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BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking to Consider Smart Grid Technologies Pursuant to Federal Legislation and on the Commission's Own Motion to Actively Guide Policy in California's Development of a Smart Grid System.	Rulemaking 08-12-009 (Filed December 18, 2008)

COMMENTS BY UTILITY CONSUMERS' ACTION NETWORK ON THE COMMISSION'S PROPOSED SMART GRID METRICS

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August 17, 2010

I. INTRODUCTION

According to the February 30, 2010 Assigned Commissioner's and Administrative Law Judge's Joint Ruling in the latest phase of the Smart Grid Technologies proceeding:

> "*Comments should focus on the appropriateness of the metrics, and should propose additions, modifications, or deletions to the proposed metrics. When recommending additions or modifications, parties should recommend specific wording and the reasoning behind their proposal."*

Based on parties' responses to the February 8, 2010 Joint Ruling, the Commission staff prepared a new set of proposed metrics, presented as Attachment A to this latest Joint Ruling. As the Joint Ruling states:

> "*The goals of this proposal are unchanged from that of the Joint Ruling of February 8, 2010, which were that the Commission 'adopt a set of metrics and require each utility to measure its performance relative to the metrics as part of its Smart Grid deployment plan.'"*

Accordingly, UCAN offers its comments on appropriateness of the proposed metrics and provides an explanation on how the utilities should use those metrics to develop meaningful performance measures. Towards that end, we offer criteria for developing and evaluating performance measures. Our overarching objective in these revised metrics is to ensure that utilities track the necessary data and produce the essential baseline estimates for comparison. UCAN also offers very specific revisions, as set for the Attachment A to these Comments.

UCAN concurs with other parties, including DRA in their assertion that "metrics should "have a purpose" or they risked "being a waste to time." [1] What UCAN proposes herein is to give the proposed metrics that purpose and make them meaningful as they measure performance relative to them. Measuring performance, rather than just tracking data, could be a very valuable part of Smart Grid deployment. However, UCAN is concerned that too many of the metrics proposed by the Commission are simply measuring and tracking a broad range of metrics (measurements) without ever measuring

[1] DRA's Opening Comments to Ruling, pp. 18-19

actual performance. For example, it is too easy to simply track changes in the value of the metric over time and call the increase or decrease in that metric "performance" when in fact in too many cases an increase or decrease in the value of the metric says little or nothing definitive about whether or not utility performance improved as a result of the Smart Grid deployment.

One very salient example is cost-effectiveness. Reasonable performance measures should track whether Smart Grid technology investments have generated benefits in excess of cost. That is, regardless of the direction of the metric, whether it increases or decreases and by how much, one cannot claim success if Smart Grid technologies costs more to install than they produce in terms of savings/benefits.

At the July 31, 2009 workshop, the Commission solicited input from parties on the various metrics enumerated in the Department of Energy (DOE) Report entitled "Metrics for Measuring Progress Toward Implementation of the Smart Grid." In that report, participants agreed that "…a properly planned, designed, implemented, and operated smart grid will:

- Enable active participation by consumers
- Accommodate all generation and storage options
- Enable new products, services, and markets
- Provide power quality for the range of needs in a digital economy
- Optimize asset utilization and operating efficiency
- Anticipate and responds to system disturbances in a self-healing manner
- Operate resiliently against physical and cyber attack and natural disasters

UCAN asserts that the metrics adopted in this proceeding should reveal Smart Grid performance that leads to these results.

Therefore, before finalizing the list of proposed metrics, utilities should understand the relevant baseline measures necessary to measure performance. In the sections below, UCAN offers guidance regarding the translation of the proposed metrics into performance measurement. Finally, in the attachment, we make the necessary modifications to each metric, especially where baseline estimates (other than tracking the changes in the metric values from year to year) are necessary.

II. DEVELOPING PERFORMANCE MEASURES

According to the July 30, 2010 Joint Ruling: "The original proposed metrics were structured to conform with § 8360 of the Pub. Util. Code, and were designed to be a mix of "build" and "outcome" related metrics." (Joint Ruling , Section 2, p. 3) In UCAN's view, build-related metrics reflect the activities and costs related to the construction and installation of Smart Grid technologies. Build-related metrics are ex post metrics that measure how well the actual activities and cost meet these ex ante expectations. So the objectives (or performance measurements) of such metrics should be to determine whether:

- the Smart Grid technology installations were cost effective ex post,
- the downstream investments benefited from Smart Grid installations,
- the Smart Grid technologies were installed under over budget,
- the Smart Grid technology were installed on or behind schedule.

It follows, then, that the metrics adopted should provide the data from which performance measures are devised. We presume that in measuring performance, the decision has already been made and that the proposed timing and schedule are consistent with the ex ante benefit-cost calculations. UCAN's focus in these comments is directed less to the build-related metrics and more towards the outcome-related metrics.

Outcome-related metrics measure the operational efficiency and related benefits of the Smart Grid technologies installed. These outcome-related metrics must be capable of linking the Smart Grid investment to the specific outcomes measured. Otherwise, the metric has little meaning and does not inform future Smart Grid decisions. These outcome metrics may measure:

- dollars saved compared to "no Smart Grid" scenarios, i.e., cost effectiveness
- increased customer value specifically attributable to Smart Grid technology investments ,
- increased operational efficiency due to the installation of specific Smart Grid technologies,
- improved responsiveness of utility operations as a direct result of Smart Grid technologies.

- increased investment in renewable, demand response or energy efficiency by customers (that are directly attributable to specific Smart Grid technology installations),
- the new functionalities that were utilized by customers,
- the incremental adoption of renewable resources attributable to the investment,
- increased cyber security that is the direct result of Smart Grid investments, and
- increased interconnectivity among utility systems due to Smart Grid technologies

It is important to note that the above examples of output-related metrics are incremental values, i.e., they represent the change in cost, value, efficiency, responsiveness, security or interconnectivity that is attributable (linked causally) to the Smart Grid investment.

"Cost effectiveness" is a desirable metric that is a hybrid, in that it combines build and outcome metrics. It is important because it assists decision makers to determine whether the expected value of benefits meets or exceeds the cost of the Smart Grid technology investment and operating costs.

Since elements of the Smart Grid system remain conceptual, it may be necessary to define specific metrics to measure performance later once concepts are translated into actual Smart Grid technologies and part of the deployment plan or to refine the set of proposed metrics periodically to reflect the evolution of the Smart Grid over time. The metrics should provide the data from which the utilities can measure and report performance relative to the metrics.

As importantly, a proper metric must control for and compare to what outcomes would have occurred without the investment. Project evaluation analysts prefer a "with versus without" (the Smart Grid investment) method for designing metrics to a "before versus after" method. For example, distributed generation, demand response and energy efficiency may increase even in the absence of Smart Grid technologies. So a baseline other than zero will be required to avoid overestimating the contribution to those programs caused by Smart Grid technology investments. Some increase would have happened anyway and that represents the baseline needed for performance measurement.

Such baseline estimates may involve simple trend analysis or require more sophisticated forecast techniques. But the baseline is non-zero.

One objective means of defining metrics would be to compare outcomes on circuits with Smart Grid technology investments to circuits without the technology investment where feasible. This approach essentially compares a target group (with Smart Grid investment) to a control group (without the Smart Grid investment). The difference between the two scenarios is a reasonable measure of Smart Grid performance. Essentially, it is important to control for other variables that may also produce similar outcomes when designing these performance measurements. That said, it is necessary to understand what performance measurements will be necessary overall to finalize the proposed metrics to be used in their calculation. There may be some benefits to completing deployment but initially delaying operations of certain representative areas (some rural, some urban) to create such a metric.

Since none of the proposed metrics suggest baseline estimates as something to measure over time, most of the proposed metrics use "time" as the point of demarcation, i.e., assumes the trend in the metric over time is indicative of whether the outcome has improved. But "time" is not an adequate causal factor in most cases and it is critical to exclude other potential causes of the trend in the metric. For example, time is sufficient where the "build" metric is designed to track progress toward completion, i.e., number of Smart Grid meters installed or when measuring the number of outages identified using digital information. But even here, it begs a comparison to outages identified by other more conventional means.

The new set of Commission proposed metrics is comprised of 11 categories and 80 plus measures overall. It is fairly extensive and exhaustive; UCAN did not find any gaps. The utilities suggested in their comments that fewer metrics are appropriate. UCAN concurs that less can be more when developing performance measures. Too many measures can be confusing and lead to potentially inconsistent metrics.

A major concern with the proposed metrics is the absence of a baseline for many of the metrics. UCAN submits that the proposed metrics cannot be measured adequately without a corresponding methodology for linking the metric data to specific Smart Grid installations. To measure performance, it must be possible to identify the direct causal

relationship between the Smart Grid technology and the metric. In many cases, there are potentially multiple causes for the outcome. In fact, some outcomes may not be caused by Smart Grid technology at all. This is the reason baseline estimates are so critical. For example, "Total annual production of distributed energy facilities," one metric under the Deployment and Integration of Distribution Resources, including Renewable Resources (Category 4), is an example where no direct linkage is posited between the level of growth in distribution resources production to specific Smart Grid technology investments. There are many reasons why the level of distribution resource production, i.e., economics or policy, may grow but this metric does not define a causal relationship. An unambiguous measure would identify specific outcomes that could only be caused by the addition of specific Smart Grid technology. From there, a more accurate baseline and measure of incremental performance is possible.

Another challenge facing the parties (and utilities) is that we do not have sufficient specificity at this time to define the Smart Grid technology ultimately installed. The utilities have installed meters, but they are proposing many additional system upgrades and modifications in coming years to fully maximize the new meter infrastructure. With each of these investments, the Commission will likely have to require the utilities to add metrics to whatever list is adopted.

There is yet an additional temporal element that the Commission must consider. For example, the installation of various Smart Grid technologies takes place over time, such as Smart Meters, and the impacts of those Smart Grid investments may also occur over time rather than instantaneously. This makes determining when the full impact becomes measurable and meaningful somewhat problematic. The joint ruling suggests that utilities should report progress (performance relative to the metrics) annually. But if installation takes time and response to Smart Grid technology involves "lags" between customer awareness, customer decisions and customer response, then it may be difficult to state with certainty what the level of performance in some cases actually means.

Finally, UCAN also will urge that each of the metrics be adjusted for customer growth. Normalizing the numbers by using a per-thousand basis or some other normalization technique will be required for many of these metrics.

Given these examples, the list of 80 plus measures should be modified to make sure that the outcomes measured are meaningful and timely. While some of the statistics may certainly be worthwhile to know, it cannot be said that they all are necessary to measure performance. When more is known about the Smart Grid technologies, e.g., closer to the installation of specific technologies, it may be easier to define the most effective performance measures. In Attachment A, UCAN has endeavored to revise the metrics to incorporate the baseline and temporal issues discussed above.

III. CRITERIA FOR EVALUATING PROPOSED PERFORMANCE MEASURES

A good performance measure can be determined using the following criteria:

- Easily measured with readily available data
- Simple to understand and targeted to specific Smart Grid investments
- Few in number and selective to reduce the administrative burden while making sure that the right investments are made to achieve the desired outcomes
- Revisable and adaptable over time as Smart Grid technologies change
- Results-oriented (performance-related) rather than activity-oriented
- Outcome-related metrics help measure the incremental value to utility, customers or other interconnected utilities
- Build-related metrics help measure the incremental progress toward completion of the Smart Grid deployment, including costs
- Reflect an unambiguous link to specific Smart Grid investments
- Calculations control for or exclude changes in metric value due to other factors unrelated to the Smart Grid investment (using with-without or control group methods)
- Provide clear direction to all parties on how to improve Smart Grid deployment
- Are internally consistent and therefore, clear direction on Smart Grid deployment

In Attachment A, UCAN endeavors to apply these criteria to each of the categories and/or specific metrics within those categories to determine how to modify the

proposed metric to be able to provide a meaningful measure of performance. In many cases, we propose establishing a baseline estimate that assumes no Smart Grid technology installed. There are several approaches to developing baseline estimates. The simplest is to assume zero or the level achieved prior to introduction of Smart Grid technologies. This approach is likely to overstate the contribution of Smart Grid technology to the value of the metric if the trend has been upward. More accurately, the trend, e.g., five-year average growth, in the metric can provide an estimate of the growth in the metric going forward, expected in the absence of Smart Grid investments. We do not propose to pre-judge what method for baseline estimates is most appropriate for any particular metric or utility. But we do propose that at the workshops, baseline methods be developed by utilities to reflect their specific and unique circumstance and the specific and unique aspects of the Smart Grid technologies adopted. What is most important is that performance not be defined as nothing more than the change in the proposed metric over time.

UCAN submits that in the workshop, agreement amongst the parties to performance measure criteria will aid the review process that the parties and Commission plan to undertake. We also believe that agreement upon how to establish baselines for many, if not all, of the criteria will aid the process.

Respectfully submitted, Dated: August 17, 2010

/s/

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PROOF OF SERVICE

I, Laura Impastato declare under penalty of perjury that I am employed in the City and County of San Diego, California. I am over the age of 18 years and am not a party to this action. On August 18, 2010, I served COMMENTS BY UTILITY CONSUMERS' ACTION NETWORK ON THE COMMISSION'S PROPOSED SMART GRID METRICS upon the public service list in this proceeding, as well as the Administrative Law Judge.

_____/s/_____ Dated: August 18, 2010

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ATTACHMENT A
UCAN's Proposed Metrics

In the sections below, UCAN makes specific recommendations for changes in the wording to the proposed metrics in the Joint Ruling.

1. Increased Use of Digital Information and Controls to Improve Reliability, Security, and Efficiency of the Grid (§ 8360(a))

Most of the originally proposed metrics in this category track growth in the use of digital information but alone do not indicate the quality of performance, whether good or bad, except as a trend over time. What is needed is a comparison to outcomes with and without Smart Grid technology, either a comparison of outages on circuits with and without the specific investments or otherwise controlling for other factors that contribute to outages. The best metrics provide guidance regarding whether to do more, do less or do something different. These measures simply track statistics but not specifically performance of these Smart Grid investments. Moreover, broad measures like SAIDI, SAIFI and MAIFI are most valuable if their historical performance serves as a baseline for future measurement. Moreover, separating out between customer reported outage detection vs. digitally diagnosed outages may provide greater insight into the benefits of the Smart Grid. Finally, the cost of Smart Grid technologies that enable outages to be detected digitally should be tracked and ultimately compared to the increase in outages detected using the digital information, i.e., the change in outage indices divided by relevant Smart Grid costs. UCAN's revisions are underlined. We note that these metrics should allow the utility to identify changes in SAIDI, SAIFI and MAIFI on a year-to-year basis due to investments in Smart Grid and grid efficiency technologies.

- <u>The total number of minutes per year of sustained outage per customer that are customer reported and those that are identified using Smart Grid digital information</u>.
- The system-wide total number of minutes per year of sustained outage per customer served as reflected by the System Average <u>Separate</u> Interruption

Duration Indices (SAIDI) for customer reported and digitally identified outages tracked system-wide and by customer class and location.

- The frequency of customer interruptions system-wide in the reporting year that were customer reported versus those that were identified using digital information.
- How often the system−wide average customer was interrupted in the reporting year as reflected by the System Average Interruption Frequency Index (SAIFI) system-wide and by customer class and location that are customer reported and those identified using the digital information.
- The number of momentary outages per customer per year as reflected by separate Momentary Average Interruption Frequency indices (MAIFI) system-wide and by customer class and location that are customer reported and separately for those identified using the digital information.
- The number of outages listed by transmission and distribution circuits separately for customer reported and digitally identified outages.
- Tons of CO2-equivalent emissions avoided through improved efficiency of the use of existing fossil resources (including ancillary services).
- Cost of Smart Grid technologies designed to identify outages using digital information. (Tracking cost permits the digitally identified outages to be compared to the data cost).

2. Dynamic Optimization of the Grid Including Asset Management (§ 8360(b))

Most of the originally proposed metrics in this category track growth in data measurements related to dynamic optimization of the Grid, including asset management, but alone do not indicate the quality of asset performance, whether good or bad, except as a trend over time. What is needed is either a comparison to grid operations without Smart Grid technology and/or some other proxy that allows for some comparison and the identification of factor that caused any differences. Good metrics provide guidance regarding whether to do more, do less or do something different. The metrics below

allow for comparisons between portions of the grid subject to dynamic optimization and the more conventional grid.

- Number and percentage of miles of ***transmission*** circuits being operated under dynamic line ratings and number of corresponding miles not being operated under dynamic line ratings. These metrics can be compared to determine the progress toward completion.
- Number and percentage of miles of ***distribution*** circuits being operated under dynamic line ratings and number of corresponding miles not being operated under dynamic line ratings. These metrics can be compared to determine the progress toward completion.
- Capacity factor of the ***transmission*** system operated under dynamic line ratings as measured by the total annual energy transmitted by the transmission system under dynamic line ratings divided by the total annual energy capacity of the transmission system operated under dynamic line ratings.
- Capacity factor of the ***distribution*** system operated under dynamic line ratings as measured by the total annual energy transmitted by the distribution system under dynamic line ratings divided by the total annual energy capacity of the distribution system operated under dynamic line ratings.
- Energy efficiency of the part of the ***transmission*** system operated under dynamic line ratings as measured by energy delivered from that part of the transmission system to the distribution grid divided by energy entering the transmission system from the part of the transmission grid operating under dynamic line ratings.
- Energy efficiency of the part of the ***distribution*** system operated under dynamic line ratings as measured by the energy delivered from that part of the distribution grid to end-use customers divided by energy entering the distribution grid from the part of the distribution grid operating under dynamic line ratings.
- Cost of the Smart Grid components that enable dynamic optimization of the grid. (Tracking cost permits the capacity factor and energy efficiency improvements to be compared to the cost of the associated Smart Grid technologies).

3. Grid and Cyber Security

Most of the originally proposed metrics in this category track incidents over time and rely on trends in those metrics to make judgments about performance. But they provide no guidance regarding the quality of that performance, i.e., good or bad, nor do they specify which, if any, Smart Grid technology is responsible for reducing the number or types of incidents.

- Number of attempted cyber attacks on the utility where Smart Grid investments to reduce such attacks have been installed versus number of attempted cyber attacks on the utility where no related Smart Grid technologies are installed, either compared to (between) different locations or to baseline forecast of cyber attacks where no such technologies were installed.
- Number of security breaches experienced by the utility where Smart Grid investments to reduce such breaches have been installed versus number of security breaches where no related Smart Grid technologies are installed, either compared to (between) different locations or to baseline forecast of breaches where no such technologies were installed.
- Number of customers affected by security breaches where Smart Grid investments to reduce such breaches have been installed versus number of security breaches where no related Smart Grid technologies are installed, either compared to (between) different locations or to baseline forecast of breaches where no such technologies were installed.
- Monetary damages suffered by utilities as a result of cyber attacks on the utility or its infrastructure where Smart Grid investments to reduce such cyber attacks have been installed versus number of cyber attacks where no related Smart Grid technologies are installed, either compared to (between) different locations or to baseline forecast of cyber attacks where no such technologies were installed.
- Number and total number of minutes of outages attributable to grid and cyber attacks where Smart Grid investments to reduce such cyber attacks have been installed versus number of minutes of outages where no related Smart Grid

technologies are installed, either compared to (between) different locations or to baseline forecast of minutes of outages where no such technologies were installed.

- Cost of Smart Grid technologies installed to improve cyber security. (Tracking cost of relevant Smart Grid technology permits the improvement in cyber security, i.e., fewer attacks, breaches or minutes of outage, if any, to be compared to the cost of related Smart Grid technologies).

4. Deployment and Integration of Distributed Resources, Including Renewable Resources (§ 8360(c))

Most of the originally proposed metrics in this category track the growth in deployment and integration of distributed resources over time but there is no guidance for performance measurement, merely data measurements that alone do not permit comparisons of good performance to bad performance, except as a measure of the trend over time. Good and bad performance, therefore, is subjective and does not provide any clear direction regarding whether to do more, do less or do something different. For these metrics, it is critical to develop baseline forecasts that presume no Smart Grid technologies that facilitate the deployment and the integration of distributed resources.

- A baseline estimate of the number and percentage of electricity customers and magnitude of total load served by grid-connected distributed generation (split between renewable and non-renewable) compared to the actual numbers and percentages with Smart Grid technologies installed.
- A baseline estimate (assuming no Smart Grid investments) of the total annual production of distributed generation facilities compared to the actual total annual production of distribution generation facilities with facilitating Smart Grid technologies installed.
- The number, percentage and capacity of substations capable of handling reverse power flows caused by distributed energy resources that are due to Smart Grid investments.
- A baseline estimate of the average number of days between interconnection request for distribution-level distributed generation and activation of resource,

including separate averages for consumer-owned generation and non-consumer-owned generation, compared to comparable numbers with Smart Grid technologies installed, if any.

- Frequency and duration of interruptions of distributed generation due to transmission or distribution interruptions as measured in terms of an interruption duration index, interruption frequency index, and momentary interruption frequency index, where the indices are separately calculated for "Smart Grid" and "No Smart Grid" scenarios.
- Frequency and duration of interruptions of customers caused by distributed resources as measured in terms of an interruption duration index, interruption frequency index, and momentary interruption frequency index, where the indices are separately calculated for "Smart Grid" and "No Smart Grid" scenarios.
- A baseline estimate (no Smart Grid) of tons of CO2-equivalent emissions avoided through improved efficiency of renewable resource integration compared to actual tons of CO2-equivalent emissions avoided with Smart Grid technologies installed.
- Cost of Smart Grid technologies designed to support the deployment and integration of distribution resources.

5. Incorporation of Cost-Effective Demand Response, Demand-Side Resources, and Energy-Efficient Resources (§ 8360(d))

Most of the originally proposed metrics in this category track the growth in demand response, demand-side resources and energy-efficient resources over time but there is no performance measure implied, merely data measurements that alone do not clearly indicate whether this is good performance or bad, except as a measure of trend over time. Good and bad performance, therefore, is subjective and does not provide any clear direction regarding whether to do more, do less or do something different. For these metrics, it is critical to develop baseline forecasts that presume no Smart Grid technologies that facilitate the deployment and the integration of distributed resources.

- A baseline estimate (no Smart Grid technology) of the total megawatts and percentage of peak load of demand response (expected load impact when called)

compared to the actual megawatts and percentages with Smart Grid technologies installed.

- A baseline estimate (no Smart Grid technology) of total megawatt-hours of energy efficiency savings compared to the actual megawatt-hours with Smart Grid technology.
- A baseline estimate (no Smart Grid) of the amount of load bidding in ancillary services market compared to actual amount with supporting Smart Grid technology installed.
- A baseline estimate (no Smart Grid) of the amount of load clearing in the ancillary services market compared to actual amount with Smart Grid technology installed.
- A baseline estimate (no Smart Grid) of the amount of load bidding in the wholesale market compared to actual amount with Smart Grid technology installed, if any.
- A baseline estimate (no Smart Grid) of the amount of load clearing in the wholesale market compared to actual amount with Smart Grid technology installed, if any.
- Percentage of demand response AutoDR enabled versus all other demand response.
- Cost of Smart Grid technologies designed to support the investment in cost-effective demand response, demand-side resources, and energy-efficient resources.

6. Deployment of Cost-Effective Smart Technologies (§ 8360(e))

Most of the originally proposed metrics in this category track growth in the number and percentage of smart technologies installed, such as SCADA , but there are no performance metrics to suggest whether they are cost effective. Cost effectiveness calculations require tracking the cost of the specific technologies. These metrics are basically build metrics and as such measure change over time as more and more Smart technologies are installed. There are no outcome-related metrics proposed in this category

that would quantify the benefits of these installations to compare to their costs. Some of these outcome benefits may be addressed in other categories. We have added a cost metric, however, to help measure cost effectiveness.

- The number and percentage of installations and magnitude of total load served by substations or feeder lines that use automation equipment or that possess advanced measurement technologies
- The number of points and percentage and magnitude of the total load covered by Supervisory Control and Data Acquisition (SCADA) systems
- The number of installation points and percentage and magnitude of the total load in the service territory covered by phasor measurement units (PMUs)
- The number of installation points and percentage and magnitude of the total load served by phase data concentrators (PDCs) receiving data from PMUs that share all relevant data with external parties in support of reliability management
- The number of installation points and percentage and magnitude of the total load served by real-time data management and visualization systems receiving data from PDCs and PMUs
- The number of installation points and percentage magnitude of the load covered by automated electric transmission systems or possessing advanced measurement
- Cost of Smart Grid investments that facilitate the deployment of Smart Grid technologies.

7. Integration of Cost-Effective Smart Appliances and Consumer Devices (§ 8360(f))

Most of the originally proposed metrics in this category link meters and devices to the Home Area Network but there is no performance measure implied here, merely data measurements that alone do not indicate whether this is good performance or bad, except as a measure of trend over time. There is no direction implied regarding whether to do less, do more or something different. These are simply build-related metrics and measure progress toward system-wide coverage. What is missing is quantification of the benefits achieved by customers with these networks and consumer devices, including cost savings. Many of these may be covered in the other categories. Therefore, UCAN adds a

placeholder metric to be defined at a future time that allows the utility to track the use and usefulness of the smart grid investments to customers by their response to these Home Area Networks and consumer devices installed.

- Number and percentage of meters with an activated Home Area Network
- Number and percentage of Home Area Networks able to communicate with consumer devices
- Number and percentage of consumer devices registered with the utility
- Number and percentage of consumer devices actively communicating with Home Area Networks
- Number and percentage of customer complaints related to interaction of consumer devices with Home Area Networks
- A baseline estimate of customer actions, e.g., pricing, demand response and other program participation, in the absence of Smart Grid technology investments by the utility compared to the actual customer actions with the Smart Grid investments.
- Cost to the utility of the Smart technologies that facilitate the beneficial use of Home Area Networks and related appliances and other consumer devices.

8. Deployment and Integration of Energy Storage and Peak Shaving (§ 8360(g))

The originally proposed metrics in this category are not sufficient as measures of the impact of Smart Grid technologies on electric storage and peak shaving without reference to the specific Smart Grid installations and timing nor do they control for other factors that may contribute to the growth of energy storage and peak shaving without Smart Grid technologies. UCAN has revised these metrics to permit comparisons to a baseline estimate without Smart Grid installed.

- A baseline estimate of the number and percentage of electricity customers and magnitude and percentage of total load served by energy storage compared to the actual numbers and percentages with relevant Smart Grid technologies installed.
- A baseline estimate of the number and percentage of electricity customers and magnitude and percentage of total load served by thermal-storage air conditioning compared to the actual numbers and percentages with Smart Grid technologies.
- A baseline estimate of the amount of energy storage participating in ancillary services markets compared to the actual numbers and percentages with relevant Smart Grid technologies installed.
- A baseline estimate of the amount of energy storage providing ancillary services to the grid compared to the actual numbers and percentages with Smart Grid technologies.
- A baseline estimate of the MW and Mwh of capacity of peak load-reducing energy storage installed compared to the actual numbers and percentages with relevant Smart Grid technologies installed.
- A baseline estimate of the MW and Mwh of capacity installed energy storage compared to the actual numbers and percentages with relevant Smart Grid technologies installed.
- A baseline forecast of the distribution feeder load factor with and without energy storage compared to the actual load factor with Smart Grid technologies installed.
- A baseline estimate of substation capacity resulting from energy storage compared to the actual numbers and percentages with relevant Smart Grid technologies installed.
- A baseline estimate of the frequency and duration of interruptions of customers due to energy storage compared to the actual frequency and duration of the interruptions of customers with the relevant Smart Grid technologies installed.
- Cost of the Smart Grid technologies designed to facilitate energy storage and peak shaving. (Tracking costs will facilitate preparation of cost effectiveness calculations).

9. Deployment and Integration of Plug-in Electric Vehicles

Tracking most of the original proposed metrics in this category over time may be insufficient unless linked specifically to the timing and installation of the relevant Smart Grid technologies and control for any other factors over time that may contribute to the growth in electric vehicles. The alternative metrics below permit comparisons to baseline estimates. UCAN has substantially reduced the number of metrics for EVs largely because of the highly speculative nature of these metrics and the likelihood of other non-Smart-Grid factors in the adoption of EVs.

- A baseline estimate (no Smart Grid technology) of the number of plug-in electric vehicles registered within the utility service territory compared to the actual number of plug-in electric vehicles registered within the utility service territory with facilitating Smart Grid technology installed.
- A baseline estimate (no Smart Grid technology) of electricity usage and peak demand attributable to plug-in electric vehicle charging during off-peak and on-peak hours compared to the actual electricity usage and peak demand attributable to plug-in electric vehicle charging during off-peak and on-peak hours.
- A baseline estimate (no Smart Grid technology) of the number of customers utilizing a separate meter and number of customers utilizing a submeter to separately measure plug-in electric vehicle usage from facility usage compared to the same metrics with Smart Grid technology installed.
- A baseline estimate (no Smart Grid technology) of the number of customers enrolled in time-variant utility tariffs or plug-in electric vehicle customers compared to the same metrics with Smart Grid technology installed.
- A baseline estimate of the number of networked customer-premise plug-in electric charging facilities that communicate with the utility: 1) Via the HAN; 2) Via the PLC; 3) Via the internet; 4) Via and alternative communications platform compared to the same metrics with Smart Grid investments installed.
- A baseline estimate of the number and percentage of networked device installations on distribution and transmission systems that can communicate with

plug-in electric vehicles compared to the same values with Smart Grid investments installed.

- Cost of the Smart Grid technologies designed to facilitate the development and integration of plug-in electric vehicles.

10. Provide Consumers with Timely Information and Control Options (§ 8360(h))

Most of the originally proposed metrics in this category need to be compared to comparable data from more conventional meters, e.g., number of customers, complaints, audits, pricing programs. These changes are reflected in the alternative metrics below.

- The number and percentage of electricity customers and magnitude of total load served by advanced metering infrastructure.
- The number of complaints related to advanced meters compared to the number of complaints related to conventional meters.
- Number and percent of advanced versus conventional meters replaced annually.
- Number of outages attributed to advanced meter versus conventional meter malfunctions
- Number of advanced versus conventional meter audits requested by customers.
- Number and percentage of customers with advanced meters in total and by class accessing energy usage information through the Internet or other web-based portal
- Number and percentage of authorized third parties accessing customer energy usage information.
- Number of customers accessing real-time usage and/or pricing information and how often using advanced versus conventional meters.
- The number and percentage of electricity customers and magnitude and percentage of total load served by dynamic or time-variant pricing programs (*e.g.*, real-time pricing, critical peak pricing, *et al.*) in total and by customer class using advanced versus conventional meters.

- The number and percentage of electricity customers and magnitude and percentage of total load served by default and voluntary dynamic or time-variant pricing programs in total and by customer class using advanced versus conventional meters.
- The number and percentage of electricity customers and magnitude and percentage of total load served by load management programs (*e.g.*, interruptible tariffs, direct load control, consumer load control with incentives) by customer class using advanced versus conventional meters.

11. Lowering Barriers to Adoption of Smart Grid (§ 8360(j))

UCAN believes that both items under this category were not particularly meaningful and were not metrics. Thus, we recommend deleting this subsection.