DOCKETED

Docket Number:	17-EPIC-01
Project Title:	Development of the California Energy Commission Electric Program Investment Charge 2018 â€“ 2020 Triennial Investment Plan
TN #:	215888
Document Title:	Dale Sartor Comments: Data Center Efficiency Initiative
Description:	N/A
Filer:	System
Organization:	Dale Sartor
Submitter Role:	Public
Submission Date:	2/10/2017 4:35:00 PM
Docketed Date:	2/10/2017

Comment Received From: Dale Sartor
Submitted On: 2/10/2017
Docket Number: 17-EPIC-01

Data Center Efficiency Initiative

Additional submitted attachment is included below.

CALIFORNIA ENERGY COMMISSION
1516 NINTH STREET
SACRAMENTO, CA 95814-5512
www.energy.ca.gov

The Energy Commission is currently soliciting ideas and stakeholder input for the 2018 – 2020 EPIC Triennial Investment Plan. For those that would like to submit an idea for consideration in the 2018-2020 EPIC Triennial Plan, we ask that you complete the form below. Submittals are due by **5:00 p.m. on February 10, 2017.**

Part 1. Initiative Description and Purpose:

1. Please provide a brief description of the proposed initiative:

Initiative: Data Center Energy Efficiency

Data Centers consume 1.8% of the US power and likely more in "high tech" states like California. The demand for computations doubles every 18-24 months and efficiency is critical to keep the energy consumption in check. Significant strides have been made especially in large data centers but over half the servers are in small data centers where significant opportunities remain. Small and medium sized data centers are found in all types of California businesses and technology (e.g. the Internet of Things) is driving us towards greater data center demands.

Historically approximately half a data center's energy use goes to the IT equipment while the other half goes to the building infrastructure supporting the equipment (e.g. the electrical supply and cooling systems). That ratio has generally improved in large data centers, but remains high in the smaller ones. Energy efficiency in data centers requires a holistic systems approach addressing the IT equipment and software, cooling, and the electrical supply chain. System reliability and security are additional drivers.

The energy intensity or density in data centers continues to rise leading to new electrical and cooling system demands that should be met with more efficient and reliable systems.

2. What technical and/or market barriers would the proposed initiative help overcome? For scientific analysis and tools, what knowledge gaps would the proposed initiative help fill?

Technical Barriers:
* Warm water compressor-less cooling and use of waste heat.
* Integration of data centers into micro-grids including demand response and direct current integration.

Market Barriers:
* Need for standardization of new technologies (e.g. liquid cooling and "high voltage" DC power distribution).
* Need for standard retrofit packages for small data centers that can't afford custom engineering.
* Fear/risk aversion requiring more fail safe systems and demonstrations

Part 2. Benefits and Impacts

3. If this initiative is successful, either fully or partially, what would be the expected impact? Who are the primary users and/or beneficiaries?

A recent (national) study of the potential impact of further efficiency in data centers indicates a possible savings of 45%, hence in California that could be approximately 1% of our electrical consumption. Opportunities to use the network for redundancy could also yield opportunities for shifting load between data centers to control peaks and address power shortages.

California businesses of all sorts would benefit by lower IT operations cost. While there is still room for improvement in the large data centers, the primary target and beneficiary of this initiative would be the small and medium sized data centers where the opportunities are greatest.

4. Describe what quantitative or qualitative metrics or indicators would be used to evaluate the impacts of the proposed initiative:

Technology development would be judged based on the successful implementation of lab studies and field demonstrations. Both demonstrations as well as market barrier reduction aspects can be quantitatively measured using the PUE performance metric - the ratio of the total energy consumption of a data center to the IT equipment. Typically for small and medium sized data centers that is about two. For every Watt going to the IT equipment, another Watt goes to the infrastructure. An important metric on the IT side is utilization. Typical servers running only one application are often less than 5-10% utilized. Utilizing virtualization and the network for redundancy can lead to increases in utilization (reduced number of servers and associated infrastructure energy use).

5. Please provide a list of peer-reviewed references that support the responses for questions 3 and 4. Proposed initiatives that include peer-reviewed references will be given stronger consideration.

For a comprehensive list of references relative to opportunities for efficiency in data centers, see: https://datacenters.lbl.gov/resources

For a copy of the U.S. Data Center Energy Usage Report (peer-reviewed) see: https://datacenters.lbl.gov/resources/united-states-data-center-energy-usage

6. (For technologies only) What competitive advantages does the proposed technology solution have over current benchmark technologies? If the technology is beyond the prototype stage, what strategies do you suggest to bring to scale?

A comprehensive data center initiative is proposed that would address new technology, emerging technology, best practices, and market transformation opportunities. A portfolio approach would initiate new technology research and development while at the same time help to transform the market for emerging technologies and best practices.

Part 3. Connection to Energy Commission's EPIC Framework
Energy Commission staff have developed a draft strategic framework to guide the CEC's planning and implementation of EPIC across triennial investment cycles. One of the objectives of the draft strategic framework is to communicate a consistent set of priorities for organizing current and future EPIC investments.

7. Please indicate which of the following strategic framework themes you feel the proposed initiative best fits within:
    - Advance Technology Solutions for Deep Energy Savings in Building and Facilities
    - Accelerate Widespread Customer Adoption of Distributed Energy Resources
    - Increase System Flexibility from Low-Carbon Resources
    - Increase the Cost-Competiveness of Renewable Generation
    - Create a Statewide Ecosystem for Incubating New Energy Innovations
    - Maximize Synergies in the Water-Energy-Food Nexus
    - Develop Tools and Analysis to Inform Energy Policy and Planning Decisions
    - Catalyze Clean Energy Investments in California's Underrepresented and Disadvantaged Communities

If Other, Please Specify