



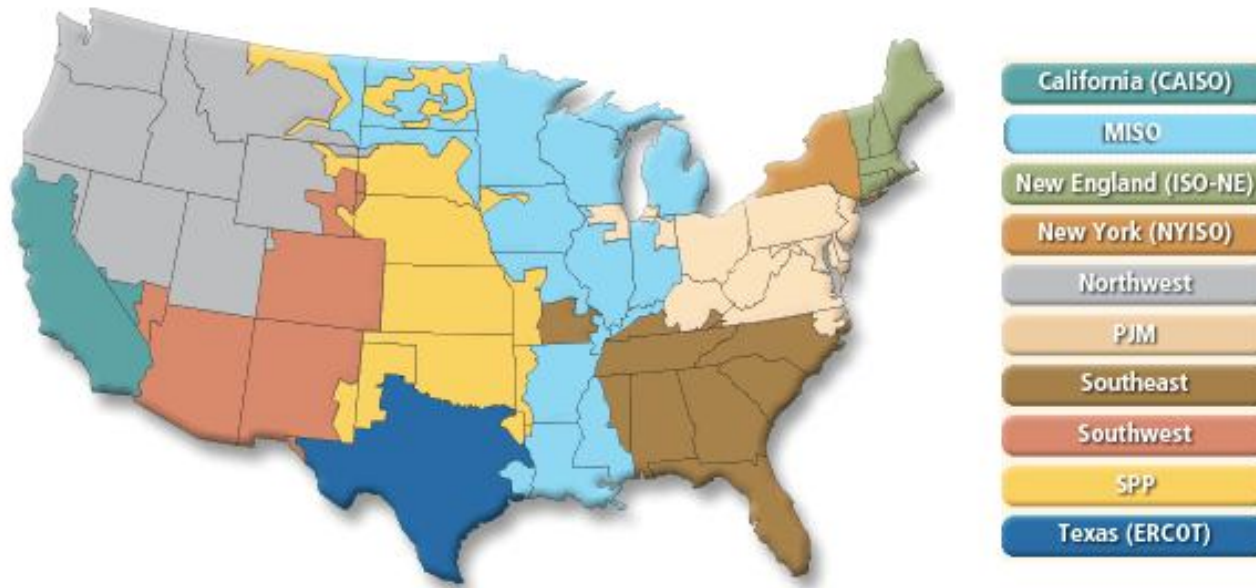
# Policy and Regulatory Approaches to Grid Integration of Renewable Energy in the US

Amy Rose, Ph.D.

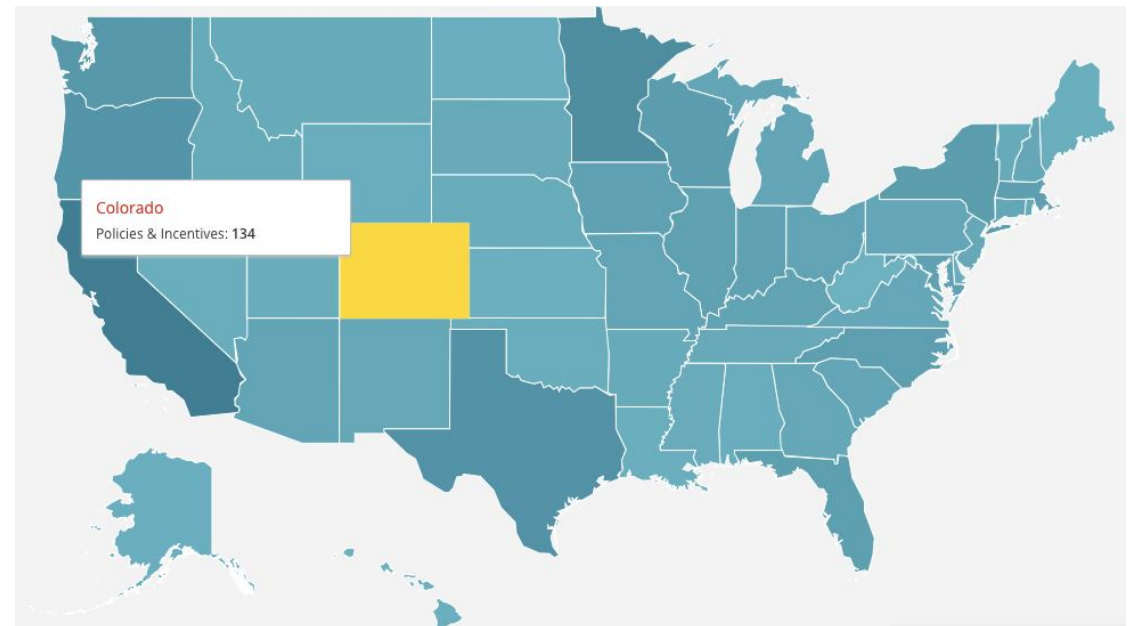
Energy Analyst

National Renewable Energy Laboratory

# US RE policies & regulations are set at multiple levels

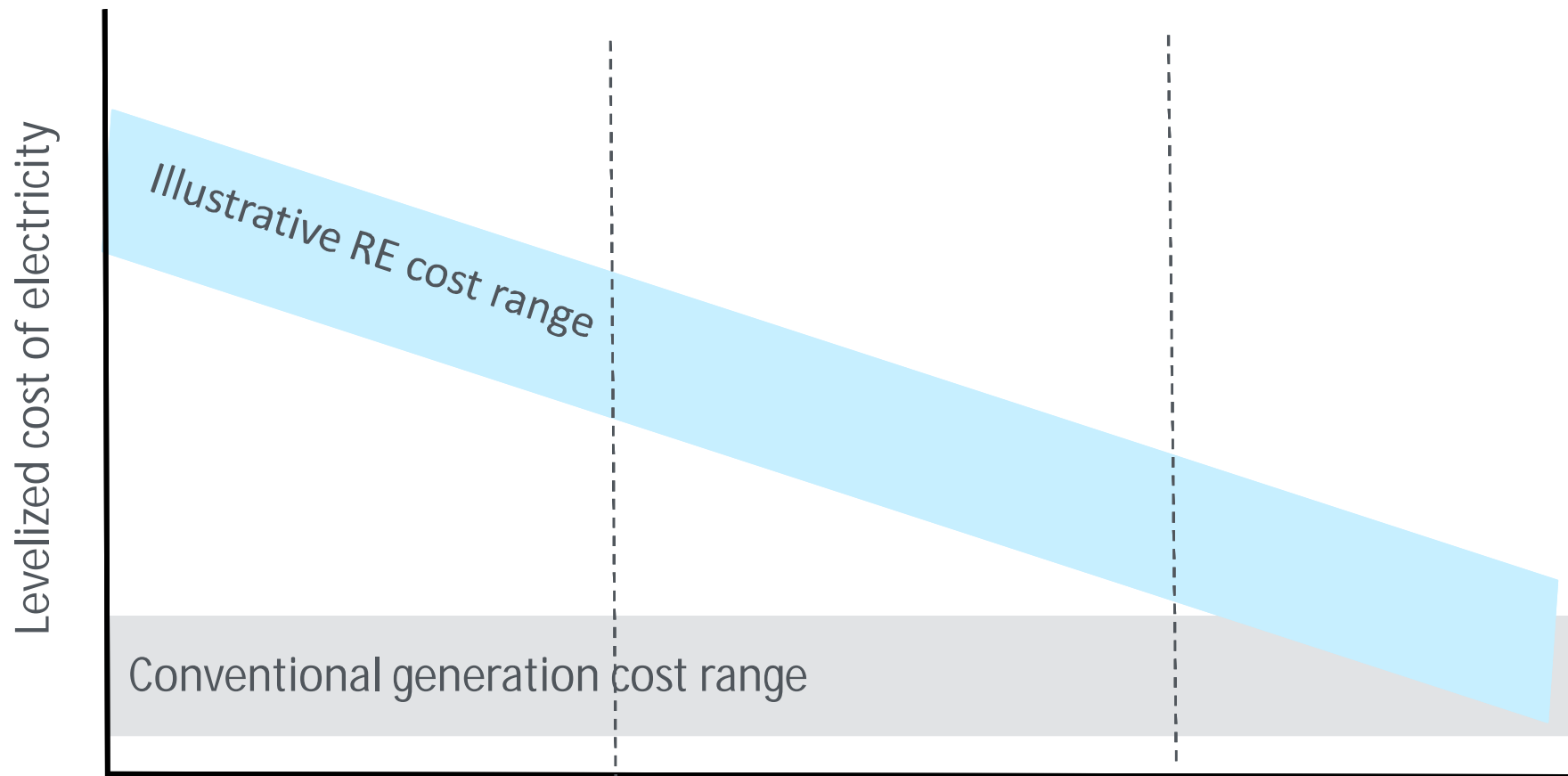


Source: <https://www.ferc.gov/market-oversight/mkt-electric/overview.asp>



Source: [dsireusa.org](http://dsireusa.org)

# Evolution of RE Policies & Regulations



Policy & Regulatory Phases

Early commercialization

Enable scale-up & competition

Promote full integration

Adapted from Jacobs et al. (2016) "RE-TRANSITION" IEA-RETD.org

# Early Commercialization

Emerging trend is to incentivize greater innovation from utilities

- *Example: New York Reforming the Energy Vision (REV)*

– **Short term** innovation: Outcome-based performance incentives

Earnings Adjustment Mechanisms
Peak load reduction
Energy efficiency
Customer engagement
Affordability
Interconnection

– **Long term** innovation: Utilities develop proposals for pilot projects to facilitate DER participation.

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**Highlights**

- **CenHub Store:** New online marketplace features energy efficient products with instant rebates.
  - **CenHub Insights:** Customized home energy profiles and energy savings tips.
  - **CenHub Points:** Earn points and redeem for gift cards to save even more!
- Start earning and saving.*  
[CentralHudson.com/CenHub](http://CentralHudson.com/CenHub)

# Enable Scale-Up & Competition: The Policy Toolkit

Policy Instrument	Description	How are prices determined?
1. Tendering or Reverse Auctions	Competitive call for bids to provide RE; long-term contract	Through competition between different producers
2. Feed-in Tariffs (FiTs)	Long-term contract to RE producers (\$/kWh) with guaranteed interconnection	Administratively determined
3. Net Metering/ Net Billing	Behind-the-meter savings; RE production "rolls back" meter, reducing size of utility bill	Usually reflect the retail rate of consumers
4. RPS/Quotas/ Tradable Certificates	Minimum RE generation requirements; Certificates disaggregate the RE quality from the electricity, enabling an entity to meet the quota without the electricity purchase	Quotas based on policy; Certificates based on trading value
5. Tax Incentives	Tax credits typically applied to production or investment values	Administratively determined

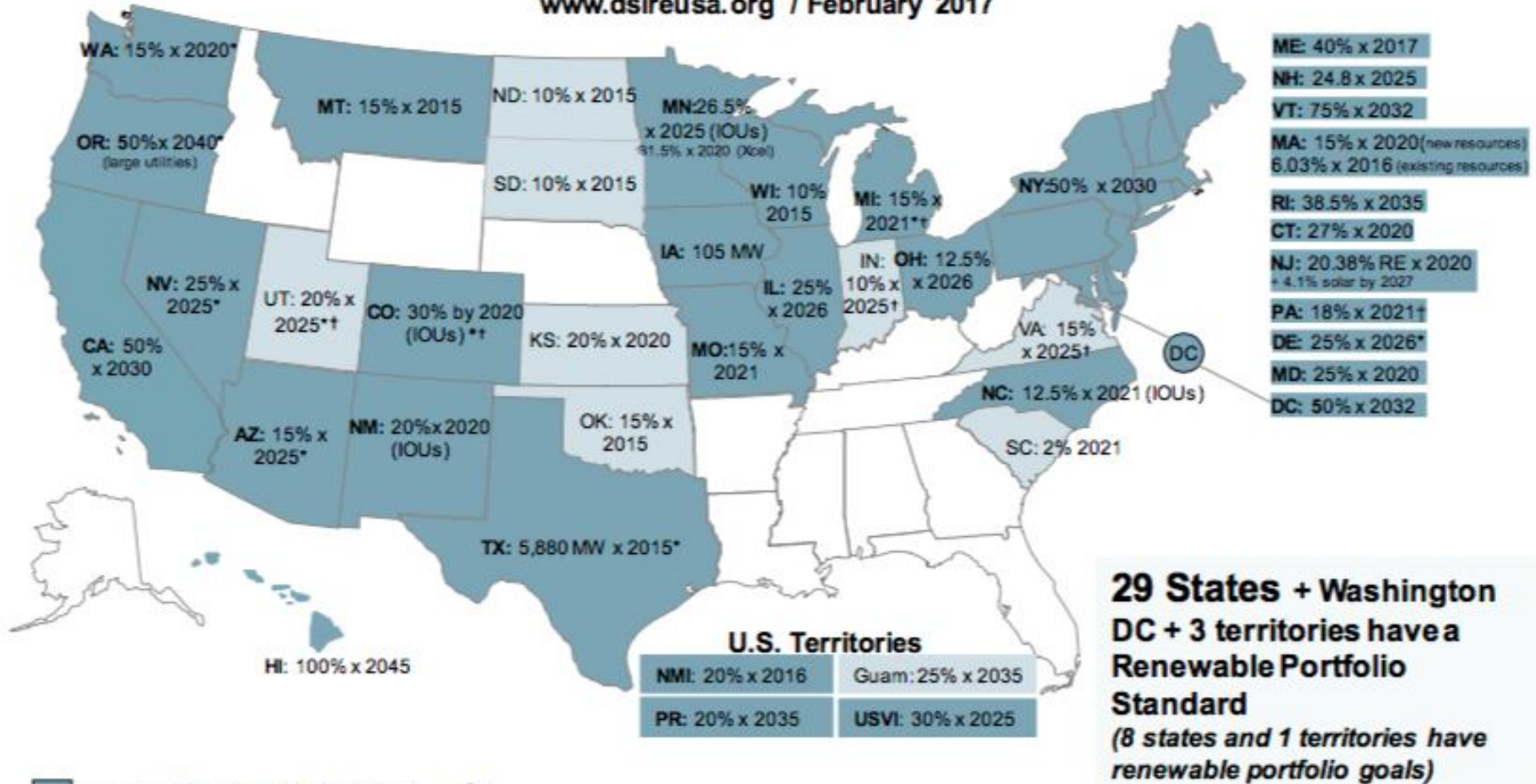
# States are setting and implementing RE targets



Energy Efficiency & Renewable Energy

## Renewable Portfolio Standard Policies

www.dsireusa.org / February 2017



Source: dsireusa.org

# States can implement similar policies in very different ways

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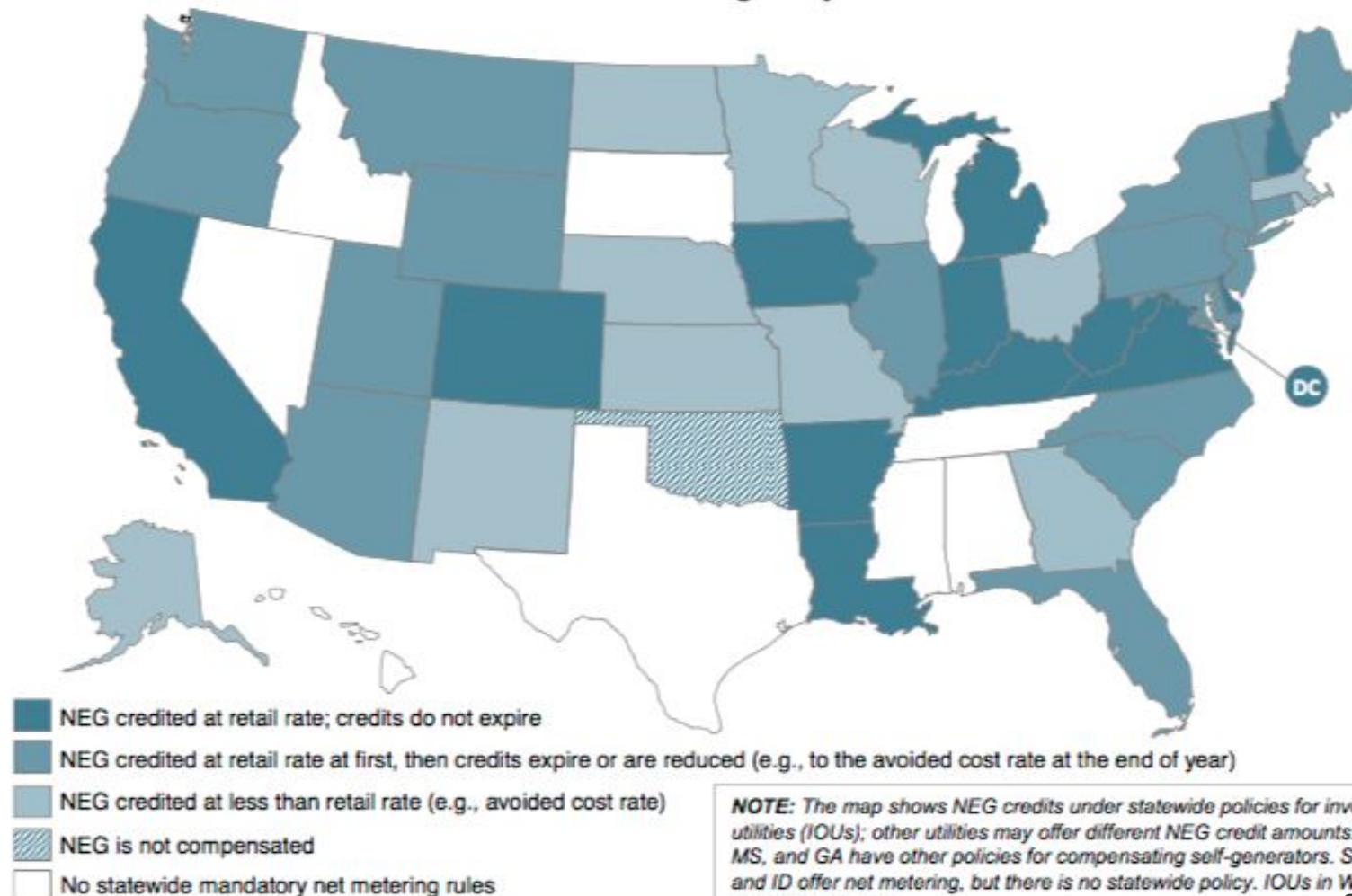
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U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

## Customer Credits for Monthly Net Excess Generation (NEG) Under Net Metering

[www.dsireusa.org](http://www.dsireusa.org) / July 2016



Source: [dsireusa.org](http://dsireusa.org)

# Promote full integration

Fully integrating RE into existing market structures may require the following changes:

- **New rules for market participation**  
(allow RE to participate in energy, capacity, and ancillary service markets; treat RE as dispatchable);
- **Update market rules to reflect new resources**  
(expand price signals to intraday time frame; update bidding formats to incorporate new operating constraints.);
- **New market instruments reflecting emerging system needs**  
(align reserves markets with energy markets and new flexibility requirements and capability; procure reactive power from market);



## Promote full integration – Examples

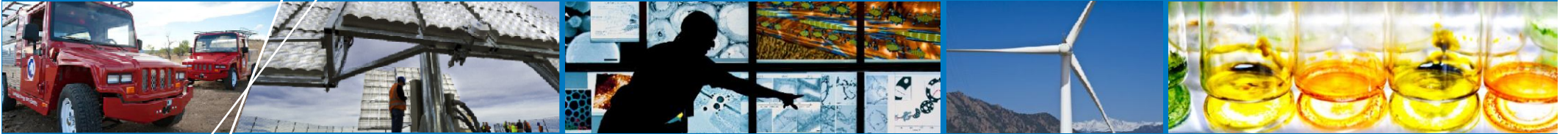
- On June 2, 2016, the US Federal Energy Regulatory Commission (FERC) approved a proposal by the California Independent System Operator (CAISO) to allow individual **energy resources that are too small to participate in the wholesale market to be grouped together** to meet the market's minimum 0.5 megawatt (MW) threshold
- ERCOT requires **new RE generators to provide grid services** including frequency response, voltage ride-through, and ramping control capabilities

## Promote full integration – Examples

- Some US markets are creating **customizable bidding format designs**. CAISO bidding format for energy storage participants can account for capacity limits, ramp rate constraints, maximum and minimum energy constraints, and state-of-charge constraints subject to charge/discharge efficiency rates.
- CAISO, ERCOT, PJM and MISO have developed various versions of a **Flexible Ramping product** — to encourage more flexible resources to enter the market

# Conclusions

- US regulations and policies are established at multiple levels
- RE incentives have evolved from the old models of single policies that support deployment
- Emerging policies and regulations are geared toward
  - Incentivizing R&D and innovation from utilities
  - Bridging remaining price gap between conventional and new RE resources
  - Updating operating rules and regulations to reflect capabilities and needs of new power system



Thank you!  
[Amy.rose@nrel.gov](mailto:Amy.rose@nrel.gov)