The possible impacts of forthcoming federal carbon regulations on energy efficiency program cost effectiveness are also worth including in such an assessment.

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