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11-IEP-1G
DOCKET
11-IEP-1H
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July 6, 2011

California Energy Commission
Docket Office, MS-4
Re: Docket No. 11-IEP-1G, 11-IEP-1H
1516 Ninth Street
Sacramento, CA, 95814-5512

To Whom It May Concern:

Subject: The Los Angeles Department of Water and Power's Response to the California Energy Commission's Request for Comments related to the June 22, 2011 Workshop on Distribution Infrastructure Challenges and Smart Grid Solutions to Advance 12,000 Megawatts of Distributed Generation, *"Docket No. 11-IEP-1G, 11-IEP-1H"*

The Los Angeles Department of Water and Power (LADWP) respectfully submits the attached comments in response to the California Energy Commission's (CEC's) request for additional information related to the June 22, 2011, Workshop on *Distribution Infrastructure Challenges and Smart Grid Solutions to Advance 12,000 Megawatts of Distributed Generation.*

The City of Los Angeles has supported renewable energy development to serve our long-term resource goals. As LADWP looks into the future, most of the issues influencing strategic and resource planning are based on the critical issues that LADWP is facing to address greenhouse gas emissions, once-through cooling, and the integration of increased amounts of renewable resources.

LADWP currently has approximately 350 MW of customer installed DG (primarily combined heat and power) on its electrical grid, producing approximately 1,700 Gigawatt hours (GWh) annually, most of which is consumed on-site, although approximately 400 MWh is exported back to LADWP.

LADWP is also working on its Smart Grid demonstration project, which is currently in the preliminary design phase. LADWP has received a $60 Million dollar American Recovery and Reinvestment Act (ARRA) grant from the

Department of Energy (DOE) for demonstrations of Smart Grid Technologies. The research performed under this grant will focus on Electric Vehicles, Demand Response, Cyber Security and Customer Behavior studies. These project demonstrations will incorporate solar, battery and wind technologies and will utilize Advance Metering Infrastructure (AMI) and other smart controllers for power system operations. We expect to have the ARRA project completed by 2015.

Based on the results of this grant research, a foundation may be developed for future distributed generation projects and initiatives.

LADWP is currently facing several issues in considering the implementation of large amounts of DG in its service area. Excess amount of DG (i.e. during low load conditions) may result in problems controlling and operating the distribution and transmission system. Also, it is important to note that Smart Grid and DG technologies are still under development. Therefore, LADWP is interested in the emerging technologies and technical standards development to enable more DG.

As mentioned earlier, there are several initiatives underway during the next decade that will require careful planning, proper integration, and adequate central control.

An electronic file was also submitted to Docket@energy.state.ca.us on July 6, 2011.

LADWP looks forward to continue working with CEC staff on this and other matters. If additional information is necessary concerning this matter, please contact Mr. Oscar A. Alvarez at (213) 367–0677 or Mr. Oscar Herrera at (213) 367–4880.

Sincerely,

For

Randy S. Howard
Power Engineering Manager

OH:oh
Enclosures
c/enc: Mr. Oscar A. Alvarez
Mr. Oscar Herrera

California Energy Commission's Request for Comments

The IEPR Committee requests that parties address the following in the panel discussions and public comment portions of the workshop and in written comments. The questions are organized by topic in the workshop. Written comments are due to the Energy Commission by 5:00 p.m. on July 6, 2011. Please see the workshop notice for instructions on how to submit written comments:

Planning for interconnecting and integrating 12,000 MWs of Distributed Generation into the Distribution System by 2020

I. Planning for the Future

1Q. What is your vision for your distribution system?

1A. The Los Angeles Department of Water and Power ("LADWP") is responsible for planning, designing, implementing, operating, and maintaining a distribution system that is safe, economical, and reliable in supplying power to customers in the city of Los Angeles while being consistent with our commitment to environmental stewardship.

2Q. Have you developed a plan and roadmap of distribution system upgrades to address aging infrastructure issues, and the two-way power flow? How are these plans integrated with your smart grid deployment plans?

2A. LADWP has established programs to address aging infrastructure, including replacement programs for poles, conductors, distribution transformers, station transformers, circuit breakers and various other system elements. These programs are regularly reviewed and adjusted as needed.

LADWP has about 4,000 DGs presently connected to the Los Angeles distribution and/or subtransmission system, ranging from 1KW to more than 30MW. To date, with decades of experience and careful planning and implementation, there have been virtually no significant, pervasive problems or instances of DG reverse power flow causing voltage regulation or power quality issues. LADWP monitors system performance and will implement actions as may be needed to assure acceptable system security and high level power quality is achieved.

The LADWP EMS/SCADA system is presently undergoing a complete replacement and expansion that includes considerable additional (both present and future) monitoring and control capability. LADWP is initiating selected automated and communicating metering with the capability for automated meter reading, real-time pricing signals, load control, and other features. Where applicable, upgraded equipment at all levels from the bulk power station to the customer is implemented to be compatible with future automation, monitoring and control.

Possible additional future actions may include changes in utility-side controls, apparatuses, operations and/or changes to DG requirements. In addition, LADWP plans to test and study various DG monitoring and control devices within in its Smart Grid Demo Project.

3Q. Have you received American Recovery and Reinvestment Act (ARRA) funds for Smart Grid Projects? What is the status of your ARRA projects and how might they advance distributed generation?

3A. Yes, LADWP received a $60 Million dollar ARRA grant from the DOE for demonstrations of Smart Grid Technologies. The Demonstration grant will focus on research of Electric Vehicles, Demand Response, Cyber Security and Customer Behavior studies. These project demonstrations will incorporate solar, battery, and wind technologies, and will utilize Advanced Metering Infrastructure (AMI) and various other smart controllers for operations. The project is currently in preliminary design. LADWP expects to have the ARRA project completed by 2015.

Based on the results of these research projects, a foundation may be developed for future distributed generation projects and initiatives.

4Q. What strategies will you be implementing to achieve this vision in the near-term (1-2 years), mid-term (2-5 years), and long-term (5 years or longer)?

4A. Within budget limitations, all infrastructure replacement programs will continue. SCADA system replacement/enhancement is proceeding. Customer meter replacements from existing conventional meters to meters with improved monitoring/automating/communicating/control capability are on-going and planned to be increased.

5Q. What are the most pressing technical challenges associated with the integration of 12,000 MWs of Distributed Generation (DG) by 2020?

5A. The most pressing technical challenge associated with the integration of 12,000 MWs of DG will be the reliable integration of variable generation into the interconnection. If DG goals are achieved, these distributed generators may become the largest source of energy within the LADWP Balancing Authority area. LADWP will need the capability to monitor the variability and flow of DG in real time, the ability to use conventional generation capable of providing regulation, and excess generation to provide adequate reserves. Additional hardware and software resources are needed to aggregate, monitor, and control DG to realize the maximum benefit.

As indicated in 3A, LADWP plans to test and study various DG monitoring and control devices within its ARRA Project, which is expected to be completed by 2015.

6Q. In addition to meters, please provide an overview of what commercially available technologies and telemetry are you currently using or planning to secure in the next two years that will improve your ability to monitor and manage increasing penetrations of DG?

6A. In addition to meters, LADWP plans to:

- Secure a newer SCADA System;
- Update the PI Historian System, which collects control-type data;
- Substation Automation (Replacing RTUs with newer technology); and
- Implement wired & wireless controls to more distribution devices (Poletop Distribution Station Configuration).

7Q. How are you planning to leverage load management programs and storage to help manage increased penetrations of DG?

7A. As indicated in 3A, LADWP's Smart Grid Demonstration project will test out a variety of technologies including DG technology and a Demand Response component. Currently, LADWP is evaluating various residential load aggregation technologies that will provide an option of demand response participation to residential customers. Aggregation of a large number of residential customers may potentially reduce generation costs and distribution system strain during peak consumption periods.

It is important to note that emerging smart grid technologies for system monitoring & controls, and standards are still in their development infancy. The implementation of cyber security requirements along with system controls is also a hurdle yet to conquer.

II. Interconnecting DG to the Distribution System

1Q. Modifications to the Wholesale Distribution Access Tariff for some utilities and the California Independent System Operator Generation Interconnection Procedure allow for the study of interconnection applications in clusters. It is assumed that these new coordinated processes will be more efficient. Beyond revisions to these processes, please provide suggestions for how the overall process could be improved?

1A. This question is not applicable since LADWP is a POU.

2Q What analytical tools or models do you currently use to analyze the impact of DG projects on system performance? What new tools have you added or plan to add in the next two years that will improve your ability to quickly, but safely process the growing number of interconnection applications?

2A Thousands of DG installations have already been planned and implemented in Los Angeles that range in capacity from 1kW to over 30MW. Proposed DG projects are assessed using analysis tools including load flow assessment. DGs must comply with LADWPs rules for electric service and published service requirements to assure that voltage, power factor, and harmonic content are acceptable. . The majority of small DG installations don't require specific system performance evaluation at this time.

3Q Given that a growing number of wholesale or system-side renewable DG projects are applying for interconnection, many of which may not be located within or close to load centers, what planning process should be used to determine the need and timing for expanding the distribution infrastructure to accommodate these new generators? Should the process be coordinated with the CAISO? How should the costs for these upgrades be allocated and what suggestions do you have for allocating these costs in the future?

3A Thousands of DG installations have already been planned and implemented in Los Angeles that range in capacity from 1kW to over 30MW. As noted above, proposed DG projects are assessed using analysis tools including load flow assessment. DGs must comply with LADWPs rules for electric service and published service requirements to assure that voltage, power factor, and harmonic content are acceptable. The majority of small DG installations don't require specific system performance evaluation.

LADWP supports a case-by-case evaluation based on customer proposals, while LADWP ensures successful integration of DGs into its network based on the number of interconnection requests and the diversity of technologies interconnected to a circuit, LADWP conducts cluster-level studies to prevent overloads and potential problems.

Each utility's distribution system is unique. LADWP has its own internal planning process for both transmission and distribution. The need to coordinate with the CAISO seems inappropriate given the use of limited state and individual utility resources.

LADWP supports a policy that assigns costs of distribution upgrades necessary for interconnecting customers, to be paid by the interconnector.

4Q In comments filed for the May 9th Localized Renewable DG IEPR workshop, the Clean Coalition suggested that "The establishment of predefined standardized interconnection costs would avoid these issues [cost-related issues casing multiple studies of project that add to the bottlenecks in the queue and study process], providing transparency and predictability to the process while greatly reducing study requests for projects that will not be built." Would using a similar approach to Germany's in trying to predetermine costs by posting formulas that estimate the technical performance levels of a proposed DG project improve the interconnection process? Is a standardized table of assigned interconnection costs feasible? If not, why?

- What are the drivers of interconnection costs? Do costs increase as volume increases?
- Currently, the CAISO is using a cluster approach for interconnecting to transmission systems. After conducting a study of the impacts of a cluster of proposed projects, the CAISO determines the costs of interconnecting the cluster of projects, then allocates the cost to the number of participants in the cluster. Would this approach be feasible for the utilities to use to establish a standardized interconnection cost table for distributed generation?

4A Interconnecting localized renewable DG to the 4.8kV and 34.5kV distribution grid can range from a marginal amount to hundreds of thousands of dollars. If the proposed renewable DG's site has existing on-site transformation, the interconnection cost is marginal since most of the equipment is already there. If new conduits, cables, switches, fuses, transformers, and telemetering equipment are needed for the interconnection, the costs may be significant. As the volume of DG increases, the cost for integration may also increase due to the need for network upgrades.

LADWP does not recommend standardizing interconnection costs due to the variation in costs; these costs are site specific. In order to maintain reliability and minimize the need for network upgrades, LADWP recommends an incremental approach, with geographic diversification to the integration of the renewable DG.

5Q Should a new integrated infrastructure planning process that includes both distribution and transmission studies be established to ensure that investments in both the transmission and distribution systems are coordinated statewide?

5A Each utility's distribution system is unique. For a utility like LADWP a statewide coordinated integrated infrastructure planning process to include both distribution and transmission studies would not be practical or beneficial. LADWP has its own internal planning process for both transmission and distribution. To expand that to a statewide integrated process would seem an inappropriate use of limited state and individual utility resources.

III. Smart Grid to Support State Environmental Goals

1Q For the Investor Owned Utilities: Smart Grid Implementation Plans will be filed at the CPUC on July 1, 2011. What smart grid technologies have already been included in your current General Rate Case (GRC) at the CPUC, or if you are just filing your GRC, what smart grid technologies are you requesting funding for?

1A This question is not applicable to LADWP.

2Q For the Publicly Owned Utilities: What smart grid technologies have already been included in your current budget, and/or do you plan to include what smart grid technologies are you requesting funding in your next budget cycle?

2A LADWP's current and future budgets include the following technologies:

- Distributed Generation (Solar, Wind, Energy Storage)
- Transmission Automation
- Substation Automation
- Distribution Automation
- Advanced Metering Infrastructure

Supporting technologies also in the budgets include:

- Communications media
- Cyber Security

As mentioned in Sec. I, 7A, it is important to note that emerging smart grid technologies for system monitoring & controls, and standards are still in their development infancy. The implementation of cyber security requirements along with system controls is also a hurdle yet to conquer.

3Q Developing and achieving the vision articulated in SB 17 for a smart grid is an evolutionary process. Smart meters are being installed throughout the state and the focus is on capturing the value of customer data and information. Moving forward, when do you anticipate focusing on distribution grid modernization?

3A The modernization of the distribution grid is occurring concurrently with the implementation of smart meters. These smart meters will allow for:

- Monitoring of pole top transformers,
- Monitoring / control of pole top capacitor banks,
- Monitoring of fault detectors,
- Monitoring / control of line switches.

The primary factor allowing the concurrent effort is the establishment of a robust and secure smart meter communication infrastructure.

During this implementation process, LADWP is continuously reviewing the costs and benefits of the technologies, both individually and in combination. The results of this review will provide guidance for future direction of distribution grid modernization.

4Q What emerging smart grid technologies and software offer near term opportunities to support the monitoring and management of DG on the distribution system?

4A The greatest challenge and near term opportunity for DG on the distribution system is the implementation of a robust and reliable communication system to support the data transfer between the customer and the utility. This is the communication from the smart meter and potentially the customer appliances to the back-office system. It is the critical component of all the Smart Grid technologies and software.

5Q When doing a cost benefit analysis of smart grid technologies, how do you value societal benefits associated with state goals (e.g. environmental benefits, increased renewable generation)?

5A The benefit analysis of Smart Grid technologies requires reviewing quantitative and qualitative factors. The quantitative analysis would yield a direct result in the cost benefits for Smart Grid technologies; the qualitative analysis does not. The qualitative analysis must use a non-cost factor as a baseline point of reference. As an example, to qualitatively analyze the carbon dioxide creation by power generation would require identifying the current carbon dioxide creation value as a point of reference. If the implementation of a Smart Grid technology can be shown as providing a reduction in carbon dioxide creation by power generation, assuming other factors are demonstrated to be independent, then that Smart Grid technology could be considered as providing a societal benefit.

IV. Inverter Functions to support integration of 12,000 MW of DG & Storage. Can California move forward sooner rather than later?

1Q.	What are the key distribution system **operational challenges** from high penetrations of distributed generation and storage (including EVs)? Managing fluctuations due to renewable source variability? Managing DER power output to avoid transformer overloads and/or reverse power flow in "sensitive environments"? Managing volt/vars? Minimizing impacts from voltage and frequency deviations? Low voltage ride-through? Mitigating transmission system impacts? Coping with excess "must run" energy? Other?

1A. DG will have to be truly distributed throughout our system in a studied fashion. Saturation in any area can result in voltage instability and/or circuit loading issue. LADWP would like to have operational aggregate control of inverter var and energy output for voltage control and support.

It is important that all inverters have low voltage ride through capability to avoid voltage collapse. Replacement and augmentation of LADWP's current thermal generation with quick start thermal and hydroelectric generation will assist to manage LADWPs must-run generation. The construction of an additional hydroelectric pump storage and generation facility would be the best operational solution to this challenge.

2Q.	How will/should the IEEE 1547.8 requirements address those interconnection challenges? In particular, what communication monitoring and control requirements (including autonomous, pre-set controls) for "sensitive environments" should be included?

2A. IEEE 1547.8 does not address DG's primary challenges. LADWPs' need for conventional thermal and hydroelectric generation to regulate and back up the variability of distributed generation is not addressed.

The integration of this variable generation also requires real time monitoring. The standard four-second scan rate in our SCADA system probably needs to be implemented on all distributed generation. Further, LADWP would need to monitor distributed generation as an aggregate in LADWPs balancing area, and have the ability to curtail or increase overall output on a pro-rata basis determined by the generational and stability requirements encountered in daily operations.

3Q.	What advanced DER inverter functions are being defined that can help meet the high penetration challenges and the 1547.8 requirements? What other functions may be needed to manage high penetrations of DER, including EVs and storage?

3A. Functions that need to be managed for high penetrations of DER are: VAR control, low-voltage ride-through, and SCADA functionality including some form of curtailment & monitoring. These functions will not offset the need for significant amount of reserve generation for large amounts of DERs.

4Q. What communications infrastructure will be needed for supporting those functions? What might be the optimal mix of autonomous (pre-set) DER actions, commanded control actions, and/or broadcast actions? Why is interoperability and use of communications standards important?

4A. LADWP currently does not have a description or a plan for communication infrastructure that can support such functions. The communication infrastructure will have to be robust, redundant & high availability of reliability.

5Q. How can California best utilize the inverter functions which have been defined in the IEC 61850 standard and mapped to DNP3 (and eventually to SEP 2.0)? What implementations and demonstrations of these functions are taking place or planned in the U.S.?

5A. Assuming large installations and/or aggregated DER DR controls, Inverter control in PV/Storage facilities could be useful in a few different scenarios:

- Tightly couple controls [direct command and control response] functions are useful to mitigate localized circuit loading issues and voltage issues.
- There is potential for some load following and regulation.
- Loosely coupled controls and/or programmed responses could be useful for systemic voltage control and for reshaping load curves.

This assumes large installations and/or aggregated DER DR controls. We are unaware of any current or planned demonstrations of these functions.

6Q. Compensation for customers – tariff-based or pricing-signal-based? Rates through energy service providers? Separate contracts with commercial and industrial customers? Different tariffs for different customers? Providing incentives to install DER systems while not penalizing those customers who may not be able to install DER systems?

6A. LADWP is currently providing incentives to its customers for the installation of customer-owned solar DG through the Solar Incentive Program. The solar energy is net-metered; any excess generation will be credited to customers' account to offset customer's future consumption.

LADWP is developing a Feed-in Tariff program to be available in Fall 2011, subject to financing.

7Q. NIST has proposed five standards for adoption by FERC, including IEC 61850 which supports the inverter functions. These standards are fundamental to smart grid interoperability overall. How important is the adoption of these standards by FERC and/or State regulators to developing uniform and interoperable communications systems between distribution operations and DER systems?

7A. The establishment of national standards for all Smart Grid technologies is paramount for implementation of robust and secure interoperable DG. It would provide certainty and guidance to the customers and the utility on how to pursue different technologies and/or vendors, and to achieve a comprehensive and cost effective solution.

8Q. In comments filed by SCE in response to Committee Workshop on Renewable, Localized Generation on June 5, 2011, on standards and the standard process, SCE indicated it will take several years to finalize new requirements to take into account the interconnection of high penetrations of solar DG which are addressed in the current Institute of Electrical and Electronics Engineers (IEEE) Standard 1547. SCE suggests that, "In the interim, load serving entities would need to put their own rules in place to avoid having a large base of installed equipment that does not support the grid under a high-LER-penetration scenario." Could SCE or other utilities comment on what they anticipate these rules would be?

8A. LADWP does not have a response for this question at this time.

9Q. Also included in the SCE comments, it was suggested that developing models to evaluate the performance of the distribution grid, comparing the results through laboratory tests, field data, and benchmarking models against existing situations in Europe where high penetration levels exist is necessary to mitigate the risk that current system models can no longer predict performance of a future system. Is this type of research currently planned? If not, when and who should do this research?

9A. This research appears to be inherently conducted already within LADWP's Smart Grid plan. Smart Grid refers to intelligent data gathering and advanced two-way digital communication capabilities overlaid on electric distribution networks to provide real-time data that enhances the utility's ability to optimize energy use. In essence, Smart Grid technologies can turn every point in the existing network – including every meter, switch and transformer – into a potential information source, able to feed performance data back to the utility instantly. Smart Grid Technologies will provide utilities with the information required to implement real-time, self-monitoring networks that are predictive rather than reactive to instantaneous system disruptions.

In September 2010, LADWP invited a group of German Delegates to share with us 'lessons learned' on their Feed-in-Tariff program. German representatives stated that their implementation of smart grid technology will achieve greater grid reliability. Smart meters will allow operators to manage the generation and flow of renewable energy in their system.

During the transition period, the German Delegation recommended that utilities carefully perform system studies to determine the grid capacity for solar, and integrate the FIT at a manageable level to ensure system stability.