



**RAP**

Energy solutions  
for a changing world

# Making Energy Efficiency, Demand Response, and Distributed Generation Count as Grid Resources

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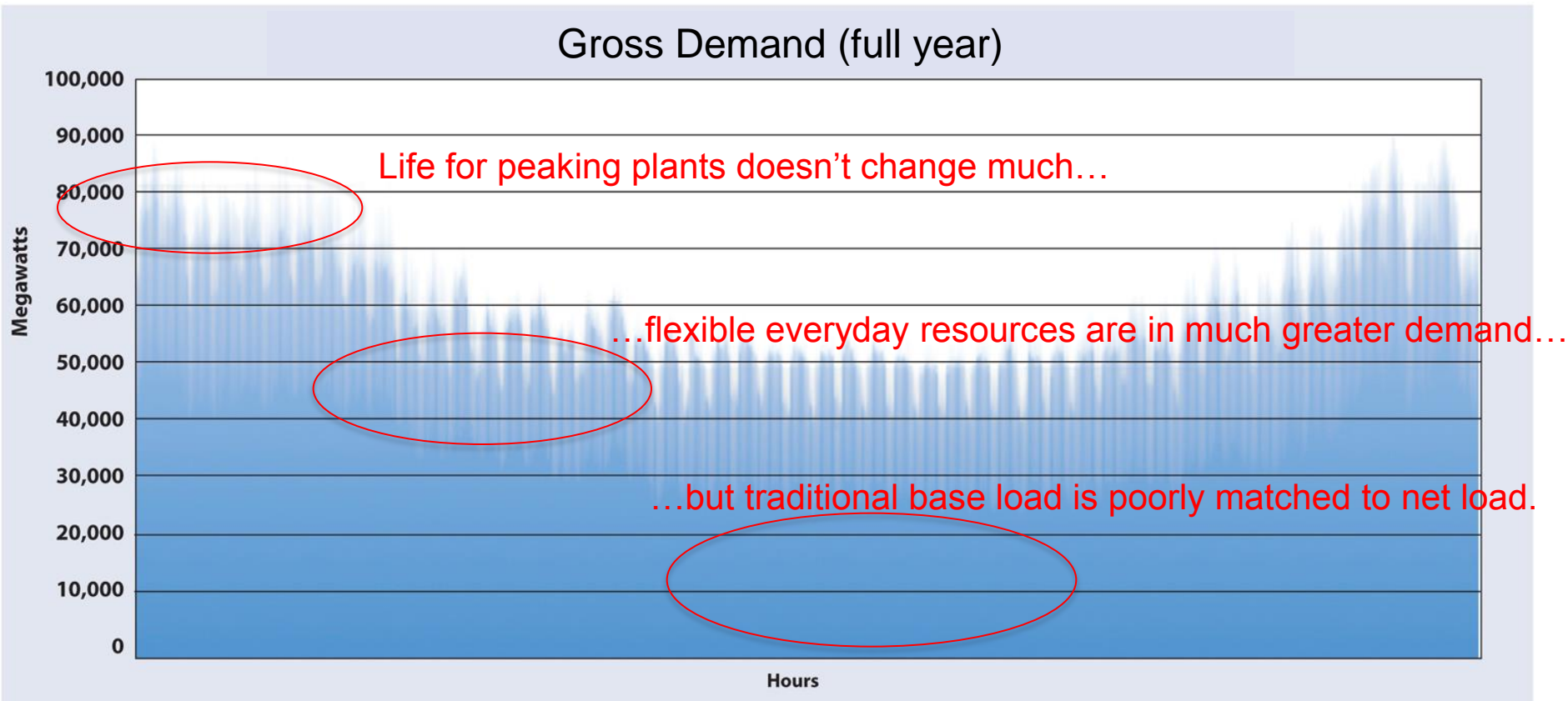
# We are in a Transition to a Transactive Grid

- Step 1: EE, DR and DG as load modification
- Step 2: EE, DR and DG capabilities as a resource
- Step 3: Establishing tariffs and markets to access capabilities
- Step 4: Building the infrastructure:  
Getting capabilities reflected in planning

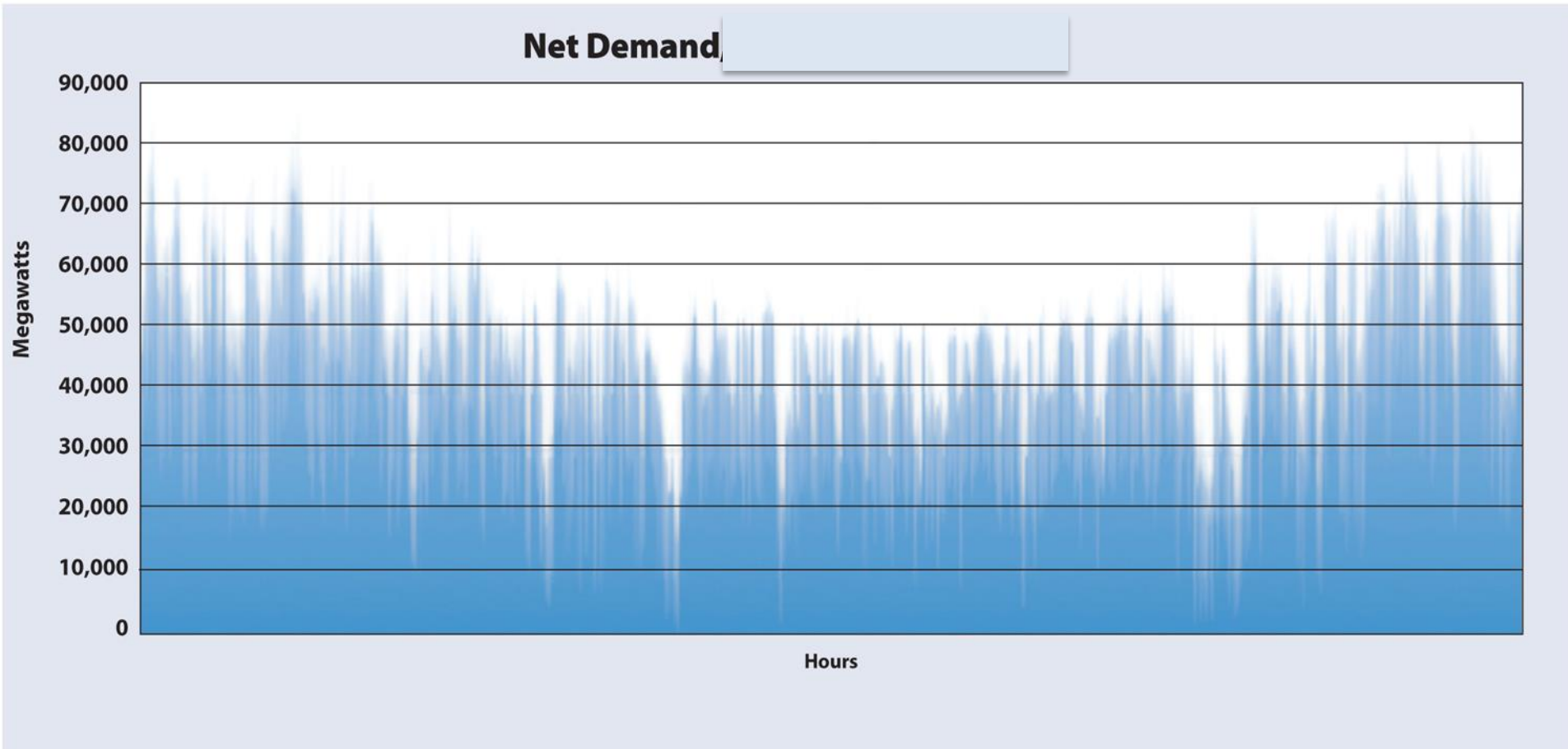
# Step 1 Question

Are EE, DR and DG load modifications reflected in net need assessments?

# Some capabilities will be needed less ...



# Load following and regulation needed more ...



## Step 2 Question

Are net needs well articulated and are EE, DR and DG capabilities recognized in the operational time frame?

# “Demand Response as a Power System Resource,” Synapse for RAP, May 2013

Table 11. Ancillary Services that may be Provided by Demand Response

Service	Service Description			
	Response Speed	Duration	Cycle Time	Price Range* (Average, Max) \$/MW-hr
<b>Normal Conditions</b>				
Frequency Regulation	Online resources, on automatic generation control, that can respond rapidly to changes in frequency.			
	<30 seconds	Seconds to Minutes	Seconds to Minutes	
Regulating Reserve	Online resources, on automatic generation control, that can respond rapidly to system-operator requests for up and down movements; used to track the minute-to-minute fluctuations in system load and to correct for unintended fluctuations in generator output.			
	4 Seconds to 5 minutes	Minutes	Minutes	\$35-\$40 \$200-\$400
Load Following	Similar to regulation but slower. Bridges between regulation service and hourly energy markets. This service is performed by the real-time energy market in regions where such a market exists.			
	~10 minutes	10 min to hours	10 min to hours	-

# Under Contingency Conditions

Contingency Conditions				
<b>Spinning Reserve</b>	Online generation, synchronized to the grid, that can increase output immediately in response to a major generator or transmission outage and can reach full output within 10 min.			
	<i>Seconds to &lt;10 min</i>	<i>10 to 120 min</i>	<i>Hours to Days</i>	<i>\$7-\$7 \$100-\$300</i>
<b>Non-Spinning Reserve</b>	Same as spinning reserve, but need not respond immediately. Resources can be			
	<i>&lt;10 min</i>	<i>10 to 120 min</i>	<i>Hours to Days</i>	<i>\$3-\$6 \$100-\$400</i>
<b>Replacement or Supplemental Reserve</b>	Same as supplemental reserve, but with a 30-60 min response time; used to restore spinning and non-spinning reserves to their pre-contingency status.			
	<i>&lt;30 min</i>	<i>2 hours</i>	<i>Hours to days</i>	<i>\$0.4-\$2 \$2-\$36</i>



## Step 3 Question

Are EE, DR and DG capabilities qualified to meet net needs in the operational time frame through markets and tariffs?

# Follow up questions

1. Are the capabilities characterized?
2. Are the capabilities qualified through tariffs or markets?
3. What tariffs or markets need to be created?
4. Is M&V in place to verify the contributions?

# Step 4 Question

Are EE, DR and DG capabilities reflected in planning models and processes?

# What can Energy Offices do?

- Convene broad set of providers, procurers, stakeholders and government
- Provide data and information to regulators, planners and legislators on need, capabilities and markets
- Convene discussions on emerging infrastructure and resource technologies

# Resources

- What Lies Beyond Capacity Markets? (RAP)  
<http://raponline.org/document/download/id/6041>  
<http://raponline.org/document/download/id/4854>
- Demand Response as a Power System Resource (Synapse for RAP)  
[www.raponline.org/document/download/id/6597](http://www.raponline.org/document/download/id/6597)
- CAISO DR/EE Roadmap: Maximizing Preferred Resources  
<http://www.caiso.com/Documents/DR-EERoadmap.pdf>

## About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at [www.raonline.org](http://www.raonline.org)

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