



California ISO

# CAISO GHG Market Design

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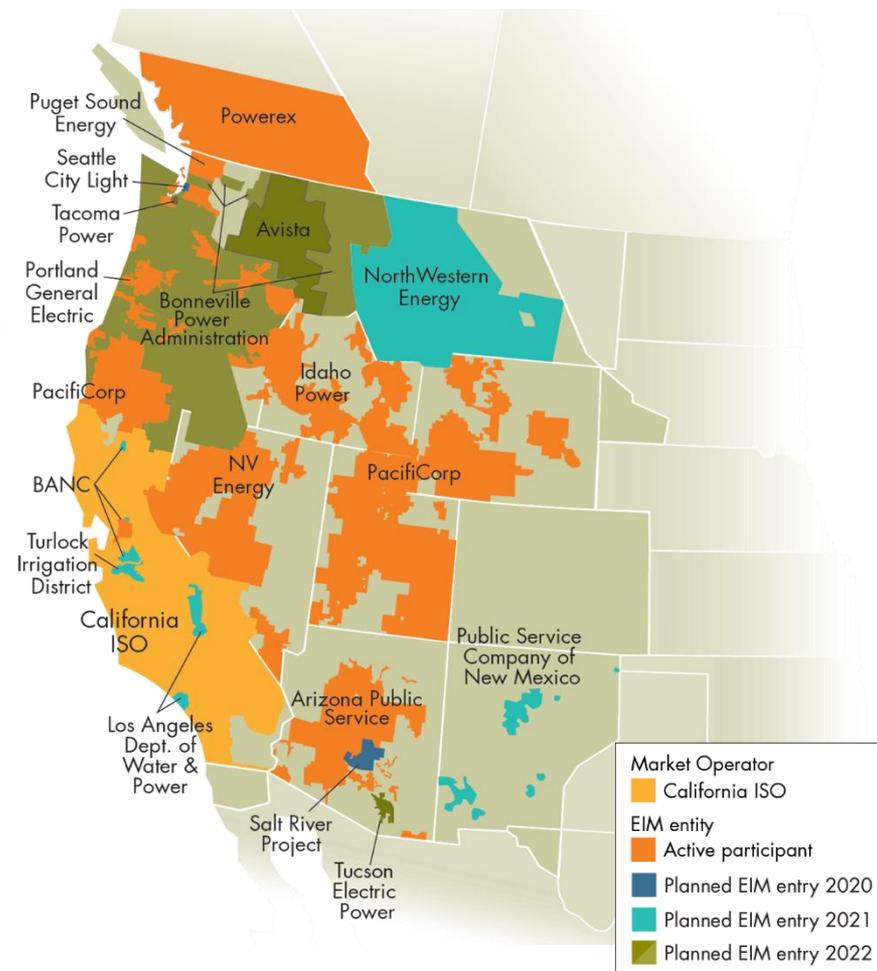
# California Air Resources Board provides three options to determine an imports compliance obligation

- Resource specific emissions rate
- Default emissions rate
- Asset controlling supplier emission rate

Imports include the cost of compliance in energy bids just like internal generators

# The Western Energy Imbalance Market

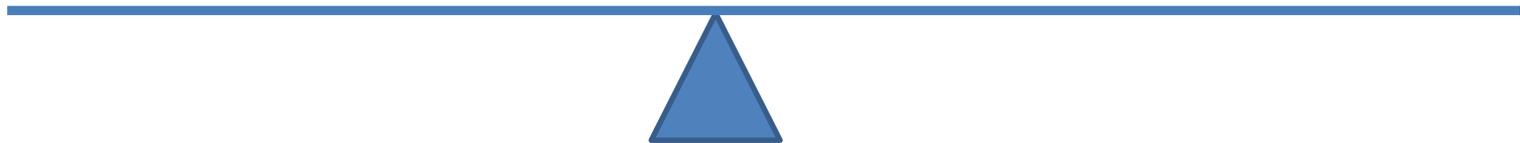
- Went live November 2014
- Allows other balancing authority areas in the West to participate in the CAISO's real-time market
- Currently, on California has a GHG program
- Needed approach to optimize across the combined footprint with/without GHG costs



# Non-California resource attribution for GHG tracking has competing objectives which must be balanced

Efficient  
Dispatch

Accurate  
Accounting for  
GHG Compliance



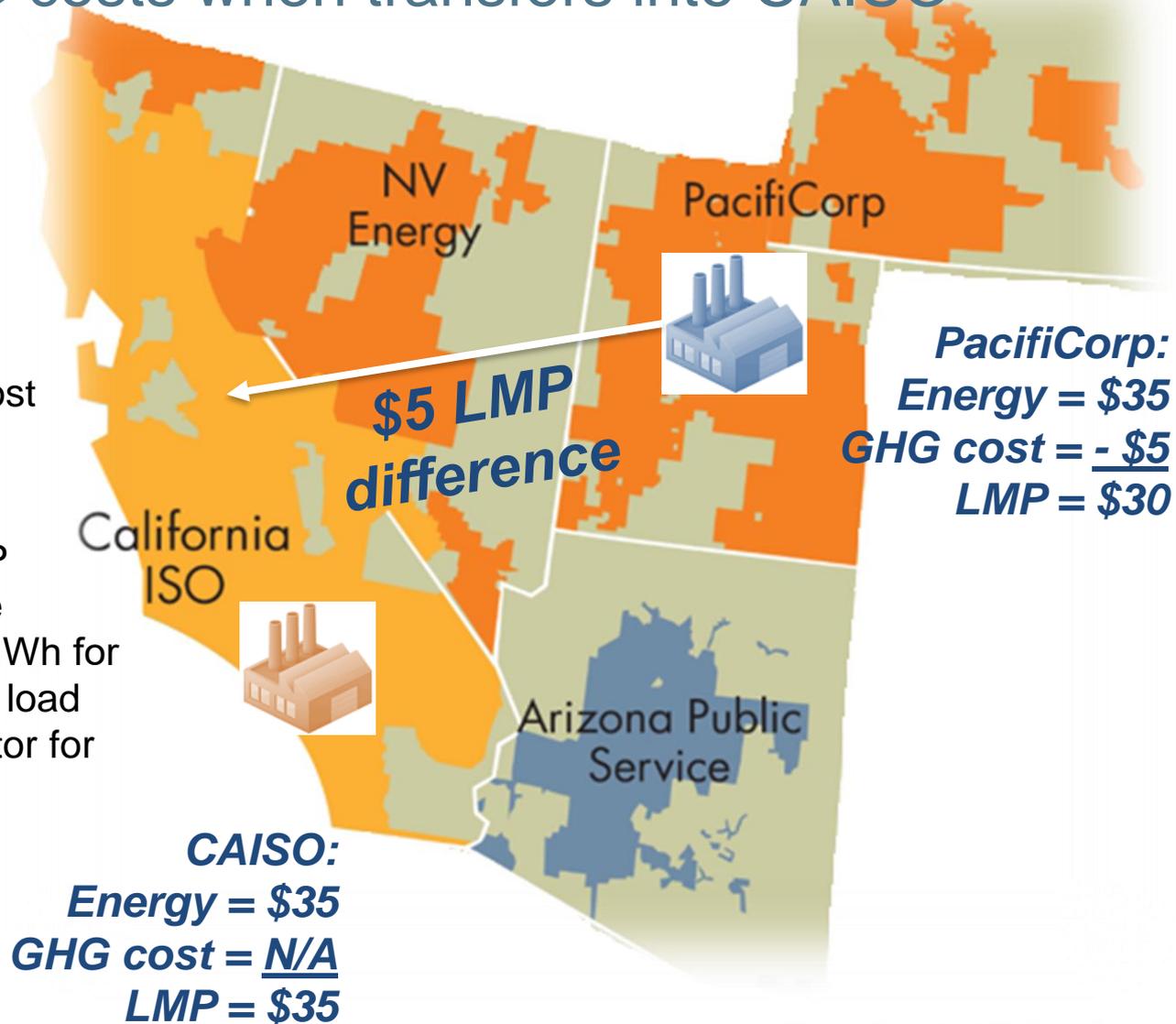
# EIM GHG design recognizes only certain generation is subject to California Air Resources Board regulations

- Generation inside CA BAAs have a compliance obligation
- Generation outside CA BAAs have a compliance obligation when serving CA BAA load
- Generation outside CA BAAs does not have compliance obligation when serving non-CA BAA load

EIM participating resources submit a separate GHG bid MW quantity and price which expresses willingness to support EIM transfer to CA BAAs

# GHG design ensures price paid by non-CA load does not include GHG costs when transfers into CAISO

- Both generators
  - Fuel cost = \$30/MWh
  - GHG cost = \$5/MWh
- CA generator
  - \$35/MWh energy bid
  - Sets \$35/MWh ISO LMP
  - Covers \$5/MWh GHG cost
- PacifiCorp generator
  - Imported to CA
  - Sets \$30/MWh PAC LMP
  - Sets \$5/MWh GHG price
  - ISO collects “extra” \$5/MWh for transfer to ISO from ISO load
  - Pays \$5/MWh to generator for its GHG costs

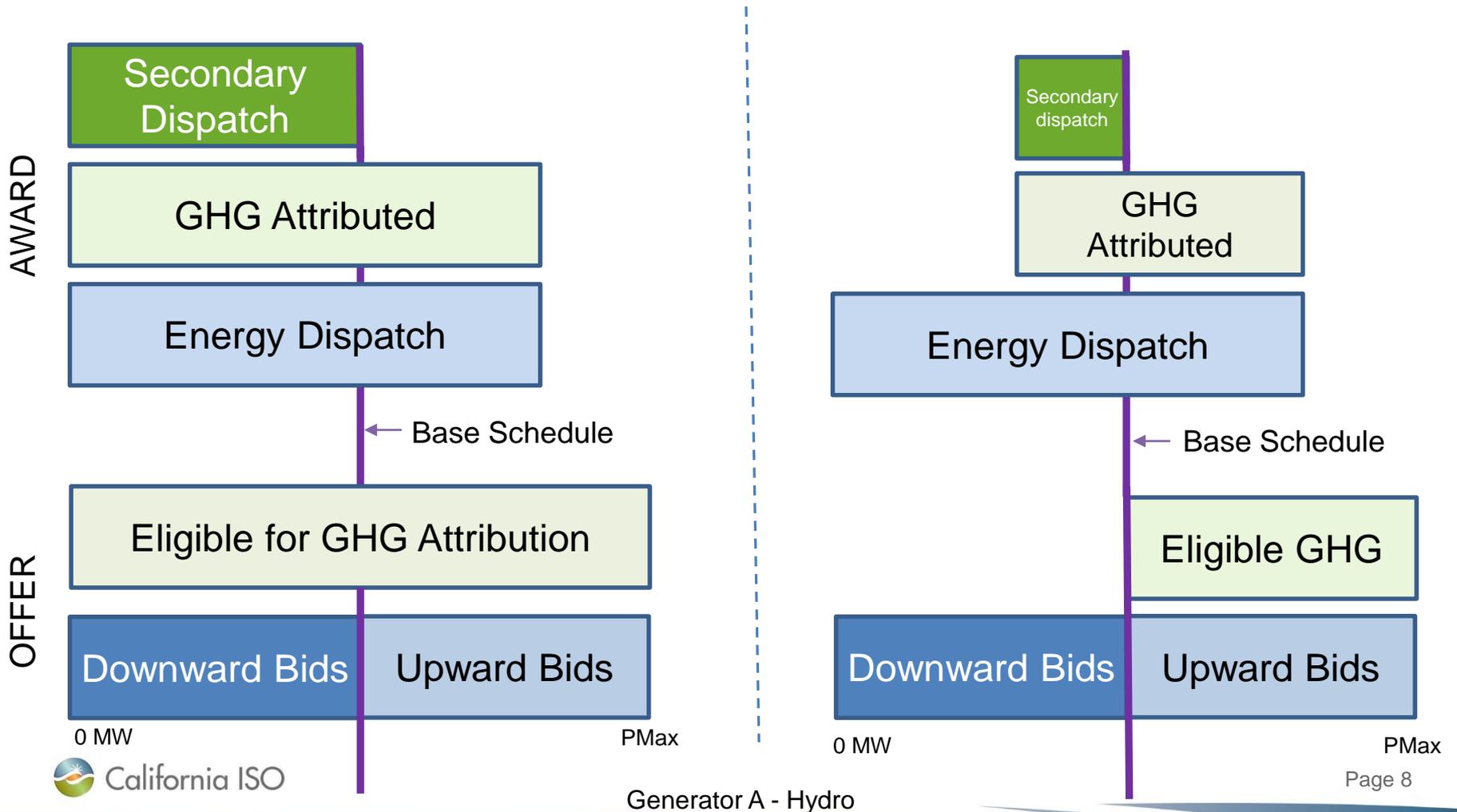


# The GHG design has evolved since the start of EIM to improve attribution accuracy

	GHG Bid Quantity	GHG Bid Price
At outset of EIM	Pmax of resource	$\leq$ \$1,000 less Energy bid
Year One Enhancement	0 MW to Pmax	$\leq$ Resource daily GHG cost plus 10%
Minimize secondary dispatch	0 MW to (Upper economic limit less base schedule)	$\leq$ Resource daily GHG cost plus 10%

Base schedule is the hourly resource plan to serve a non-CA BAA's load prior to start of the real-time market

# Latest enhancement reduces magnitude of secondary dispatch by reducing potential attribution quantity to base schedule



# Secondary dispatch may or may not cause under-accounting of full atmospheric effects

No change  
in emissions

Backfill Energy  
Dispatch

Generator C - Hydro

Emissions



Secondary Dispatch

Generator A - Hydro

Unaccounted  
emissions

Backfill Energy  
Dispatch

Generator B - Gas

Emissions



Secondary Dispatch

Generator A - Hydro

## New initiative looking to allow EIM entities to participate in the day-ahead market

- Base schedules are zero in day-ahead
- Current EIM approach may not be scalable to the day-ahead market
- Potential designs must be consistent between the day-ahead market and real-time market