Northwest Power and Conservation Council

Resource Adequacy Forum

Technical Committee

February 5, 2007

Reassessment of the NW Pilot Capacity Standard

Northwest Power and Conservation Council

Outline

- Reassessment of temperature deviation reserve requirements
- Reassessment of current power supply capacity reserves
- Converting a sustained peak adequacy target into a single-hour peak target
- Incorporating the NW standard into the WECC analysis

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Reassessment of Temperature Deviation Reserve requirements

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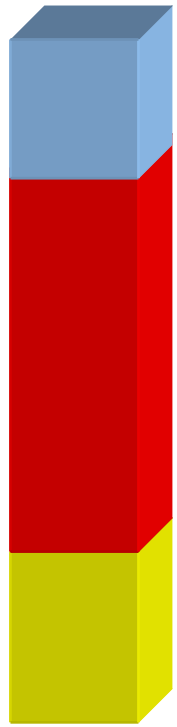
Pilot Capacity Metric

- Surplus generating capacity
- over the expected peak load,
- over the peak load duration period,
- in units of percent, also referred to as the *Surplus Sustained Peaking Capability* or the *Planning Reserve Margin (PRM)*

Pilot Winter Capacity Target

Target: 25%



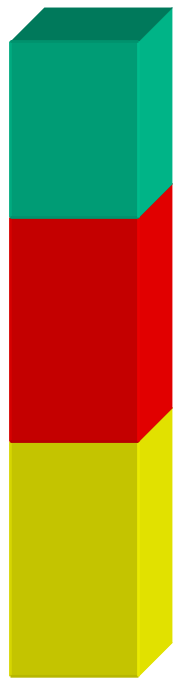
4% for
Planning adjustment reserves

15% for
Adverse temperature reserves

6% for
Operating reserves

Pilot Summer Capacity Target

Target: 19%



7% for
Planning adjustment reserves

6% for
Adverse temperature reserves

6% for
Operating reserves

Last Year's Analysis

Temperature Statistics

Regional Daily-Average Temperatures

	Dec	Jan	Feb	Jul	Aug
EPT	28.7	22.9	29.0	75.4	74.2
1-in-20	14.3	10.2	14.5	80.1	79.6
Diff	-14.4	-12.7	-14.5	4.7	5.4

EPT = Expected Peak Temperature in degrees Fahrenheit
1-in-20 = Expected Peak Temperature for a 1-in-20 year event

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Last Year's Analysis

Temperature – Load Relationship

(1995-2002 data, NWPCC assessment)

Month	Avg	T Dev	L Dev
December	-336	-14.4	4,838
January	-226	-12.7	2,870
February	-277	-14.5	4,016
July	236	4.7	1,109
August	253	5.4	1,366

Avg = Daily-average megawatts per degree change (Fahrenheit)
T Dev = Daily average temperature deviation for a 1-in-20 year event
L Dev = Load deviation for a 1-in-20 year event (MW-days)

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Last Year's Analysis

Adverse Temperature Reserve Margins

	Dec	Jan	Feb	Jul	Aug
Load	25,297	27,251	26,872	22,008	21,511
L Dev	4,838	2,870	4,016	1,109	1,366
TR	19%*	11%	**15%**	5%	**6%**

Load = Expected normal temperature daily load (MW-days)

L Dev = Load deviation for a 1-in-20 year event (MW-days)

TR = Temperature reserve (percent over expected load)

*There were concerns regarding the temperature/load relationship for December, therefore, the February value was used for the winter target.

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Initial Capacity Targets and Components

	Winter	Summer
Temperature Reserve	15%	6%
Operating Reserve	6%	6%
Adjustment Reserve	4%	7%
Capacity Target	**25%**	**19%**

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Current Analysis

Adverse Temperature Reserve Margins

	Dec	Jan	Feb	Jul	Aug
Normal Load	27,590	27,879	25,892	24,228	23,648
1-in-20 Load	31,643	32,190	29,847	25,215	24,583
Diff in Load	4,053	4,311	3,955	987	935
Temp Reserve	**14.7%**	**15.5%**	**15.3%**	**4.1%**	**4.0%**

All load values are in units of average megawatts over a 10-hour per day, 5-day period.

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Comparison to Last Year's Assessment of Temperature Reserve Requirements

	Last Year	Current	Diff
Dec	19%	15%	- 5%
Jan	11%	16%	+ 5%
Feb	15%	15%	0%
July	5%	4%	- 1%
Aug	6%	4%	- 2%

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Revised Capacity Target and Components

	Winter	Summer
Temperature Reserve	**16%**	**4%**
Operating Reserve	6%	6%
Adjustment Reserve	**3%**	**9%**
Capacity Target*	**25%**	**19%**

*The capacity targets are derived from an LOLP analysis and do not change. The implication here is that the **adjustment reserve** requirement will change.

Reassessment of Current Power Supply Capacity Reserves

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Last Year's Assessment of the Capacity Reserve Margin

Op Year 2007	**Winter**	**Summer**
Hydro ('37)	17,500	18,200
Hydro Flex	2,000	1,000
Non-hydro	10,400	10,400
Net Imports	-850	-2,500
IPP	3,500	1,000
Wind (15% of cap)	160	160
Spot Imports	3,000	0
Total Resource	35,710	28,260
Exp **Daily** Load	25,300*	22,000*
Balance	10,410	6,260
Reserve	**41%**	**28%**

*These daily load estimates come from the GENESYS HELM algorithm.

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Last Year's Energy vs. Capacity Assessment

Units in MW-days, unless noted	**Current System** L/R = 2,000 LOLP = 0%		**@ Energy Limit** L/R = -1,500 LOLP = 5%		**Note**
	Winter	**Summer**	**Winter**	**Summer**	To simulate a supply that just meets NW energy needs, 3,500 MW of resource generation was removed.
Resources	35,710	28,260	32,210	24,760	
Daily load	25,300	22,000	25,300	22,000	
Balance	10,410	6,260	6,910	2,760	
RM	41%	28%	27%	13%*	
Target	25%	19%	25%	19%	

*At the energy limit (i.e. LOLP = 5%), the summer reserve margin falls below the proposed target.

Current Assessment of the Capacity Reserve Margin

Op Year 2007	Winter	Summer
Hydro ('37)	17,500	18,200
Hydro Flex	2,000	1,000
Non-hydro	10,400	10,400
Net Imports	-850	-2,500
IPP	3,500	1,000
Wind (15% of cap)	160	160
Spot Imports	3,000	0
Total Resource	35,710	28,260
Exp **Peak** Load	**25,903***	**23,097***
Balance	9,807	5,163
Reserve	**38%**	**22%**

*These load estimates come from the Council's new short-term forecasting model and are averaged over the 50-hour sustained peak period.

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Current Energy vs. Capacity Assessment

Units in MW-days, unless noted	**Current System** L/R = 2,000 LOLP = 0%		**@ Energy Limit** L/R = -1,500 LOLP = 5%		**Note**
	Winter	**Summer**	**Winter**	**Summer**	To simulate a supply that just meets NW energy needs, 3,500 MW of resource generation was removed.
Resources	35,710	28,260	32,210	24,760	
Peak load	25,903	23,097	25,903	23,097	
Balance	9,807	5,163	6,307	1,663	
RM	38%	22%	24%*	7%*	
Target	25%	19%	25%	19%	

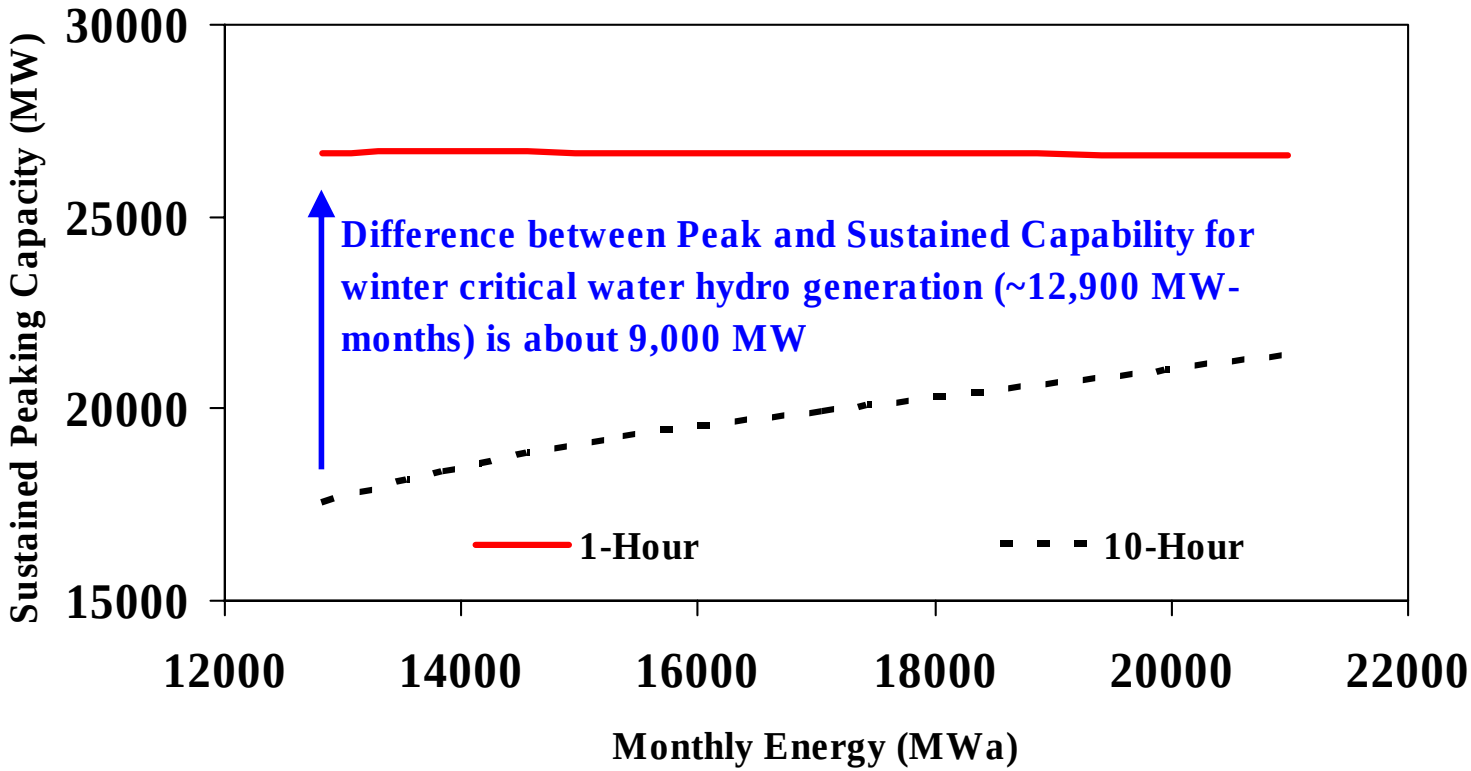
*At the energy limit (i.e. LOLP = 5%), the reserve margins fall below the proposed target.

Note: Hydro sustained peaking capability was not revised for these calculations. New data is available and will be incorporated into this assessment once it is benchmarked.

Converting a Sustained Peak Adequacy Target into a Single-hour Peak Target

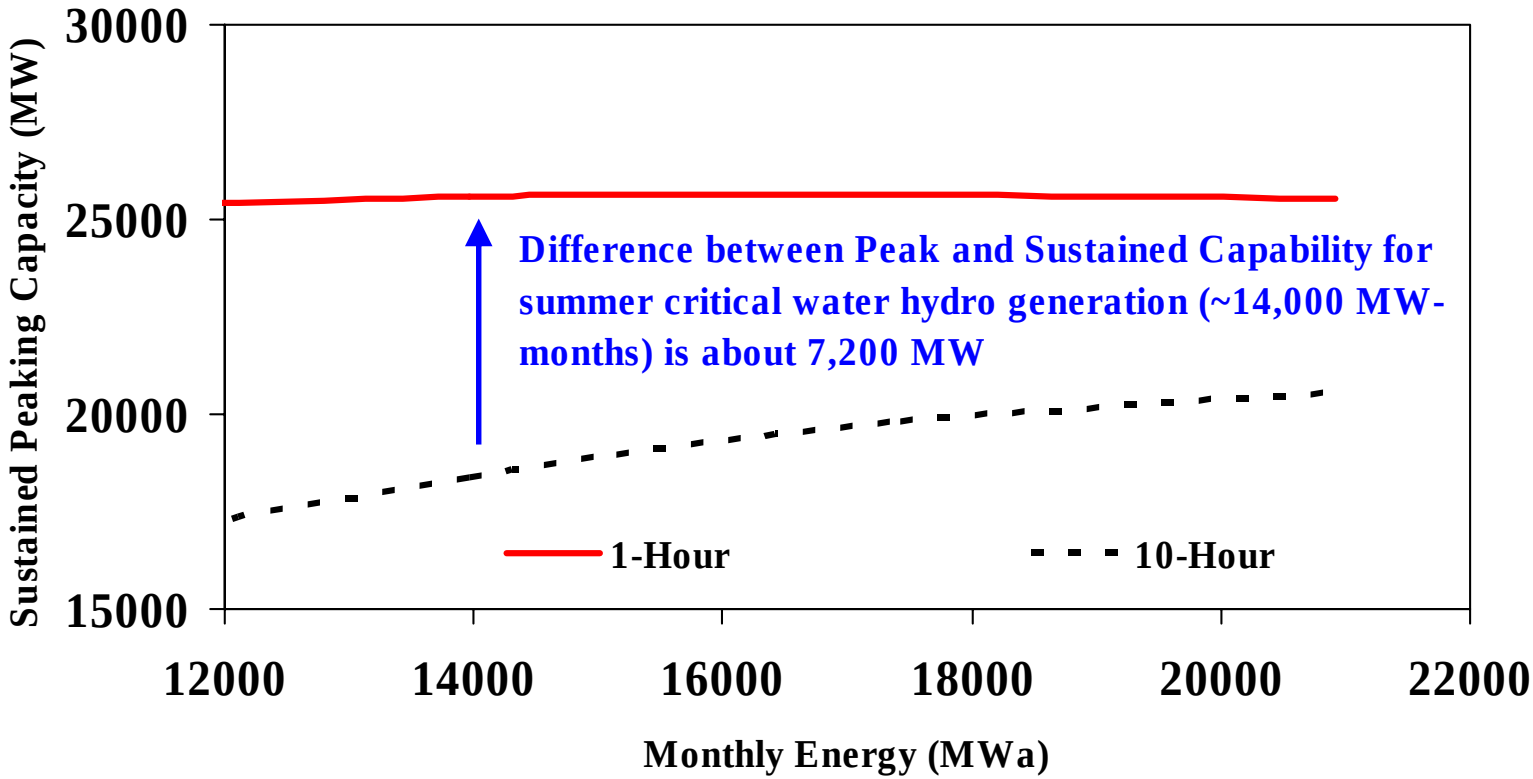
Sustained Hydro Peaking Capability

as a function of Energy Production (Winter)



Sustained Hydro Peaking Capability

As a function of Energy Production (Summer)



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Capacity Reserve Calculation

- $CRs = (Rs – Ls)/Ls – 1$
  - CRs = capacity reserve target for the sustained period
  - Rs = resource capability over the sustained period
  - Ls = average normal load over the sustained period
- $CRp = (Rp – Lp)/Lp – 1$
  - CRp = capacity reserve target for the peak hour
  - Rp = resource capability over the peak hour
  - Lp = single hour peak normal load

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Sustained vs. Peak Targets

	Winter		Summer	
	Sustained	**Peak**	**Sustained**	**Peak**
Resource	34,487	43,610	28,831	36,058
Load	27,590	30,291	24,228	25,524
Reserve	25%	44%	19%	41%

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Incorporating the NW Standard into the WECC Analysis

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Current WECC Process: Hydro Derates

- WECC Power Supply Assessment NW Derate:
  - 4,880 MW in summer (Un-derated Hydro = 35,427 MW)
  - 3,660 MW in winter (Un-derated Hydro = 34,575 MW)
  - Based on WECC/NWPP judgment that hydro capacity based on critical water conditions and a sustained peaking period to reflect cold snap/heat wave conditions is too conservative given the interconnected nature of the Western Interconnection
- NWPP Derate: www.nwpp.org/pdf/NWPP%20Winter%20Assessment%202006-2007.pdf
  - 7,000 MW in winter
  - Based on critical hydro and 4 hours per day over 3 days sustainable peak period

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Options for WECC

1. Use PNW capacity and energy metrics and targets, as currently defined
   - Long-term goal: incorporate standard as finalized, once WECC has better analytical tools
   - Short-term option: incorporate separate PNW Resource Adequacy Assessment (done by Council) as Attachment to replace PNW Energy Assessment
2. Use equivalent single-hour peak capacity target
3. Use current NW capacity target but provide derated hydro capability and load values to WECC