State of the National Solar Industry

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Moderator: Molly Brown, *GenPro Energy Solutions*

12TH ANNUAL
Nebraska Wind & Solar
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Nebraska Wind & Solar Conference

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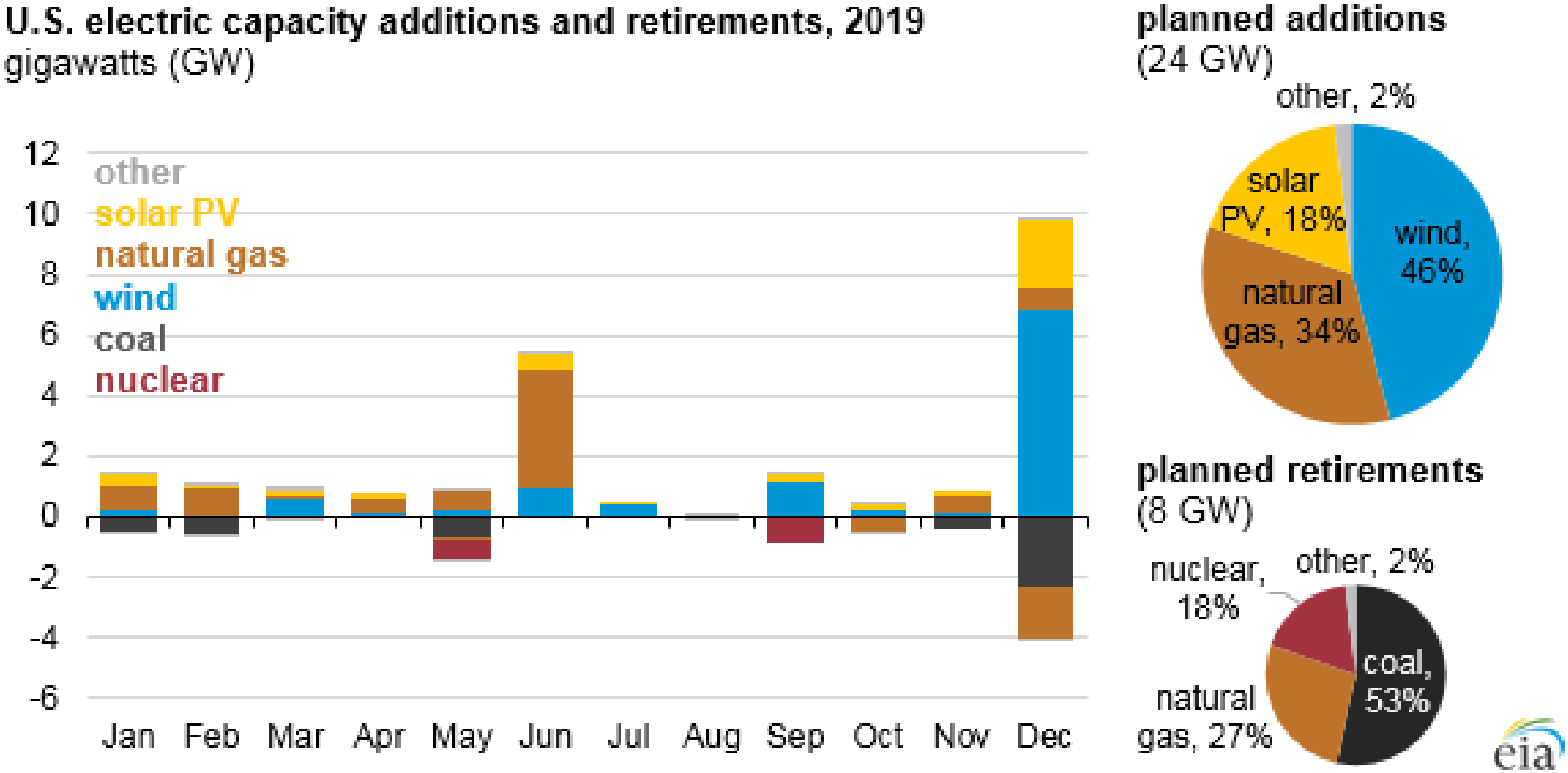


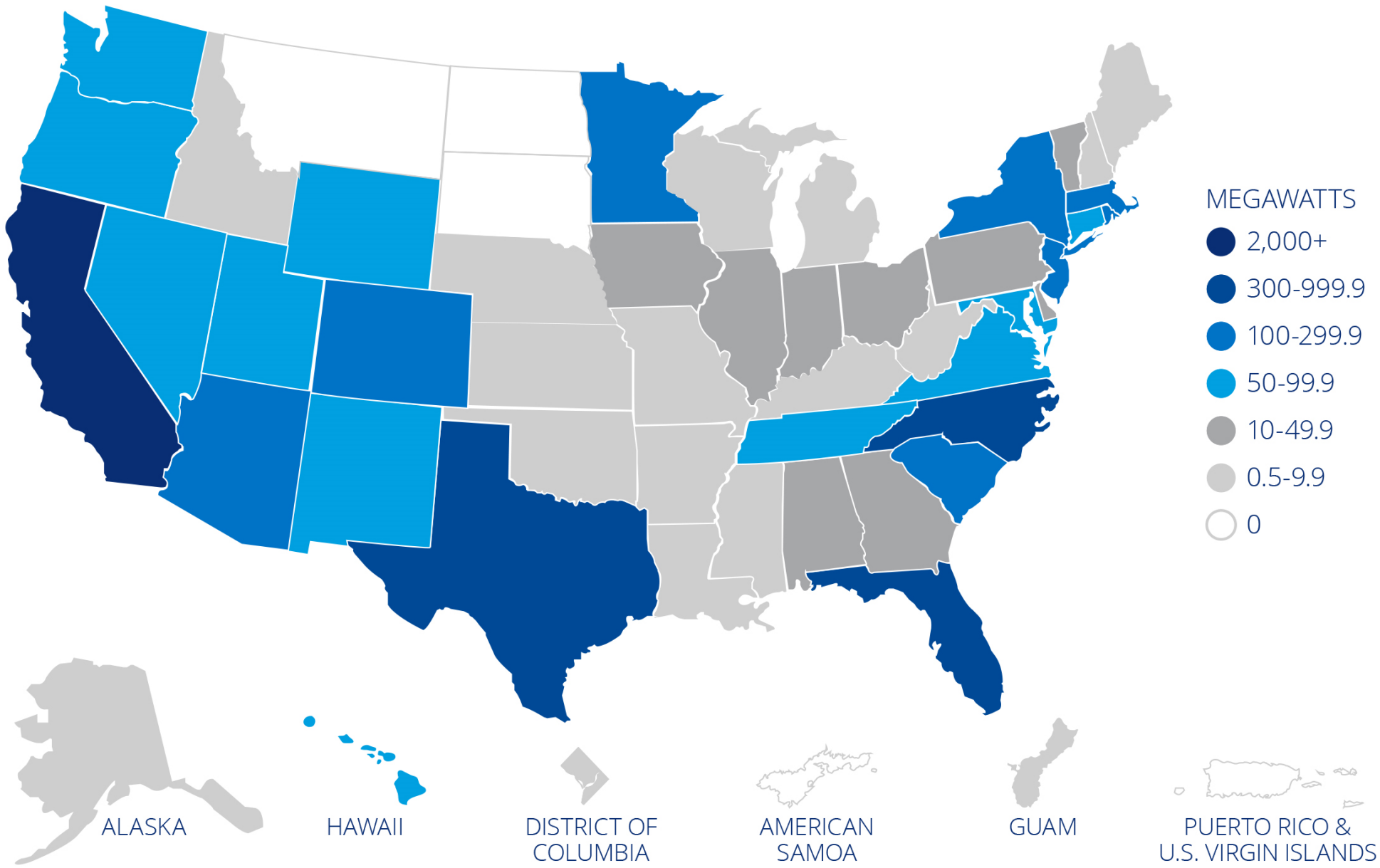
4,300 MW Utility Scale Solar (CA, TX, NC)

3,900 MW Small Scale Solar

Source: US Energy Information Administration, 2019

- Northeast: Dominated by Smaller Scale Solar (5MW and less)
- Pacific, Mountain, South Central: Dominated by Grid Tied, Large Scale Solar (50 MW and greater)
- Southeast, Mid-Atlantic: Blend of Large and Smaller Scale Solar

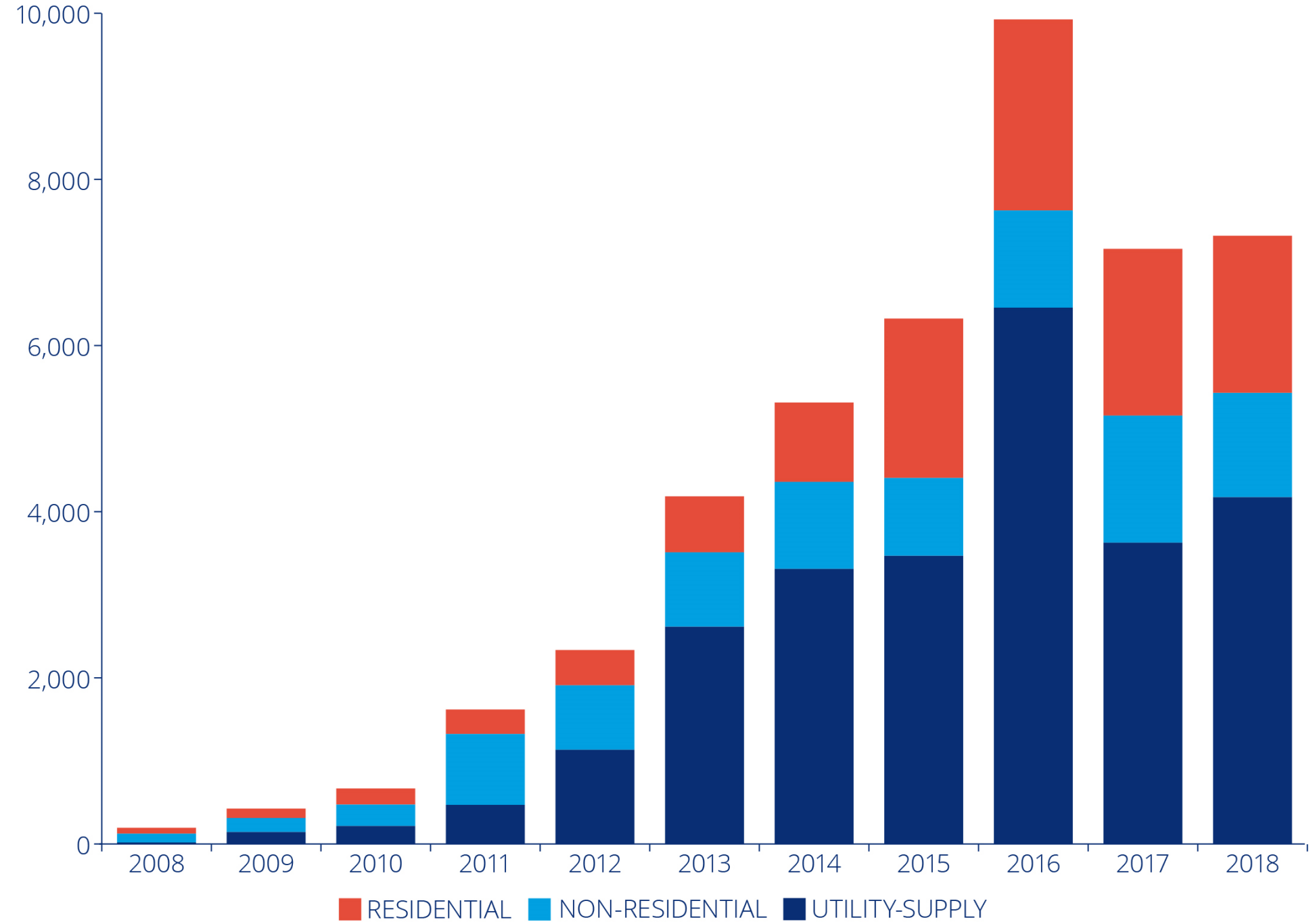
FIGURE 1: 2018 ANNUAL SOLAR CAPACITY (MW-AC)



Source: Smart Electric Power Alliance, 2019

Annual Solar Growth by Sector (MW-AC)

- 2018 – 7,321 MW
- 2016 – 9,925 MW
- 2012 – 2,335
- 2008 – 124 MW



Source: Smart Electric Power Alliance, 2019

What areas of the business are being supported by Solar in US?

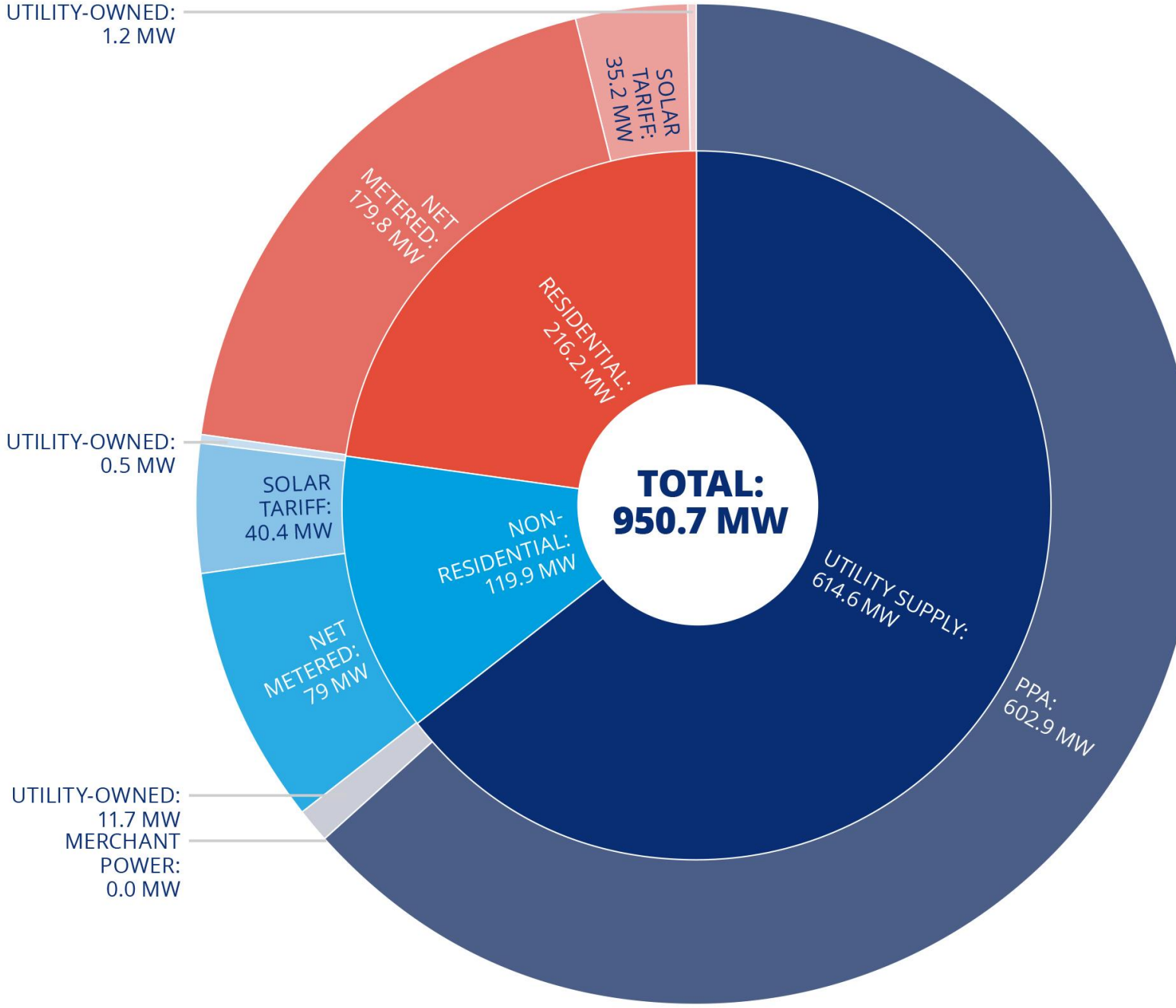
- Regulatory Compliance & Resiliency
- Fuels Planning
- Revenue/Cost Forecasting
- Demand Side Management
- Power Generation Planning/Supply
- Load Balancing
- Power Delivery/Grid Stability

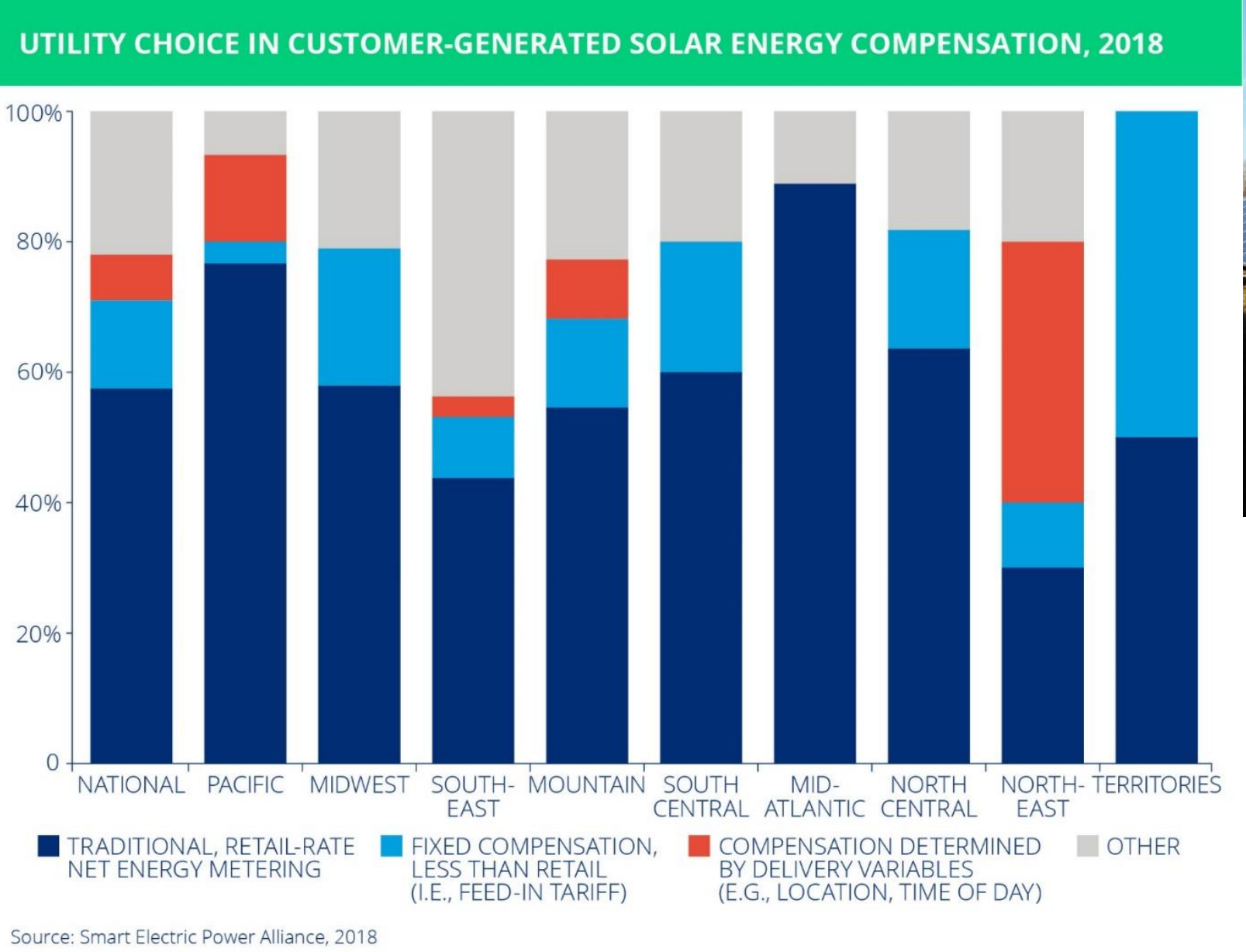
Customer Service

Public Power - Utilities Composition of Solar Capacity

- Large Scale - Trend remains Power Purchase Agreement (PPA) dominant
- Smaller Scale – Large/Industrial customer driven (cost savings or stakeholder driven)
- Residential – Customer preference driven (environmental benefit driven)

Source: Smart Electric Power Alliance, 2019





- Facilities tend to be smaller scale and behind the meter focused.
- Land Use Limitations
- Limited/Constrained Transmission

Northeast

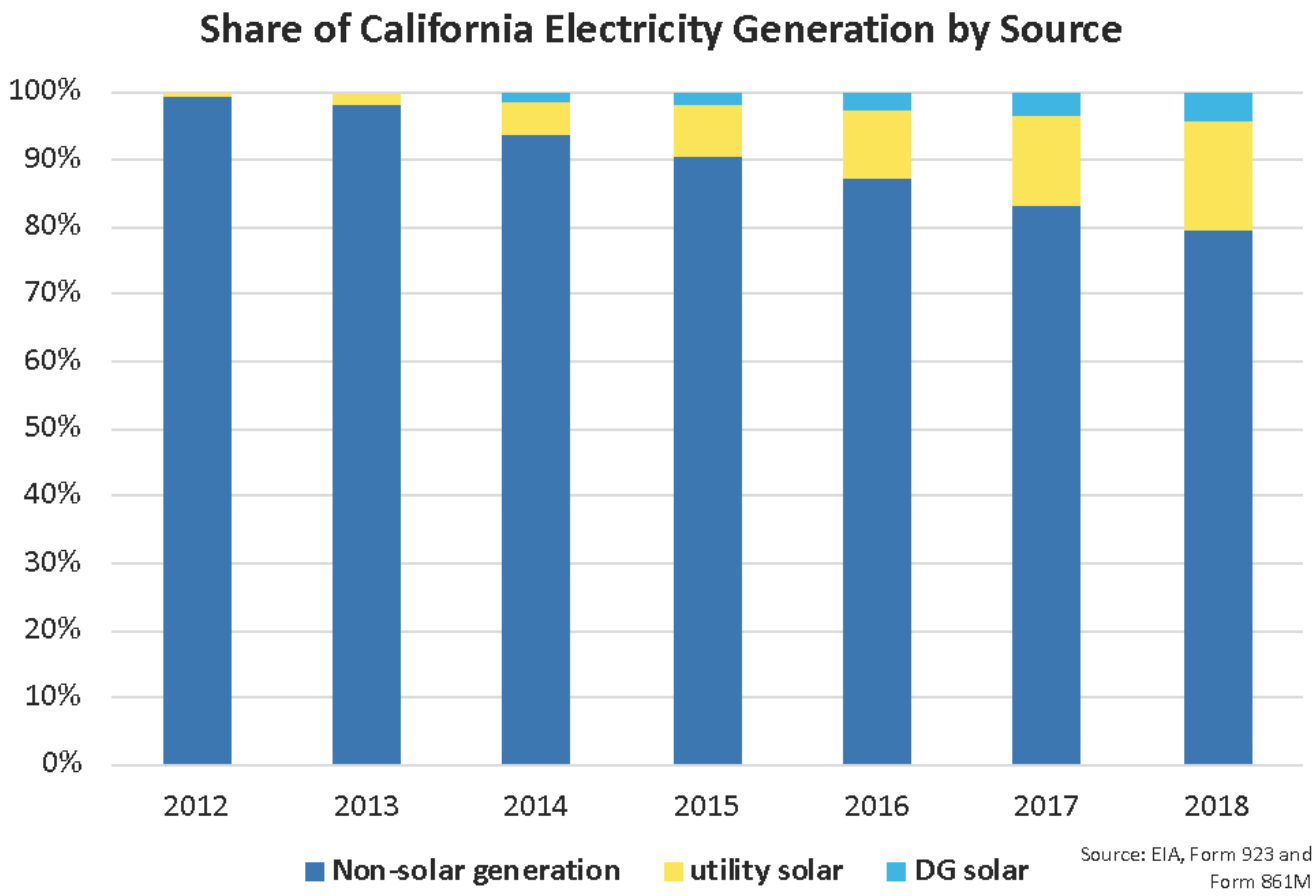
Southeast

- Lack of Regional Transmission Authority
- Driven by individual state policies
- Large Scale Solar
  - Economic Development (Data center/large Industrial) driven market
  - Large IOU market transition from PPA to Utility Ownership business models
- Distributed Solar
  - Smaller scale behind the meter commercial/industrial with Utilities as part of electrification and resiliency

California (Southwest)

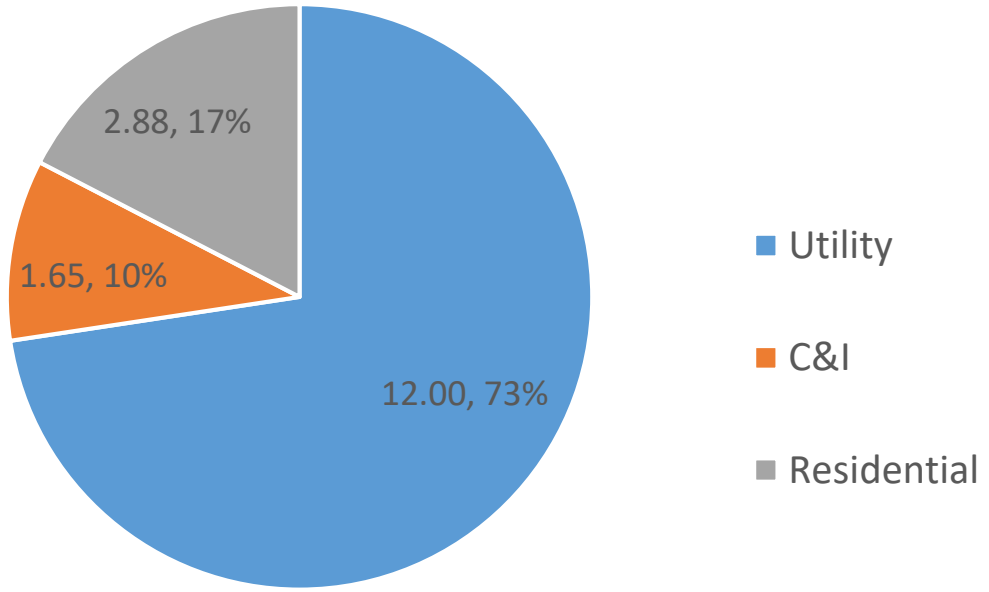
- Solar generation in California now makes up nearly 21% of the state's electricity mix
  - 4% comes from distributed solar
  - 750 MW storage planned in California, 53% grid connected, 47% behind the meter. (Source: California Energy Storage Alliance, 2019)
- CAISO Impacts
- Community Choice Aggregation (CCA)
- California Rate Design Changes for Time of Use
- California Wildfires and Utility Response

Source: Solar Electric Industries Association, March 2019 (EIA, Form 923, Form 861M)



Nebraska Trends

- Utility Scale: Economic Development Driven or Stakeholder driven
- Utility scale solar projects (> 100 MW) in development
- Public Power structure continues to influence renewables build out in Nebraska.



Source: Smart Electric Power Alliance, 2019

Some Industry Trends to Consider with Nebraska Development

- System Planning & Analysis
- Financial Analysis
- Safe Harbor – “good” tax advice/Vendors potential offerings of savings that will not count (Contact tax atty)
- Life Cycle Cost Development
- Schedule Development
- Determine the program/project approach moving forward that ties into larger company operating profile.

Industry Hot Topics – Social/Political/ Environmental

- Permitting Analysis – increased focus on water/erosion issues
- Desktop identification of critical constraints that will increase project risks or costs associated with facility development or operations
- Public outreach / Stakeholder outreach
- Consider O&M access needs including Health, Life and Safety Requirements
- Consider fire access requirements

Industry Hot Topics – Engineering

- Local seeding alternatives/ pollinators/ sustainable agriculture
- Vegetation plan that meets Life Cycle Needs
- Sustainable design approach (use ditches, no concrete conveyance systems, infiltration trenches, etc.)
- Wind and Structural Codes
- “Or Equal” Equipment

Industry Hot Topics - Construction

- Quality Assurance and Quality Control failures common with potential for significant impacts to substantial completion dates and financial assurance
- **One small component installed sub-par 50,000 times is a significant point of failure in a project life cycle**
- Data management is key to maintaining orderly deliveries and construction progress
  - Just in time deliveries for major equipment
  - Crane staging for inverter placement
  - Inspections and fix-it procedures
  - Timely resolution to RFIs
  - Timely closure of issues on site

Ramp Control	Expanded Frequency And Voltage Ride Through	Randomized Reconnect	Curtailment	Voltage Support	Residential	Re
49.8%	47.9%	52.1%	48.6%	41.3%	43.8%	4
35.5%	32.7%	41.9%	34.4%	36.7%	39.4%	4
10.1%	10.6%	2.8%	11.5%	12.8%	10.1%	
2.3%	4.2%	0.9%	2.3%	5.5%	N/A	
2.3%	4.6%	2.3%	3.2%	3.7%	6.7%	

Utility Interest in Advanced Inverter Functionality and Solar + Storage

Source: Smart Electric Power Alliance, 2018

QUESTIONS?

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