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SAVING OF RESOURCES IN WINERIES – WHAT ARE THE INTERNATIONAL BENCHMARKS

ANITA OBERHOLSTER

COOPERATIVE EXTENSION SPECIALIST IN ENOLOGY

&

JILL BRIGHAM

DIRECTOR, SUSTAINABLE WINE& FOOD PROCESSING CENTER

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63rd International DWV-congress

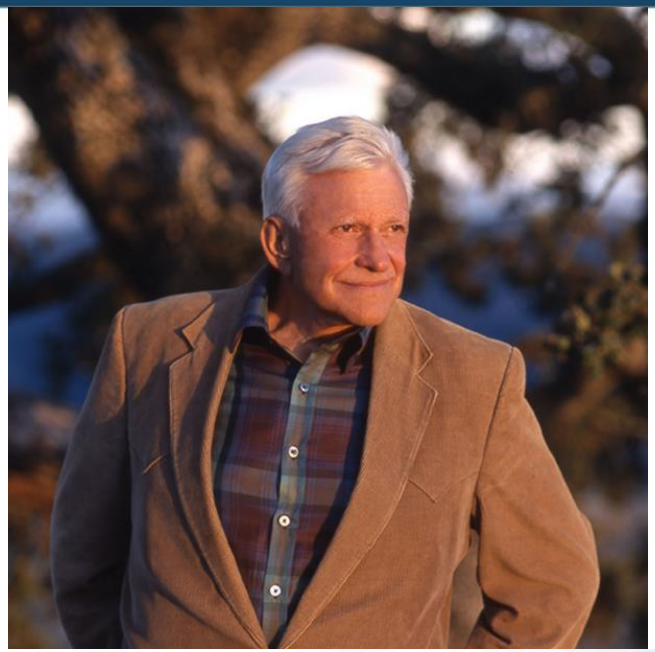
LEED Platinum UCD Teaching and Research Winery

Net Positive Winery

- Water Positive
  - Rainwater Capture
  - Reuse process water & cleaning solutions multiple times
  - No wastewater pond
- Energy Positive
  - Renewable Power & Storage
  - Solar Panels
  - Li-Ion Batteries for Energy Storage
- Carbon neutral
  - Capture & Sequester CO2

Aerial view

Jess S. Jackson Sustainable Winery Building

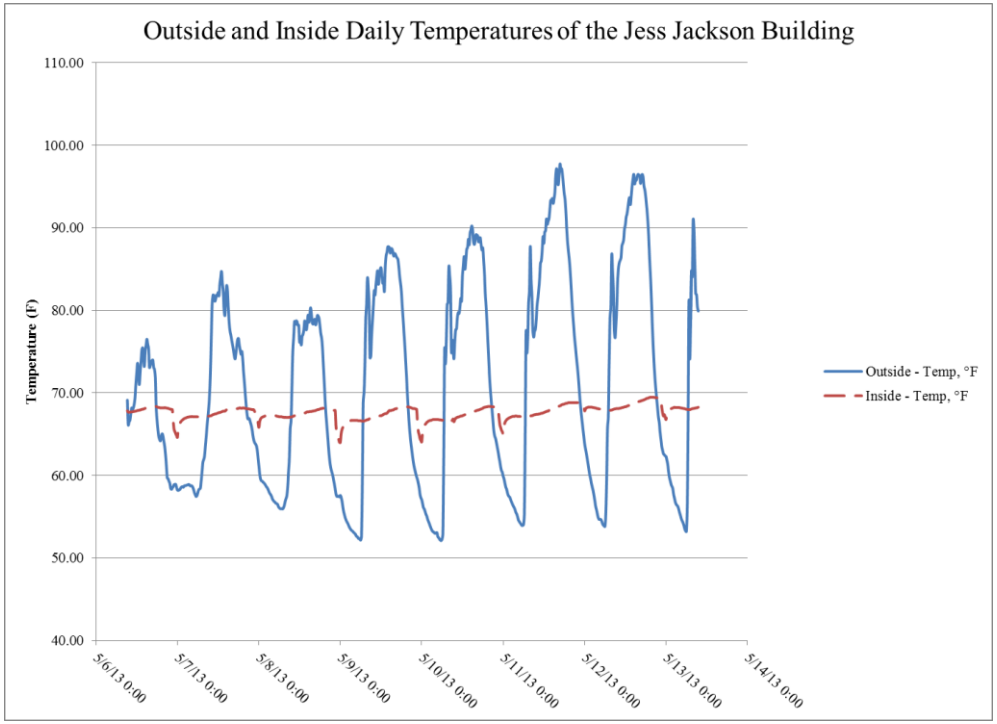


Jess S. Jackson Sustainable Winery Building

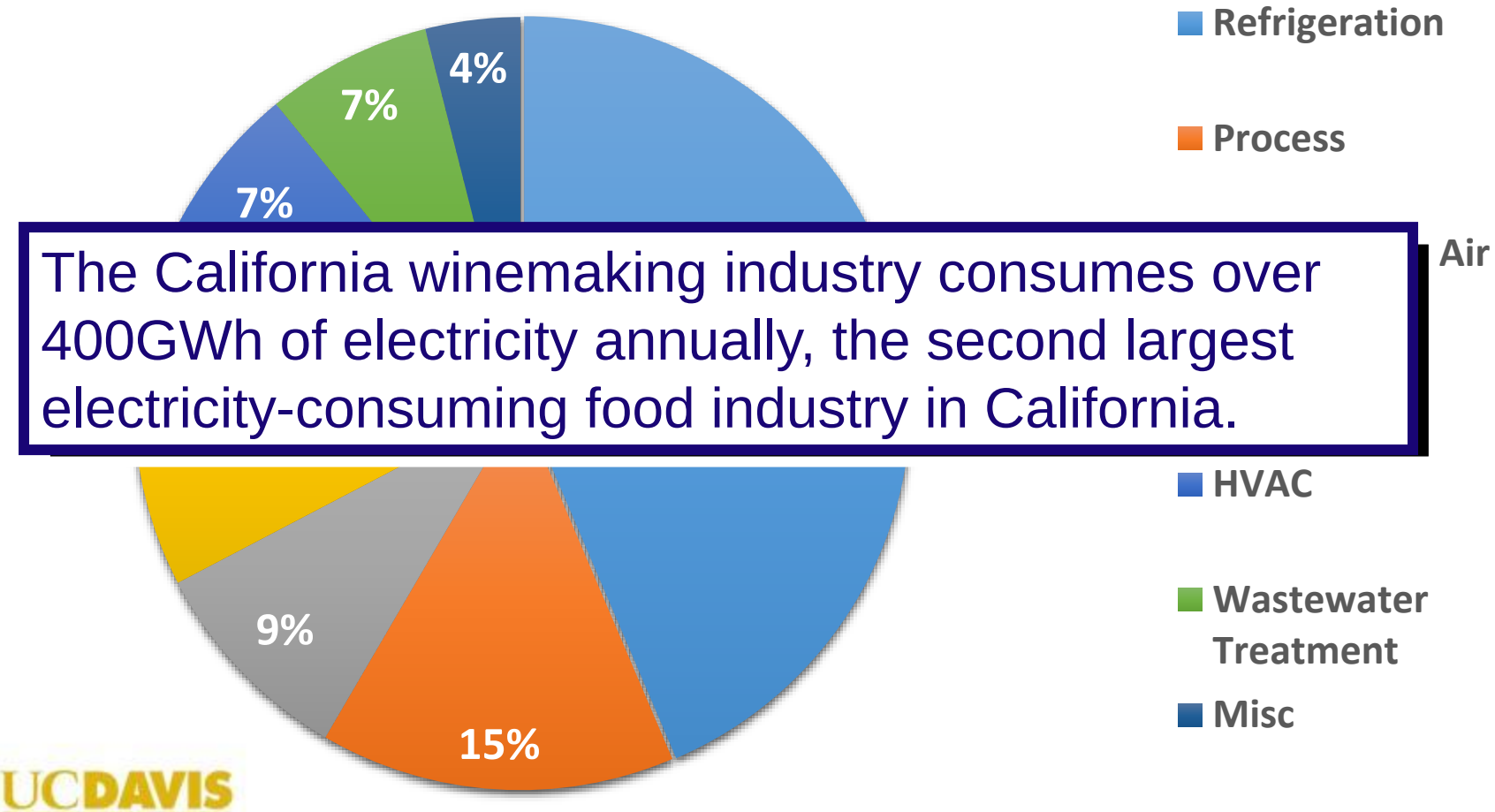
- One of the most thermally-insulated buildings in California
- Certified Net Zero Energy by the Living Building Challenge program
- Designed to be passive, low energy building – provide all energy and water for LEED Platinum Winery
- Designed on PassivHaus principles

Jess S. Jackson Sustainable Winery Building

- The Building has heavily-insulated walls (R=60) and Roof (R=85)
- The indoor temperature variation is 1/10th that of the outside air
- It has tubes within the floor to heat and cool the building
- It is cooled by night air displacement
- It is designed for a future underground rock bed for additional cooling



Electricity Consumption in Winery



The California winemaking industry consumes over 400GWh of electricity annually, the second largest electricity-consuming food industry in California.

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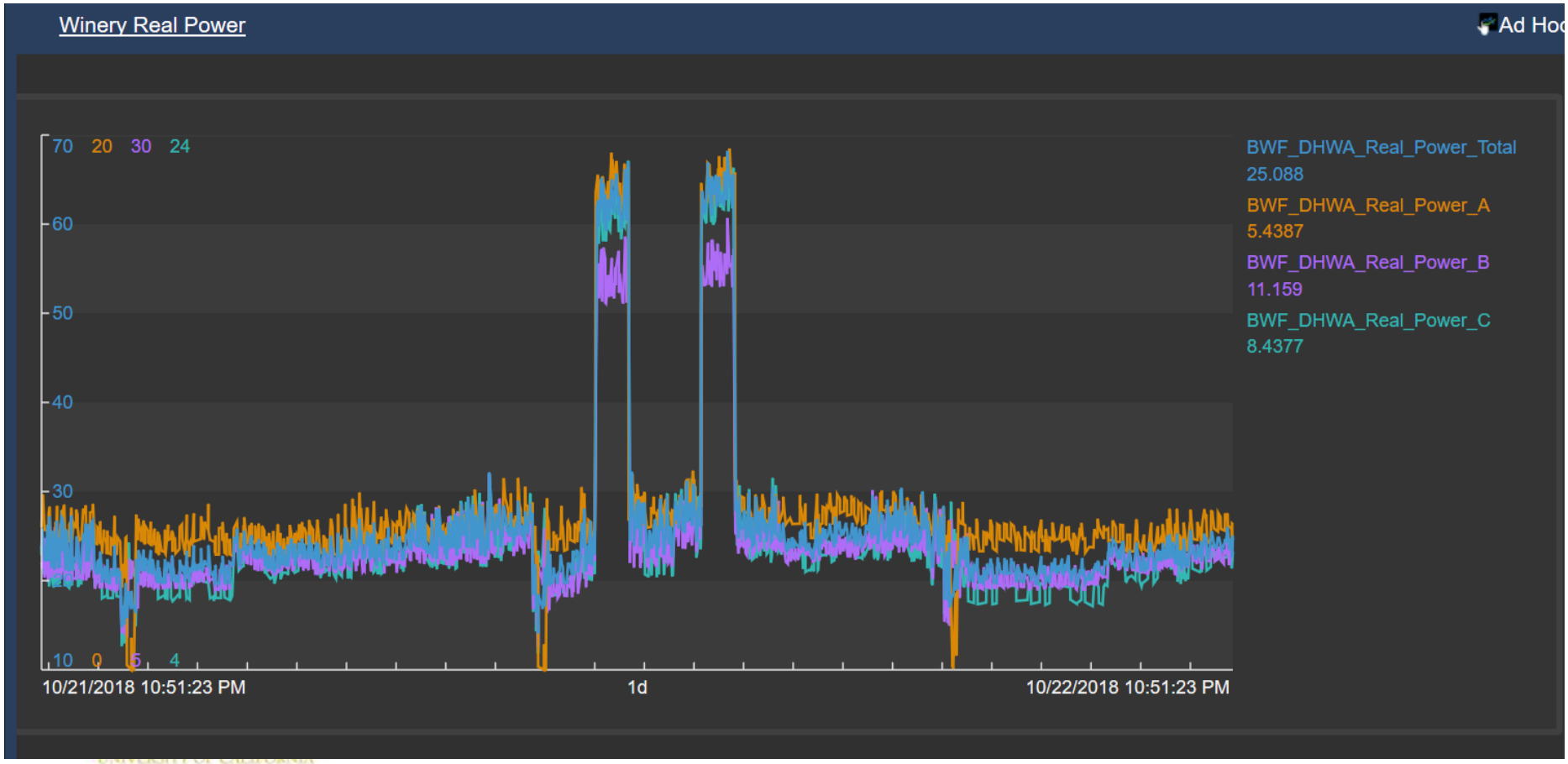
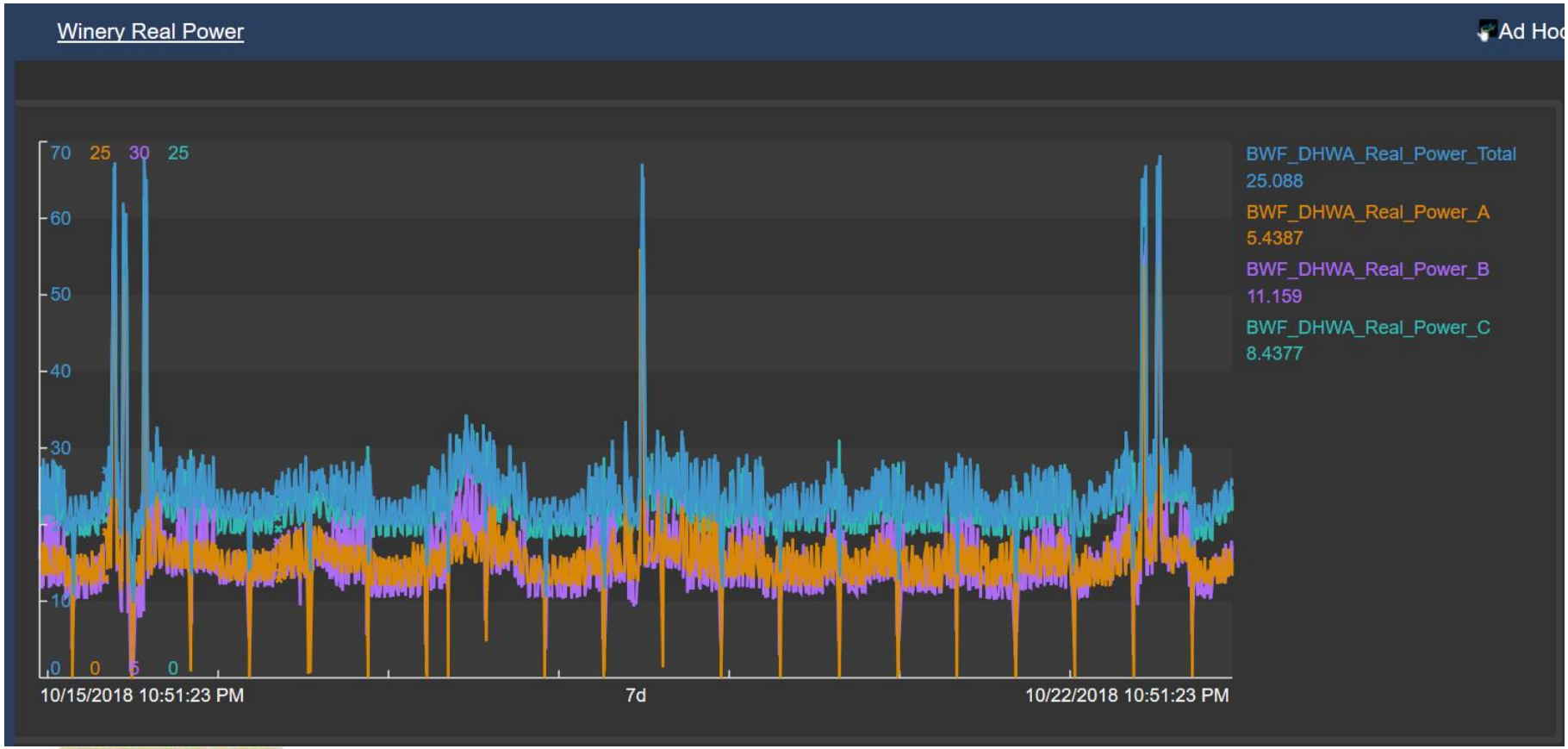
"Energy Efficiency Opportunities in Wineries for Retrofit and New Construction Projects" BASE Energy

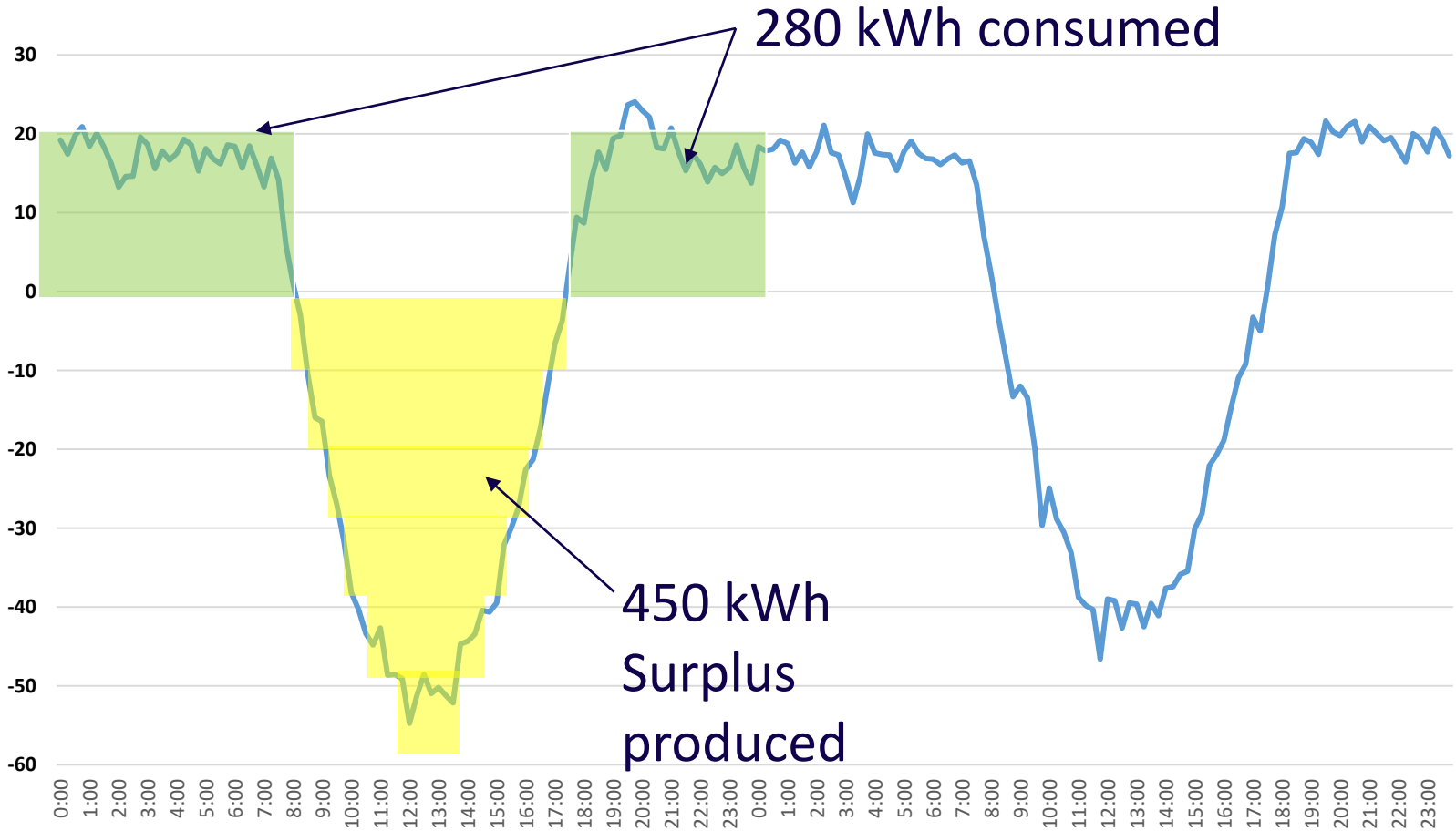
UCD Winery Power Demand During Harvest – 1 Day



UCD Winery Power Demand During Harvest – 1 Week

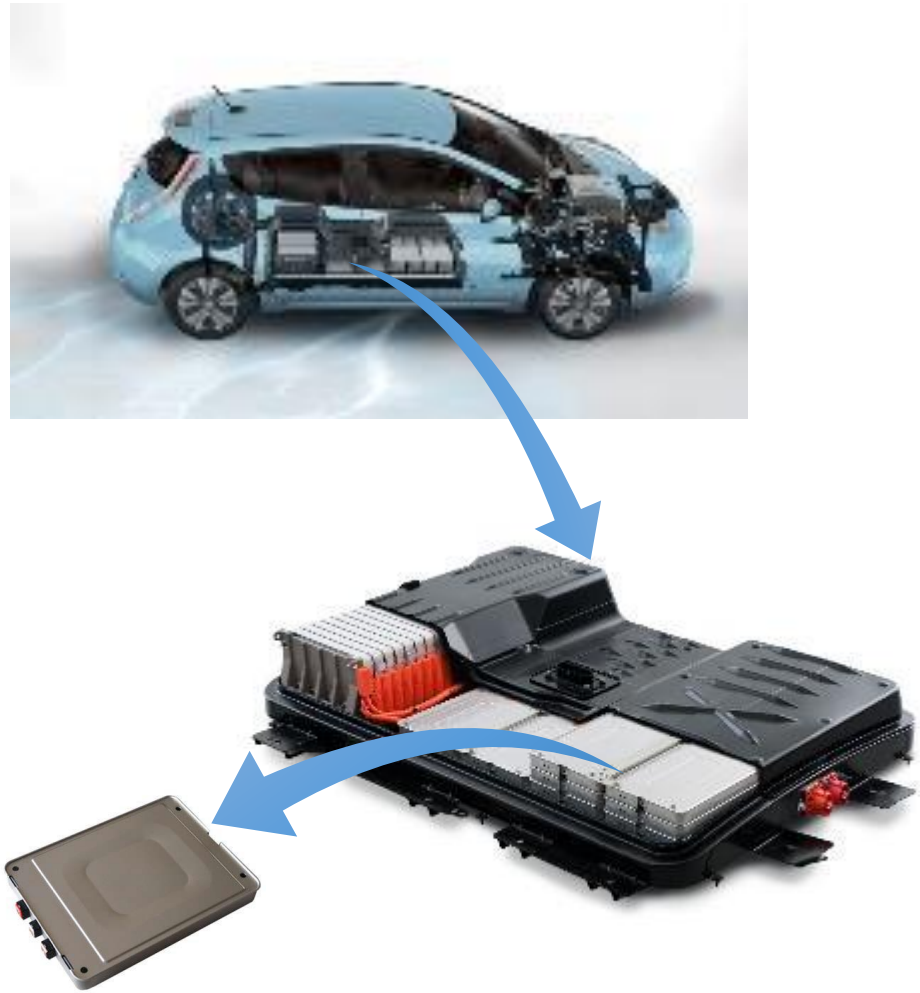


UCD Winery Solar Energy



Energy Storage

- Second-Life lithium-ion batteries are recycled after replacement in electric vehicles
- Charged each day by solar photovoltaics, power UCD Winery at night and shift peak loads during the day
- 260 kWh storage capacity
- Donated by Nissan and 4R Energy, California Energy Commission funding

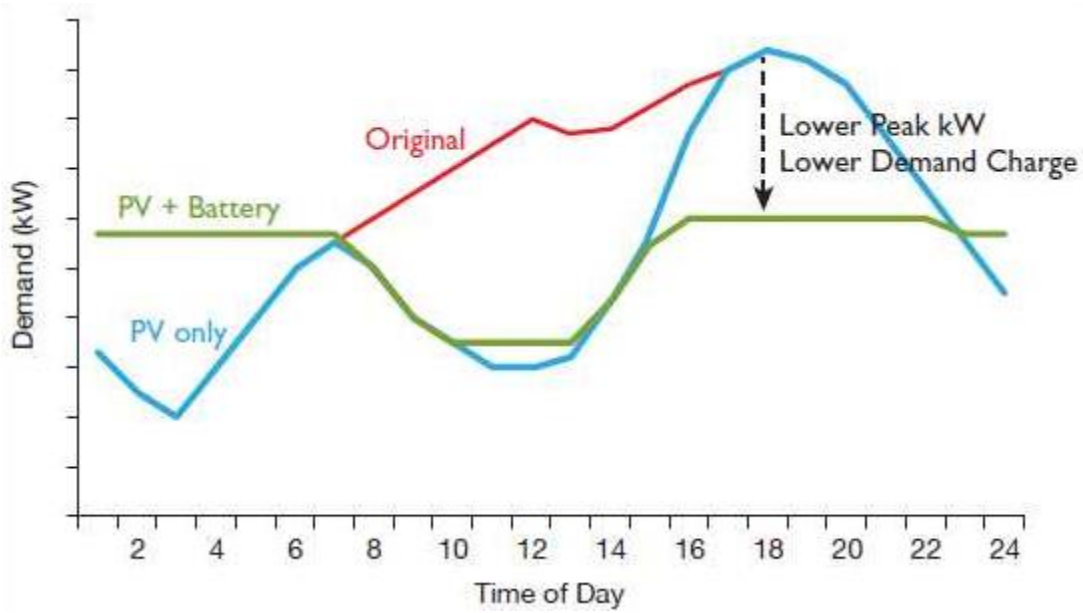


Battery Assemblies

UCD Winery: Energy Sustainability

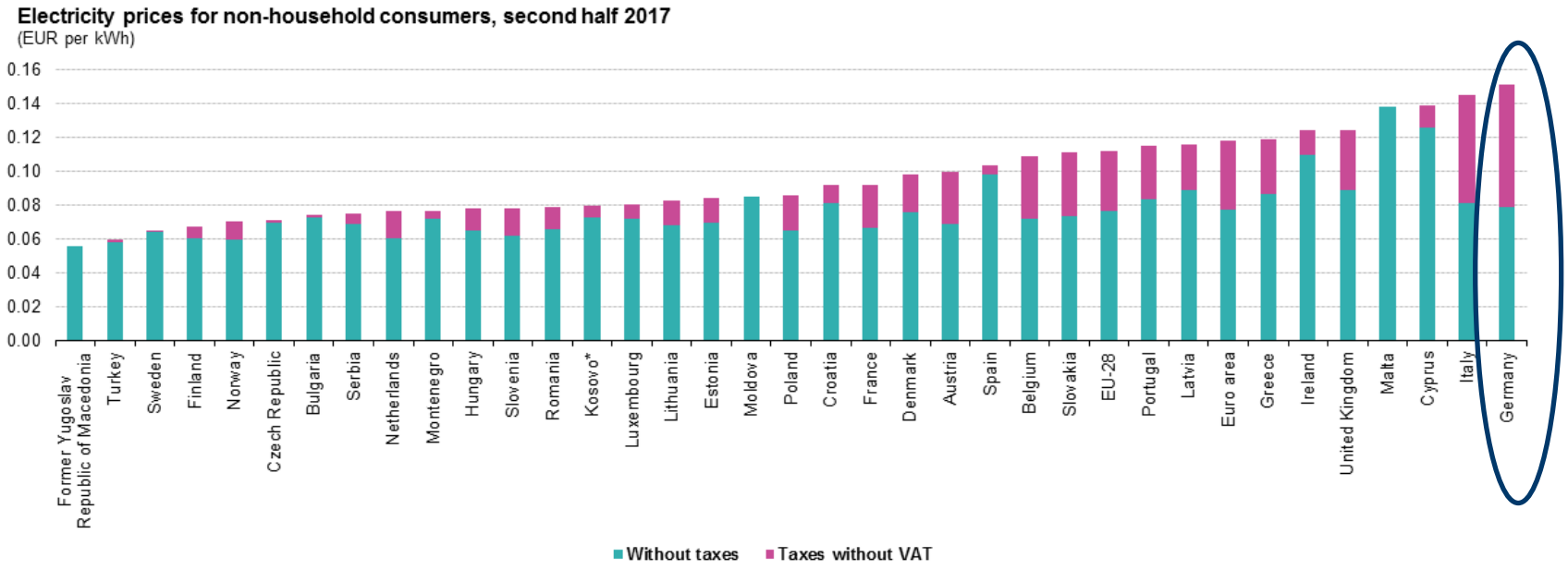
- 180 kW Solar Photovoltaic Panels
- 260 kWh second-life lithium-ion batteries

- Energy Peak Shaving – store energy at renewable generation peak for use at energy consumption peak



Solarpowerworld.com

Cost of Energy in EU



(*) This designation is without prejudice to positions on status, and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo Declaration of Independence.

Source: Eurostat (online data codes: nrg_pc_205)

eurostat

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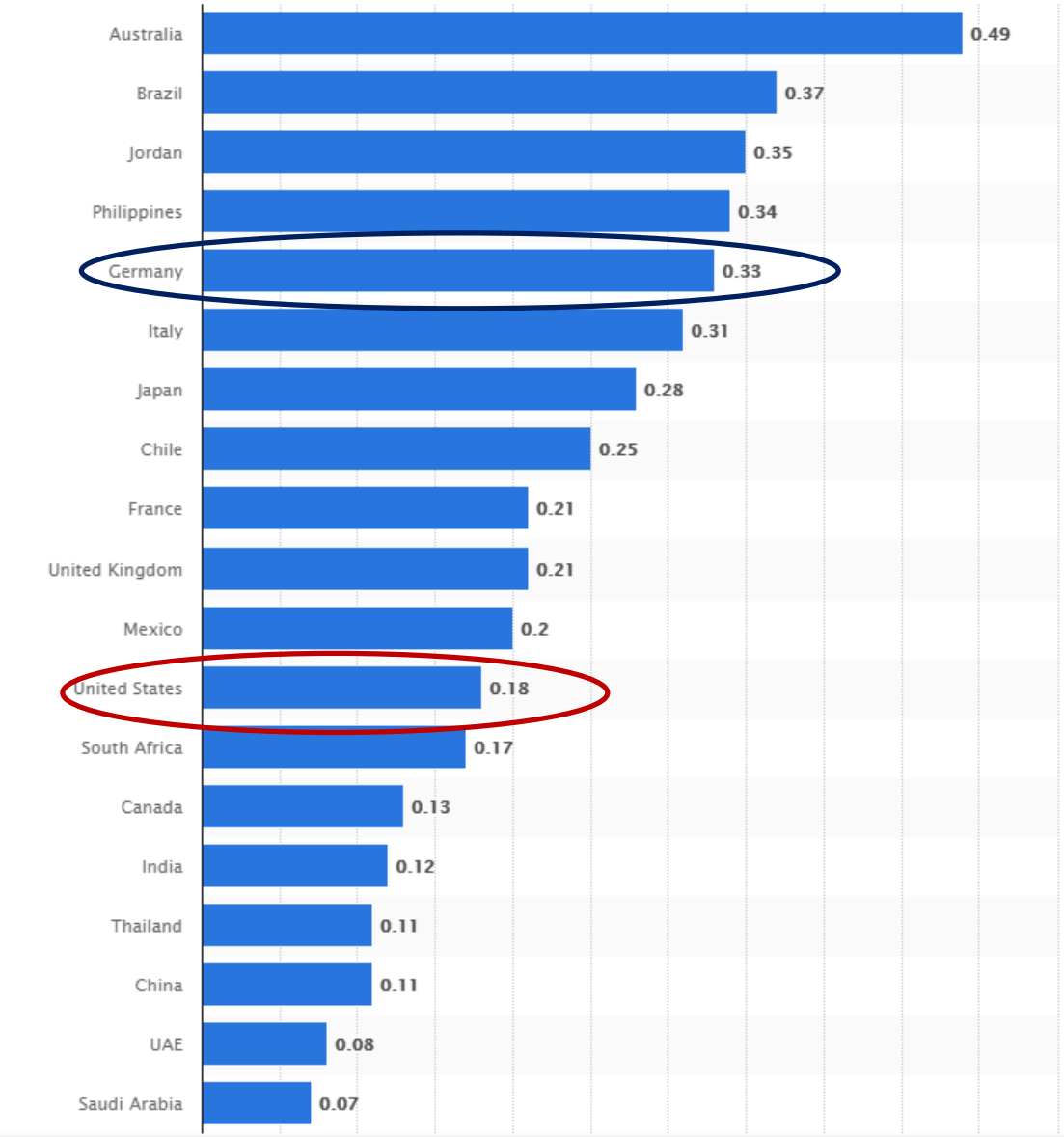
Electricity prices by country in 2015 (USD/kWh



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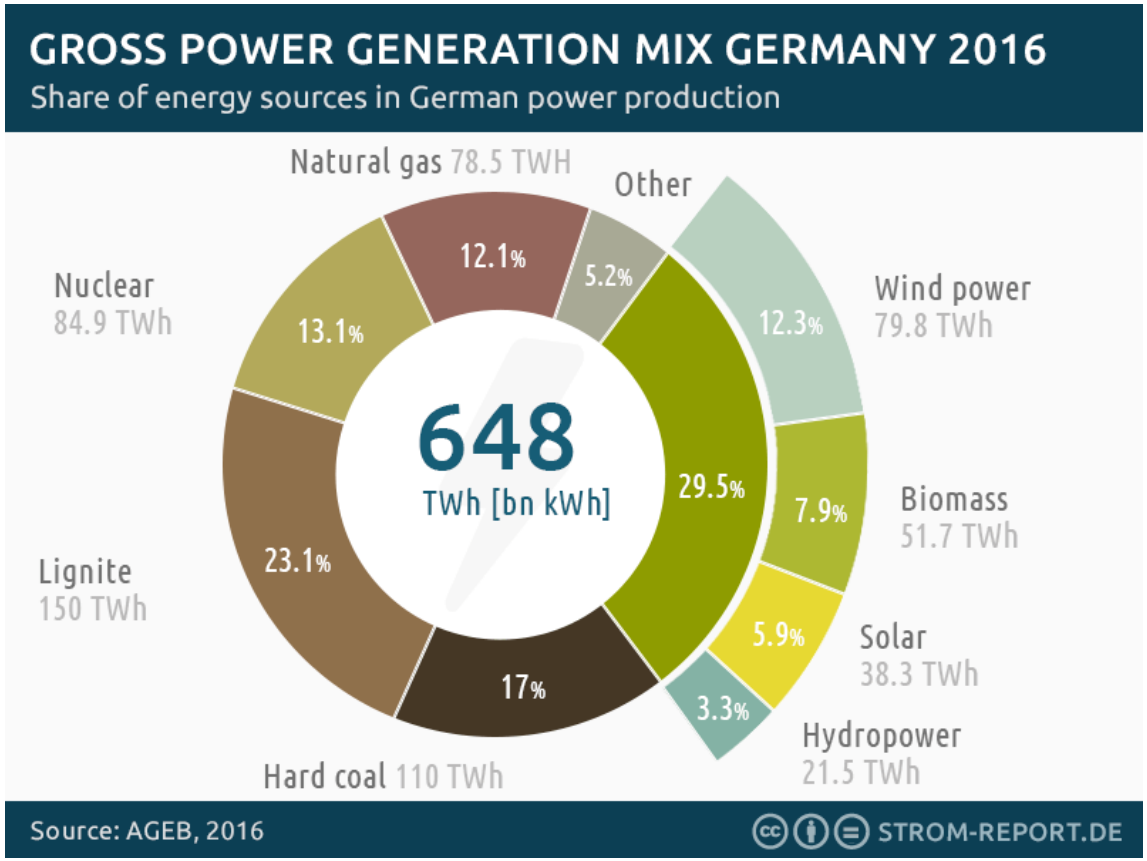
Energy supply in Germany



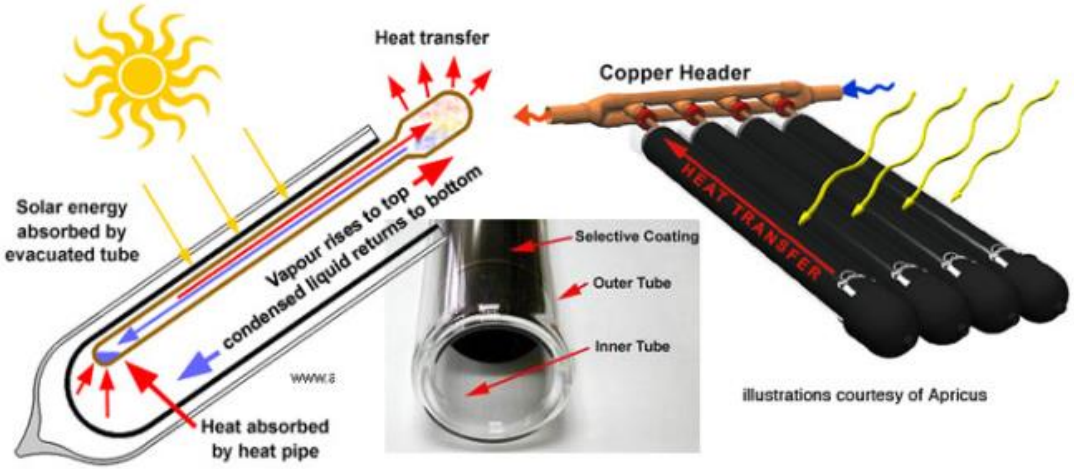
Ways to Save Energy

- Optimize usage
  - Temp control of buildings
  - LED, natural light
  - Heat exchangers
  - Energy efficiency of walk-in coolers
  - Optimizing cleaning and sanitation
  - Using solar to heat/cool water
  - Optimize winery control

- Renewable energy and storage
  - Shift energy form renewable generation peak to energy consumption peak

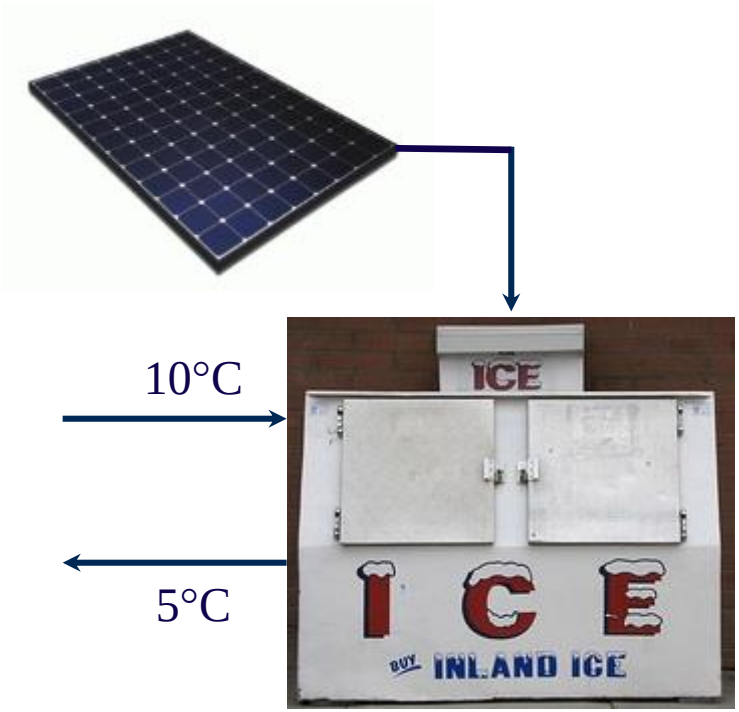
Fermentation Temperature Control – Hot Water

- Sun heats water in Evacuated Tube Collectors
- Heat Pipe absorbs heat from tube heat absorber fin & hot vapor rises to heat pipe header
- Water circulates through the header pipe and is heated
- Water is stored at 50˚C (120˚F)



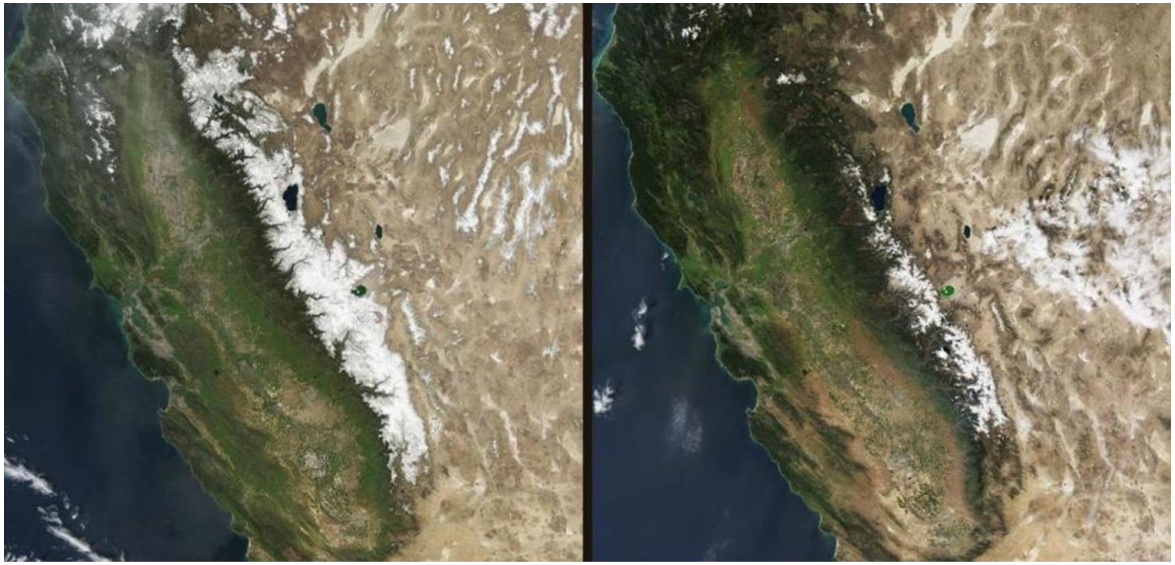
Fermentation Temperature Control – Cold Water

- Ice chips are made during the day using photovoltaic energy
- Water is passed over the chips to provide 40˚F (5˚C) for the Winery by direct heat transfer



Water Sustainability

- Rain water harvest
- Water Filtration
- Water Reuse



2017 2015

Earthobservatory.nasa.gov

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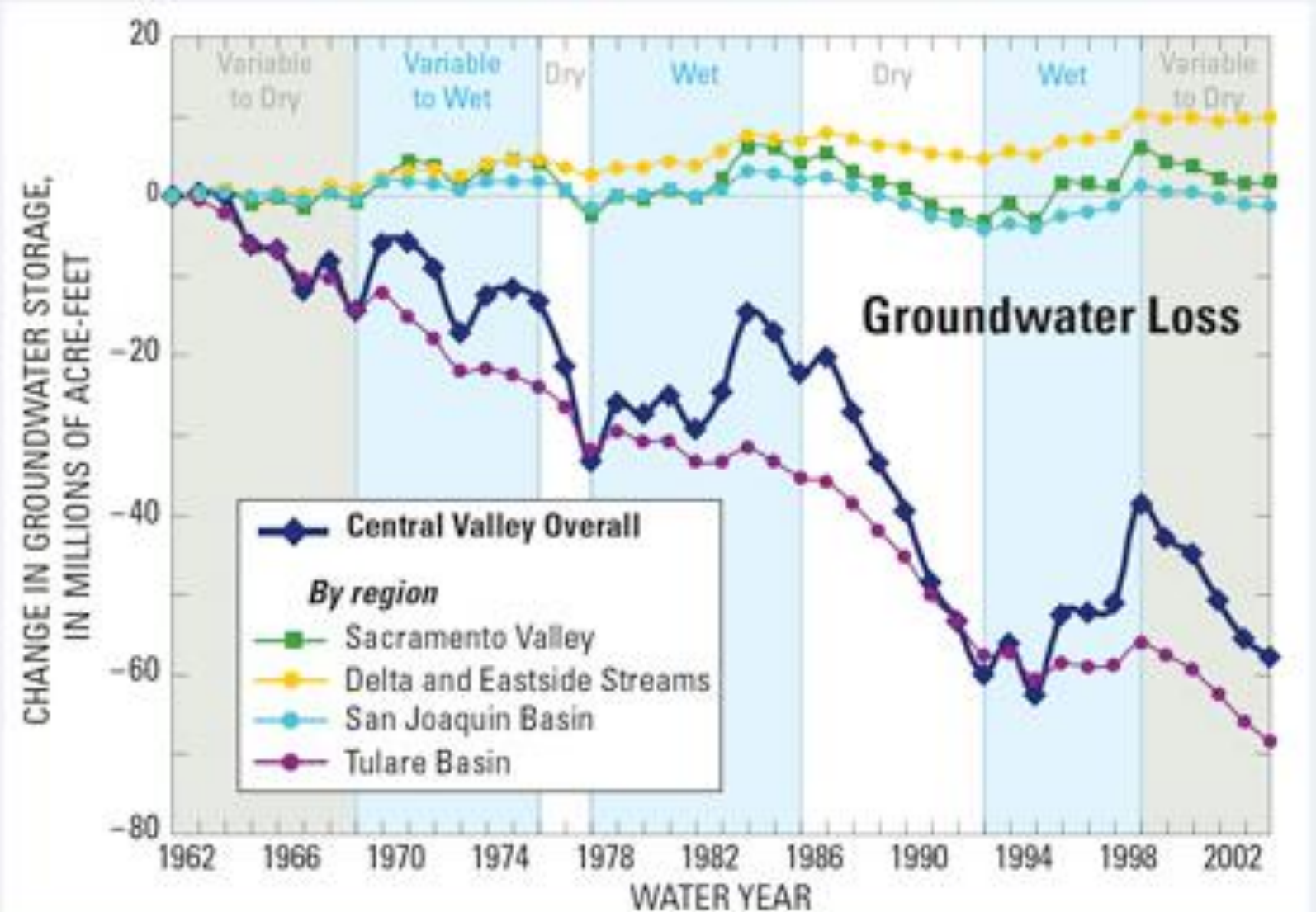
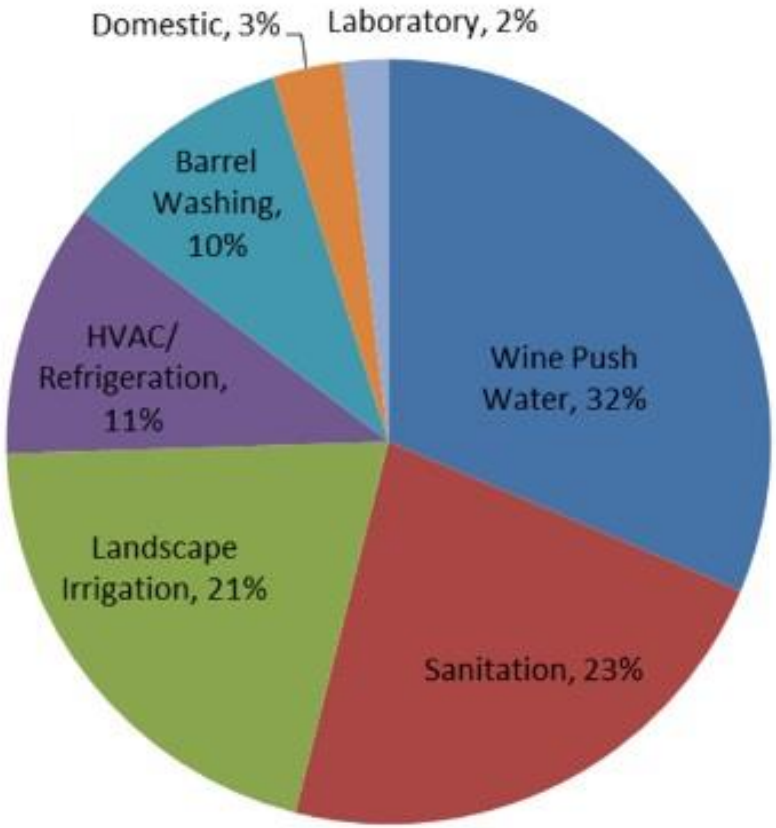
California's Water Sources - Groundwater



Water Use in the Winery



Breakdown of water use by process in Kendall Jackson Winery *(from Kendall-Jackson 2011).*

Water Storage
Potable: 1,000,000 L
Non-Potable: 680,000 L

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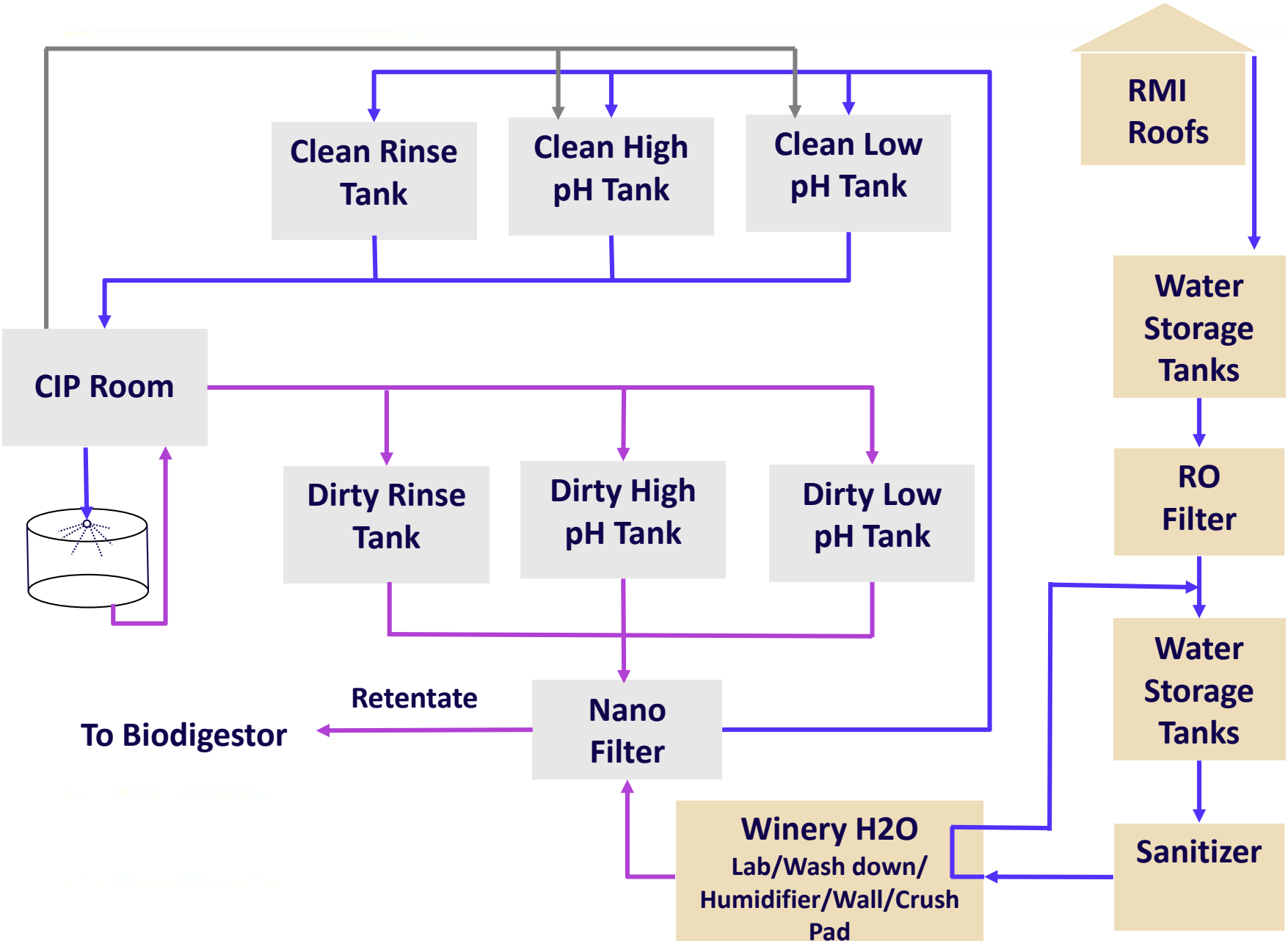
Non-Potable Water

- Collected from swales
- Filtered, treated with ozone
- Used for irrigation & toilets

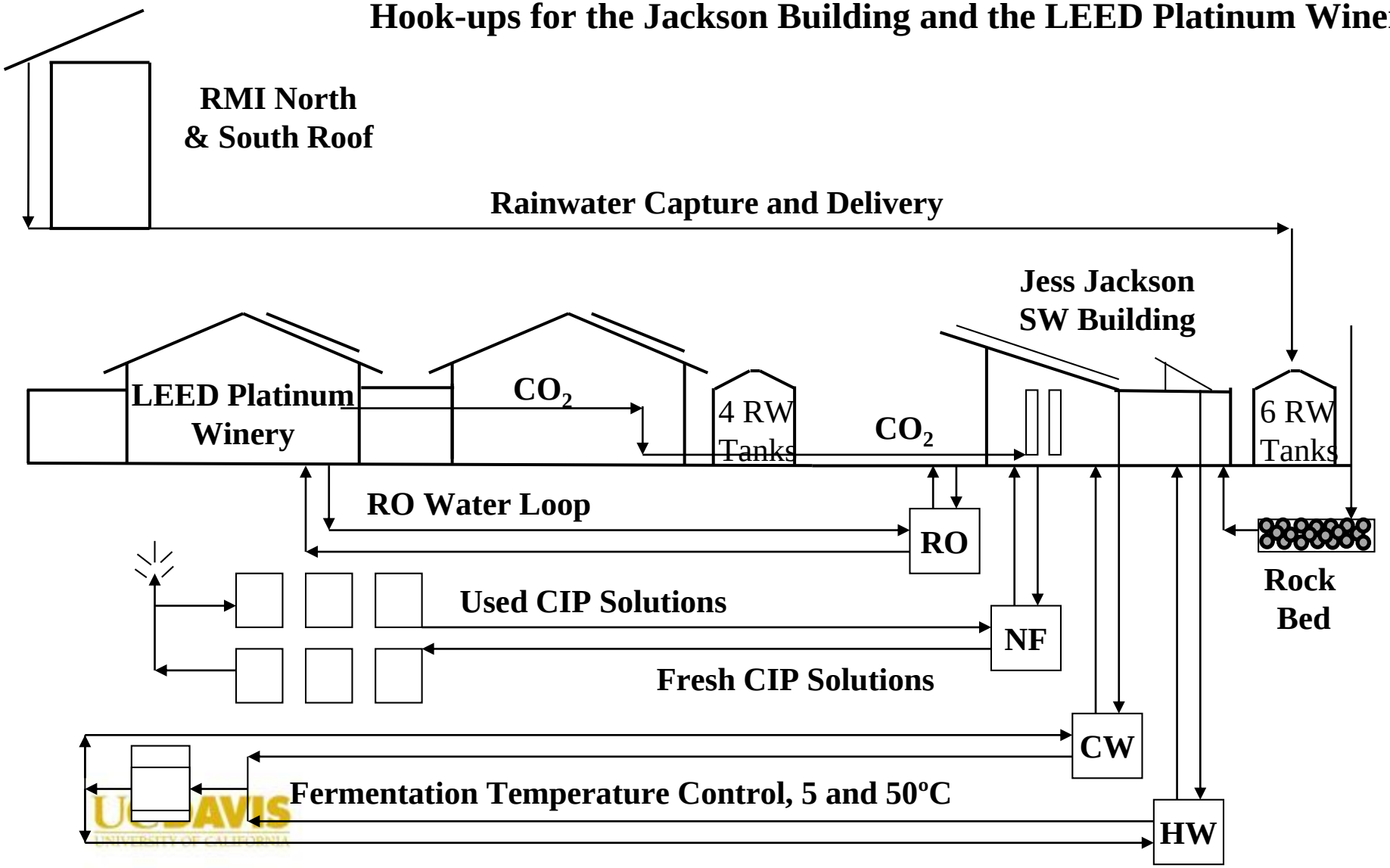
Rainwater Harvest

- **Why rainwater?**
  - **No Aquifer Depletion**
  - **High Quality**
  - **No Hardness or Silica**
  - **Low RO Energy Requirement**

Rainwater Harvest/Clean In Place / Water Reuse



Hook-ups for the Jackson Building and the LEED Platinum Winery



The LEED Platinum Teaching and Research Winery

- Produce more water & power than winery needs in a season
- Energy positive & water positive
- Onsite capture & storage

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Acknowledgements

- Roger Boulton (visionary)
- Jim Wolpert, Andy Waterhouse and Dave Block (previous and current chairs)
- Chik Brenneman (winemaker)
- All donors to the Research and Teaching Winery
- Jackson family for funding the Jess S. Jackson Winery Building