HISTORICAL CAPACITY CONTRIBUTION OF WIND AND SOLAR RESOURCES

OVERVIEW

PacifiCorp uses the historical capacity contribution provided by its portfolio of existing intermittent resources to evaluate the capacity value of new intermittent resources. Capacity contribution represents the percentage of a generator's nameplate capacity that PacifiCorp can use to reliably satisfy peak load requirements. The methodology used to measure historical capacity contribution compares the reliability of intermittent resources during peak load hours with the expected reliability of the next deferrable resource in the integrated resource plan ("IRP"). Based on the assumption that the full capacity of the next deferrable resource in the IRP will be available in approximately 90 percent of peak load hours, the methodology measures the level of power provided by PacifiCorp's portfolio of intermittent resources that was achieved or exceeded in 90 percent of the largest 100 summer peak load hours.

Using historical data, the average capacity contribution of wind and solar resources in calendar years 2007 to 2011[1] was as follows:

Resource Class	Capacity Contribution
Wind	4.1%
Solar (Energy-oriented)	11.5%
Solar (Peak-oriented)	25.9%

METHODOLOGY

The approach used by PacifiCorp to measure historical capacity contribution is commonly referred to as an exceedance methodology. The concept behind this methodology is to measure the level of intermittent capacity necessary to provide the same level of reliability in peak hours as expected from the next deferrable resource in the IRP. Because the full output of the next deferrable resource in the IRP is expected to be available in more than 90 percent of peak load hours, the methodology measures the level of power achieved or exceeded by the intermittent resources in 90 percent of the largest 100 summer peak load hours.

ASSUMPTIONS

The measurement of historical capacity contribution is based on the following principles and assumptions:

- The measurement is based on the aggregate capacity benefit of the resource class taken as a whole, not the capacity benefit of an individual resources analyzed in isolation.
    - A resource class is defined as group resources that rely on the same generation technology and possess the same supply characteristics, such as wind and solar resources.

[1] Calendar years 2007 to 2011 were used in order to present a multiyear view of the capacity provided by particular resources.

  - The use of an aggregate capacity value is required because a geographically dispersed array of facilities may produce a level of reliability greater than any one resource taken separately.

  - The use of aggregate output ensures that all of the generators in a resource class share proportionally in the capacity benefit provided by the class as a whole.

- The measurement calculates the reliability of generation output from a resource class based on a 90% reliability requirement.

  - The methodology calculates the level of generation that was achieved or exceeded in 90 percent of peak load hours.

  - Because incremental IRP resources are added to provide capacity, the capacity contribution of the intermittent resource must be measured based on the level of capacity necessary to provide the same level of reliability as the incremental IRP resource.

- The measurement is performed on an annual basis over the top 100 summer peak load hours to ensure that it is representative of PacifiCorp's peak system load obligation, while preserving the statistical significance of the calculation.

  - Due to varying correlations between the output from intermittent resources and peak load hours, the number of hourly intervals used in the measurement must be sufficiently large to preserve the natural variability the resource output and sufficiently small to preserve the relationship between generation output and peak load hours.

  - The period of measure is restricted to summer load hours since PacifiCorp's system peak occurs in the summer months and will continue to do so in the foreseeable future. On a weather normalized basis, a winter peak does not occur until the top 160th hour.

CALCULATION

PacifiCorp measured the historical capacity contribution provided by a particular resource class based on the level of power that was achieved or exceeded in 90 percent of the top 100 summer load hours. The measurement was performed separately for each resource class over the five year period from 2007 to 2011. PacifiCorp then calculated the average of five annual values to be representative of the ongoing capacity value provided by the resource class in the future.

The calculation was based on the following steps:

- Compile the aggregate energy output from all resources within the resource class in each hour of the year.

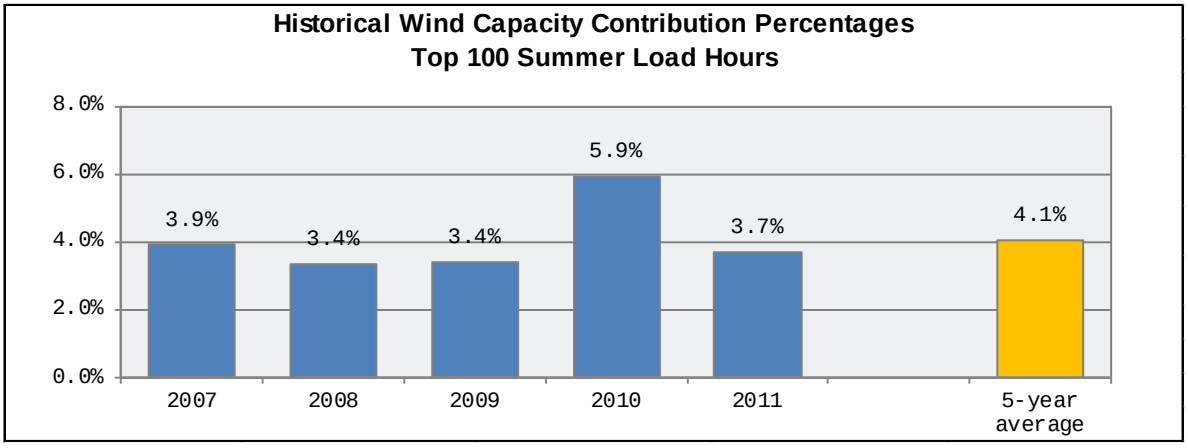
- Calculate the aggregate nameplate capacity from all resources in the resource class in each hour of the year.

- Divide the aggregate energy output by the aggregate nameplate capacity to arrive at the aggregate capacity factor for each hour of the year.

- Use actual hourly system load data to determine the top 100 load hours that occurred in each year between the months of June and September. The resulting hours are the top 100 summer peak load hours for 2007-2010 for each year.
- Filter the hourly aggregate capacity factors to the top 100 summer peak load hours.
- Calculate the capacity factor that was achieved or exceeded in 90 percent of the top 100 summer load hours for each year.

WIND

Over the period 2007 to 2011 PacifiCorp's portfolio of wind resources provided an average capacity contribution of 4.1 percent. This value is comparable to the 5 percent wind capacity contribution assumption used by the Northwest Power and Conservation Council.[2] The annual capacity contribution values were as follows:



[2] Sixth Northwest Conservation and Electric Power Plan, N.W.P.C.C. Chapter 12, 4, http://www.nwcouncil.org/energy/powerplan/6/final/SixthPowerPlan_Ch12.pdf .

Hourly generation logs were used to measure the historical capacity contribution from the PacifiCorp's system wind resources. The analysis included both owned and non-owned wind resources where PacifiCorp acquired the output under a power purchase agreement. The analysis did not include wind resource where PacifiCorp did not acquire the final output from the facility, such as under an exchange agreement. The wind resources included in the measurement were as follows:

Wind Resource	COD	Type	Nameplate Capacity
Chevron Wind QF	12/1/2009	PPA	16.5
Combine Hills	12/22/2003	PPA	41.0
Dunlap I Wind	10/1/2010	Owned	111.0
Foote Creek Generation	7/21/1997	Owned	32.1
Glenrock III Wind	1/17/2009	Owned	39.0
Glenrock Wind	12/31/2008	Owned	99.0
Goodnoe Wind	5/31/2008	Owned	94.0
High Plains Wind	9/13/2009	Owned	99.0
Leaning Juniper 1	9/14/2006	Owned	100.5
Marengo 1 & 2	8/3/2007	Owned	210.6
McFadden Ridge Wind	9/29/2009	Owned	28.5
Mountain Wind 1 & 2 QF	7/2/2008	PPA	140.7
Oregon Wind Farm QF	3/31/2009	PPA	64.6
Rock River I	11/7/2001	PPA	50.0
Rolling Hills Wind	1/17/2009	Owned	99.0
Seven Mile II Wind	12/31/2008	Owned	19.5
Seven Mile Wind	12/31/2008	Owned	99.0
Spanish Fork Wind 2 QF	7/31/2008	PPA	18.9
Three Buttes Wind	12/1/2009	PPA	99.0
Threemile Canyon Wind QF	9/1/2009	PPA	9.9
Top of the World Wind	10/1/2010	PPA	200.2
Wolverine Creek	2/12/2006	PPA	64.5
		Total Wind:	**1,736.5**

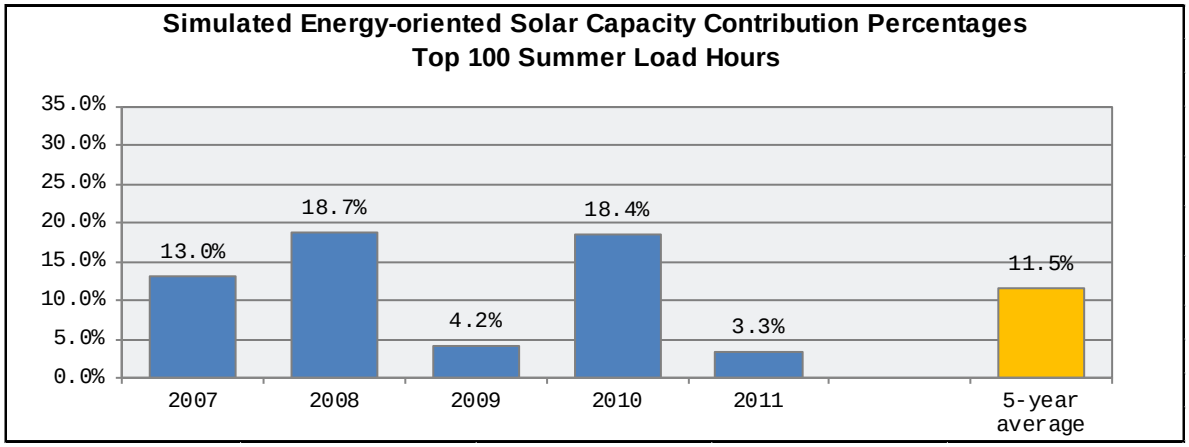
SOLAR

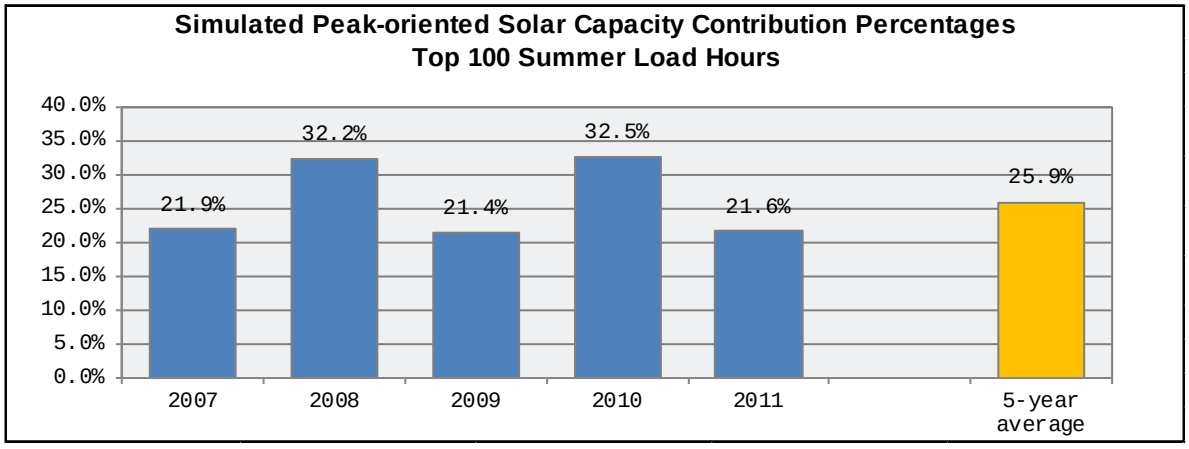
PacifiCorp has limited historical solar data necessary to develop the capacity contribution value of a class of geographically distributed solar resources on its system. Accordingly, PacifiCorp relied on simulated hourly solar profile data developed by the National Renewable Energy Laboratory (NREL). The simulated hourly data is compared against the top 100 summer load hours in each year 2007 – 2011 using the methodology described above. Unlike wind, where the levels of generation change in each year depending on the output of the resource set, the simulated solar output remains constant in each year and is compared to changes in the timing of the top 100 peak summer load hours from year-to-year.

Differences in the panel configuration of a solar resource impact the capacity value provided by the resource. Accordingly, it is necessary to differentiate between classes of solar resources based on whether the resource has been configured to maximize energy output or whether it has been configured to maximize output during peak load periods. A solar resource configured to maximize energy output may operate at a low capacity factor during peak loads that occur in the evening, where a solar resource aligned more towards the west or with a tracking device may operate at a higher capacity factor during evening peaking periods. Based on these panel configurations the following capacity contribution measurements resulted:

Configuration	Energy-orientation	Peak-orientation*
Tilt	Latitude	Latitude minus 15°
Azimuth	Due South	Due South plus 25°
Capacity Contribution	11.5%	25.9%

*A solar resource with a tracking system is considered a peak orientation.





In developing the solar generation profile PacifiCorp used an NREL tool, PVWatts, to simulate hourly solar generation levels based on historical meteorological solar radiation data. The PVWatts tool develops a solar profile based on input parameters such as the location, size, array type, tilt angle, and azimuth angle of the solar resource.

The capacity contribution measurement was based on a simulated class of solar resources representative of locations throughout the PacifiCorp's service territory. It was developed using the combined simulated profiles from five locations: Pocatello, ID; Yakima, WA; Pendleton, OR; Lander, WY; and Salt Lake City, UT. The analysis was performed twice, first with all of the resources configured to energy and second with all of the resources configured to peak, as detailed above.