NERC

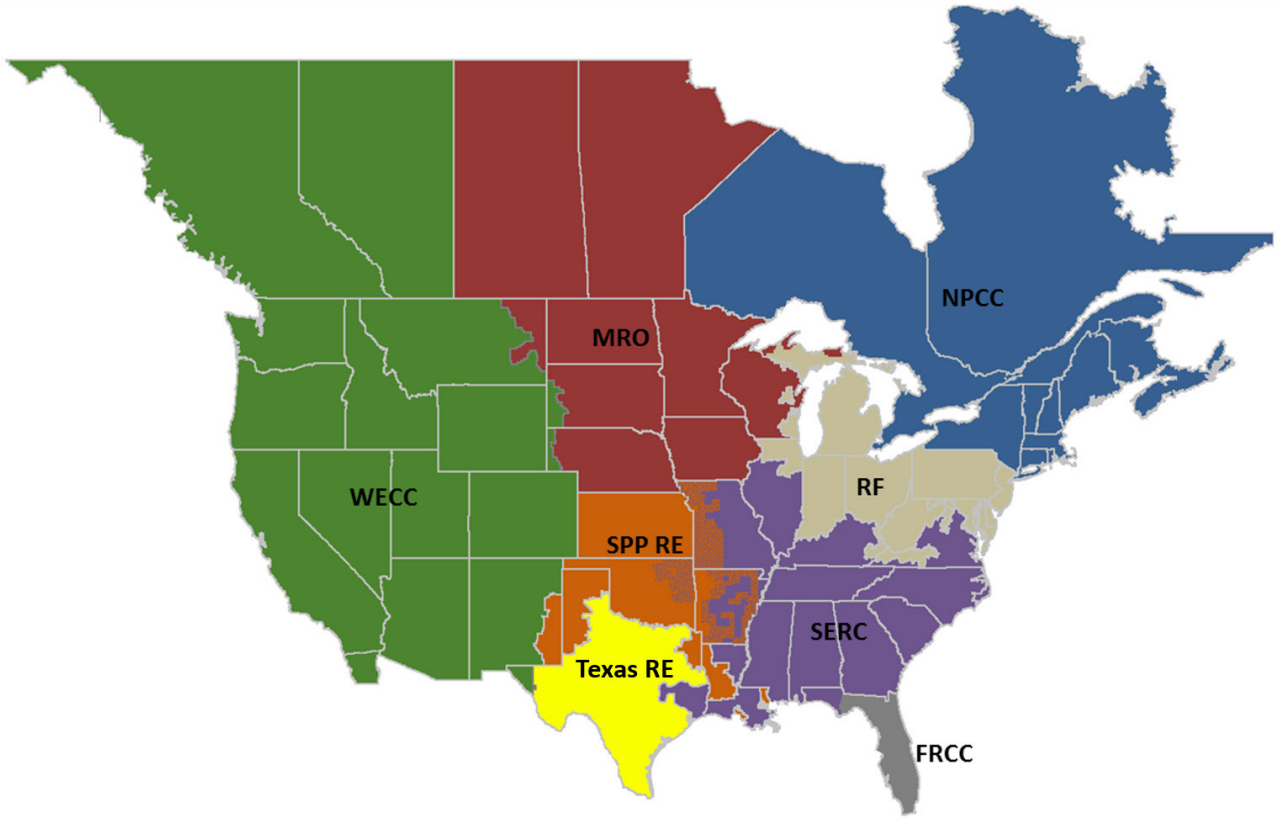
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

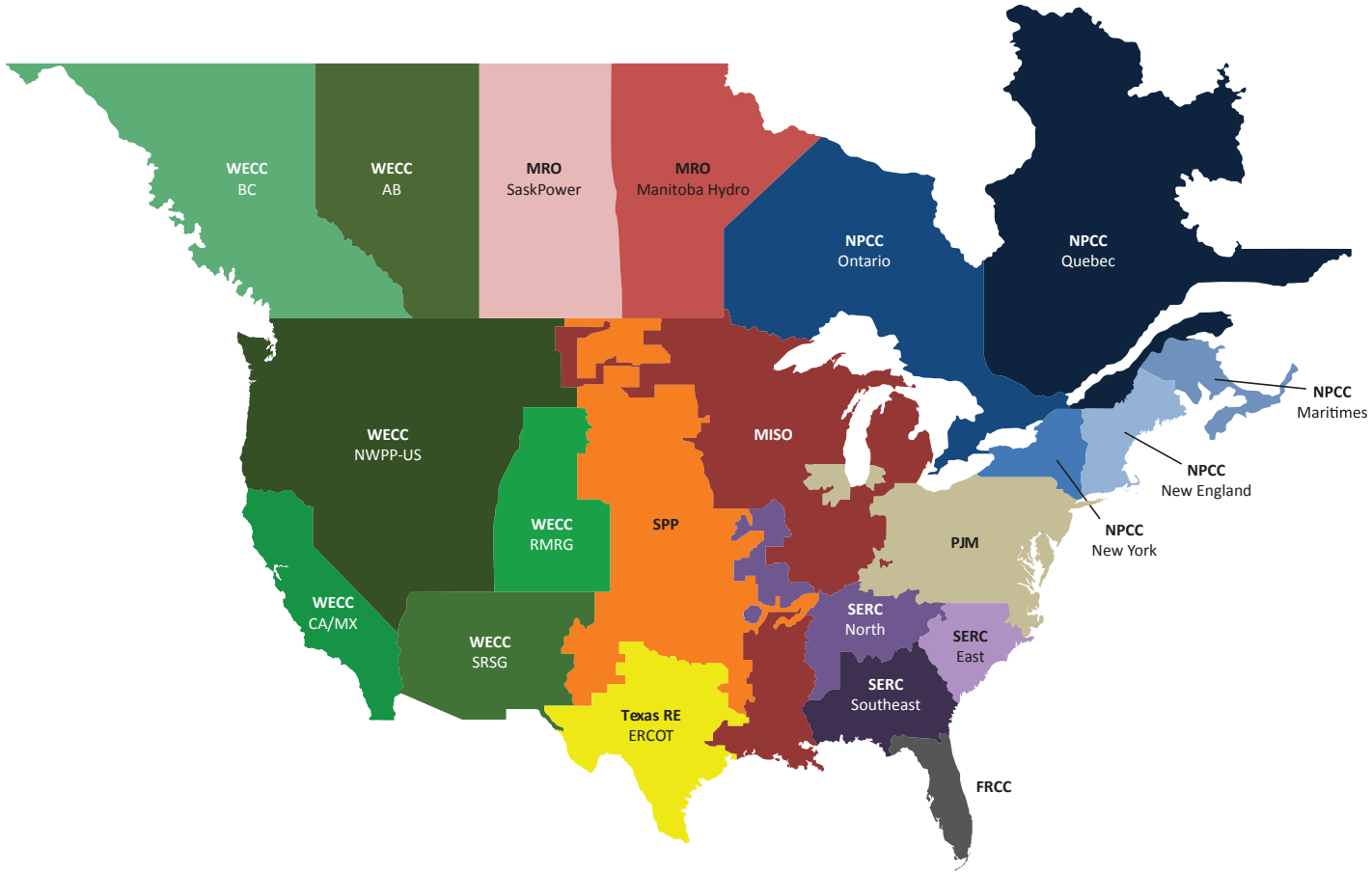
2016–2017 Winter Reliability Assessment

Table of Contents

Preface

The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to assure the reliability of the bulk power system (BPS) in North America. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the BPS through system awareness; and educates, trains, and certifies industry personnel. NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California in Mexico. NERC is the electric reliability organization (ERO) for North America, subject to oversight by the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. NERC's jurisdiction includes users, owners, and operators of the BPS, which serve more than 334 million people. The North American BPS is divided into eight Regional Entity (RE) boundaries as shown in the map below. The assessment areas are shown on page 4. Refer to the *Data Concepts and Assumptions Guide* for more information.





FRCC—Florida Reliability Coordinating Council
- FRCC

MRO—Midwest Reliability Organization
- MRO-SaskPower
- MRO-Manitoba Hydro
- MISO

SPP RE—Southwest Power Pool Regional Entity
- SPP

Texas RE–Texas Reliability Entity
- ERCOT

NPCC—Northeast Power Coordinating Council
- NPCC-New England
- NPCC-Maritimes
- NPCC-New York
- NPCC-Ontario
- NPCC-Québec

RF—ReliabilityFirst
- PJM

WECC—Western Electricity Coordinating Council
- WECC-BC
- WECC-AB
- WECC-RMRG
- WECC-CA/MX
- WECC-SRSG
- WECC-NWPP-US

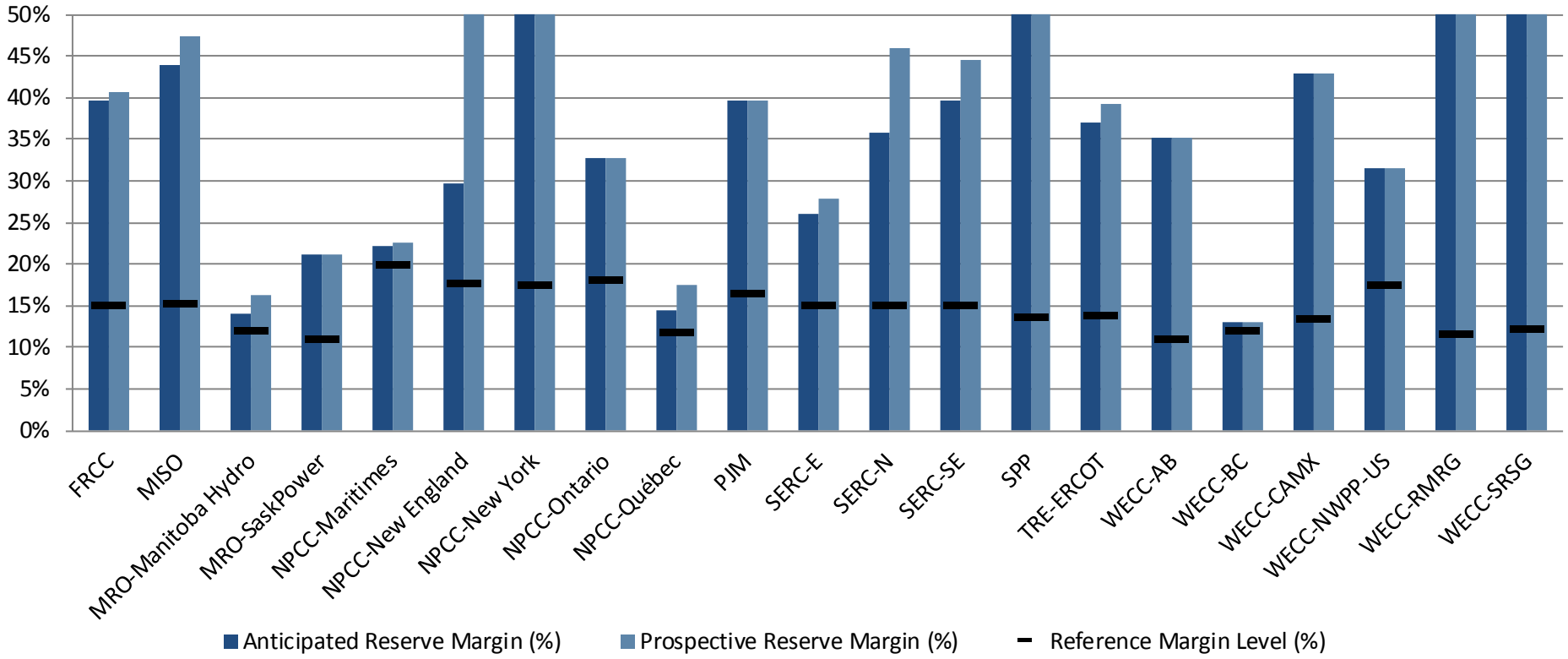
SERC—SERC Reliability Corporation
- SERC-East
- SERC-North
- SERC-Southeast

Key Findings

NERC's annual winter reliability assessment covers the three-month (December–February) winter period. The assessment provides an overall perspective on the adequacy of the generation resources and the transmission systems necessary to meet projected winter peak demands. The assessment monitors and identifies potential reliability issues of interest and regional areas of concern in meeting projected customer demands. The following key findings represent NERC's independent evaluation of electric generation capacity and potential operational concerns that may need to be addressed.

Supply Adequacy

Anticipated resources meet the reference margin level in all assessment areas for Winter 2016–17 as illustrated below. Refer to the *Data Concepts and Assumptions Guide* for additional information.



2016–17 Anticipated/Prospective Reserve Margins Compared to Reference Margin Level

Fuel Supply

NERC anticipates adequate levels of fuel supply for all assessment areas and Regions. Natural gas continues to be the predominant fuel of choice for most locations in winter. While the supply of natural gas is vast and not expected to cause any supply shortages, transportation and delivery challenges may impact the ability for some natural-gas-fired generation to receive fuel to serve on-peak demand. For example, ISO-NE developed procedures, called Winter Reliability Solutions, that enable generators to address challenges posed by natural gas restrictions by using dual-fuel capabilities that employ alternative resources, like fuel oil.[1] Coal inventories in the U.S. are relatively high compared to previous years due to a mild 2015–16 winter and more reliance on natural gas as fuel for generation.[2]

For the 2016–17 winter capacity period, ISO-NE forecasts that nearly 3,450 MW of capacity could be at risk when natural gas pipelines become constrained. New England expects increased pipeline capacity from Spectra Energy's Algonquin Incremental Market (AIM) project. However, while this project expands the pipeline capacity of the existing Algonquin Gas Transmission system by roughly 340,000 dekatherms of natural gas per day, ISO-NE anticipates this relief to be short lived as local distribution companies expand their infrastructure and retiring non-gas-fired resources are replaced with new gas-fired generation. ISO-NE's outage coordination and real-time efforts evaluate at-risk gas-fired generation in determining sufficient capacity margins. ISO-NE would mitigate these scenarios with real-time supplemental unit commitment and the use of emergency procedures as needed.

In Texas, ERCOT assumes that about 1,500 MW of gas curtailment outages/derates occur for typical temperatures at the time of the winter peak load hour. An additional 1,060 MW of outages/derates also occur, assuming that extreme cold temperatures happen during the peak load hour. Even with extreme temperatures and associated loads, ERCOT projects sufficient generation for its system.[3]

In WECC, the staff of the California Public Utilities Commission, the California Energy Commission, the California Independent System Operator, the Los Angeles Department of Water and Power, and Southern California Gas performed analysis and generated the *Aliso Canyon Winter Risk Assessment Technical Report*.[4] This study analyzed the possible impacts to electric reliability due to the reduced natural gas availability associated with the Aliso Canyon storage facility leak. The LADWP/California ISO joint power-flow study found that, under most gas supply and demand conditions, electric reliability can be satisfied for colder than normal weather, such as 1-in-10 year winter peak electric demand. At the time of this report, Aliso Canyon holds 15 Bcf of natural gas, and under normal winter weather conditions, withdrawals for electric generation are not likely.

Transmission System Reliability

Overall, the transmission system is projected to be adequate for the upcoming winter season. Assessment areas with large footprints, such as the Western Interconnection, do not predict any operational flow challenges. However, some assessment areas will be very reliant on the transmission system to offset generation capacity reduction; the LA Basin in southern California may be dependent on interstate transfers to balance demand, and for stability of the system, in the event of supply constraints.

---

[1] https://www.iso-ne.com/committees/key-projects/winter-reliability-solutions

[2] https://www.eia.gov/electricity/monthly/update/fossil_fuel_stocks.cfm

[3] http://www.ercot.com/content/wcm/lists/91620/SARA_PreliminaryWinter2016_2017.pdf

[4] http://docketpublic.energy.ca.gov/PublicDocuments/16-IEPR-02/TN212913_20160823T090035_Aliso_Canyon_Winter_Risk_Assessment_Technical_Report.pdf

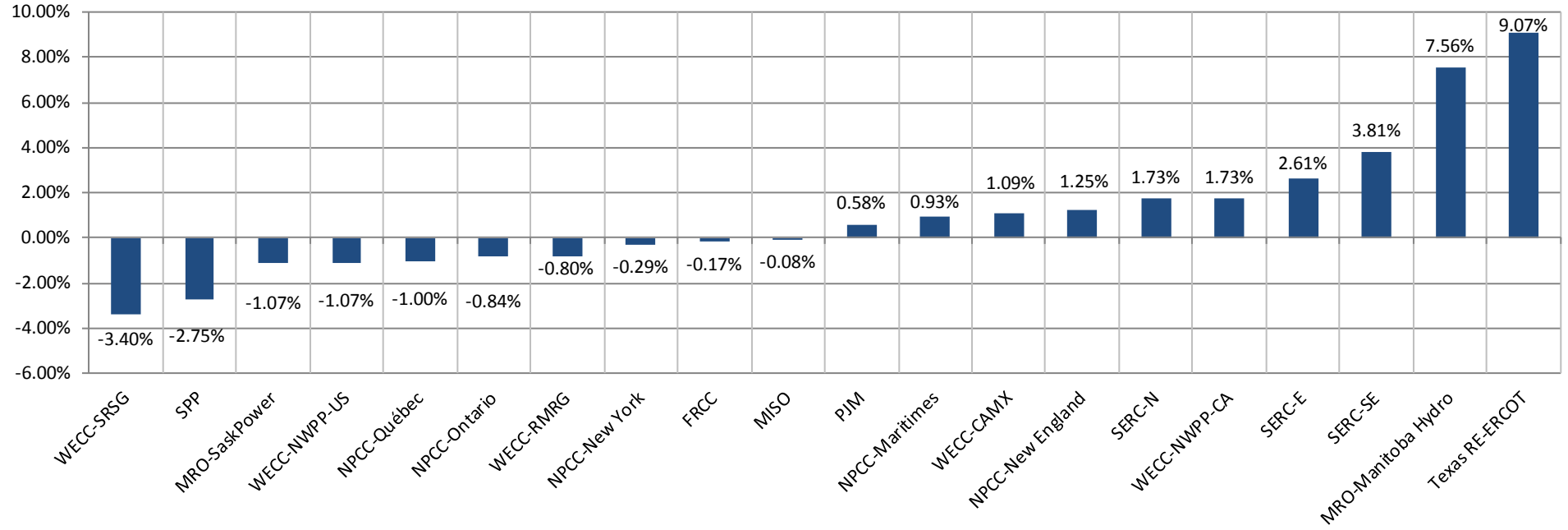
Total Internal Demand

Peak demand forecast for most assessment areas has decreased or remained flat from prior assessments. Some assessment areas, such as SERC and Texas RE-ERCOT, are forecasting growth in total internal demand. The increases in forecasted demand for each assessment area are explained below:

SERC-SE: For the upcoming season, some entities in the SERC Region switched from using a 10-year period for normal weather to a historical 20–30 year period. Given that the winters are slightly more extreme on average in the 30 year period, the effect was an increase in forecasted winter peak demand. For example, the change in the "normal weather" period had the effect of raising the winter peak forecast by approximately 200 MW by 2020.

MRO Manitoba–Hydro: The change in Manitoba Hydro's demand is due to a change in the method for reporting; specifically, Manitoba Hydro reported January peak load for the 2015–16 winter and they reported winter peak load for the 2016–17 winter.

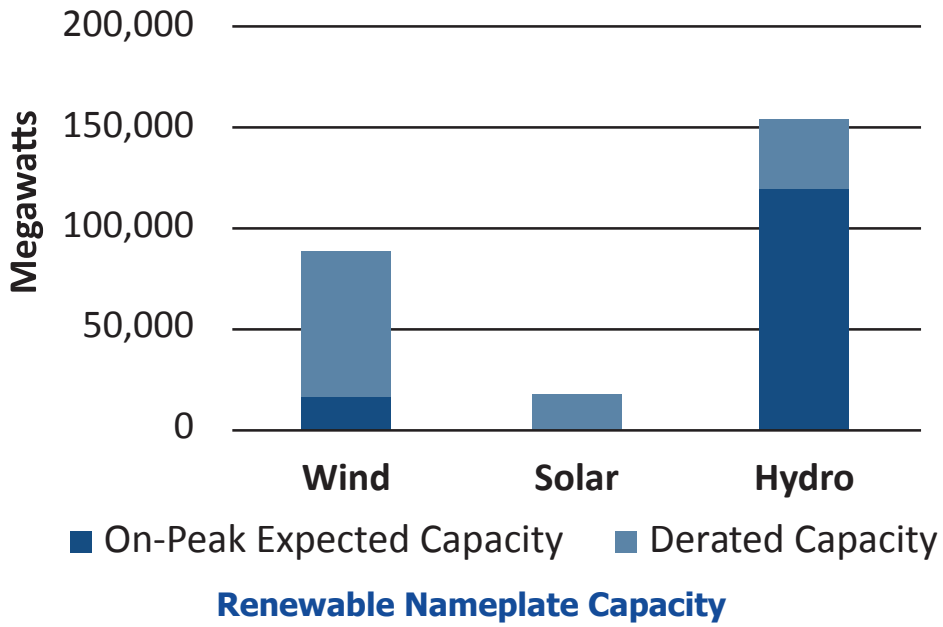
Texas RE-ERCOT: The nine percent growth in Texas RE-ERCOT is attributable to both strong customer growth and a refinement to ERCOT's forecast model for the winter months. ERCOT's winter peaks experience relatively high volatility, so year-on-year changes of such magnitude are not uncommon.



Net Demand Change from 2015–16 Winter to 2016/17

Wind, Solar, and Hydro Resources

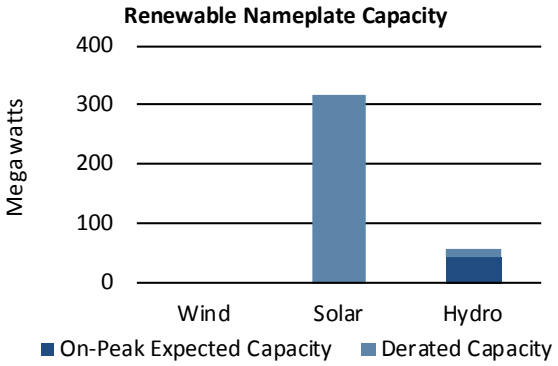
Wind and solar power generation are projected to grow in most North American areas. On-peak available wind capacity is projected to be 16.5 percent of the total nameplate capacity, on-peak available solar capacity is projected to be 4.2 percent of the total nameplate capacity, and hydro on-peak available capacity is projected to be 77.3 percent of the total nameplate capacity.

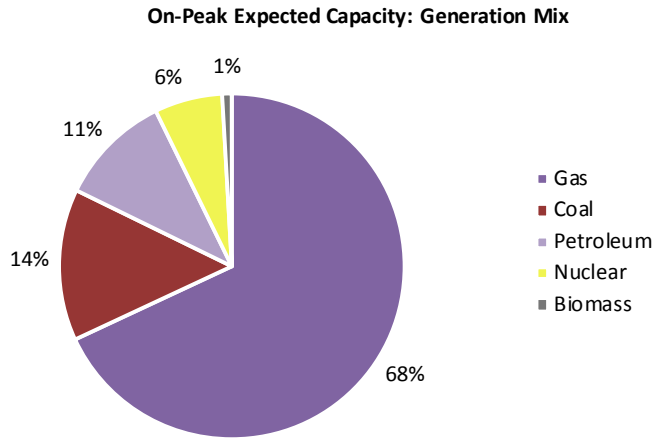


Renewable Nameplate Capacity

FRCC

The Florida Reliability Coordinating Council's (FRCC) membership includes 30 Regional Entity Division members and 23 Member Services Division members composed of investor-owned utilities (IOUs), cooperatives, municipal utilities, power marketers, and independent power producers. FRCC is divided into 10 Balancing Authorities with 47 registered entities (both members and non-members) performing the functions identified in the NERC Reliability Functional Model and defined in the NERC Reliability Standards. The Region contains a population of over 16 million people and has a geographic coverage of about 50,000 square miles over Florida.

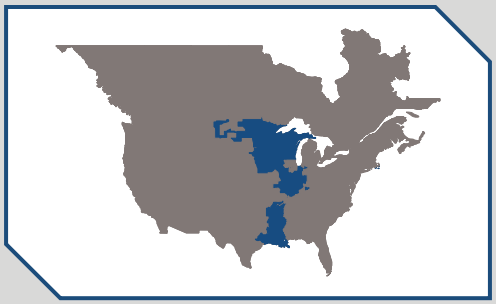




FRCC Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	45,600	45,521	-0.17
Demand Response: Available	2,976	2,885	-3.1
Net Internal Demand	42,624	42,636	0.03
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	57,041	54,839	-3.9
Tier 1 Planned Capacity	0	3,453	-
Net Firm Capacity Transfers	1,242	1,254	0.97
Anticipated Resources	58,284	59,546	2.2
Existing-Other Capacity	402	452	12.4
Prospective Resources	58,686	59,998	2.2
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	36.7%	39.7%	3.0
Prospective Reserve Margin	37.7%	40.7%	3.0
Reference Margin Level	15.00%	15.00%	0.00

Highlights

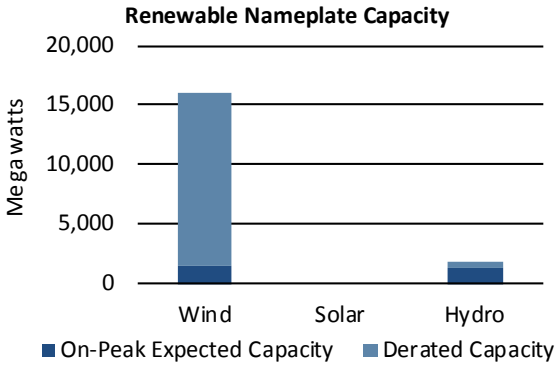
- The anticipated reserve margins is forecasted to be 39.7 percent, which is above the reference margin level of 15 percent.
- The FRCC Region does not anticipate any issues that could lead to a large-scale impact to generator availability during the winter season and expects the BES to perform adequately throughout various system operating conditions.

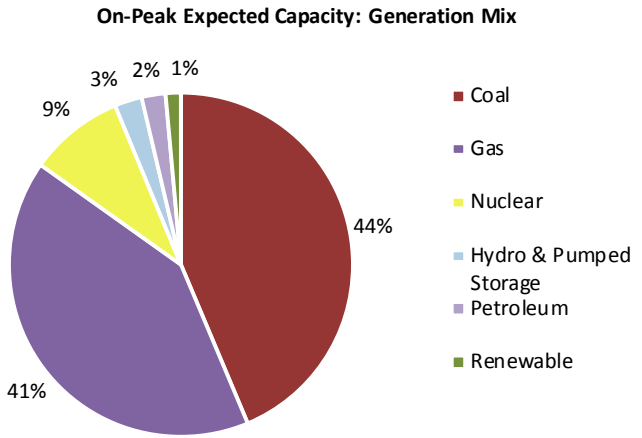


MISO

The Midcontinent Independent System Operator, Inc. (MISO) is a not-for-profit, member-based organization administering wholesale electricity markets that provide customers with valued service; reliable, cost-effective systems and operations; dependable and transparent prices; open access to markets; and planning for long-term efficiency. MISO manages energy, reliability, and operating reserve markets that consist of 36 local Balancing Authorities and 394 market participants, serving approximately 42 million customers. Although parts of MISO fall in three NERC Regions, MRO is responsible for coordinating data and information submitted for NERC's reliability assessments.

The load and resources in the MRO-MAPP Assessment Area has been integrated primarily into SPP, with smaller portions integrated into MISO and WECC (WAPA). This development was considered when comparing 2015-16 and 2016-17 WRA data.

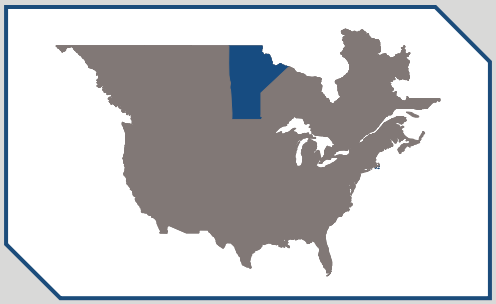




MISO Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	103,965	103,878	-0.08
Demand Response: Available	2,869	4,506	57.0
Net Internal Demand	101,095	99,372	-1.7
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	143,694	145,095	0.97
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	-1,128	-1,994	76.8
Anticipated Resources	142,566	143,101	0.37
Existing-Other Capacity	2,474	2,267	-8.4
Prospective Resources	145,040	146,495	1.0
Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	41.0%	44%	3.0
Prospective Reserve Margin	43.5%	47.4%	3.9
Reference Margin Level	14.3%	15.2%	0.9

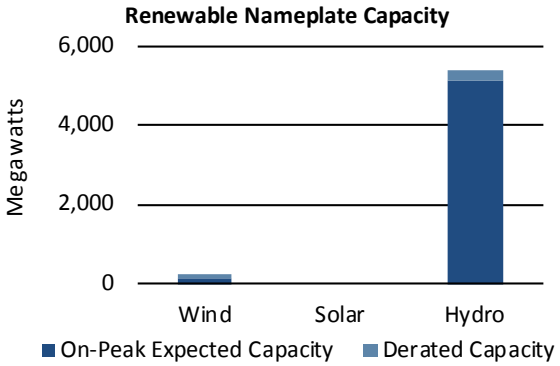
Highlights

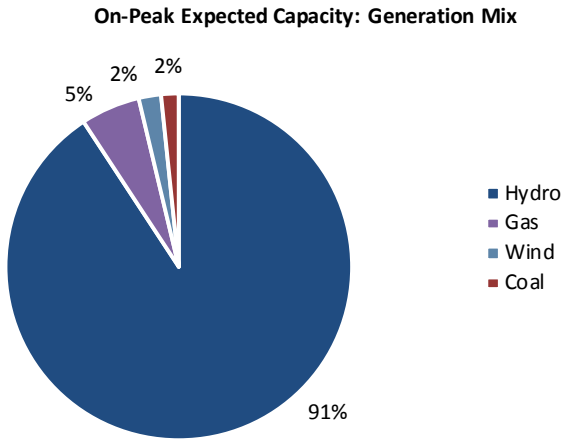
- The anticipated reserve margin is forecasted to be 44 percent, which is above the reference margin level of 15.2 percent.
- Lessons learned from the polar vortex resulted in the implementation of new operational tools and reports and an increase in communication with gas entities. This resulted in improved situational awareness for system operators and Generator Operators, particularly during extreme events. These actions also include holding the winter readiness workshop that reviews resource and transmission adequacy, operating procedures, and overall reliability of the BPS.



MRO-Manitoba Hydro

Manitoba Hydro is a provincial crown corporation that provides electricity to 556,000 customers throughout Manitoba and natural gas service to 272,000 customers in various communities throughout southern Manitoba. The Province of Manitoba is 250,946 square miles. Manitoba Hydro is winter peaking. No change in the footprint area is expected during the assessment period. Manitoba Hydro is its own Planning Coordinator and Balancing Authority. Manitoba Hydro is a coordinating member of MISO. MISO is the Reliability Coordinator for Manitoba Hydro.

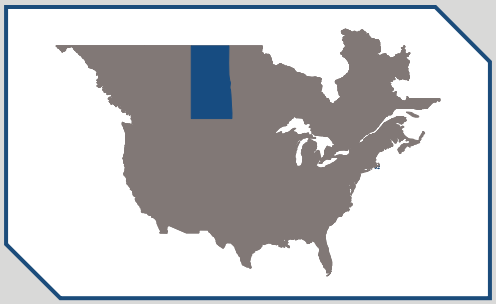




MRO-Manitoba Hydro Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	4,378	4,709	7.6
Demand Response: Available	0	0	-
Net Internal Demand	4,378	4,709	7.6
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	5,304	5,460	2.8
Tier 1 Planned Capacity	0	1	-
Net Firm Capacity Transfers	30	-92	-406.7
Anticipated Resources	5,334	5,368	0.6
Existing-Other Capacity	151	109	-27.8
Prospective Resources	5,485	5,477	-0.14
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	21.8%	14%	-7.8
Prospective Reserve Margin	25.3%	16.3%	-9
Reference Margin Level	12.0%	12.0%	-

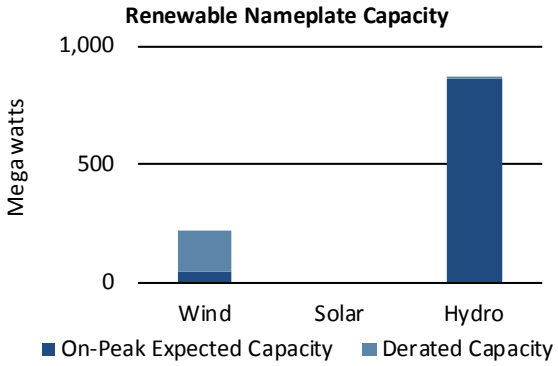
Highlights

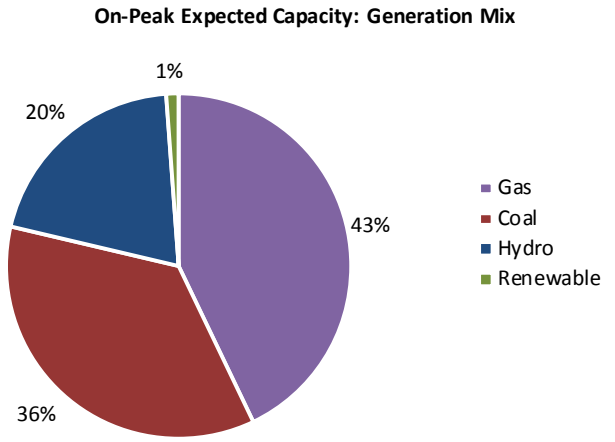
- The anticipated reserve margin is forecasted to be 14 percent, which is above the reference margin level of 12 percent. This change from the prior year is primarily due to a forecasted increase in net internal demand by 7.6 percent.
- No significant operational challenges are anticipated that would impact BPS reliability for 2016–17 winter season.



MRO-SaskPower

Saskatchewan is a province of Canada and comprises a geographic area of 651,900 square kilometers (251,700 square miles) with approximately 1.1 million people. Peak demand is experienced in the winter. The Saskatchewan Power Corporation (SaskPower) is the Planning Coordinator and Reliability Coordinator for the province of Saskatchewan and is the principal supplier of electricity in the province. SaskPower is a provincial crown corporation and, under provincial legislation, is responsible for the reliability oversight of the Saskatchewan bulk electric system and its interconnections.

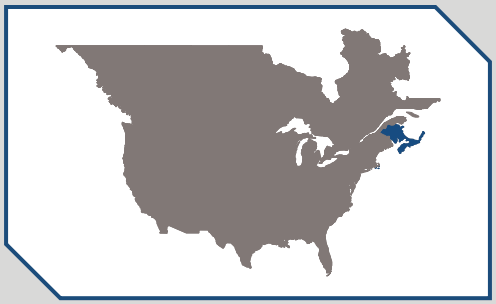




MRO-SaskPower Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	3,675	3,636	-1.1
Demand Response: Available	244	85	-65.2
Net Internal Demand	3,431	3,551	3.5
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	4,169	4,277	2.6
Tier 1 Planned Capacity	0	1	100
Net Firm Capacity Transfers	25	25	-
Anticipated Resources	4,194	4,303	2.6
Existing-Other Capacity	0	0	-
Prospective Resources	4,194	4,303	2.6
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	22.2%	21.2%	-1.0
Prospective Reserve Margin	22.2%	21.2%	-1.0
Reference Margin Level	11.0%	11.0%	-

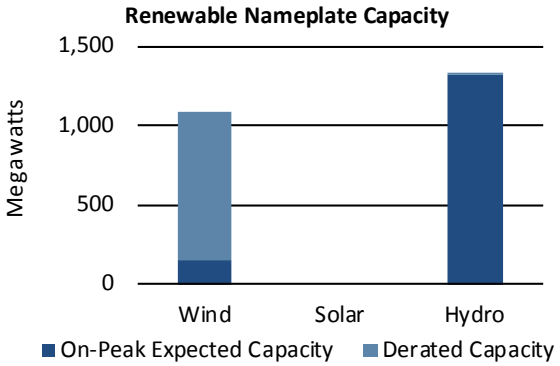
Highlights

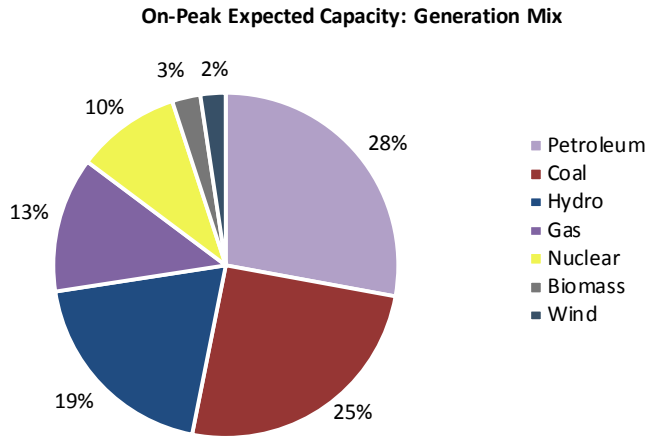
- The anticipated reserve margin is forecasted to be 21.2 percent, above the reference margin level of 11 percent.
- The seasonal operating reserve margins for 2016–17 winter will be adequate with no significant seasonal constraints identified at this time.



NPCC-Maritimes

The Maritimes Assessment Area is a winter-peaking NPCC subregion that contains two Balancing Authorities. It is comprised of the Canadian provinces of New Brunswick, Nova Scotia, and Prince Edward Island, and the northern portion of Maine, which is radially connected to the New Brunswick power system. The area covers 58,000 square miles, with a total population of 1.9 million people.

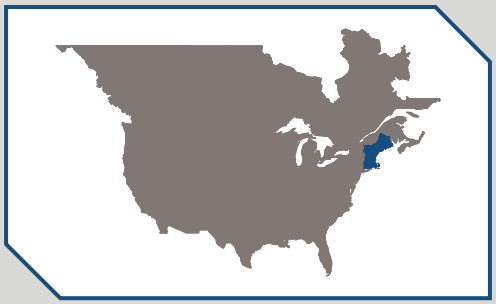




NPCC-Maritimes Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	5,509	5,560	0.9
Demand Response: Available	256	268	4.6
Net Internal Demand	5,253	5,292	0.74
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	6,816	6,641	-2.6
Tier 1 Planned Capacity	0	27	-
Net Firm Capacity Transfers	0	-200	-
Anticipated Resources	6,816	6,468	-5.1
Existing-Other Capacity	0	20	-
Prospective Resources	6,816	6,488	-4.8
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	29.7%	22.2%	-7.5
Prospective Reserve Margin	29.7%	22.6%	-7.1
Reference Margin Level	15.00%	20.00%	5.0

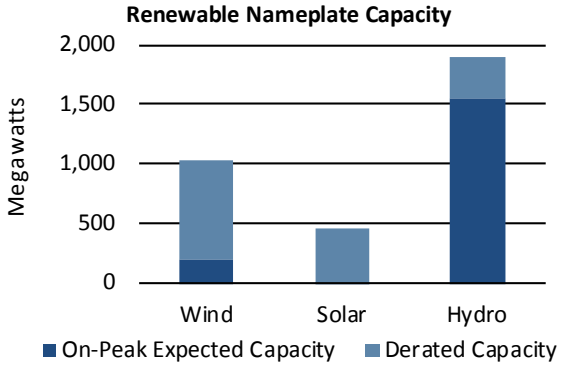
Highlights

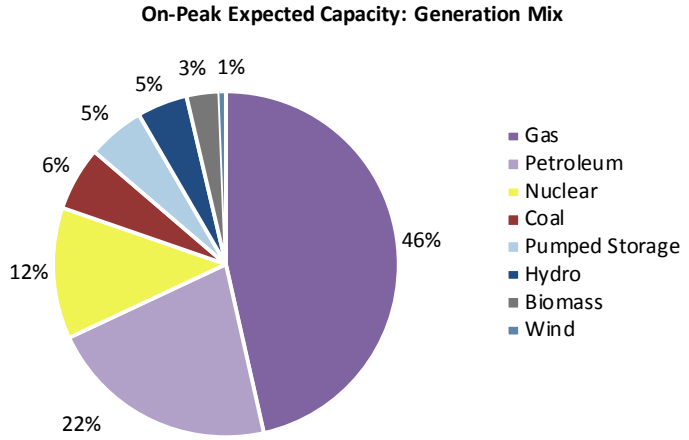
- The anticipated reserve margin is forecasted to be 22.2 percent, which is above the reference margin level of 20 percent. This change from the prior year is primarily due to a forecasted decrease in anticipated resources by 5.1 percent.
- The Maritime area does not expect any interruption to the supply to its gas-fired generation facilities.



NPCC-New England

ISO New England (ISO-NE) Inc. is a regional transmission organization that serves Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. It is responsible for the reliable day-to-day operation of New England's bulk power generation and transmission system and also administers the area's wholesale electricity markets and manages the comprehensive planning of the regional BPS. The New England regional electric power system serves approximately 14.5 million people over 68,000 square miles.

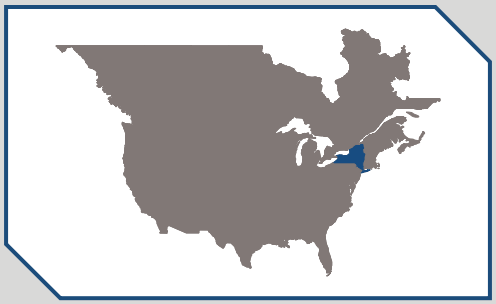




NPCC-New England Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	21,077	21,340	1.2
Demand Response: Available	587	543	-7.5
Net Internal Demand	20,490	20,797	1.5
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	25,002	25,647	2.5
Tier 1 Planned Capacity	80	82	2.4
Net Firm Capacity Transfers	1,226	1,037	-18.4
Anticipated Resources	26,308	26,766	1.7
Existing-Other Capacity	7,020	6,251	-12.3
Prospective Resources	33,328	33,017	-0.9
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	28.4%	28.70%	1.1
Prospective Reserve Margin	62.6%	58.76%	-6.5
Reference Margin Level	16.7%	17.6%	0.9

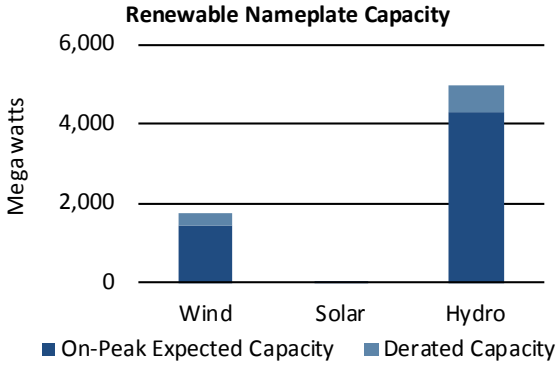
Highlights

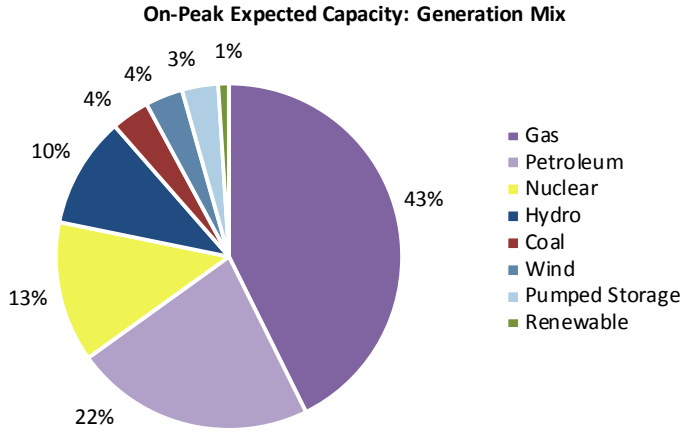
- The anticipated reserve margin is forecasted to be 28.7 percent for the winter season, which is above the reference margin level of 17.6 percent.
- ISO-NE's long- and short-term outage coordination efforts evaluate and account for gas-fired generation at risk in determining sufficient capacity margins.
- For the 2016–17 winter capacity period, ISO-NE forecasts approximately 3,450 MW of capacity could be at risk when natural gas pipelines become constrained.
- NERC conducted an operational risk analysis that studied an extreme case scenario in NERC's *Short-Term Special Assessment*.



NPCC-New York

The New York Independent System Operator (NYISO) is the only Balancing Authority (NYBA) within the state of New York. NYISO is a single-state ISO that was formed as the successor to the New York Power Pool—a consortium of the eight IOUs—in 1999. NYISO manages the New York State transmission grid, encompassing approximately 11,000 miles of transmission lines, over 47,000 square miles, and serving the electric needs of 19.5 million people. New York experienced its all-time peak load of 33,956 MW in the summer of 2013.

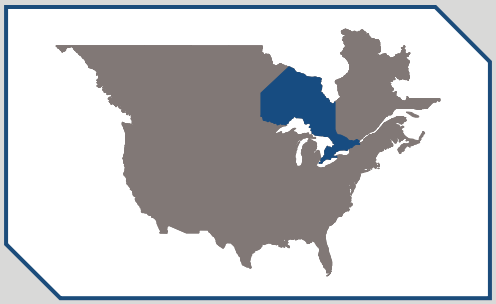




NPCC-New York Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	24,515	24,445	-0.28
Demand Response: Available	885	842	-4.8
Net Internal Demand	23,630	23,603	-0.11
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	41,312	41,445	0.32
Tier 1 Planned Capacity	0	0	-
Net Firm Capacity Transfers	338	504	49.1
Anticipated Resources	41,725	41,948	0.53
Existing-Other Capacity		0	-
Prospective Resources	41,650	42,170	1.2
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	76%	77.7%	1.7
Prospective Reserve Margin	76%	78.7%	2.7
Reference Margin Level	17.0%	17.5%	0.5

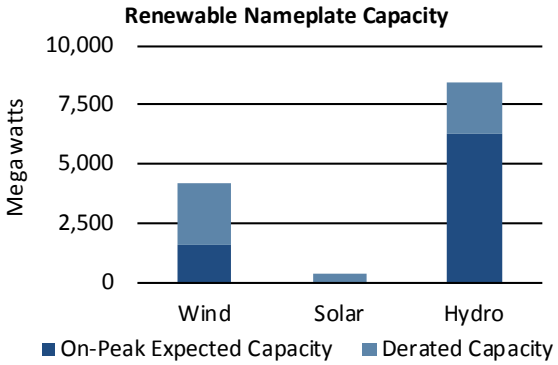
Highlights

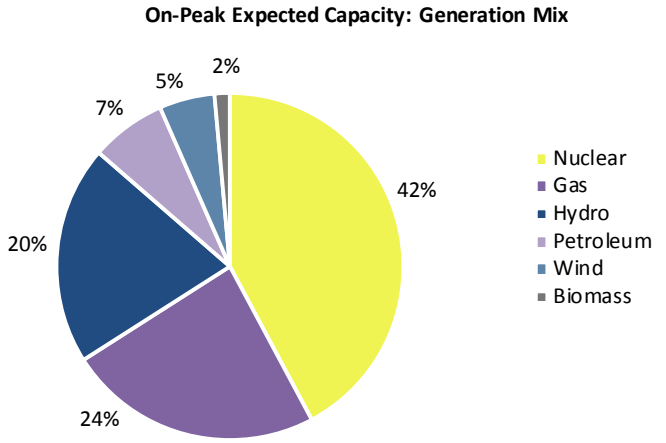
- The anticipated reserve margin is forecasted to be 77.7 percent, which is above the reference margin level of 17.5 percent.
- There no concerns are anticipated for the reliable operation of the bulk power system for the winter period.



NPCC-Ontario

The Independent Electricity System Operator (IESO) is the Balancing Authority for the province of Ontario. The province of Ontario covers more than 1 million square kilometers (415,000 square miles) and has a population of more than 13 million people. Ontario is interconnected electrically with Québec, MRO-Manitoba, states in MISO (Minnesota and Michigan), and NPCC-New York.

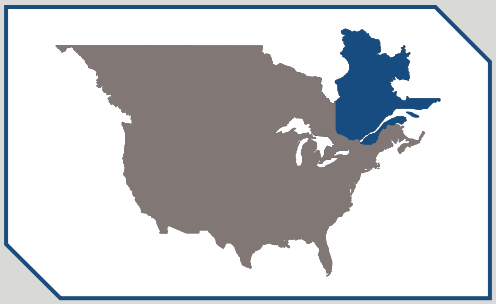




NPCC-Ontario Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	22,389	21,981	-1.8
Demand Response: Available	555	692	24.7
Net Internal Demand	21,834	21,289	-2.5
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	29,197	28,021	-4.0
Tier 1 Planned Capacity	560	571	2.0
Net Firm Capacity Transfers	-500	-500	-
Anticipated Resources	29,256	28,092	-4.0
Existing-Other Capacity	0	0	-
Prospective Resources	29,256	28,092	-4.0
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	34.0%	32%	-2.0
Prospective Reserve Margin	34.0%	32%	-2.0
Reference Margin Level	19.1%	18.1%	-1.0

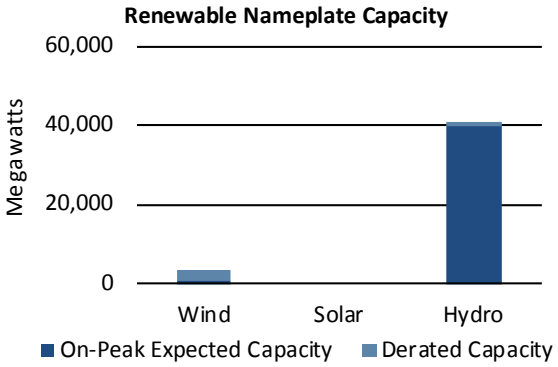
Highlights

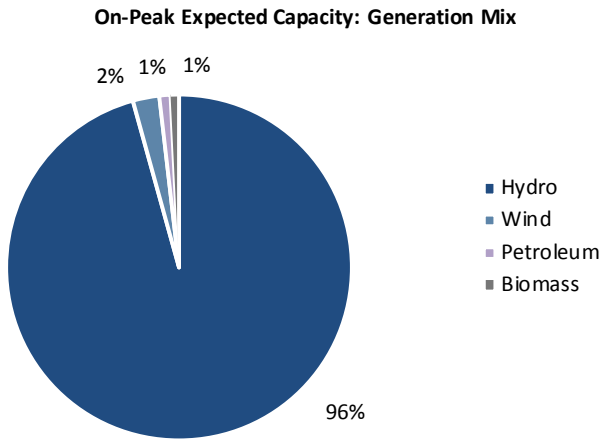
- The anticipated reserve margin is forecasted to be 32 percent, which is above the reference margin level of 18.1 percent.
- Ontario has a robust gas supply and storage system, and the IESO does not expect any gas supply or delivery issues.



NPCC-Québec

The Québec Assessment Area (Province of Québec) is a winter-peaking NPCC sub region that covers 595,391 square miles with a population of eight million. Québec is one of the four NERC interconnections in North America, with ties to Ontario, New York, New England, and the Maritimes, consisting of either HVDC ties or radial generation or load to and from neighboring systems.

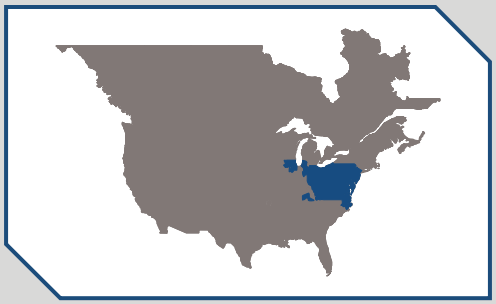




NPCC-Québec Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	38,252	37,870	-1.0
Demand Response: Available	1,899	2,018	6.3
Net Internal Demand	36,353	35,852	-1.3
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	40,844	41,277	1.4
Tier 1 Planned Capacity	315	98	-68.9
Net Firm Capacity Transfers	26	-326	-1353.8
Anticipated Resources	41,117	41,049	-0.16
Existing-Other Capacity	0	0	-
Prospective Resources	41,117	42,149	2.5
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	13.1%	14.5%	1.4
Prospective Reserve Margin	13.1%	17.6%	4.5
Reference Margin Level	11.7%	11.9%	0.2

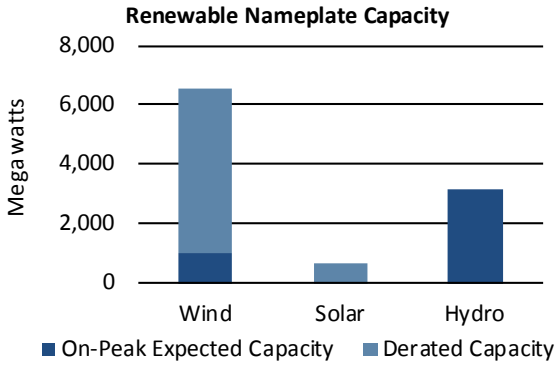
Highlights

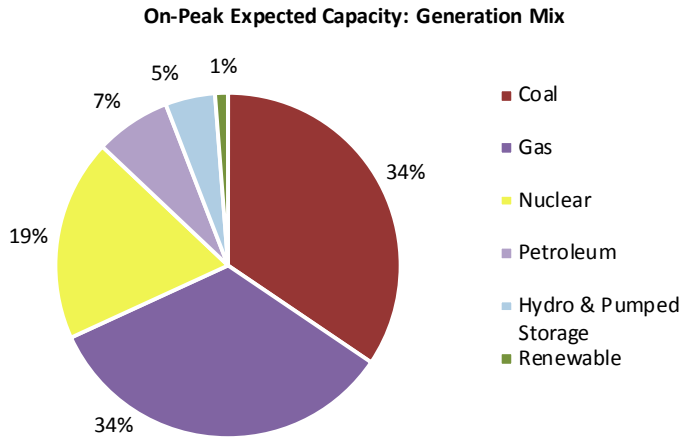
- The anticipated reserve margin is forecasted to be 14.5 percent, which is above the reference margin level of 11.9 percent



PJM

PJM Interconnection is a regional transmission organization (RTO) that coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia, and the District of Columbia. PJM serves 61 million people and covers 243,417 square miles. PJM is a Balancing Authority, Planning Coordinator, Transmission Planner, Resource Planner, Interchange Authority, Transmission Operator, Transmission Service Provider, and Reliability Coordinator.

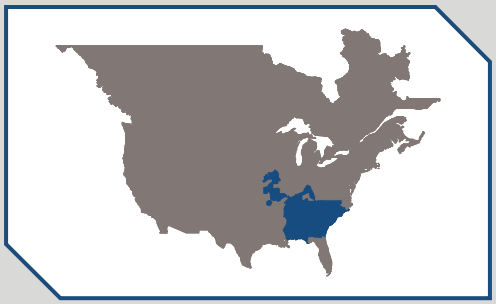




PJM Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	131,721	132,482	0.57
Demand Response: Available	525	138	-73.7
Net Internal Demand	131,196	132,344	-0.87
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	174,697	179,502	2.7
Tier 1 Planned Capacity	5,569	0	-100.0
Net Firm Capacity Transfers	2,942	5,353	81.9
Anticipated Resources	183,208	184,855	0.9
Existing-Other Capacity	0	0	-
Prospective Resources	183,208	184,877	0.9
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	39.6%	39.7%	0.1
Prospective Reserve Margin	39.6%	39.7%	0.1
Reference Margin Level	15.6%	16.4%	0.8

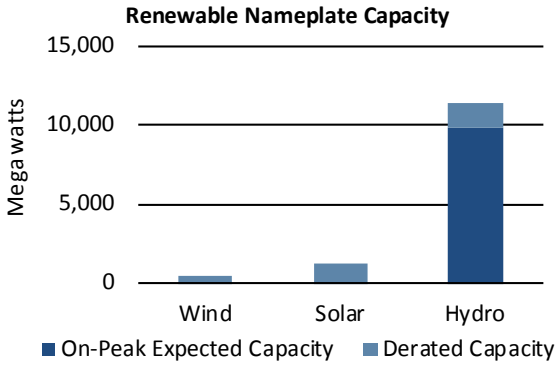
Highlights

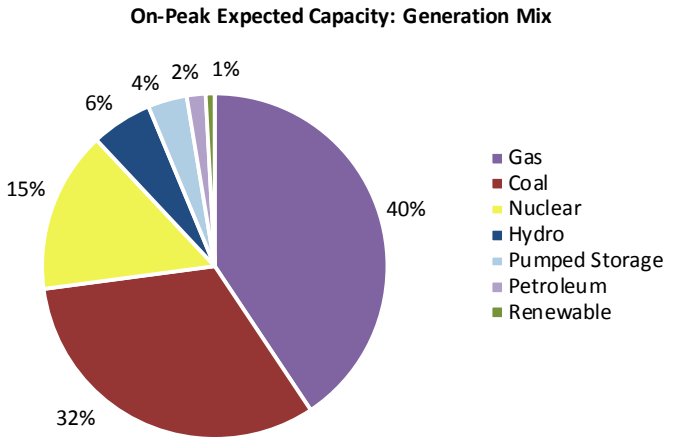
- The anticipated reserve margin is forecasted to be 39.7 percent, which is above the reference margin level of 16.4 percent.
- With the implementation of the capacity performance initiatives, PJM anticipates that the amount of natural gas interruptions on an extreme cold weather day or extended period of extreme cold weather would be less than 4% of total installed capacity.



SERC

SERC is a summer-peaking assessment area that covers approximately 308,900 square miles and serves a population estimated at 39.4 million. SERC is divided into three assessment areas: SERC-E, SERC-N, and SERC-SE. The SERC Region includes 11 Balancing Authorities: Alcoa Power Generating, Inc.–Yadkin Division (Yadkin), Associated Electric Cooperative, Inc. (AECI), Duke Energy Carolinas and Duke Energy Progress (Duke), Electric Energy, Inc. (EEI), LG&E and KU Services Company (as agent for Louisville Gas and Electric (LG&E) and Kentucky Utilities (KU)), PowerSouth Energy Cooperative (PowerSouth), South Carolina Electric & Gas Company (SCE&G), South Carolina Public Service Authority (Santee Cooper, SCPSA), Southern Company Services, Inc. (Southern), and Tennessee Valley Authority (TVA).

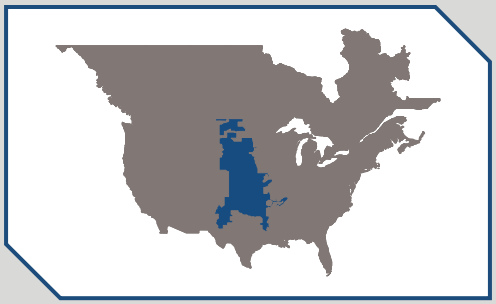




SERC Resource Adequacy Data						
Demand, Resource, and Reserve Margins	**SERC-E**	**SERC-N**	**SERC-SE**	**2015-16 WRA SERC Total**	**2016-17 WRA SERC Total**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts**	**Megawatts**	**Megawatts**	**Megawatts**	**Megawatts**	**Net Change (%)**
Total Internal Demand (50/50)	43,018	41,699	45,647	126,884	130,364	2.7
Demand Response: Available	643	1,668	2,216	4,380	4,527	3.3
Net Internal Demand	42,375	40,031	43,431	122,504	125,837	2.7
Resource Projections	**Megawatts**	**Megawatts**	**Megawatts**	**Megawatts**	**Megawatts**	**Net Change (%)**
Existing-Certain Capacity	52,875	52,573	59,763	171,929	165,210	-3.9
Tier 1 Planned Capacity	0	1,211	883	1,355	2,094	54.5
Net Firm Capacity Transfers	499	569	50	-3,727	1,118	130.0
Anticipated Resources	53,374	54,353	60,696	169,556	168,422	-0.67
Existing-Other Capacity	304	1,920	453	2,220	2,678	20.6
Prospective Resources	54,149	58,445	62,757	171,777	175,352	2.0
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Percent (%)**	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	26%	35.8%	39.7%	27.7%	25.3%	-2.4
Prospective Reserve Margin	27.8%	46.0%	44.5%	28.7%	28.2%	-0.5
Reference Margin Level	15.0%	15.0%	15.0%	15.0%	15.0%	0.0

Highlights

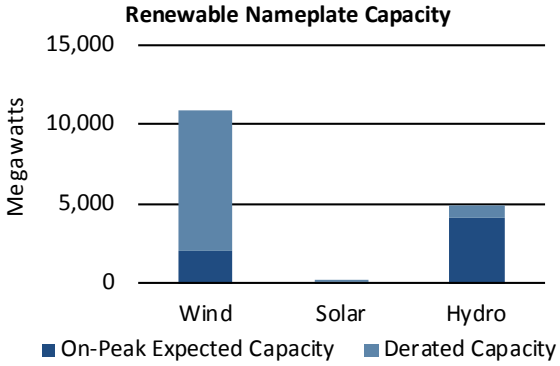
- Anticipated reserve margins for all areas are forecasted to be above the reference margin level of 15 percent
- Dual fuel units are exercised on a regular schedule, and adequate supplies of alternative fuel are generally stored on-site
- Some natural-gas-fired units use secondary or interruptible pipeline transportation capacity and fuel oil.
- Salt dome storage facilities are available to mitigate gas supply interruptions

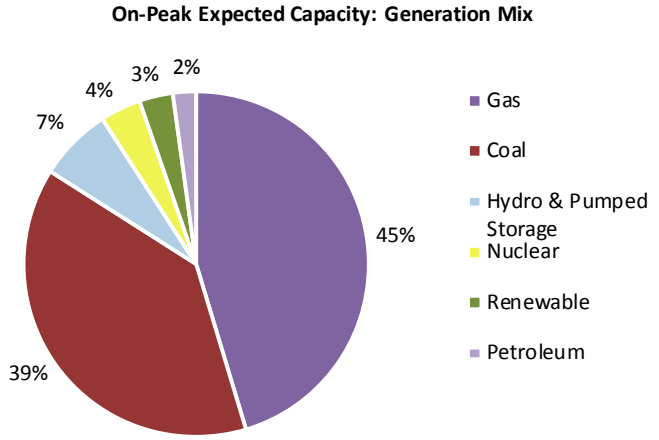


SPP

Southwest Power Pool (SPP) Planning Coordinator footprint covers 575,000 square miles and encompasses all or parts of Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas and Wyoming. The SPP Long-Term Assessment is reported based on the Planning Coordinator footprint, which touches parts of the Southwest Power Pool Regional Entity, Midwest Reliability Organization Regional Entity, and Western Electricity Coordinating Council. The SPP Assessment Area footprint has approximately 61,000 miles of transmission lines, 756 generating plants, and 4,811 transmission-class substations, and it serves a population of 18 million people.

The load and resources in the MRO-MAPP Assessment Area has been integrated primarily into SPP, with smaller portions integrated into MISO and WECC (WAPA). This development was considered when comparing 2015-16 and 2016-17 WRA data.

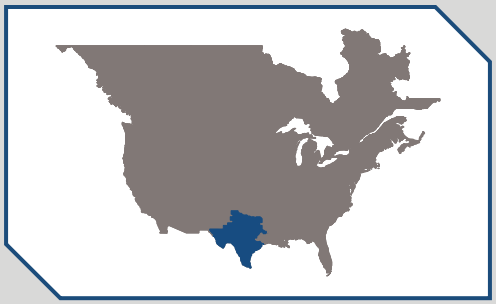




SPP Resource Adequacy Data*			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	41,766	40,618	-2.7
Demand Response: Available	766	369	-51.8
Net Internal Demand	41,000	40,249	-1.8
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	67,566	65,847	-2.5
Tier 1 Planned Capacity	761	754	-0.9
Net Firm Capacity Transfers	-509	-1,537	202
Anticipated Resources	67,819	65,064	-4.0
Existing-Other Capacity	125	100	-20
Prospective Resources	67,944	64,512	-5.0
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	65.4%	62%	-3.4
Prospective Reserve Margin	65.7%	60.3%	-5.4
Reference Margin Level	13.6%	13.6%	0.0

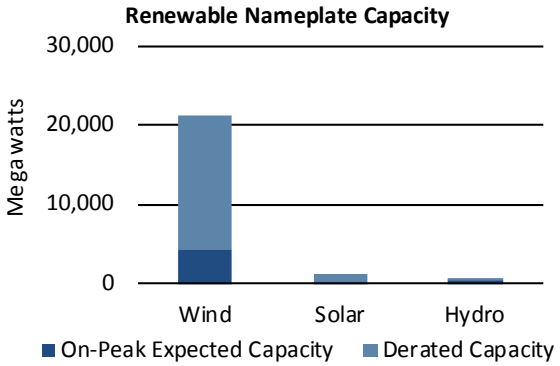
Highlights

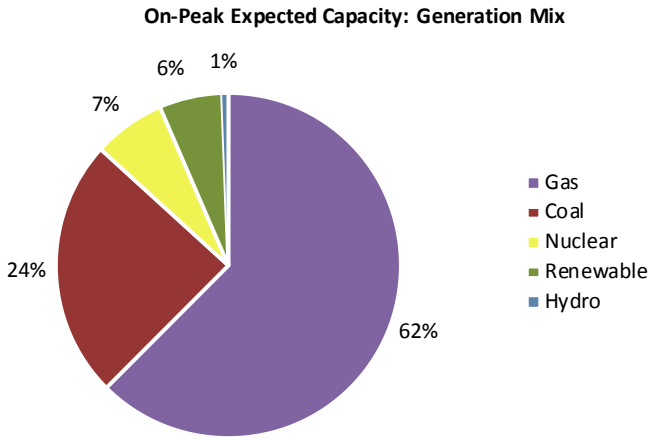
- The anticipated reserve margin is forecasted to be 62 percent, which is above the reference margin level of 13.6 percent.
- SPP members monitor their fuel supplies and inventories and keep the SPP RTO informed of any generation experiencing (or projected to experience) impacts due to fuel limitations.



Texas RE-ERCOT

The Electric Reliability Council of Texas (ERCOT) is the ISO for the ERCOT Interconnection and is located entirely in the state of Texas; it operates as a single Balancing Authority. ERCOT is a summer-peaking Region that covers approximately 200,000 square miles, connects 40,530 miles of transmission lines, and 566 generation units, and serves 23 million customers. The Texas Reliability Entity (Texas RE) is responsible for the RE functions described in the Energy Policy Act of 2005 for the ERCOT Region.

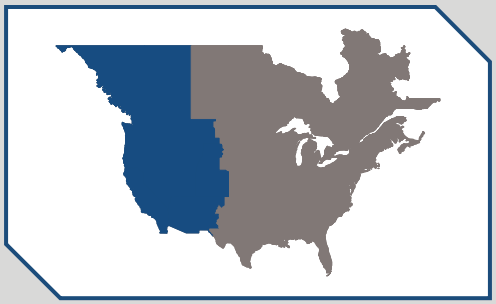




Texas RE-ERCOT Resource Adequacy Data			
Demand, Resource, and Reserve Margins	**2015-16 WRA**	**2016-17 WRA**	**2015-16 vs. 2016-17 WRA**
Demand Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Total Internal Demand (50/50)	53,719	58,591	9.1
Demand Response: Available	2,338	2,484	6.2
Net Internal Demand	51,381	56,107	9.2
Resource Projections	**Megawatts (MW)**	**Megawatts (MW)**	**Net Change (%)**
Existing-Certain Capacity	76,654	73,836	-3.7
Tier 1 Planned Capacity	820	2,238	173
Net Firm Capacity Transfers	1,177	835	-29.0
Anticipated Resources	78,197	76,909	-1.6
Existing-Other Capacity	0	0	0
Prospective Resources	78,197	78,160	-0.04
Planning Reserve Margins	**Percent (%)**	**Percent (%)**	**Annual Difference**
Anticipated Reserve Margin	52.2%	37.1%	-15.1
Prospective Reserve Margin	52.2%	39.3%	-12.9
Reference Margin Level	13.75%	13.75%	0.0

Highlights

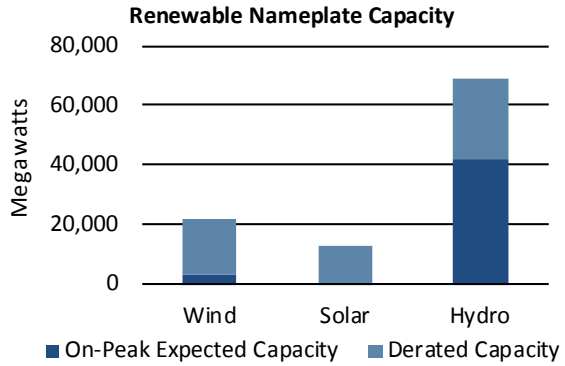
- The anticipated reserve margin is forecasted to be 37.1 percent, which is above the reference margin level of 13.75 percent. This change from the prior year is primarily due to a forecasted increase in net internal demand by 9.2 percent and a forecasted decrease in anticipated resources by 1.6 percent.
- Since May 2016, about 660 MW of installed gas-fired capacity have begun commercial operation in ERCOT as well as over 700 MW of nameplate wind capacity.

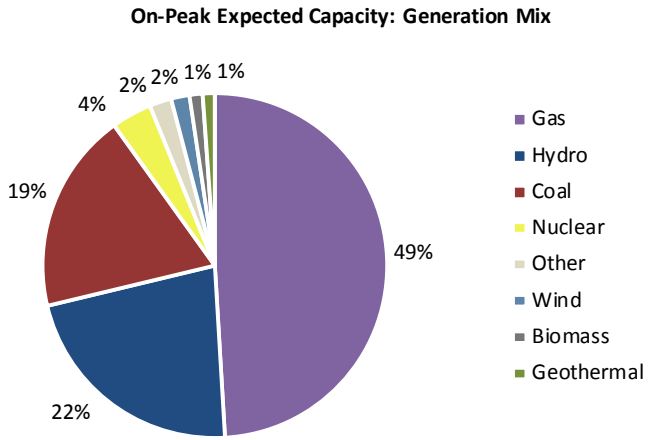


WECC

The Western Electricity Coordinating Council (WECC) is responsible for coordinating and promoting Bulk Electric System reliability in the Western Interconnection. WECC's 329 members, which include 38 Balancing Authorities, represent a wide spectrum of organizations with an interest in the BES. Serving an area of nearly 1.8 million square miles and approximately 82.2 million people, it is geographically the largest and most diverse of the NERC Regional Entities. WECC's service territory extends from Canada to Mexico. It includes the provinces of Alberta and British Columbia in Canada, the northern portion of Baja California in Mexico, and all or portions of the 14 western states in between. The WECC Assessment Area is divided into five subregions: Rocky Mountain Reserve Group (RMRG), Southwest Reserve Sharing Group (SRSG), California/Mexico (CA/MX), and the Northwest Power Pool (NWPP), which is further divided into the NW-Canada and NW-US areas. These subregional divisions are used for this study, as they are structured around reserve sharing groups that have similar annual demand patterns and similar operating practices.

The load and resources in the MRO-MAPP Assessment Area has been integrated primarily into SPP, with smaller portions integrated into MISO and WECC (WAPA). This development was considered when comparing 2015-16 and 2016-17 WRA data.





WECC Resource Adequacy Data

Demand, Resource, and Reserve Margins	CA/MX	NWPP CA	NWPP US	RMRG	SRSG	2015-16 WRA WECC Total	2016-17 WRA WECC Total	2015-16 vs. 2016-17 WRA
Demand Projections	**MW**	**MW**	**MW**	**MW**	**MW**	**MW**	**MW**	**Net Change (%)**
Total Internal Demand (50/50)	39,528	23,186	46,922	10,311	14,737	134,007	133,655	-0.26
Demand Response: Available	873	0	9	297	306	1,844	1,485	-19.4
Net Internal Demand	38,655	23,186	46,913	10,014	14,431	132,163	132,170	0.005
Resource Projections	**MW**	**MW**	**MW**	**MW**	**MW**	**MW**	**MW**	**Net Change (%)**
Existing-Certain Capacity	54,720	27,987	58,929	18,617	32,365	188,890	193,773	2.5
Tier 1 Planned Capacity	667	652	654	0	200	1,974	1,566	-20.7
Net Firm Capacity Transfers	-160	215	2,083	-2,323	-3,025	0	0	-
Anticipated Resources	55,227	28,854	61,666	16,294	29,541	190,864	195,339	2.3
Existing-Other Capacity	0	0	0	0	0	0	0	-
Prospective Resources	55,227	28,854	61,666	16,294	29,541	190,864	195,339	2.3
Planning Reserve Margins	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**Annual Difference**
Anticipated Reserve Margin	42.9%	24.4%	31.4%	62.7%	104.7%	44.9%	47.8%	2.9
Prospective Reserve Margin	42.9%	24.4%	31.4%	62.7%	104.7%	44.4%	47.8%	2.9
Reference Margin Level	13.50%	10.96%	17.50%	11.65%	12.11%	17.70%	14.27%	-3.43

Highlights

- The *Aliso Canyon Winter Risk Assessment Technical Report* was developed through coordination between the CPUC, CEC, CAISO, LADWP, and SoCalGas. This report provides a more detailed analysis of the storage facility and the possible impacts to reliability in the LA Basin.
- The anticipated reserve margins for all WECC subregions will remain above their respective reference margin levels throughout the 2016–17 winter.

Data Concepts and Assumptions Guide

The table below explains data concepts and important assumptions used throughout this assessment.

General Assumptions
The reserve margin calculation is an important industry planning metric used to examine future resource adequacy.
All data in this assessment are based on existing federal, state, and provincial laws and regulations.
Differences in data collection periods for each assessment area should be considered when comparing demand and capacity data between the 2015 and 2016 SRA.
Demand Assumptions
Electricity demand projections, or load forecasts, are provided by each assessment area.
Load forecasts include peak hourly load,[5] or total internal demand, for the summer and winter of each year.[6]
Total internal demand projections are based on normal weather (50/50 distribution)[7] and are provided on a coincident[8] basis for most assessment areas.
Net internal demand, used in all reserve margin calculations, and is equal to total internal demand, reduced by the amount of controllable and dispatchable demand response projected to be available during the peak hour.
Resource Assumptions
Resource planning methods vary throughout the North American BPS. NERC uses the following categories to provide a consistent approach for collecting and presenting resource adequacy:
Anticipated Resources • Existing-certain capacity: Included in this category are commercially operable generating units, or portions of generating units, that meet at least one of the following requirements when examining the period of peak demand for the winter season: (1) unit must have a firm capability and have a power purchase agreement (PPA) with firm transmission must be in effect for the unit; (2) unit must be classified as a designated network resource; (3) where energy-only markets exist, unit must be a designated market resource eligible to bid into the market. • Tier 1 capacity additions: includes capacity that either is under construction or has received approved planning requirements. • Net firm capacity transfers (imports minus exports): transfers with firm contracts.
Prospective Resources: Includes all anticipated resources, plus: • Existing-other capacity: included in this category are commercially operable generating units, or portions of generating units, that are expected to be available to serve load for the period of peak demand for the winter season, but do not meet the requirements of existing-certain.
Reserve Margins
Reserve Margins: the primary metric used to measure resource adequacy, defined as the difference in resources (anticipated or prospective) and net internal demand, divided by net internal demand, shown as a percentile.

Anticipated Reserve Margin =	(Anticipated Resources – Net Internal Demand) / Net Internal Demand
Prospective Reserve Margin =	(Prospective Resources – Net Internal Demand) / Net Internal Demand

[5] *Glossary of Terms* Used in NERC Reliability Standards

[6] The summer season represents June–September and the winter season represents December–February.

[7] Essentially, this means that there is a 50% probability that actual demand will be higher and a 50% probability that actual demand will be lower than the value provided for a given season/year.

[8] Coincident: The sum of two or more peak loads that occur in the same hour. Noncoincident: The sum of two or more peak loads on individual systems that do not occur in the same time interval. Meaningful only when considering loads within a limited period of time, such as a day, a week, a month, a heating or cooling season, and usually for not more than one year. SERC and FRCC calculate total internal demand on a noncoincidental basis.

Reference Margin Level: the assumptions of this metric vary by assessment area. The reference margin level is typically based on load, generation, and transmission characteristics for each assessment area and, in some cases, the reference margin level is a requirement implemented by the respective state(s), provincial authorities, ISO/RTO, or other regulatory bodies. If such a requirement exists, the respective assessment area generally adopts this requirement as the reference margin level. In some cases, the reference margin level will fluctuate over the duration of the assessment period, or may be different for the summer and winter seasons. If one is not provided by a given assessment area, NERC applies a 15% reference margin level for predominately thermal systems and 10% for predominately hydro systems.
On-Peak Expected Capacity Generation Mix – Generation mix is aggregated from 2016 LTRA data. Fuel types with nominal quantities were aggregated together as fuel types, renewables, other renewables, or other fuels.
Renewable Nameplate Capacities – These charts include renewable on peak and nameplate (de-rated and expected on peak added together) capacities.