



# Fort Collins Utilities Peak Partners programs

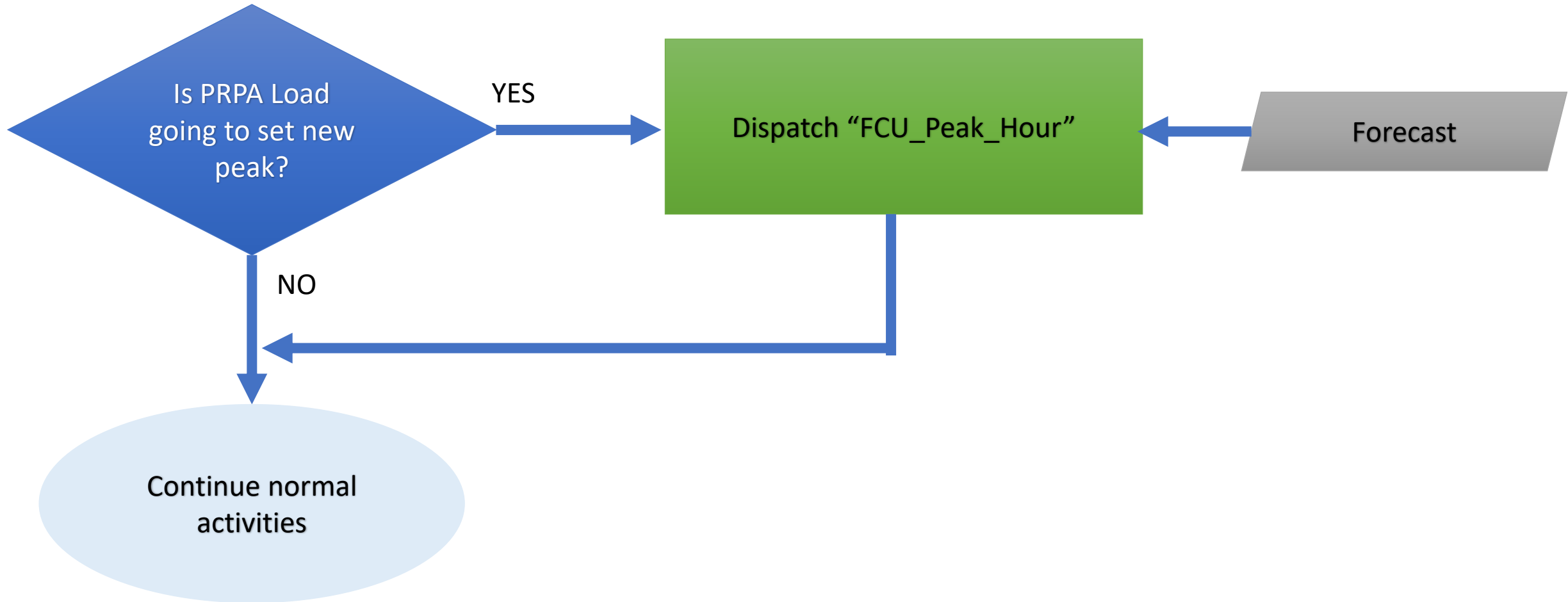
The (Ongoing) Journey from DERMS to Regional VPP

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# How we got here

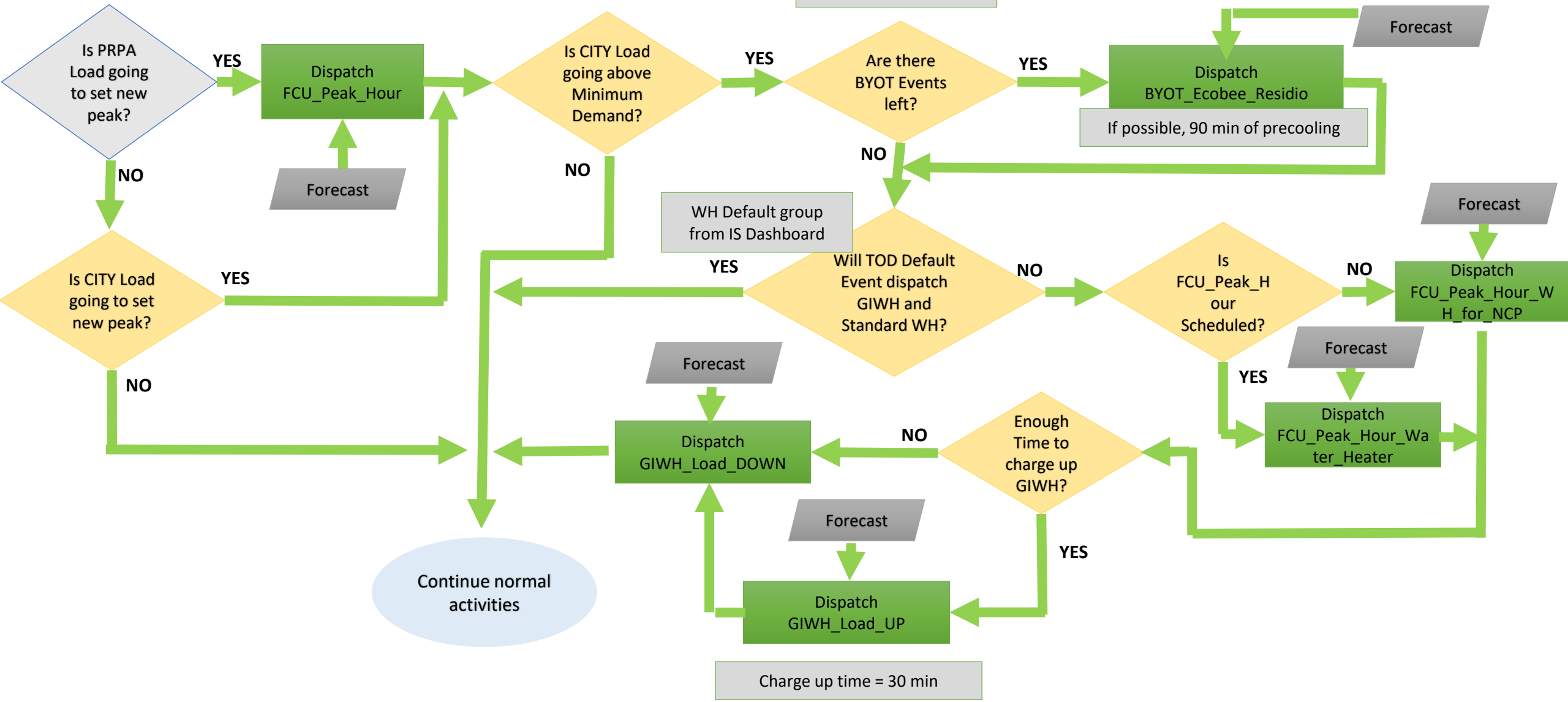
- 1982-2000s
  - “Hot Shot” program for electric water heaters (one-way radio)
  - PRPA Demand Ratchet Savings (winter peaking)
- 2000s-2013
  - “Load Management” program for water heaters and HVAC (one-way radio)
  - PRPA Coincident Peak Savings (summer peaking)
- 2013-onwards
  - “Peak Partners” program for BTM resources
  - DERMS (IntelliSOURCE, originally Comverge now Itron)
  - PRPA Coincident Peak Savings
  - Grid flexibility services available now for upcoming organized market

# Old Flow Chart for Dispatch

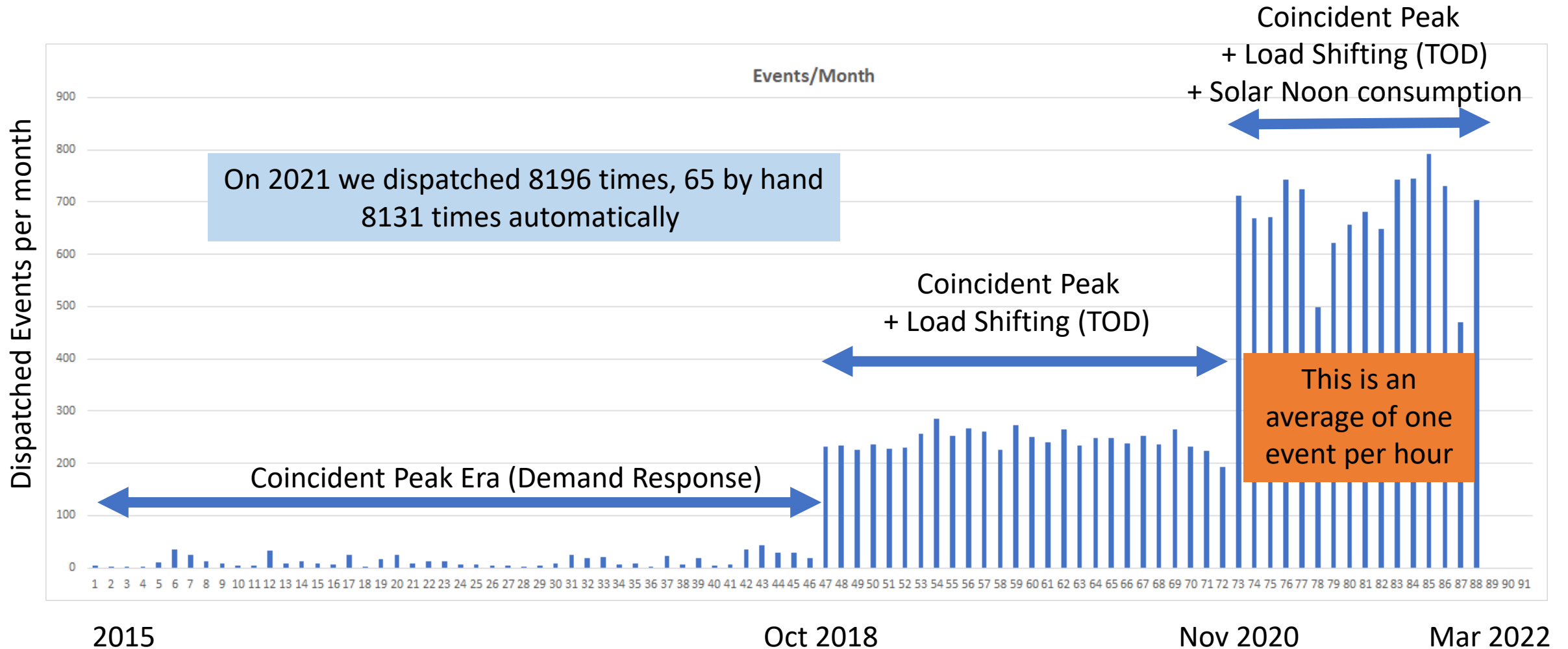


# Current Dispatch Flow Chart

BYOT Limits  
 <20 events  
 <40 hrs/yr  
 Event lasts < 3 hr

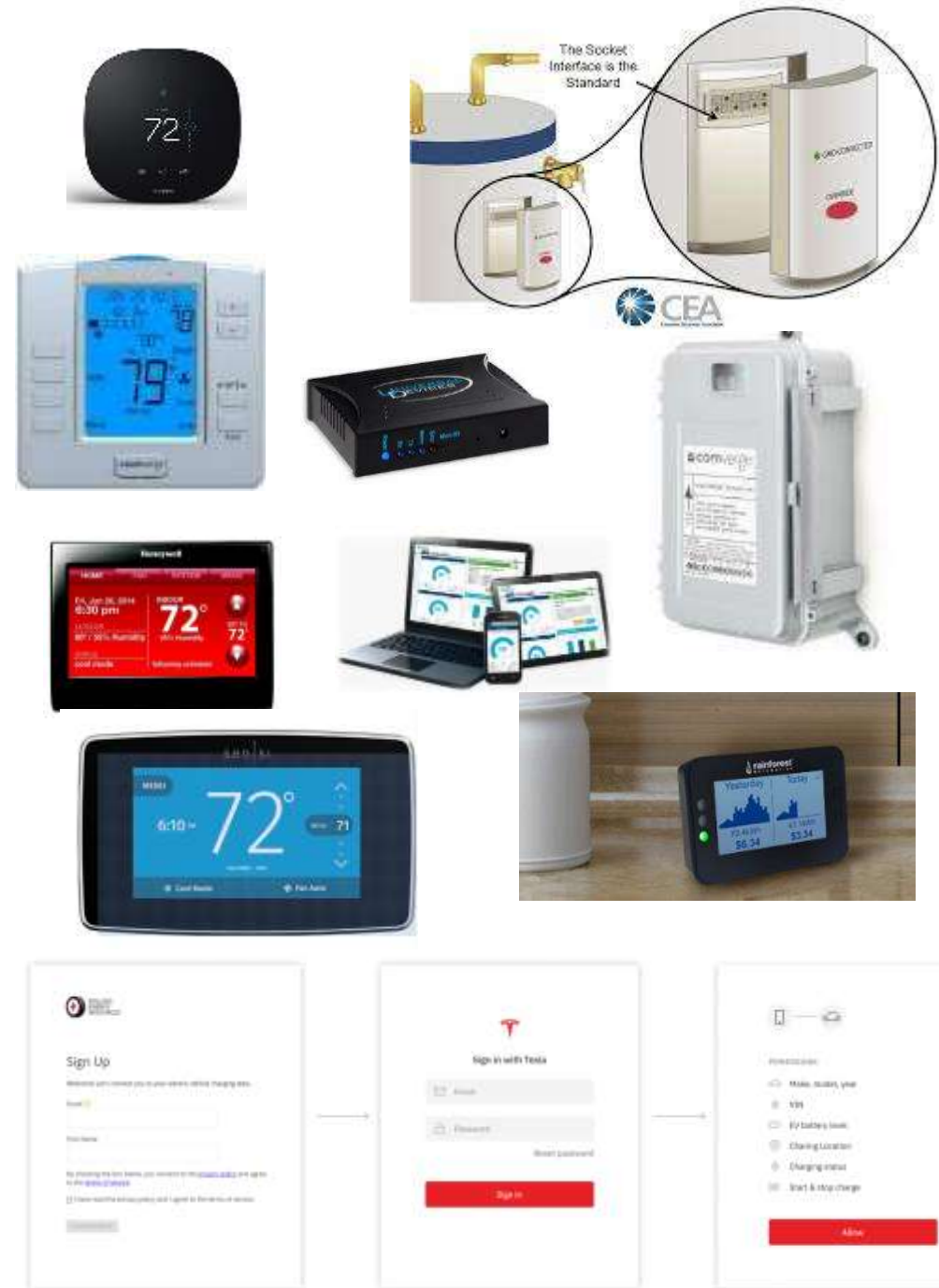


# Evolution of IntelliSOURCE use frequency



# Peak Partners Programs

- Equipment/Interfaces
  - Wi-Fi thermostats
    - Direct Install and BYOT
  - Standard Electric water heaters
  - Grid Interactive Water Heater (Thermal Storage)
    - CTA-2045
  - Electric Vehicles (Charge Management)
  - OpenADR
    - Commercial & Industrial
  - IEEE 203.5 (offer in BFO 23-24)
    - Batteries and PV inverters
- About 3,500 homes and 7 large commercial
- -1.8/+2.4 MW of effective capacity
- Current functions
  - CP/NCP savings –impacted by MBD-
  - TOD Load shifting
  - Solar noon consumption



# IntelliSOURCE (DERMS for Distribution Utilities)

## IntelliSOURCE provides

- Work Orders: Installs, Repair, etc
- Inventory Management
- Auto-enrollment portal
- Case management
- Command and Control
- Two-way communication
  - Wi-Fi Thermostats (DI/BYOT)
  - Standard Water Heater
  - Grid Interactive Water Heaters
  - EV Telematics
- Forecast (load and resources)
- Monitoring and Verification

The screenshot displays the IntelliSOURCE web application interface. At the top, there is a navigation bar with the City of Fort Collins logo and the IntelliSOURCE™ name. The user is logged in as FCU - Pablo Bauleo, with a sign-out option and the current time (09:53:20 AM MDT) and temperature (66°F). The main navigation menu includes ACQUIRE, MANAGE, CONTROL, MEASURE, and ANALYZE.

The dashboard is titled "DASHBOARD" and shows the user is signed in as FCU - Pablo Bauleo (Last login: 04/28/2022 11:25 AM). There were 0 failed login attempts since your last login.

The "CONTROL EVENTS" section is divided into three categories: YESTERDAY, TODAY, and FUTURE. The YESTERDAY and TODAY sections contain tables of events with columns for Status, Start Time, End Time, Nodes/Premises, Rate Contracts, and Control Report. The FUTURE section indicates there are no control events in the future.

The "LOAD POTENTIALS" section has tabs for Overview, By Rate, and By Node. The Overview tab shows a table with the following data:

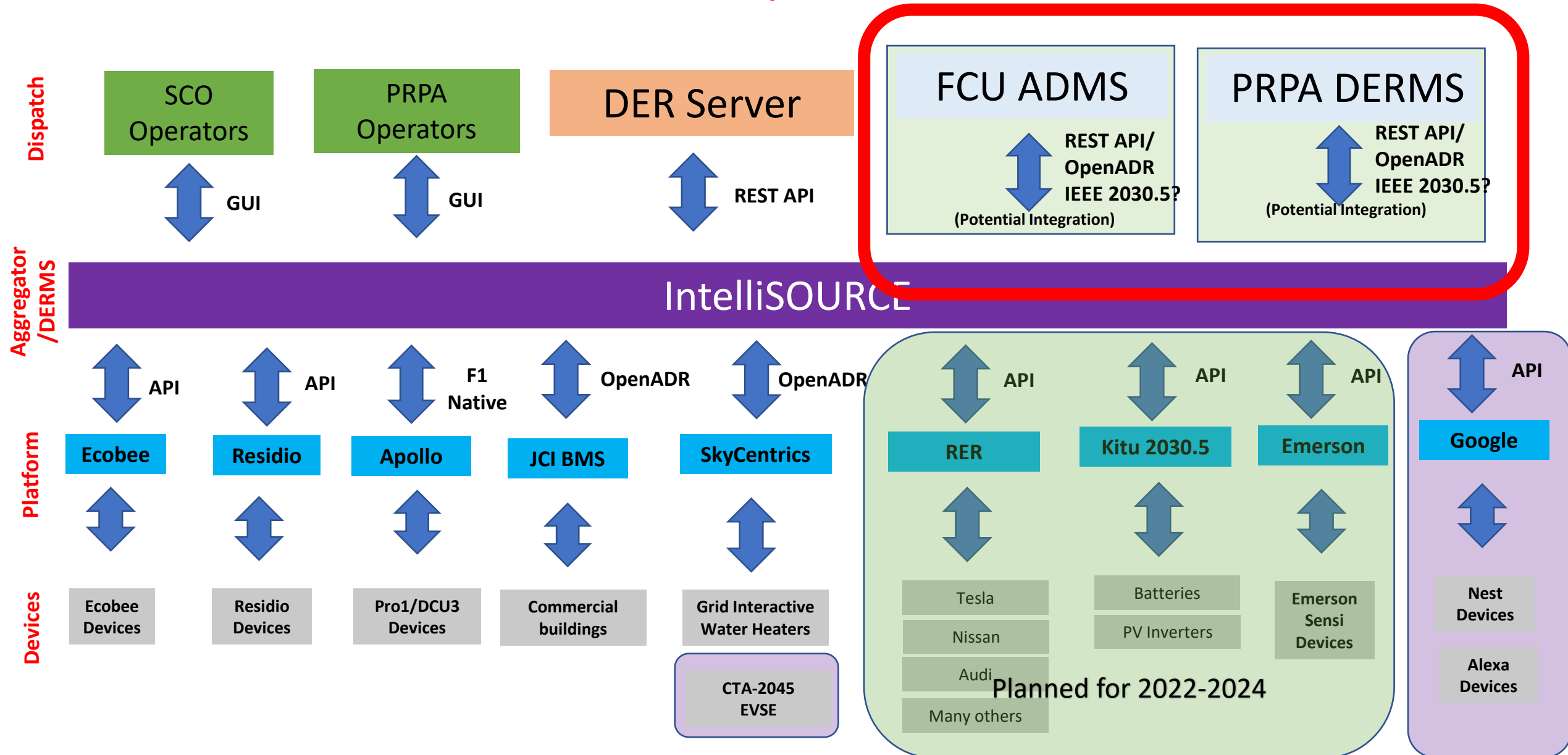
Category	Value
End Points	6327
C&I Meters	33
Total Load	5.1 MW
Rate Contracts	34
Topology Nodes	1
Unattached Devices	1639
Unattached Load	700.0 W

The "SYSTEM STATUS" section has tabs for Summary, Services, Transmitters, RTM's, and M&V. The Summary tab shows a table with the following data:

Device Type	Online	Offline	Deactivated	Controllable
IntelliCONNECT	281	115	71	280
IntelliTemp 800	974	570	1474	972
IntelliTemp 801	41	12	23	41
SkyCentrics	81	0	15	66

A "View Offline Details" link is located at the bottom right of the System Status section.

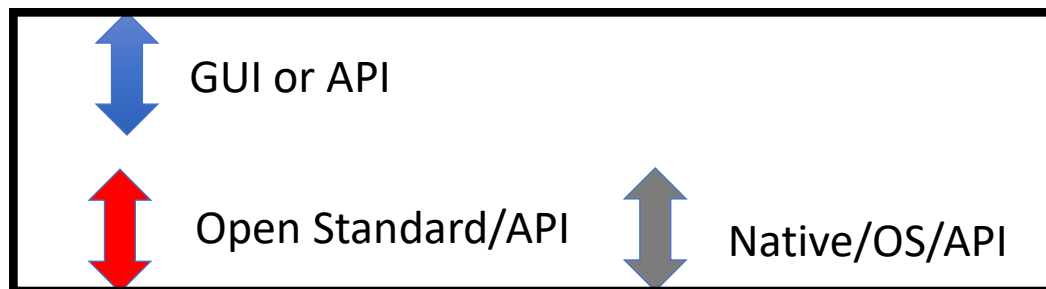
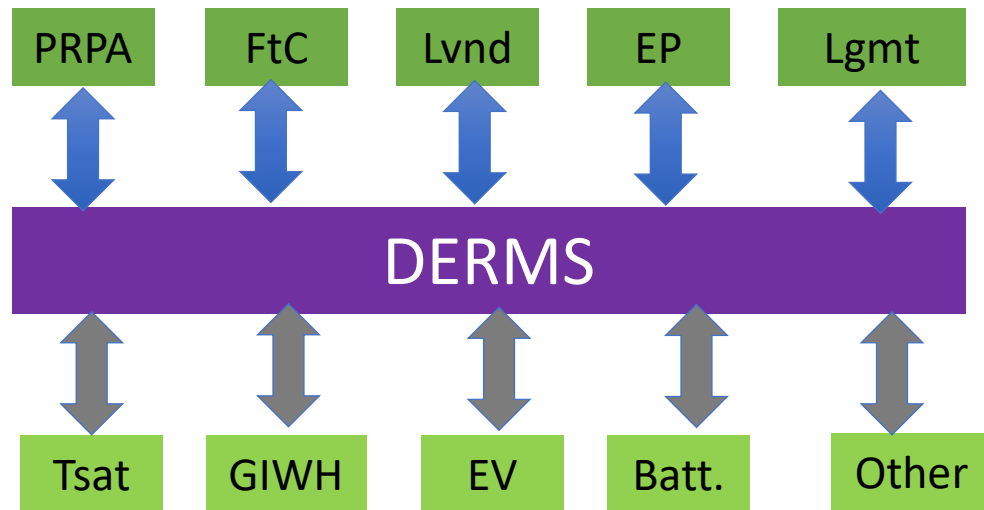
# IntelliSOURCE - System Architecture



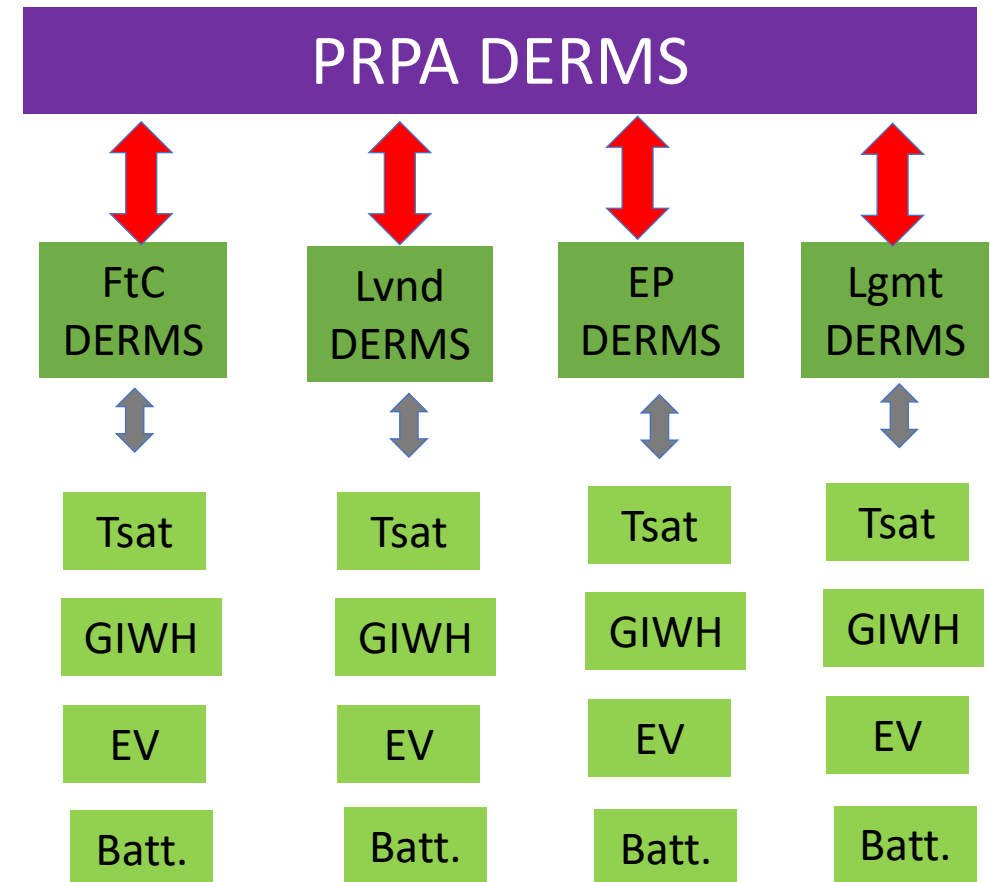


# Some options on a regional DERMS/VPP

- All 5 Utilities with a single DERMS



## Combination of DERMS





Thank you!

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Extra slides for general discussion

# Future State

**We anticipate integrated market in place**

**We anticipate renewable balancing will be needed**

System-wide (via EIM)

Locally (duck curve in some feeders)

**PRPA is planning a DERMS**

Sister cities status is uncertain at this point

## Opportunities

Market participation by customers

Integrated operations w/PRPA

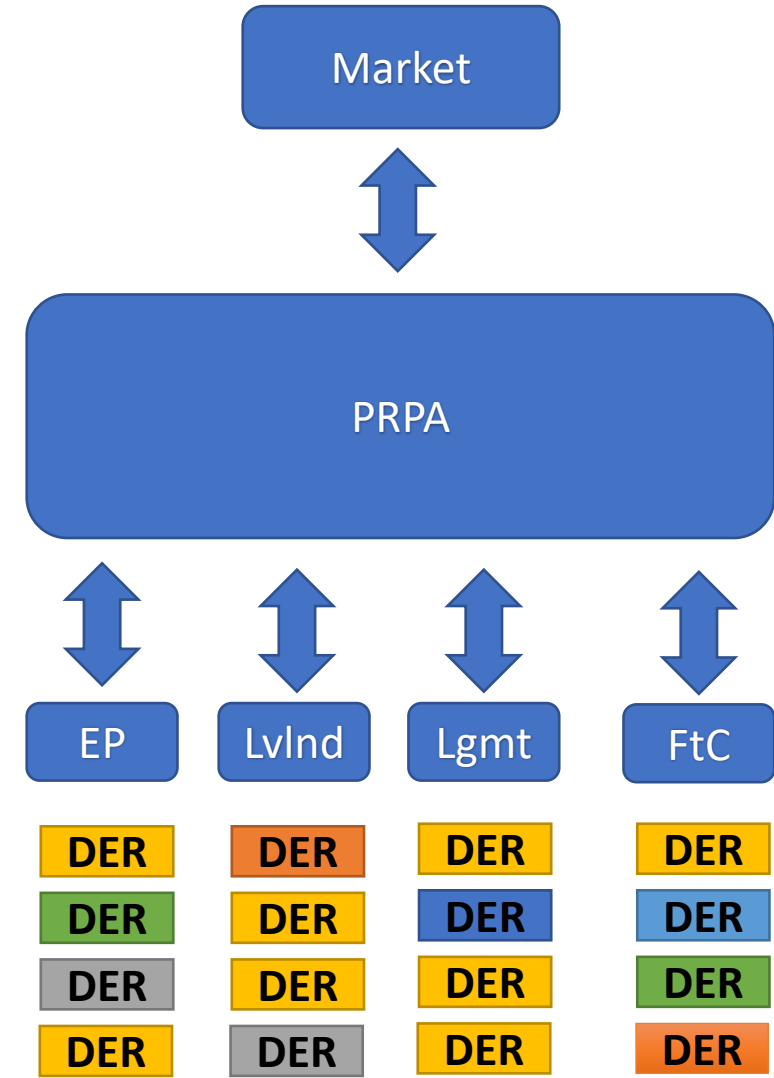
Lower (zero) carbon

## Challenges

DERMS/ADMS integrations (technical challenge)

Hierarchical shared DER (who can call and when)

Wholesale/retail rates mismatch



Different DER colors represent different types like EV, Tstat, GIWH, PV, Batteries, etc

# Future State (detail)

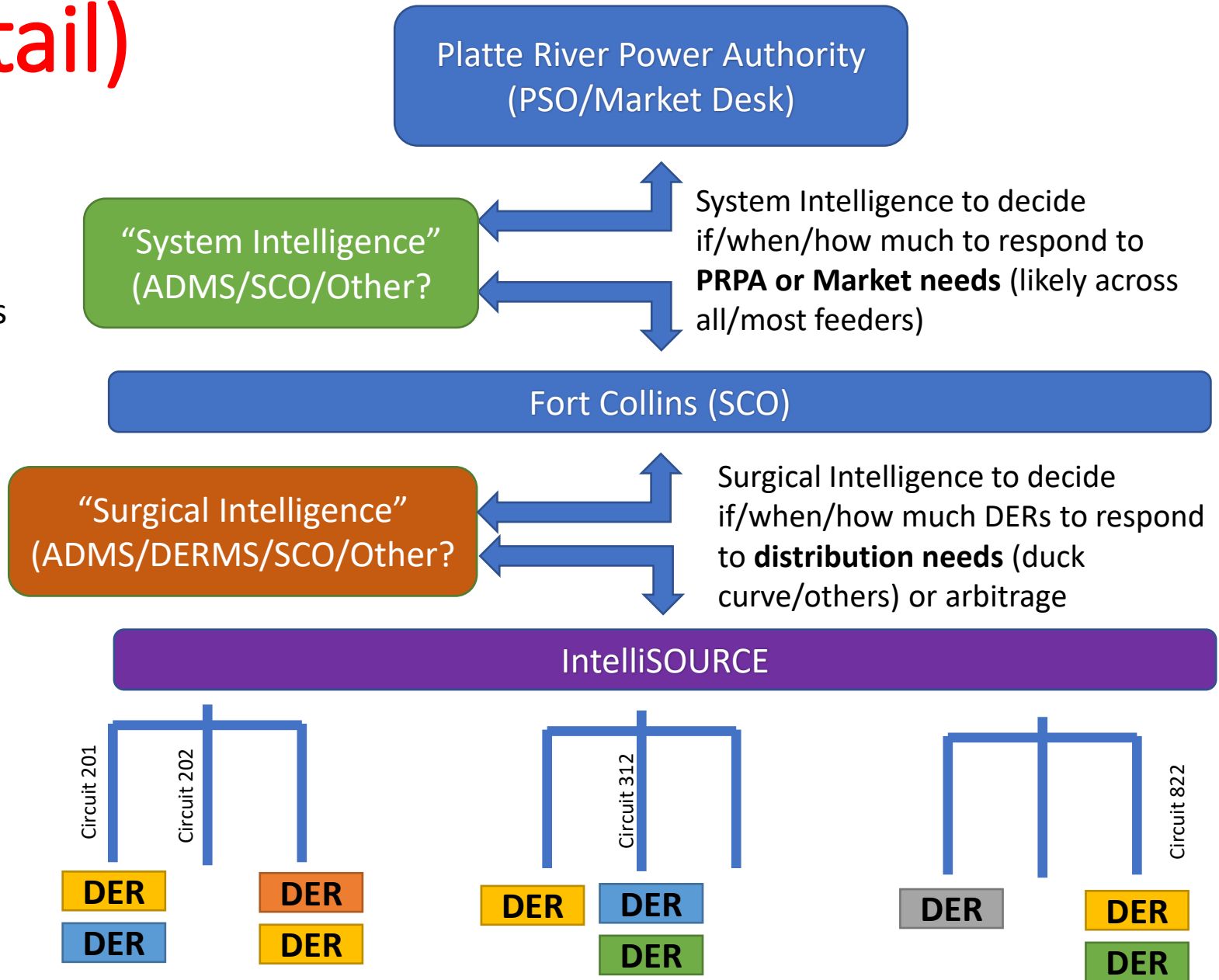
## Integrations will be needed across systems

## Intelligence (analytics) will be required

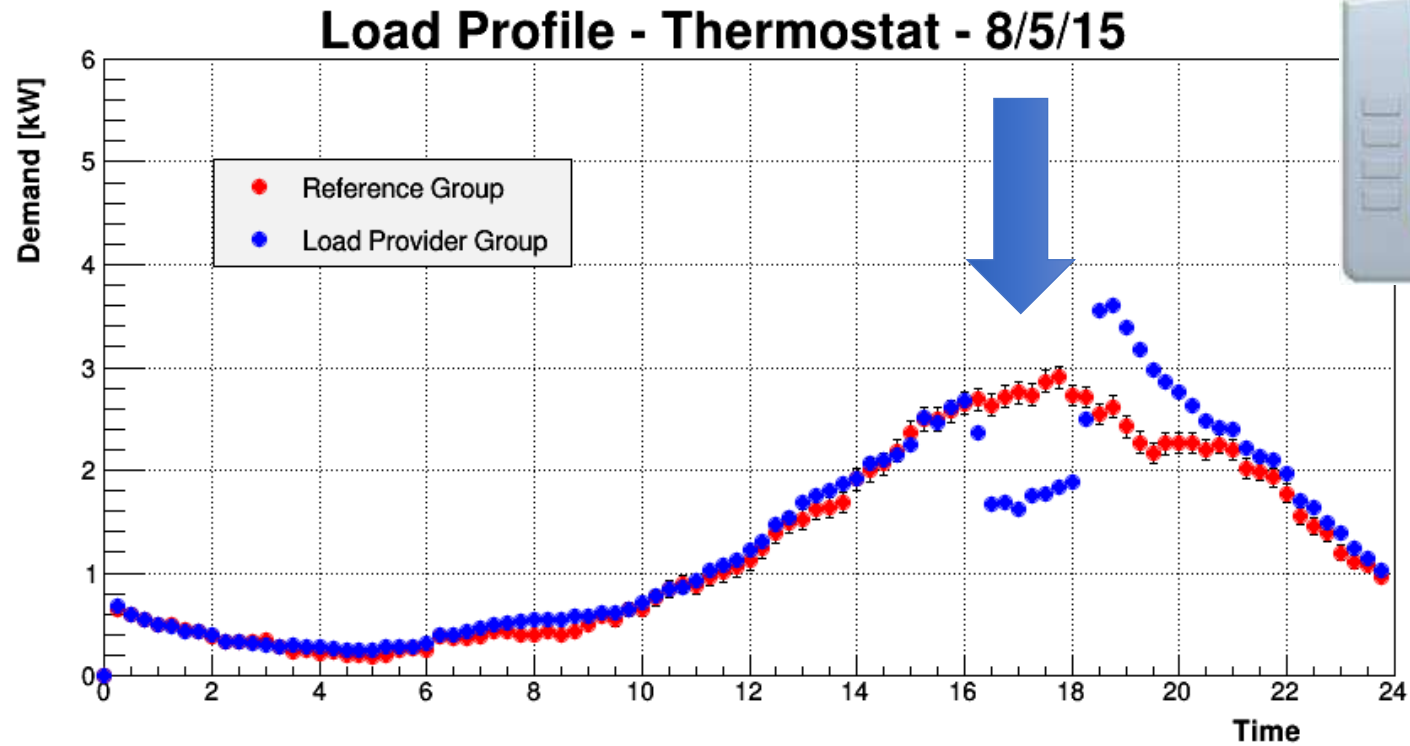
- Supervision of –some- decisions by operators
- Automation of dispatch for known cases

## Expected use cases (not exhaustive)

- PRPA will want to increase/decrease usage across all feeders
  - FCU will respond with selected feeders depending on feeder conditions
- FCU will want to increase/decrease usage across selected feeders (or all)
  - Wholesale/Retail arbitrage
  - Duck curve
  - Underutilized DG (duck curve)



# Thermostat Performance

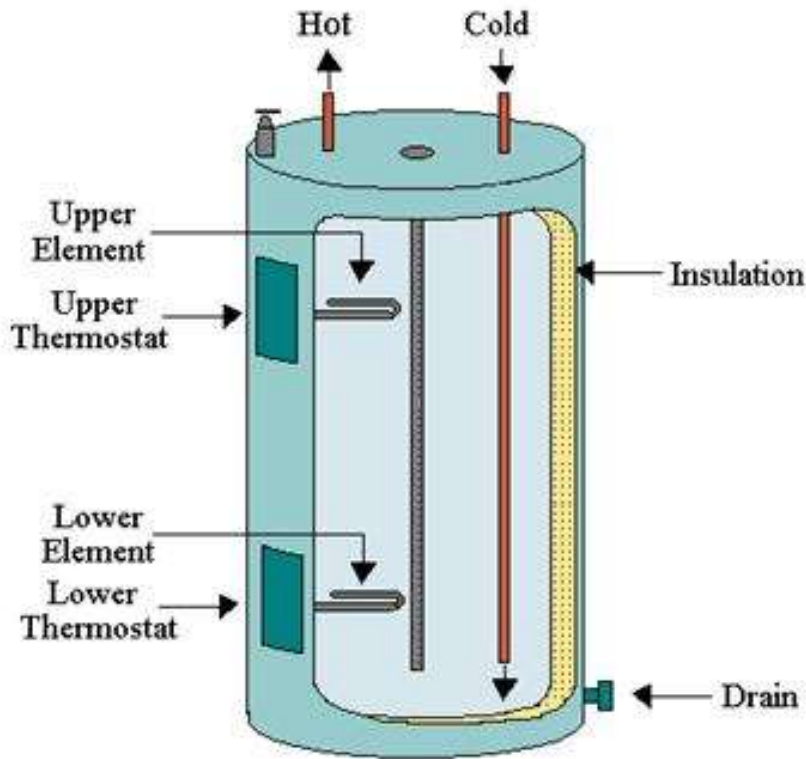


Using AMI data for M&V – Average performance 1.3 kW/device

Total energy use for both groups is similar within 1%



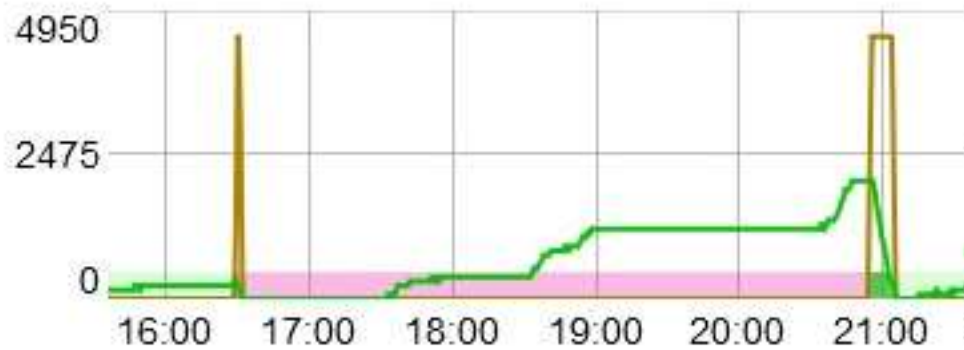
# Electric Water Heaters and thermostat dead bands



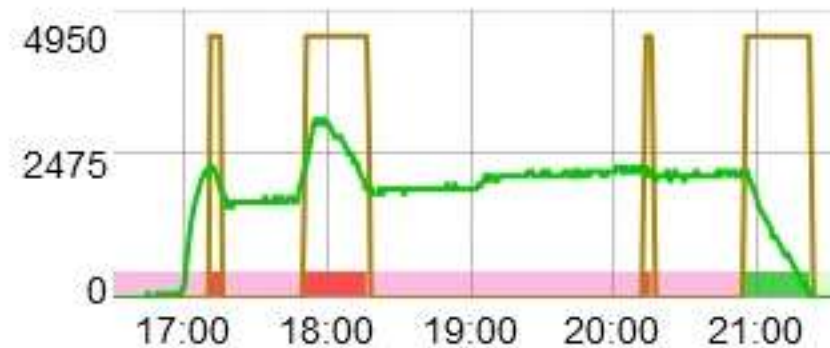
Electric Water Heater - Storage Type

- The water cools down before upper/lower elements kicks-in
  - It could be up to 10 deg F before kicks-in
- A less than 120F water heater has “capacity”
  - How much energy can be “stored” to reach 120F
- **Grid Interactive Water Heater (GIWH)**
  - Can “turn on” within the dead-band → “charge up”
  - Can “turn off” outside the dead band → “curtail”
  - Can “turn on” if about to run out of hot water
    - → unless grid emergency conditions

# Individual GIWH Behavior During Events



- On-Peak Period from 17:00 to 21:00
- WH charged up at 16:30
- Water consumption during event
- WH fully charged up at 21:00
  - Shifted load about 2 kWh



- » On-Peak Period from 17:00 to 21:00
- » WH partial charges at 17:10 to 17:15; 17:45 to 18:15 and 20:15 to 20:20
- » WH fully charge up at 21:00
  - On-Peak consumption, about 1 kWh
  - Off-Peak consumption, about 2 kWh
  - Shifted load about 1 kWh

Hot water was available always