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 #:	215863
Document Title:	Joseph Gallegos Comments: Water Table Management for Agricultural Energy Improvements
Description:	N/A
Filer:	System
Organization:	Joseph Gallegos
Submitter Role:	Public
Submission Date:	2/10/2017 2:16:13 PM
Docketed Date:	2/10/2017

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

Water Table Management for Agricultural Energy Improvements

Agriculture related: Water Table Management (MTM) Part of the Food Energy Water nexus (FEW):
During the last drought, a large percentage of agriculture land was irrigated with well water. The environmental outcome was the deepening of the water tables in all regions of California. The general initiative is to increase water filtration as a means of increasing the height of the water table and lowering the energy needed to pump the water to the surface.

Example economics:
Largest reference crop in California is almonds, with 1,000,000 acres in production. If the total acreage decreased the pumping height across the 1,000,000 acres of planted almonds by 1 foot, the energy savings would equal 23.5 million kWh annually.

Infiltration / recharging is not a critical energy production event; thus, it can be part of a variable energy grid load-shaping relief valve, meaning that the infiltration pumps can manage variability of energy loads by taking excess power for pumping water into spreading fields or cisterns but also allowing demand response when needed. This is a seasonal load shaping solution, used mostly in the fall and winter seasons, yet the load shifting is calculated on an annual basis, meaning using low periods of energy demand (fall and winter) to shave demands for high peak seasons (summer).

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:

Agriculture related: Water Table Management (MTM) Part of the Food Energy Water nexus (FEW):
During the last drought, a large percentage of agriculture land was irrigated with well water. The environmental outcome was the deepening of the water tables in all regions of California. The general initiative is to increase water filtration as a means of increasing the height of the water table and lowering the energy needed to pump the water to the surface.

Example economics:
Largest reference crop in California is almonds, with 1,000,000 acres in production. If the total acreage decreased the pumping height across the 1,000,000 acres of planted almonds by 1 foot, the energy savings would equal 23.5 million kWh annually.

Infiltration / recharging is not a critical energy production event; thus, it can be part of a variable energy grid load-shaping relief valve, meaning that the infiltration pumps can manage variability of energy loads by taking excess power for pumping water into spreading fields or cisterns but also allowing demand response when needed. This is a seasonal load shaping solution, used mostly in the fall and winter seasons, yet the load shifting is calculated on an annual basis, meaning using low periods of energy demand (fall and winter) to shave demands for high peak seasons (summer).

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?

The FEW nexus market is built around silos; and, the concept of improving natural resources for greater efficiencies is many times overlooked. This initiative elevates quantitative numbers to the bigger picture of an environmental eco-system across multiply interdisciplinary segments and can even be viewed as an interdisciplinary research program where, instead of looking only at energy, research is shared on larger initiatives that effect Departments of Water Resources, Department of Food and Agriculture, and other departments in California. Stake holders benefit in each of of the underling departments.
Knowledge gaps that the initiative will fill by combining interdisciplinary research in the obvious larger problems of Water Table Management (MTM) is unknown but theoretically significant. That is the point – discovering what is unknown to meet the larger problem.

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?

The impacts are sustainable energy grid demand shaving during the peak season (summer months) by applying energy resources in water storage during the low peak seasons of fall and winter. Basically, time of year load shifting (instead of time of day).

Storing energy potential in water transport is not new, much of that is done today with reservoirs and hydrogeneration. This initiative is transformative in how we view energy use and store it.
The primary users are the large agricultural users; the beneficiaries are the rate payers knowing that, instead of investment in new energy plants with potential greenhouse gases production, the CAPEX investment is in shaving energy demand for summer months.

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

Quantitative is the effective cost of raising the water table by a foot over a period of time. How many farms pull from that 1 foot rise? The CAPEX return on investments can be summarized as:
CAPEX total / life years / load shaping factor/ energy load reduction = cost per kWh

Infiltration will need to be spread over large areas to make a significant difference; so, the qualitative metric is the cultural acceptance of farmers willing to investment in infiltration during fall and winter months, knowing that the benefit for higher water table might be a few 3years away (depending on infiltration rates).

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.

The demand on well water for agricultural crop production is mentioned in the following report:
Marks, G., Wilcox, E., Olsen D., Goli, S. "Opportunities for Demand Response in California Agriculture Irrigation: A Scoping Study" Ernest Orlando Lawrence Berkeley National Laboratory: LBNL-6108E (2013)

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?

This author reports that limiting the initiative(s) to any one stage limits the larger potential, especially when trying to identify initiatives that are transformative. The reasoning is that some innovations have already started to advance to commercial stage before the market was ready for transformative change; therefore, this innovation needs the support of validation. On the other side of the spectrum are early stage innovations that require fundamental beta testing or prototype manufacturing. Without the heavy burden of EPIC grant, rather more like a CAPSEED or, even better, a micro development incubator that measures success of the innovations tested instead of the innovations funded.

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

Also: Increase the cost competitiveness of Renewable Generation: by using the initiative strategy as a load shaping tool.