

# 2009 IEPR WORKSHOP

## SCAQMD Air Credits for Power Plants Assessing Los Angeles Basin Reliability Given Environmental Constraints

**September 24, 2009**  
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### **DOCKET**

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# Today's Topics

- **Overview of the Problem and Issues**
- **Analytic Approach and Caveats**
- **Scenarios and Results**
- **Conclusions and Further Analysis**

# Overview of the Problem

- **Peak-load reliability** - Finding adequate resources within SP-26 and DWP with transmission and resource-constrained conditions.
- **OTC Retirements** - Power plants strategically located are to be retired or replaced because they use ocean water.
- **ERCs** – To meet reliability requirements while replacing existing OTC generation.

# Important Environmental Constraints

- **SWRCB and OPC** - Mitigate existing OTC by either converting to wet cooling towers or strict monitoring.
  - Question of what are, and what is eligible for “wholly disproportionate costs.”
- **SCAQMD** - New power plant projects are constrained regarding what ERCs can be used to offset project emissions.
- **What are the interactions between these two policy objectives, and reliability and RPS goals?**

# Analytic Objectives

- **Create a tool to estimate:**
  - Resource requirements for peak loads for 2010-2018
  - Minimum operating requirements to replace OTC capacity
  - ERCs created and needed for OTC actions
- **Analyze scenarios that vary:**
  - Demand forecasts
  - Retirements and resource additions

# Overview of Analytic Approach

- **An exploratory, NOT a predictive, tool**
- **Flexible, focuses on scenario analysis**
- **Transparent, user-friendly, easy to inspect/modify inputs**
- **Can vary assumptions about supply, demand, DSM/DG, transmission, etc.**

### Input

#### Capacity/Emissions Input

DWP Units	CAISO Units
LADWP Units <a href="#">List</a>	CAISO Existing <a href="#">List</a>
Glendale Units <a href="#">List</a>	CAISO New <a href="#">List</a>
Burbank Units <a href="#">List</a>	

New Import Transmission Capacity (MW) [Edit Table](#)

Transmission Multiplier [Edit Table](#)

DWP Resource Input

CAISO Resource Input

Emission Input

Supply Scenario All

### Load Input

**Demand Forecast and Profiles** 1 in X Peak multiplier [DetermTa](#)

# hrs to scale [Edit Table](#)

Add'l Annual Load Growth % (+ or -) (%/yr) [Edit Table](#)

Peak Demand Probability: 1 in X 1 in 2

Peak Adjustments (MW) [Edit Table](#)

Include Peak Adjustment? (Yes/No) [Edit Table](#)

Firm Sales Obligations (MW) [Edit Table](#)

Credit for Imports Carrying Own Reserves (-) (MW) [Edit Table](#)

Reserve Margin Method [Edit Table](#)

Reserve Margin: Absolute (MW) [Edit Table](#) % [Edit Table](#)

### Output

Note: all "requirements" include reserve margin [Model Details](#)

Resources vs. Requirements (MW)	<a href="#">Calc</a>	mid
Requirements, Capacity, Imports (MW)	<a href="#">Calc</a>	mid
Add'l Capacity Required (Beyond Prescribed) (MW)	<a href="#">Result</a>	mid
Required Capacity (MW)	<a href="#">Calc</a>	mid
Required Capacity by Type (MW)	<a href="#">Calc</a>	mid
Hours OTC Capacity to be Displaced (Hours)	<a href="#">Calc</a>	mid

[Revisions](#)

### Other Output

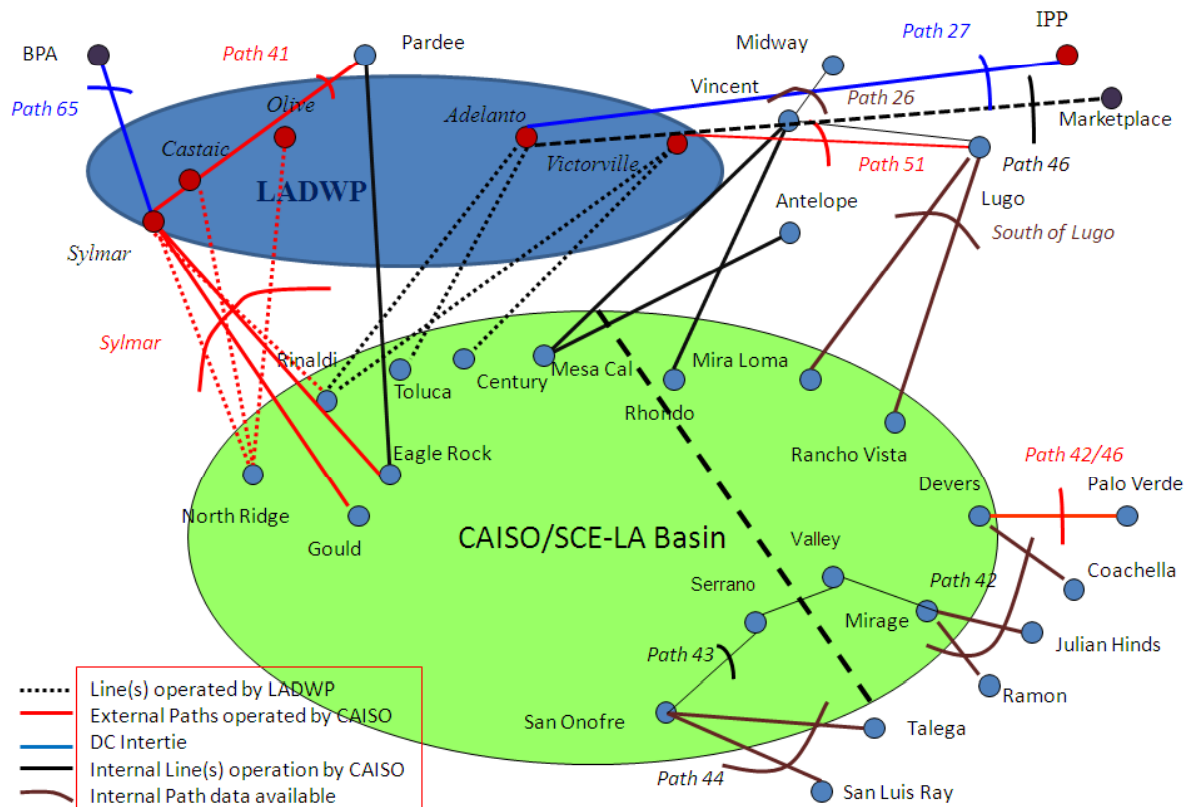
Min LCR vs. Exist/Planned Capacity (MW)	<a href="#">Calc</a>	mid
Capacity (MW)	<a href="#">Result</a>	mid
"Other OTC" Displacement Duration Curve (MW)	<a href="#">Calc</a>	mid
Local Capacity Requirement Duration Curve (MW)	<a href="#">Calc</a>	mid
Resource Req'mt vs. Total NonOTC Capacity (MW)	<a href="#">Calc</a>	mid

Net Chg ERCs (using net LCR approach) (lb/day)	<a href="#">Calc</a>	mid
ERCs generated (lbs/day)	<a href="#">Result</a>	mid
New ERCs needed (lbs/day)	<a href="#">Result</a>	mid
Net ERCs Needed (new - generated) (lbs/day)	<a href="#">Calc</a>	mid

# Transmission into Load Pockets

Ability to reduce in-basin generation is affected by existing (or future) transmission into load pockets

## Transmission Lines into LA Basin

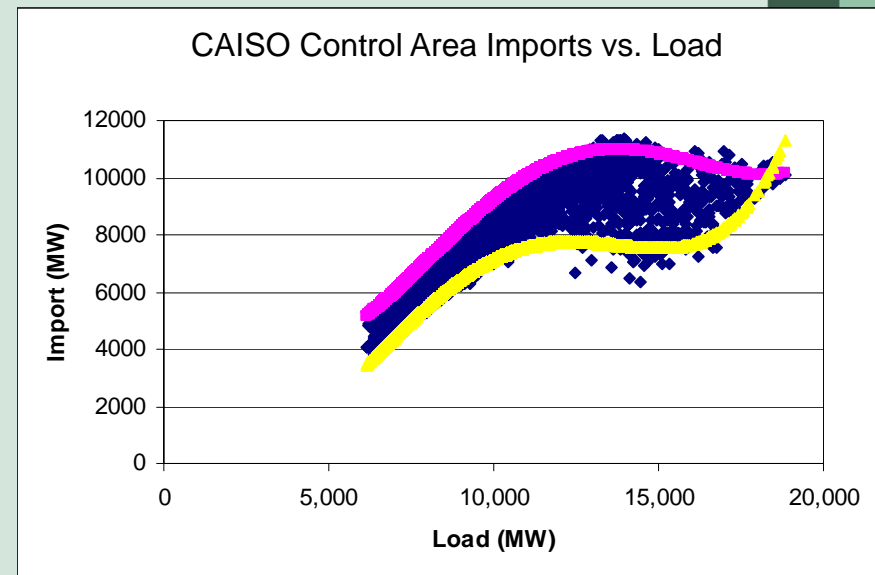
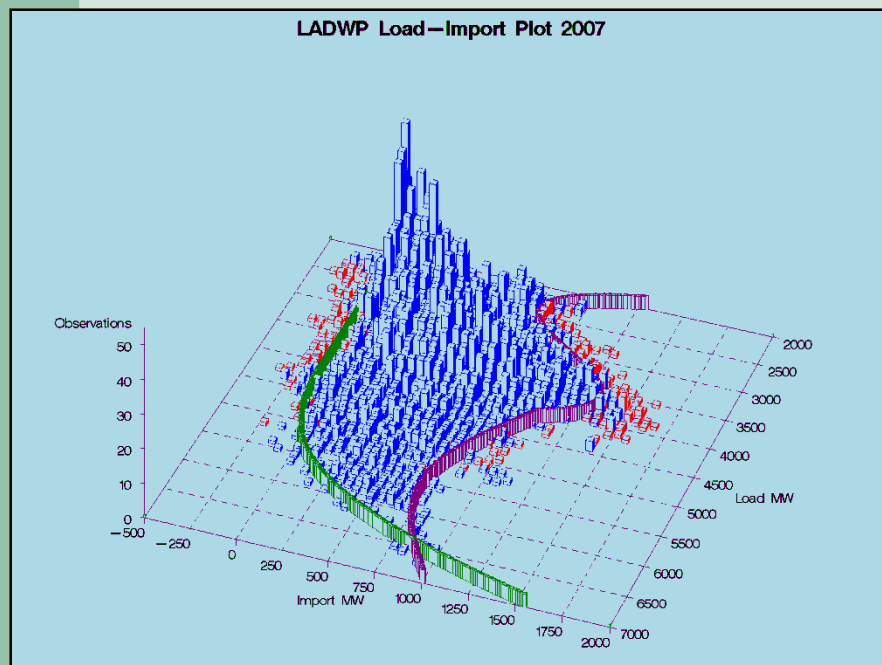


Note: CAISO-operated transmission lines into LA Basin are modeled in CAISO CRR FNM

# Transmission Congestion

Derived using 2007 data to estimate maximum import capability

- CAISO - Full network model with historic load data
- LADWP – Actual loads and generation





# Key Relationships

- **Local Capacity Requirement =**  
***Peak Resource Requirement<sup>1</sup> –***  
***Maximum Imports via Transmission***
  
- **Additional Capacity to Displace OTC =**  
***Local Capacity Requirement –***  
***Total Non-OTC Capacity<sup>2</sup>***

1. Considers adjustments to baseline such as forecast demand side management + distributed generation as well as 15% planning reserve margin
2. Includes the non-OTC generation in the load pocket plus the maximum transmission import capacity that is prescribed (and/or calculated) in the “Supply” and “Transmission” scenarios.

# Emission Reduction Credits (ERCs)

- **ERCs produced when a scenario prescribes retirement of an OTC unit**
  - Estimated using available historic emissions data (CARB 2007)
- **ERCs needed to permit a new generating unit**
  - Estimated from applications and/or preliminary/final CEC staff assessments (where available). Engineering estimates used where other data not available.
- **Effect of new transmission and other factors affecting ERC production or demand are not simulated**

# Analytic Limitations

- **Relies on heuristics and revealed characteristics from analyzing model output and historic system data (2007 basis).**
- **Focuses solely on meeting reserve margin targets as defined in LCR analysis.**
  - Does NOT include economic or AS generation beyond reliability requirements
- **Relies on published resource plans and do not necessarily represent “optimal” or otherwise desirable plans**

# Caveats

- **Does not include AS requirements for sub-area minimum generation, voltage and stability support, inertial constraints, ramp rate limits, etc.**
- **Transmission capacity is only dynamically linked to load, and is static for other variables.**
- **Contingent on transmission and other resources plans developing on the schedules provided by CAISO and LADWP with CEC Staff input.**

# Using the Results

- **Analysis in perspective: “directional and indicative”**
  - Assesses feasibility of meeting policy goals and the tradeoffs the agencies face
- **While showing the range of potential outcomes, don’t plan on best outcome—don’t plan on “winning the lottery”**
- **Requires more detailed modeling to address the caveats listed**

# Illustration of scenarios analyzed

- **16 scenarios analyzed (2x2x4)<sup>1</sup>**
  - 2 Demand Scenarios
    - **(High Stress, Low Stress)**
  - 2 Transmission Scenarios
    - **(Include/Excluded Planned New Transmission)**
  - 4 Supply Scenarios
    - **(Low, Moderate, High, Long-Run)**

1. Eight scenarios are illustrated herein that bound the more extreme conditions. The Moderate and High supply scenario results are not contained in this presentation.

# Demand Scenarios

## ➤ **Low Stress**

- 2009 DRAFT Mid-Rates Forecast
- High Renewable DG Penetration (CED 2007)
- 300 MW of utility-scale PV, ramping 50 MW/yr from 2013-2018

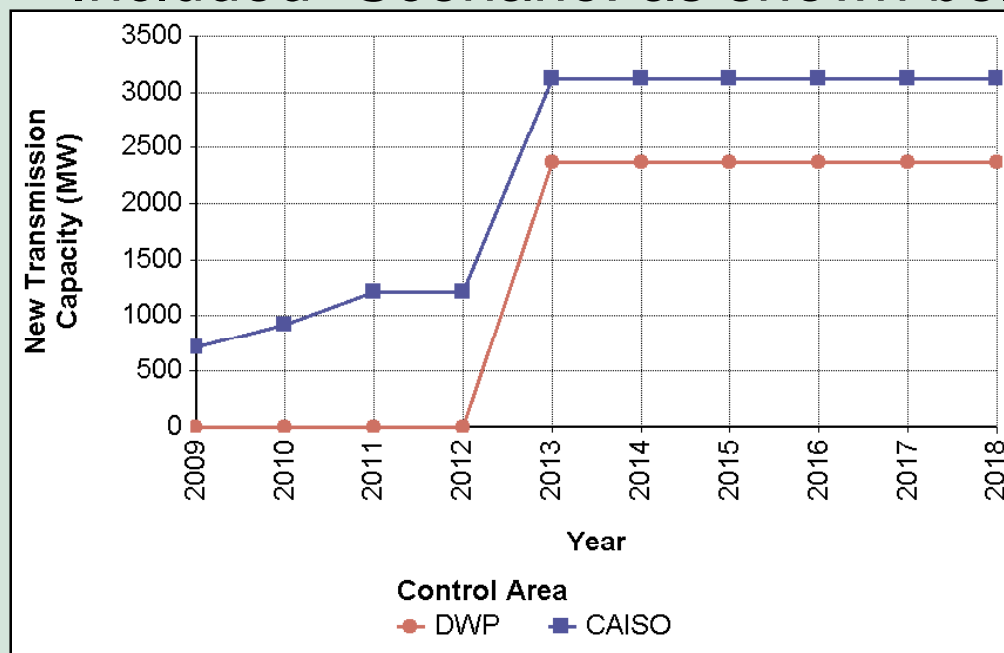
## ➤ **High Stress**

- 2007 IEPR Forecast
- Low Renewable DG Penetration (20% above CED 2009)
- 600 MW of utility-scale PV, ramping 100 MW/yr from 2013-2018

# Transmission Scenarios

“Excluded” Scenario: no new transmission

“Included” Scenario: as shown below



CAISO Source: *Local Capacity Technical Analysis Report and Study* (for 2008, 2009, 2010, 2011-2013). LADWP Source: Electric Transmission-Related Data (Docket 09-IEP-1D) Submittal to the California Energy Commission's (CEC's) Integrated Energy Policy Report, Dated March 16, 2009.



# Supply Scenarios

- **“Supply” scenarios combine retirement/repowering of existing OTC units with new units coming online<sup>1</sup>**
- **4 Scenarios Analyzed**
  - **Low OTC Retirement**
  - **Moderate OTC Retirement** (results not shown here)
  - **High OTC Retirement** (results not shown here)
  - **Long-Run OTC Retirement**

1. Online dates/capacities derived from planning documents. LADWP: Capacity Resource Accounting Tables. CAISO: Interconnection Queue and CEC Plant Status Reports (primarily, with additional Staff postulated peaking units depending on scenario).

# Supply Scenarios: CAISO

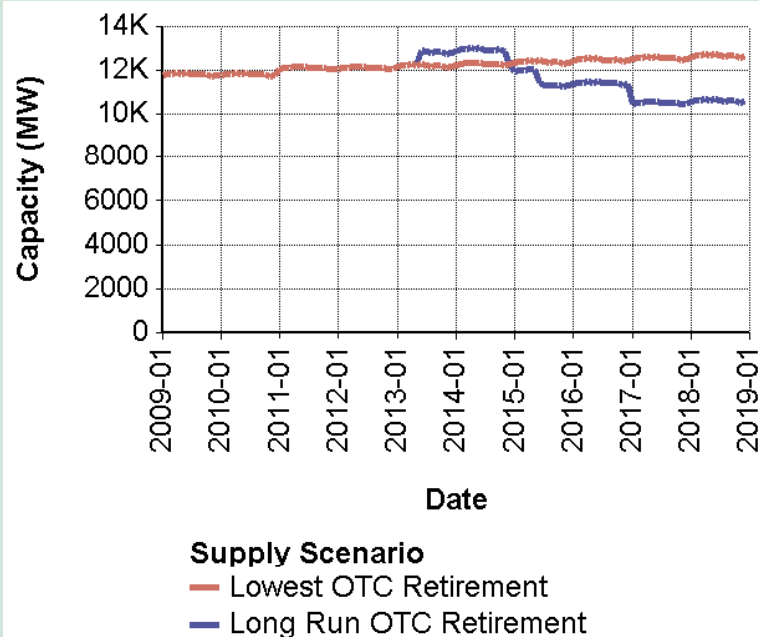
MW	Existing Units	Assumed Retirement Date	
		<i>(Any unit not listed here assumed to continue operation)</i>	
		Low OTC Retirement	Long Run OTC Retirement
335	El Segundo, Unit 3	N/A	Jun-2015
335	El Segundo, Unit 4	N/A	Jun-2015
179	Redondo Beach, Unit 5	N/A	Jun-2013
175	Redondo Beach, Unit 6	N/A	Jun-2013
493	Redondo Beach, Unit 7	N/A	Jun-2013
496	Redondo Beach, Unit 8	N/A	Jun-2013
175	Alamitos, Unit 1	N/A	Jun-2013
175	Alamitos, Unit 2	N/A	Jun-2013
332	Alamitos, Unit 3	N/A	Dec-2014
336	Alamitos, Unit 4	N/A	Dec-2014
498	Alamitos, Unit 5	N/A	Jan-2017
495	Alamitos, Unit 6	N/A	Jan-2017
226	Huntington Beach, Unit 1	N/A	Dec-2014
226	Huntington Beach, Unit 2	N/A	Dec-2014
225	Huntington Beach, Unit 3	N/A	Dec-2014
227	Huntington Beach, Unit 4	N/A	Dec-2014
MW	New Units	Assumed Online Date	
		Low OTC Retirement	Long Run OTC Retirement
630	El Segundo	N/A	Jun-2013
501	Walnut	N/A	Jun-2013
96	Riverside	Jan-2011	Jan-2011
850	Sentinel	N/A	Jun-2013
500	New LMS 100s at Alamitos	N/A	Dec-2014
400	New LMS 100s at Huntington Beach	N/A	Dec-2014

# Supply Scenarios: LADWP

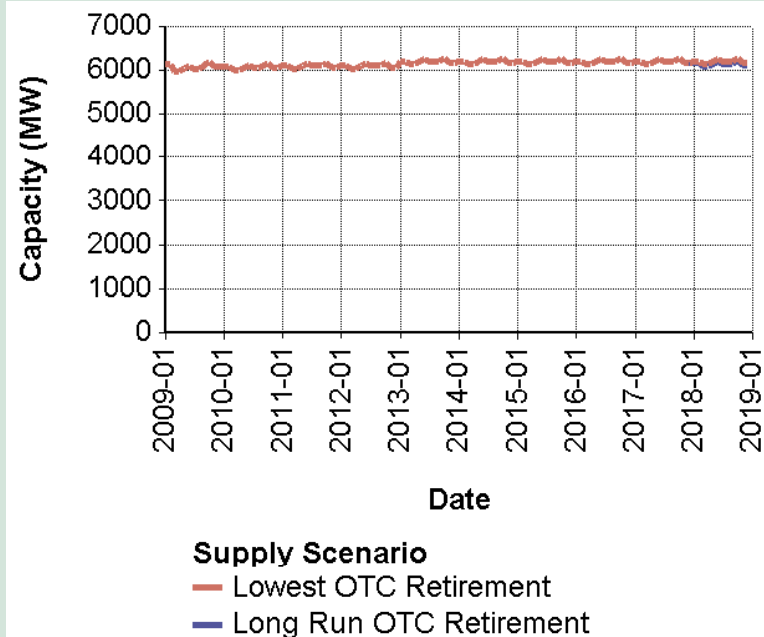
MW	Existing Units	Assumed Retirement Date	
		<i>(Any unit not listed here assumed to continue operation)</i>	
		Low OTC Retirement	Long Run OTC Retirement
322	Haynes, Unit 5	Jan-2013	Jan-2013
243	Haynes, Unit 6	Jan-2013	Jan-2013
157	Scattergood, Unit 1 (Net of 22 MW of Digester)	Jan-2015	Jan-2015
179	Scattergood, Unit 2	Jan-2014	Jan-2014
450	Scattergood, Unit 3	N/A	Jan-2018
MW	New Units	Assumed Online Date	
		Low OTC Retirement	Long Run OTC Retirement
600	Haynes CTs	Jan-2013	Jan-2013
38	Hyperion Digester (Net of 22 MW of Digester)	Jan-2013	Jan-2013
260	Scattergood CC	Jan-2014	Jan-2014
100	Scattergood CT	Jan-2015	Jan-2015
400	New LMS 100s	N/A	Jan-2018
3	Bio_LADWP_20 (Biogas)	Jan-2010	Jan-2010
20	Bio_LADWP_26 (Biogas)	Jan-2011	Jan-2011
1	TI Fuel Cell (Biogas)	Jan-2011	Jan-2011

# Net MW Impact of Supply Scenarios<sup>1</sup>

## CAISO Control Area



## LADWP Control Area (minimal “net” retirements/additions)

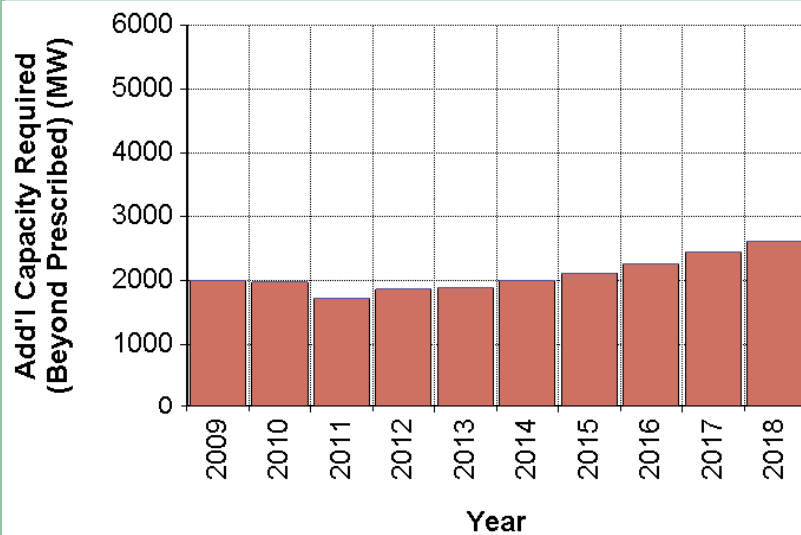


1. Specific assumptions regarding online dates/capacities for new units and retirement dates/capacities for existing units can be found in the appendix. Values shown are for the “Low Stress” Demand Scenario. The “High Stress” values differ slightly due to assumptions about utility-scale renewable penetration.

# Additional Capacity to Displace OTC: CAISO Control Area, Low OTC Retirement, Excluding New Transmission

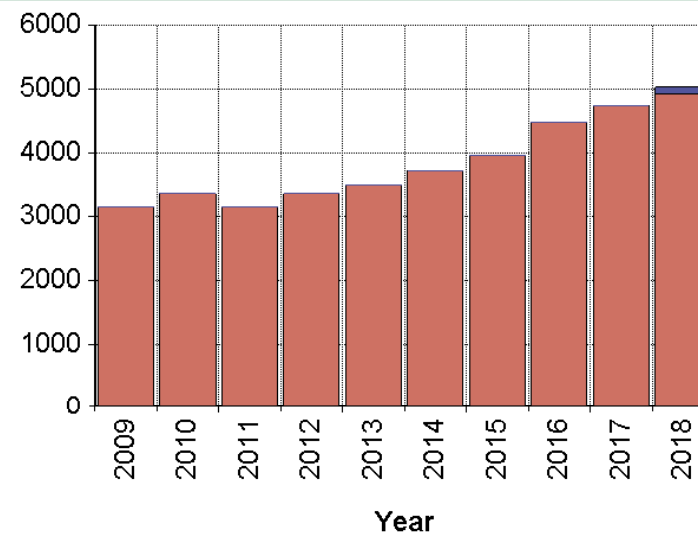
With no OTC retirements & Riverside prescribed to come online in 2011: 1700 and 4928 MW additional capacity (out of an estimated 4928 MW of current OTC units) needed to displace OTC & meet reliability.

Low Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

High Stress

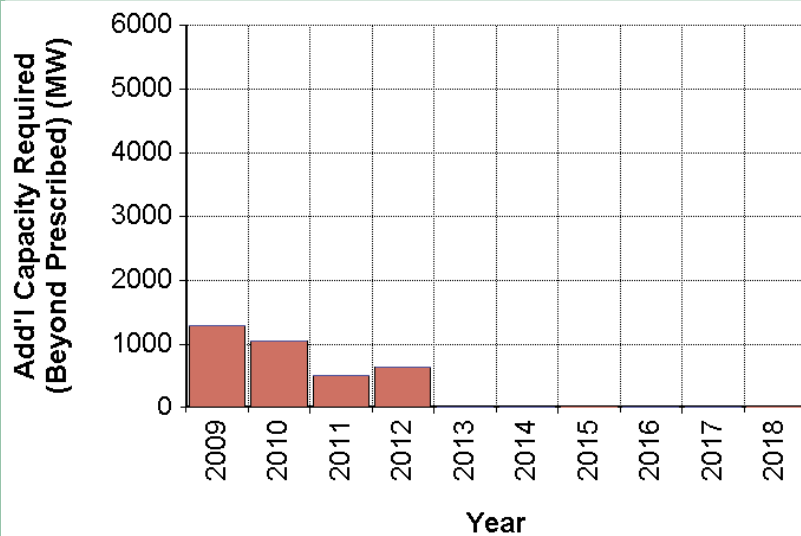


**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

# Additional Capacity to Displace OTC: CAISO Control Area, Low OTC Retirement, Including New Transmission

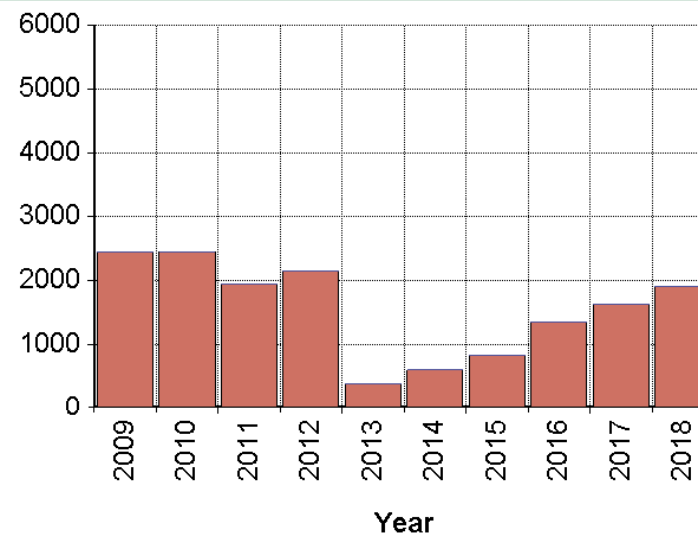
If new transmission could come online as fast as the scenario describes (3126 MW by 2013), OTC is fully displaced by 2013 in the “Low Stress” scenario, but not in the “High Stress” Scenario without additional generation capacity.

Low Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

High Stress

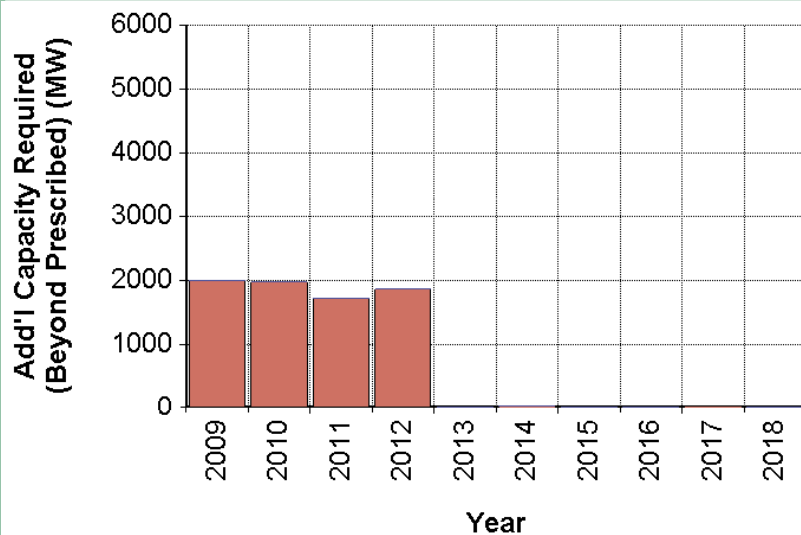


**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

# Additional Capacity to Displace OTC: CAISO Control Area, Long-Run OTC Retirement, Excluding New Transmission

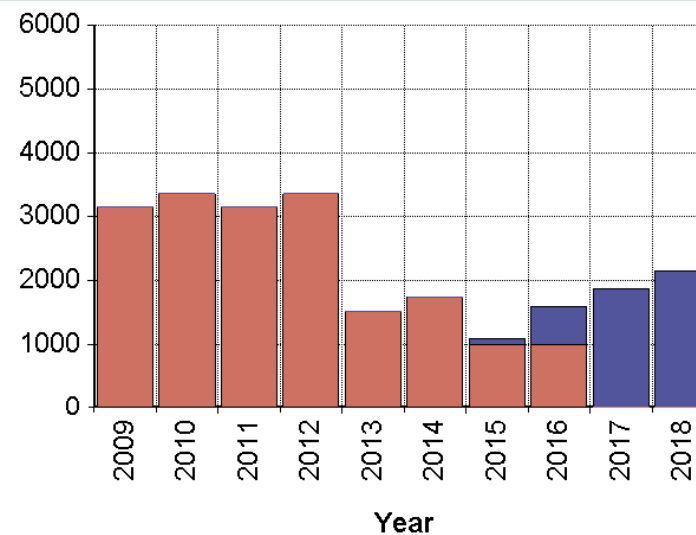
The retirements/additions prescribed in the “Long-Run OTC Retirement” scenario are sufficient to obviate the need for OTC in the low stress case, but not in the high stress case, without new transmission.

Low Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

High Stress

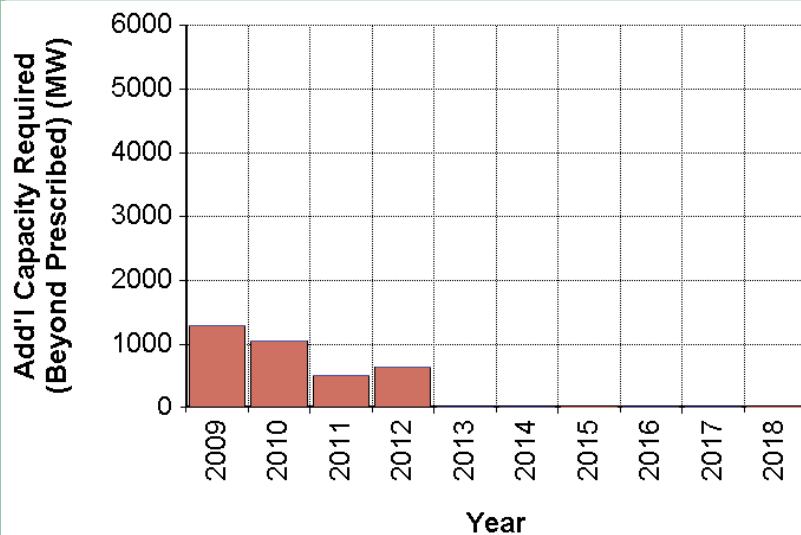


**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

# Additional Capacity to Displace OTC: CAISO Control Area, Long-Run OTC Retirement, Including New Transmission

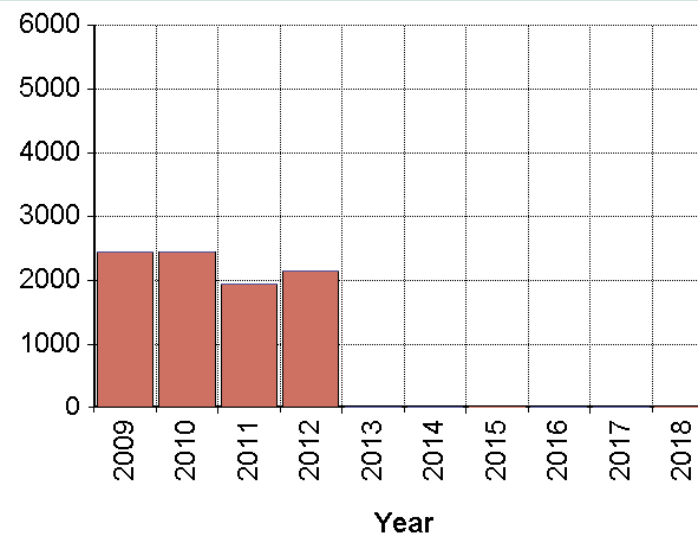
If new transmission could come online as fast as the scenario describes (~3200 MW by 2013), OTC is fully displaced by 2013 in both the “Low Stress” and “High Stress” scenarios with the “Long-Run” prescribed retirements and additional units.

Low Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

High Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

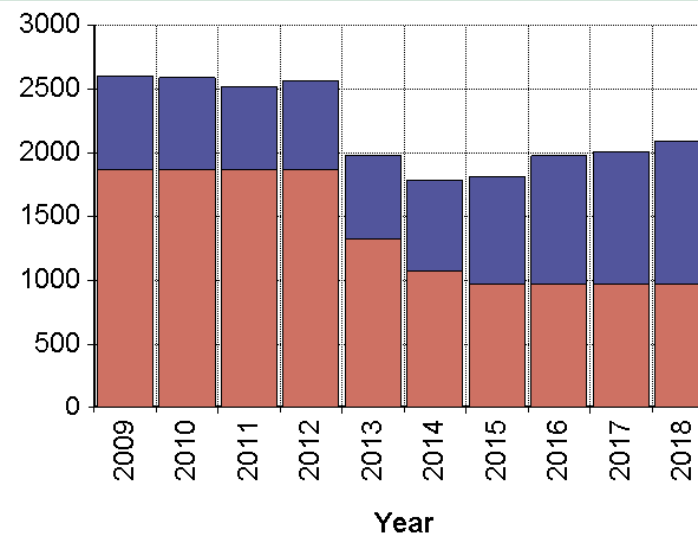
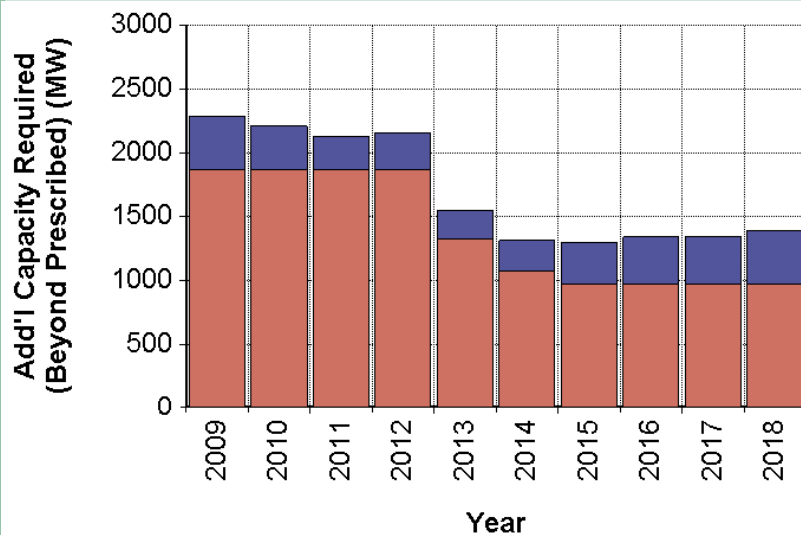


# Additional Capacity to Displace OTC: LADWP Control Area, Low OTC Retirement, Excluding New Transmission

With transmission constraints, LADWP control area does not appear to meet a 15% planning reserve margin. Thus, the entire quantity of existing OTC capacity (1870 MW) seems to be required to be replaced to ensure reliability, in addition to capacity that may further be required to achieve a 15% planning reserve margin.

Low Stress

High Stress



**Add'l Capacity Category**

- Capacity Req'd to Displace OTC
- Add'l Cap. Req'd to Meet Reliability

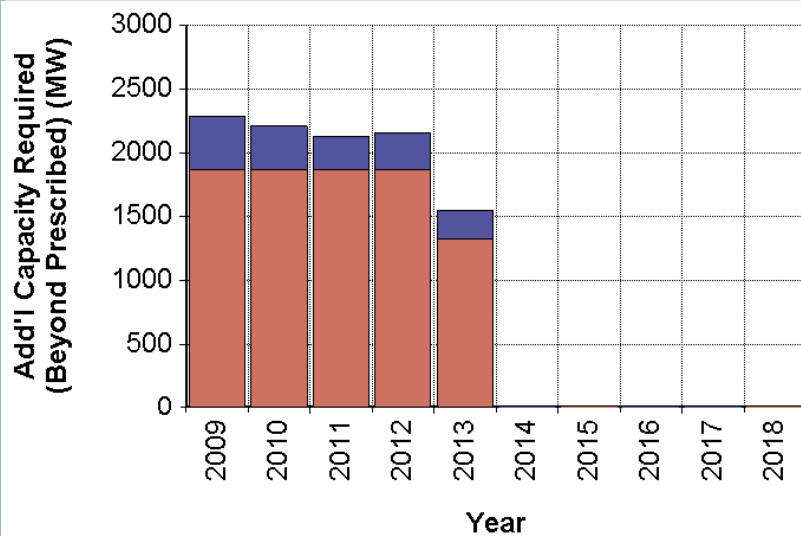
**Add'l Capacity Category**

- Capacity Req'd to Displace OTC
- Add'l Cap. Req'd to Meet Reliability

# Additional Capacity to Displace OTC: LADWP Control Area, Low OTC Retirement, Including New Transmission

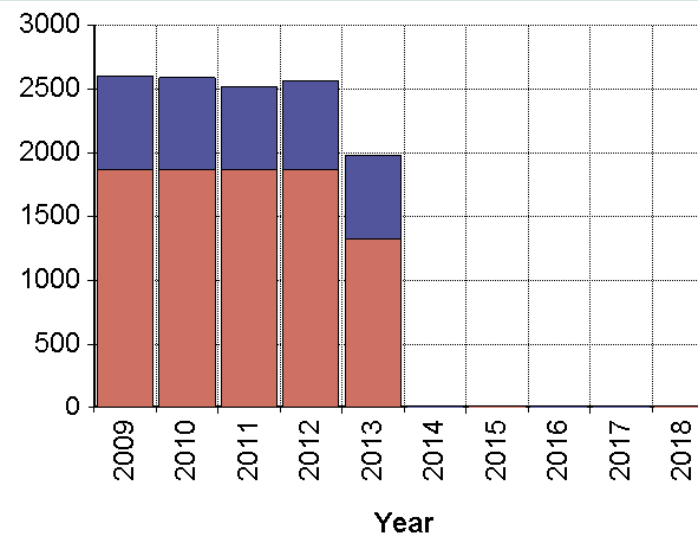
If new transmission could come online as fast as the scenario describes (2366 MW by 2013), OTC is fully displaced by 2014 in the “Low Stress” and “High Stress” scenarios without additional generating capacity.

Low Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

High Stress

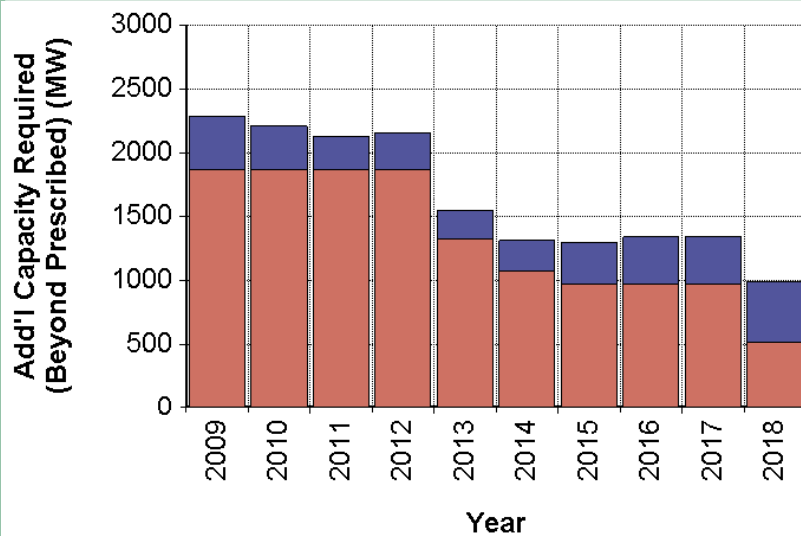


**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

# Additional Capacity to Displace OTC: LADWP Control Area, Long-Run OTC Retirement, Excluding New Transmission

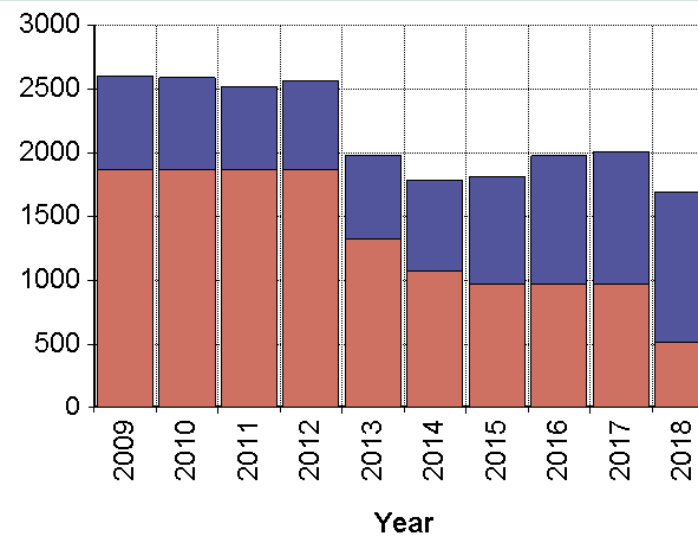
The retirements/additions prescribed in the “Long-Run OTC Retirement” scenario are not sufficient to obviate the need for OTC in the low stress case or the high stress case without new transmission.

Low Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

High Stress

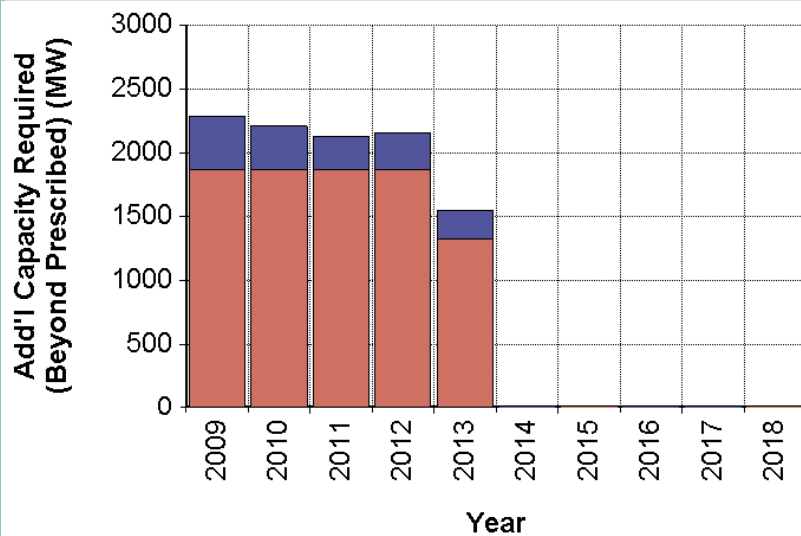


**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

# Additional Capacity to Displace OTC: LADWP Control Area, Long-Run OTC Retirement, Including New Transmission

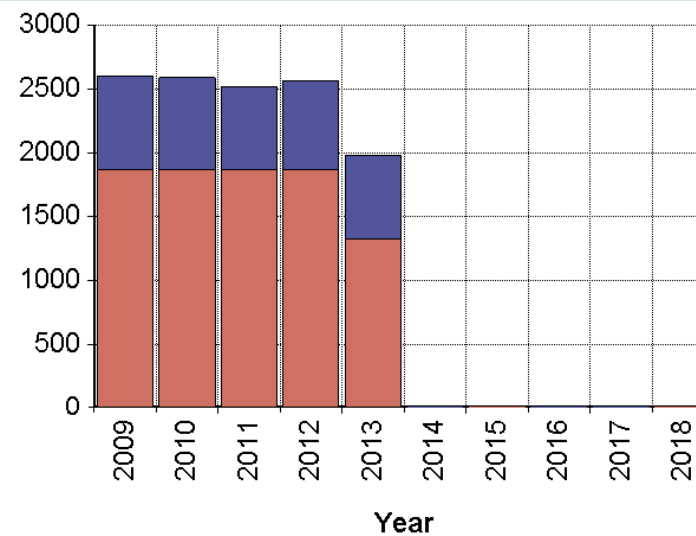
If new transmission could come online as fast as the scenario describes (2366 MW by 2013), OTC is fully displaced by 2014 in both the “Low Stress” and “High Stress” scenarios with the “Long-Run” prescribed retirements and additional units.

Low Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

High Stress



**Add'l Capacity Category**  
■ Capacity Req'd to Displace OTC  
■ Add'l Cap. Req'd to Meet Reliability

# Additional Capacity Required to Displace OTC: Scenario Summary

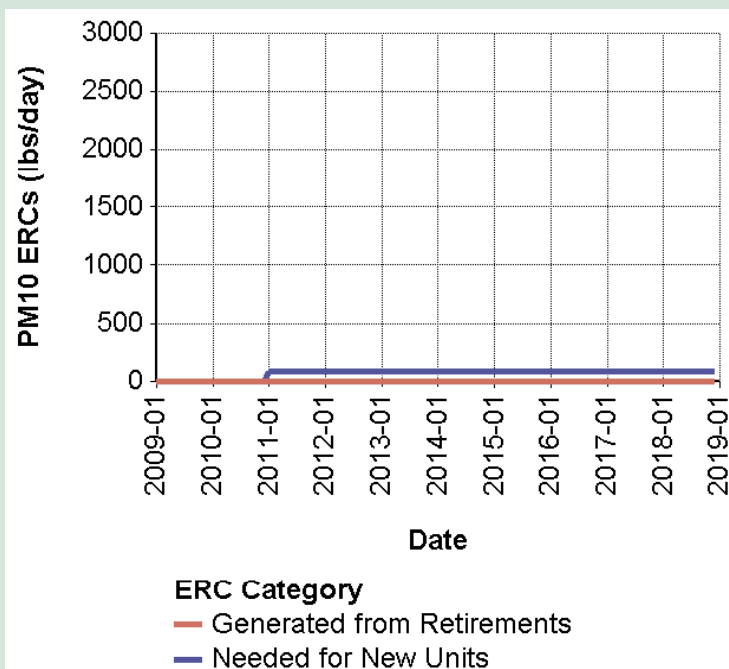
CAISO Control Area	Excluding New Transmission		Including New Transmission	
	Low Stress	High Stress	Low Stress	High Stress
Low OTC Retirement				
Long-Run OTC Retirement				

LADWP Control Area	Excluding New Transmission		Including New Transmission	
	Low Stress	High Stress	Low Stress	High Stress
Low OTC Retirement				
Long-Run OTC Retirement				

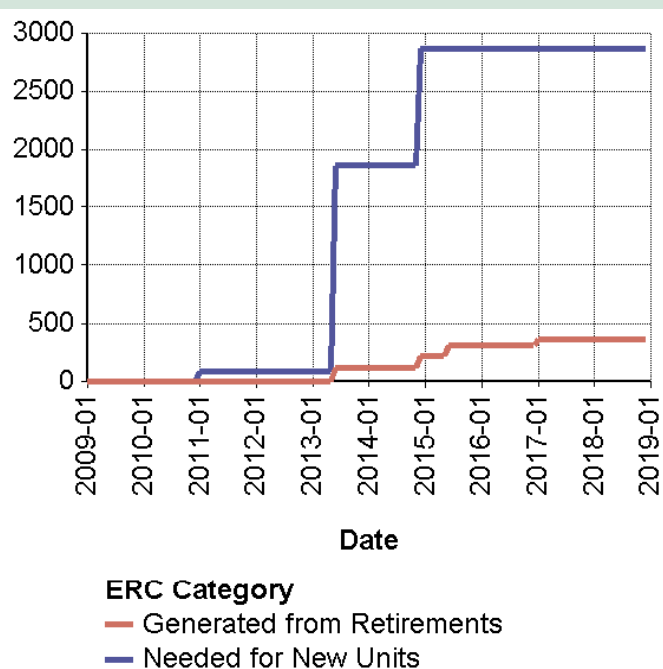
	OTC capacity ultimately displaced in time horizon (2009-2018). However, this does NOT necessarily imply that ERCs would be available in sufficient qty.
	OTC capacity NOT ultimately displaced in time horizon (2009-2018)

# Emission Reduction Credits (PM10): CAISO Control Area

## Low OTC Retirement



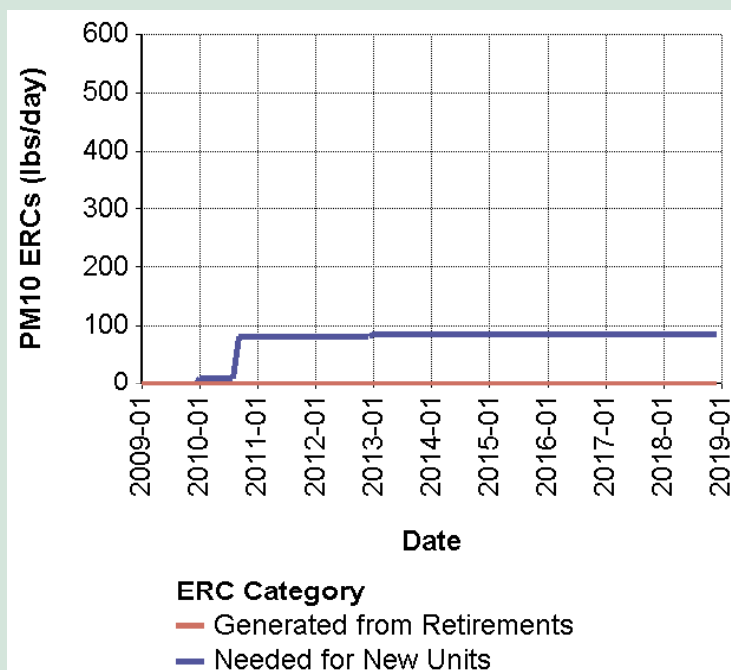
## Long-Run OTC Retirement



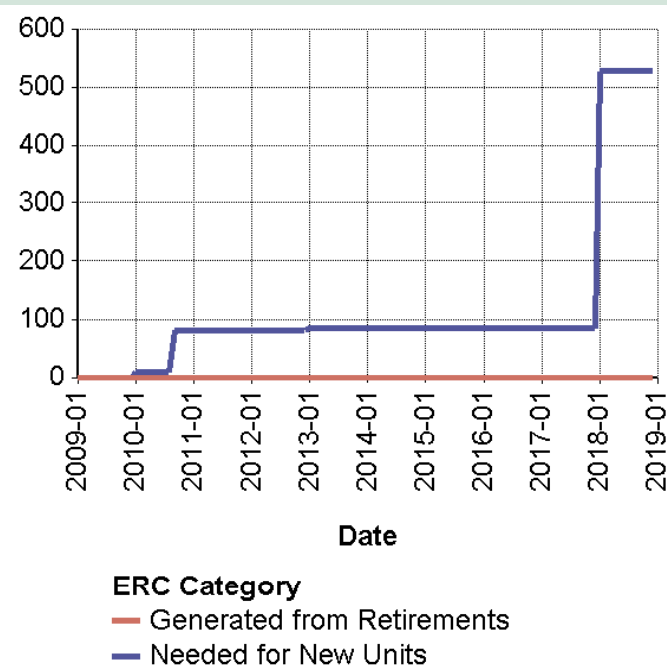
1. Only “net” values available for El Segundo (i.e., no differentiation between ERCs generated via retirement of El Segundo 3&4 and new ERCs needed for 600 MW of new capacity). Thus, the values for El Segundo are captured entirely in the “Needed for New Units” line as a net value.

# Emission Reduction Credits (PM10): LADWP Control Area

## Low OTC Retirement



## Long-Run OTC Retirement



1. Only “net” values available for Haynes & Scattergood units (i.e., no differentiation between ERCs generated via retirement of Haynes/Scattergood units and new ERCs needed for the repowering of Haynes Scattergood, which net to a very small value). Thus, the values for Haynes/Scattergood are captured entirely in the “Needed for New Units” line as a net value.

# Conclusions

- **LADWP appears to be capacity short regardless**
- **As new TX comes on line, the CAISO may have to specifically designate in-basin needs beyond MRTU supply**
- **New TX appears to be needed to retire OTC units**
- **ERCs from outside the electricity sector will be required to replace OTC units**



# Additional data desired that could enhance the analysis

- **Specific analytic nomograms (not just graphical) for transmission and generation limitations**
- **Minimum generation requirements for other than next-day commitment**
- **Expected available ERCs for existing units (not just plants)**