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Request for Comments

Draft Solicitation on Modeling Tools to Evaluate Distributed Energy Resources (DERs) and Microgrids located behind the meter on California's Modern Distribution Systems

California Energy Commission staff is developing a competitive Grant Funding Opportunity (GFO) through the Electric Program Investment Charge (EPIC) program to improve dynamic distribution modeling tools that can determine how to operate with high amounts of renewables, Distributed Energy Resources (DERs), including plug-in electric vehicles, and microgrids using advanced smart grid equipment. Staff is seeking input from stakeholders on the proposed solicitation approach, and more specifically seeks input to the questions asked on page 4 of this document.

The Energy Commission's strategy to improve the modeling of the distribution system and evaluate DERs and microgrids located behind the meter is supported by the following objectives:

1. There continues to be a need for modeling to determine the locational impacts of DERs either as standalone elements, as part of a microgrid, or as a combination of DER systems.
2. There is a need for a desktop interface to integrate all the critical distribution system grid-planning tools and enable them to share information more effectively between applications.
3. There is a need for faster calculations in modeling tools. Tools should have their underlying programming code updated to take advantage of multi core processors, Graphics Processing Units (GPUs) and high performance computing. There is a need for improving the dynamic time series analysis along with sequencing and paralleling the analysis in distribution modeling tools.

Funding for this GFO is expected to be about $9 million. To implement this solicitation, the following separate project groups are proposed:

Group 1 Validated and Transparent Microgrid Valuation and Optimization Tool

Proposed Group Funding Level: $2 million

Though it is becoming widely recognized that microgrids with behind-the-meter DER can benefit the grid and provide greater value to customers than only photovoltaic (PV) or storage alone can, there is not yet consensus on how to determine those values or how they can be maximized. This project group is focused on the development of a microgrid valuation and optimization modeling tool to help streamline the deployment of distributed microgrids that include high penetrations of DERs and maximize benefits to individual customers and the larger grid. This project group will develop and evaluate models to reduce

costs and increase the potential value streams for microgrids to help strengthen the business case.

The Energy Commission developed a similar style of tool for energy storage called StorageVet (http://www.storagevet.com/). The software is a publicly available, web-hosted tool to help estimate the benefits and costs of energy storage in diverse use cases. The tool performs optimization and simulation of energy storage project dispatch for user-configured cases. The user has the ability to flexibly customize energy storage use cases for different locations, project specifications, value objectives, and constraints. The microgrid valuation and optimization modeling tool will leverage the lessons learned from the StorageVet project to develop a similar tool for microgrids.

Tools created in this group should leverage the California Public Utilities Commission (CPUC) – Investor Owned Utilities (IOUs) Distribution Resources Plans, CalEnviroscreen, and other existing modeling tools to provide additional enhancing features focused on increasing the value of microgrids to customers and the grid.

Eligible Group 1 projects will:

Develop, test, and validate a publicly available modeling tool to determine the most optimal size, and the combination of the most optimal DERs for a microgrid for a given location. Microgrids, being a built up system of DERs, can provide a variety of benefits to constrained areas of the grid, local communities, and disadvantaged communities. The tool must identify and assess the greatest value for microgrids by geographic location and use case (critical facility, high penetration renewables, others) and be able to identify if these locations are within disadvantaged communities and the benefits to the disadvantaged community. The tool must also assess the optimal DERs for use within each microgrid. Tools developed will run "sensitivity cases" for fuel costs, load growth, etc. Projects will have a Technical Advisory Committee that will include utilities to check for sensitivities.

Group 2: Open-Source Modeling Framework and Translation tool.

Proposed Group Funding Level: $1 million

Various tools are used in distribution planning. These tools come from a diverse number of suppliers and do not operate within a single user framework to interact and share information. Enabling the sharing of information across tools would save time and money. A single desktop environment/user interface and a common information model to enable data sharing information between applications needs to be developed to integrate the various tools into a distribution-planning suite.

Eligible Group 2 projects will:

Perform an initial study to determine the various models that are used for grid modeling and planning across the three investor owned utilities. Projects will map the modeling tools information fields into a common information model such as International Electrotechnical Commission (IEC) standard CIM 61968 data fields to provide information exchange across different applications. Using this information, a translation tool will be developed to transfer the data into and out of the data set for use by the various modeling tools making up the suite. This will be included in a desktop environment to integrate the various tools.

Group 3: Enabling High Performance Computing in Open-Source Grid Modeling

Proposed Group Funding Level: $3 million

The time needed for models doing any iterative analysis takes too long to run. Currently, a compromise between time to run and accuracy is made. As an example, an application of an iterative method to provide a capacity analysis takes about 25 minutes to run and there are questions on whether it supplies the needed accuracy. Measurably improving the speed and accuracy of open-source modeling tool algorithms capable of dynamic time series modeling is critically needed.

Eligible Group 3 projects will:

Speed up the overall simulation process of open-source modeling by enabling high-performance computing using multicore processors and exploring parallel processing coding to take advantage of the emerging power of graphics processing unit (GPU) accelerated computing. This will use a GPU to accelerate deep learning, analytics, and engineering applications. GPU accelerators now power energy-efficient data centers in government labs, universities, enterprises, and small-and-medium businesses around the world. They play a huge role in accelerating applications in platforms ranging from artificial intelligence to cars, drones, and robots. Projects will also look at improving the dynamic time series analysis along with sequencing and paralleling the analysis for improvements to meet more modern software and Application Program Interface (API) practices. An API specifies how software components should interact.

Group 4: Open-Source Desktop Environment/User Interface for Gridlab-D

Proposed Group Funding Level: $3 million

Many modelers are working with Gridlab-D, an open-source distribution-modeling tool. Gridlab-D is suitable for simulation of smart grid technologies and unlike other commercial power flow software, uses an agent-based approach to simulating smart grids. Gridlab-D enables the modeling not only of power systems, but also energy markets, building technologies, and the other

resources such as demand response that are becoming part of modern electricity systems. A weakness identified that hinders its adoption by more users is the use of only a command line interface. Developing a better user interface than the current command line interface would help make Gridlab-D more user-friendly in the context of public interest and potential ease of use for developers, researchers and public agencies.

Eligible Group 4 projects will:

Develop an open-source desktop environment/user interface to replace the command line interface for Gridlab-D. The interface will be developed to create input models and for execution and control of the simulations. This interface will be developed with input from users and will include representatives from the Energy Commission and CPUC.

Questions:

Energy Commission staff is seeking input from interested stakeholders on the four funding groups of the draft GFO. Specifically, staff seeks responses and comments on the following questions:

1. (For all groups) Are the proposed funding amounts identified in this Request for Comments (RFC) appropriate for the work requested? Please explain the rationale behind the recommendations, and if applicable, what the appropriate level of funding should be to develop the products identified in this draft solicitation?
2. (For all groups) What are specific recommendations you can provide to improve the group descriptions of the solicitation outlined in this RFC that would result in a better evaluation of the impacts of high concentrations of DER? Please explain the rationale behind the recommendations.
3. (For all groups) Are there existing efforts that complement the groups identified in this RFC? Are there specific changes to this proposed solicitation that you would suggest to better leverage these existing efforts? Please explain the rationale behind the recommendations and the expected value of your recommendations.
4. (For groups 2,3 and 4) Should it be required that all source code generated as a result of this solicitation be hosted on a public open-source developers site such as GitHub? If not, describe how to ensure distributed version control and source code management functionality while making the open-source code available to the open-source developers' community.
5. (For all groups) Are there suggestions to better complement the needs associated with CPUC proceedings related to Modeling, distributed renewable generation, electric vehicles, the use of Smart Grid Technologies and Distribution Resource Planning? Please provide specific recommendations and rationale.

EPIC Program Background

EPIC is a ratepayer surcharge authorized by the California Public Utilities Commission (CPUC). In December 2011, the CPUC adopted Decisions 11-12-035, as modified by Decision 13-01-016, authorizing the collection of EPIC funds for the benefit of electricity ratepayers of Pacific Gas and Electric (PG&E), San Diego Gas & Electric (SDG&E), and Southern California Edison (SCE). In May 2012, the CPUC adopted Decision 12- 05-037, as modified by Decision 13-04-030, establishing the purposes and governance for the EPIC Program and designating the Energy Commission as one of its administrators. On April 9, 2015, the CPUC adopted Decision 15-04-020, which approved the Energy Commission's Proposed 2015-2017 EPIC Investment Plan. The plan sets the current framework for providing investments in applied research and development, technology demonstration and deployment, and market facilitation of clean energy technologies and approaches. Additionally, Senate Bill 96 (Committee on Budget and Fiscal Review, Chapter 356, Statutes of 2013) provides that in administering the EPIC Program, the Energy Commission will fund research, development, and demonstration programs and projects that lead to technological advancement and breakthroughs to overcome barriers that prevent the achievement of the state's statutory energy goals, and result in advancements on the most significant technological challenges.

The California Energy Commission is committed to supporting the inclusion of a diverse group of participants from disadvantaged and underrepresented businesses and communities – including disabled veteran-, women-, LGBTQ- and minority-owned businesses.

To learn how to apply for EPIC solicitations please see: http://www.energy.ca.gov/research/notices/2014-06-17_workshop/2014-06-17_EPIC_solicitations_presentation.pdf.

For additional information on the EPIC Program, please see: www.energy.ca.gov/research/epic/index.html.

Written Comments

Written Comments
Comments should be submitted by 5 p.m. on Wednesday, June 21, 2017. The Energy Commission encourages comments through the Energy Commission's docket system to Docket # 16-EPIC-01(EPIC Idea Exchange). Please include your name and the name of the organization you represent. Comments should be in a downloadable, searchable format such as Microsoft® Word (.docx) or Adobe® Acrobat® (.pdf). Please include the title of the EPIC Request for Comments: Modeling Tools RFC in the subject line.

If you prefer, you may send a paper copy of your comments to:
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Public Adviser and Other Commission Contacts

The Energy Commission's Public Adviser's Office provides the public assistance in participating in Energy Commission proceedings. If you want information on how to participate in this request for comments, please contact the Public Adviser, Alana Mathews, at PublicAdviser@energy.ca.gov or (916) 654-4489, toll free at (800) 822-6228.

If you have a disability and require assistance to participate, please contact Poneh Jones at Poneh.Jones@energy.ca.gov or (916) 654-4425.

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