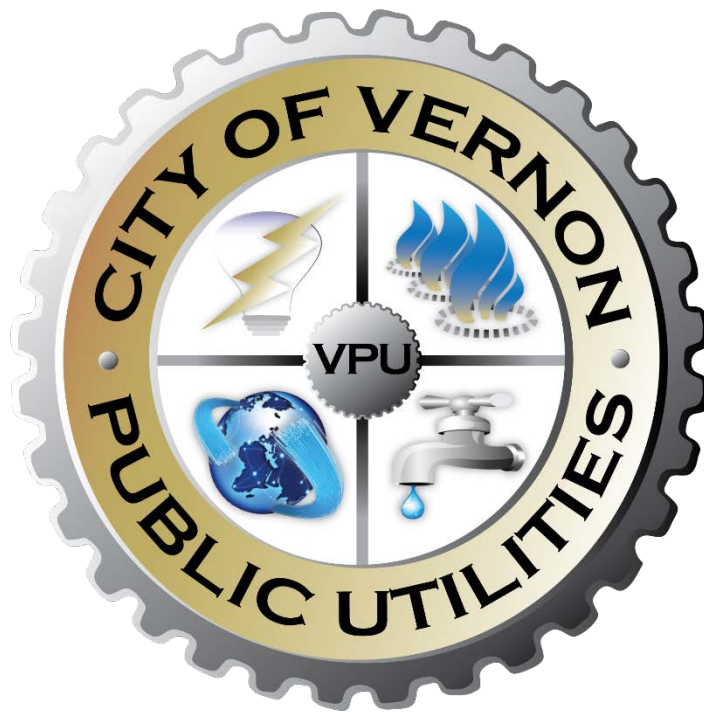


VERNON PUBLIC UTILITIES
2018 INTEGRATED RESOURCE PLAN



GLOSSARY/ACRONYMNS

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ACE – AREA CONTROL ERROR: The instantaneous difference between a [Balancing Authority](#)'s net actual and scheduled interchange, taking into account the effects of frequency bias, correction for meter error, and automatic time error correction.

AGC – AUTOMATIC GENERATOR CONTROL: Equipment that automatically adjusts generation in a [Balancing Authority Area](#) from a central location to maintain the [Balancing Authority](#)'s interchange schedule plus frequency bias. AGC may also accommodate automatic inadvertent payback and time error correction.

ANCILLARY SERVICES: Ancillary services support the reliable operation of the transmission system as it moves high voltage electricity (generally >100 kV) from power plants to retail customers. Current ancillary services in the [CAISO](#) market include: regulation (up and down), spinning reserve, non-spinning reserve, voltage support, and black start.

BA – BALANCING AUTHORITY: The balancing authority is the responsible entity that maintains the balance of load and generation within a [balancing authority area](#), the exchange of power between the balancing authority area and others, and supports interconnection frequency in real time. The California Independent System Operator ([CAISO](#)) is an example of a [balancing authority](#), and it operates a balancing authority area. VPU is in the CAISO balancing authority area.

BAA –BALANCING AUTHORITY AREA: A balancing authority area is the collection of generation, transmission, and electrical loads within the metered boundaries of the balancing authority.



BIOMASS: A renewable energy source made of organic, non-fossil material of biological origin. Sources may include wood, agricultural waste and other living-cell material that can be burned to produce heat energy. They also include algae, sewage and other organic substances that may be used to make energy through chemical processes.

BIOMETHANE OR BIOGAS: A medium Btu gas containing methane and carbon dioxide, resulting from the action of microorganisms on organic materials, such as may occur at a landfill or dairy waste digester. (see also [Landfill Gas](#)).



CAISO – CALIFORNIA INDEPENDENT SYSTEM OPERATOR: CAISO is the California Independent System Operator, an impartial, non-profit corporation that reliably plans and operates the electrical transmission grid for most of the state of California and that operates a day-ahead and real-time wholesale power market. The CAISO is also known as a [balancing authority](#). Most electrical utilities in California, including Vernon Public Utilities, are CAISO members. Non-members include the Los Angeles Department of Water & Power, Sacramento Municipal Utilities Department, Imperial Irrigation District, and cities of Burbank and Glendale. For more information, see the CAISO website at: www.caiso.com.

CARB – CALIFORNIA AIR RESOURCES BOARD: ARB's mission is to promote and protect public health, welfare and ecological resources through the effective and efficient reduction of air pollutants, while recognizing and considering the effects on the state's economy. An 11-member board appointed by the governor governs the ARB. Six of the members are experts in fields such as medicine, chemistry, physics, meteorology, engineering, business and law. Five others are elected officials who represent regional air pollution control agencies--one each from the Los Angeles region, the San Francisco Bay area, San Diego, the San Joaquin Valley and another to represent other, more rural areas of the state. The ARB also oversees the activities of 35 local and regional air pollution control districts. These districts regulate industrial pollution sources. They also issue permits, develop local plans to attain healthy air quality and ensure that the industries in their area adhere to air quality mandates.¹

CCCT – COMBINED CYCLE COMBUSTION TURBINE: A combined-cycle power plant uses both a gas and a steam turbine together to produce up to 50 percent more electricity from the same fuel than a traditional simple-cycle plant. The waste heat from the gas turbine is routed to the nearby steam turbine, which generates extra power. This is how a combined-cycle plant works to produce electricity and captures waste heat from the gas turbine to increase efficiency and electrical output:

1. Gas turbine burns fuel.
 - a. The gas turbine compresses air and mixes it with fuel that is heated to a very high temperature. The hot air-fuel mixture moves through the gas turbine blades, making them spin.
 - b. The fast-spinning turbine drives a generator that converts a portion of the spinning energy into electricity.
2. Heat recovery system captures exhaust.
 - a. A Heat Recovery Steam Generator (HRSG) captures exhaust heat from the gas turbine that would otherwise escape through the exhaust stack.
 - b. The HRSG creates steam from the gas turbine exhaust heat and delivers it to the steam turbine.
 3. Steam turbine delivers additional electricity.
 - c. The steam turbine sends its energy to the generator drive shaft, where it is converted into additional electricity.²

CEC – CALIFORNIA ENERGY COMMISSION: The California Energy Commission (“CEC”), formally the Energy Resources Conservation and Development Commission, is California’s primary energy policy and planning

¹ Source: [California Air Resources Board](#)

² Source: [General Electric - GE Power Combined Cycle Power Plants](#) – How it works



agency. Established by the Legislature in 1974 and located in Sacramento, seven core responsibilities guide the Energy Commission as it sets California energy policy³:

- Forecasting future energy needs;
- Promoting energy efficiency and conservation by setting the state's appliance and building energy efficiency standards;
- Supporting energy research that advances energy science and technology through research, development and demonstration projects;
- Developing renewable energy resources;
- Advancing alternative and renewable transportation fuels and technologies;
- Certifying thermal power plants 50 megawatts and larger;
- Planning for and directing state response to energy emergencies.

The Governor appoints the [commissioners](#) to staggered five-year terms and selects a chair and vice chair from among the members every two years. The appointments require Senate approval. By law, one commission member must be selected from the public at large. The remaining commissioners represent the fields of engineering / physical science, economics, environmental protection, and law.

COGENERATION: Production of electricity from steam, heat, or other forms of energy produced as a byproduct of another process.

COMMUNITY SOLAR (AKA SOLAR GARDENS): Some customers are interested in the benefits of rooftop solar energy systems, but are unable to install them for a variety of reasons, such as the structure or angle of their roof, shading, or because they do not own the property. "Community Shared Solar" projects or "Solar Gardens" offer an alternative for these customers. A shared solar program typically involves a single, larger solar energy system designed to benefit multiple electric consumers by allowing consumers to choose to invest in (or "subscribe" to) the program and receive a portion of the electricity generated by the system with typically lower initial investment costs, economies of scale, and the ability to transfer if they relocate. The output of the customer's participation in these projects can offset a portion or most of their regular power bill.

CONTINGENCY: The unexpected failure or outage of an electric system component, such as a generator, transmission line, circuit breaker, switch or other electrical element.

CPUC – CALIFORNIA PUBLIC UTILITIES COMMISSION: The [California Public Utilities Commission](#) (CPUC) is a regulatory agency that regulates privately owned public utilities (e.g., [Southern California Edison](#), [San Diego Gas & Electric](#), and [Pacific Gas & Electric](#)) in the state of California, including electric power, telecommunications, natural gas, water, railroad, rail transit and passenger transportation companies. The CPUC does not regulate VPU, but some of the policies set by the CPUC are coordinated with the [CAISO](#) and [CEC](#), and may consequently impact VPU.

CY – CALENDAR YEAR: The period of 365 days (or 366 days in leap years) starting from the first of January.

³ Source: [California Energy Commission - About the California Energy Commission](#)



DEMAND: 1. The rate at which electric energy is delivered to or by a system or part of a system, generally expressed in kilowatts or megawatts, at a given instant or averaged over any designated interval of time. 2. The rate at which energy is being used by the customer.

DG – DISTRIBUTED GENERATION: A generator that is located close to the particular load that it is intended to serve. General, but non-exclusive, characteristics of these generators include: an operating strategy that supports the served load; and interconnection to a distribution or sub-transmission system (138 kV or less).

DR – DEMAND RESPONSE: Demand response programs are incentive-based programs that encourage electric power customers to temporarily reduce their demand for power at certain times in exchange for a reduction in their electricity bills. Some demand response programs allow electric power system operators to directly reduce load, while in others, customers retain control. Customer-controlled reductions in demand may involve actions such as curtailing load, operating onsite generation, or shifting electricity use to another time period. Demand response programs are one type of demand-side management, which also covers broad, less immediate programs such as the promotion of energy-efficient equipment in residential and commercial sectors.

DSM – DEMAND SIDE MANAGEMENT: The term for all activities or programs undertaken by a utility or its customers to influence the amount or timing of electricity they use, or any utility action that reduces or curtails end-use equipment or processes. DSM is often used in order to reduce customer load during peak demand and/or in times of supply constraint. DSM includes programs that are focused, deep, and immediate such as the brief curtailment of energy-intensive processes used by a utility's most demanding industrial customers, and programs that are broad, shallow, and less immediate such as the promotion of energy-efficient equipment in residential and commercial sectors.



EE – ENERGY EFFICIENCY: Refers to programs that are aimed at reducing the energy used by specific end-use devices and systems, typically without affecting the services provided. These programs reduce overall electricity consumption, often without explicit consideration for the timing of program-induced savings. Such savings are generally achieved by substituting technologically more advanced equipment to produce the same level of end-use services (e.g. lighting, heating, motor drive) with less electricity. Examples include high-efficiency appliances, efficient lighting programs, high-efficiency heating, ventilating and air conditioning (HVAC) systems or control modifications, efficient building design, advanced electric motor drives, and heat recovery systems.

EIA – ENERGY INFORMATION ADMINISTRATION: An independent agency within the U.S. Department of Energy that develops surveys, collects energy data, and does analytical and modeling analyses of energy issues. The Agency must satisfy the requests of Congress, other elements within the Department of Energy, Federal Energy Regulatory Commission, the Executive Branch, its own independent needs, and assist the general public, or other interest groups, without taking a policy position.⁴

EIM – ENERGY IMBALANCE MARKET: The automated CAISO system balances electricity supply and demand every five minutes by choosing the least-cost resource to meet the needs of the grid. External to the CAISO, however, utilities still manually balance supply and demand. A broader and more precise system helps with the transformation to a more diverse energy mix. Renewable resources introduce new operating dynamics best met by modernized grid dispatching. The EIM technology increases visibility of interconnected systems and uses automated tools to more accurately balance resources, which is why it is referred to as an “energy imbalance market” or EIM. Participants in the [Western EIM](#) are listed in [Table 1](#) below. Participation is open to other regional utilities as well.

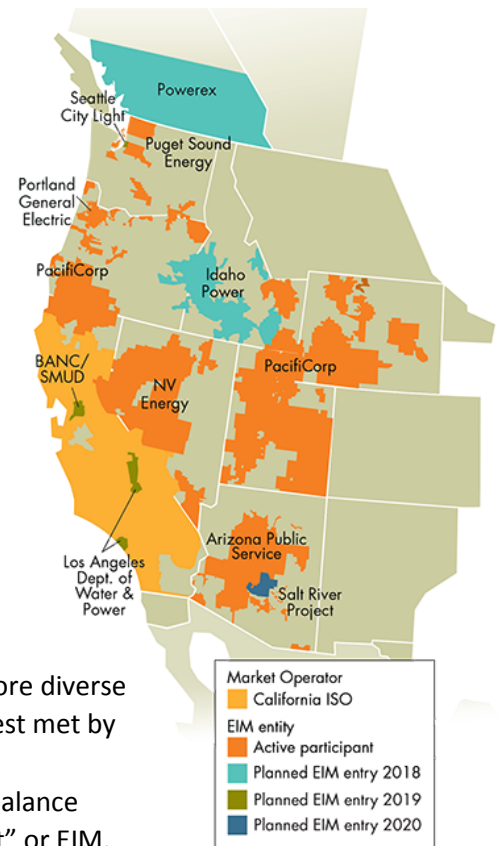


Figure 1 - Western Energy Imbalance Market

Table 1 – Western EIM Participants

PARTICIPANTS	
ACTIVE	PENDING
CAISO	Idaho Power Company (2018)
PacifiCorp (2014)	Powerex (2018)
NV Energy (2015)	Seattle City Light (2019)
Puget Sound Energy (2016)	Los Angeles Dept. of Water & Power (2019)
Arizona Public Service (2016)	Balancing Authority of Northern California/SMUD (2019)
Portland General Electric (2017)	Salt River Project (2020)

⁴ Source: [EIA - EIA Glossary](#)



ELCC – EFFECTIVE LOAD CARRYING CAPACITY: ELCC is a percentage that expresses how well a resource is able to meet reliability conditions and reduce expected reliability problems or outage events (considering availability and use limitations). It is calculated via probabilistic reliability modeling, and yields a single percentage value for a given facility or grouping of facilities. ELCC can be thought of as a derating factor that is applied to a facility’s maximum output ([P_{max}](#)) in order to determine its [QC](#). Because this derating factor is calculated considering both system reliability needs and facility performance, it will reflect not just the output capabilities of a facility but also the usefulness of this output in meeting overall electricity system reliability needs.

ENERGY STORAGE: An energy storage system is a commercially available technology that is capable of absorbing energy, storing it for a period of time, and thereafter dispatching the energy. An energy storage system may be centralized or distributed. Some of the most common examples of energy storage include: various forms of batteries, pumped hydroelectricity, compressed air energy storage, and thermal energy storage.

EPA – U.S. ENVIRONMENTAL PROTECTION AGENCY: The United States Environmental Protection Agency (EPA or sometimes USEPA) is an agency of the U.S. federal government which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.

FERC – FEDERAL ENERGY REGULATORY COMMISSION: The Federal Energy Regulatory Commission⁵ (FERC) is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied natural gas ([LNG](#)) terminals and interstate natural gas pipelines as well as licensing hydropower projects. The Energy Policy Act of 2005 gave FERC additional responsibilities as outlined and updated in its [Strategic Plan](#).

FIT – FEED-IN TARIFF: A feed-in tariff, or “FIT,” is a standard offer contract designed to accelerate investment in renewable energy technologies by offering long-term contracts to renewable energy producers at prices that are typically based on the cost of generation of each technology in order to facilitate project financing.

FRAC – FLEXIBLE RESOURCE ADEQUACY CAPACITY: [CAISO](#) has identified a need for sufficient capacity that is operationally flexible enough to address the uncertainty and variability of changing load profiles and of intermittent energy resources such as wind and solar. Flexible resource adequacy capacity, also known as “FRAC,” is a subset of resource adequacy capacity, with specific operating characteristics, as defined in [Section 40.10 of the CAISO Tariff](#), to address these needs. There are three categories of flexible resource adequacy capacity resources: Base Ramping, Peak Ramping, and Super Peak Ramping.

FY – FISCAL YEAR: The period of 365 days (or 366 days in leap years) starting from the first of **July**, used by VPU for accounting and financial statement purposes.

GHG – GREENHOUSE GAS: A greenhouse gas is any gaseous compound in the atmosphere that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere. Gases such as water

⁵ Source: Federal Energy Regulatory Commission (FERC) - [What FERC Does](#)



vapor, methane, carbon dioxide, ozone, nitrous oxide, and fluorine-containing compounds are called “greenhouse” gases because they trap heat and warm the planet’s surface⁶. Some of these gases are generated naturally, and some through human activities. Policies and regulations that call for reducing GHG emissions are most commonly targeting carbon dioxide (CO²).

GT – GAS TURBINE: A plant in which the prime mover is a gas turbine (typically natural gas-fired). A gas turbine consists typically of an axial-flow air compressor and one or more combustion chambers where liquid or gaseous fuel is burned and the hot gases are passed to the turbine and where the hot gases expand drive the generator and are then used to run the compressor.

IOU – INVESTOR OWNED UTILITY: A privately-owned electric utility whose stock is publicly traded. It is rate regulated and authorized to achieve an allowed rate of return. The three major California IOUs are [Southern California Edison](#) (SCE), [San Diego Gas & Electric](#) (SDG&E), and [Pacific Gas & Electric](#) (PG&E). They are regulated by the [California Public Utilities Commission](#) (CPUC).

IPP – INDEPENDENT POWER PRODUCER: Any entity that owns or operates an electricity generating facility that is not included in an electric utility’s rate base. This term includes, but is not limited to, co-generators, small power producers and all other nonutility electricity producers, such as exempt wholesale generators, who sell electricity.

IRP – INTEGRATED RESOURCE PLAN: An Integrated Resource Plan (IRP) is a long-range (typically 20-year) utility plan for meeting forecasted peak capacity and energy demand, plus some established reserve margin, within a defined geographic area or service territory, through a combination of supply-side and demand-side resources. Supply-side resources may include (i) conventional generation, such as nuclear, coal-fired, natural gas-fired, and large hydroelectric and/or (ii) renewable generation, such as wind, solar, geothermal and bioenergy. Demand-side resources can include conservation or energy efficiency and demand response. The IRP is a comprehensive decision support tool and road map for meeting the objectives of providing reliable, affordable, and environmentally responsible electric service to all customers while addressing the substantial risks and uncertainties inherent in the electric utility business. The IRP is generally updated every couple of years to keep it fresh in response to changing conditions.

KW OR KWH – KILOWATT OR KILOWATT-HOUR: A kilowatt is one thousand watts of electric capacity. A kilowatt-hour is a measure of electricity defined as a unit of work or energy, measured as 1 kilowatt (1,000 watts) of power expended for 1 hour. One kWh is equivalent to 3,412 Btu.

LCR – LOCAL CAPACITY REQUIREMENT: Certain geographical areas have transmission constraints that may limit the amount of generation that can be reliably imported into the area to serve electrical load. These areas are defined by the [CAISO](#) as “local capacity areas.” A minimum amount of internal generation within the constrained transmission boundaries of these local capacity areas must be available to ensure that electrical load will be served reliably. This generation is known as local resource adequacy capacity.

LFG – LANDFILL GAS: Gas that is generated by decomposition of organic material at landfill disposal sites. The average composition of landfill gas is approximately 50 percent methane and 50 percent carbon

⁶ Source: [NASA Jet Propulsion Laboratory - Global Climate Change](#)



dioxide and water vapor by volume. The methane percentage, however, can vary from 40 to 60 percent, depending on several factors including waste composition (e.g. carbohydrate and cellulose content). The methane in landfill gas may be vented, flared, combusted to generate electricity or useful thermal energy on-site, or injected into a pipeline for combustion off-site.

LOCAL SOLAR: Local solar refers to solar power that is located within the VPU distribution service territory and that does not require the use of the high voltage (100 kV and above) bulk transmission grid to import the power into the community. Local solar may be located on individual customer or business rooftops, in parking lots, or may be larger scale ground mounted installations, as long as it is directly connected to the VPU distribution grid.

LOLE/LOLP – LOSS OF LOAD EXPECTATION/LOSS OF LOAD PROBABILITY: The Loss of Load Expectation (LOLE) is an adequacy index that identifies the likelihood that generation will be insufficient to meet demand during a part of the year. [NERC](#) defines this index as:

The expected number of days in the year when the daily peak demand exceeds the available generating capacity.

It is obtained by calculating the probability of daily peak demand exceeding the available capacity for each day and adding these probabilities for all the days in the year. The index is referred to as Hourly Loss-of-Load-Expectation if hourly demands are used in the calculations instead of daily peak demands. LOLE is also sometimes referred to as Loss-of-Load-Probability (LOLP).

LNG – LIQUIFIED NATURAL GAS: Reducing the temperature of natural gas to minus 259 degrees at atmospheric pressure will convert the gas into a liquid. Its volume as a liquid is about 1/600 compared to its volume as a gas.

LRA – LOCAL REGULATORY AUTHORITY: The state or local governmental authority, or the board of directors of an electric cooperative, responsible for the regulation or oversight of a utility. For VPU, the local regulatory authority is the Vernon City Council.

LSE – LOAD SERVING ENTITY: An organization that secures energy and transmission service to serve the electrical demand and energy requirements of its end-use customers. VPU is a load serving entity.

MMBTU – MILLION BRITISH THERMAL UNITS: A British Thermal Unit (BTU) is a measure of the heating value of a fuel (the term MMBtu or “Dekatherm” is commonly used as a measure of natural gas consumption in generation). A Btu is the amount of heat energy required to raise the temperature of one pound of water one degree Fahrenheit.

MW – MEGAWATT: MW stands for megawatt, or one million watts (one thousand kilowatts). A MW is a measure of power or capacity (the potential to do work).

MWH – MEGAWATT-HOUR: MWh is megawatt hour, or one million watts per hour. A MWh is a measure of energy (the amount of work done over an hour). One MWh is one MW of power flowing for one hour. A MWh is equivalent to one thousand 100-watt light bulbs burning for 10 hours.



NERC – NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION: The North American Electric Reliability Corporation (NERC) is a not-for-profit international regulatory authority whose mission is to ensure the reliability of the bulk power system in North America. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the bulk power system 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, 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 bulk power system, which serves more than 334 million people.⁷

NET LOAD: In the context of reliability and resource planning, net load is the difference between forecasted electrical load and expected electricity production from variable generation resources such as wind and solar. Net load projections help power resource planners anticipate periods of potential over-generation and times when flexible resources may be required to ramp quickly up or down in response to changes in system load and variable generation. The [CAISO “duck chart”](#) below illustrates the potential changes in net load as levels of variable generation increase. Learn more at: [What the duck curve tells us about managing a green grid.](#)

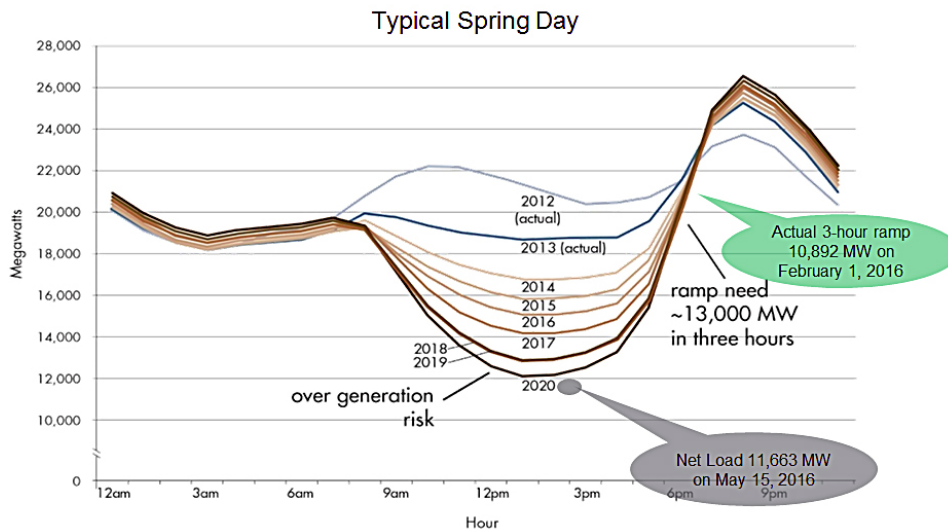


Figure 2 - CAISO Duck Chart

NON-SPINNING RESERVE: Non-spinning reserve is either (a) generating reserve not connected to the system but capable of serving [demand](#) within a specified time (generally within 10 minutes), or (b) interruptible load that can be removed from the system within a specified time (generally within 10 minutes). See also: [Operating Reserve](#).

NQC – NET QUALIFYING CAPACITY: NQC is Net Qualifying Capacity, the maximum capacity of a resource that is eligible for the Resource Adequacy requirement counting process based on a generating facility’s

⁷ Source: North American Electric Reliability Corporation - [About NERC](#)



historical capacity availability during peak electrical demand periods. For certain renewable resources without an availability history, the CAISO may base NQC on the [Effective Load Carrying Capability](#) for a resource of the same type and location until an availability history is established.

OATT – OPEN ACCESS TRANSMISSION TARIFF: Electronic transmission tariff (service and rate schedule) accepted by the U.S. Federal Energy Regulatory Commission ([FERC](#)) requiring the transmission service provider to furnish to all shippers with non-discriminating service comparable to that provided by transmission owners to themselves.

OPERATING RESERVES: That generating capability above firm system [demand](#) required to provide for regulation, load forecasting error, equipment forced and scheduled outages and local area protection. Because large sections of the United States power grid are interconnected, it is important that [balancing area](#) operators like the [CAISO](#) maintain operating reserves to recover from [contingency](#) events⁸, rather than drawing on power from neighboring systems, overloading transmission circuits and causing cascading outages throughout the grid. Operating reserve margin is the amount of generation (including imports) and dispatchable load, above current electrical demand during real-time operations. Operating reserve excludes generation that is not scheduled to operate, shut down for planned maintenance, or generation that is unable to be delivered due to transmission problems. Balancing areas, such as the CAISO, are required by national and regional reliability standards to carry a minimum amount of operating reserve equal to 3% of load plus 3% of generation. There are two types of operating reserve: spinning and non-spinning. At least 50% of the minimum operating reserve requirement must be in the form of spinning reserve.

PEAK DEMAND: 1. The highest hourly integrated net energy for load within a [Balancing Authority Area](#) occurring within a given period (e.g., day, month, season, or year). 2. The highest instantaneous [demand](#) within the Balancing Authority Area.

PLANNING RESERVE MARGIN: Planning reserve margin is designed to measure the amount of generation capacity available to meet expected demand in the planning horizon. A planning reserve margin is a long-term measurement intended to assure sufficient electricity supplies can meet real-time operating reserve requirements and avoid the possibility that a loss of load would occur more frequently than one-day-in-ten-years. A one-day-in-ten-years loss of load probability equates to roughly a 15-17% planning reserve target. Coupled with probabilistic analysis, calculated planning reserve margins have been an industry standard used by planners for decades as a relative indication of [resource adequacy](#). Generally, the projected demand is based on a 50/50 forecast. Based on experience, for bulk power systems that are not energy-constrained, reserve margin is the difference between available capacity and peak demand, normalized by peak demand shown as a percentage to maintain reliable operation while meeting unforeseen increases in demand (e.g. extreme weather) and unexpected outages of existing capacity. Further, from a planning perspective, planning reserve margin trends identify whether capacity additions are keeping up with demand growth. Since this is a capacity based metric, it does not provide an accurate assessment of performance in energy limited systems, e.g., hydro capacity with limited water resources or renewable capacity with variable generation such as wind or solar. The North American Electric Reliability Corporation

⁸ A contingency in this context is defined as the unexpected failure or outage of a bulk electric system component, such as a generator, transmission line, circuit breaker, switch or other electrical element.



([NERC](#)) sets a reference planning reserve margin that is equivalent to the target reserve margin of the applicable regional or sub-regional reliability council (in VPU's case, [WECC](#)). WECC's own specific planning reserve margin is based on load, generation, and transmission characteristics as well as regulatory requirements. If a planning reserve margin is not provided by the regional reliability council, NERC has assigned a 15 percent planning reserve margin for predominately thermal systems and 10 percent for predominately hydro systems.⁹ VPU's target planning reserve margin is 15%.

PMAX - The maximum normal capability of the Generating Unit. PMax should not be confused as an emergency rating of the Generating Unit.

PPA – POWER PURCHASE AGREEMENT: A power purchase agreement is a contract between a generator or seller of electricity and related products and a purchaser or buyer of those products.

POU – PUBLICLY OWNED UTILITY: A class of ownership found in the electric power industry. This group includes those utilities operated by municipalities and State and Federal power agencies.

PSE – PURCHASING-SELLING ENTITY: The entity that purchases or sells, and takes title to, energy, capacity, and interconnected operations services. Purchasing-Selling Entities may be affiliated or unaffiliated merchants and may or may not own generating facilities.

PSEUDO-TIE: A telemetered reading or value that is updated in real time and used as a "virtual" tie line flow in the automatic generation control ([AGC](#))/area control error ([ACE](#)) equation, but for which no physical tie or energy metering actually exists. The integrated value is used as a metered MWh value for interchange accounting purposes.

PTO – PARTICIPATING TRANSMISSION OWNER: An investor owned utility, a publicly owned utility, or a federal power marketing authority that has turned over its transmission facilities and/or entitlements to the [CAISO](#)'s operational control.

PV – PALO VERDE (NUCLEAR PLANT): The Palo Verde Nuclear Generation Station consists of 3 units totaling 3,379 MW of capacity, located approximately 40 miles west of Phoenix, Arizona. Construction began in 1976. Units 1 and 2 were completed in 1986 and Unit 3 was completed in 1988. The plant is operated by Arizona Public Service ([APS](#)), and is jointly owned by APS (29.1%), Salt River Project ([SRP](#) – 17.5%), [El Paso Electric Company](#) (15.8%), Southern California Edison ([SCE](#) – 15.8%), Public Service of New Mexico ([PNM](#) – 10.2%), Southern California Public Power Authority ([SCPPA](#) – 5.9%), and the Los Angeles Department of Water and Power ([LADWP](#) – 5.7%). The SCPPA participants include Azusa, Banning, Burbank, Colton, Glendale, Imperial Irrigation District, LADWP, Pasadena, Riverside and Vernon.

PV – PHOTOVOLTAIC: Energy radiated by the sun is converted into electricity by means of photovoltaic solar cells or concentrating (focusing) collectors. A photovoltaic cell is an electronic device consisting of layers of semiconductor materials fabricated to form a junction (adjacent layers of materials with different electronic characteristics) and electrical contacts and being capable of converting incident light directly into electricity (direct current). A photovoltaic module is an integrated assembly of interconnected photovoltaic cells designed to deliver a selected level of working voltage and current at its output terminals, packaged

⁹ Source: North American Electric Reliability Council (NERC) - [Planning Reserve Margin](#)



for protection against environmental degradation, and suited for incorporation in photovoltaic power systems.

QC – QUALIFYING CAPACITY: The maximum [Resource Adequacy](#) capacity that a Resource Adequacy resource may be eligible to provide. The criteria and methodology for calculating the Qualifying Capacity of resources may be established by the [CPUC](#) or other applicable [Local Regulatory Authority](#) and provided to the [CAISO](#). A resource’s eligibility to provide Resource Adequacy capacity may be reduced below its Qualifying Capacity through the CAISO’s assessment of [Net Qualifying Capacity](#).

RA – RESOURCE ADEQUACY: Resource adequacy (RA) capacity is sufficient generation or demand-side management resources available to the [CAISO](#) when and where needed to serve the demands of electrical load in “real time” (i.e., instantaneously). The RA program requires that [Load Serving Entities](#) (LSE) like VPU meet a [planning reserve margin](#) for their obligations. The program provides deliverability criteria that each LSE must meet, as well as system, local and [flexible capacity](#) requirements. Rules are provided for “counting” resources towards meeting resource adequacy obligations. The resources that are counted for RA purposes must make themselves available to the CAISO for the capacity for which they were counted.

RELIABLE OPERATION: Operating the elements of the bulk-power system within equipment and electric system thermal, voltage, and stability limits so that instability, uncontrolled separation, or cascading failures of such system will not occur as a result of a sudden disturbance, including a cybersecurity incident, or unanticipated failure of system elements.

RFP – REQUEST FOR PROPOSALS: A request for proposal (RFP) is a solicitation made, often through a bidding process, by an agency or company interested in procurement of a commodity, service or valuable asset, to potential suppliers to submit business proposals.

RPS – RENEWABLE PORTFOLIO STANDARD: A renewable portfolio standard (“RPS”) is a regulation that requires the increased production of energy from renewable sources, such as wind, solar, geothermal, and [biomethane](#). The current California RPS is at least 33 percent by the end of 2020, and at least 50 percent by the end of 2030. Today, the 50% RPS is a minimum level of renewable energy procurement, although publicly owned utilities are allowed certain exceptions, such as establishing a cost limitation, under the law.

SB (SENATE BILL) 350: [The California Clean Energy and Pollution Reduction Act of 2015](#) (De León), Approved by Governor Brown October 07, 2015. Established a new set of objectives in clean energy, clean air, and pollution reduction for 2030 and beyond, including: (1) To increase from 33 percent to 50 percent, the procurement of our electricity from renewable sources, and (2) To double the energy efficiency savings in electricity and natural gas final end uses of retail customers through energy efficiency and conservation.

SB (SENATE BILL) 100: [California Renewables Portfolio Standard Program: emissions of greenhouse gases](#), as amended (De León), January 11, 2017. If passed, the goal of the program is to achieve a target of 50% renewable resources by December 31, 2026, and 60% by December 31, 2030. The bill would modify California’s existing RPS to require that retail sellers and local publicly owned electric utilities procure a minimum quantity of electricity products from eligible renewable energy resources so that the total kilowatt-hours of those products sold to their retail end-use customers achieve 44% of retail sales by December 31, 2024, 52% by December 31, 2027, and 60% by December 31, 2030. The bill would state that



it is the policy of the state that eligible renewable energy resources and zero-carbon resources supply 100% of retail sales of electricity to serve California end-use customers and all state agencies no later than December 31, 2045. Achievement of this policy for California must not increase carbon emissions elsewhere in the western grid and must not allow resource shuffling.

SCPPA – SOUTHERN CALIFORNIA PUBLIC POWER AUTHORITY: SCPPA is a joint powers agency consisting of eleven municipal utilities and one irrigation district. SCPPA members deliver electricity to approximately 2 million customers over an area of 7,000 square miles, with a total population of 4.8 million. The Members include the municipal utilities of the cities of Anaheim, Azusa, Banning, Burbank, Cerritos, Colton, Glendale, Los Angeles, Pasadena, Riverside, Vernon, and the Imperial Irrigation District. SCPPA was formed in 1980 to finance the acquisition of generation and transmission resources for its members. Currently, SCPPA has several generation and transmission projects, bringing power from Arizona, New Mexico, Utah, and Nevada. For more info, see [SCPPA](#).

SPINNING RESERVE: Spinning reserve includes generation that is synchronized to the grid, and fully available to serve load within the 15-minute disturbance recovery period following a [contingency](#) event, or load that is fully removable from the system within the 15-minute disturbance recovery period following a contingency event. See also [Operating Reserve](#).

SONGS – SAN ONOFRE NUCLEAR GENERATING STATION: The San Onofre Nuclear Generating Station (SONGS) is an inoperative nuclear power plant located in the northwestern corner of San Diego County, south of San Clemente, CA. The plant is decommissioning after being closed in 2013 following the failure of recently replaced steam generators. The nuclear facility was operated by Southern California Edison ([SCE](#)). Edison International, parent of SCE, holds 78.2% ownership in the plant; San Diego Gas & Electric ([SDG&E](#)), 20%; and the [City of Riverside Utilities Department](#), 1.8%. When fully functional, the plant had employed over 2,200 people. The plant's first unit, Unit 1, operated at up to 436 MW (net) from 1968 to 1992. Unit 2, at 1,070 MW (net) was started in 1983 and Unit 3, at 1,080 MW (net) started in 1984. Southern California Edison announced on June 7, 2013 that it would "permanently retire" Unit 2 and Unit 3.

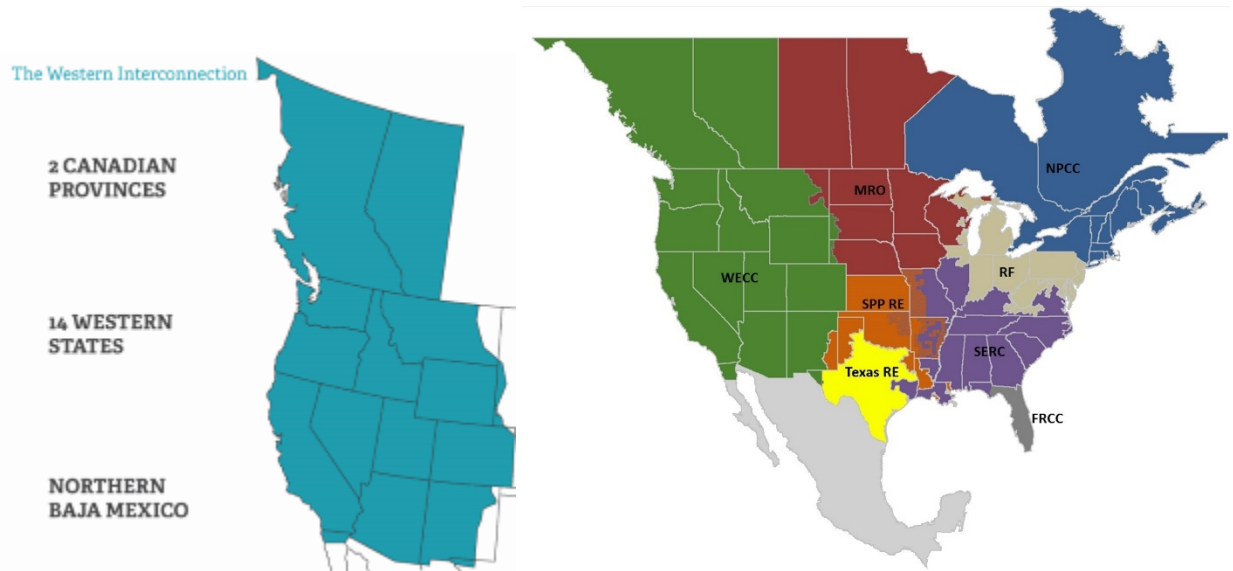
STOCHASTIC MODELING: A method of portfolio modeling in which one or more variables within the model are random. Stochastic modeling is for the purpose of estimating the probability of outcomes within a forecast to predict what conditions might be like under different situations. The random variables are usually constrained by historical data. The Monte Carlo Simulation is an example of a stochastic model. When used in portfolio evaluation, multiple simulations of the performance of the portfolio are done based on the probability distributions of the individual outcomes. A statistical analysis of the results can then help determine the probability that the portfolio will provide the desired performance.

TRANSMISSION: An interconnected group of lines and associated equipment for the movement or transfer of bulk energy products from where they are produced or generated to other electric systems, or to distribution lines that carry the energy products to consumers.

WECC – WESTERN ELECTRICITY COORDINATING COUNCIL: The Western Electricity Coordinating Council (WECC) is the regional entity responsible for coordinating and promoting bulk electric system reliability in the Western Interconnection. In addition, WECC provides an environment for coordinating the operating and planning activities of its members as set forth in the WECC Bylaws. WECC is geographically the largest



and most diverse of the eight regional entities that have delegation agreements with the North American Electric Reliability Corporation ([NERC](#)). The Western Interconnection, WECC's service territory, extends from Canada to Mexico. It includes the provinces of Alberta and British Columbia, the northern portion of Baja California, Mexico, and all or portions of the 14 Western states between, as indicated in blue in the Western Interconnection map, and green in the NERC map below.¹⁰



REGIONAL ENTITIES: Florida Reliability Coordinating Council (FRCC), Midwest Reliability Organization (MRO), Northeast Power Coordinating Council (NPCC), ReliabilityFirst Corporation (RFC), SERC Reliability Corporation (SERC), Southwest Power Pool, RE (SPP), Texas Reliability Entity (TRE), Western Electricity Coordinating Council (WECC).

WHEELING: The transmission of electricity by an entity that does not own or directly use the power it is transmitting.

¹⁰ Source: [Western Electricity Coordinating Council - About WECC](#)