Water-energy nexus in California

- **Water and energy are linked**
  - It takes water to generate energy (dams, plants, etc.)
  - It takes energy to move and pressurize water
- **What does it mean? Price of water set by energy used**
- **Drought impacts utility grid:**
  - More water pumped
  - Deeper wells need more power
  - Less energy from dams
  - “Brown outs” in some areas

Problem: we don’t measure water well

“Precision agriculture today is like measuring with a micrometer and cutting with an axe” – Irrigation Instructor

\[
\frac{\text{yield}}{\text{energy}} = \frac{\text{water}}{\text{energy}} \times \frac{\text{yield}}{\text{water}}
\]

- **How efficiently is water applied?**
  - Pump tests
  - Design pressure
  - Leaks
  - VFD controller
  - Etc.
- **How is water turned into food?**
  - Crop needs (ET)
  - Irrigation system
  - Soil characteristics
  - Irrigation schedule
  - Etc.

Work done under CEC contract EPC-14-081
Solution: measure water and close the loop

Feedback loop

Data remains private and access is controlled at the farm

Example: smart meter can be your friend

Current program:
Time-of-Use (TOU) pricing

Innovation: Well pump alert before it is too late

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