

# ET Summit 2019

Presented by



# Considerations in Evaluating Efficiency Programs in the Agriculture Sector

**Frank Loge**

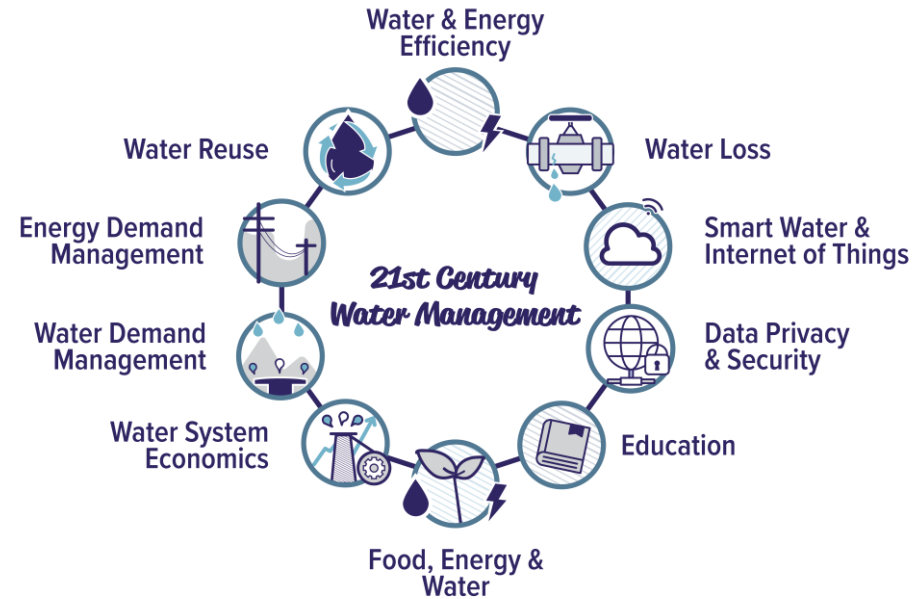
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# Introduction to CWEE

Advance water management solutions for the integrated savings of water & energy resources



# Impact Evaluation Approaches

## Deemed savings values

*stipulations based on historical & verified data*

## Measurement & Verification (M&V)

*a project-by-project approach involving estimating energy and/or demand savings*

- Retrofit Isolation
- *Whole Facility* billing regression analysis
- Calibrated Simulation (e.g., EnergyPlus)

## Large-scale consumption data analysis

*uses metered energy use data to compare the energy use of the program participants with the energy use of a control group*

Source: State and Local Energy Efficiency Action Network. 2012. Energy Efficiency Program Impact Evaluation Guide.

## Farm Sites in Research Study



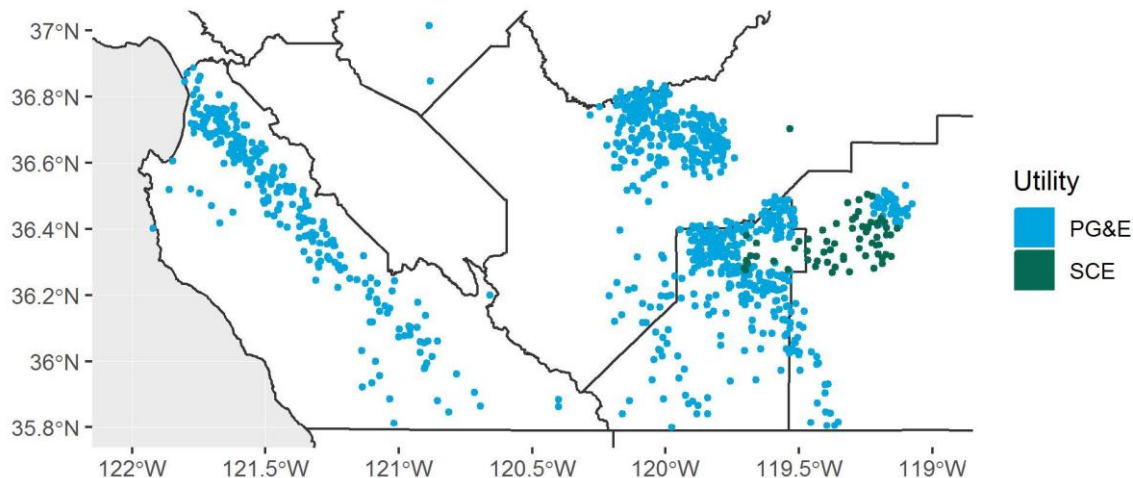
# Agricultural Electricity

## Agricultural Accounts

- PG&E ~ 13,300 meters
- SCE ~ 3,400 meters

## In Total:

~ 1,900,000 billing records  
~ 450,000,000 hourly kWh  
records



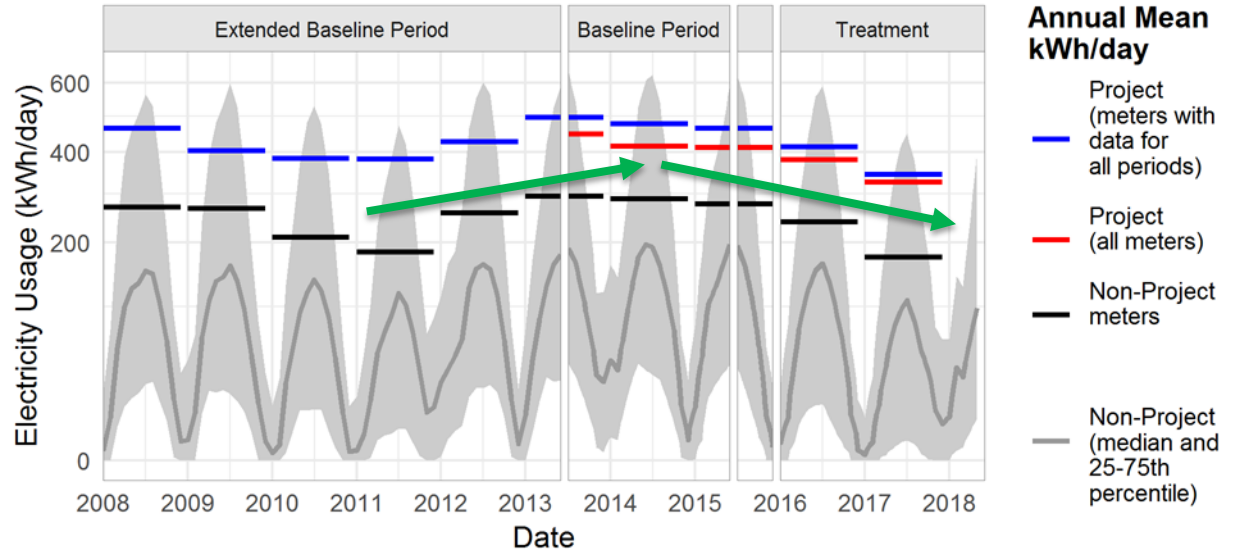
# Challenges

## Data availability:

- Groundwater extraction
- Crop production levels
- Operational changes

## Regional long term trends, which are driven by external factors:

- Drought
- Groundwater levels
- Crop transitions

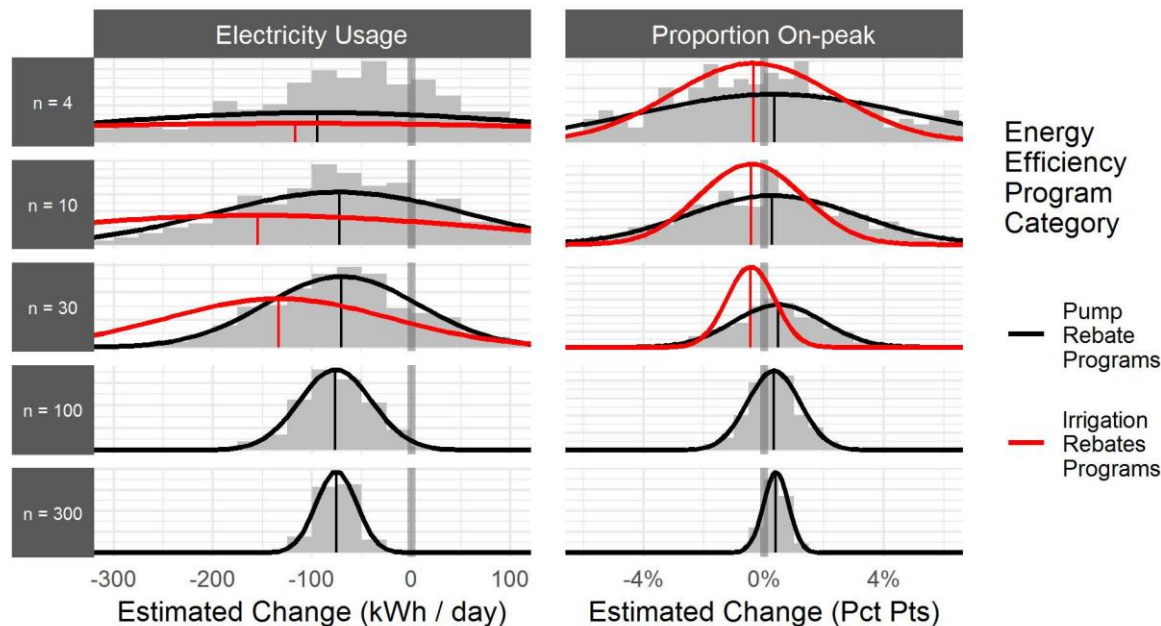




# Irrigation Pump Rebate Programs

*Can efficiency program savings be identified using a simple, pre-post comparison?*

→ Yes, but estimated savings are unreliable in small sample sizes





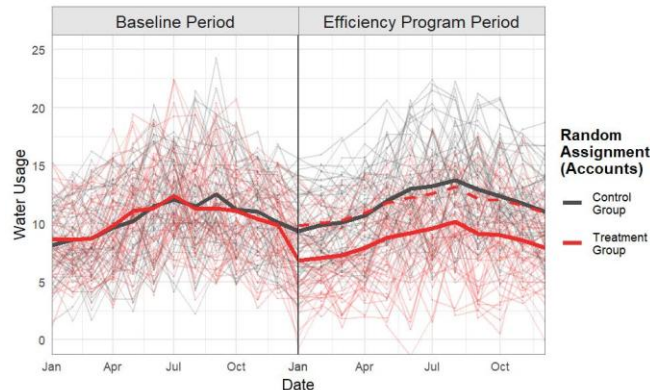
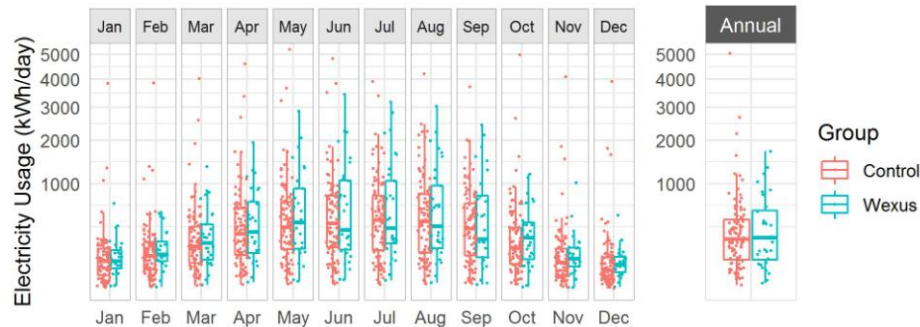
# Behavior-based Programs

## Additional Challenges

- Expected savings are small (<10%)
- Impossible to isolate
- Causal attribution is difficult

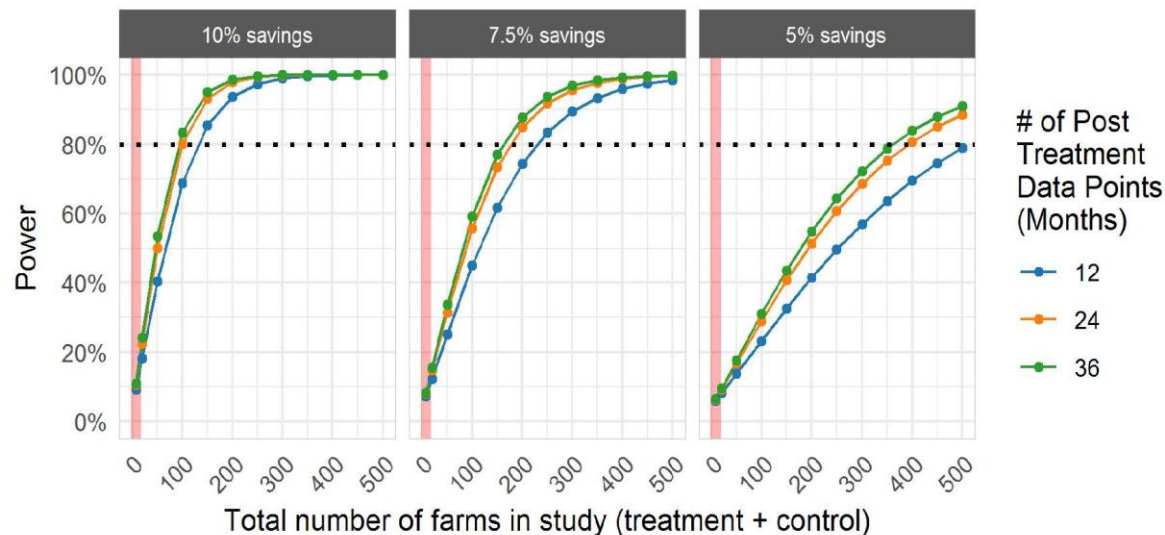
## Control Group Comparison

- Matching methods used to identify similar control group (using baseline data)
- Panel data regression model used to incorporate longitudinal (over time) variation and cross-sectional (between farm) variation



## Behavior-based Programs

- Smaller savings require larger samples sizes to identify
  - Power calculations are illustrated, given the observed variation and selected model
- **Larger sample sizes** (more participating farms) are needed for these types of studies



# Conclusions

## Technology retrofit programs

- Pre-post comparisons (using retrofit isolation, or whole facility billing regression analysis) are possible, given access to the appropriate data
- An alternative is to carefully aggregate billing/consumption data regression analysis from many retrofits & farms

## Behavior-based efficiency programs

- Large-scale consumption data analysis with a control group is the best approach
- Ideally designed as Randomized Controlled Trial (RCT)
- If RCT was not planned for, quasi-experimental approaches are possible
- In either case, control group meter data is required



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