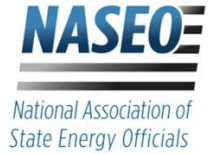




NARUC
National Association of
Regulatory Utility Commissioners

**NARUC-NASEO TASK FORCE
ON COMPREHENSIVE
ELECTRICITY PLANNING**



Task Force Member States: Introductory Information

April 2019

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Figure 1. Comparison of Task Force Member States by Planning Approaches and Market Models

This figure summarizes member states planning approaches, including resource and distribution planning, and market models, including retail, wholesale, and capacity market.

| | Approach | | Market Model | | |
|----------------|----------|----------------------------------|--------------------|---------------------|-----------------|
| | Does IRP | Active Dist. Planning Proceeding | Retail Competition | IOU Owns Generation | Capacity Market |
| Arizona | ● | ○ | ○ | ● | ○ |
| Arkansas | ● | ● | ○ | ● | ○ |
| California | ● | ● | ◐ | ◐ | ◐ |
| Colorado | ● | ◐ | ○ | ● | ○ |
| Hawaii | ● | ● | ○ | ● | ○ |
| Indiana | ● | ○ | ○ | ● | ◐ |
| Maine | ○ | ○ | ● | ○ | ● |
| Maryland | ○ | ● | ● | ○ | ● |
| Michigan | ● | ● | ◐ | ● | ◐ |
| Minnesota | ● | ● | ○ | ● | ◐ |
| North Carolina | ● | ○ | ○ | ● | ○ |
| Ohio | ○ | ● | ● | ◐ | ● |
| Puerto Rico | ● | ○ | ○ | ● | ○ |
| Rhode Island | ○ | ● | ● | ○ | ● |
| Utah | ● | ○ | ○ | ● | ○ |
| Virginia | ● | ○ | ◐ | ● | ● |

Key




- Yes 
- Partial 
- No 

Figure Notes:

¹ “Active Dist. Planning Proceeding” indicates states with an open proceeding that includes distribution system planning in its scope. Colorado is indicated as “partial” because it recently closed a relevant proceeding and may open a future proceeding.

² “Retail Competition” indicates states where retail choice is available to all customers. Michigan allows retail choice up to 10% of retail sales, and Virginia offers retail choice to residential customers only. California also allows 10% retail access or community choice aggregation (CCA).

³ “IOU Owns Generation” indicates states that are vertically integrated and own generation. In California, IOUs own legacy generation and in Ohio, one IOU (DP&L) owns generation.

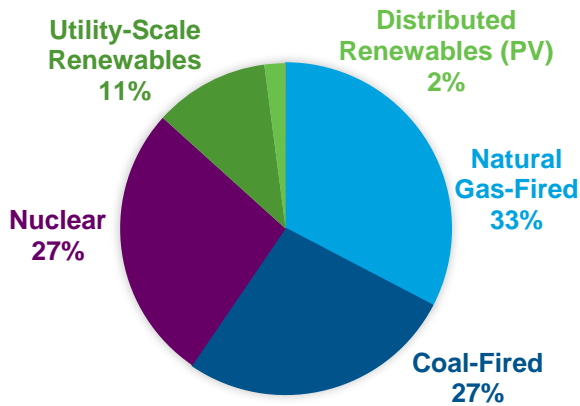
⁴ “Capacity Market” indicates states in which system operators procure capacity commitments in a market structure. CAISO and



AGENCY ROLES

Utility Commission: The Arizona Corporation Commission (ACC) reviews and acknowledges the Integrated Resource Plans (IRP) prepared by load-serving entities every 2-years. The ACC also determines modeling assumptions, and establishes state renewables and energy efficiency targets.

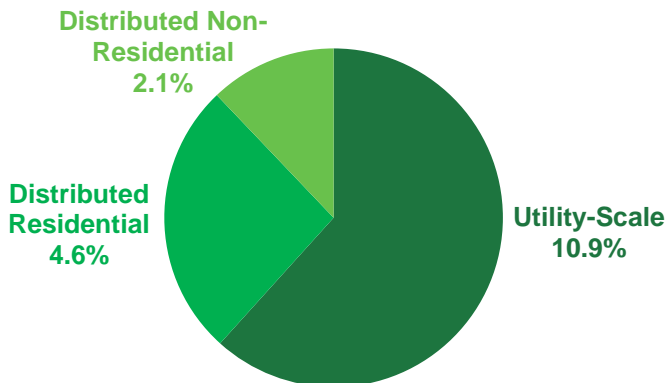
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 17.6%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW



Retail Competition

Yes; on the next rate case, APS to expand retail choice to medium size commercial customers, and TEP and UNS Electric to propose retail choice to medium and large commercial and industrial customers



Distribution Utility Owns Generation

Yes, IOUs are vertically integrated (with the exception of cooperatives)



Region/ISO/RTO

IOUs manage resource adequacy (RA) via IRP and do transmission planning in coordination with WECC, APS participates in Western Energy Imbalance Market (EIM)



Regulated Electric Utilities

Served by five IOUs (APS, TEP, UNS, Ajo Improvement, Morenci Electric) and cooperatives

STATE TARGETS



Renewable Energy

15% renewable energy by 2025; of that, 30% distributed renewable energy of the affected utilities' requirement



Energy Efficiency

Each affected utility (excluding AEPCO) to meet 22% energy savings from demand-side programs by 2020; cooperatives meet 15% of the 22% energy savings.

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|-------------------|---|--|--------|
| Resource Planning | Resource planning and procurement changes, including pending natural gas plants moratorium and pending rulemaking to modify existing energy rules, including energy resources planning. | Natural gas plant moratorium reinstated until August 1, 2019 | ACC |

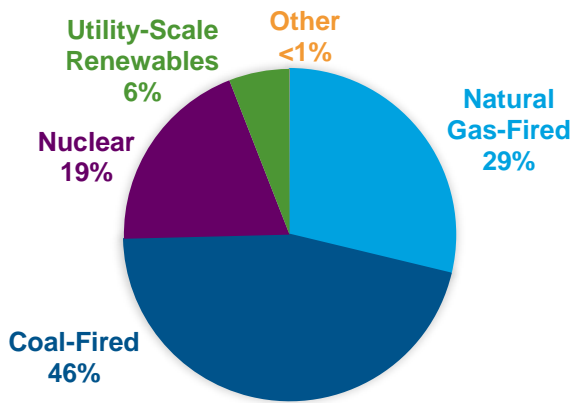


AGENCY ROLES

Utility Commission: The Arkansas Public Service Commission (PSC) acknowledges utilities’ informational Integrated Resource Plans (IRP) covering at least a 20-year period, including a near-term action plan. IRPs are filed every three years, unless utilities choose to file more frequently.

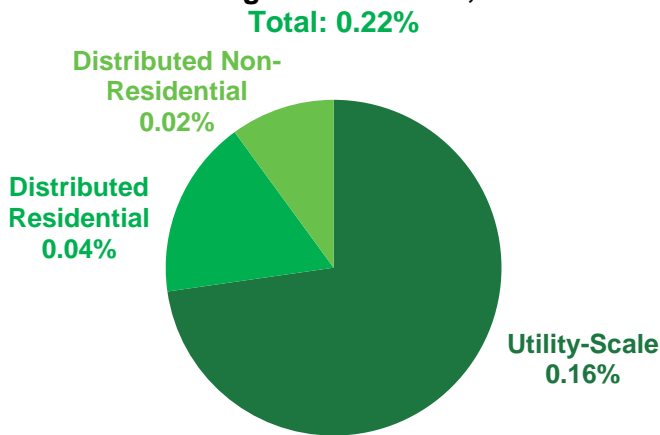
State Energy Office: The Department of Environmental Quality’s Energy Office (DEQ-EO) promotes energy efficiency, clean technology, and sustainable strategies to encourage energy security, economic development, and environmental well-being for Arkansas residents. DEQ-EO administers several incentive programs and partners with IOUs for energy efficiency programs.

Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW

| | | |
|--|---|---|
| | Retail Competition | Retail load served by incumbent utilities only |
| | Distribution Utility Owns Generation | Yes, utilities are vertically integrated |
| | Region/ISO /RTO | Eastern portion of state served by MISO and Western portion served by SPP; IOUs primarily manage resource adequacy (RA) via IRP and do transmission planning. |
| | Regulated Electric Utilities | Full regulation for state’s 4 IOUs; partial regulation for 17 distributions co-ops (including IRPs but not EE rules) and one G&T cooperative |

STATE TARGETS

| | | |
|--|--------------------------|---|
| | Renewable Energy | 1.2% of baseline utility sales targeted annually from 2020-2022 (IOUs only) |
| | Energy Efficiency | 1% reduction in electric sales in 2019 and 1.2 % energy reductions for 2020-2022 from 2018 baseline |

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|------------------------------|---|---|--------|
| Distribution Planning | Docket 16-028-U investigates DER-related policies, including data access issues. | Docket open; information gathering phase | PSC |
| Distribution Planning | Docket 16-027-R gathers information to determine appropriate rates, T&C, and necessary changes to net metering rules. | Docket open; utility rate schedule submitted for review | PSC |

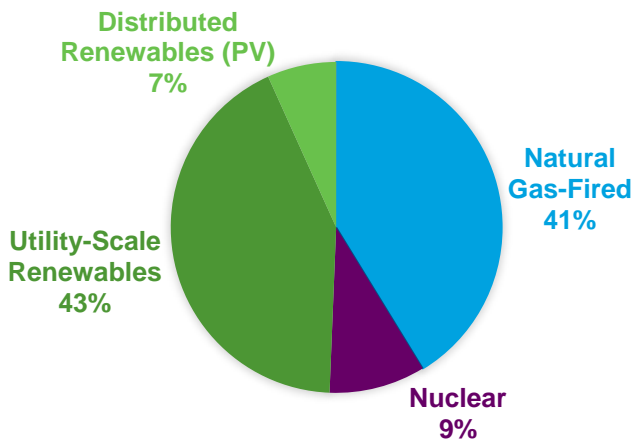


AGENCY ROLES

Utility Commission: The California Public Utilities Commission (CPUC) reviews, modifies, and approves individual IOU's Integrated Resources Plans (IRP), Distribution Resources Plans (DRP), Grid Needs Assessments (GNA), and Distribution Deferral Opportunity Reports (DDOR). The CPUC also certifies IRP for Community Choice Aggregators (CCA) and approves IRPs for energy service providers.

State Energy Office: The California Energy Commission (CEC) regulates publicly-owned utilities (POUs). The CEC develops, along with the California Independent System Operator (CAISO), the forecast and planning assumptions used in the IRP and the DRP processes.

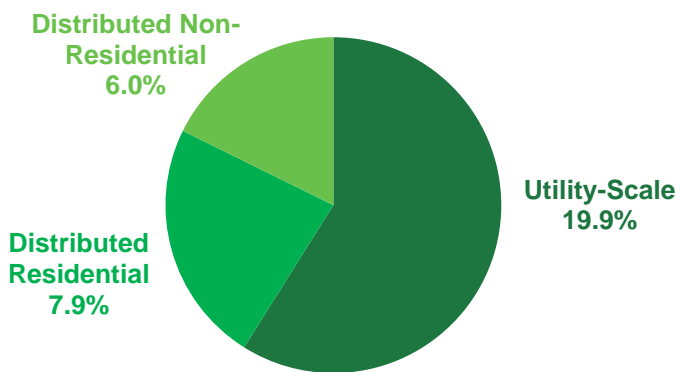
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 33.8%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW

| | | |
|--|---|--|
| | Retail Competition | Regulated direct access for non-residential customers up to 10% of IOUs load; residential choice for CCA customers |
| | Distribution Utility Owns Generation | Restructured; utilities own legacy generation |
| | Region/ISO /RTO | CAISO; resource adequacy (RA) managed via load-serving entities and CAISO does transmission planning |
| | Regulated Electric Utilities | CPUC regulates 3 IOUs (PG&E, SCE, SDG&E); and supervises CCAs and co-ops. CEC regulates publicly owned utilities. |

STATE TARGETS

| | | |
|--|---------------------------------------|---|
| | Renewable Energy | 60% by 2030 and 100% by 2045 |
| | Energy Efficiency | Double 2015 statewide energy efficiency savings by 2030 |
| | GHG Emissions Reductions | 40% GHG emission reduction below 1990 levels by 2030 |
| | Transportation Electrification | 5 million zero-emission vehicles by 2030 and 250,000 electric vehicle charging stations by 2025 |
| | Energy Storage Procurement | 1,325 MW energy storage by 2020 |

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|------------------------------|---|---------------------------------|--------|
| Resource Planning | R. 14-08-013, Decision 18-02-018 requires load-serving entities to file individual IRPs and establishes a 2-year IRP cycle process. | Decision filed in February 2018 | CPUC |
| Distribution Planning | R. 14-08-013, Decision 18-02-004 requires IOUs to file GNAs by June 1 and DDORs by September 1, annually. | Decision filed in February 2018 | CPUC |

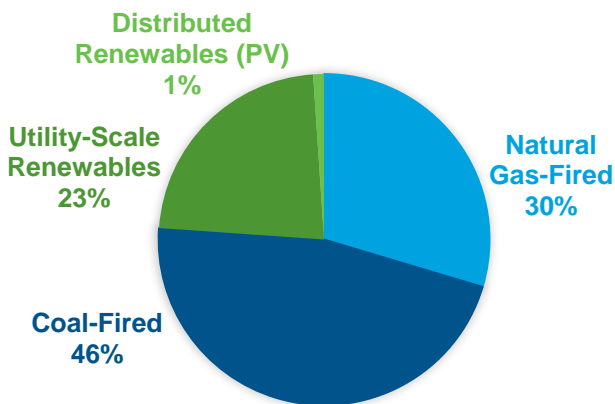


AGENCY ROLES

Utility Commission: The Colorado Public Utilities Commission (PUC) reviews, approves, and/or modifies the Phase I Electric Resource Plans (ERPs) prepared by utilities every 4 years, covering a 20 to 40 year planning horizon. Competitive solicitation then occurs. In Phase II a preferred resource portfolio is approved, based on modeling of bid data using the Phase I-approved modeling parameters. The PUC also reviews, approves, and/or modifies utilities’ DSM and RES Compliance Plans.

State Energy Office: The Colorado Energy Office has a variety of responsibilities, including formally engaging with the PUC as an intervenor on electricity-related proceedings, working closely with the legislature on electricity legislation, and running state-level clean energy finance and grant programs.

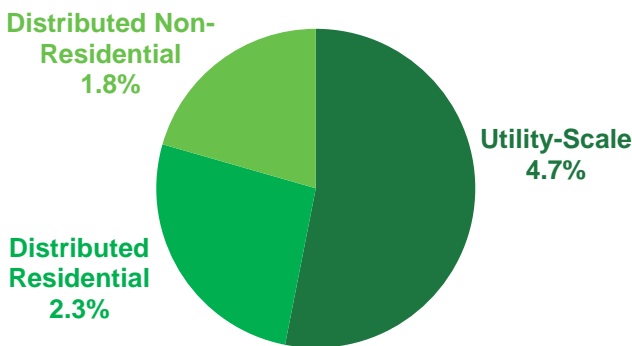
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 8.8%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW



Retail Competition

Retail load served by incumbent utilities only



Distribution Utility Owns Generation

Yes, utilities are vertically integrated



Region/ISO /RTO

IOUs manage resource adequacy (RA); transmission planning managed by IOUs in coordination with WECC



Regulated Electric Utilities

2 IOUs; limited regulation of one G&T, which serves most (18) co-ops

STATE TARGETS



Renewable Energy

By 2020, 30% of IOU sales, with separate, lower targets for co-ops



Energy Efficiency

1.68% annual incremental DSM savings target through 2020 (IOUs only)



GHG Emissions Reductions

Governor’s goal to reduce state GHG emissions 26% by 2025



Transportation Electrification

2040 target of 940,000 EVs on the road

SUMMARY OF KEY CHANGES IN PLANNING

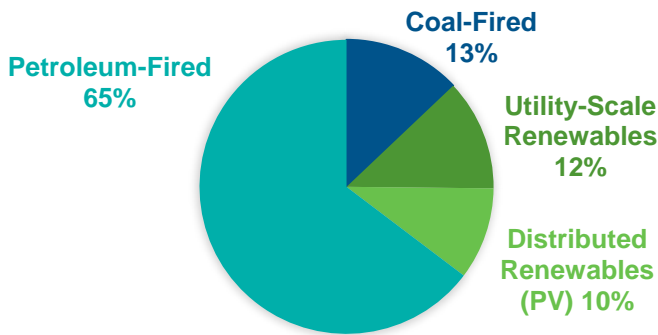
| | Description | Status | Source |
|------------------------------------|--|-------------------------------|-------------|
| Resource and Distribution Planning | Resource planning, renewable energy standard compliance, and interconnections now being addressed via a NOPR. | Proceeding No. 19R-0096E open | PUC |
| Storage Procurement | HB18-1270 directed the PUC to adopt rules establishing storage procurement mechanisms for IOUs by February 2019. | Law passed | Legislature |

AGENCY ROLES

Utility Commission: The Hawaii Public Utilities Commission (PUC) regulates all three subsidiaries of the state’s investor-owned utility, Hawaiian Electric, as well as the Kaua’i Island Utility Cooperative. Once the new Integrated Grid Planning (IGP) process begins, the PUC will review, modify, and approve or reject company filings, as it did previously in the IRP and Power Supply and Improvement Plan (PSIP) processes.

State Energy Office: The State Energy Office (SEO) supports efforts to devise and deploy statewide clean energy plans, policies, and strategies, including providing technical assistance, financing support, and other resources for renewable energy and electric vehicle (EV) infrastructure development. SEO also reviews and files comments to the Commission regarding planning proceedings.

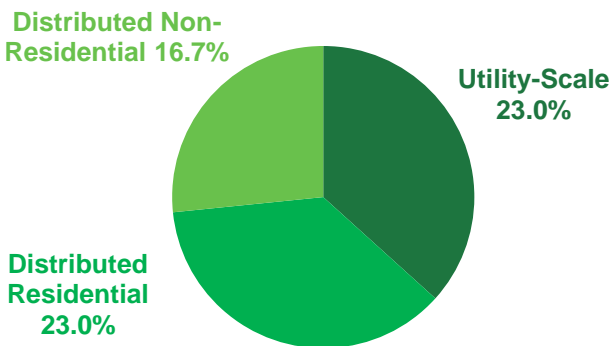
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser





Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 62.7%






Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW

| | | |
|---|---|--|
|  | Retail Competition | Retail load served by incumbent utilities only |
|  | Distribution Utility Owns Generation | Yes, utilities are vertically integrated |
|  | Region/ISO /RTO | IOUs manage both resource adequacy (RA) and transmission planning (through Integrated Grid Plan) |
|  | Regulated Electric Utilities | 1 IOU (HECO) with 3 subsidiaries; 1 co-op |

STATE TARGETS

| | | |
|---|---------------------------------|---|
|  | Renewable Energy | 100% electricity from renewable sources by 2045 |
|  | Energy Efficiency | 4,300 GWh reduction from 2008 electricity consumption by 2030 through efficiency and conservation |
|  | GHG Emissions Reductions | 10% reduction from 1990 levels by 2020; 2.5% annual reduction starting 2022; carbon neutral by 2045 |

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|--|--|--|--------|
| Resources and Distribution Planning | Docket 2018-0165 initiated the development of a new integrated grid planning (IGP) process, combining generation, transmission, and distribution planning into a unified 2-year cycle. | PUC approved HECO’s IGP workplan on March 14, 2019 | PUC |
| Performance-Based Regulation (PBR) | Docket 2018-0088 opened to establish PBR parameters following a statewide mandate. | PUC to issue Phase I decision in Upcoming months | PUC |

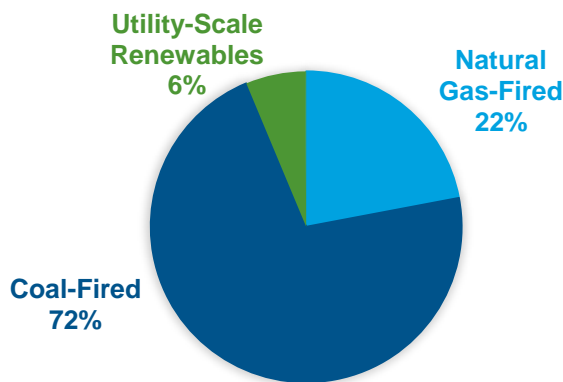


AGENCY ROLES

Utility Commission: The Indiana Utility Regulatory Commission (IURC) regulates electric utilities, including oversight and review of the Integrated Resource Plan (IRP) and the Transmission, Distribution, and Storage System Improvement Charge (TDSIC) filing.

State Energy Office: The Office of Energy Development (OED) coordinates state energy policy with executive branch agencies, houses energy-related programs, and works to support a strong, comprehensive, coordinated energy plan for Indiana.

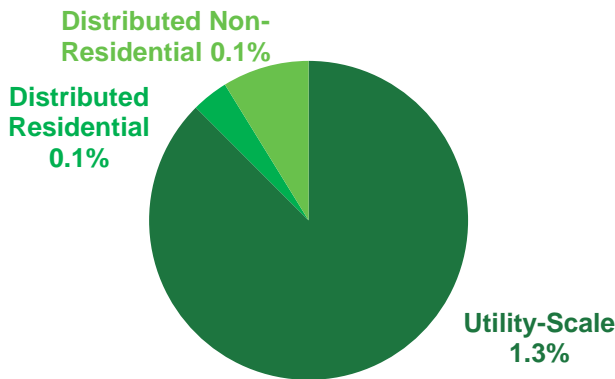
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 1.5%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW



Retail Competition

Retail load served by incumbent utilities only



Distribution Utility Owns Generation

Yes, utilities are vertically integrated



Region/ISO/RTO

IOUs primarily manage resource adequacy (RA), MISO capacity market for short-term needs, MISO primarily manages transmission planning (a portion of the state is in PJM)



Regulated Electric Utilities

5 IOUs are fully integrated, along with munis; co-ops have opted out of regulation

STATE TARGETS



Clean Energy

Voluntary; 7% from clean technologies by 2019 and 10% by 2025, including renewables, nuclear, DSM, EE, and certain qualifying natural gas and coal technologies

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|------------------------------|---|--|------------------|
| Distribution Planning | Encourages utilities to submit 7-year plans for eligible transmission, distribution, and storage system improvements, including routine maintenance and operational issues as part of distribution system planning. | Passed in 2013; legislation currently pending would amend original statute | General Assembly |



AGENCY ROLES

Utility Commission: The Maine Public Utilities Commission (PUC) regulates transmission and distribution utilities and licenses competitive electricity providers to participate in the state’s retail market.

State Energy Office: The Governor’s Energy Office (GEO) is responsible for planning and coordinating state energy policy and serves as the primary energy policy advisor to the Governor. GEO works in conjunction with other State government departments, the Legislature, and private and nonprofit sectors.

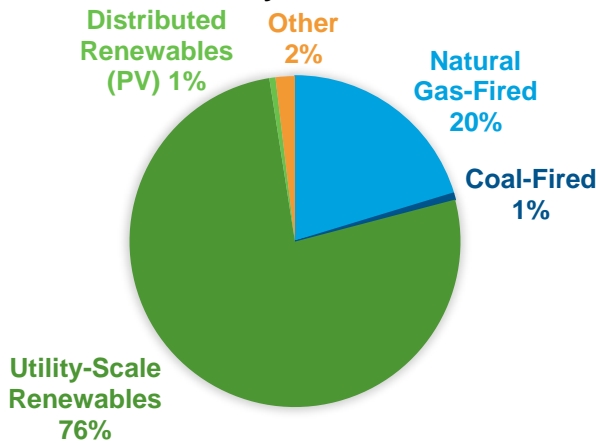
MARKET OVERVIEW

| | | |
|--|---|--|
| | Retail Competition | Full retail choice |
| | Distribution Utility Owns Generation | No; restructured |
| | Region/ISO /RTO | ISO-NE manages resource adequacy (RA) via capacity market and transmission planning for the majority of the state; Northern Maine Independent System Administrator responsible for the northern portion of the state |
| | Regulated Electric Utilities | 2 IOUs (Emera and CMP), consumer-owned utilities, and competitive electric providers |

STATE TARGETS

| | | |
|--|-----------------------------------|---|
| | Renewable Energy | 30% of electricity generated from Class II renewables, dating to the beginning of retail choice; 10% of electricity generated from Class I renewables by 2017; 8 GW wind capacity by 2030 |
| | Energy Efficiency | By 2030, 100 MW reductions from 2010 in peak-load electricity and natural gas, 20% in heating fuel consumption |
| | GHG Emissions Reductions | 10% reduction from 1990 levels by 2020; 2.5% annual reduction starting 2022 |
| | Oil Consumption Reductions | 30% reduction from 2007 state oil consumption levels by 2030 and 50% reduction by 2050 |

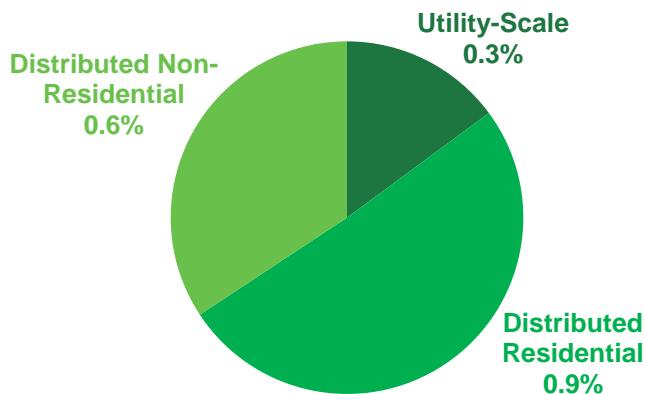
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 1.8%



Source: ICF Analysis of EIA and SEIA Data

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|------------------------------|---|--|--------|
| Transmission Planning | Docket 2016-00049 investigated designation of a Non-Transmission Alternative Coordinator (NTAC), and Docket 2018-00171 explores incentives for non-wires solutions. | PUC did not designate NTAC; instead IOUs developing rate/incentive realignment proposals under Docket 2018-00171, due March 27, 2019 | PUC |

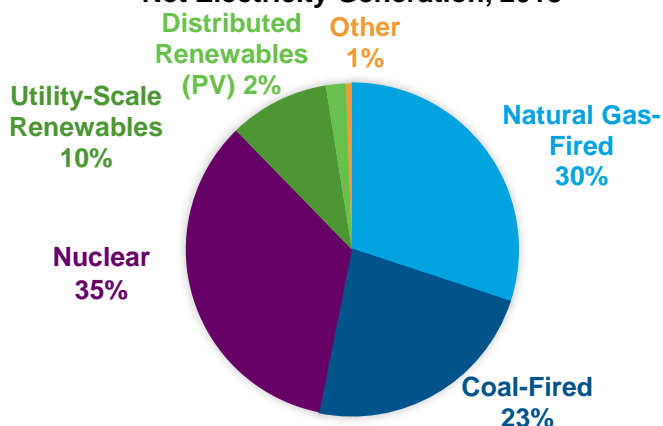


AGENCY ROLES

Utility Commission: The Maryland Public Service Commission (PSC) has jurisdiction over electricity companies and suppliers. The Commission oversees the energy efficiency programs and the implementation of the State's RPS. The PSC submits the 10-Year Plans annually to the Secretary of the Department of Natural Resources. The Commission also oversees the Public Conference (PC) 44 proceeding on grid modernization.

State Energy Office: The Maryland Energy Administration (MEA) advises the Governor and the General Assembly on matters relating to energy policy.

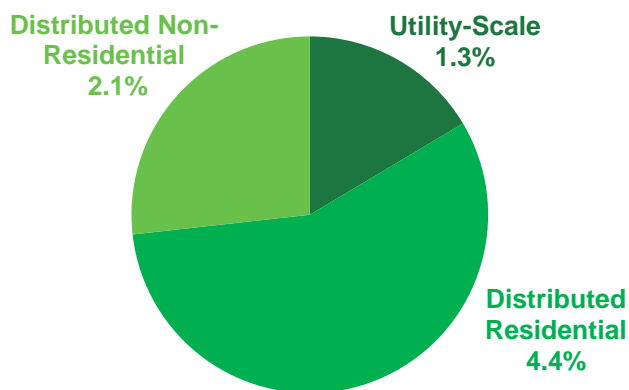
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 7.8%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW

| | | |
|--|---|--|
| | Retail Competition | Full retail choice |
| | Distribution Utility Owns Generation | No, restructured |
| | Region/ISO /RTO | PJM manages resource adequacy (RA) via capacity market and manages transmission planning |
| | Regulated Electric Utilities | All IOUs, munis, and cooperatives are regulated |

STATE TARGETS

| | | |
|--|---------------------------------------|---|
| | Renewable Energy | 25% by 2020 |
| | Energy Efficiency | 2% per year of annual gross energy sales |
| | GHG Emissions Reductions | 25% by 2020; 40% by 2030; 90% by 2050 (all below 2006 levels) |
| | Transportation Electrification | 300,000 zero-emission vehicles by 2025 |

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|---|--|--------------------------|-------------|
| Resource and Transmission Planning | MPSC, Ten-Year Plan (2018-2027) of Electric Companies in Maryland | December 2018 | Legislature |
| Distribution Planning | Public Conference 44 (PC44) Transforming Maryland's Electric Grid proceeding includes distribution system planning as one of six topics. | Opened in September 2016 | PSC |

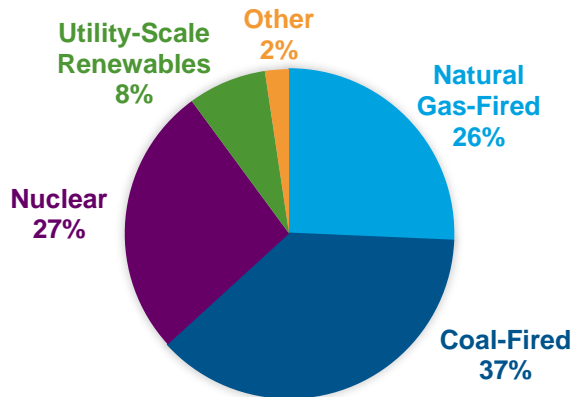


AGENCY ROLES

Utility Commission: The Michigan Public Service Commission (MPSC) reviews Integrated Resource Plans (IRP) prepared by utilities every 5 years. Separately, the MPSC reviews Investment and Maintenance Distribution Plans prepared by utilities every 2 years. Distribution plans were reviewed for the first time in early 2018.

State Energy Office: The Michigan Agency for Energy designs and implements programs that can support the distribution system, and facilitates conversation among stakeholders, including munis and coops, on important energy policy issues.

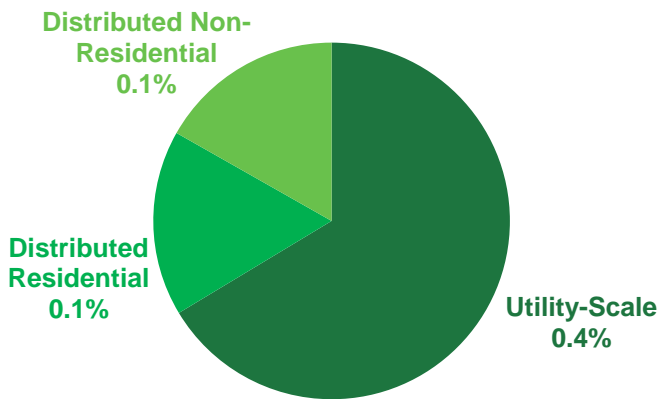
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 0.6%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW



Retail Competition

Some, up to 10% of retail sales



Distribution Utility Owns Generation

Yes, utilities are vertically integrated (transmission owned by separate entities)



Region/ISO/RTO

MISO is the transmission planning entity; MISO Planning Resource Auction (PRA) may meet short-term resource adequacy (RA). PJM serves the Southwest corner, and manages RA via capacity market and manages transmission planning.



Regulated Electric Utilities

2 largest IOUs are DTE Energy and Consumer Energy; munis not regulated

STATE TARGETS



Renewable Energy

35% combined energy waste reduction and renewable energy by 2035



Energy Efficiency

SUMMARY OF KEY CHANGES IN PLANNING

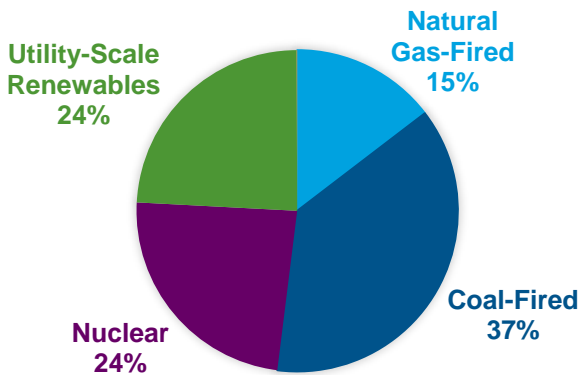
| | Description | Status | Source |
|------------------------------|---|----------------------|-----------------------|
| Resource Planning | PA 341 (Section 6t) enacted a new IRP process. | Passed December 2016 | Legislature, Governor |
| Distribution Planning | Docket (U-20147) for certain regulated electric utilities to file 5-year distribution investment and maintenance plans. | Opened April 2018 | MPSC |

AGENCY ROLES

Utility Commission: The Minnesota Public Utilities Commission (PUC) reviews, approves, and/or modifies utilities' Integrated Resource Plans (IRP) covering at least a 15-year period along with a 5-year action plan. The PUC also reviews utilities' 10-year Integrated Distribution Plans (IDPs), filed annually by Xcel and biannually by other utilities, and utilities' biannual, jointly-filed State Transmission Plan. The PUC participates through the Organization of MISO States on regional and federal matters.

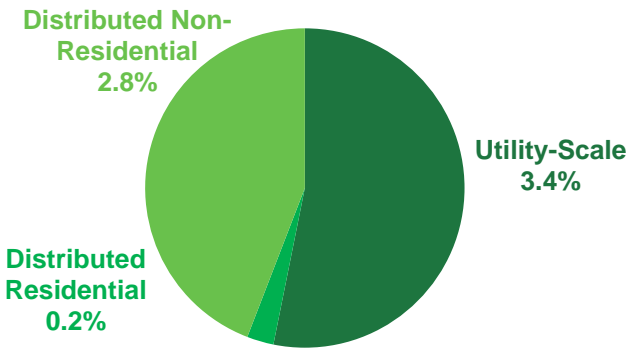
State Energy Office: The Regulation and Planning Unit, Division of Energy Resources within the Department of Commerce (DOC), advocates on behalf of the public interest before the Commission, including rate cases, resource plans, and certificates of need, as well as in regional and federal matters. DER also provides technical expertise and support to the Commission on large energy project siting and routing and conducts the environmental reviews required for such projects through the Energy Environmental Review and Analysis unit.

Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017
Total: 6.4%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW

| | | |
|--|---|---|
| | Retail Competition | Retail load served by incumbent utilities only |
| | Distribution Utility Owns Generation | Yes, utilities are vertically integrated |
| | Region/ISO/RTO | IOUs primarily manage resource adequacy (RA), MISO capacity market for short-term needs, MISO manages transmission planning |
| | Regulated Electric Utilities | 4 IOUs (full regulation) and 1 co-op (rates only); other co-ops may opt into regulation |

STATE TARGETS

| | | |
|--|--------------------------|--|
| | Renewable Energy | 31.5% by 2020 for Xcel and 25% for others, both including 1.5% solar carve-out |
| | Energy Efficiency | 1.5% annual incremental savings required beginning 2010; can be adjusted to a minimum 1% with PUC approval; savings > 1.5% can be carried forward at least 3 years |

SUMMARY OF KEY CHANGES IN PLANNING

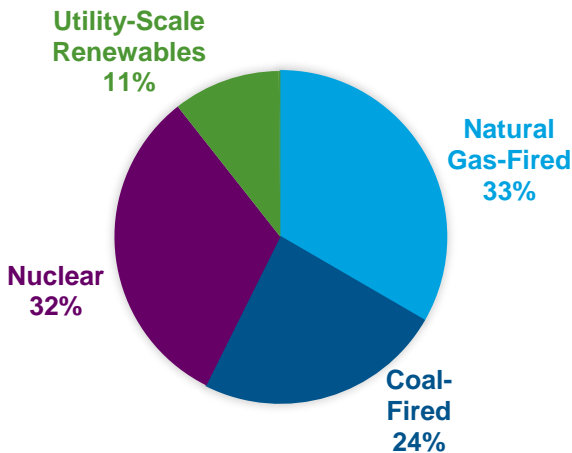
| | Description | Status | Source |
|------------------------------|---|--|----------------------------|
| Distribution Planning | Docket CI-18-251 established distribution planning filing requirements for Xcel, formalizing the structure of IDP; CI-18-253, -254, and 255 established IDP filing requirements for Otter Tail Power, Minnesota Power, and Dakota Electric. | Stakeholders submitted comments on Xcel's first IDP filing. OTP, MP and DEA plans are due November 1, 2019 | PUC |
| e21 Initiative | Industry stakeholders collaborating on new integrated systems planning processes. | Public forum on planning held in December 2018 | e21/Great Plains Institute |

AGENCY ROLES

Utility Commission: The North Carolina Utilities Commission (NCUC) determines content and data to be included in Integrated Resource Plans (IRP). In addition, NCUC reviews and accepts or requires modification to utility IRP.

Department of Environmental Quality (DEQ) / Energy Policy Council: The DEQ is only involved with planning in the context of the Energy Policy Council and other energy program initiatives. For example, the Energy Policy Council is responsible for developing the state energy plan, which must be consistent with the IRP

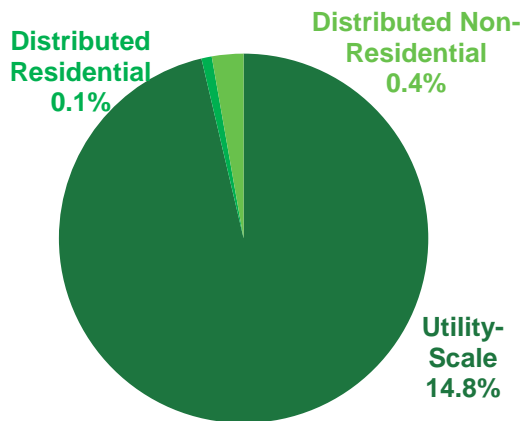
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser





Nameplate PV Capacity as Percentage of Peak Load, 2017

Total: 15.3%







Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW

| | | |
|---|---|---|
|  | Retail Competition | Retail load served by incumbent utilities only |
|  | Distribution Utility Owns Generation | Yes, vertically integrated |
|  | Region/ISO /RTO | IOUs manage resource adequacy (RA) via IRP and coordinate transmission with munis and co-ops through North Carolina Transmission Planning Collaborative. The northeastern corner of the state is served by PJM. |
|  | Regulated Electric Utilities | IOU rates and quality of service; jurisdiction over munis and cooperatives for compliance of REPs |

STATE TARGETS

| | | |
|---|---------------------------------------|--|
|  | Renewable Energy + EE | IOUs: 12.5% of renewable energy resources and energy efficiency portfolio standard (REPs) plus 3500 MW of solar PV by 2021. Co-ops/Municipal suppliers: 10% of REPs. |
|  | Energy Efficiency | 40% energy reduction per square foot in state-owned buildings by 2025 |
|  | GHG Emissions Reductions | 40% GHG emission reduction below 2005 levels by 2025 (aspirational goal) |
|  | Transportation Electrification | 80,000 additional zero-emission vehicles by 2025 |

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|--------------------------------|--|-------------------------------------|-------------------|
| Resource/Dist. Planning | Three major IOUs submit IRP with a 15-year planning horizon, including analysis of supply and demand resources. Smart Grid Technology Plans (SGTP) filed with IRP. | Due September 1 and October 1, 2020 | Legislature |
| Resource Planning | Per Executive Order 80, the DEQ will develop the Clean Energy Plan which will consider integration of DER to facilitate development of a modern and resilient electric grid. | Due October 1, 2019 | Governor's Office |

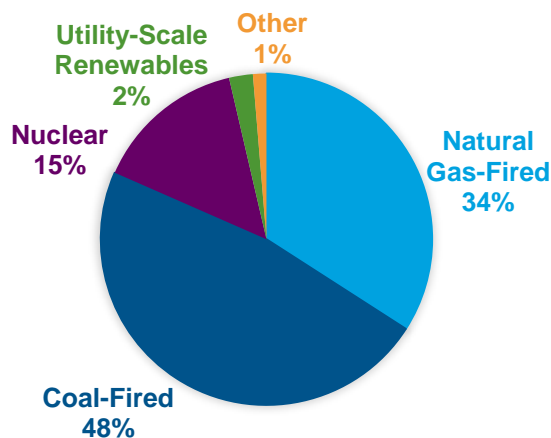


AGENCY ROLES

Utility Commission: The Public Utilities Commission of Ohio (PUCO) annually develops a 20-year energy forecast needs for the Governor and General Assembly (Long-term Forecast Report – LTFR).

Development Services Agency: The Ohio Development Services Agency runs the Energy Efficiency Program which helps businesses, manufacturers, nonprofits, schools and local governments reduce energy use and improve energy efficiency. The energy office is focused on implementation and not planning.

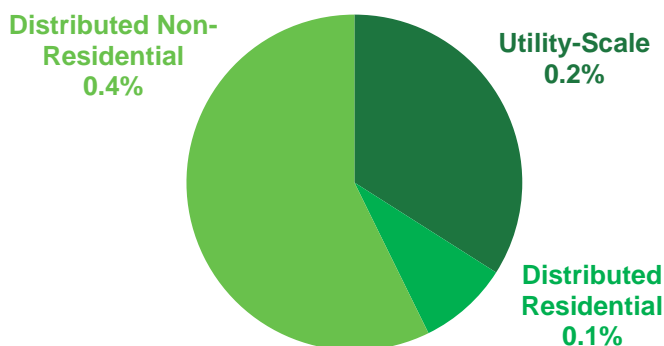
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 0.7%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW



Retail Competition Full retail choice



Distribution Utility Owns Generation Mostly restructured (Dayton Power & Light owns some generation)



Region/ISO/RTO PJM manages resource adequacy (RA) via capacity market and manages transmission planning



Regulated Electric Utilities Six IOUs: AEP Ohio, FirstEnergy (three operating companies), Dayton Power & Light, and Duke Energy Ohio

STATE TARGETS



Renewable Energy 12.5% renewable energy by 2027 (at least 0.5% must come from solar sources)



Energy Efficiency IOUs to meet 2% reduction of electric sales annually, for a cumulative reduction of 22% by 2027

SUMMARY OF KEY CHANGES IN PLANNING

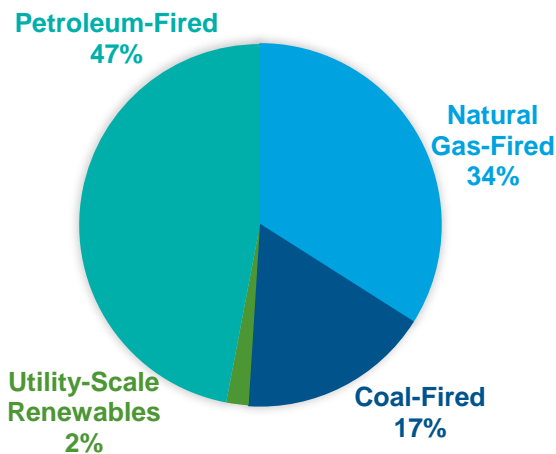
| | Description | Status | Source |
|-----------------------|---|----------------------------|-------------|
| Resource Planning | Electric utilities file annual 10-year forecast reports. | Annual reports by April 15 | Legislature |
| Resource Planning | PUCO staff develop Long-term Forecast Report (LTFR). | Annual (no date) | Legislature |
| Distribution Planning | PowerForward: A Roadmap to Ohio's Electricity Future established 3 groups, including Distribution System Planning. Requires IOUs to file a current state planning assessment. | Reports due April 1, 2019 | Commission |

AGENCY ROLES

Utility Commission: The Puerto Rico Energy Bureau (PREB) reviews and approves the Integrated Resource Plan filed every three years.

Puerto Rico Energy Policy Program: The Puerto Rico Energy Policy Program (PREPP) establishes energy efficiency parameters for state energy offices and municipalities.

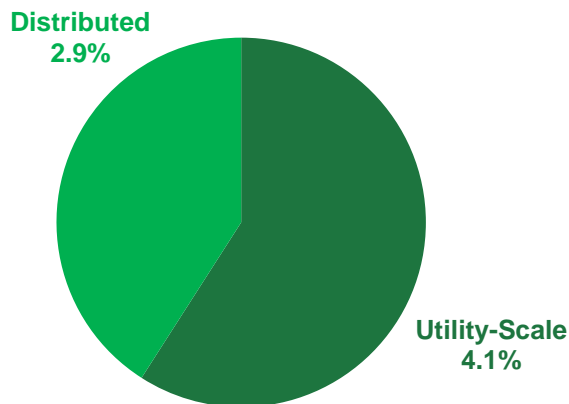
Net Electricity Generation, 2017



Source: EIA Puerto Rico Territory Energy Profile

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 7.0%



Source: ICF Analysis of EIA and Puerto Rico Electric Power Authority data

MARKET OVERVIEW



Retail Competition

Retail load served by incumbent utility only



Distribution Utility Owns Generation

Yes, vertically integrated



Region/ISO/RTO

PREPA manages resource adequacy (RA) and transmission planning via IRP



Regulated Electric Utilities

Puerto Rico Electric Power Authority (PREPA)

TARGETS



Renewable Energy

15% by 2020 and 20% by 2030 (SB1121, if approved, would establish 100% RPS by 2050)

SUMMARY OF KEY CHANGES IN PLANNING

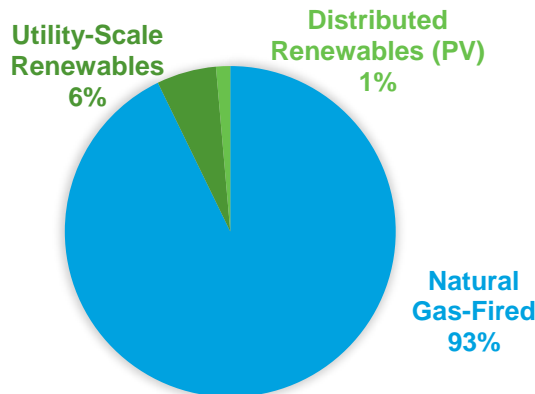
| | Description | Status | Source |
|-------------------|--|-------------------|------------|
| Resource Planning | “Regulation on IRP for PREPA” updates IRP framework and filing requirements | February 8, 2019 | Commission |
| | Docket NEPR-AP-2018-0001 authorizes PREPA to file IRPs more frequently than every 3-years with Commission approval | Opened April 2018 | Commission |

AGENCY ROLES

Utility Commission: The Public Utilities Commission comprises two distinct regulatory agencies: a 3-member Commission (Commission) and the Division of Public Utilities and Carriers (Division). The Commission reviews and approves Infrastructure, Safety, and Reliability (ISR), Energy Efficiency (EE) plans, and System Reliability Procurement (SRP) filings for National Grid, and also provided input on the Power Sector Transformation (PST) initiative. The Division represents ratepayer interests in all dockets before the Commission, enforces the Commission’s orders, and has its own separate authority, rules, and jurisdiction over certain regulatory issues.

State Energy Office: The Office of Energy Resources (OER) is the lead agency on energy policy/programs, working with the Commission, Division, and others on initiatives such as the PST and the State Energy Plan.

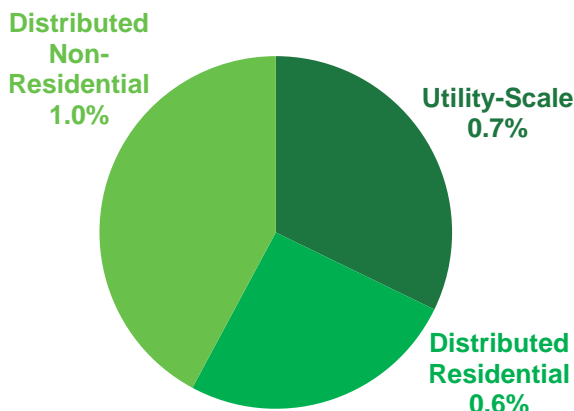
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser





Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 2.3%






Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW

| | | |
|---|---|--|
|  | Retail Competition | Full retail choice |
|  | Distribution Utility Owns Generation | No; restructured |
|  | Region/ISO/RTO | ISO-NE manages resource adequacy (RA) via capacity market and transmission planning for the majority of the state |
|  | Regulated Electric Utilities | 1 IOU (National Grid) serves the majority of electric customers; Commission also regulates Block Island Power company and Pascoag Utility District |

STATE TARGETS

| | | |
|---|---------------------------------|--|
|  | Renewable Energy | 38.5% renewables by 2035; 400 MW renewables by 2029 |
|  | Energy Efficiency | Targets filed within utility EE/SRP based on Energy Efficiency and Resource Management Council recommendations |
|  | GHG Emissions Reductions | 10% reduction from 1990 levels by 2020, 45% by 2035, and 80% by 2050 |

SUMMARY OF KEY CHANGES IN PLANNING

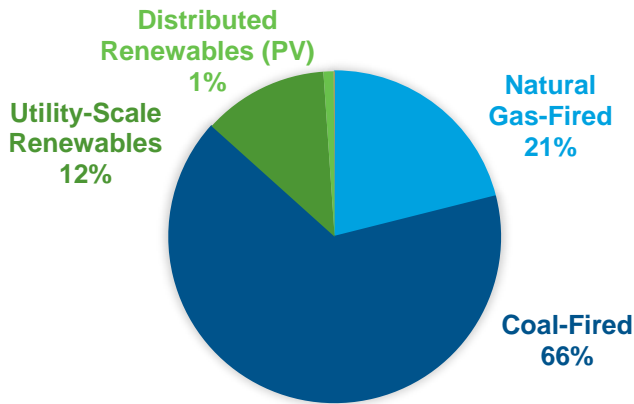
| | Description | Status | Source |
|------------------------------|--|---|--|
| Integrated Planning | Docket 4539 ordered National Grid to consider DER in long-range planning, including beneficial locations/heat maps. | Docket closed following approval of National Grid 2016 ISR filing | Commission |
| Distribution Planning | Power Sector Transformation includes, distribution system planning as one of four work streams to continue modernization of the state electric system. | Phase One report published in 2017 | Division of Public Utilities and Carriers and Office of Energy Resources |

AGENCY ROLES

Utility Commission: The 3-member Utah Public Service Commission (UPSC) ensures safe, reliable, adequate, and reasonably priced utility service, including reviewing and acknowledging Integrated Resource Plans (IRP), and conducting hearings and investigations of utility company operations to determine just and reasonable rates. The Utah Division of Public Utilities (DPU) is an independent agency that makes recommendations to UPSC on rate-making, applications, hearings, and other issues affecting utility service, including IRPs.

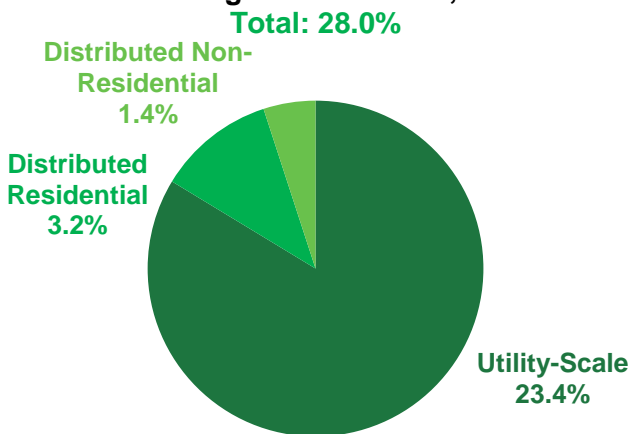
State Energy Office: The Governor’s Office of Energy Development (OED) was created in 2011 under the Governor’s 10-Year Strategic Energy Plan, and provides industry assistance, education and outreach, and policy solutions to promote resource diversity and innovation to advance all forms of responsible, affordable, reliable, and sustainable energy.

Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW

| | | |
|--|---|---|
| | Retail Competition | Retail load served by incumbent utilities only |
| | Distribution Utility Owns Generation | Yes, utilities are vertically integrated |
| | Region/ISO /RTO | IOU manages resource adequacy (RA) and transmission planning; participates in western Energy Imbalance Market (EIM) |
| | Regulated Electric Utilities | 1 IOU (PacifiCorp (d/b/a in Utah as Rocky Mountain Power)); co-ops are regulated but not required to file IRP |

TARGETS

| | | |
|--|-------------------------|--|
| | Renewable Energy | 20% of adjusted retail sales from renewables by 2020, to the extent that renewables are cost-effective |
|--|-------------------------|--|

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|--------------------------|---|------------------------------|---|
| Regional Planning | Goal 8 of State Energy Action Plan, “Expand Regional Engagement,” includes analysis for broadening regional electricity markets as the sector increasingly uses variable renewable resources. | Final plan published in 2018 | Governor’s Office of Energy Development |

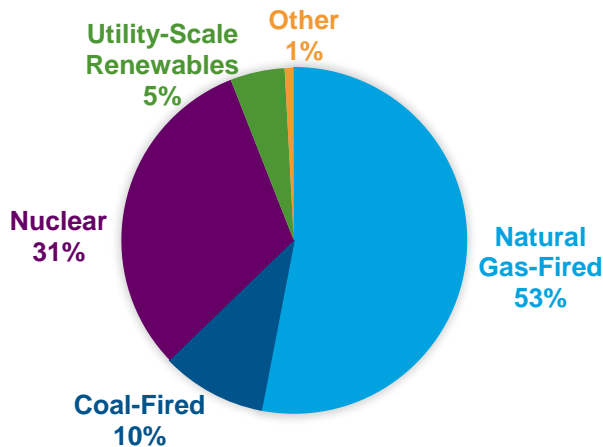


AGENCY ROLES

Utility Commission: The Virginia State Corporation Commission (SCC) reviews Integrated Resource Plans (IRP) through public proceedings and evaluates them as to whether they are reasonable and in the public interest for the specific and limited purpose of filing the planning document.

State Energy Office: The Department of Mines, Minerals, and Energy (DMME) prepares the State Energy Plan and supports integrating distribution planning with IRP. In addition, DMME develops and manages energy financing programs that support renewable energy, energy efficiency, and advanced transportation projects and programs.

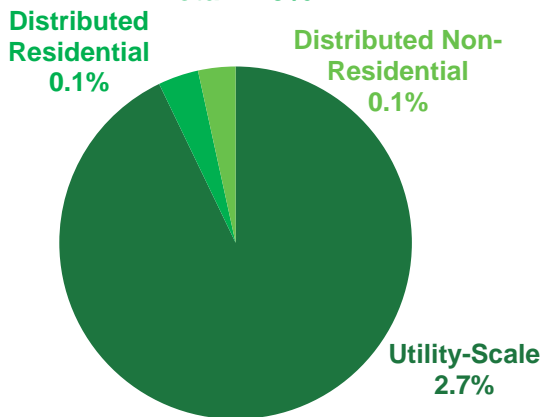
Net Electricity Generation, 2018



Source: EIA Electricity Data Browser

Nameplate Installed PV Capacity as Percentage of Peak Load, 2017

Total: 2.9%



Source: ICF Analysis of EIA and Wood Mackenzie Power & Renewables Data

MARKET OVERVIEW



Retail Competition

Full retail choice for companies over 5 MW, or aggregated with Commission's permission. Any customer may buy 100% renewable energy if customer's incumbent utility does not have an approved 100% renewable energy tariff



Distribution Utility Owns Generation

Yes, utilities are vertically integrated



Region/ISO/RTO

PJM manages resource adequacy (RA) via capacity market and manages transmission planning



Regulated Electric Utilities

SCC has jurisdiction over IOUs and co-ops. Largest IOUs: Dominion Energy and Appalachian Power Company

STATE TARGETS



Renewable Energy

Voluntary RPS 7% on average for 2017-2021; 12% for 2022 and on average for 2023-2024; 15% by 2025. 5,000 MW of wind/solar in VA or off its shoreline in the public interest; 25% of solar shall be non-utility owned (Legislature).



Energy Efficiency

10% electricity savings by 2022 (Executive)

SUMMARY OF KEY CHANGES IN PLANNING

| | Description | Status | Source |
|-----------------------|---|------------------------|-------------|
| Resource Planning | Code of Virginia § 56-599 enacted the Integrated resource plan requirement for utilities every 3-years with a 15-year planning horizon. | Effective July 1, 2018 | Legislature |
| Distribution Planning | Grid Transformation and Security Act requires IOUs to file distribution grid modernization plans. | Enacted March 9, 2018 | Legislature |