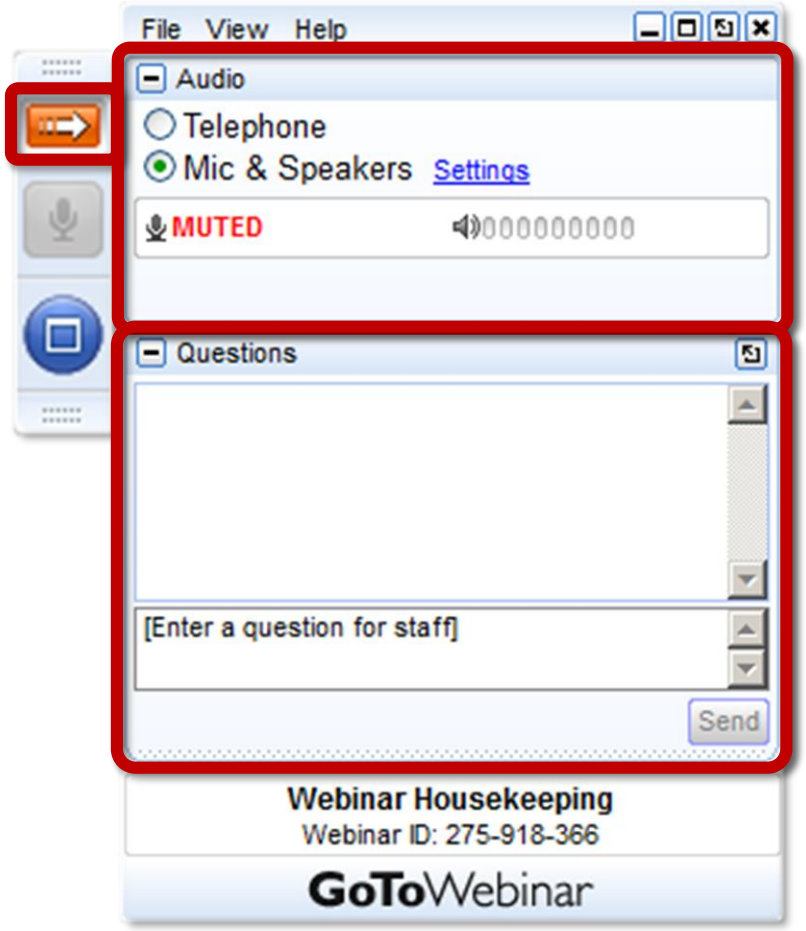
Energy Storage in the Clean Peak Standard

Hosted by Todd Olinsky-Paul,
Clean Energy Group / Clean Energy States Alliance

November 8, 2018

Housekeeping



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RPS Collaborative

With funding from the Energy Foundation and the U.S. Department of Energy, CESA facilitates the Collaborative, which includes state RPS administrators, federal agency representatives, and other stakeholders. For more information and resources related to RPS, including reports, webinars, and our free monthly newsletter, visit: www.cesa.org/projects/renewable-portfolio-standards

Energy Storage Working Group

Managed by CESA and Clean Energy Group with support from the Barr Foundation, the working group is open to CESA members and other state energy officials interested in learning about and developing energy storage policy. To join, email todd@cleanegroup.org

Energy Storage Technology Advancement Partnership (ESTAP)

Funded by the U.S. DOE Office of Electricity and Sandia National Laboratories, and managed by CESA, ESTAP facilitates joint federal/state energy storage project deployment, disseminates information through webinars, and supports state energy storage efforts with technical, policy and program assistance. Learn more at: www.cesa.org/projects/energy-storage-technology-advancement-partnership

Resilient Power Project

Foundation funded, the Resilient Power Project is managed by Clean Energy Group to increase public/private investment in clean, resilient power systems (solar+storage), protect low-income and vulnerable communities, and engage policymakers. For more information visit www.resilient-power.org

Webinar Speakers

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Clean Peak Standard & Energy Storage

Presented to Clean Energy States Alliance
November 8, 2018

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Strategen provides insight to global corporations, utilities and public sector leaders, helping them to develop impactful and sustainable clean energy strategies

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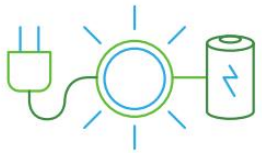
We work with governments, utilities, research institutions, technology providers, project developers, and large energy users seeking to evaluate and implement next generation grid and clean energy technologies.



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Our clients come to us for our expertise in developing business models, commercial strategies, financing tools and regulatory support that empower them to create sustainable value and long-term solutions.

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Our team is comprised of well-respected thought leaders and industry experts who have played instrumental roles in shaping the power sector's transformation in the 21st century.

Today's Topics

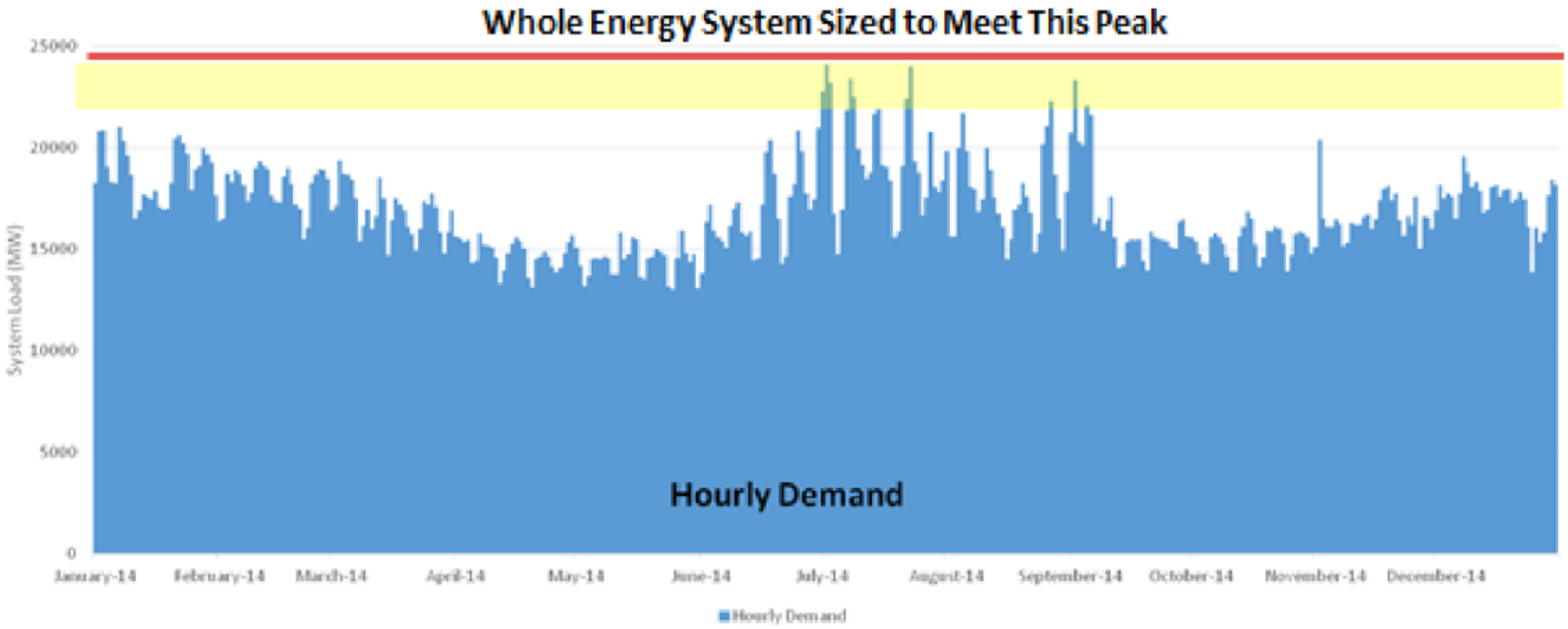
- Motivations for establishing a "clean peak" policy goal
- Technical and policy options for achieving a clean peak
- Focus on implementing a Clean Peak Standard as a policy option
- State policy updates

Electricity System Challenges Related to Peak Demand

1. Higher customer costs due to size of generation fleet needed to meet:
   - System peak demand
   - Local peak demand
   - Flexible ramping needs (limited to date, but increasing in some areas)
2. Higher customer costs due to high marginal energy costs during peak periods
   - E.g. 2018 SoCal price excursion; 2014 Polar Vortex
3. Higher emissions during peak periods
   - Increased total MWh generated
   - Higher marginal emissions rate

- Possible interpretations of system "peaks"
  - Annual peak (summer)
  - "Duck curve" ramps (spring & fall)
    - E.g. CA, HI
- Fixed generation costs passed to customers via:
  - Cost of new peakers added to rate base (vertically integrated markets)
  - Capacity market payments to merchant generators (restructured markets)

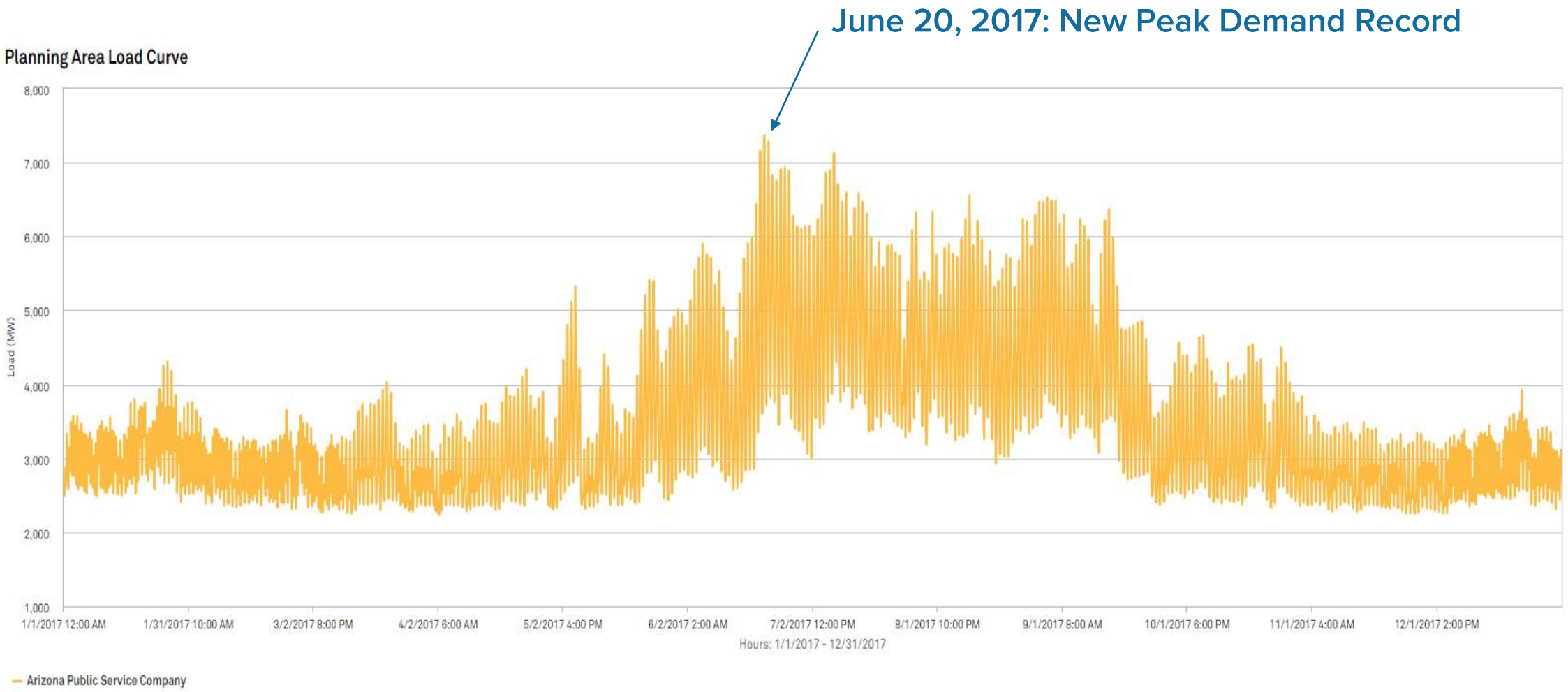
Electric Grid is Sized for Highest Hour of Demand



Top 1% of Hours accounts for 8% of Massachusetts Spend on Electricity
Top 10% of Hours accounts for 40% of Electricity Spend

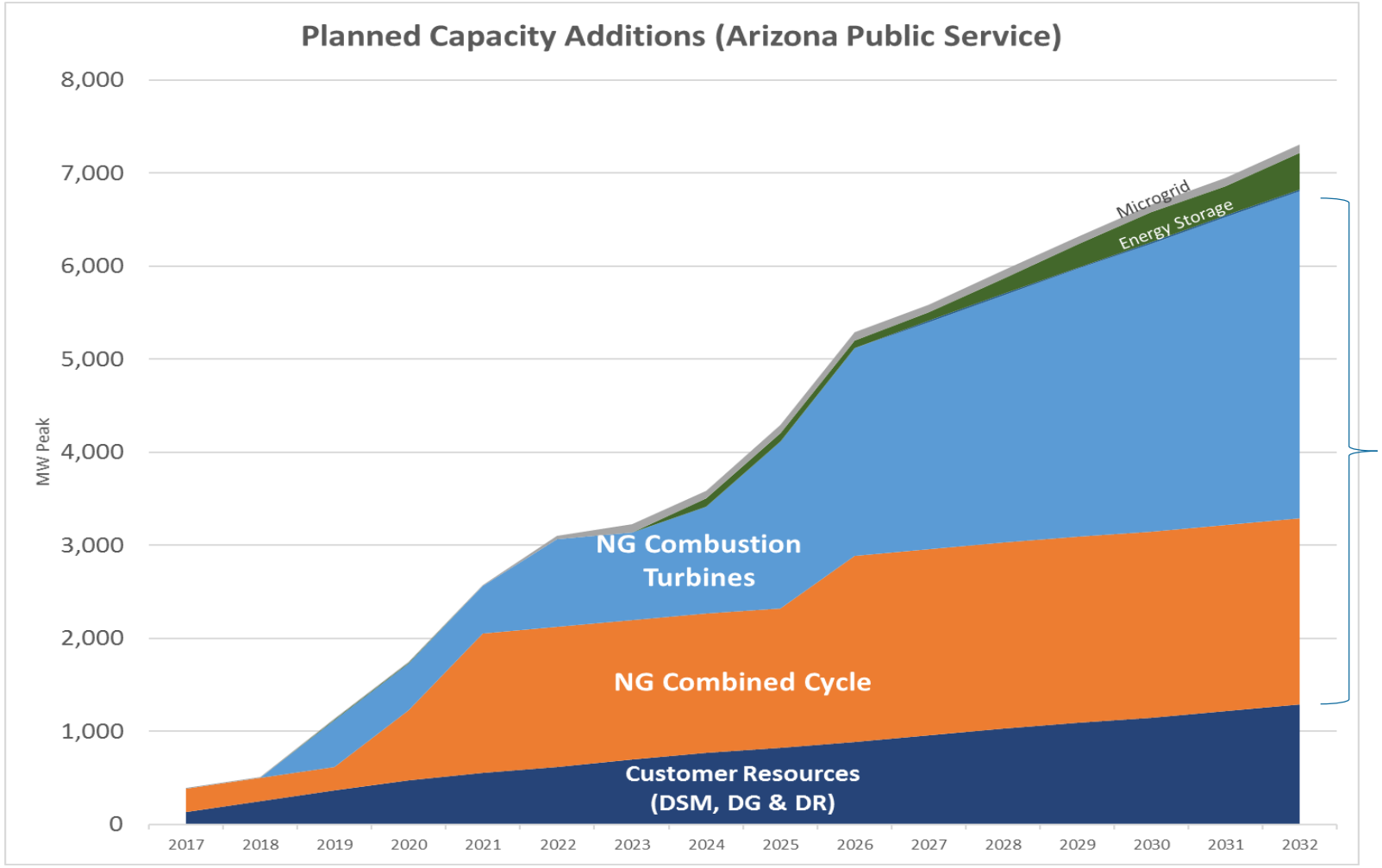
MA DOER slide: Commissioner Judson presentation at Restructuring Roundtable, May 2016

APS Hourly Load and System Peak



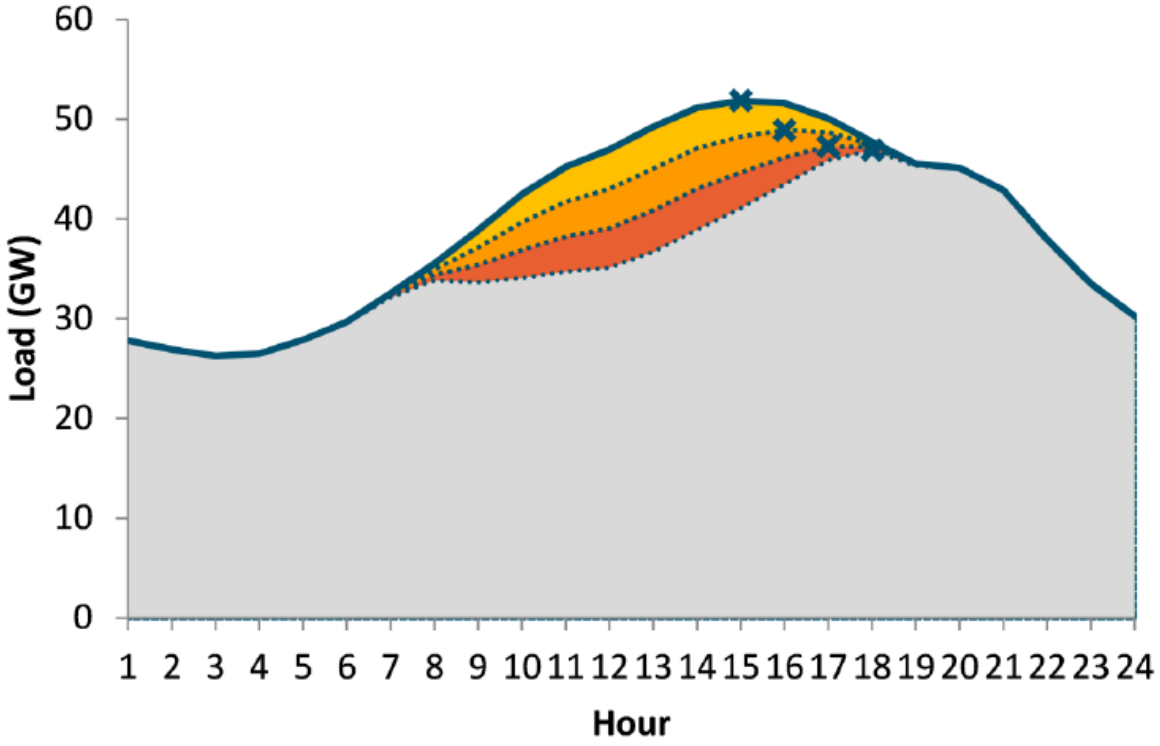
Source: S&P Global

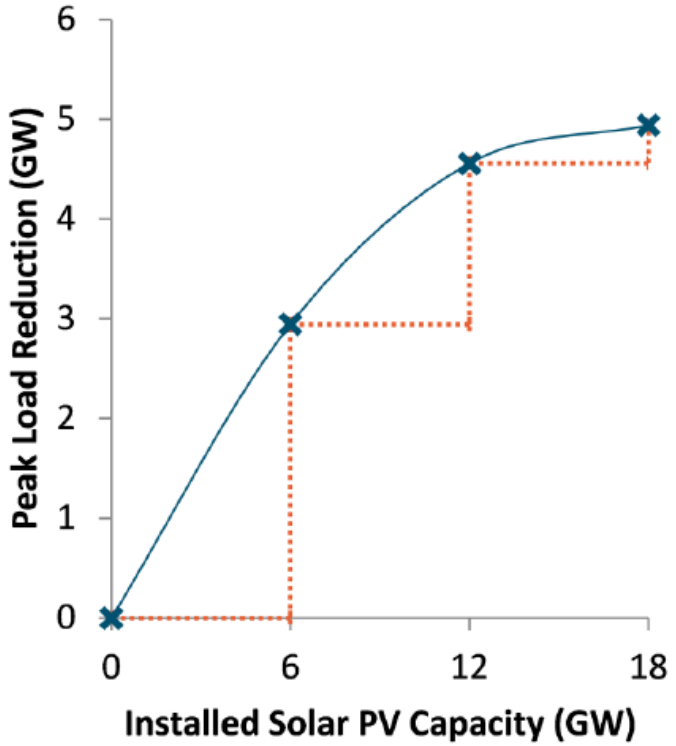
APS' Proposed Resource Plan



- >5,000 MW new natural gas;
- >$7 billion CapEx
- >$600M annual rev. req. increase

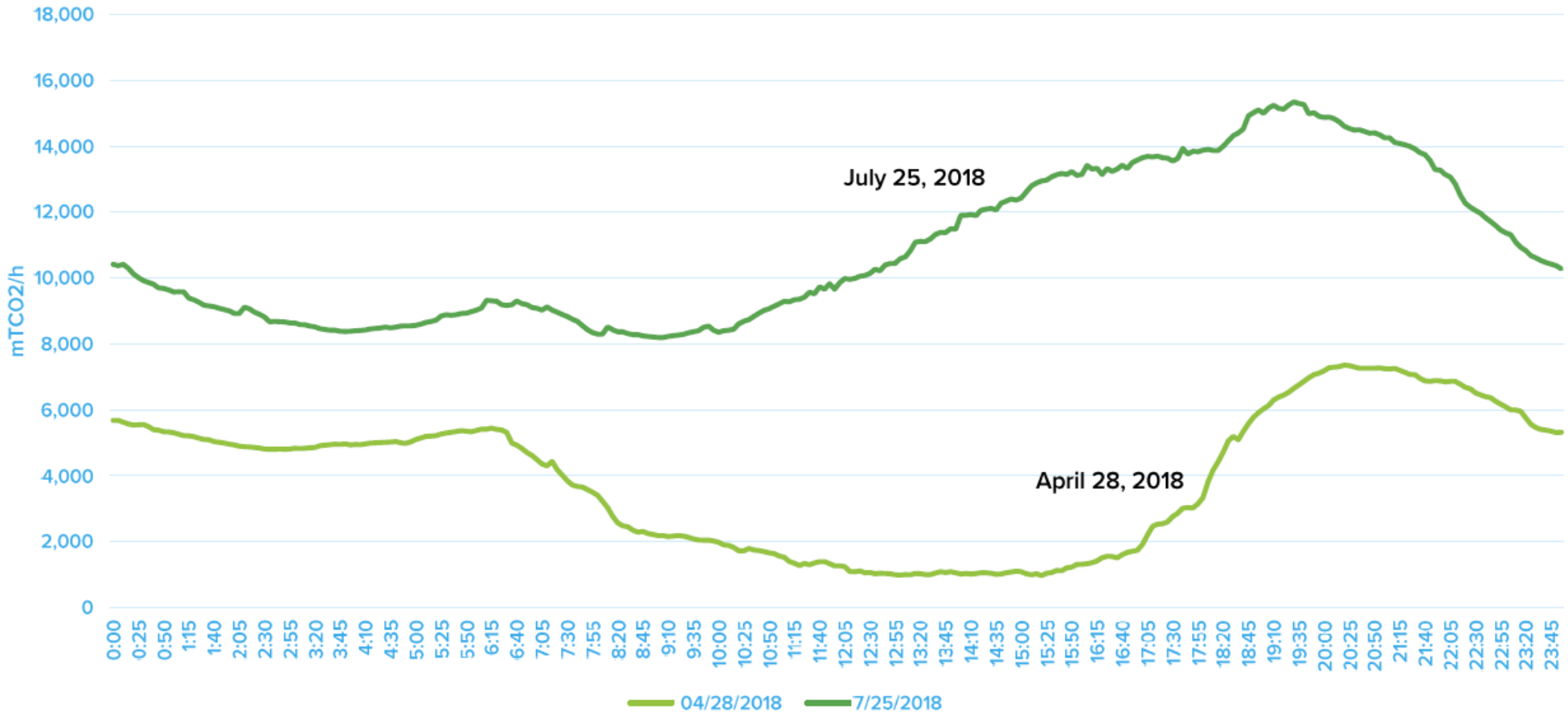
Declining Solar PV Capacity Value





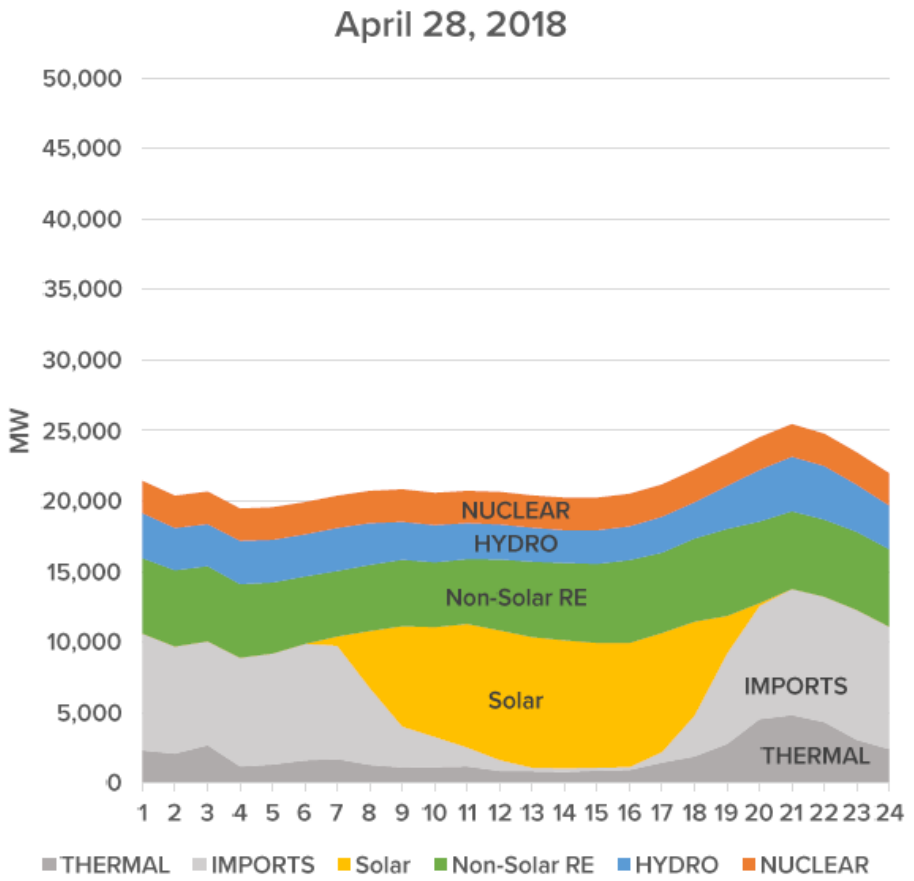
https://www.ethree.com/tools/recap-renewable-energy-capacity-planning-model/

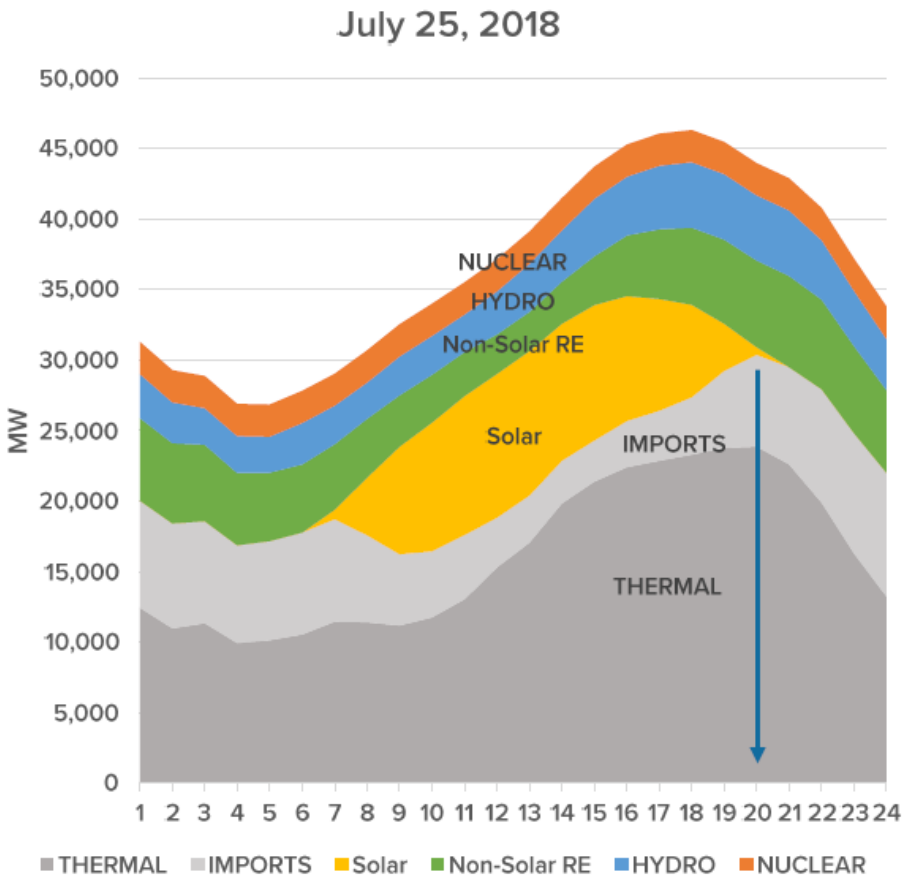
CO_2 emissions on two days in CAISO



Source: CAISO http://www.caiso.com/TodaysOutlook/Pages/default.aspx

Two days in the life of the California ISO





Source: CAISO http://www.caiso.com/market/Pages/ReportsBulletins/RenewablesReporting.aspx

Marginal Emissions in NYISO

- Modest differential with on-peak/off-peak emissions based on modeling efforts

GHG Marginal Emission Rates Heatmap for Zone: Max (NYS)																								
Short Tons CO2 /MWh	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
January	0.47	0.47	0.47	0.46	0.47	0.49	0.49	0.49	0.51	0.50	0.54	0.54	0.56	0.56	0.55	0.54	0.52	0.52	0.54	0.54	0.54	0.54	0.50	0.49
February	0.54	0.53	0.52	0.51	0.47	0.50	0.55	0.56	0.55	0.57	0.64	0.65	0.63	0.61	0.62	0.63	0.60	0.64	0.63	0.62	0.62	0.60	0.55	0.51
March	0.46	0.45	0.45	0.44	0.43	0.44	0.48	0.49	0.50	0.50	0.51	0.51	0.50	0.50	0.49	0.48	0.48	0.49	0.49	0.51	0.52	0.49	0.47	0.44
April	0.46	0.45	0.44	0.44	0.43	0.44	0.46	0.48	0.50	0.51	0.52	0.53	0.52	0.52	0.51	0.51	0.51	0.54	0.52	0.52	0.53	0.52	0.49	0.48
May	0.45	0.46	0.45	0.43	0.43	0.44	0.46	0.45	0.48	0.46	0.51	0.54	0.53	0.52	0.52	0.52	0.51	0.50	0.50	0.50	0.51	0.51	0.48	0.45
June	0.44	0.39	0.37	0.37	0.40	0.41	0.43	0.43	0.44	0.47	0.51	0.54	0.55	0.55	0.55	0.56	0.52	0.52	0.52	0.51	0.51	0.52	0.50	0.45
July	0.50	0.48	0.43	0.42	0.44	0.43	0.42	0.44	0.45	0.47	0.50	0.55	0.57	0.59	0.59	0.58	0.59	0.60	0.59	0.55	0.54	0.52	0.53	0.53
August	0.56	0.51	0.50	0.47	0.48	0.47	0.48	0.47	0.49	0.51	0.57	0.60	0.63	0.64	0.64	0.63	0.67	0.67	0.66	0.65	0.61	0.60	0.58	0.59
September	0.49	0.48	0.44	0.43	0.45	0.45	0.49	0.50	0.52	0.52	0.54	0.56	0.56	0.56	0.57	0.60	0.61	0.61	0.58	0.58	0.57	0.56	0.54	0.51
October	0.44	0.44	0.42	0.40	0.44	0.44	0.44	0.49	0.48	0.48	0.51	0.54	0.55	0.52	0.53	0.50	0.51	0.52	0.54	0.54	0.53	0.51	0.48	0.46
November	0.39	0.39	0.38	0.36	0.37	0.41	0.44	0.47	0.49	0.48	0.54	0.53	0.52	0.50	0.53	0.52	0.50	0.55	0.56	0.53	0.52	0.50	0.44	0.40
December	0.43	0.42	0.41	0.38	0.38	0.44	0.46	0.47	0.48	0.49	0.50	0.51	0.50	0.51	0.51	0.50	0.51	0.58	0.57	0.54	0.54	0.50	0.47	0.44

Source: NYSERDA 2018 Energy Storage Roadmap, http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={2A1BFBC9-85B4-4DAE-BCAE-164B21B0DC3D}

Technology Options for Meeting Peak Load

Cleanest Options

- Demand-side management:
  - Demand Response
  - Energy Efficiency
    - Prioritize measures whose load shape coincides with peak
- Renewable Energy
  - Capability depends upon resource capacity value (e.g. Solar PV ≈ 40%, Wind ≈ 10%)
- Hybrid Resources (New)
  - Solar PV + Storage
  - Wind + Storage
  - ITC benefit

Clean Options

- Energy Storage (Standalone)
  - Must factor in net effects of charging & round trip losses
- Hybrid Resources (Retrofit)
  - Add-on to existing renewables (ITC benefit)
  - Add-on to existing gas turbines
    - Enables redispatch

Fossil Options

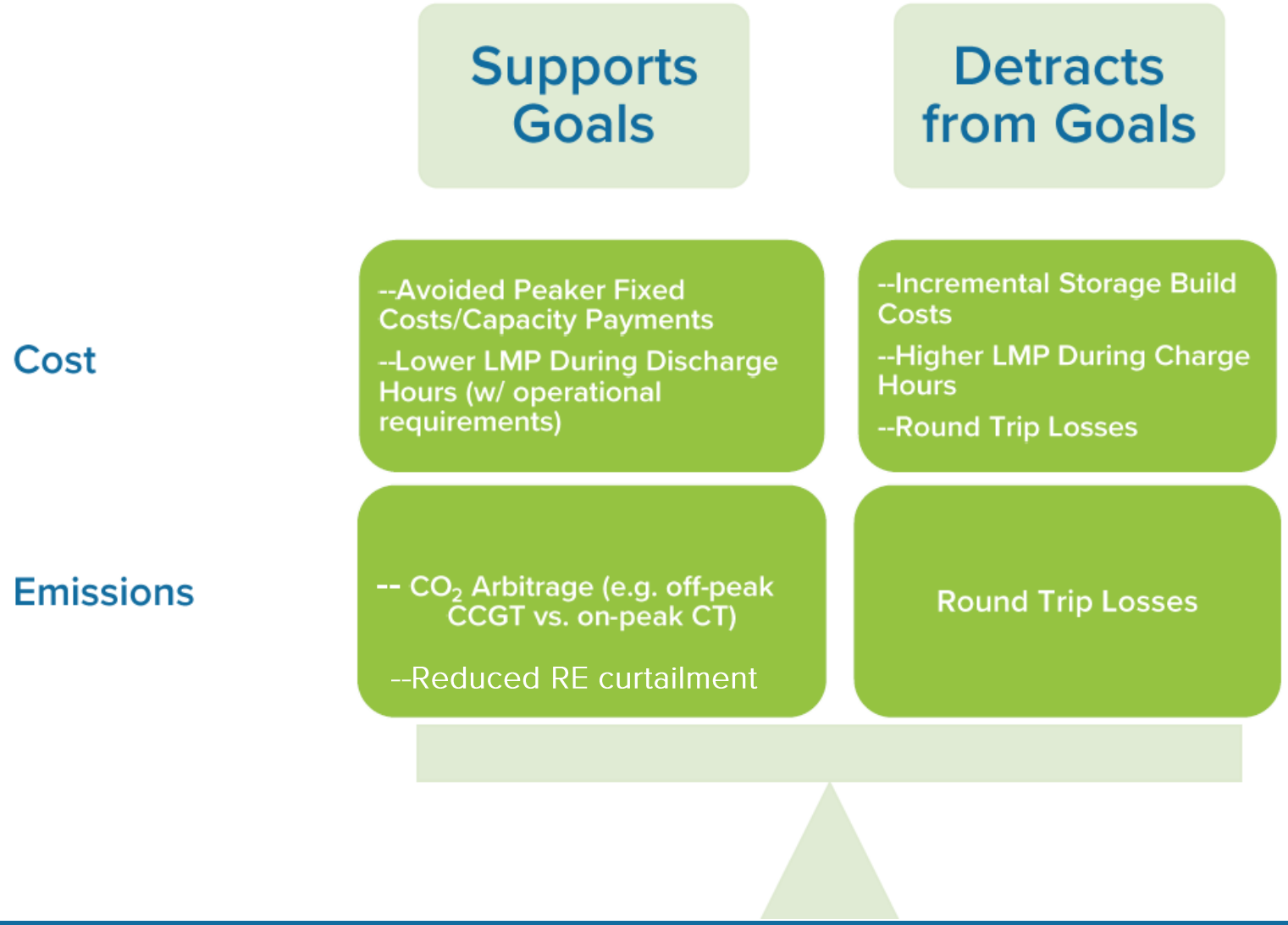
- New Natural Gas Peaker Plants
- New Natural Gas Combined Cycle Plants

Policy Goal: maximize Clean & Cleanest Options, while minimizing Fossil Options

Recent Competitive Costs For Hybrid Storage Resources

- NV Energy 2018 Integrated Resource Plan:
  - $30.94/MWh for 101 MW Solar PV w/ 25 MW battery storage (4-hr)
  - $34.87/MWh for 200 MW Solar PV w/ 50 MW battery storage (4-hr)
  - $36.94/MWh for 100 MW Solar PV w/ 25 MW battery storage (4-hr)
- Xcel Energy (Colorado) 2017 All Source Solicitation:
  - $20.63/MWh wind + storage (median bid price)
  - $38.30/MWh solar PV + storage (median bid price)

Role of Standalone Energy Storage in Supporting Clean Peak Policy Goals



Additional Benefits of Standalone Storage

(may also apply to other clean resources)

- Can reduce local criteria air pollutants
- Can help alleviate future renewable energy curtailment
- Can help reduce generator startup costs
- Can provide flexible ramping capacity
- Superior performance for critical reliability services:
  - Frequency regulation
  - Primary frequency response
- Can be located in “hard to site” urban areas with local capacity needs

Policy Options for Cleaning the Peak

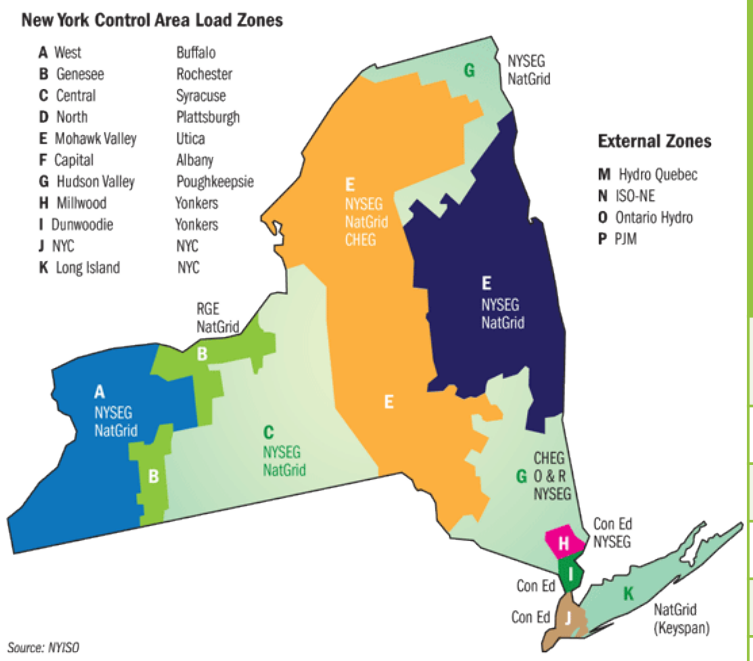
- Standards for load reduction/load shifting through customer resources:
  - Energy Efficiency Resource Standard (esp. programs targeted towards peak),
  - Peak Demand Reduction target,
  - Energy Storage Deployment target (w/ operational requirements).
- RPS Modification
  - Time of Delivery multiplier or carve out
- Integrated Resource Planning & Procurement
  - Planning model used to determine optimal (e.g. least-cost) resource mix to meet two primary constraints:
    - Peak Load requirements
    - RPS/GHG requirements
  - Procurement implemented based on results (i.e. not based on least-cost RECs)
- Moratorium on new-build fossil resources
- Resource Adequacy requirement with minimum clean resource contribution
- Clean Peak Standard

Resource Adequacy Requirement Example

- California SB 1136, signed 9/27/2018, amending §380 of PUC Code *(amended language):*
  - §380(b) In establishing resource adequacy requirements, the commission shall *ensure the reliability of electrical service in California while advancing, to the extent possible, the state's goals for clean energy, reducing air pollution, and reducing emissions of greenhouse gases. The resource adequacy program shall* achieve all of the following objectives:
    - (1) Facilitate development of new ~~generating~~ *generating, nongenerating, and hybrid* capacity and retention of existing ~~generating~~ *generating, nongenerating, and hybrid* capacity that is economic and needed.
- Key changes:
  - RA requirements established by PUC now have additional objectives -- to advance state clean energy goals (in addition to reliability).
  - RA program objectives now include development of "nongenerating and hybrid" facilities that are economic and needed.

Hypothetical Capacity-based Procurement Target

Illustrative example based on a hypothetical 5% MW capacity target



- Storage likely to be deployed due to siting constraints

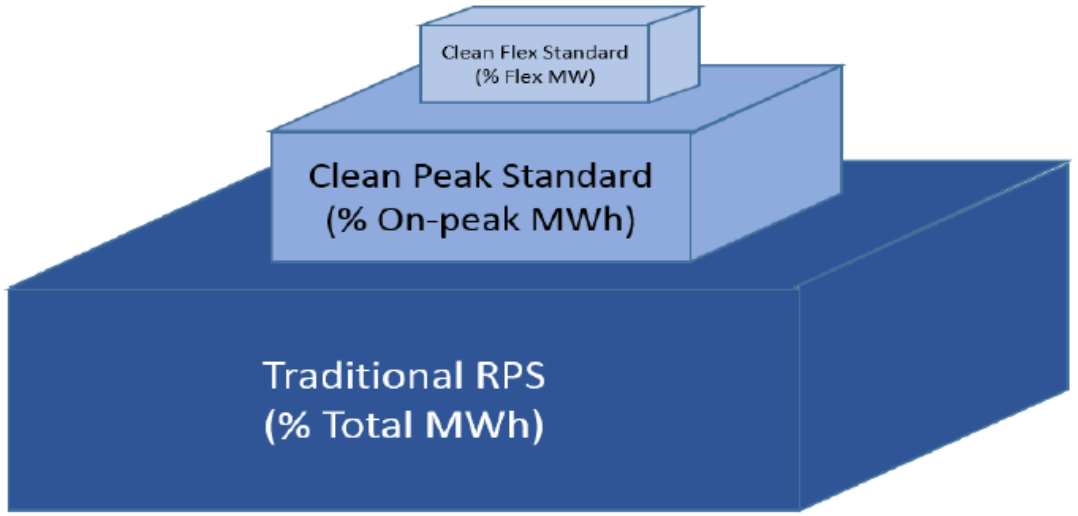
Utility	Total Requirement, 5% of ICAP MW (inclusive of LCRs)	Lower Hudson Valley (G-J) Requirement, MW (inclusive of Zone J LCR)	NYC (Zone J) Requirement, MW	Long Island (Zone K) Requirement, MW
CenHud	65	50	-	-
ConEd	805	614	475	-
LIPA	323	-	-	281
NYPA	20	-	-	-
NYSEG	188	17	-	-
NGrid	398	-	-	-
O&R	68	52	-	-
RGE	93	-	-	-
Total	1,960	734	475	281

Clean Peak Standard (CPS)

From Clean Energy to Clean Energy AND Capacity:

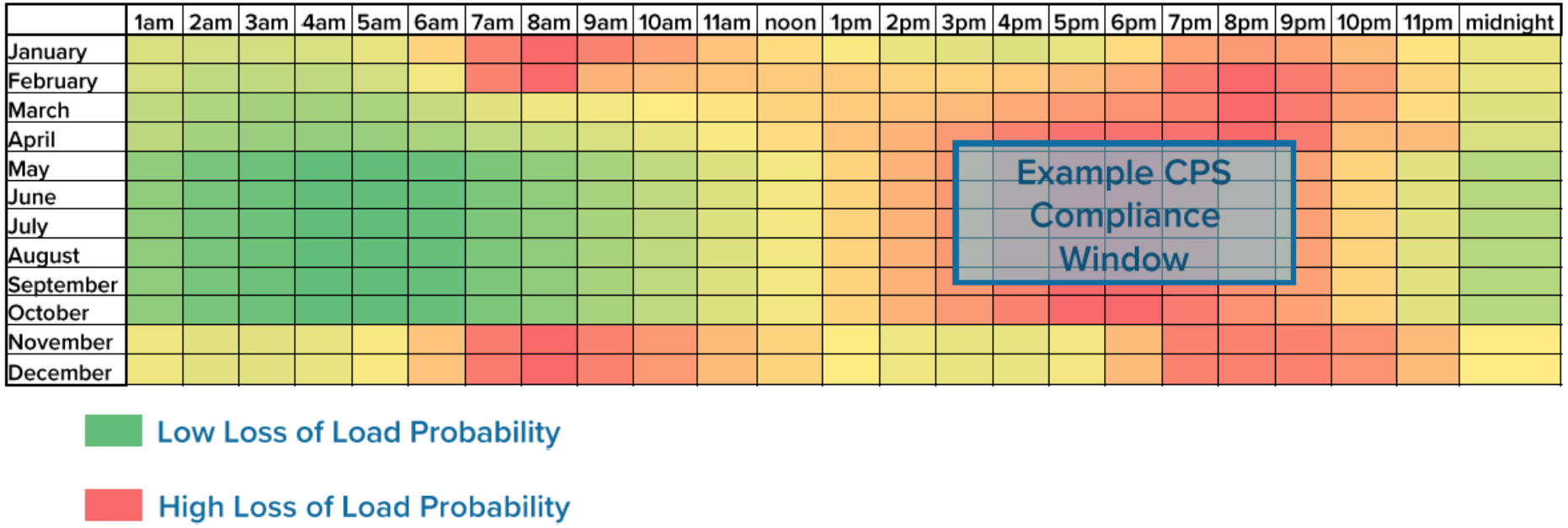
- Additional new requirement layers on top of existing RPS policy
- Sets time window to establish subset of MWh sales that are "on-peak"
- % of "on-peak" sales must come from clean resources
  - Under a REC-based compliance scheme, RECs could carry an additional "clean peak" attribute if produced during "on-peak" window.
- Analogy: "time-of-use" for RE supply

Policy design increases in sophistication as new building blocks are added

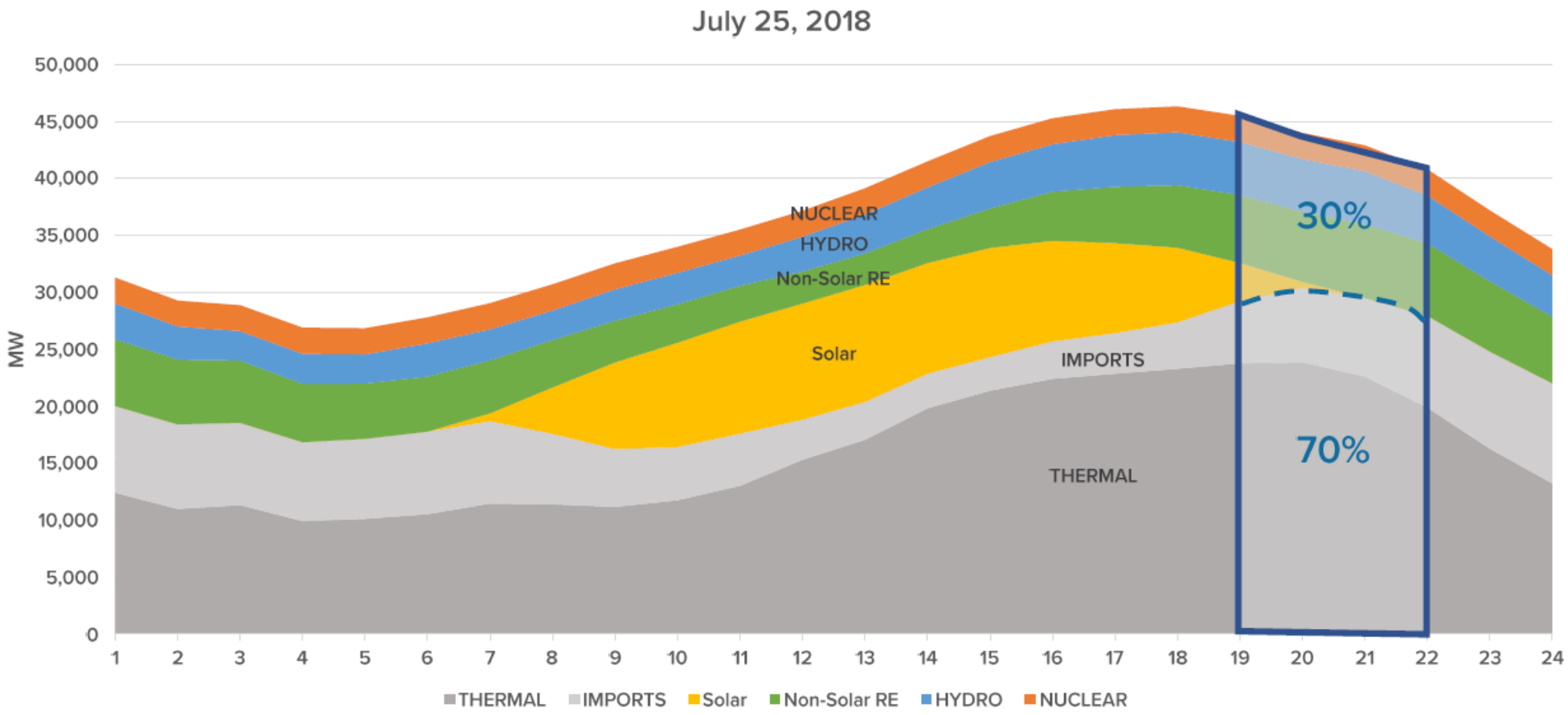


Setting a CPS Compliance Window & Target

- Heat map with target hours
- MWh sales during Compliance Window = denominator
- Compliance target = % of MWh sales in window (can ramp up over time)



Example CPS Compliance Window

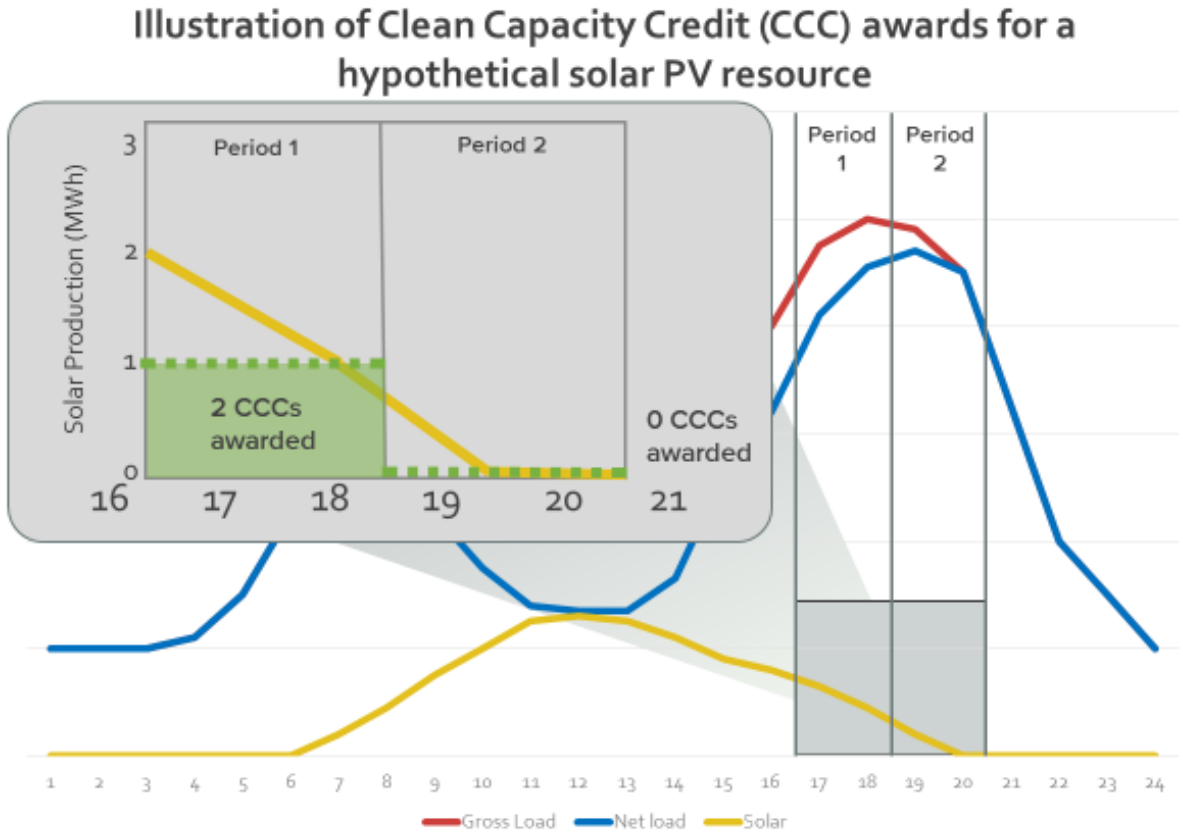


Additional Considerations

- Net peak versus Peak
- Multiple “buckets” within time window (optional)
- Evolving/expanding time window over time (optional)
- Resource eligibility
  - Some customer resources may require baseline or counterfactual

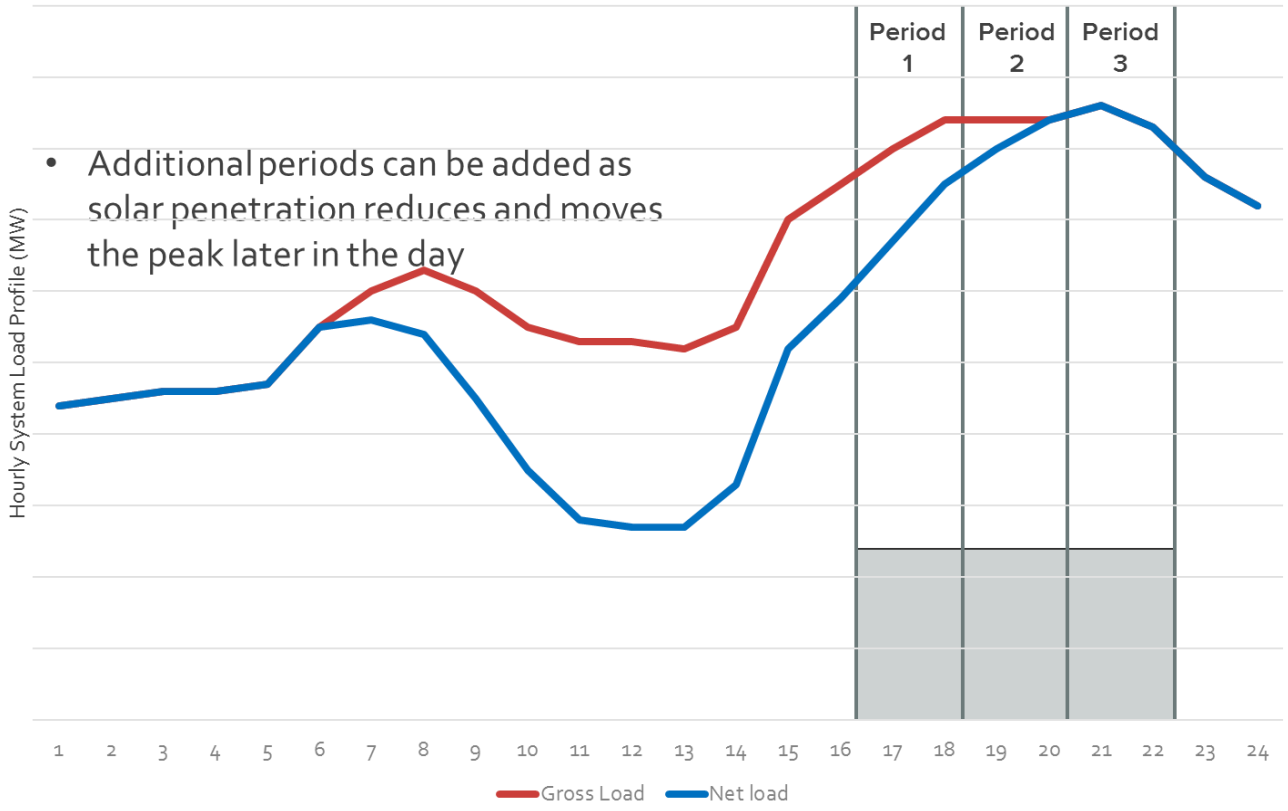
Multiple “buckets” could encourage storage

- Multiple buckets add additional compliance obligation
- Intended to address potential concern that solar PV may only be available during portion of critical peak window period
- Could encourage deployment of storage to provide energy during later portion of peak period



Evolving/expanding time window & storage

- Could encourage deployment of storage resource that are able to respond to new dispatch instructions



Recent State Developments

- Arizona's "Energy Modernization Plan"
  - Proposed by Arizona Corporation Commissioner Andy Tobin.
  - Proposal would require 1.5%/yr increase in clean resource deployed during peak hours.
- New York's Energy Storage Roadmap
  - Includes "clean peak" recommendations
  - Recommended study of benefits of replacing aging peakers with portfolio of "clean energy" alternatives.
- Massachusetts' Act to Advance Clean Energy (H. 4857)
  - Requires electric retailers to meet a minimum % of kWh sales from clean peak resources
  - Increases by 0.25%/yr
  - Department to establish baseline by December 2018
  - Department to establish rules & regulations

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Thank You!

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Thank you for attending our webinar

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Visit our website to learn more about the RPS Collaborative:
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For more information and resources related to energy storage, visit bitly/ESTAP and www.resilient-power.org.

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Thursday, November 29, 1-2pm ET

Americans' Changing Views of Renewable Energy Policies
Tuesday, December 4, 1-2pm ET

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