

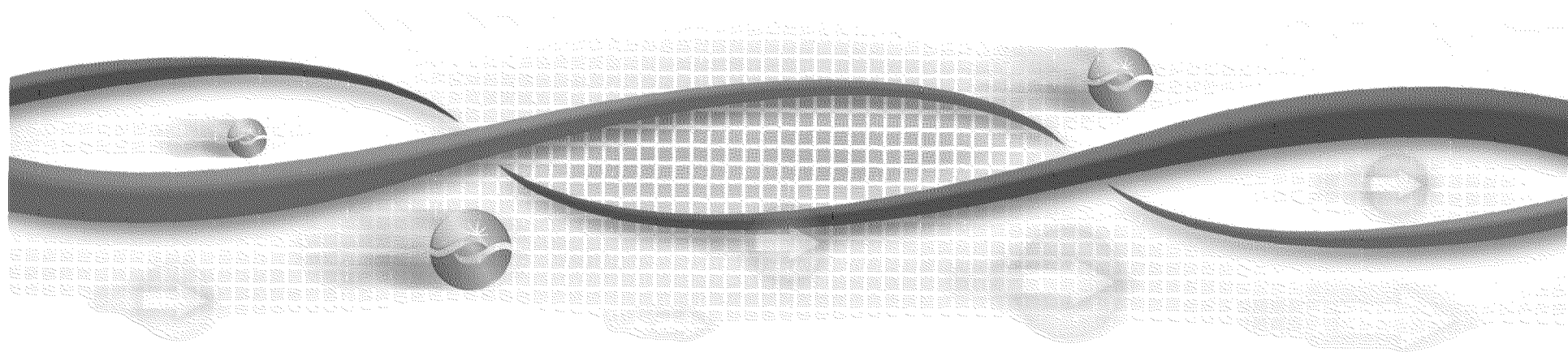
# R.11-10-023: RA Flexibility Workshop Flexible Capacity Procurement Proposal

Presented by:

Mark Rothleder

John Goodin

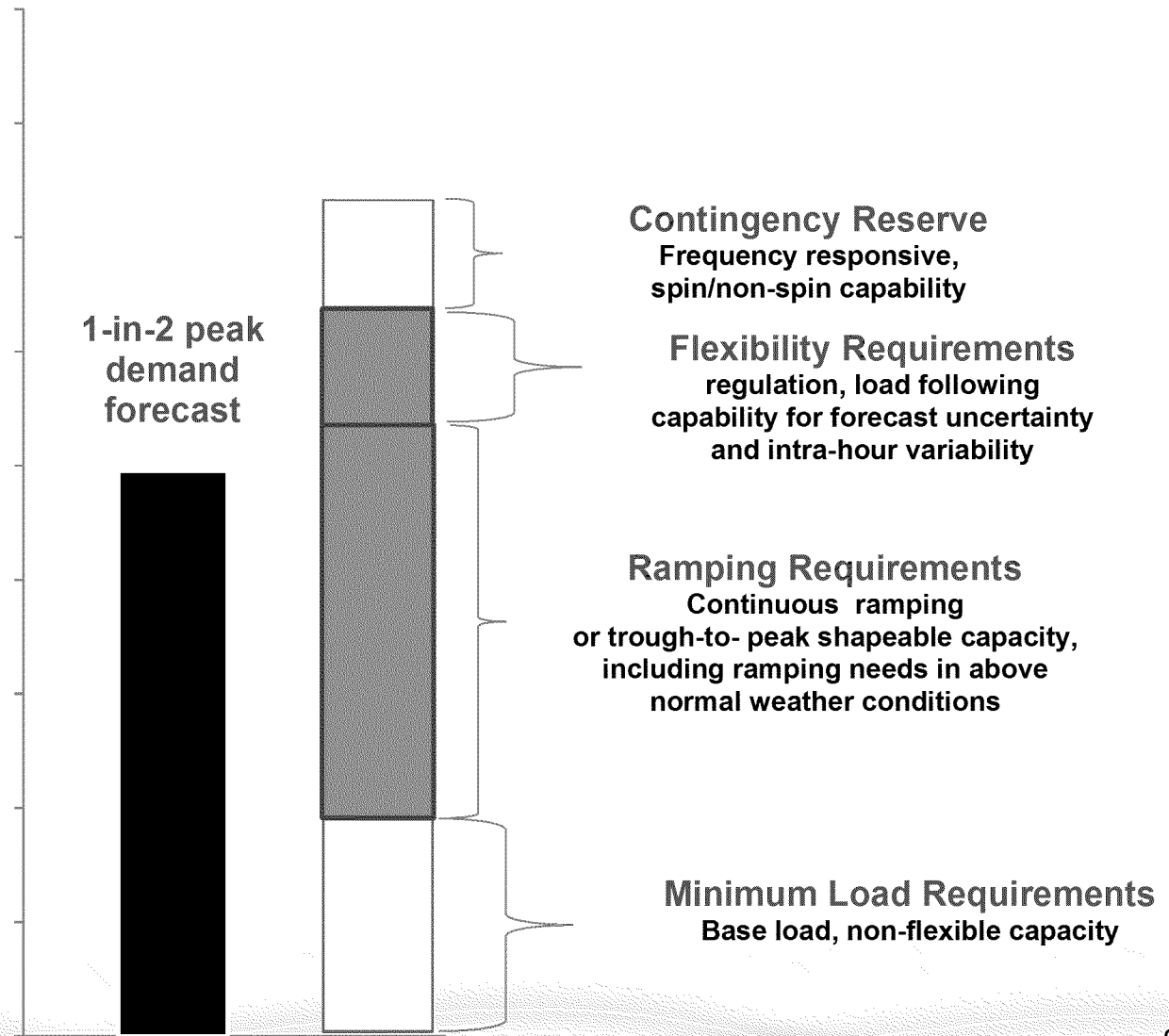
Karl Meeusen



# Agenda

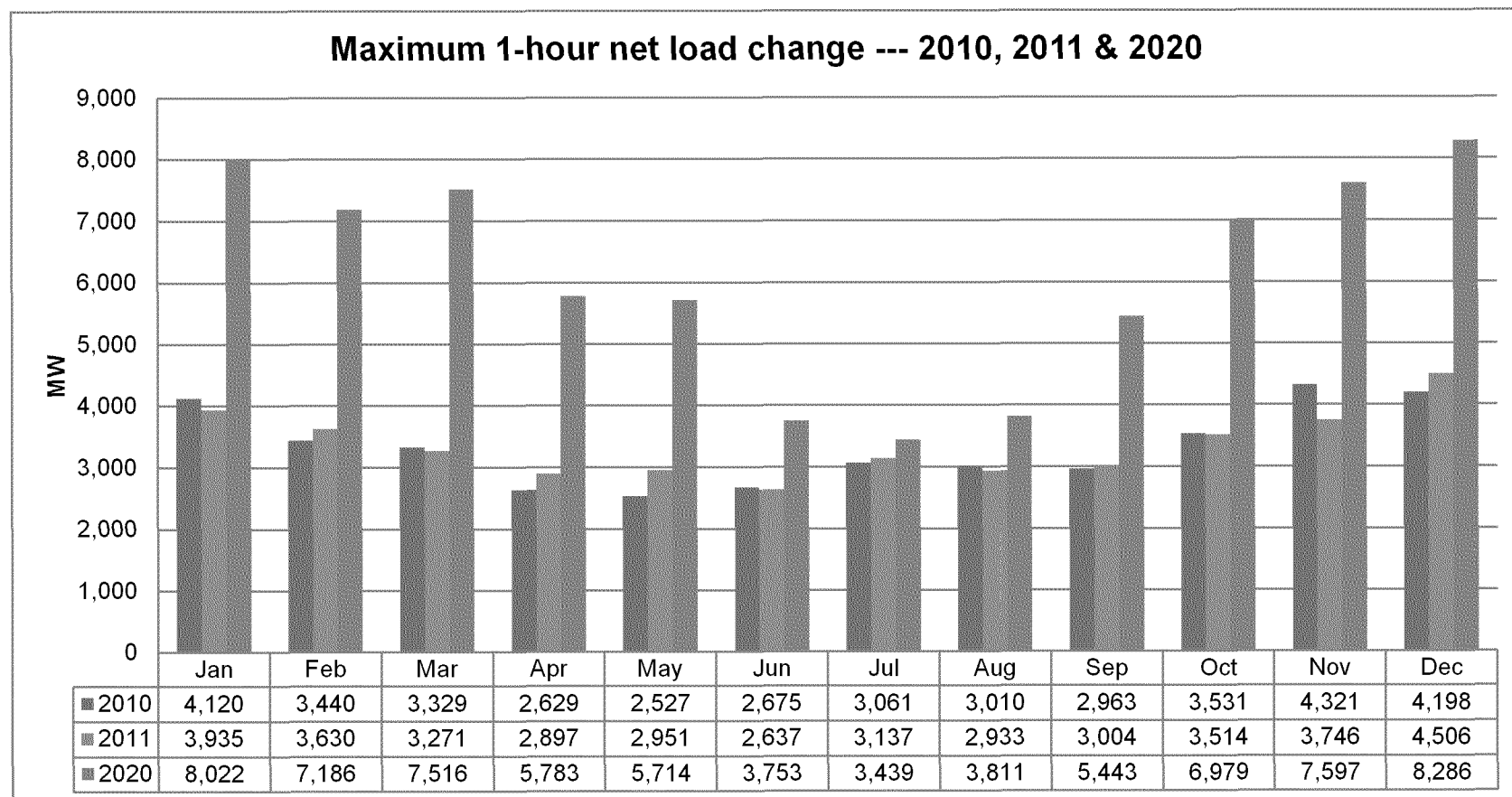
- Mark- Why we need flexible capacity
  - Review Demonstrated Need for Flexible Capacity
  - Next “Analysis” Steps
- John- Flexible capacity proposal and process
  - Short-term vs. long-term solution
  - Interim Flexible Capacity Proposal
  - Process and Timeline

# Future procurement should provide operating flexibility and satisfy traditional capacity requirements



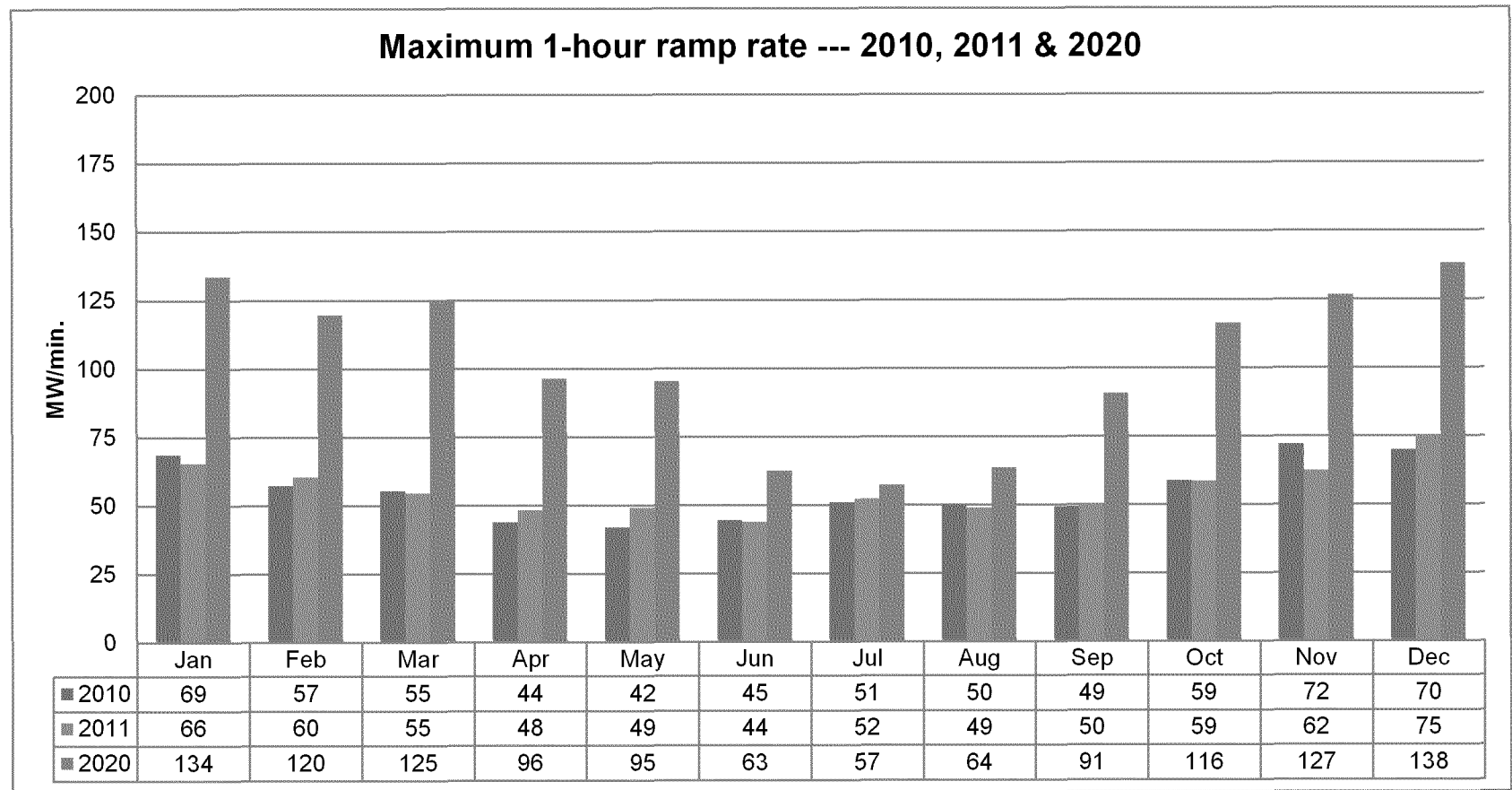
# Maximum 1-hour net-load change comparison --- Actual 2010 & 2011 --- Simulated 2020

Observation: Hourly changes increases in 2020 in shoulder periods.



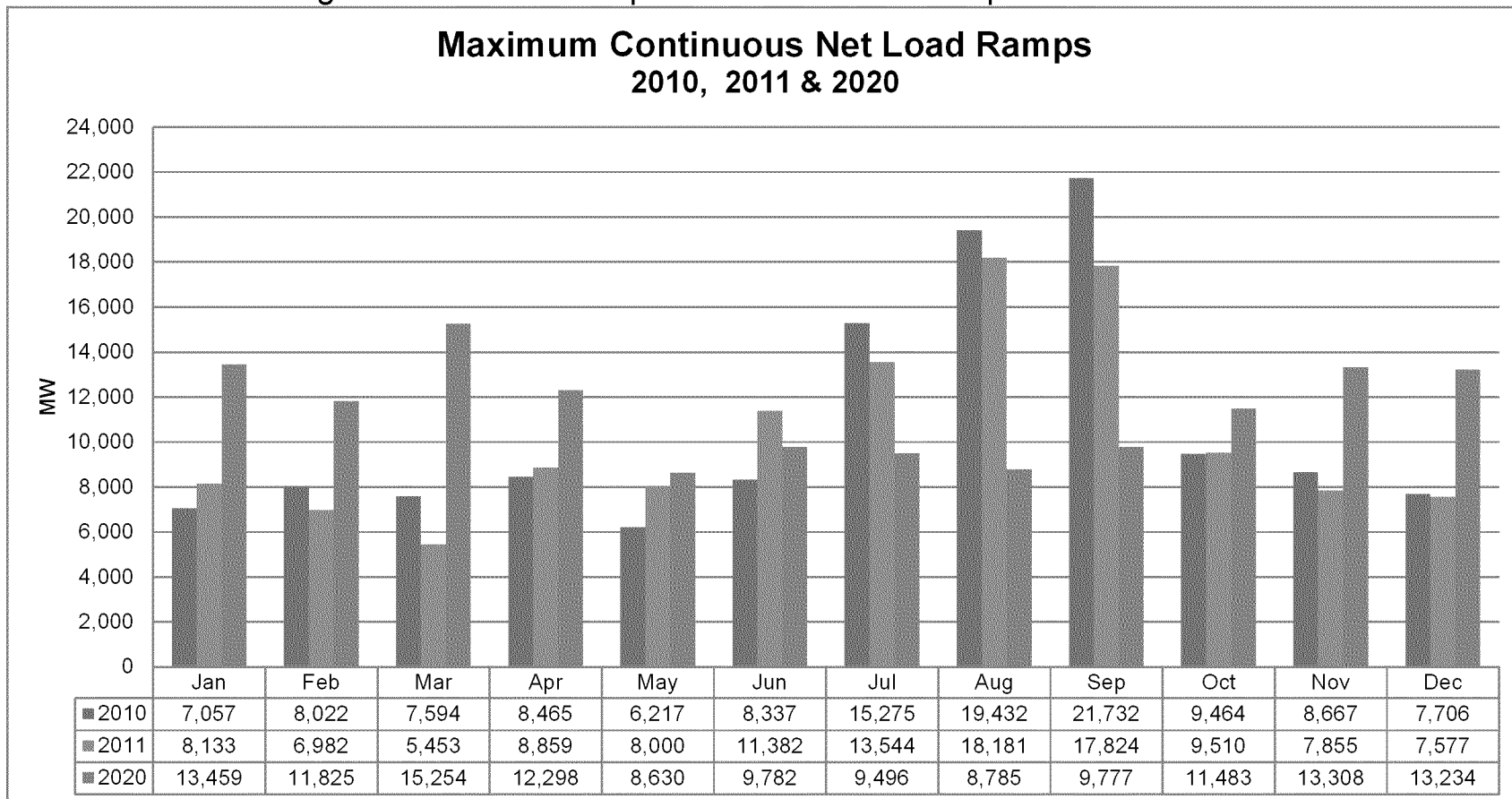
# Maximum 1-hour ramp rate based on net load --- Actual 2010 & 2011 --- Simulated 2020

Observation: Speed of ramp increases in 2020 in shoulder periods.



# Maximum continuous net load ramps (trough to peak) - Actual 2010 & 2011--- Simulated 2020

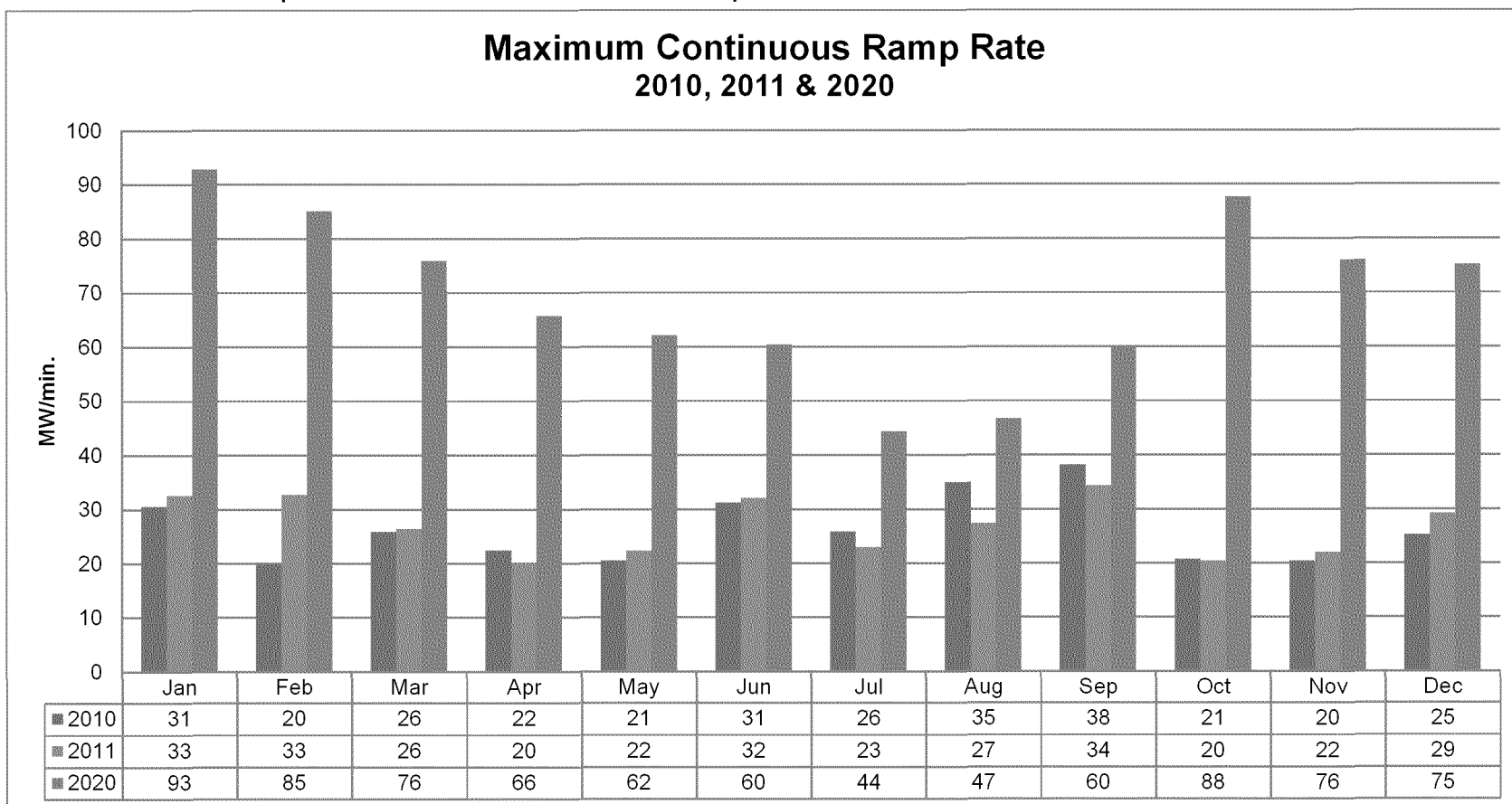
Observation: Range of continuous ramp decreases in summer periods.



# Maximum continuous ramp rates based on net load

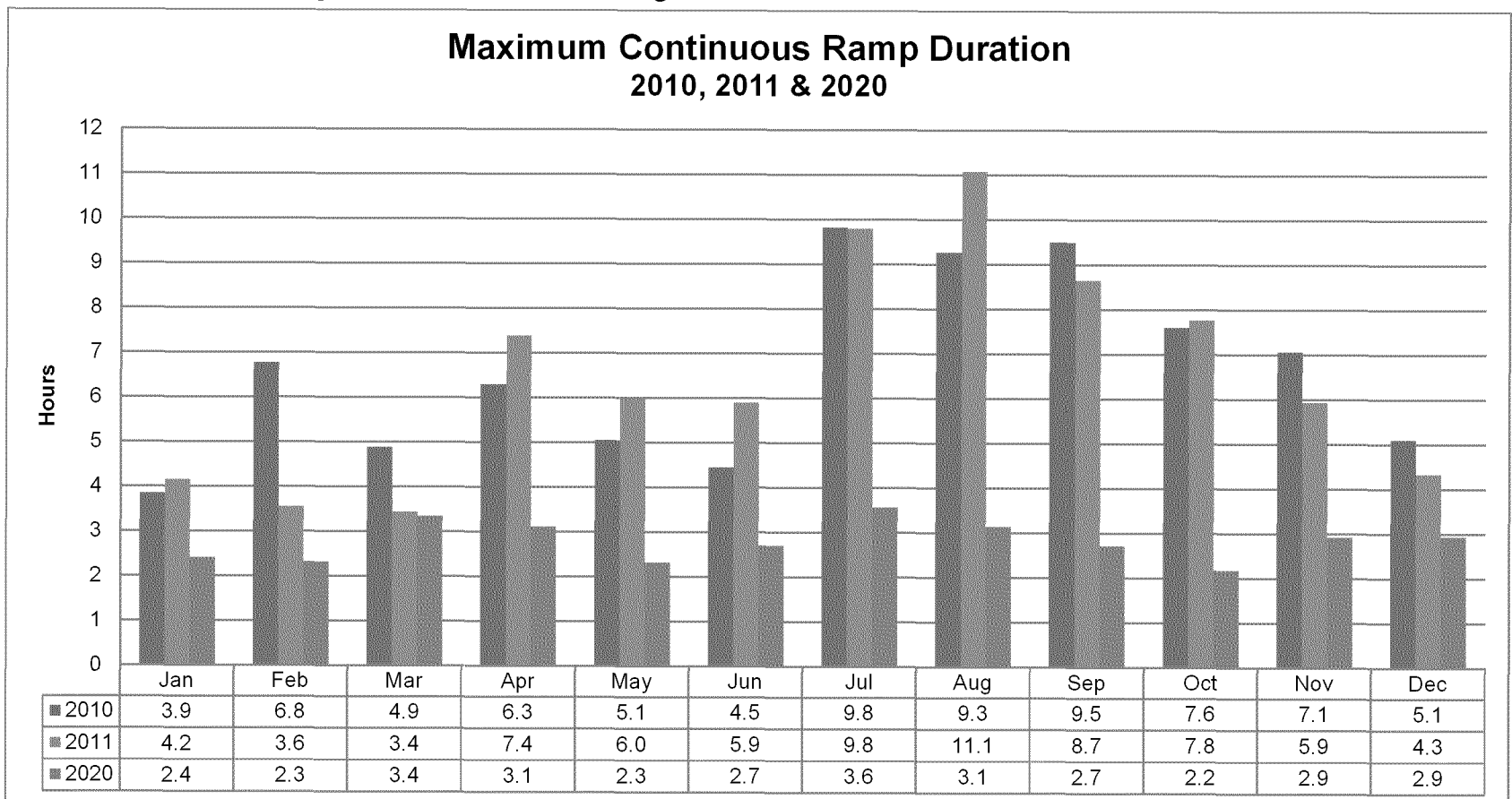
## Actual 2010 & 2011---- Simulated 2020

Observation: Speed of increases in shoulder periods.



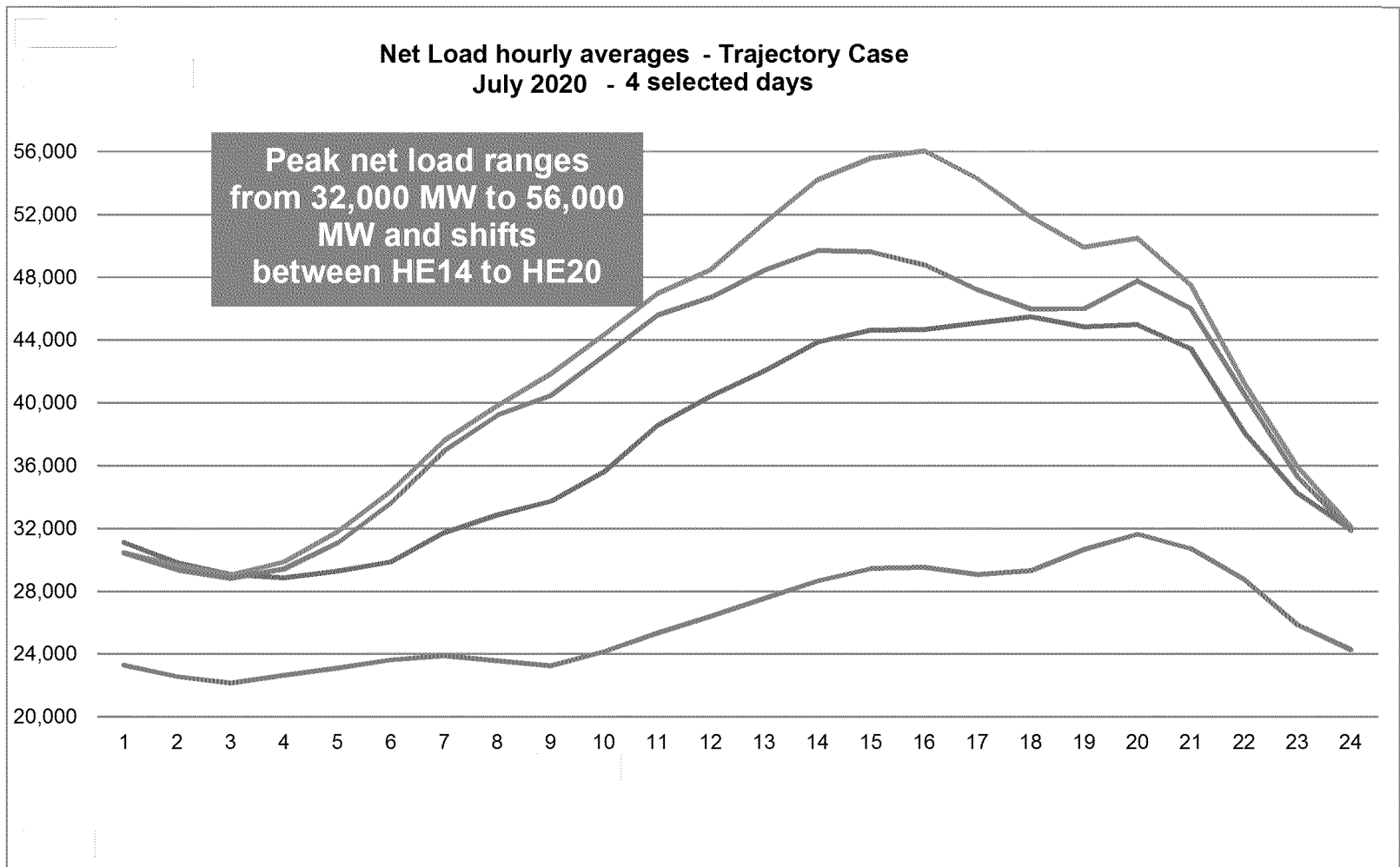
# Maximum continuous ramp duration based on net load Actual 2010 & 2011---- Simulated 2020

Observation: Length of continuous during summer decreases to 2-3 hours in 2020



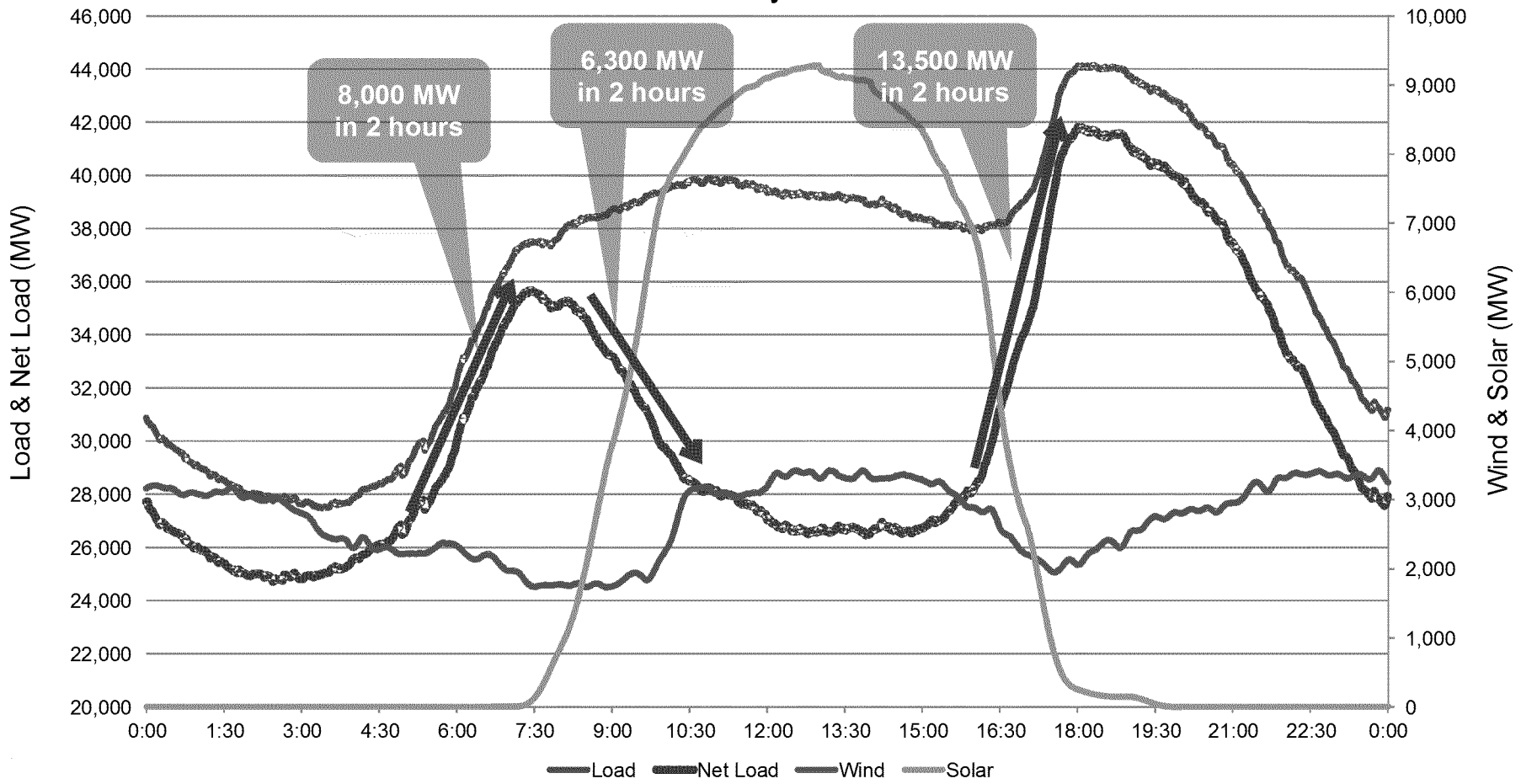


# Large range of net load in summer period requires flexible capacity commitment capability

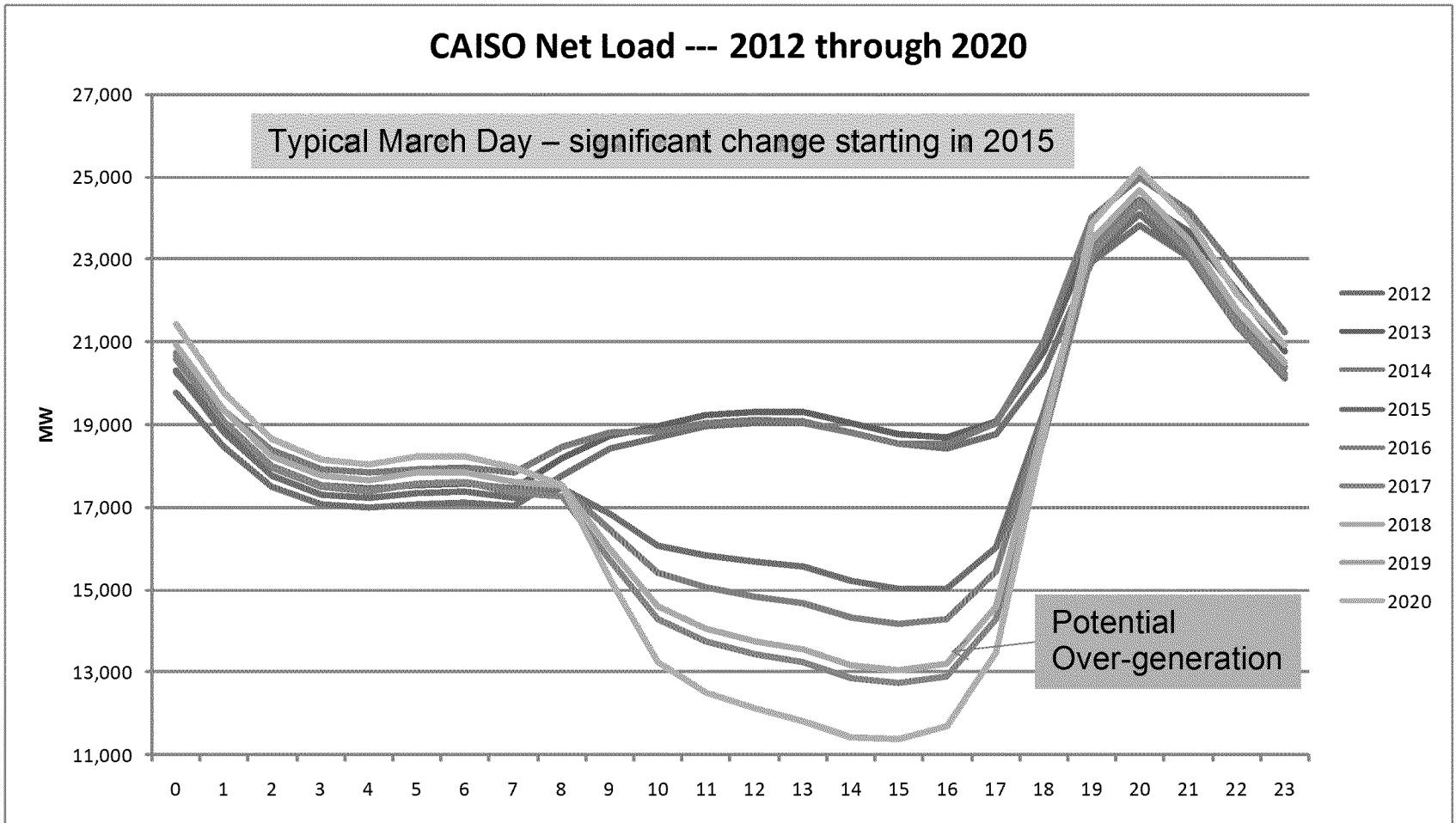


# Conventional resources will be dispatched to the net load demand curve – High Load Case

## Load, Wind & Solar Profiles – High Load Case January 2020



# Net load pattern changes significantly starting in 2015



# Analysis Roadmap

- “Step 1” Process for 2014-2016 net load
  - Develop minute by minute estimate of net load
- From the results derive the requirements for the amounts of flexibility needed
  - Regulation
  - Load Following
  - Maximum Ramping
- Results by early September
- This data will allow us to
  - Determine how effective any interim proposal will be at ensuring sufficient flexible resources
  - Develop long term flexible requirements
  - Determine when requirements might become binding

## Other Issues

- What is level of net import/export
  - Palo Verde & Hoover (~ 1,200 MW jointly owned by ISO entities)
  - Collecting data on what other WECC BAs are assuming about their flexibility needs and how this might impact our estimates
- Level of DER, DR, and EE
- Amount of conventional resources that must remain on-line for reliability (frequency response)

# Understanding the Fleet's Capabilities

## Analysis Objective:

Matching system flexibility needs with the fleet's capabilities will determine which flexibility requirements are binding and if there will be enough flexibility in future years.

## Generator Characteristics:

- Pmin and Pmax, Regulation Point and Range
- Ramp rates
- Minimum run or down times
- Start Up Times
- Run Limitations

## Preliminary Conclusions:

- Not all plants can ramp over their full range, or ramp while being at their most efficient state
- Flexibility contributions differ between technologies, and within technologies
- The sum of flexibility requirements, rather than a single individual requirement, could be the binding factor

## Next Steps:

- Determine if fleet can meet short term flexibility requirements and which requirements could be binding in future

# Supporting Material

# 2011 RA resources ramping capability

Fleet Capability of RA Resources	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Combined Cycle	7,493	8,301	8,160	10,770	9,596	9,554	10,557	11,858	10,701	10,655	9,575	8,301
Gas Turbine	3,905	3,902	3,880	3,905	3,905	3,905	3,905	3,905	3,905	3,905	3,905	3,905
Hydro	5,875	5,875	5,875	5,875	5,875	5,875	5,875	5,875	5,875	5,875	5,875	5,875
Pump-Storage	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330	1,330
Steam	11,266	11,266	11,266	11,266	11,266	11,266	11,266	11,194	11,266	11,266	11,266	11,266
<b>Total</b>	<b>29,869</b>	<b>30,674</b>	<b>30,511</b>	<b>33,146</b>	<b>31,972</b>	<b>31,930</b>	<b>32,933</b>	<b>34,162</b>	<b>33,077</b>	<b>33,031</b>	<b>31,951</b>	<b>30,677</b>



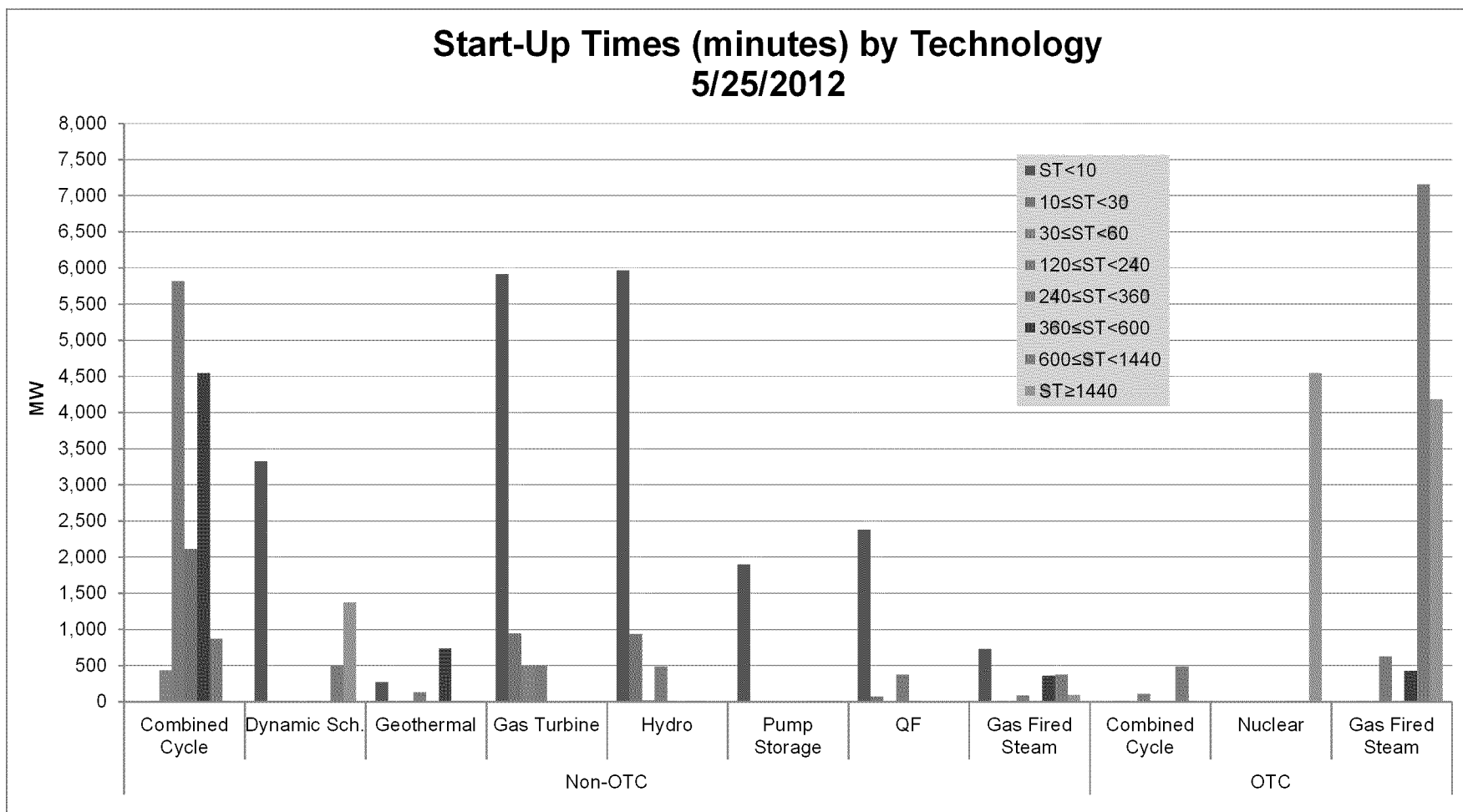
# Summary of flexibility needs for 2011

2011							
Monthly System Requirements	Maximum Continuous Ramp			60-Minute Load Following Requirement		Regulation Requirement	
	Capacity (MW)	Ramp Rate (MW/min.)	Duration (Hr.)	60-min Capacity (MW)	Ramp Rate (MW/min.)	5-minute Capacity (MW)	Ramp Rate (MW/min.)
January	8,133	32.7	4.2	3,935	66	664	132.8
February	6,982	32.8	3.6	3,630	60	656	131.3
March	5,453	26	3.4	3,271	55	1,020	204.0
April	8,859	20	7.4	2,897	48	544	108.7
May	8,000	22	6.0	2,951	49	678	135.7
June	11,382	32	5.9	2,637	44	637	127.5
July	13,544	23	9.8	3,137	52	840	167.9
August	18,181	27	11.1	2,933	49	686	137.1
September	17,824	34	8.7	3,004	50	634	126.8
October	9,510	20	7.8	3,514	59	635	126.9
November	7,855	22	5.9	3,746	62	1,351	270.2
December	7,577	29	4.3	4,506	75	668	133.7

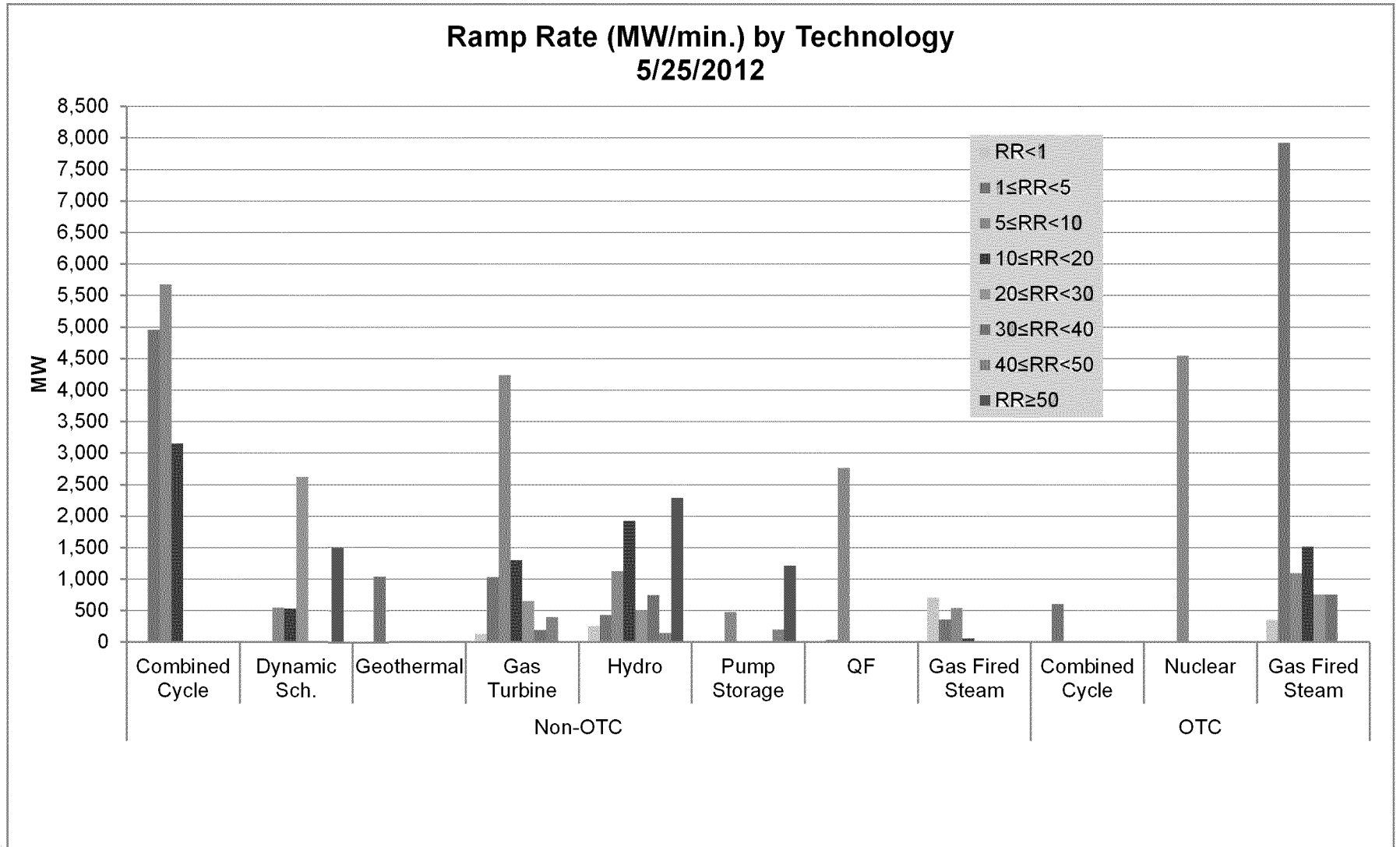
# Summary of flexibility needs for 2020

2020							
Monthly System Requirements	Maximum Continuous Ramp			60-Minute Load Following Requirement		Regulation Requirement	
	Capacity (MW)	Ramp Rate (MW/min.)	Duration (Hr.)	60-min Capacity (MW)	Ramp Rate (MW/min.)	5-minute Capacity (MW)	Ramp Rate (MW/min.)
January	13,459	93	2.4	8,022	134	1,054	211
February	11,825	85	2.3	7,186	120	860	172
March	15,254	76	3.4	7,516	125	1,423	285
April	12,298	66	3.1	5,783	96	818	164
May	8,630	62	2.3	5,714	95	712	142
June	9,782	60	2.7	3,753	63	1,575	315
July	9,496	44	3.6	3,439	57	2,360	472
August	8,785	47	3.1	3,811	64	1,862	372
September	9,777	60	2.7	5,443	91	1,162	232
October	11,483	88	2.2	6,979	116	1,057	211
November	13,308	76	2.9	7,597	127	998	200
December	13,234	75	2.9	8,286	138	1,135	227

# Resource start up times as of May 25, 2012



# Resource ramp rates as of May 25, 2012



John Goodin

# FLEXIBLE CAPACITY PROPOSAL AND PROCESS



Slide 20

# Two Key ISO Objectives

1. Institute an Interim RA Solution with an explicit flexible capacity requirement beginning in the 2014 compliance year.
2. Collaborate with the CPUC and stakeholders to create a more durable and sustainable RA solution that takes us beyond 2020, beginning in the 2017 compliance year.

# Why an Interim Flexible Capacity Procurement Solution?

“Institute an Interim RA Solution with an explicit flexible capacity requirement beginning in the 2014 compliance year”

- Ensure sufficient flexible capacity is procured to reliably operate the grid through the 2016 RA compliance year by establishing an explicit flexible capacity need
- Minimize changes to the existing bi-lateral, 1-year forward RA program
- Avoid disrupting existing procurement practices in the interim period

# Why is a longer-term RA solution required?

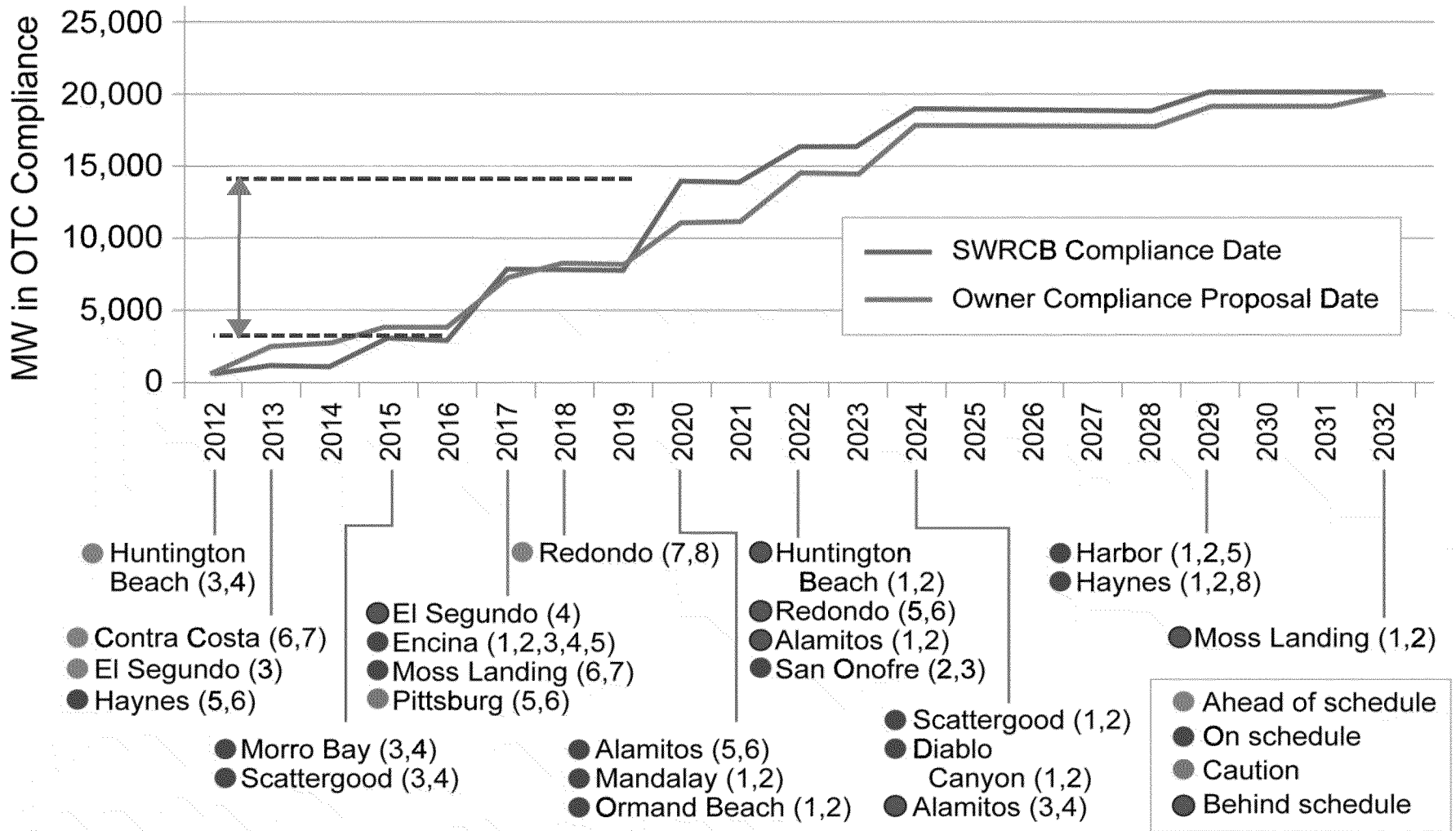
“Create a more durable and sustainable RA solution that takes us beyond 2020, beginning in 2017”

*Need a roadmap for where we want to go and how we get there*

1. Rapidly evolving supply portfolio and changing load patterns
2. A single “dispatchability” attribute doesn’t fully capture need
3. Multi-year requirement to address risk of retirement concerns
4. More complex procurement given multiple attributes
5. Ability to buy or sell small RA capacity quantities
6. Load migration true-up capability (essential with multi-year)
7. More fungible capacity products and refined cost allocation

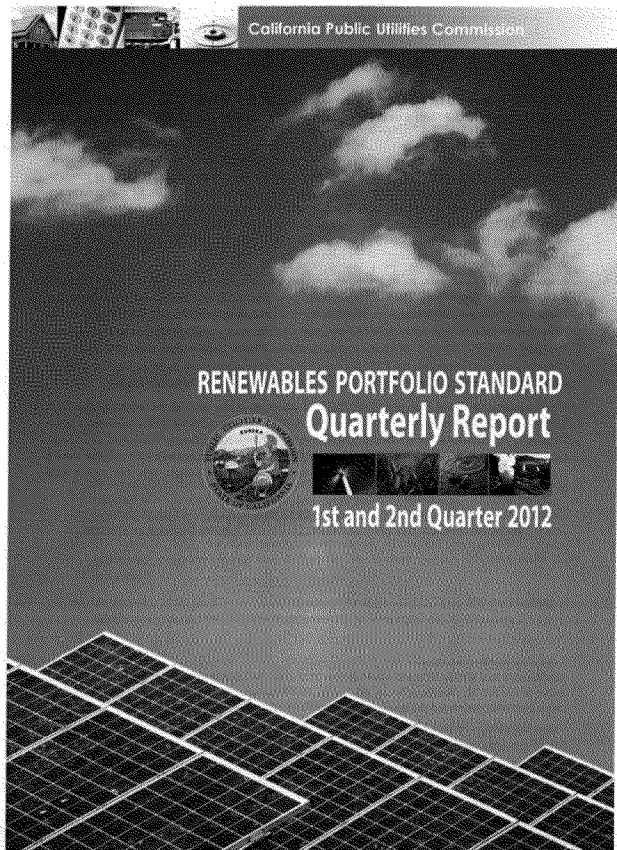


# Once-Through-Cooling Phase-out Compliance



Source: California Clean Energy Future, Dec. 23, 2011

# RPS Compliance Phase-in



“2011 showed the greatest year-to-year increase in the capacity of renewable generation achieving commercial operation since the beginning of the program, and 2012 is already on track to far surpass 2011.”

20%  
2011-2013

+5%  
%

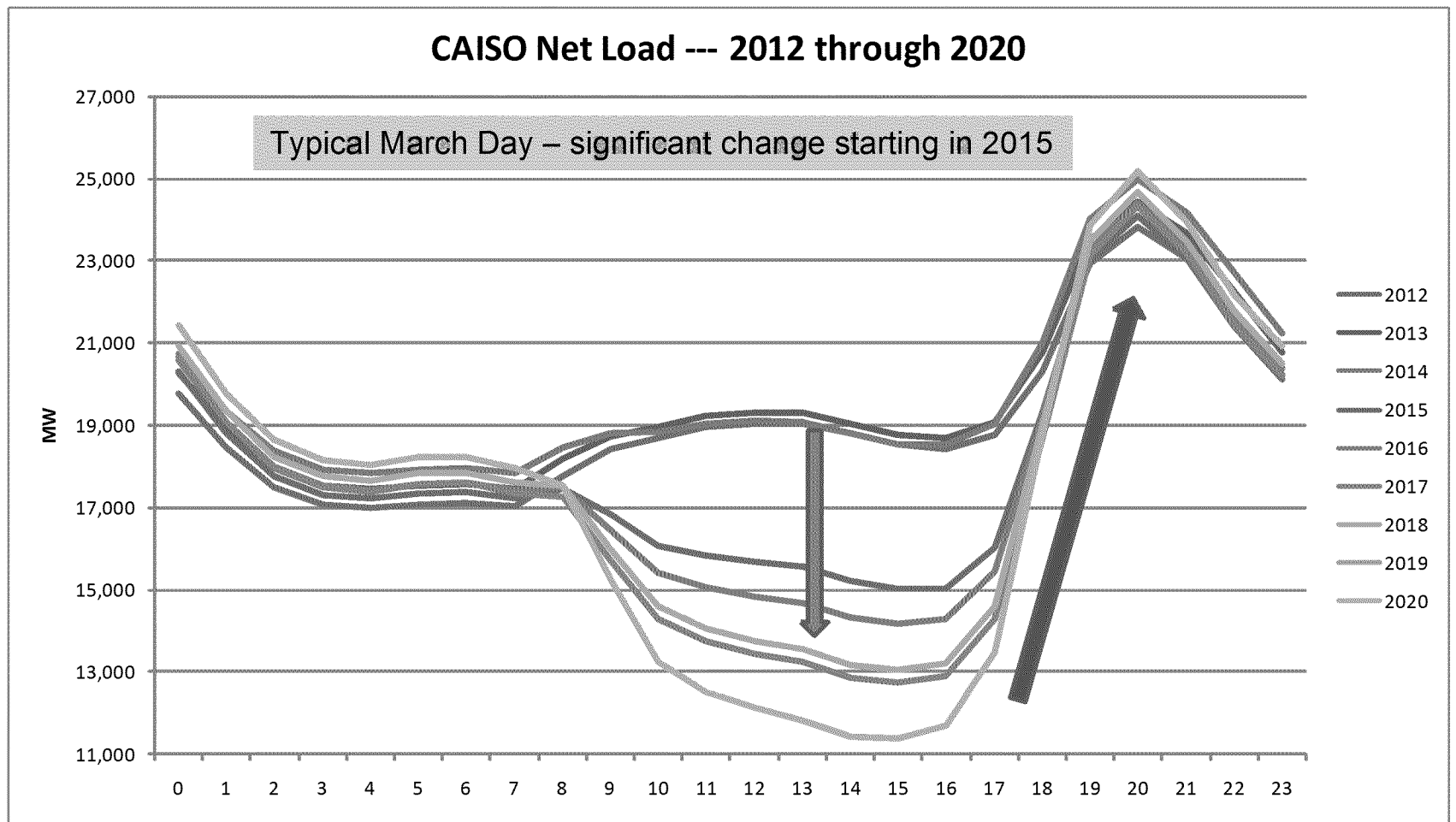
25%  
2014-2016

+8%  
%

33%  
2017-2020

“In 2012, 2,500 MW is scheduled to come on line before the end of the year. That compares with 2,871 MW of new renewables capacity to come on line since the RPS program started in 2003.”

# Net load patterns change significantly starting in 2015

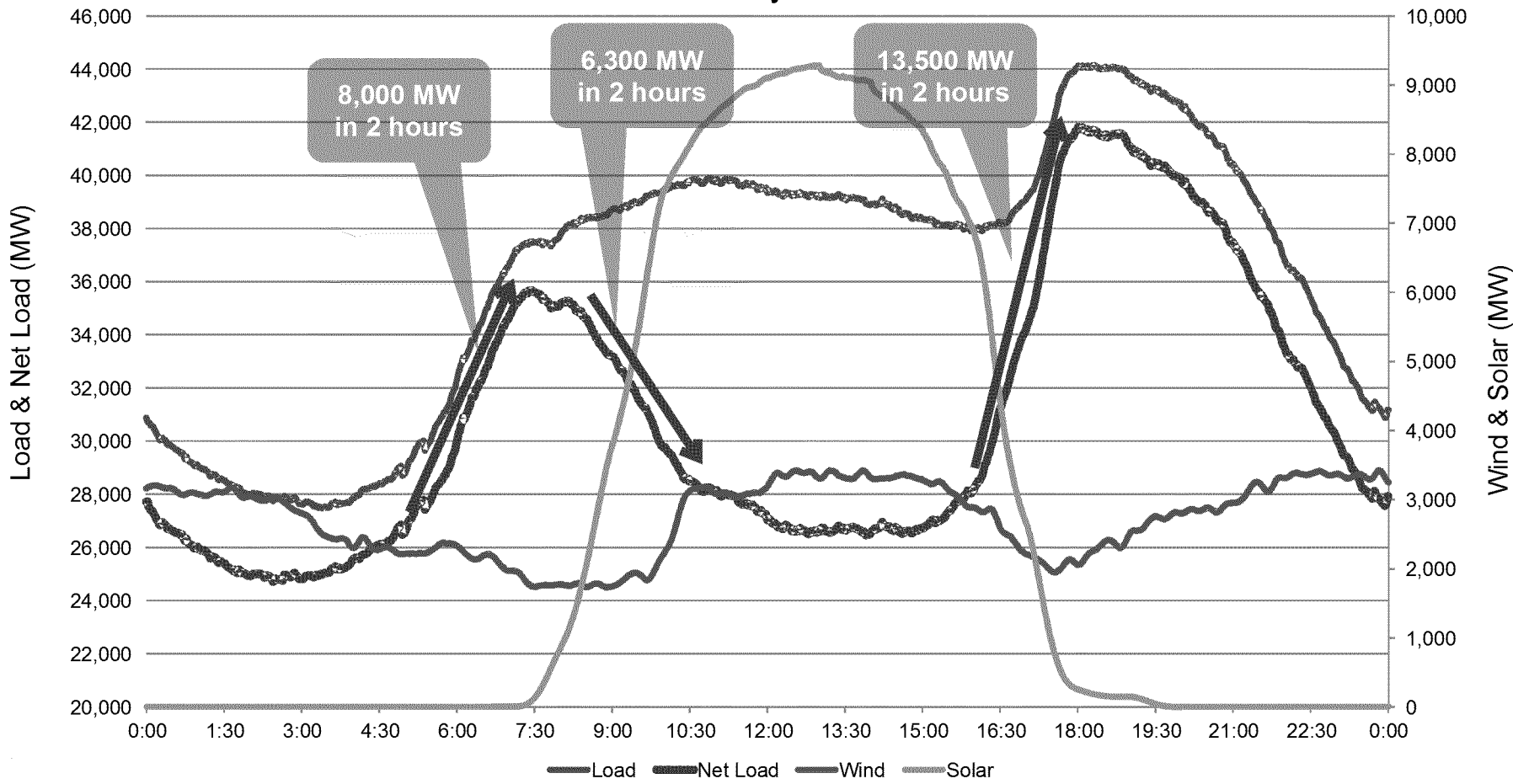


# Interim Flexible Capacity Proposal

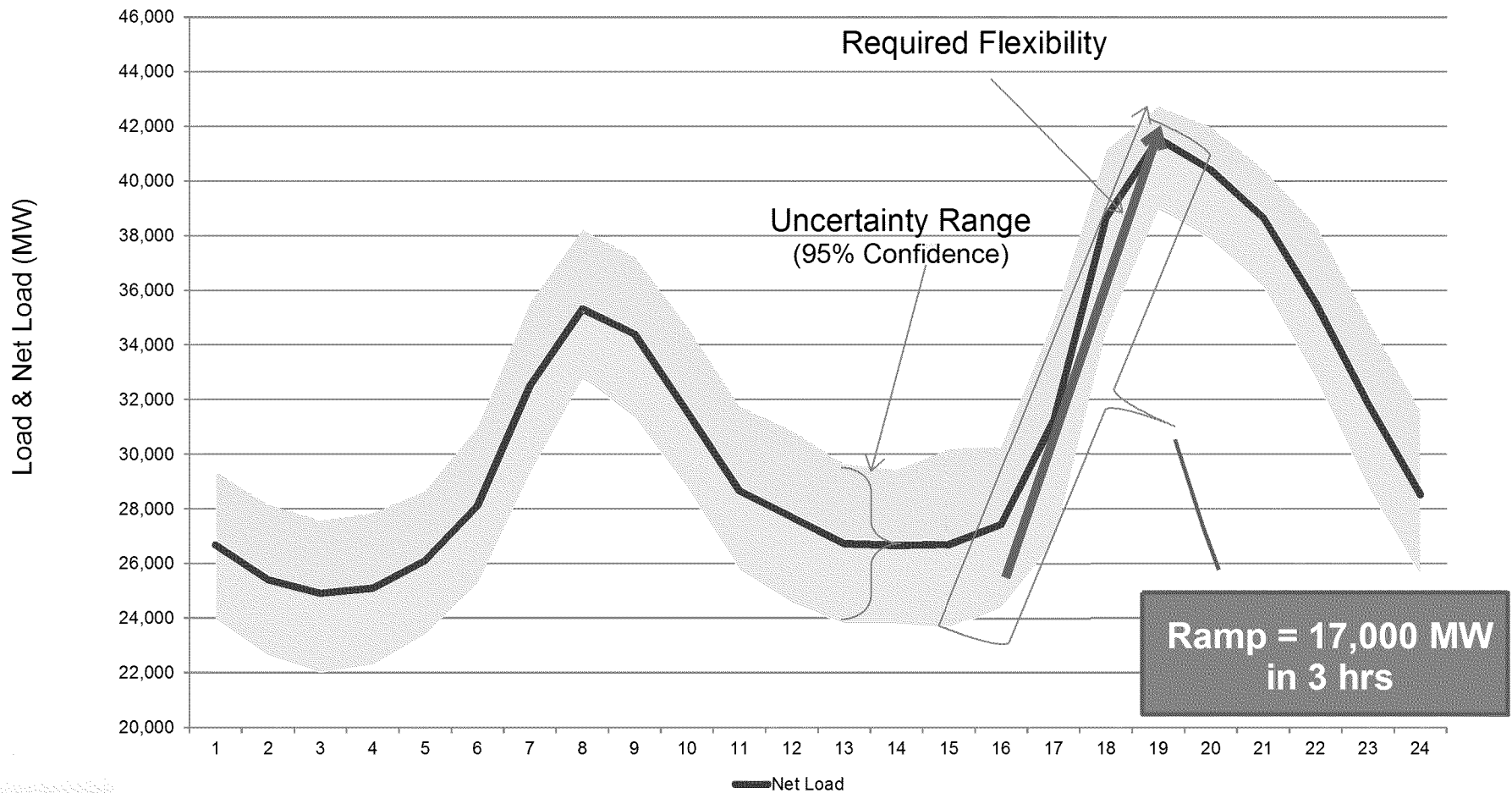
- Previous proposal added three new RA attributes:
  - Regulation
  - Load following
  - Maximum continuous ramping
- New “Dispatchability Tag” Proposal:
  - Is more simplistic and implementable under the existing RA program given implementation time
  - Adds a single “dispatchability” attribute
  - Minimizes changes to existing procurement practices

# Conventional resources will be dispatched to the net load demand curve- Load minus Wind + Solar

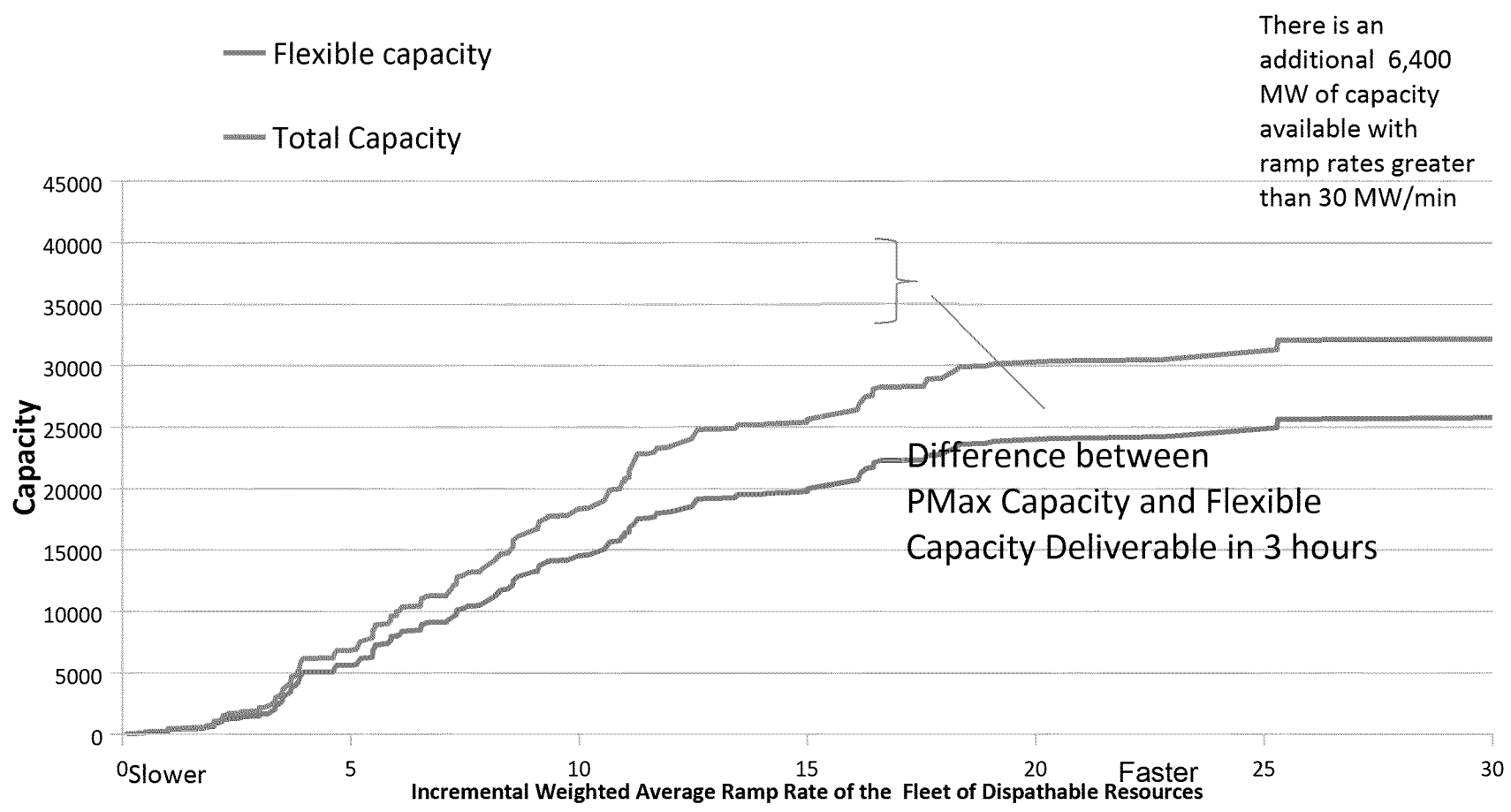
## Load, Wind & Solar Profiles – High Load Case January 2020



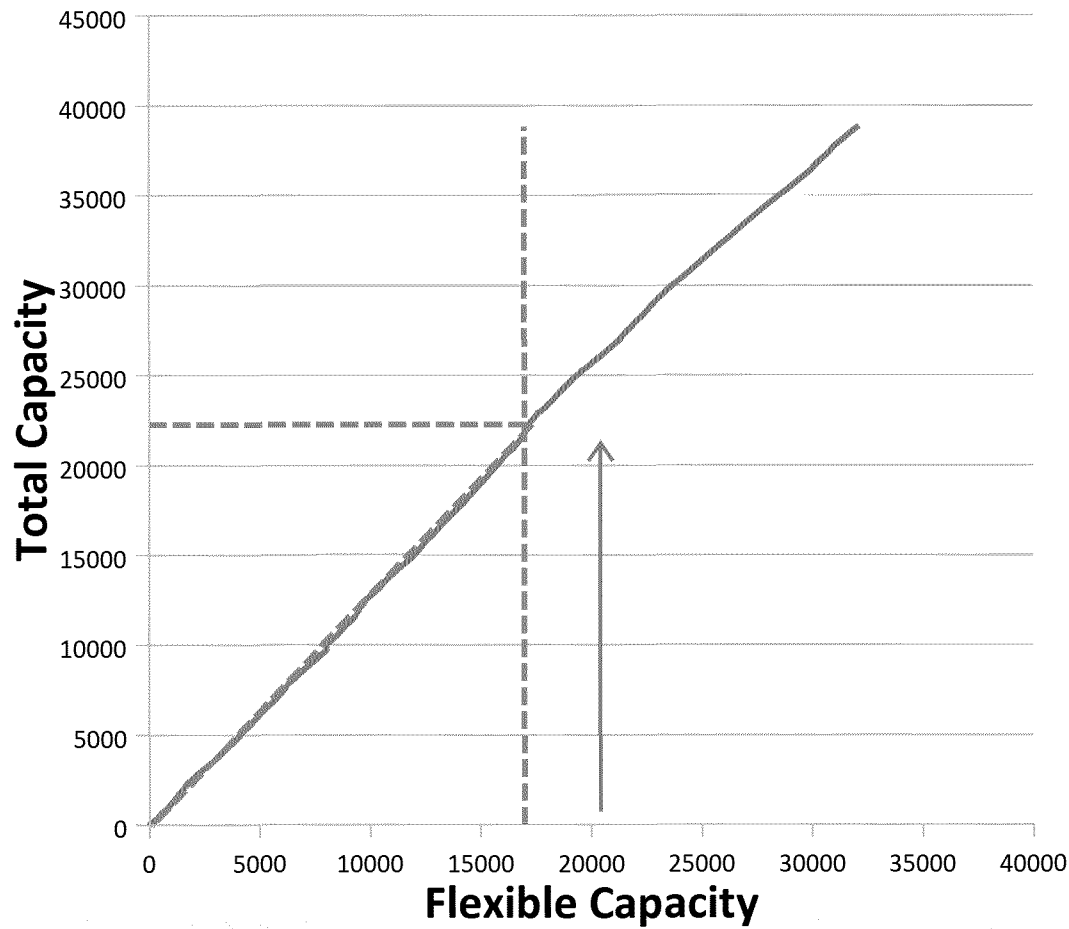
# Assessing Flexibility Needs: An Example



# Assess “Dispatchability” of the Resource Fleet: Example: Satisfy Ramp Rate of 17,000 MW Over 3 Hrs



# Translating Flexible Capacity Needs into Procurement



- Flexible capacity
- Capacity
- Ramping Capacity Need



# Interpretation of Results in this Example

In this 2020 Example:

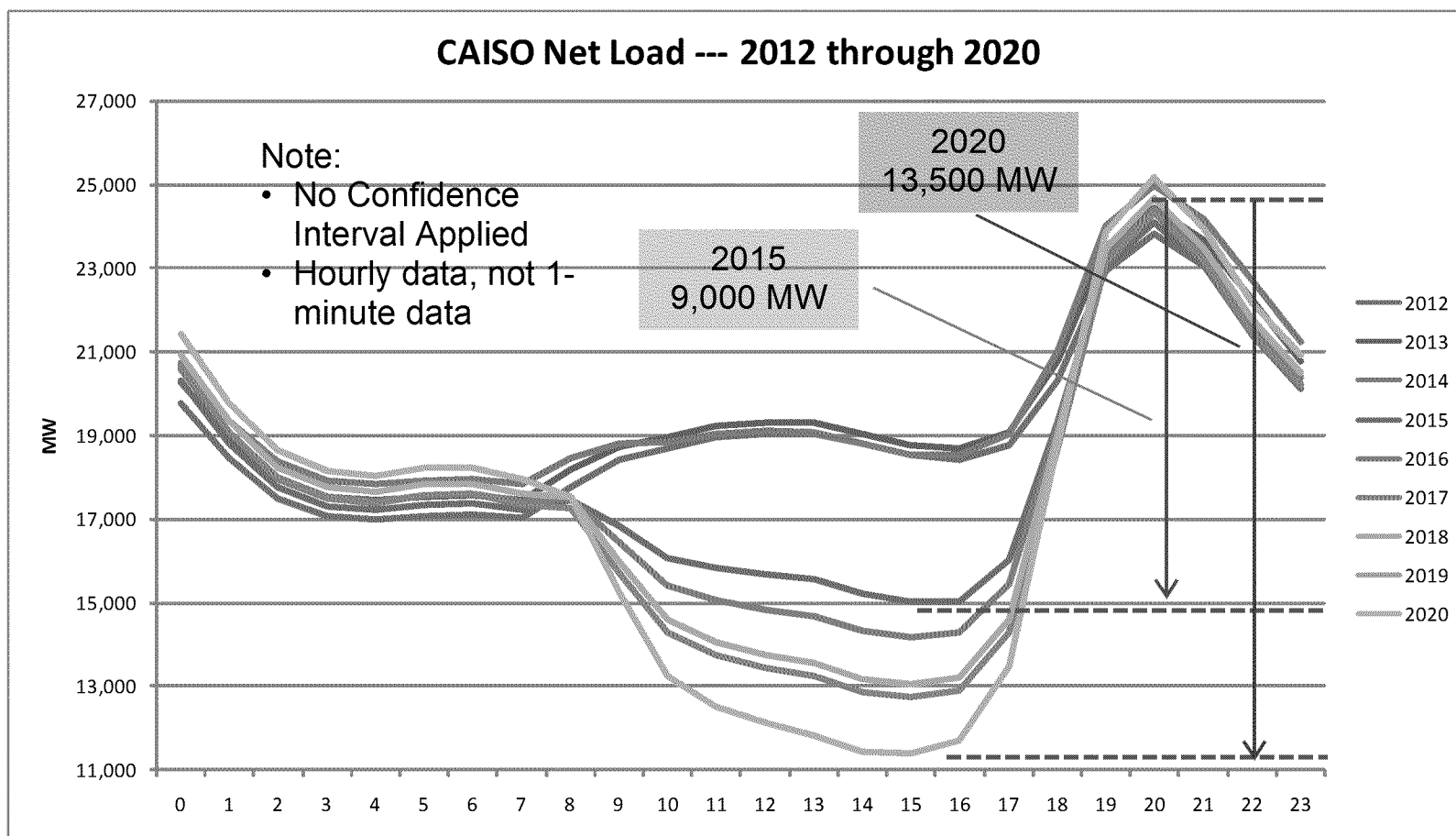
- If the slowest dispatchable resources were procured, the ISO would need 22,285 MW of dispatchable capacity to meet a 17,000 MW ramp over 3 hrs (2020 scenario)
  - The total capacity to be procured relative to the flexible capacity need depends on:
    - Resource ramp rates and ability to deliver full capacity over period required e.g., 3 hours in this example
    - Amount of PMin to procure in overall fleet
- Actual requirement would be set based on need in each month of the corresponding RA compliance year

# Assessment of Market Power Concerns

- ISO conducted a basic “HHI” market power test using resources currently with dispatchable flags
- HHI Results (size of firms relative to industry):
  - Using all market participants, HHI = 0.076 (Low)
  - Using top 12 and “All others,” HHI = 0.119 (Moderate)
- US Department of Justice considers HHIs between 0.1500 and 0.2500 to be *moderately concentrated* and indices above 0.2500 to be *highly concentrated*

# Flexible Capacity Need Will Increase Each Year

*Interim solution sets flexible capacity need one year at a time*



# Model flexible capacity process after the local capacity requirement process

For instance:

- LCR and Flexible Capacity Study Produced and vetted in May
  - Include how much flexibility is needed in each month of the upcoming RA compliance year based on a net load evaluation
  - Flexibility would be evaluated on a system-wide basis; not locally
- Resource “dispatchability” reported to the ISO
- CAISO check against PMax/NQC and deliverability
- Resource “dispatchability” election made in June for each month of the following RA compliance year
- CAISO publishes a list of dispatchable resources and quantity of available flexible capacity by month for the RA compliance year
- LSE procurement and showings made
- CAISO issues a residual analysis of local and flexible capacity needs

# Run ISO Stakeholder Process in Coordination with the CPUC

*Target March 2013 CPUC Decision on Flexible Capacity*

- Conduct Supporting ISO Stakeholder Process to:
  - Set the year-ahead monthly forecasts and procurement needs and publication timing
  - Determine resource eligibility
  - Consider treatment of intertie energy
  - Address self-scheduling
  - Establish the treatment of use-limited resources
  - Modify the Must offer obligation, as necessary
  - Address resource substitution/replacement rules

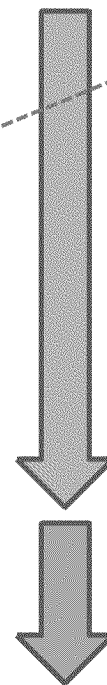
# Process and Timeline

Procedure	Objective	Date
Agenda and questions sent to parties	Set the agenda for Workshop -1	August 7, 2012
Workshop-1	1. Definition of flexibility 2. Needs methodology 3. Generator capability methodology	August 13, 2012
ED staff workshop report	Creating a record for the workshop	September 4, 2012
Ruling	Post-workshop comments	September 4, 2012
Party Comments	Post-workshop comments	September 24, 2012
Party Reply Comments	Post-workshop comments	October 1, 2012
ED Proposal	1. Definition of flexibility 2. Needs methodology 3. Generator capability methodology 4. Allocation methodology 5. Compliance rules	October, 2012
Workshop 2 (if needed)	1. Allocation methodology 2. Compliance rules	November, 2012
Ruling	Post-workshop comments	December, 2012
Party Comments	Post-workshop comments	December, 2012
Party Reply Comments	Post-workshop comments	January, 2012
Proposed Decision	Adopting a mechanism for flexible capacity procurement	February, 2013
Decision	Adopting a mechanism for flexible capacity procurement	March, 2013

## Schedule Modifications

Updated Flexible Capacity Proposal Submitted

Potential workshop or call to discuss proposal



ISO Stakeholder Process

FERC Process (as necessary)