BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Commission Review of Numeric Conservation Goals Florida Power & Light Company	)	DOCKET NO. 080407-EG
In re: Commission Review of Numeric Conservation Goals Progress Energy, Florida, Inc.	)	DOCKET NO. 080408-EG
In re: Commission Review of Numeric Conservation Goals Tampa Electric Company	)	DOCKET NO. 080409-EG
In re: Commission Review of Numeric Conservation Goals Gulf Power Company	)	DOCKET NO. 080410-EG
In re: Commission Review of Numeric Conservation Goals Florida Public Utilities Company	)	DOCKET NO. 080411-EG
In re: Commission Review of Numeric Conservation Goals Orlando Utilities Commission	)	DOCKET NO. 080412-EG
In re: Commission Review of Numeric Conservation Goals Jacksonville Electric Authority	)	DOCKET NO. 080413-EG

DIRECT TESTIMONY & EXHIBIT OF:

PHILIP H. MOSENTHAL

I. IDENTIFICATION AND QUALIFICATIONS

Q. State your name and business address.

A. Philip H. Mosenthal, 14 School Street, Bristol, VT 05443.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of the Natural Resources Defense Council (NRDC) and the Southern Alliance for Clean Energy (SACE).

Q. Mr. Mosenthal, by whom are you employed and in what capacity?

A. I am a partner in Optimal Energy, Inc., a consultancy specializing in energy efficiency and utility planning.

Q. **Summarize your qualifications.**

A. I have over 25 years of experience in all aspects of energy efficiency, including facility energy management, policy development and research, integrated resource planning, cost-benefit analysis, efficiency potential studies, and efficiency and renewable program design, implementation and evaluation. I have developed numerous utility efficiency plans, and designed and evaluated utility and non-utility residential, commercial and industrial energy efficiency programs throughout North America, in Europe, and in China.

I have also completed or led numerous studies of efficiency potential and economics, including ones in China, Maine, Massachusetts, Michigan, New England, New Jersey, New York, Quebec, Texas, and Vermont. Most recently, I led the analysis of electric and natural gas efficiency and renewable electric potential and development of suggested programs for New York State, on behalf of the New York State Energy Research and Development Authority (NYSERDA) and the NY Department of Public Service, as well as currently working on an updated electric efficiency potential study for New York State. I have also recently contributed to electric efficiency potential and program planning studies for the Long Island Power Authority, New York Power Authority, and Orange & Rockland Utilities.

In 2007, I was the lead author of the US EPA's "Guide for Conducting Energy Efficiency Potential Studies" for its National Action Plan on Energy Efficiency (NAPEE).[1] I also led development of the curriculum, and have conducted trainings for industry professionals on conducting potential studies and cost-effectiveness analysis, as well as program planning, design, and implementation, for the Association of Energy Service Professionals, and have spoken widely on these subjects.

Optimal Energy also has developed, largely under my direction, a comprehensive suite of cost-effectiveness analysis and program planning software widely used in the industry. Our portfolio and project screening tools, which calculate all the major cost-effectiveness tests, are currently used for portfolio planning and program implementation in virtually every state in the Northeast and elsewhere. It has been translated into a Chinese version currently used in two Chinese provinces. These tools perform state of the art cost-effectiveness screening, and include many aspects often ignored by other analysts. These include important non-energy and market transformation benefits, and timing effects that if not included will tend to significantly undervalue the cost-effectiveness of retrofit (early retirement) measures.

[1] U.S. EPA, November 2007.

Beginning in 1998 I led development of commercial and industrial programs for the Long Island Power Authority. I continue to advise LIPA on program design, planning and implementation issues, and have recently been involved in assessment of the achievable electric potential from a portfolio of ramped up electric and gas efficiency programs on Long Island to meet New York States' goal of 15% electric efficiency savings by 2015.

I was the chief architect of the nation's first and only "energy efficiency utility" (EEU) in Vermont in the late 1990's, and led the development of the EEU, including all planning, program design and analysis, and testimony. I am currently an advisor for business energy services at Efficiency Vermont (EVT), which operates as the EEU.

I also currently lead a team representing the Massachusetts Energy Efficiency Advisory Council, which oversees and advises on all electric and gas efficiency efforts in the Commonwealth. In this role, I work closely with the utility electric and gas program administrators throughout the state. We are currently in the process of integrating existing electric and gas programs into a single portfolio, to ramp up to all available cost-effective efficiency levels in the range of 2-3% of incremental savings per year.[2]

Prior to co-founding Optimal Energy in 1996, I was the Chief Consultant for the Mid-Atlantic Region for XENERGY, INC. (now KEMA). I have a *B.A.* in Architecture and an *M.S.* in Energy Management and Policy, both from the University of Pennsylvania.

Q. Have you previously testified before the Florida Public Service Commission? ("the Commission" or "PSC")?

A. No.

II. INTRODUCTION AND SUMMARY

Q. What is the purpose of your testimony in this proceeding?

A. My testimony addresses three primary issues: (1) the consistency of the FEECA utilities' achievable potential analyses and proposed goals with the Florida Energy Efficiency and Conservation Act as revised in the 2008 Energy Act (the FEECA Statute); (2) the appropriateness and accuracy of the FEECA utilities' achievable potential analyses, and consistency with standard and accepted DSM industry practice; and (3) appropriate goals that the PSC should consider. I also discuss briefly Florida's record of DSM achievement compared to other jurisdictions, which is more fully addressed in SACE/NRDC Witness Wilson's testimony.

Q. Summarize your testimony.

A. My testimony shows that the FEECA utilities directed their consultants to use assumptions and methods for estimating the achievable potential of DSM resources that are neither consistent with the FEECA statute nor good DSM industry standards and practices. The result of the achievable potential analysis on its face is simply not a credible estimate of the maximum amount of DSM resources that could be captured cost-effectively in Florida. Indeed, it is more than

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[2] Expected goals a still being negotiated. However, assessments indicate levels of 3%/yr incremental savings as a percent of load are achievable for electric and 2%/yr for gas.

an order of magnitude lower than many states are already capturing, and roughly two orders of magnitude lower than has been achieved in targeted geographic areas.

The flaws in this analysis include, but are not limited to: unreasonable assumptions and criteria that screen out virtually all achievable DSM potential; a flawed understanding of the principals of integrated resource planning and the language of the FEECA statute; unreasonably low assumed penetration rates; inaccurate analysis of cost-effectiveness; and the lack of consideration of new and enhanced innovative program strategies in Florida that could result in much higher penetration of cost-effective efficiency and demand resources than is currently occurring in Florida.

I will also suggest goals for the Commission to consider, in the absence of any more thorough and appropriate analysis.

My testimony covers the following issues, identified by Commission staff:

ISSUE 1: Did the Company provide an adequate assessment of the full technical potential of all available demand-side and supply-side conservation and efficiency measures, including demand-side renewable energy systems, pursuant to Section 366.82(3), F.S.?

ISSUE 2: Did the Company provide an adequate assessment of the achievable potential of all available demand-side and supply-side conservation and efficiency measures, including demand-side renewable energy systems?

ISSUE 3: Do the Company's proposed goals adequately reflect the costs and benefits to customers participating in the measure, pursuant to Section 366.82(3)(a), F.S?

ISSUE 4: Do the Company's proposed goals adequately reflect the costs and benefits to the general body of ratepayers as a whole, including utility incentives and participant contributions, pursuant to Section 366.82(3)(b), F.S.?

ISSUE 7: What cost-effectiveness test or tests should the Commission use to set goals, pursuant to Section 366.82, F.S.?

ISSUE 8: What residential summer and winter megawatt (MW) and annual Gigawatt-hour (GWh) goals should be established for the period 2010-2019?

ISSUE 9: What commercial/industrial summer and winter megawatt (MW) and annual Gigawatt hour (GWh) goals should be established for the period 2010-2019?

III. TECHNICAL & ACHIEVABLE POTENTIAL ANALYSES (Issues 1, 2, 3, 4 & 7)

Q. Have you examined the achievable potential analyses done by the FEECA utilities and Itron/KEMA?

A. To some extent. Unfortunately, due to the schedule for this testimony, the lack of detailed information provided in the utilities' and Itron Witness Rufo's testimony, the receipt of discovery responses, along with the utilities' unwillingness to provide an electronic version of the DSM ASSYST model used in the analysis except for viewing in Tallahassee, I have not been able to access the DSM ASSYST model, nor all the detailed inputs or outputs of the model. As a result, while I have had access to some data, and have reviewed the testimony describing conceptually how the analysis was done, I have not been able to perform a fully comprehensive analysis. Further, while I believe all my comments apply to all the FEECA utilities, I have most thoroughly scrutinized the analysis as it was done for FPL. Where applicable, I use FPL numbers as examples, however, my testimony should be considered as applying to all the FEECA utilities where not otherwise noted.

Q. What are your primary concerns with the achievable potential analysis?

A. I believe the analysis dramatically understates the achievable potential for the following reasons:

1. The analysis begins with a low estimate of technical potential that does not address all possible opportunities.
2. The analysis inappropriately removes a large portion of the technical potential by simply considering any measure that offers a customer payback of less than 2 years not an appropriate or eligible DSM resource, in violation of the FEECA Statute.
3. The analysis inappropriately removes an additional large portion of potential from any measures that do not pass the participant test absent any utility incentives or federal tax credits.
4. The analysis inappropriately relies on the ratepayer impact measure (RIM) test, rather than the total resource cost (TRC) test, as required under the FEECA Statute.
5. The analysis inappropriately includes (at least for some if not all FEECA utilities) program administrative costs when screening individual measures, rather than programs.
6. The analysis inappropriately bundles measures together for screening out measures, but then unbundles them again.

7. The analysis uses a flawed model of achievable penetration that effectively constrains the achievable potential to no more than Florida is currently capturing.
8. The analysis inappropriately assumes that DSM programs can not be designed to better overcome barriers associated with awareness and information that currently preclude greater adoption of efficiency opportunities.
9. The analysis fails to consider the design of new and more innovative and aggressive approaches to capturing DSM potential than the currently limited Florida offerings.
10. The analysis results in estimates that range from 0% to 0.7% cumulative maximum achievable potential over ten years, which quite simply defies logic and the vast amount of DSM experience over several decades throughout North America.

Q. Why do you think the technical potential analysis provides a low starting point for the achievable potential analysis?

A. Technical potential is somewhat of an academic construct to begin with, and in my opinion not a very useful exercise to undertake. As Witness Rufo states, "technical potential is defined in this study as the complete penetration of all measures analyzed in applications where they were deemed technically feasible from an engineering perspective."[3]

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[3] Rufo direct testimony, p. 12, ll. 4-6.

Consider, for example, that we know how to build *net zero* electricity buildings.[4] While in many cases these are not cost-effective, from a technical standpoint, this can be done. So, in theory, technical potential is by definition 100% of the electricity used in residential and commercial buildings. In such a scenario, the remaining demand would consist of industrial process load, but even this demand can often be offset by combined heat and power or other distributed generation strategies, in combination with efficiency improvements. In actuality, technical potential studies are generally very similar to economic potential studies. This is because analysts do not bother to include a lot of measures that they know will not pass cost-effectiveness screening. As a result, the majority of technical potential is typically also included in economic potential.

Regardless, I believe the technical potential study performed by Itron is a reasonable first cut of potential, but on the conservative *(i.e.*, low) side. First, it ignores technology advancement or future price reductions for efficiency opportunities by 2019.[5] For example, LED lighting is fast becoming cost-effective and significantly more efficient than current lighting technologies, as well as offering many non-energy benefits. Many experts predict that LEDs will offer very large and cost-effective savings opportunities within just a few years. Secondly, the

[4] Net zero buildings refer to buildings which, through a combination of efficiency and distributed generation (either renewable or combined heat and power), result in a zero net load on the utility system.

[5] "The scope of measures proposed for consideration in the study was limited to measures that are currently available in the Florida market for which independently-verified cost and savings data are available. In this sense, non-commercialized 'emerging' technologies were specifically excluded from the study." Itron/KEMA, *Technical Potential for Electric Energy and Peak Demand Savings in Florida*, March 12, 2009, p. 3-27.

measures list, while large, does not fully include all potential opportunities, nor fully incorporate important synergies between measures and systems that can result in very deep and cost-effective savings.[6]

Building commissioning and retrocommissioning are just two examples of important measures that were not included, despite specific requests by collaborative parties to include them, as NRDC/SACE Wilson explains. Commissioning refers to a process of independently reviewing design specifications and actual equipment and systems installations and controls to ensure that all systems are performing as designed, and adjusting as appropriate to optimize the real world efficiency in new buildings or systems.

Retrocommissioning refers to a process of performing a similar assessment on existing buildings to adjust operating procedures, control settings, etc. In most buildings even efficient equipment often underperforms because of the many adjustments and modifications made over the years by often untrained maintenance personnel. This low cost process, which relies mostly on behavioral changes and adjustments rather than capital improvements, has been shown to be highly cost-effective. A major study found average (median) savings of *total building energy use* for this single measure of 15%, with a typical customer payback of 0.7 yrs.[7]

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[6] The Itron study does take into account interactions between measures, but in an asymmetric way. They only reduce each measure savings based on prior savings. However, they ignore the important synergies that can allow for deeper and more cost-effective savings by considering whole buildings as systems. For example, well designed buildings can often result in dramatically downsizing major system components (e.g., by reducing cooling loads), resulting in deeper savings and lower incremental costs.

[7] Mills, Evan et al., *The Cost-Effectiveness Of Commercial-Buildings Commissioning: A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States,* Lawrence Berkeley National Laboratory, 2004, p. 1.

Just these two single measures can offer substantial cost-effective savings opportunities in the commercial and industrial sectors. SACE/NRDC witness Wilson discusses this in more detail.

Finally, there are many general reasons that technical potential estimates tend to be conservative. For example, it is impossible to accurately account for every possible opportunity in every market segment. As a result, for reasonable resource and other reasons, any analysis is somewhat constrained in its comprehensiveness. For example, the Itron analysis chose to not analyze any opportunities from the agricultural sector, despite some successful agriculture programs in California and elsewhere. I note also the exclusion of consideration of agriculture sector efficiency opportunities is in contradiction with the statute, which states: "It is the policy of the State of Florida to consider in its decisions the energy needs of each economic sector, including residential, industrial, commercial, **agricultural,** and government uses, and reduce those needs whenever possible." (Section 377.601 (2)(g)).

Similarly, they omitted wastewater treatment facilities and outside lighting, where many programs have found large and cost-effective opportunities. Any time that a particular market segment or opportunity is excluded, the default is to assume zero potential. Obviously, we know there is potential in these markets, but the default assumption is zero rather than some non-zero estimate such as the average of other proportional opportunities. This method, while understandable, virtually guarantees that any analysis will understate the true opportunities.

Q. Please explain how the two year customer payback rule was applied to the achievable potential analysis.

A. As described by witness Rufo, "measures that demonstrated simple payback periods of less than two years with no incentive applications were excluded from the RIM and TRC 'portfolios' and screened from the achievable potential analyses."[8]

Q. What was the FEECA utilities' logic for doing this?

A. Witness Haney explains "the assumption underlying the two-year payback criterion is that a reasonable customer will adopt DSM if the DSM measure provides them a payback on incremental costs in terms of lower utility bills or bill savings within two year or less of the adoption of the measure."[9] He goes on to state that:

> "FPL's customers should only have to pay customer incentives necessary to encourage additional customer adoption of DSM measures. When a customer has a sufficient incentive to implement a DSM measure – a cost-effective incentive that results in a two-year payback – the remaining FPL customers should not have to pay a higher incentive. A two-year payback is a sufficient economic incentive for a customer to implement DSM. Paying a higher incentive to encourage a customer to do what the customer already has a sufficient incentive to do does not make economic sense for FPL's general body of customers."[10]

Q. Do you agree with Mr. Haney's logic?

A. No. Mr. Haney's first statement is both illogical and circular for a number of reasons. First, the technical potential analysis begins with the base case forecast

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[8] Rufo test., p. 20, ll. 4-6.

[9] Haney direct testimony, p. 23, ll. 1-5

of future load, which already effectively includes the level of efficiency that is expected to naturally occur without DSM efforts, as well as the efficiency FEECA utilities have assumed will come from pending federal efficiency standards.[11] It also specifically accounts for estimated base case adoption of naturally occurring efficiency. As a result, all the efficiency potential identified that offers customers a payback of less than two years is, *by definition, efficiency opportunities that customers have not and are not expected to adopt on their own.* While Mr. Haney may believe the two year payback alone should be sufficient inducement, the analysis has explicitly estimated the *remaining potential over and above naturally occurring efficiency that exists.*

This is supported by Witness Rufo's testimony. Exhibit MR-11 shows the numerous and well documented market barriers that prevent economically rational efficiency from being adopted. There is a large body of literature on these barriers and they are in fact the fundamental basis behind DSM in the first place. Essentially, the purpose of DSM is to intervene in the market to overcome these barriers that otherwise prevent highly economic efficiency opportunities from being adopted within the current marketplace.

Q. Does witness Rufo discuss this issue?

A. Yes. Rufo confirms this: "The implicit premise of efficiency programs is that it is the existence of these barriers that necessitates program interventions to increase adoption of energy efficiency measures."[12]

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[10] Haney direct test., p. 23, ll. 8-17

[11] Sims direct test., p. 23, ll. 16-19

[12] Exhibit MR – 11, p. 5

Rufo goes on to:

> "note that for the moderate, high and extremely high barrier curves, the participant benefit-cost ratios have to be **very high** before significant adoption occurs. This is because the referential participant benefit-cost ratios are calculated using a 15-percent discount rate. A consumer discount rate of roughly this level reflects likely adoption **if there were no market barriers or market failures**, as reflected in the no-barriers curve in the figure (*i.e.,* under the no barriers curve roughly half the market adopts with a part B-C ratio of 1.0 using the 15% discount rate). Real-world program and market experience shows, however, that actual adoption behavior does not follow the no barrier curve **for the vast majority** of measures. Instead, most measure adoption levels observed in real markets and programs correlate with implicit discount rates several times those that would be expected in a perfect market (*i.e.,* a market without barrier to the adoption of efficiency measures)."[13] [emphasis added]

Rufo goes on to explain in a footnote to the above paragraph:

> "For comparison purposes, a long-lived measure of 15 years and a 15-percent discount rate, the equivalent payback **at which half of the market would adopt a measure is roughly 6 months,** based on the low [sic — I believe it should read "high"] barrier curve in the exhibit (or roughly 2 years based on the low barrier curve). **At a 1-year payback, one-quarter of the market would adopt** the measure on the high barrier curve. The curves reflect the real-world

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[13] Exhibit MR – 11, p. 5

observation that **implicit discount rates can be well over 100%.**"[14] [emphasis added]

Q. What do you conclude from witness Rufo's above statements?

A. Witness Rufo's statements are quite clear. Even for measures with paybacks as short as 6 months, there may still remain fully half of the potential that will not be captured absent DSM programs. With a 1-year payback, fully three-quarters of all the opportunities will be left on the table if DSM does not promote them. It is also important to note that the technical potential only includes the remaining portion not naturally adopted by these measures. This means that 100% of the estimated technical potential associated with measures that payback in less than 2 years will not be captured in Florida absent some DSM intervention.

Q. Do you have other comments on witness Haney's rationale?

A. Yes. Witness Haney seems to assume that the only effective or important DSM program strategy is rebates to customers. He further makes an ideological judgment that it is unfair for ratepayers to support DSM that he believes economically rational customers should do on their own.

On the contrary, some of the most important and effective DSM strategies are the non-financial ones. These include things like educating customers about their efficiency opportunities, performing technical analyses, working with and training architects and engineers to ensure efficiency opportunities are effectively considered and promoted, training builders and other trade allies, working with distributors and retailers to ensure that efficient products are stocked and promoted, coordinating and facilitating procurement and installation processes, and many

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[14] Exhibit MR – 11, p. 5, footnote 5.

other services specifically designed to overcome important market barriers. The most effective programs include combinations of many of these strategies, often along with financial incentives that can include cash rebates but also can use market-rate financing, to increase customer adoption. As a result, it may well be that many of these measures can be captured cost-effectively by FEECA utilities with little or no cash rebates, and while minimizing free ridership – which I discuss below – thereby alleviating Haney's concerns. Even if rebates are deemed necessary, the FEECA utilities' approach has the ironic result of leaving on the table the most cost-effective and beneficial efficiency opportunities that should be a high priority for any DSM portfolio to capture.

Q. Is the utilities' practice and Mr. Haney's perspective regarding the elimination of all measures with less than a 2 year payback consistent with the FEECA Statute?

A. No. I do not see any language in the FEECA statute that directs the Commission to exclude the most cost-effective measures from the participant cost test perspective from the goals established for the utilities. Rather, the plain language of the FEECA statute suggests that the FEECA utilities are to be directed to capture all available cost-effective energy efficiency potential. Section 366.81 indicates "the Legislature finds and declares that it is critical to utilize the **most efficient and cost-effective** demand-side renewable energy systems and conservation systems" [emphasis added]. I fail to see how ignoring the most cost-effective opportunities available over and above those naturally occurring can be consistent with that language.

Q. Do you agree with Mr. Haney's belief that it is unfair for ratepayers as a whole to subsidize programs that promote efficiency measures that customers should do on their own?

A. No. The issue of cross subsidies in general is discussed by NRDC/SACE Witnesses Cavanaugh and Steinhurst. However, for purposes of the 2-year payback issue this logic makes no sense. The legislature has made clear that they find it appropriate and important for the general body of ratepayers as a whole to contribute to funding a portfolio of programs to capture cost-effective efficiency opportunities, and directed the Commission to set goals. Given this, there is no logical reason to cause those ratepayers to only invest in the *least* cost-effective opportunities, while ignoring those opportunities that offer all ratepayers the biggest cost savings at the lowest investment and lowest long term energy costs. Through good program design, large and cost-effective savings net of free riders can be captured from these measures.

Q. Does your argument that measures with payback in less than two years should be included in the analyses mean that you disagree with FEECA utilities' incentive approach of not buying measures down to less than a 2 year payback?

A. No. They are two completely separate issues. As I mentioned above, good DSM programs must rely on a multitude of strategies and services, specifically designed to overcome the specific barriers in the markets they are targeting. In some cases, this incentive design may be appropriate. In others it may not.

One of the fundamental problems with the achievable potential study method is that it fails to acknowledge potential best practices program designs.

Rather, it simply uses a one size fits all incentive methodology and penetration model for every measure. For example, capping incentives at a 2 year payback may be entirely appropriate – and in fact probably more generous than necessary on average – as a strategy for promoting commercial or residential new construction measure packages. On the other hand, it will certainly not result in deep penetration among low income customers, or those customers with split incentives.[15]

I would encourage the Commission to note that best practice programs are not limited to a customer incentive model, as assumed in the DSM ASSYST model. Other approaches that are widely used include upstream incentives (to the manufacturer or distributor), aggressive marketing and education, and financing mechanisms. These strategies are widely used as a means of reducing program cost and increasing market penetration. The core equation utilized in the DSM ASSYST model is inherently incompatible with modeling such program designs.

Also, in practice, even if the FEECA utilities were to impose this program design rule in all cases, it is highly likely that much of the savings captured would be from individual measures with paybacks of less than 2 years. If a program is successful at addressing customer opportunities comprehensively, typically customers will adopt a combination of measures, some very cost-effective and some not so. The net result may be a combined payback of 4 or 5 years, which the utility may then buy down to a level sufficient to encourage the customer to move

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[15] Split incentives refer to situations where the party making capital investment decisions is not the same as the party receiving the benefit from those investments. The classic example is when a landlord installs equipment in a tenant-metered building, and therefore gets no energy savings benefit from additional investment except perhaps some intangible marketing and tenant retention benefits.

forward with the full package of measures. Because of this, the programs delivered may well benefit greatly from this potential that the FEECA utilities have simply wiped away as non-existent by fiat. Therefore, any goals the Commission establishes should be based on a full accounting of all achievable potential.

Q. The FEECA utilities argue that limiting incentives to no more than a buy down to a 2 year payback is designed to minimize free riders. Isn't that a good thing?

A. Designing programs to minimize free riders is certainly a good practice, so long as efforts to do it do not undermine the overall capture of cost-effective savings net of free riders. The focus of any programs should be on maximizing the net benefits to the general body of ratepayers as a whole. The level of free riders can certainly influence that, although in some cases achieving that goal may require accepting a certain level of free ridership.

The FEECA utilities, however, fundamentally misunderstand the issue of free ridership. They claim that paying higher incentives would result in an increase in free riders.[16] However, *the exact opposite occurs.* All else equal, the *lower* incentives are in a program, the *higher* the free ridership.

Free riders are those customers that, while participating in a DSM program, would have installed the efficiency measure (or some portion of it) anyway. Thus, they can consume program resources – including receiving an incentive – while not providing any net savings to the electric system. As a result, when incentives are relatively low, they have the effect of not being able to induce as many people that

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[16] See, for example, Haney direct testimony p. 22, ll. 13-15, and Sims direct testimony p. 38, ll. 5-6.

wouldn't otherwise do so to adopt an efficiency measure. However, by definition, all the free riders will still adopt the measure because they would have adopted it even with no incentive. Therefore, with low incentives free ridership (as a percentage of overall program gross savings, which is what matters) tends to be very high, because those customers that wouldn't be free riders have not been induced in large number to participate. Effectively, all you are left with is the free riders. This can result in not only very little net savings, but programs that are not cost-effective.

If, on the other hand, incentives are much more generous and result in inducing large numbers of people to adopt efficiency that otherwise wouldn't have, the result is lower free ridership. While some free riders may collect these higher incentives too, the overall effect is much more cost-effective programs and greater net savings and net benefits to the Florida economy. This fundamental and stunning misunderstanding of basic program design concepts seems to permeate the FEECA utilities' testimony and basic approach to DSM.

Q. What other approaches should the utilities use to ensure that ratepayers are not paying high free ridership costs?

A. Designing programs to minimize free riders is certainly a good practice, and program design should be targeted in recognition that different barriers exist for different measures and markets. As a result, free ridership can be minimized in many ways through good program design and delivery. This includes everything from how programs are marketed and to whom, what services they offer, what measures and efficiency criteria they promote, to the specific implementation techniques used.

In fact, it appears to me that the Florida legislature has correctly anticipated the need to address these concerns at the program level rather than at the goal-setting level. The 2008 revisions to the FEECA statute indicate, "Following adoption of goals . . . In approving plans and programs for cost recovery, the commission shall have the flexibility to modify or deny plans or programs that would have an undue impact on the costs passed on to customers." (366.82(7)). It would appear to me that the Commission would correctly consider modifying or denying a program design that entailed an unacceptably high free ridership cost.

Q. Isn't customer payback the most relevant issue when considering potential free ridership?

A. No. Each measure has unique market barriers, different non-energy benefits, and different levels of awareness, understanding and overall attractiveness to customers. Retrocommissioning is a perfect example of how free ridership concerns are not correlated primarily with short payback periods. Retrocommissioning typically offers customers significant savings at very low cost, often with paybacks of one year or less, as mentioned above. However, because it is behavioral in nature, and hard to understand and monitor, it has not yet been widely adopted in building management budgets. Therefore a successful program to promote retrocommissioning would likely have very low free ridership.

On the other hand, a measure like a high efficiency chiller often has a relatively long payback, but yet will often have a relatively high level of natural adoption. This is because chillers are single pieces of equipment with readily understandable efficiency ratings, are very expensive, last a very long time, and are installed by large, sophisticated customers. Typically these customers will perform an engineering analysis, supported by vendors or independent engineers, and make more sophisticated decisions before investing in a chiller that may cost half a million dollars or more.

These examples illustrate how a simplistic focus on customer payback, absent other issues, is a poor way to predict or influence free ridership. As explained more fully below, this is also a fundamental flaw in the achievable penetration – or "market adoption" – model relied on by Itron that assumes all penetration rates are primarily a function of customer economics.

Q. Do other DSM programs outside of Florida typically promote measures that offer less than a 2 year payback?

A. Yes. In fact, perhaps the bulk of savings in many programs come from these measures. An example is compact fluorescent lightbulbs (CFLs). These products offer very quick paybacks (often less than 6 months), but still after being available for over a quarter century, have relatively low penetration and awareness among the general population.[17] This shows clearly the effect of market barriers, as even in the early 1980's CFLs were highly cost-effective for most customers, often paying for themselves simply with avoided incandescent bulb replacement costs due to the long life of the CFLs, even when ignoring the substantial energy savings.

This may change in the relatively near future because of federal standards that will likely spur the adoption of CFLs starting around 2012.[18] However, even

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[17] Current estimated penetration nationally is only around 10%, http://www.nytimes.com/2009/07/06/business/energy-environment/06bulbs.html?pagewanted=2&_r=2&hp.

[18] The 2007 EISA standards are performance-based lighting standards that phase in from 2012-2014. However, it remains to be seen exactly what effect the standards will have on a shift from incandescent to

assuming that will happen they offer significant short-term resource acquisition opportunities, and virtually all leading DSM portfolios currently promote them.

It is worth noting that in reviewing FPL's achievable potential analysis for the commercial sector, the only indoor lighting measure to have been included based on FPL's screening criteria is LED exit signs.[19] This is contrary to the best DSM practices throughout North America, where indoor lighting has typically accounted for the largest share of commercial DSM portfolio savings, and also typically is estimated to have the largest share of cost-effective achievable potential of any commercial end use. Given the additional cooling benefits from improved lighting efficiency because of reduced waste heat, these opportunities may be particularly important in Florida.

It is further ironic that many programs have long since discontinued promotion of LED exit signs except for retrofit kits, because they are widely considered to be baseline practices now for new exit sign installations, and often required by building codes.[20] Thus, if the Commission were to adopt the FEECA utilities' approach, ratepayers would not be able to benefit from highly cost-

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compact fluorescent lighting. Currently, standard incandescent lamps do not meet the standard. However, high efficiency halogen lamps do, and recent research has developed promising new laser based technologies that can dramatically increase incandescent lamp efficiencies. See, for example, http://www.nytimes.com/2009/07/06/business/energy-environment/06bulbs.html?pagewanted=2&_r=2&hp, which indicates lighting companies have now developed a number of different incandescent technologies that will meet the standards. As a result, it is highly likely that the Itron study overestimates the savings from Federal Standards and significantly underestimates the opportunities for efficiency programs.

[19] FPL Resp to NRDC-SACE informal_discovery(prepared by Itron).xls

[20] For example, a 2000 commercial new construction baseline study done for the Long Island Power Authority estimated LED Exit sign market share at 97%. Long Island Power Authority, *LIPA Commercial and Industrial Baseline Study*, November 2001, p. 2-27.

effective investments in large amounts of commercial lighting savings, yet be forced to invest in a single, relatively expensive commercial lighting measure that would likely suffer from extremely high free ridership.

Again, CFLs and other efficient lighting measures are only one example of highly cost-effective energy efficiency measures that were inappropriately excluded by the utilities because they offered participants a payback of under two years.

Q. What is the effect of eliminating efficiency measures with less than a 2 year payback?

A. Unfortunately, I can not say with precision because the utilities did not include this information in their testimony or reports to the Collaborative, and I have been unable to review the DSM ASSYST model. However, I was able to obtain technical potential results, by measure, for FPL, which includes customer payback estimates.[21] Based on this data, more than half of all the commercial and industrial energy (GWh) technical potential is eliminated from this screen. For residential it is 26%. For the total FPL analysis, fully 34% of the starting technical potential is eliminated.

Similarly, FPL witness Sims testifies that almost half of remaining measures were eliminated from economic potential when the 2-year payback screen was applied (Exhibit SRS-4). For the RIM test, 197 of 476 measures (41%) were

[21] The files provided in response to NRDC/SACE POD 2-4 and used for this analysis are, for residential, commercial and industrial sectors, respectively, NRDCSACE POD 2-4 – Res F_Saere_Fpl.xls, NRDCSACE POD 2-4 – Comm F_Saece_Fpl.xls, and NRDCSACE POD 2-4 – Industrial Fs_Aeie.xls.

removed at this step. For the TRC test, 275 of 585 measures (47%) were removed at this step.

Effectively, the FEECA utilities have simply redefined achievable potential in a way that considers the cheapest and most cost-effective opportunities non-existent.

Q. Please explain why you think screening out measures based on the participant test is inappropriate?

A. As discussed above, the fundamental purpose of DSM is to overcome barriers to encourage customers to adopt cost-effective efficiency they otherwise would not. Obviously, it is not in a customer's interest to install efficiency measures that do not provide them with a positive economic return, nor would the Commission or utilities want to encourage that. However, if an efficiency opportunity is cost-effective when considered for the general body of ratepayers as a whole (as the FEECA statute directs), then it can be made to be in a customer's economic interest through the DSM program design. That is one of the purposes of incentives – to improve the customer economics to the point they will choose to adopt a measure.

However, the FEECA utilities have screened out measures that do not pass the participant test *without* any incentive.[22] Rather, one should include all cost-effective measures based on an all-ratepayer perspective, and then design incentives to ensure that those measures that will reduce the total costs of the electric system will indeed be attractive to participants.

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[22] This step, described as part of "Step 2" in Sims direct testimony, p. 36, precedes analysis with incentives.

Q. Doesn't the FEECA statute say that "the costs and benefits to customers participating in the measure" should be considered? Wouldn't this indicate that the participant test is a necessary screen?

A. The FEECA statute does include this criteria in Section 366.82 (3)(a). I reiterate that I am not testifying to a legal interpretation of the FEECA statute. However, based on my expertise in the field and my general reading of the statute, the context of this statement suggests to me that it concerns how the PSC should analyze the costs and benefits to participants of the portfolio of programs the FEECA utilities offer. My reading is consistent with the legislative history described by SACE witness Wilson, which appears to indicate that the utility incentive should be included in the Participant Cost Test established in the FEECA statute by the 2008 legislature. This approach makes sense as it is certainly of legitimate public interest to consider the economic costs and benefits to participants of DSM programs. I further agree that it is critical that any DSM program be designed to ensure that participants will be economically better off for having participated. This is virtually always the case. Typically, the bill impacts to participants from DSM programs are large, and highly cost-effective from the participant's perspective.

Q. Can you provide a concrete example of why it is important to only consider the participant test after incentives, at the program level?

A. Yes. Florida's history of DSM has been to focus more heavily on demand response measures rather than energy efficiency, in part driven by the past focus on the ratepayer impact measure (RIM) test. FPL offers a residential load management program to control peak impacts from residential cooling.[23] Ironically, this is an area where the benefits are to the general body of ratepayers as a whole and not to the participant. Residential customers don't generally pay demand charges based on their monthly peak demand. As a result, shutting off their air conditioner or duty cycling it during a few hours of very high system load offers virtually no financial benefit to the customer, and imposes significant costs. These costs include both the actual measure cost of installing and operating load control equipment, but also the less tangible but real costs of reduced comfort. So, this type of measure could never pass a participant test absent consideration of the program incentives simply because the participants don't realize any significant bill savings. The whole concept of this program is to provide a financial incentive to residential customers to make it worth their while to participate, so that the general body of ratepayers as a whole can benefit. Once that is done, the participants of course benefit too because of the utility incentives.

Q. What is the effect of screening out measures that do not pass the participant test without any incentives?

A. As with the customer payback, I can not say with certainty the full effect on the achievable potential. However, based on FPL's technical potential analysis data, the participant test alone (not in combination with any other tests) eliminates fully 45% of the technical potential. In combination with the customer payback screening criteria, the net effect on FPL's technical potential of requiring measures to pass both of these screens is the elimination of a whopping 79% of all the energy

[23] Exhibit JRH-4, p. 1.

efficiency savings opportunities.[24] In other words, these two inappropriate screens by themselves simply wipe away *four-fifths of all the technical potential* before even considering the normal cost-effectiveness tests or achievable participation rates.

Q. Why do you think it was inappropriate for the achievable potential analyses to rely on the RIM test rather than the TRC test?

A. I recognize that DSM regulatory policy in Florida has been to rely on the RIM test as its primary screening criteria for over a decade. FPL witness Dean discusses this in great detail, and includes the Commission Order No. 94-1313-FOF-EG that establishes this as his first exhibit.[25] However, there are a number of reasons I believe this Order needs to be revisited given a number of changes in Florida. SACE/NRDC witnesses Cavanaugh, Wilson and Steinhurst also address this issue in depth. I have read and agree with their testimony, and will not address this issue as a legal expert, nor in great detail. However, as a nationally respected leader in the field of DSM cost-effectiveness and as a practitioner of DSM cost-effectiveness analysis, I offer some further comments.

First, and most fundamentally, Florida has passed legislation since the Commission last considered this issue. The FEECA statute states (Section 366.82 (3) that the Commission should take into consideration:

(a) "the costs and benefits to customers participating in the measure."

(b) "the costs and benefits to the general body of ratepayers as a whole, including utility incentives and participant contributions."

[24] Based on GWh potential.

As SACE witness Wilson testifies, the legislative history indicates that the Commission is directed to consider the costs and benefits in two ways: 1) from the perspective of participants, and 2) from the perspective of the "general body of ratepayers as a whole." The first part is clearly done through a participant test at the program or portfolio level, as described above. The second part is entirely consistent with the TRC test.

Nowhere in the FEECA statute is there any mention at all of considering the costs and benefits to *non-participants*, nor to consider the impacts directly on utility *rates*, in the goal-setting process. The absence of any language about non-participants and rates makes clear the RIM test is no longer the appropriate cost-effectiveness criteria. RIM ignores the costs and benefits to the general body of ratepayers as a whole (that the FEECA statute discusses).

Q. FPL Witness Dean and others point to the statutory language about including "*all* the costs and benefits to the general body of ratepayers, including *utility incentives and participant contributions*" and state that the TRC test neither includes all costs nor utility incentives, and therefore, the statutory language can not refer to a TRC [emphasis added]. Please explain why you disagree?

A. I believe FPL Witness Dean's argument fundamentally rests on a flawed semantics argument. Quite simply, the TRC test is one of two primary DSM cost-effectiveness tests (the other being the Societal Cost Test (SCT)) that does in fact include *all* true costs and benefits to the general body of ratepayers. It is a test that considers all costs and benefits from a perspective of all ratepayers. Its fundamental

[25] Exhibit JDW-1.

purpose is to calculate the general increase or decrease in the economic welfare of the economy. In fact, the FEECA Statute (Section 366.81) mentions its purpose as pursuing efficiency "in order to protect the … general welfare of the state and its citizens." The only tests that measure this are TRC and SCT. The RIM test clearly does not include many real economic costs, including for example, the participant contributions.

Witness Dean states that "the RIM and participant tests, **when used together,** capture all relevant costs and benefits" [emphasis added].[26] This is misleading at best, and omits important facts. Simply using two different tests to separately analyze and screen out DSM measures that, when taken together consider each cost or benefit *at least once*, does not resolve the fundamental concern that neither test considers "all relevant costs and benefits." There is no sound way to combine tests in an additive way to result in a single cost-effectiveness analysis that arrives at the correct net benefits enjoyed by the Florida economy and the "general body of ratepayers."[27]

Further, the FEECA utilities have not actually attempted to combine the two tests as Witness Dean states. If they did propose such an approach, it would result in double counting of some costs and benefits, not to mention including non-real costs and benefits and mixing different discount rates and methods of valuing these costs and benefits. This would be fundamentally unsound economics. The participant test leaves out the utility program costs – clearly a real cost to the ratepayers -- and the RIM test leaves out the participant costs – also clearly a real

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[26] Dean direct test., p. 7, ll. 13-14.

cost. While they both include efficiency benefits, these are valued in very different ways.[28] Thus, each taken by themselves leaves out important costs, and taken together would result in double counting benefits with different valuation schemes.

The TRC test on the other hand, provides in a single test, all *real societal costs and benefits,* and is designed to consider the overall effect on the electric system and "general body of ratepayers as a whole."

Dean rests his argument that the TRC test leaves out important costs primarily by stating that "it [the Commission] is told [by the FEECA Statute] to consider a specific cost -- utility incentives to customers – that is not part of the TRC test."[29] This is a semantics game meant to mislead the Commission. The TRC test considers as costs the total incremental cost of efficiency measures. This is made up of two separate cost components paid by two different parties, quite simply: the utility incentives to the participant plus the participant's own contribution to the measure cost. This is exactly the FEECA Statute's direction.

It is true that the total incremental measure cost does not change with the level of incentive, so varying the utility incentive to the customer does not change the TRC test result. It is a zero-sum game. Any increase in utility incentive is exactly offset by the decrease in the customer's contribution. Dean seems to rely on this to argue that the TRC test does not include incentives. In practice, when analyzing measures it is often simpler to ignore who pays and simply include the

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[27] Quite simply: (A/B + C/D) is not equal to (A+B)/(C+D).

[28] In the case of the participant test, benefits are valued at retail electric rates and discounted to the present using a customer discount rate, while in the RIM test they are valued at avoided costs and discounted using a utility rate.

incremental measure cost regardless of incentives. However, this is exactly the same thing as counting both the "utility incentive and participant contribution." In essence, this a distinction without a difference.

The table below shows all the costs associated with DSM, and which ones are considered under each test. As can be clearly seen, the TRC captures all of them. RIM however only captures two of the five costs.

Relevant Costs of DSM

Costs	TRC Test (Y=Included, N=Omitted)	RIM Test (Y=Included, N=Omitted)
Measure costs		
- Participant Cost	Y	N
- Utility Incentives	Y	Y
O&M Costs	Y	N
Fossil Fuel Costs	Y	N
Program Administration	Y	Y

Q. Given the current economic situation, isn't this a bad time to shift away from RIM as the primary criteria?

A. No. FPL Witness Dean argues "given current conditions [poor economy, already increased rates, etc.] now is not the time for the Commission to abandon RIM and Participant tests."[30] Putting aside the mandate from the FEECA Statute, this is *exactly the time.* As Dean notes, customers have seen their electric prices increase in recent years, and are struggling economically. Therefore, the focus of the Commission should be on setting aggressive DSM goals and a complete portfolio to ensure that all customers can participate in programs that will help

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[29] Dean direct test., p. 7, ll. 12-13.

[30] Dean direct test, p. 22, ll. 2-4.

them lower their energy bills, while also providing jobs and other economic development opportunities. In fact, both the Federal government (through its ARRA funds) and numerous states are focusing renewed efforts on DSM for just this reason, recognizing it can not only reduce total ratepayer energy bills, but also creates jobs and stimulate the economy. NRDC/SACE Witness Cavanaugh also discusses this issue.

Q. Witness Sims indicates FPL's analysis is consistent with traditional IRP concepts.[31] Do you agree?

A. No. The concept behind traditional IRP is to treat supply and demand-side options on an equal footing to determine the overall least cost option to meeting the energy needs of customers. Indeed, the term "least cost planning" is often used synonymously with integrated resource planning. The FEECA utilities' focus on rates, as opposed to minimizing overall ratepayer costs, does not result in the least cost plan.[32]

Further, FPL has defined DSM as a potential resource only for their "need."[33] Need is defined as the ability to meet required reserve margins with current or planned supply capacity. Simply guaranteeing that all existing and planned supply continues to operate and then only considering new supply and demand resources for any gap in reserve margin can hardly be viewed as putting supply and demand resources on an equal footing. Quite simply, it only puts a very small amount of marginal additional resources on an equal footing.

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[31] Sims direct test., p. 19, ll. 1-11.

[32] Sims direct test., p. 10, ll. 1-2.

[33] Dean direct test., p. 7, l. 20 – p. 8, l. 2

It is quite likely that additional demand-side resources would be cost-effective to offset existing plant operation. DSM typically can be captured for 2-4 cents/KWh. This does not necessarily mean these plants sit idle, as sales into the grid can still be made, benefitting ratepayers. Also, because DSM load reductions accumulate, the more Florida captures now, the more it can defer future new capacity that might be needed after 2019, providing a present value benefit today. Finally, greenhouse gas reductions (a clear priority of the Legislature) would likely be proportionately higher with more DSM offsetting baseload coal plants rather than only those on the margin that are likely to be fueled by natural gas. A full IRP considers the least cost way to meet total resources with all available options.

Q. Is the difference between relying on RIM versus TRC significant?

A. Yes. FPL Witness Dean quotes the Commission in 1993 as finding "the record in this Docket [No. 930548-EG] reflects that the difference in demand and energy savings between the RIM and TRC portfolios are negligible."[34] Further, some of the scenarios provided in FEECA utilities' analyses would imply that perhaps this is of more academic interest than real importance.[35] However, that is not the case.

While the basic measures that pass RIM and TRC economic potential analysis do not appear to vary dramatically based on Exhibit JRH-18, the impact on actual net portfolio savings in Florida would be very large. This is because RIM can dramatically limit the ability for a utility to effectively promote a measure with

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[34] Dean direct, p. 15, ll. 11-13.

[35] For example, Exhibit SRS-4 shows the remaining measures after all screens of 279 for E-RIM and 305 for E-TRC.

a well designed program and sufficient incentives. Any increase in incentives will lower the RIM benefit-cost ratios. As I have made clear above, the result can be limited program efforts with low incentives, and very high free ridership.

This effect is not readily apparent in the record because of all the other screens, and the fixed incentive designs modeled. However, even here it can be partially seen in Exhibit MR-3, where the difference between RIM and TRC under the low incentive scenario is a 35% increase in GWh savings under the TRC Test, while under the high scenario it is 70%. With even more aggressive program strategies, it would become even larger.[36] It appears that many measures just barely pass the RIM test. Thus, there remains little opportunity to increase the budget to promote the measures as would routinely be considered in more effective programs. Indeed, FPL Witness Sim confirms that the E-TRC test "typically results….in much larger benefit-cost ratios than does the E-RIM test."[37]

Q. Have you quantified the reduction in technical potential resulting from the use of RIM instead of TRC?

A. No. The utility files I used to calculate the impact of the customer payback and participant screens only included placeholder RIM benefit-cost ratios so I could not determine how much of the remaining 21% of the technical potential made it through FPL's RIM screen.

Q. Do you have any concerns about how the cost-effectiveness was calculated?

A. Yes. I have not been able to view DSM ASSYST model, so I can not tell with certainty how the tests were conducted. However, from what I have seen and

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[36] Exhibit MR-3, p. 1: FEECA Utilities Total – Program Net Achievable Savings Potential in 2019.

read, I have a number of concerns. I believe the TRC Test may leave out important components of costs and benefits. I also believe the TRC Test relies on an unreasonably high discount rate. NRDC/SACE Witness Steinhurst addresses the appropriateness of the avoided costs used.

Q. What are the suspected omissions in the TRC costs and benefits?

A. I believe that the economic analyses are not taking into account non-electric benefits (NEBs) and market effects. They also appear to ignore important timing effects associated with early retirement measures. NEBs can be very significant for many efficiency measures. These can include, but are not limited to: fossil fuel impacts, decreases in maintenance costs (efficient equipment tends to also be more reliable, and in early retirement measures much newer too), reductions in other resources such as water, and significant industrial process benefits in terms of increased production, improved quality, reduction in waste disposal costs, etc.

Market effects refer to additional savings that can result from programs designed to transform markets, but that may not directly receive incentives and may occur after the program ends. Many programs focus on things like building awareness, education and training, and other strategies, designed to permanently modify the behavior of the market. These strategies can result in significant additional benefits beyond those from customers directly participating in a program. For example, by training HVAC contractors how to properly size and install air conditioners, these practices may well continue beyond any incentive that is paid to do this.

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[37] Sims direct test., p. 55, ll. 8-10.

For early retirement (retrofit) measures, I believe the TRC analyses may ignore the long term cost savings resulting from the replacement of older inefficient equipment with new equipment. While the initial measure cost is the total cost of equipment and labor, the customer benefits significantly from shifting out the need for future capital expenditures. For example, if an air conditioner that is 10 years old and expected to last another 10 years is replaced with a new one, the customer no longer has to buy a new one in 10 years. By shifting these planned capital investments out 10 years perpetually, the customer realizes a significant present value benefit. In addition, older equipment typically has significant maintenance costs that are avoided in the near term when replaced with new equipment.

Offsetting this cost savings, early retirement measure savings should also adjust the long term savings downward. In the example above, the savings in the first 10 years would be the difference between the old, inefficient AC and the new high efficiency one. However, in year 11 the customer would have replaced the old AC with a new standard efficiency unit. Therefore, the savings from years 11-20 should be the difference between the high efficiency unit and the expected baseline unit. As far as I can tell, neither the cost nor the benefit adjustments were done. However, in general, the cost reductions are more significant than the benefit reductions, so the result would be to underestimate the cost-effectiveness of these measures.

Q. Explain your concerns about the discount rate used in the TRC Test?

A. My understanding is that the same discount rates were used for both the RIM and TRC Tests, based on a weighted utility cost of capital. These discount rates range from a low of 5% (JEA) to a high of 8.89% (FPL). Excluding JEA, they range from 7.64-8.89%, with an average of 8.22%.[38] I believe these are nominal (including inflation) rates. While the utility cost of capital is reasonable for a RIM test, it is not for a TRC test. Generally, TRC tests are performed using a societal discount rate that is significantly lower than this, since the focus is the general welfare of society at large.

Q. What is the impact of using a higher discount rate?

A. The higher discount rate will cause DSM to appear less cost-effective, compared to supply options. This is because virtually all the costs of DSM measures and programs are paid up front, while the benefits in terms of energy savings accrue over the life of the measures. With a higher discount rate, the present value of these future benefits is significantly reduced.

Q. Why do you think it was inappropriate for the achievable potential analyses to include the program administration costs when screening individual measures?

A. The selection of individual measures in terms of cost-effectiveness should only include the costs and benefits directly related to the measure. Once the list of cost-effective measures is determined, they can be mapped into programs. The programs and overall portfolio screening should include all program costs, including, but not limited to, that spent on marketing, administration, monitoring and evaluation, technical analysis, data tracking, and other necessary program costs (collectively referred to as program administrative costs). As noted earlier, Section

[38] Response to NRDC/SACE interrogatory 1, question 3.

366.82(7) provides for the further review of costs at the program level, and therefore it is appropriate to exclude program costs at this point.

This is because once a utility is offering a program, the program administrator should strive to capture all cost-effective measures in a given customer's facility. Encouraging a single additional measure to a customer doesn't necessarily change these other fundamental program costs, which can be considered somewhat fixed.[39] Therefore, adding in these non-measure costs can dramatically underestimate the cost-effective efficiency potential by eliminating from consideration all measures that fail.

For example, consider a direct installation program model, which is a common program for certain markets, including low income customers, high use residential all electric customers, and small commercial customers. Under this model, a program staff or contractor will go on-site to evaluate efficiency opportunities for a customer. Then they will, either in the same visit or a follow-up visit, directly install the appropriate and cost-effective measures. Under this model, the utility has already incurred or committed to certain program costs, regardless of the specific measures installed at that site. They have spent money on a marketing campaign, they have developed a tracking system, they have hired program staff to administer the program, they have hired consultants to design and plan for the program, they have committed funds to monitoring and evaluation, etc. Once on site, they have also incurred the cost of travel and the initial audit or technical

[39] Obviously, some program administration costs can increase slightly with greater program measure activity, however, this is generally very minimal. For example, a customer applying for a rebate for one measure or two is likely to consume virtually identical administrative resources.

assessment regardless of how many opportunities they find. They will identify a number of appropriate measures to install. If they identify an additional measure – say an extra light fixture than can be retrofitted – the only change in cost is the cost of installing that specific measure. All the other costs can be viewed as sunk costs.

So, while it is certainly important to analyze programs and the portfolio including all costs to ensure they are cost-effective, it is not appropriate to eliminate from consideration individual measures based on these non-measure costs.

Q. Is it common practice when utilities screen individual measures for a given customer project to determine if they will provide a customer an incentive to include these administrative costs?

A. No. I am not aware of any program that will deny a customer a rebate for a "custom" measure based on adding on these already committed costs. Typically, a utility will require that any measure that is not offered in a standardized, prescriptive fashion (e.g., a published form that offers a set amount of money for a specific widget regardless of individual cost-effectiveness) — a so-called "custom" measure — to undergo a cost-effectiveness screening to determine if the measure qualifies for a rebate. In this case, only the actual measure incremental cost is used in the screening, because that is the incremental cost associated with that specific measure or package of measures getting installed. My firm has developed the custom project screening tools used by the majority of the DSM programs throughout the Northeast, including in CT, MA, NJ, NY, RI and VT.

Q. What is the impact on the achievable potential analyses from including these administrative costs in the screening?

A. I can not tell. I have not been able to determine what the program budgets are, nor how much additional costs were added to the measures to account for this. However, it could be quite large. In many DSM portfolios the administrative costs are quite large, in some programs they can exceed the measure costs, particularly those focused on longer term market transformation. For example, in 2008 the total program non-incentive ("administrative") costs for Efficiency Vermont were 76% of the total measure costs (including the customer contribution and incremental engineering costs) for its portfolio.[40] At this level, adding administrative costs would cause a measure with a TRC benefit-cost ratio of 1.75 to fail.

Q. Do all the utility achievable potential analyses apply this additional program cost?

A. I believe only FPL, PEF, TECO and Gulf do, based on Witness Rufo's direct testimony.[41]

Q. Please explain your concern about the bundling and unbundling of measures?

A. For each technology, Itron considered the opportunities for a number of building types or industrial sectors. This is common practice in potential studies, and can provide a higher level of accuracy assuming good data is available to

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[40] Efficiency Vermont 2008 cost data. Note that Efficiency Vermont's total cost of efficiency programs in 2008 was only 2.5 cents/KWh saved, indicating the portfolio was capturing savings relatively cheaply with this budget (EVT 2008 Preliminary Annual Report, March 2009).

[41] Rufo direct test., p. 20, ll. 10-11.

support this disaggregation. Thus, measures were analyzed for each combination of technology and building type.

The result is that some measures are cost-effective in certain building types, while not passing a specific test for others. For example, a hot water efficiency measure may be very cost-effective in hospitals, hotels, schools and restaurants, but fail in other building types. By bundling these measures together for all building types it is likely that a hot water measure could fail overall, thus eliminating any opportunity for this measure, even though it is cost-effective in significant opportunities that programs could capture.[42]

Q. What is the impact on the achievable potential analyses from this bundling process?

A. I can not tell. It is possible it could result in eliminating significant potential. However, it is also possible that it could result in additional potential for a technology that passes overall but has significant building types where it failed.

Q. Do you know why this bundling and then un-bundling was done?

A. No. I would normally assume for simplicity to minimize the number of measures to deal with in the analysis. However, it is generally easy to apply a given formula to a whole array of data (E.g.. in Excel, typically copying the formula down the column). I would think the effort to bundle, and then to unbundle again and still have to deal with the full measure set, would offset any saved efforts.

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[42] Note that typically the two largest commercial building in terms of load are offices and retail establishments, where little hot water is used.

Q. **Do you have other concerns regarding bundling of measures in general?**

A. Yes. While the method of screening out measures that are not cost-effective is consistent with standard practice in doing potential studies, it inherently results in conservative (*i.e.,* low) estimates of true potential. That is because the choice of including a given measure is a binary one — either it passes or it doesn't. If it fails, the implicit assumption is that there is zero cost-effective efficiency potential from that measure. In the real world however, many technologies may be cost-effective for one customer and not for another. Thus, measures that fail an overall cost-effectiveness test on average for all customers will likely still offer large and cost-effective potential among many customers. Typically, this potential will still be targeted and captured in programs, based on site-specific cost-effectiveness screening. Thus, the true achievable potential is generally larger than estimated in these types of studies.

Unbundling measures at the building type level can reduce this problem some. However, even within a single building or industrial type, there may be large variation of opportunities because of differing hours of use, coincidence with the electric system peak, and other factors.

Q. **Do you have any evidence that FEECA utilities will in fact offer programs that address the specific individual customer economics, as opposed to only promoting those measures that passed the bundled screen?**

A. Yes. When FPL Witness Haney is asked "Does the portfolio of measures utilized for the development of the proposed DSM Goals represent the expected measures that will be included in the DSM Plan to meet the goals?" he responds: "Not completely. FPL's DSM Plan will reflect a slight difference in the mix of measures to achieve the goals. This reflects the difference between the modeling of the average impact across all customers versus the impacts at an individual measure installation level."[43]

Essentially, the FEECA utilities are asking the Commission to base goals on analyses that screen out virtually all of the potential savings, but then would likely meet these goals with numerous measures they have omitted from the analyses.

Q. Please explain your concerns about the measure penetration model used in the achievable potential analyses?

A. Witness Rufo explains the methodological approach to modeling achievable penetration rates in Exhibit MR–11. Essentially, Itron has used a formulaic approach that models penetration curves as a function of customer economics, with different curves reflecting some customizable non-economic factors including the level of barriers to adoption, customer awareness and the relative importance of indirect benefits.[44] In general this approach is a significant improvement over some studies that have relied solely on a single curve that assumes customer economics is the only relevant factor. As explained above with the retrocommissioning and chiller example, customer economics alone can not accurately predict either naturally occurring or program achievable penetrations.

While the addition of other variables to modify measure-specific curves is certainly an improvement, the overall method used by Itron is still problematic for a number of reasons. I focus on the most critical of these:

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[43] Haney direct test., p. 32 l. 18 – p. 33 l. 2

[44] Exhibit MR – 11, p. 1

1. The level of customer awareness and barriers are assumed to be relatively static, regardless of any DSM efforts, resulting in the *net* penetration for any measure fundamentally ending up being driven primarily by customer economics because of the static nature of awareness, barriers, and indirect benefits;
2. The penetrations do not reflect maximum achievable penetrations that could be captured with the best programs, but are constrained by a pre-specified, one-size fits all incentive scheme, that drives the customer-economic-based penetrations;
3. The penetrations were initially based on actual industry program experience, rather than the maximum achievable penetrations; and
4. The final penetrations were calibrated and constrained to limit overall goals to no more than the status quo that has existed in Florida.

Q. Please explain the first concern, that levels of awareness and barriers are relatively static?

A. While the ability to modify qualitatively levels of customer awareness is in theory a good feature of the model, it is not clear that this barrier was assumed to be significantly overcome by good program design. A primary and necessary, but not sufficient, function of successful DSM programs is to ensure that levels of customer awareness are raised significantly. It is unclear exactly how the model was used, and what changes between the base case curves and the program penetration curves were done. However, it appears that the same basic curves were used for both scenarios. Witness Rufo states that: "The effect on the amount of adoption estimated depends on where the pre- and post-incentive benefit-cost ratios fall on the curve."[45]

Q. What is the effect of this approach?

A. In essence, it ignores the ability of successful DSM programs to overcome the non-economic barriers to efficiency adoption, and simply assumes that things like awareness and other non-economic barriers can not be influenced. This is contrary to general DSM theory, and simply assumes Florida could not deliver different and more effective DSM programs than they already offer. In my experience, the non-economic barriers are the most critical ones to achieving adoption. Indeed, experience shows that penetration rates among some programs with relatively low incentives have outperformed those that offer higher incentives, but do a poorer job of overcoming other barriers. It is as if a program that simply puts a rebate form on a website will have the same impact as one that aggressively uses broad-based marketing, upstream education, training and promotion efforts, technical assessments and other aggressive non-financial strategies.

The analysis and record support no discussion whatsoever of the actual program designs it assumes, and why they reflect the best and most aggressive achievable portfolio that could be offered in Florida.

Q. Explain what you mean by the penetrations are not based on the maximum achievable potential that could be captured?

A. Quite simply, the FEECA Statute requires an analysis of "all *available*" efficiency.[46] The Legislature has directed the Commission to establish goals after

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[45] Exhibit MR – 11, p. 6

consideration of this full available potential. However, the penetrations modeled simply do not reflect that. For example, the incentive level scenarios clearly constrain the customer economics that drive the penetration results. While it may be determined that incentive designs similar to these scenarios are appropriate for a given market or program, they certainly could be increased. By definition the maximum achievable potential should reflect the most cost-effective savings that could be captured, with the most aggressive, well designed, and fully funded programs.

For example, successful program models have been proven to capture 80% measure penetration when relying on direct installation programs with significant incentives or financing designed to offer customers immediately positive cash flow.[47] NRDC/SACE Witness Cavanaugh discusses the Hood River program that achieved even higher penetration.

The average of the maximum penetration rates for each measure for FPL's analysis of the residential sector ranges from a low of 6.8% (RIM-Low scenario) to a high of 17.1% (TRC-High scenario). For the commercial sector, the figures are 9.3% and 17.9%.[48] In addition, it is worth noting that the penetrations modeled are constant from 2010 to 2019, implying that the FEECA utilities would not be

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[46] Section 36.82 (3).

[47] See, for example, Nadel, Pye & Jordan, *Achieving High Participation Rates: Lessons Taught by Successful DSM Programs*, American Council for an Energy Efficient Economy, January 1994 and Mosenthal & Wickenden, *The Link Between Program Participation Rate and Financial Incentives in the Small Commercial Retrofit Market,* Proceedings of the International Efficiency Program Evaluation Conference, 1999.

[48] I have not been able to obtain the Industrial sector files, nor other scenarios. From: FPL Resp to NRDC-SACE Penetration rates (prepared by Itron).xls.

capable of ramping up program penetrations over time as awareness and capability builds.

Q. Why do you criticize the penetration curves for being based on typical DSM program results?

A. Actual DSM program results are certainly important results to consider when modeling penetration. However, it is very rare that existing programs, even in those areas with the most aggressive programs, have unlimited budgets and have strived to capture all achievable potential. In reality, existing program results certainly establish a floor of what can be done, but do not represent the most that can be done. Programs are almost always budget constrained.

For example, Efficiency Vermont has been considered a leader in efficiency since it began delivering programs in 2000. During the first half of this decade, it captured net savings of roughly 1% of load incrementally each year, similar to many other leading jurisdictions. While this put Vermont in the category of a leading DSM state, it was still far short of capturing maximum achievable opportunities. In 2006 Efficiency Vermont's funding was dramatically increased — although still fixed. As a result, from mid 2006 to 2008 Efficiency Vermont ramped up programs in a short time and captured 2.5% of load in incremental savings in 2008 — a 250% increase in effort.[49] In addition, it achieved 4.5% of load in incremental net savings among specific geographic areas it was asked to target because of potential T&D constraints.[50] This shows that, while considered a leader

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[49] Efficiency Vermont Preliminary 2008 Annual Report, March 2009.

[50] Geotargeted area savings and load data provided by Efficiency Vermont.

at 1%, the program activity at that level was still far from the full savings that could be achieved.

It is not clear what specific program designs are assumed for Florida, how aggressive they are, or if the analyses even consider specific program strategies beyond incentive levels when estimating penetrations. However, it is worth noting that in 2008 in the geographic areas targeted Efficiency Vermont achieved roughly an order of magnitude more savings *in a single year* than FEECA utilities have estimated as the *total 10 year achievable potential.* This results in an *average per year savings level roughly 100 time higher* than FEECA utilities proposed goals.

Q. Why do you conclude that penetrations and programs were constrained by existing Florida program performance?

A. Witness Rufo's testimony makes this clear:

> "A critically important step in the achievable potential methodology is to calibrate the adoption estimates to actual program adoptions as much as possible. For this study, program accomplishments were received from the FEECA utilities and used in this calibration process….Itron began with measure-specific adoption curves developed from other recent Itron and KEMA potential studies. Itron then compared the results from using these curves to the FEECA utilities' recent program results. Adjustments were then made to some of the adoption curves to obtain results that better align with **actual program accomplishments in Florida**. This process was repeated in consultation with the FEECA utilities **until the utilities and Itron agreed that**

the results were consistent with program experience in Florida."[51] [emphasis added]

Q. Isn't recent Florida data the most relevant information for what can be done in Florida?

A. No. If the FEECA utilities had unlimited budgets and had been pursuing very aggressive DSM efforts for years, with well designed, mature programs, then this might be appropriate. However, that is far from the case. Compared to leaders in DSM, Florida is far behind in its DSM accomplishments, as is discussed in detail by SACE/NRDC Witness Wilson. For example, FPL, despite arguing that it is a national leader in DSM, has historically captured approximately 0.2% of electric load from DSM per year.[52] This is less than an order of magnitude lower than leaders have already achieved, and than many jurisdictions are currently setting as future goals. Even some states with virtually no history of DSM have established DSM goals an order of magnitude larger than Florida's recent accomplishments. For example, in 2007 Illinois passed legislation requiring utilities to ramp up to 2% per year incremental savings.[53]

Q. What is the effect of relying on historic Florida accomplishments for calibrating penetration rates?

A. Quite simply, it is to arbitrarily limit the achievable potential analyses to no more than what Florida is currently doing. In actual result it has limited the achievable potential analyses to substantially less than Florida has been doing and

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[51] Rufo direct test., p. 24, ll. 4-18

[52] NRDC/SACE Witness Wilson Direct Testimony, Exhibit JRW-1.

[53] Illinois Power Agency Act (Public Act 095-0481).

even than its currently established goals for 2010-2014. This is because, as I have shown above, the analyses already screened out at least 4/5ths of the potential prior to applying these status quo penetration rates.

Simply constraining the analysis to past accomplishments is clearly contrary to the intent of the Legislature in passing the FEECA Statute. Presumably if the legislature had deemed the current FEECA utilities' DSM efforts sufficient, they would have seen no need to enact new legislation.

Q. What is the basis for your statement that the achievable potential results are not credible?

A. I base this on a number of factors. Besides the major methodological problems described above with the analysis, I focus on the outcome and its plausibility from my experience as an expert in the DSM field. I supplement that with the simple fact that there are numerous jurisdictions currently pursuing DSM that is an order of magnitude more aggressive than the FEECA utilities' proposed goals. Finally, I explain how, while different than other states, if anything I would expect efficiency opportunities in Florida to tend to be higher than in many of the states that are achieving well beyond the proposed goals.

Q. Can you expand on this discussion?

A. Yes. We now have in North America about two decades of DSM efforts in various regions of the country, across different climates and in jurisdictions with widely varying avoided electric costs and retail rates. A number of jurisdictions have been capturing incremental net savings in the range of 1.0% of total electric load per year for over a decade.[54] Recent ramp-ups and goals or accomplishments are 2.0% per year or more savings in a number of areas. Exhibit PHM – 1 shows currently established legislative or regulatory goals for numerous states, including many with little or no history of DSM activity. This table was compiled from ACEEE data, with adjustments as appropriate to correct errors or provide newer information. This shows that levels of 1% per year to considerably higher have been captured or are planned in a variety of areas through-out the country.

Florida, like any state, has many unique aspects. Climate, demographics, industrial sectors, energy costs, and other things can vary considerably from place to place. However, fundamentally, the market place for energy using systems and equipment is a national, if not global, one. Floridians are purchasing and using the same lights, air conditioners, motors, and other equipment that are being purchased and installed elsewhere.[55] Further, while Florida's energy costs may be lower on average than those in California and the Northeast, they are certainly higher than other areas that have found large and cost-effective efficiency resources, including the Pacific Northwest in the U.S. and many parts of Canada. In fact, lower energy costs should translate into greater efficiency potential because customers have less incentive to adopt efficiency on their own. Finally, Florida's hot climate and high saturation of all electric buildings should result in higher cost-effective achievable efficiency than in states with milder climates and substantial use of fossil fuels for buildings.

[54] For example, but not limited to, CA, CT, MA and VT.

[55] Although probably proportionately less of the most efficient ones compared to states that have aggressively pursued past DSM.

Q. Why would Florida's situation indicate that, on average, potential may be higher than other places with leading DSM achievements or goals?

A. First, it is useful to think about efficiency potential in terms of the percentage of existing or forecast load. While different end uses and climate will of course vary the absolute magnitude of efficiency (in terms of kWh or kW), the *percentage* opportunities don't generally vary dramatically. In the case of Florida, I would expect there might be proportionally higher potential than other areas for the following reasons:

1. The relatively hot climate should result in much longer cooling hours than places like the Northeast and West Coast. As a result, many more cooling opportunities should be cost-effective.
2. The long cooling hours also will increase the cost-effectiveness of commercial indoor lighting measures somewhat, because efficient lighting provides non-trivial cooling benefits from reduced waste heat. In other more temperate places, lighting cost-effectiveness is actually reduced by the need to increase space heating energy during the winter to offset the lighting savings.
3. Florida does not have a history of deep efforts in DSM. At most, Florida has been capturing about 0.2% per year in electricity savings. Therefore, I would expect more efficiency to still be available than in places that have been capturing roughly five times this amount for as long as two decades.

Q. How does Itron/KEMA's estimate of potential in Florida compare to recent studies they have done?

A. KEMA has recently completed an electric potential study for Connecticut, which has had aggressive DSM programs for about two decades.[56] KEMA found a very similar technical potential (36%) as they found in Florida (34%). However, it estimated *economic* potential at 33.1%, or 91% of the technical potential. This is fairly typical of most studies, since generally measures that are likely to not be cost-effective are omitted, as explained above. I do not know what the results of the economic potential in the Florida analysis would come to, since only four of the seven utilities reported these essential data at a summary level (only). However, I have shown above that only 21% of the technical potential (7% of load) remains after applying just two of the three screens for FPL.[57]

KEMA's Connecticut study also estimated *achievable* potential of 22.5%, or roughly 62% of the technical potential. This again is fairly typical. In contrast, Florida's analysis has only found between 0% and 2% of the technical potential depending on utility. This study also estimated the achievable potential net of Federal and State codes and standards and naturally occurring efficiency. The table below shows a comparison.

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[56] KEMA, *Potential For Energy Efficiency in Connecticut*, prepared for the Connecticut Energy Conservation Management Board, United Illuminating, and Northeast Utilities, May 2009.

Potential Study Results

State	Technical Potential	Economic Potential		Achievable Potential	
	(% of load)	(% of load)	(% of Technical)	(% of load)	(% of Technical)
CT	36.4%	33.1%	91%	22.5%	62%
FL	34%	< 7%*	< 21%	0 - 0.7%	0 – 2%

* Based on FPL analysis just applying the two screens of customer payback and participant test results in 7%. This is without even including the final screen of the RIM test, so clearly the final number is less than 7%.

Q. Isn't it possible that these extreme differences in what can be achieved is a function of the differences between the states?

A. No. Virtually all the primary differences between states are already accounted for in the technical potential, which is extremely similar between the two. These could include, but are not limited to, things like climate, building stock, average efficiency of existing equipment, demographics, fuel shares, and industrial sectors. Differences in avoided costs will have some effect on economic potential, but that is not typically large as most efficiency opportunities are highly cost-effective. The only logical explanation would be that Floridians are somehow less capable than Connecticut residents of participating in well designed and implemented programs. Rather, the low goals appear to be a result of the unreasonable assumptions, methods and constraints imposed on Itron/KEMA by the FEECA utilities in their analysis.

IV. DSM GOALS (Issues 8 & 9)

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[57] While Exhibit SRS-5 shows "economic potential" under the E-RIM and E-TRC tests, as far as I can tell this does not include the other two screens used to exclude measures prior to the achievable potential analysis.

Q. What DSM goals do you recommend the Commission establish?

A. NRDC/SACE Witness Steinhurst presents recommended goals in Exhibit WS-1. These reflect a ramp up to 1% of load incremental net savings per year. I support these goals *as a minimum level* for consideration for interim goals. Requiring at least 1% of load incremental net savings per year will establish Florida as one of many leading states, but still well behind a number of them, as shown in Exhibit PHM-1. As this exhibit shows, many of the leading states are now in the process of ramping up to significantly higher goals, in some cases in excess of 2% per year.[58] I believe the true achievable potential is likely much higher than this level. Indeed, if one were to apply typical ratios to the technical potential results, it is likely that 2.2% per year or more net savings can be achieved.

Q. FPL Witness Haney suggests that even though the proposed program goals are lower than the current Florida goals, we should consider that Floridians will actually save more because of Federal Standards.[59] Should we include codes & standards savings in any goals we set?

A. No. It is true that Florida's future electric load will be lower than it otherwise would have been because of Federal standards that will go into effect over the next ten years. However, that is already embedded in the forecast,[60] and not attributable to FEECA utilities programs, nor under the control of the FEECA

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[58] For example, I am currently in the process of working with the Massachusetts Energy Efficiency Advisory Council and the MA utilities in discussions on ramping up goals to somewhere between 2 – 3% savings per year.

[59] Haney direct testimony, p. 29 l. 16 – p. 31 l. 23.

[60] Haney direct testimony, p. 31. l. 6.

utilities. Any goals should reflect the net savings (net of free riders and spillover) of these programs only.

Q. Why are you suggesting the Commission establish interim goals at this point?

A. I believe the record is clear that the achievable potential analysis the FEECA utilities have put forward does not adequately estimate a reasonable level of savings that could be achieved. This leaves the Commission no good choices. Therefore, I believe the most appropriate solution is to establish interim goals that evidence throughout the U.S. shows are clearly achievable, and directing the FEECA utilities to revise its analysis to better reflect the true achievable potential in Florida. The Commission can then consider increased goals in the future based on this revised analysis. Further, while 1% per year is no longer considered an aggressive goal by many in the DSM industry, it is significantly higher than current the FEECA utilities' efforts. As a result, there will need to be a ramp up period that allows time for further consideration of the achievable potential.

Q. Is there any precedent for a Commission finding a potential study done for goal setting to be problematic such that it set temporary goals and required a more detailed and appropriate potential study be done to establish future goals?

A. Yes. In Colorado the Commission recently did just that with a KEMA potential study. After finding the study excluded important residential market potential, it ordered: "Public Service [of Colorado] shall complete a comprehensive update of the DSM market assessment on a timetable that will inform the 2011 ERP filing and in accordance with the discussion above."[61]

In fact, the interim goals approved by the Commission, and proposed by Public Service (PS), exceeded even KEMA's highest achievable potential scenario (incentives=75% of incremental cost). Public Service explicitly rejected its own study's findings as too conservative and proposed significantly higher goals than KEMA estimated was achievable.[62] PS Witness Sundin testified: "Q. Why did you not use the achievable potential estimated in the market potential study as your goal? A. ...the achievable potential factor barriers such as lack of customer awareness, concerns about new technology reliability, etc. into consideration. Based on the Company's recent experience in the Colorado marketplace, Public Service believes it can overcome many of these barriers through stepped-up marketing and education and that, with time, greater overall customer awareness of energy efficiency measures will facilitate achievement of the Company's goals."[63]

Q. Does this conclude your testimony?

A. Yes.

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[61] Colorado PUC, Order in Docket 07A-420E (Decision No. CO8-0560), May 23, 2008.

[62] Direct testimony of Debra L. Sundin before the PUC of Colorado, Docket No. 07A-___E, p. 14.

[63] Direct testimony of Debra L. Sundin before the PUC of Colorado, Docket No. 07A-___E, p. 14. ll. 14-22.

State Energy Efficiency Resource Standards Activity

State	Date Established	Goal	Target End Date	Implied Annual % savings* (% of total forecast load)
Texas	2007	20% of load growth	2010	0.5%
Vermont	2008	2.0% per year (contract goals)	2011	2.0%
California	2004	EE is first resource to meet future electric needs[1,9]	2013	2.0% +
Hawaii	2004	.4% - .6% per year[2]	2020	0.5%
Pennsylvania	2008	3.0% of 2009-2010 load	2013	0.6%
Connecticut	2007	All Achievable Cost Effective[3,9]	2018	2.0% +
Nevada	2005	0.6% of 2006 annually[4]	n/a	0.6%
Washington	2006	All Achievable Cost Effective[9]	2025	2.0% +
Colorado	2007	1.0% per year	2020	1.0%
Minnesota (elec & gas)	2007	1.5% per year	2010	1.5%
Virginia	2007	10% of 2006 load	2022	2.2%
Illinois	2007	2.0% per year	2015	2.0%
North Carolina	2007	5% of load[5]	2018	0.4%
New York (electric)	2008	10.5% of 2015 load[6]	2015	1.5%
New York (gas)	2009	15% of 2020 load[6]	2020	1.5%
New Mexico	2009	All achievable cost-effective, minimum 10% of 2005 load	2020	1.0% +
Maryland	2008	15% of 2007 per capita load[7]	2015	3.3%
Ohio	2008	2.0% per year	2019	2.0%
Michigan (electric)	2008	1.0% per year	2012	1.0%
Michigan (gas)	2008	0.75% per year	2012	0.8%
Iowa (electric)	2009	1.5% per year	2010	1.5%
Iowa (gas)	2009	0.85% per year	2013	0.3%
Massachusetts	2008	All Achievable Cost Effective[9]		2.0% +
New Jersey (electric & g	2008	20% of 2020 load[8]	2020	≤2.0%
Rhode Island	2008	All Achievable Cost Effective[9]		2.0% +

Source: ACEEE, Laying the Foundation for Implementing a Federal Energy Efficiency Standard, March 2009, report no. E091.

Notes:

* Implied annual reduction for targets based on current year loads assumes average underlying load growth (not accounting for EE) of 1.5% per year. Texas based on recent load growth of 3%/yr.

1 CA programs exceeded 1.5%/yr. in 2007. While current mandated goals are lower, CA policy requires investment in efficiency whenever it is less costly than alternative new supply.

2 HI established a renewable portfolio standard that includes efficiency as a resource and requires 20% savings by 2020, or approximately 2.8%/yr. However, this can come from efficiency or renewable resources. Current efficiency savings has ranged from 0.4% - 0.6%/yr.

3 CT requires capture of all available cost-effective efficiency resources. Current utility plans reflect goals of about 1.5%/yr.

4 NV has an RPS requiring 15-20% of load and allows EE to meet 25% of the goal. Utilities are ramping up to meet the maximum level of 5% of load from efficiency. Figure reflects 2006 program achievements.

5 NC RPS ramps up to 12.5% of load in 2021, with EE capped at 40% of this target, or 5%.

6 NY established a 15% savings goal (July 2008) for electric efficiency by 2015, however this includes an estimated 4.5% savings from codes & standards. Electric figure is for efficiency programs only. NY just established a 14.7% goal for gas efficiency by 2020. However, it is unclear whether this includes any savings that might come from codes & standards.

7 MD goal is set as a reduction off of 2007 per capita load. Implied annual goal assumes underlying load growth per capita (net of efficiency programs) of 0.75%.

8 NJ legislature recently authorized the BPU to set electric and gas goals of 20% savings each by 2020. Goals still under development.

9 CA, CT, MA, RI require all achievable cost effectiveness. This is shown as 2.0% + because recent studies indicate the potential is at least 2%. MA is currently discussing goals between 2-3% for electric programs.