Data mining platform to address water-energy nexus in Agriculture

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PowWow Energy

Water and energy across “food chain”

Compliance

Implementing water and energy policy

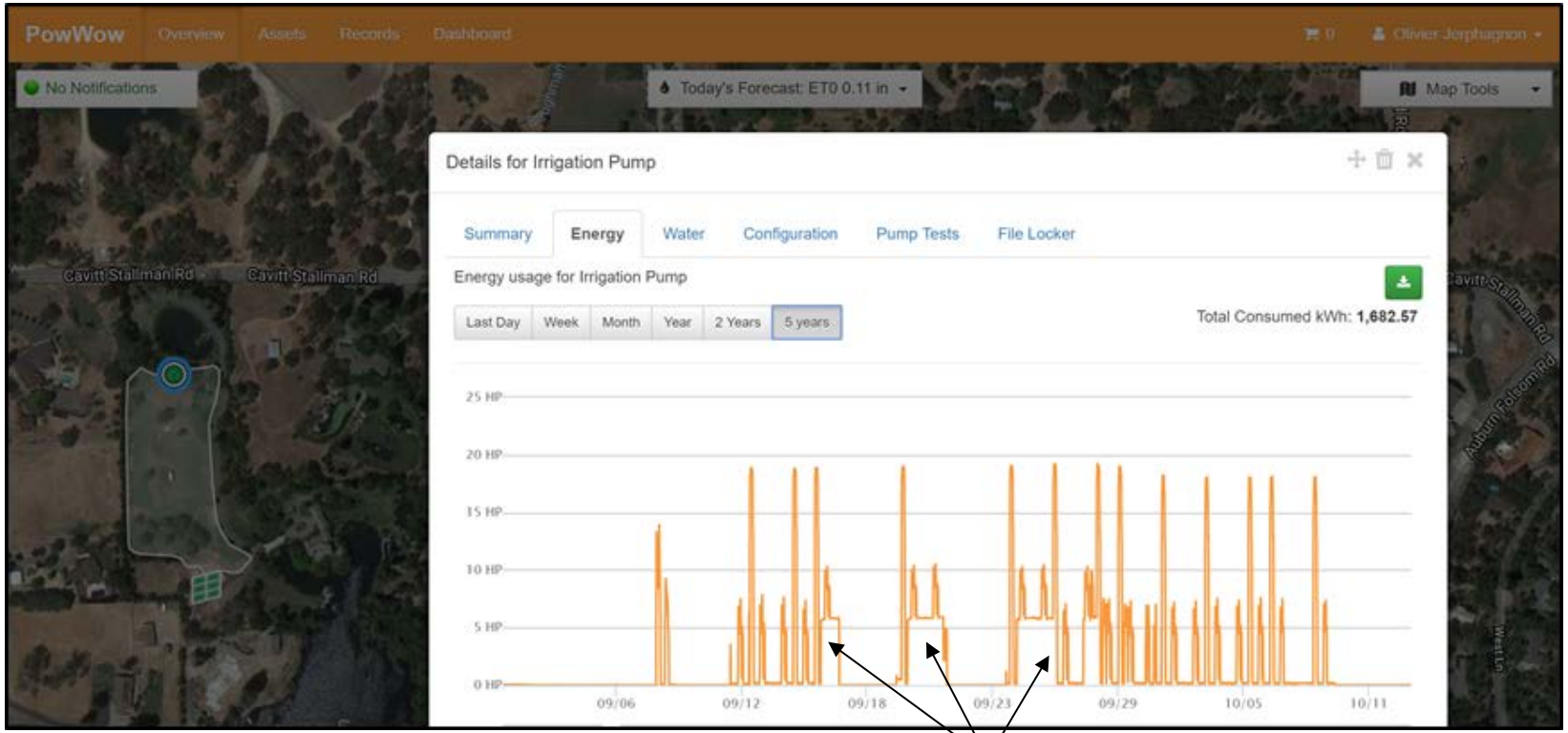
Production

Increasing yield per unit of water at the farm

Supply chain

Educating all of us about impact of our diet

Quick story: we started with a leak...



Collaboration with UCSB and UC Davis

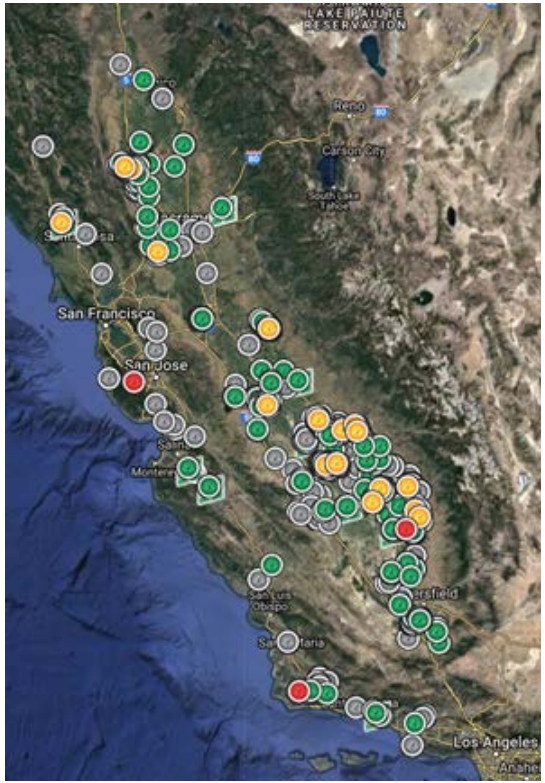
- Behavioral change at UCSB
  (Institute for Energy Efficiency)

CAMPUS CONSERVATION NATIONALS 2014

FLEXALERT.ORG

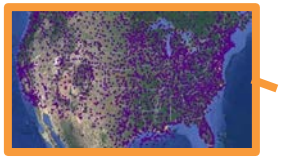
- Water tracking at UC Davis
  (Russell Ranch ran by ASI)

We incorporated company in 2013



PowWow has grown since: full platform

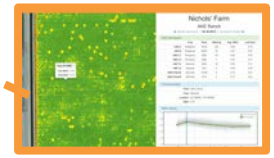
Energy data
(Green Button)



Weather data
(NWS, etc.)

Pow
Wow

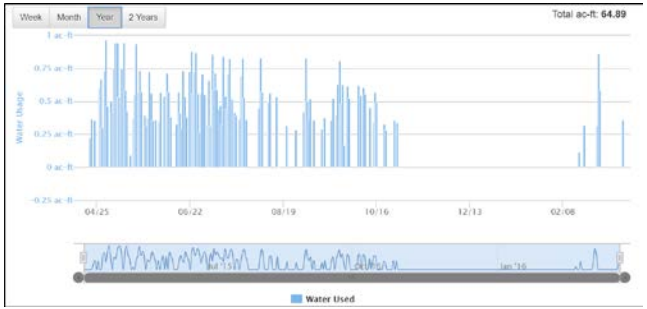
3 patents granted
2 patents pending



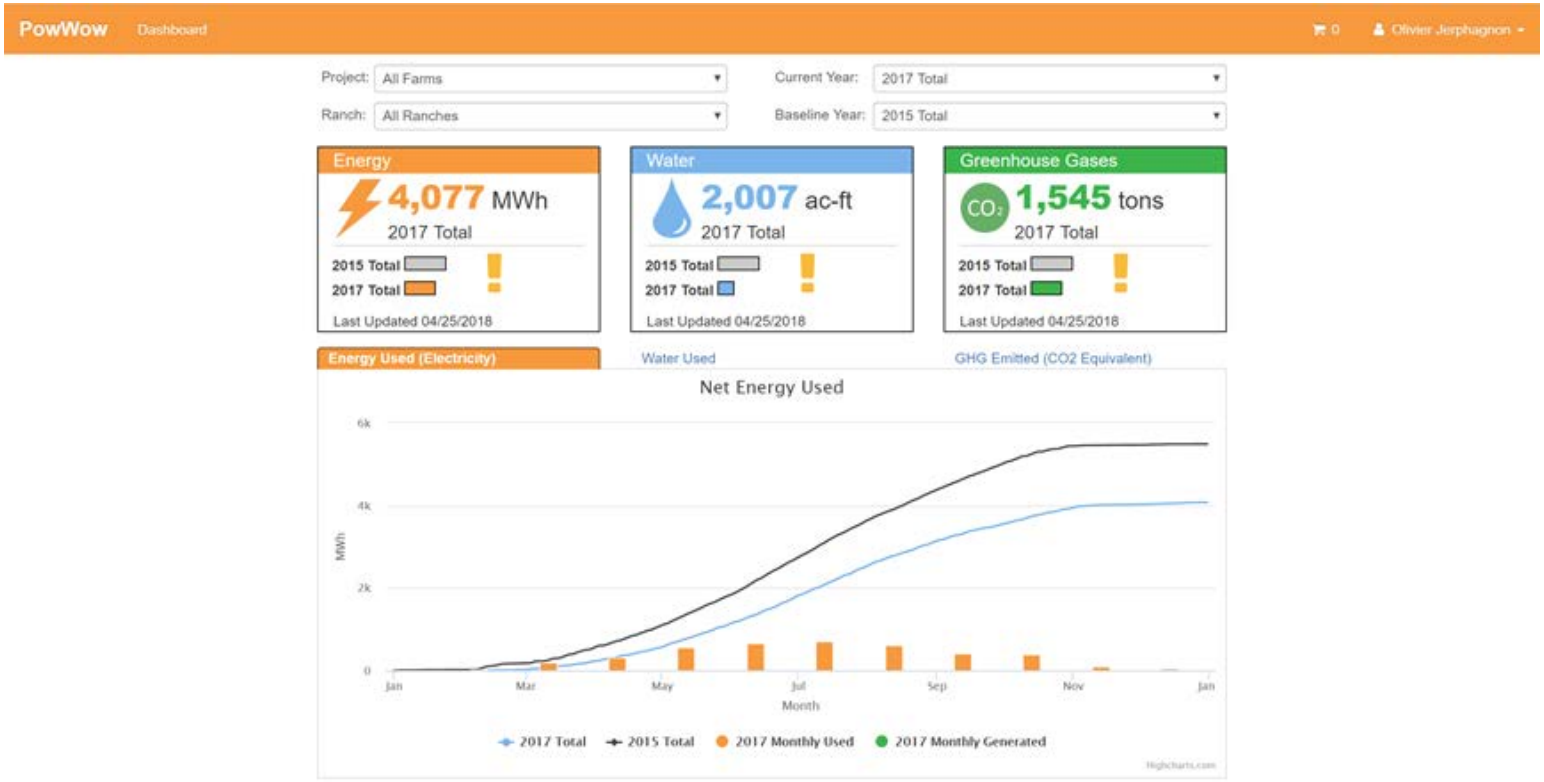
Aerial images and
irrigation schedules

Application #1: reduce farming inputs

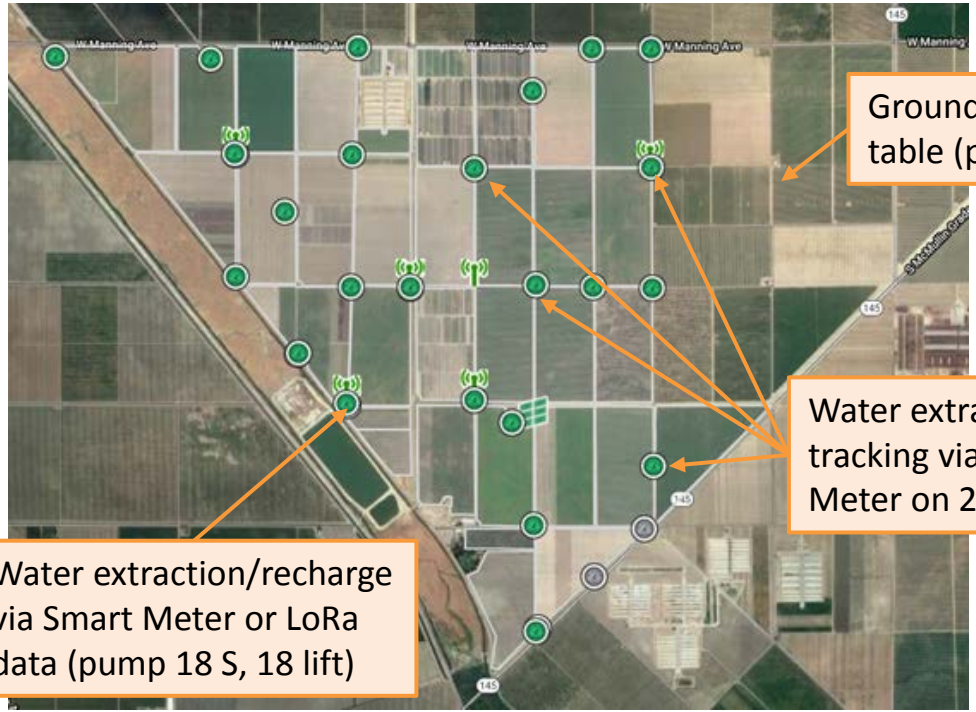
- No hardware to install
- Integrated with PG&E, SCE and SDG&E
- No recurring telemetry cost to transmit data
- Pump alerts via texts
- Daily water records



Energy input: SCE pilot since 2016



Maintain groundwater levels: SGMA

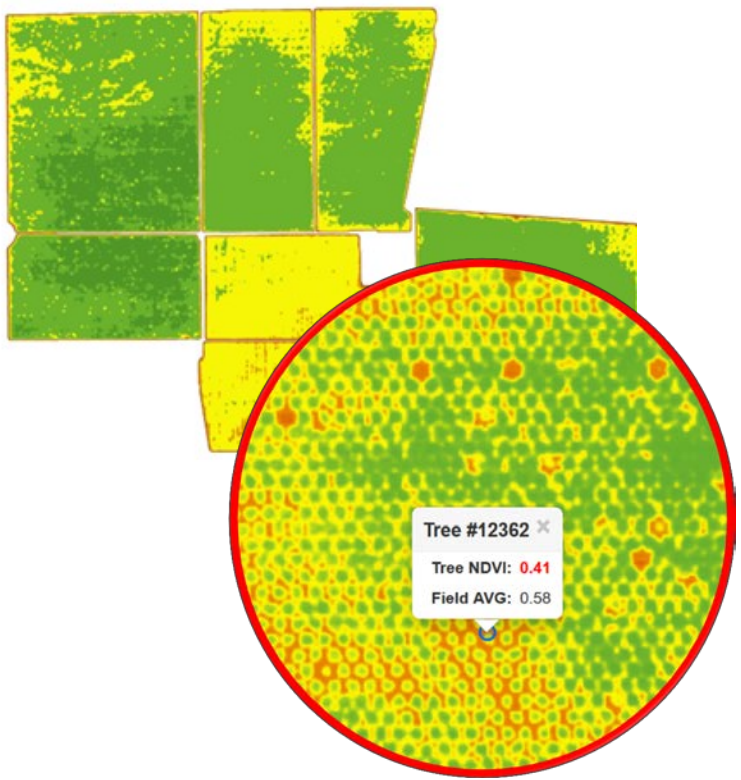


Demonstration to Groundwater Sustainable Agencies at Terranova Ranch in Helm, California

- 8 crops in 2016 (2,617 acres):
  - Alfalfa
  - Carrots
  - Peppers
  - Pistachios
  - Onion, onion fresh
  - Olives for oil
  - Seed production
  - Tomatoes (processing)
  - Wine grapes
- Results:
  - Irrigation records (ETc): **6,892 ac-ft**
  - Pumping data (energy): **6,983 ac-ft**

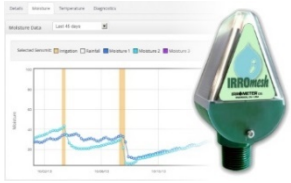
  Difference: +1.3%

Application #2: farming production

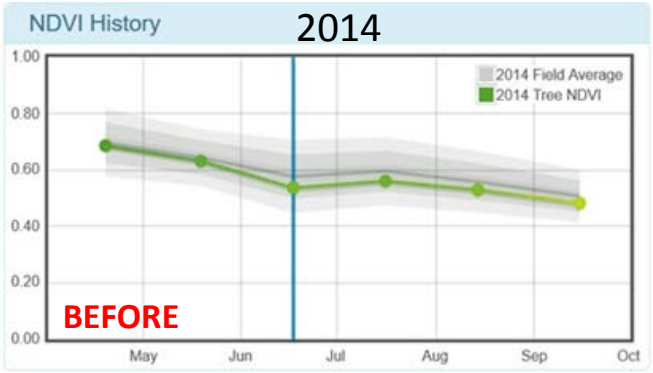


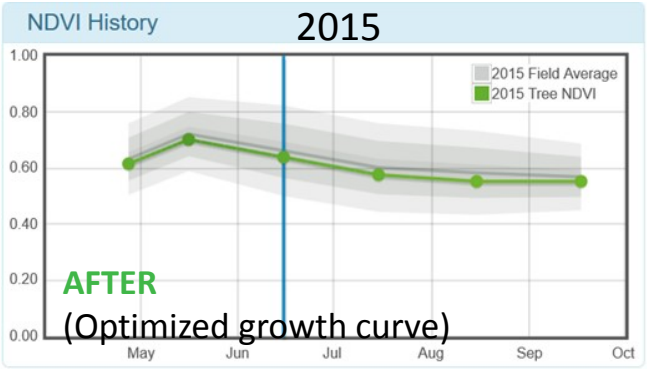
Tree level tracking:

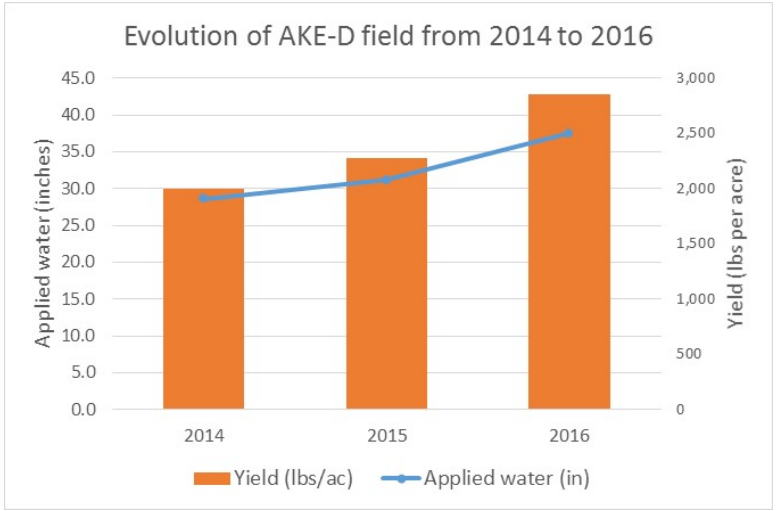
- Distribution Uniformity increase
- Irrigation schedule tuning
- Integration of on-farm data
  - Plant-based (pressure chamber)
  - Soil-based (Hortau, WiseConn, etc)
  - Atmosheric data (Tule, etc.)



Results: increased crop production







Water use efficiency increased by 9%. We compared treatment and control fields

3-year study to be published by CEC

Water use efficiency (tons per acre-feet) improved by 9%

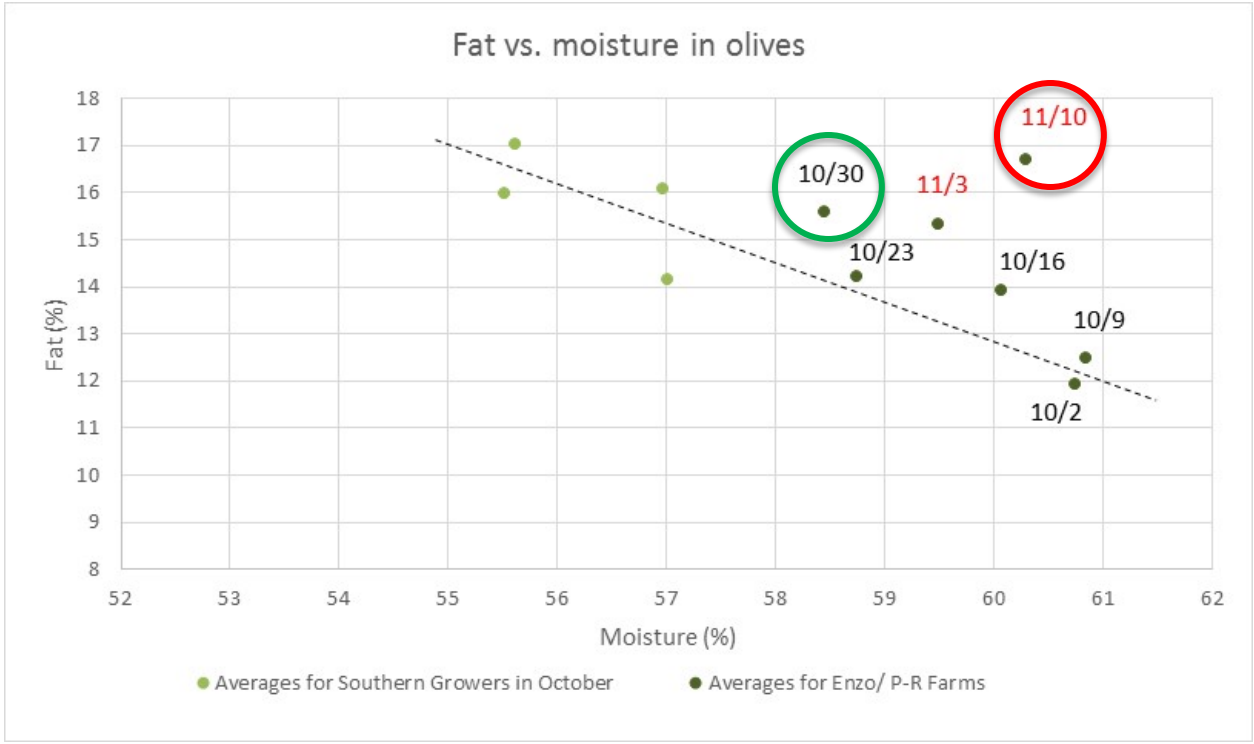
Energy use efficiency (tons per MWh) improved by 13%

CEC contract EPC-14-081

Application #3: improve food quality

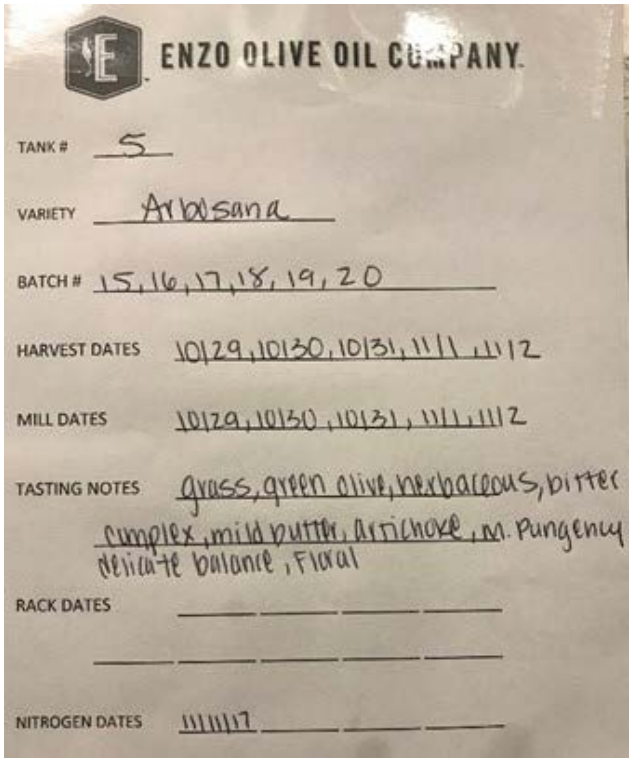
- Specific challenge with olive oil
  - Control moisture in olives to improve mill efficiency
  - Increase fat content to increase gallons per acre
  - Understand impact of irrigation on fruit maturity
- Existing issues
  - Adjust irrigation schedule based on ET to improve canopy cover and yield
  - Manage variability (leaks, soil variability, etc.)

Optimize harvest with data platform



Predictable best/worst harvest events

Best oil so far at Enzo on 10/30


ENZO OLIVE OIL COMPANY

TANK # 5

VARIETY Arbosana

BATCH # 15, 16, 17, 18, 19, 20

HARVEST DATES 10/29, 10/30, 10/31, 11/1, 11/2

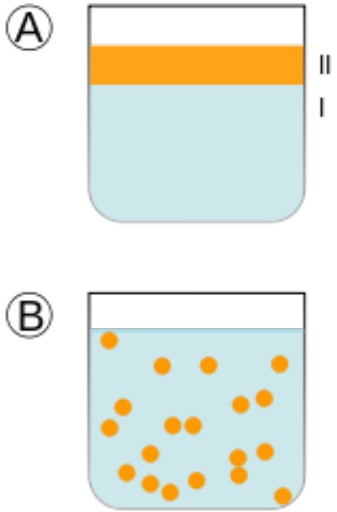
MILL DATES 10/29, 10/30, 10/31, 11/1, 11/2

TASTING NOTES grass, green olive, herbaceous, bitter complex, mild butter, artichoke, m. Pungency delicate balance, Floral

RACK DATES

NITROGEN DATES 11/1/17

Olive and Fresno chili pepper emulsified in malaxer on 11/14 (too high moisture)



Emulsion of oil in water can happen for moisture above 58%

We eat 90% of water we consume

EMERGING TECHNOLOGIES COORDINATING COUNCIL

Thank you.

Olivier Jerphagnon

Founder and CEO

PowWow Energy

Pacific Gas and Electric Company · SMUD · SDGE A Sempra Energy utility · SoCalGas A Sempra Energy utility · Southern California Edison An Edison International Company · LA DWP Los Angeles Department of Water & Power · State of California Energy Commission