Wholesale Demand Response Participation Overview

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The ISO offers several market models to enable load participation

Model	General Application
Participating load	• Large pumps • Loads
Pumped storage	• Large pumped storage • Small storage devices
Proxy demand resource (PDR)	• Aggregated, economically bid demand response
Reliability demand response resource (RDRR)	• Aggregated, emergency demand response

PDR and RDRR were ISO Initiatives enabling Demand Response wholesale participation in ISO markets

In response to FERC orders and CPUC rulings, the demand response products PDR and RDRR were developed to integrate utility programs and provide open access to 3rd party participation.

- PDR

Proxy Demand Resource implemented in 2010

- RDRR “aka” RDRP

Reliability Demand Response Resource (Product) implementation finalized in 2014 after delays due to FERC rulings and compliance filings.

Note: RDRR participation is limited to CPUC jurisdictional program integration

- capped as to MWs that count for Resource Adequacy per settlement agreement

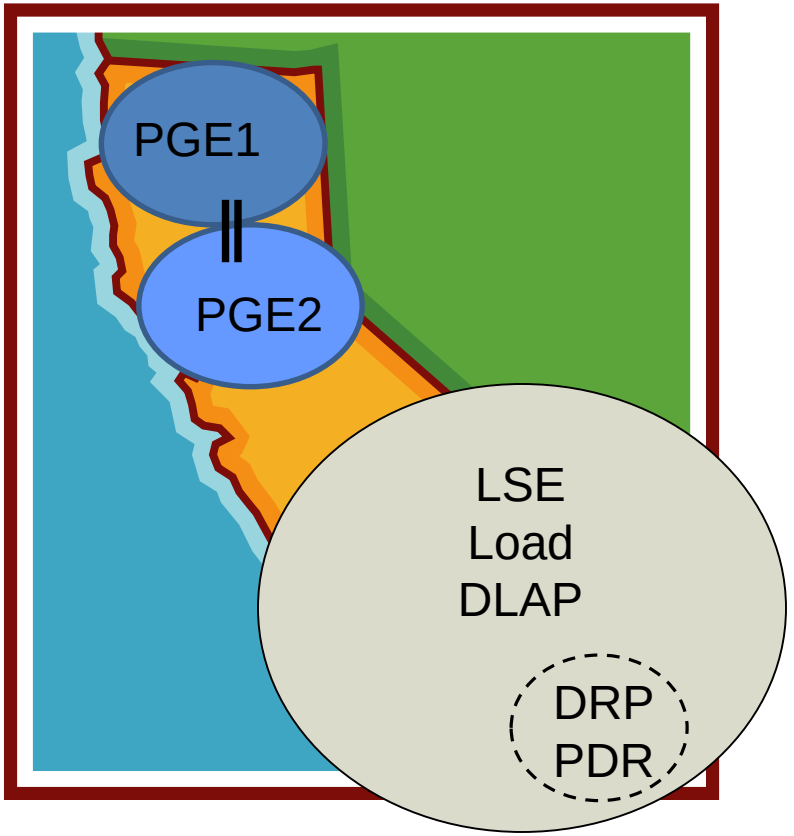
Initiatives developed models to provide enablement specific to demand resources

Provided a Wholesale Demand Response Model that Enabled:

- Direct participation of existing retail demand response programs
- Participation independent of Load Serving Entity (LSE)
- Comparable treatment
- Enabled demand response all hour and days of the year

PDR provides for direct participation of load and simplification in the scheduling of the load participation

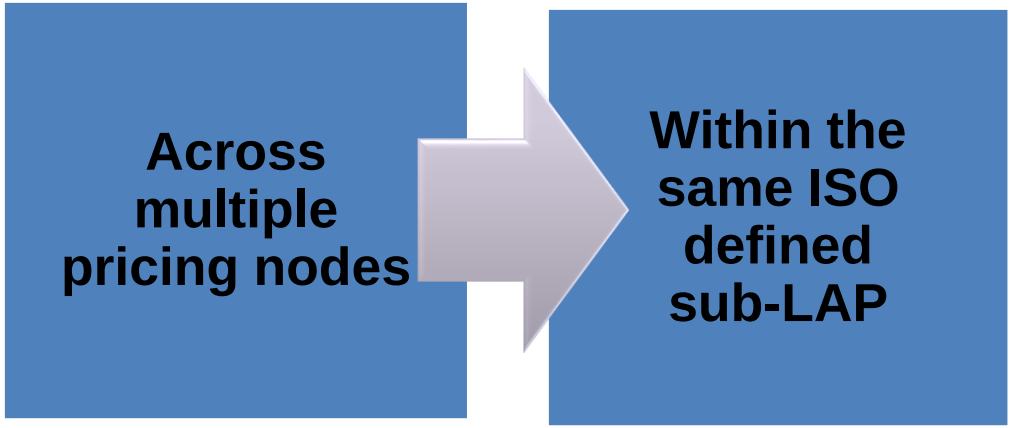
- LSE's load is forecasted and scheduled or bid-in at the DLAP.
- DRPs bid the demand response portion of the load into the ISO
- PDR bid as a *pseudo generator*
- The LSE and the DRP could be the same entity or two separate entities.
- Loads aggregated to SubLAP



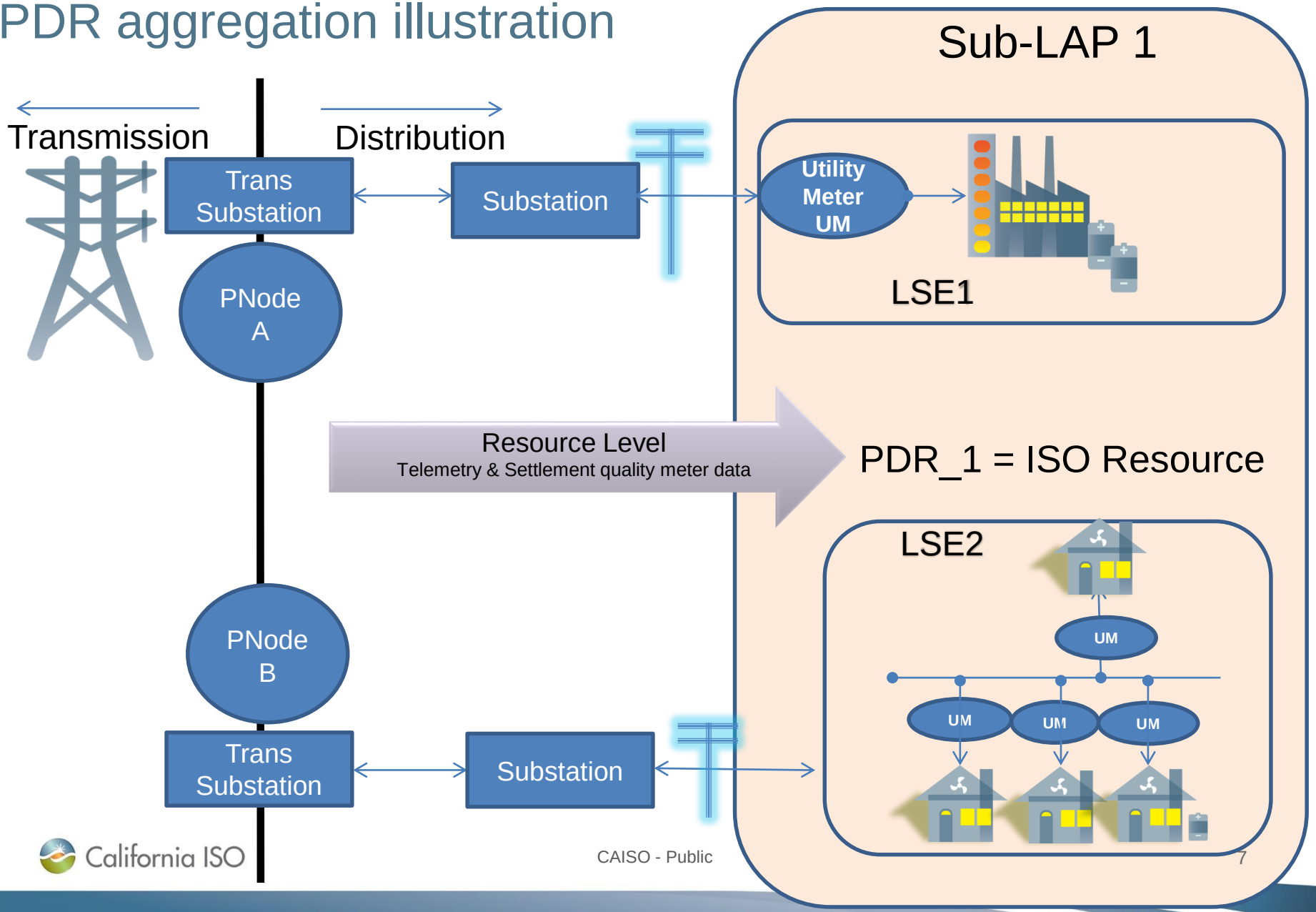
PDR and RDRR aggregation requirements have been established

Unlike traditional generation, demand response resources are comprised of an aggregation of locations, aka *"sub-resources", potentially geographically disbursed, to meet minimum participation capacity requirements.*

Aggregations are therefore permissible:



PDR aggregation illustration



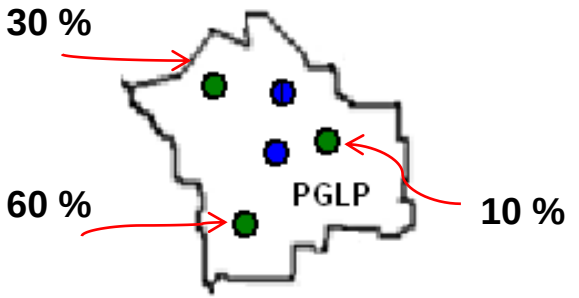
Modeled as a load, with options for resource to be pre-defined or customized

Pre-defined by Sub-Lap (available within ISO BA)

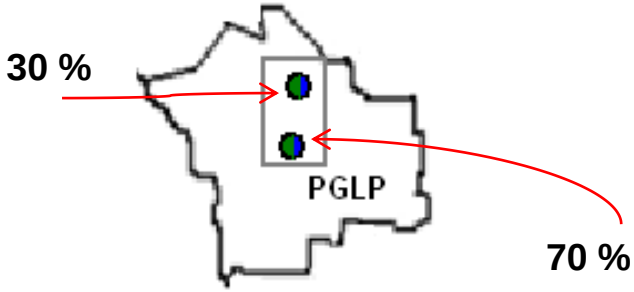
- CAISO pre-assigned a generation distribution factor (GDF) to resource

Customized (EIM participants must use)

- DRP customizes the resource by selecting load points and defining the GDF to the loads selected
- EIM participants would need to identify to the CAISO the load points and the corresponding distribution factors of the load curtailment



Pre-Defined PDR Resource
(Bus predefined, and location independent)



Custom PDR Resource
(Bus and Location are the same)

Pnode / Bus Node
PDR Location

PDR product overview and characteristics

Design	Acronym	Services	Market dispatch	Description
Proxy Demand Resource	PDR	Energy, AS non-spinning, AS spinning, and residual unit commitment (RUC)	Economic day-ahead and real-time	Bids into ISO markets as supply

- Can bid in 10kW increments
- Minimum load curtailment ≥ 100kW for energy
- Minimum load curtailment ≥ 500kW for AS
- Smaller loads may be aggregated to achieve minimum targets
- Telemetry is required for resources ≥ 10MW and/or AS certification

Telemetry requirements were slightly modified for PDR to recognize extended time to scan aggregated resources and logically represent as generation

- Current ISO tariff requirements Section 7.6.1. (d)
  - Resources ≥ 10 MW
  - Resources providing ancillary services

- Business practice manual for direct telemetry

https://bpmcm.caiso.com/Pages/BPMDetails.aspx?BPM=Direct%20Telemetry

  - Section 5.2.2,5.2.3
    - PDR telemetry timing requirements
  - Section 12
    - PDR specific telemetry requirements (points/logic)

Demand response responsibilities include registration, bidding and settlement activities

Pre-Market Activities

- Secure Agreements
- Obtain System Access
- Register Demand Resource
- Obtain Market Resource ID

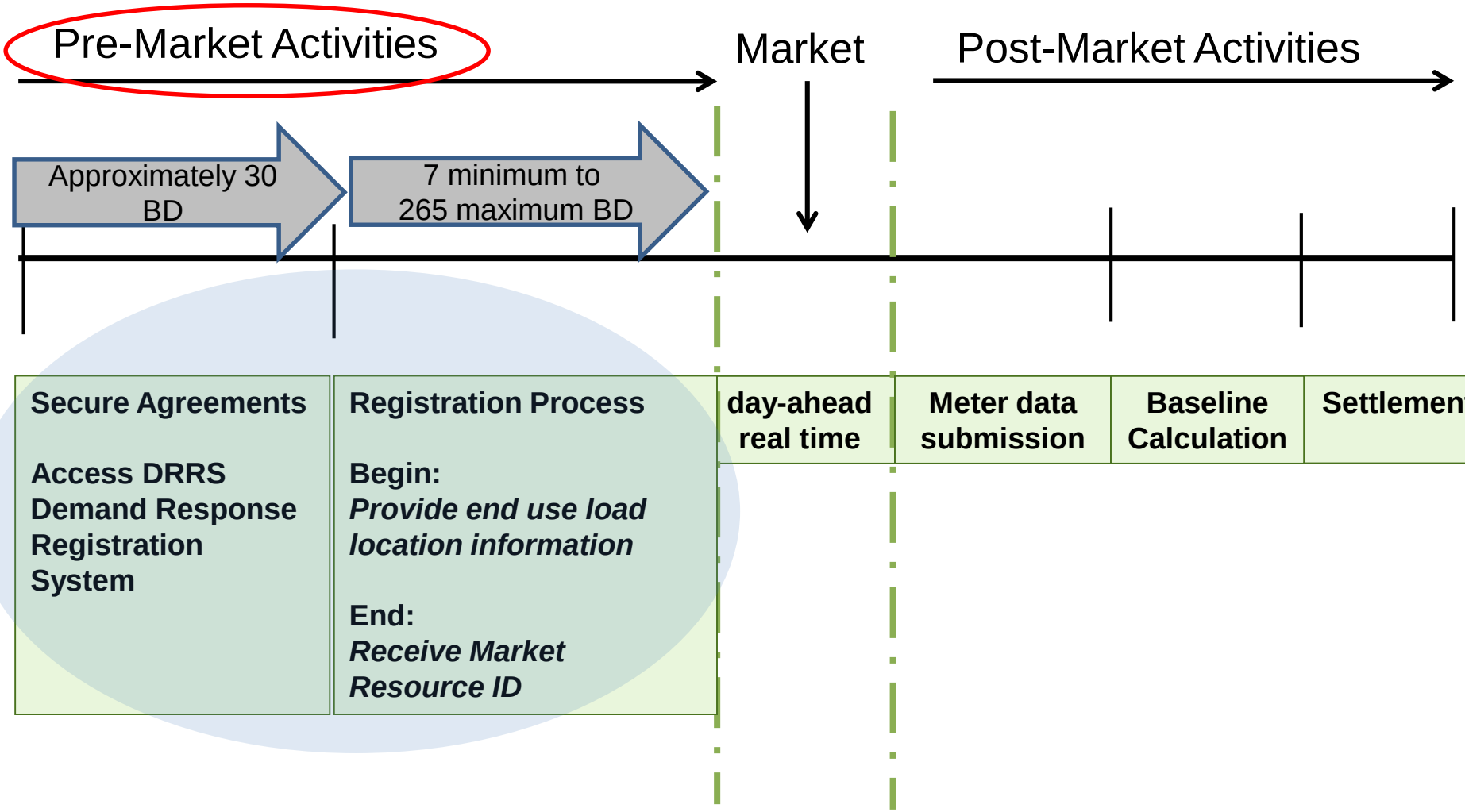
Market Activities

- Bid Submission
- Customer Market Results (CMRI) & Automatic Dispatch System (ADS)

Post Market Activities

- Baselines – Performance Measurement
- Meter Data Submission
- Settlement

Registration required prior to market participation



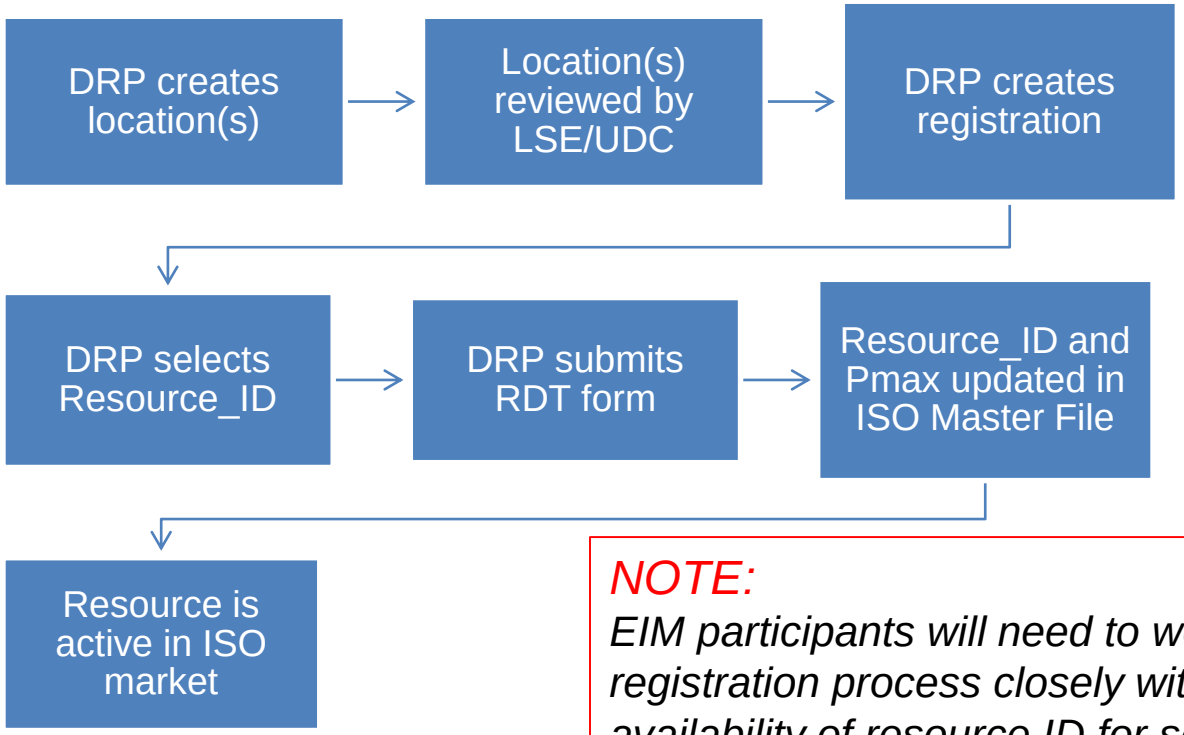
Access to the Demand Response Registration System (DRRS)

User access administrator (UAA) manages access requests for DRRS

- Access to DRRS is managed using the Access and Identity Management (AIM) application

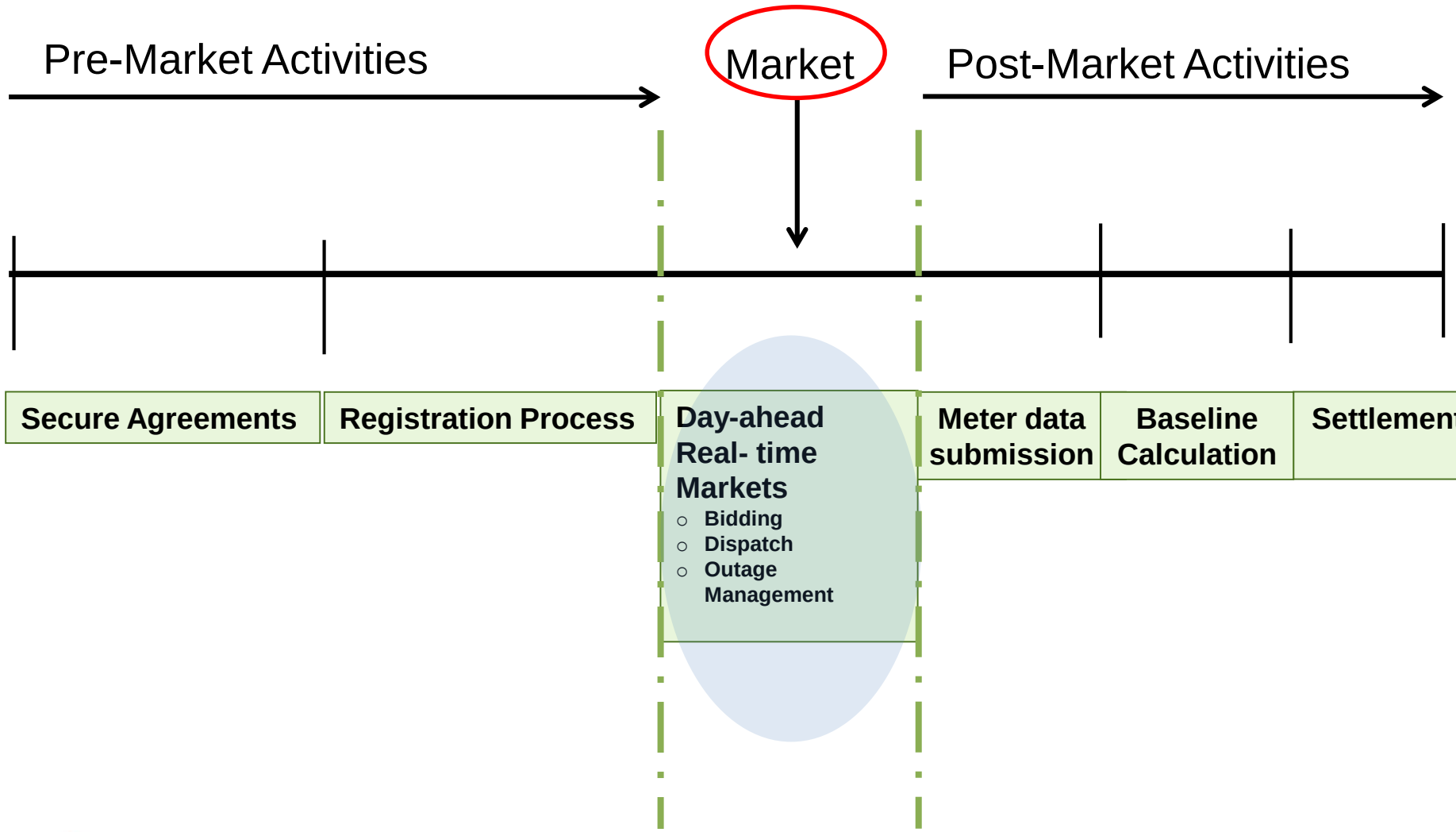
Registration provides visibility and auditability of aggregated participation to multiple entities.

- Locations are created, reviewed and registered in the Demand Response Registration System (DRRS) via User Interface or API

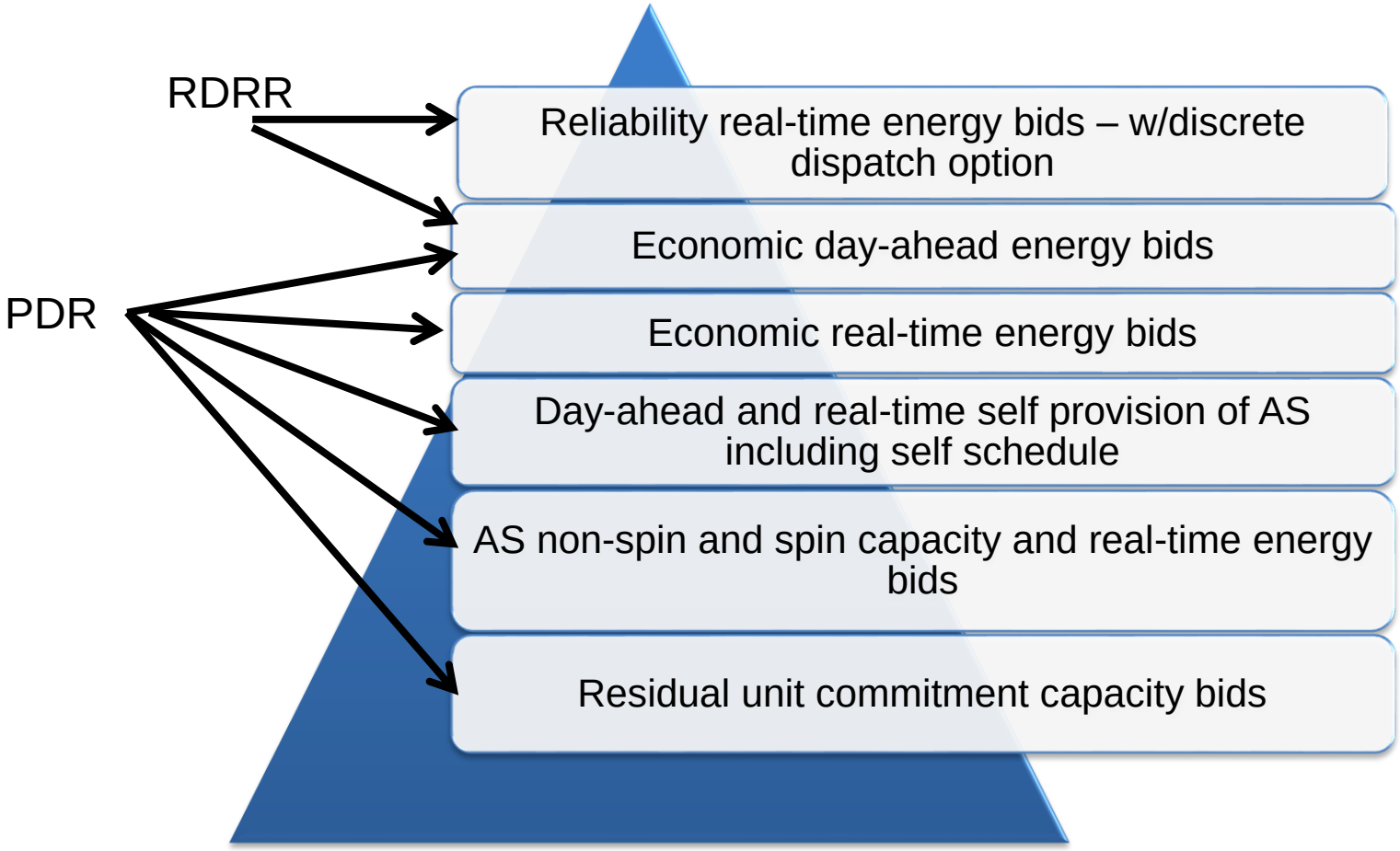


NOTE:
EIM participants will need to work through registration process closely with CAISO – availability of resource ID for selection will need to be coordinated

Demand response participate in the market as a supply resource



Scheduling Coordinator submit bids to ISO's Scheduling Infrastructure Business Rules system (SIBR)



The Master File & SIBR enforce bidding rules for PDR

SIBR bidding rule example:
No self-schedule bids in day-ahead markets
(zero base schedule for EIM)

- Real-time bidding options
  - single-segment vs multi-segment
- Minimum load curtailment requirements

PDR's will receive and must respond to awards and dispatches from the ISO

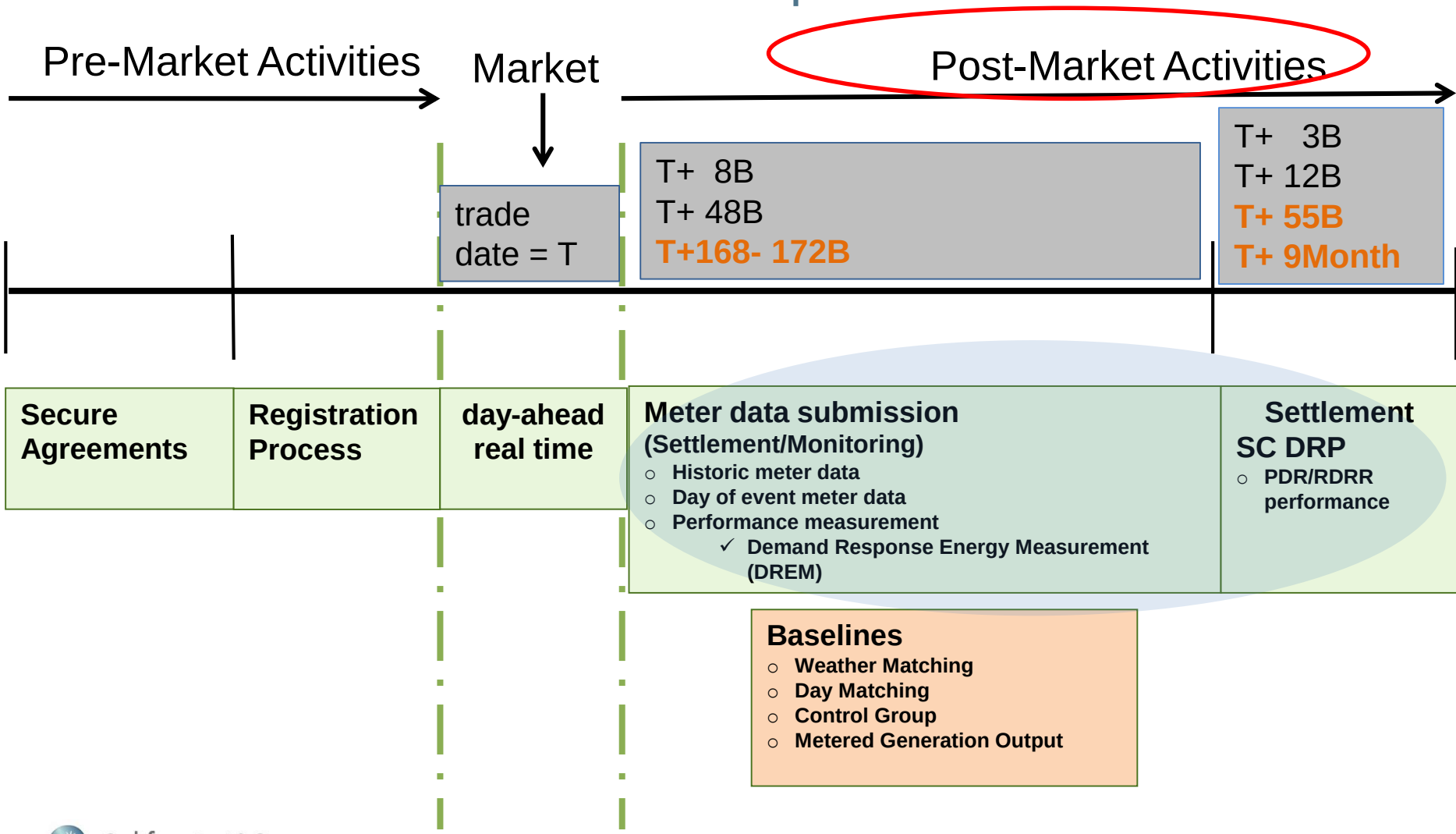
Customer Market Results Interface (CMRI)

- SCs retrieve proprietary market results

Automated Dispatch System (ADS)

- Resource instructions sent to authorized users
- No opportunity to accept or decline the instruction
- Review within 90 seconds then begin ramping to instructed MW

PDR resources are SC Metered Entities and require meter data submittal of resource performance



Post market functions performed include meter data submission and performance measurement calculations

Upload meter data

Evaluate compliance and event information

Calculate and upload customer baseline information

Calculate & upload demand response energy measurement

Multiple types of baselines are supported

1. **Control Groups**
   - Establishes baseline of load patterns during curtailment event using non-dispatched customers with similar profiles
2. **Day Matching**
   - Estimates what electricity use would have been in absence of DR dispatch, using electricity use data on non-event but similar days
3. **Weather Matching**
   - Estimates what electricity use would have been in absence of dispatch during non-event days with most similar weather conditions

A customer load baseline is an average performance measurement of DR when the resource is in a “non-event” state

- Events are defined as anything that would change the performance output of a resource
  - OMS outage
  - Real-time dispatch
  - Capacity award
- Requires sufficient historic meter data
  - 45 calendar days of historical data is suggested

A three-step process to ensure accurate development and submission of SQMD has been implemented

- **Baseline Registration**
  The CAISO will collect all registered baseline calculations, required information and justification for each DR resources. The monitoring and auditing processes will utilize the registered information.

- **Monitor**
  The CAISO will review and monitor SQMD with references to bids and event days of all DR participants.

- **Audit**
  Using available auditing provisions, the CAISO will audit DR resources to ensure the accurate development and submission of SQMD.

Information Resources on CAISO Website

- BPM for Demand Response
  - Posted in the BPM Library

- CAISO.com / Participate / Demand Response and Load
  - Comparison document
  - Overview
  - DRRS User Guide
  - Etc.…