Distribution Load Resource Balance Projections to 2032

Post 2011 Power Contract Negotiations

Chelan PUD
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3.13.07

This document includes forward-looking projections based on opinions and assumptions. The projections are subject to change based on uncertainties. Actual results may vary.

Objective

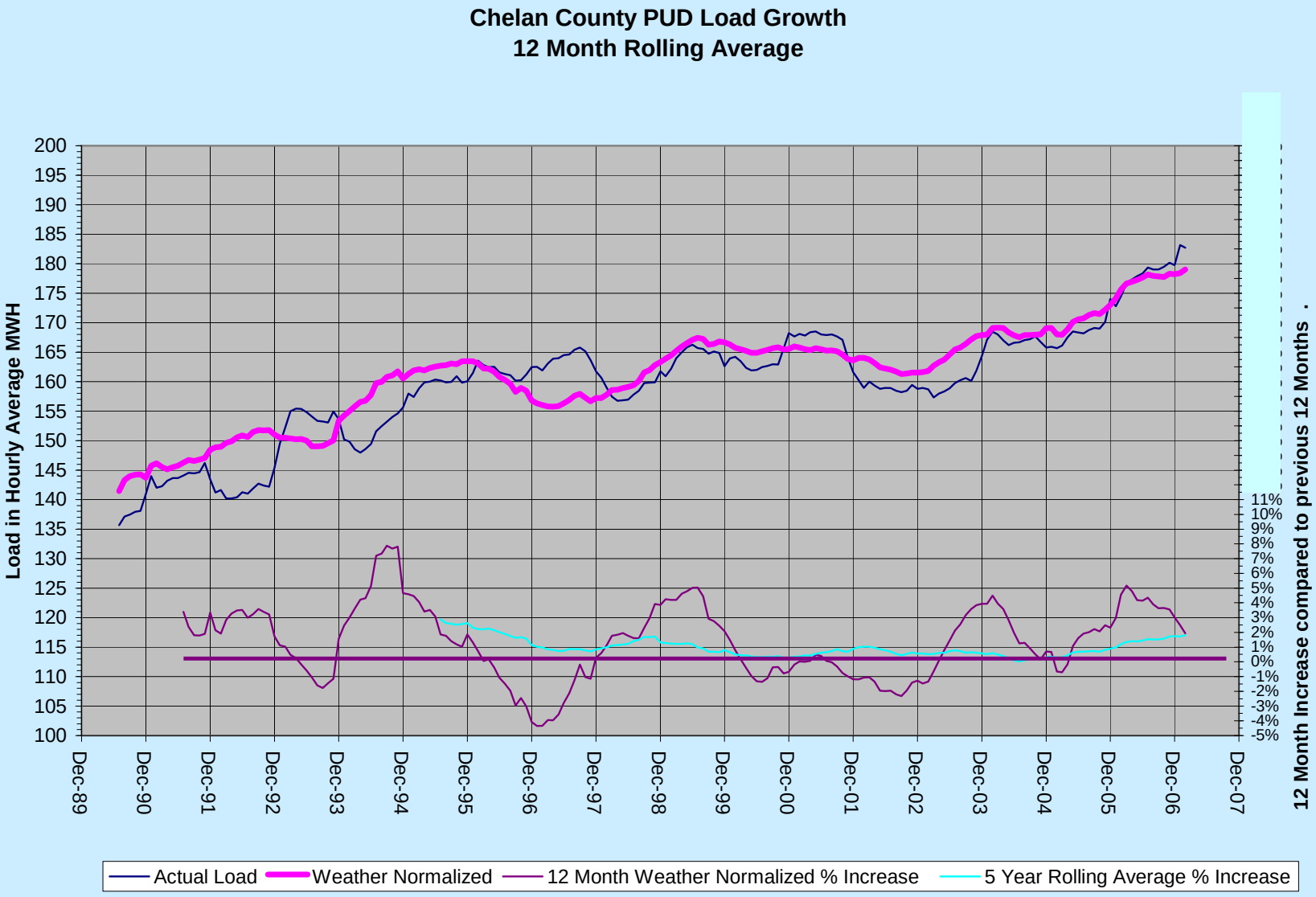
- Present load growth scenarios for energy and peak demand for 20 years past 2012
- Compare to PUD share of power resources
- Assess resource adequacy in meeting various load growth scenarios

Assumptions

- Hydro resources include effects of the following:
  - Post current contract expiration 50% of Rocky Reach and Rock Island, 100% Lake Chelan
  - Reduction for Douglas PUD 5.54% share of Rocky Reach
  - Canadian entitlement returns will continue through 2032
  - No PGE exchange post 2012
  - 70 yrs natural water history reregulated to current river operations per PNUCC and Corp study spring ’06
  - Volatility of resource provided by monte carlo simulation
    - A 90% confidence level is used to show downside uncertainty
    - Planning reserves are not subtracted from resources
- 9-Canyon wind farm is estimated at 2 aMW flat
- Impact of the Washington State renewable portfolio standard may increase resource portfolio noted

Assumptions, cont.

- Load info:
  - Historical actual loads shown for 2004 – 2006
  - 2007 is load group forecast
  - Future load scenarios are not forecasted based on specific fundamental drivers, but rather are a representation given the noted assumptions in each scenario
  - Monthly load volatility is estimate of influence of temperature and seasonal variability quantified by monte carlo simulation
  - Scenarios developed by Load Group members: B King, C Rissman, W Fields, K Carlson



Historical load growth

Load Scenarios

- A – Base: 2.5% annual growth
- B – Stress: New 5 aMW load every 3 years plus 2.5% annual
- C – Bigger Stress: Extra 10 aMW load each year 2008 – 2010, plus 5 aMW load every 3 years thereafter plus 3.0% annual
- D – Lower: 1.5% annual

Chelan PUD Distribution System

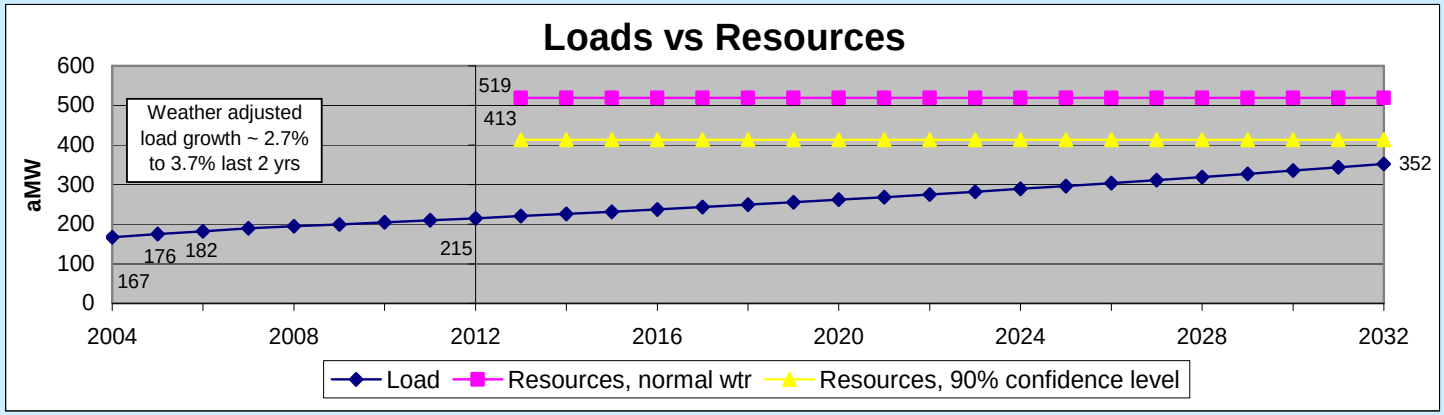
0.0 aMW New load every 3 Years

2.50% Base load growth (2012 - 2032)

50% take RR / RI

100% LC, and 9-Canyons

Scenario A Base



Chelan PUD Distribution System

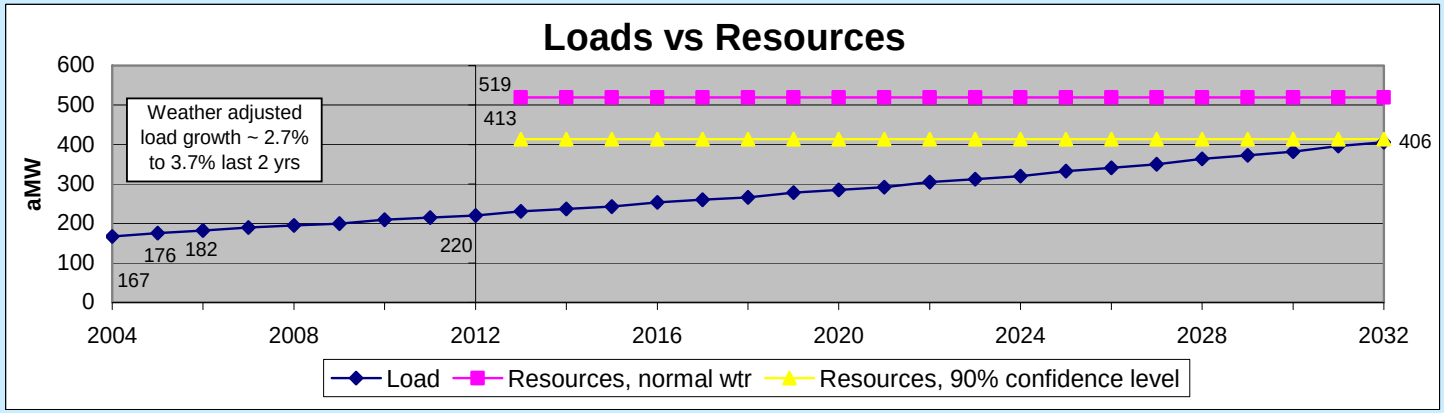
5.0 aMW New load every 3 Years

2.50% Base load growth (2012 - 2032)

50% take RR / RI

100% LC, and 9-Canyons

Scenario B Stress



Scenarios vary with rate and amount of load growth

Chelan PUD Distribution System

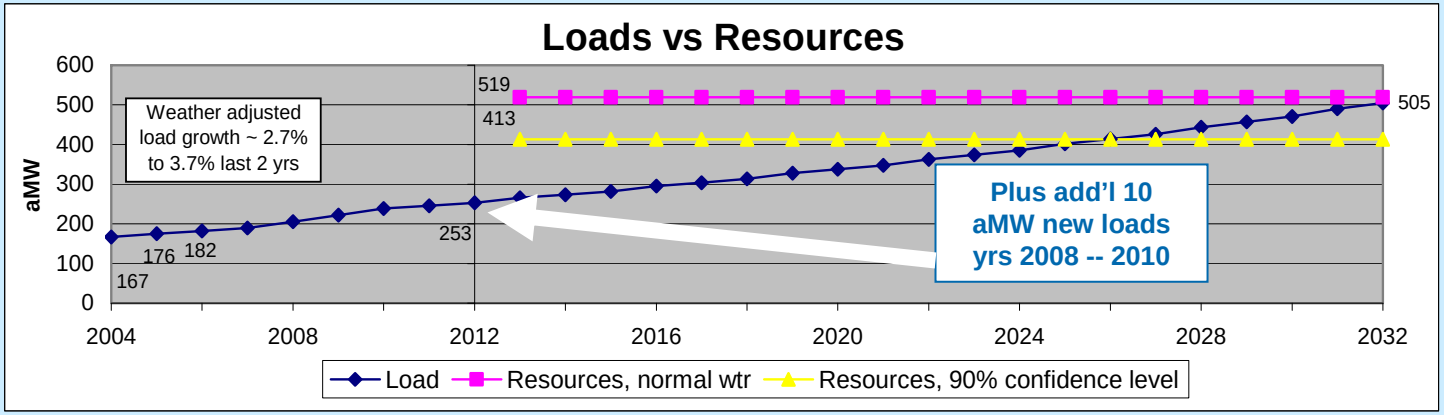
5.0 aMW New load every 3 Years

3.00% Base load growth (2012 - 2032)

50% take RR / RI

100% LC, and 9-Canyons

Scenario C Bigger Stress



Chelan PUD Distribution System

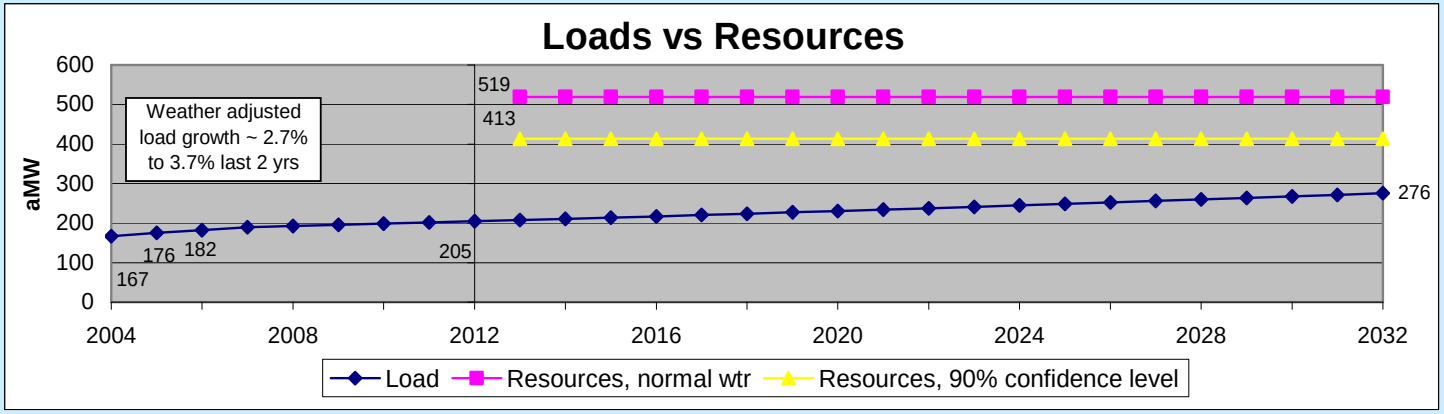
0.0 aMW New load every 3 Years

1.50% Base load growth (2012 - 2032)

50% take RR / RI

100% LC, and 9-Canyons

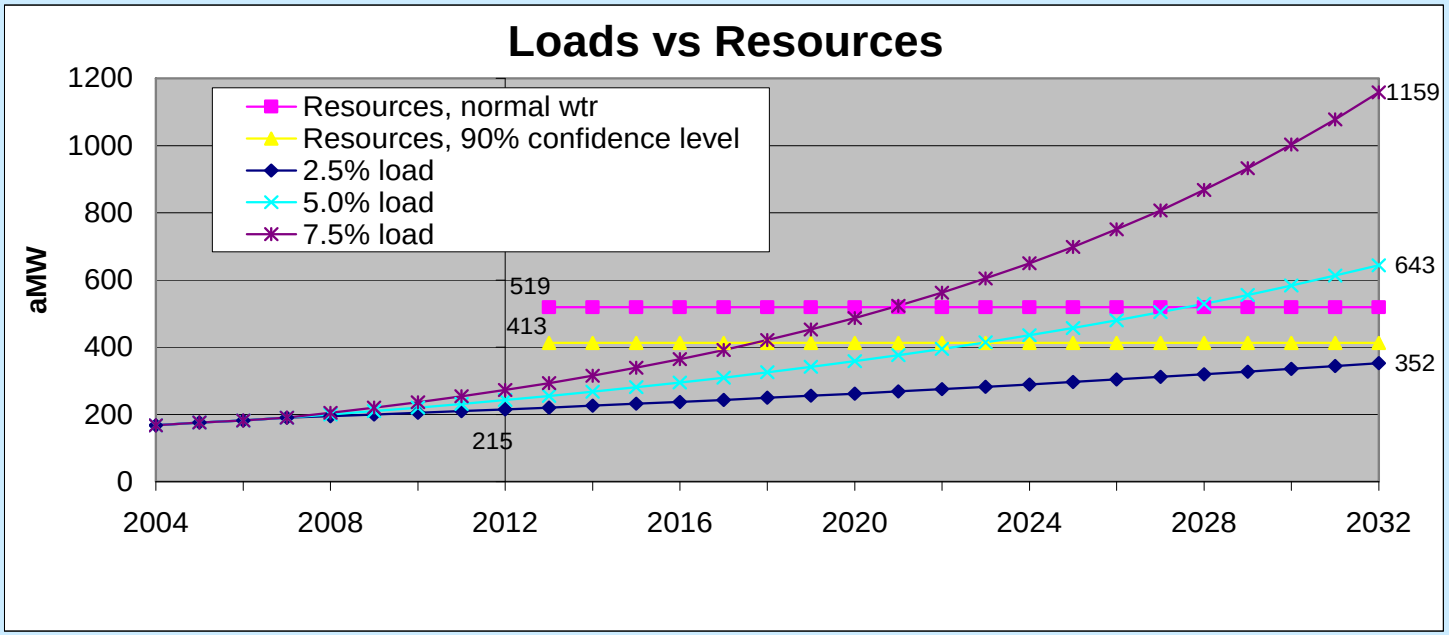
Scenario D Lower



Scenarios vary with rate and amount of load growth

Chelan PUD Distribution System

50% take RR / RI
100% LC, and 9-Canyons



Three other load growth scenarios: 2.5%, 5%, 7.5%

Possibility of a growth rate at a flat 5% or higher scenario is considered very unlikely.

Observation: For comparison Seattle City Light 2005 load was 1,046 aMW

Energy Comments / Conclusion

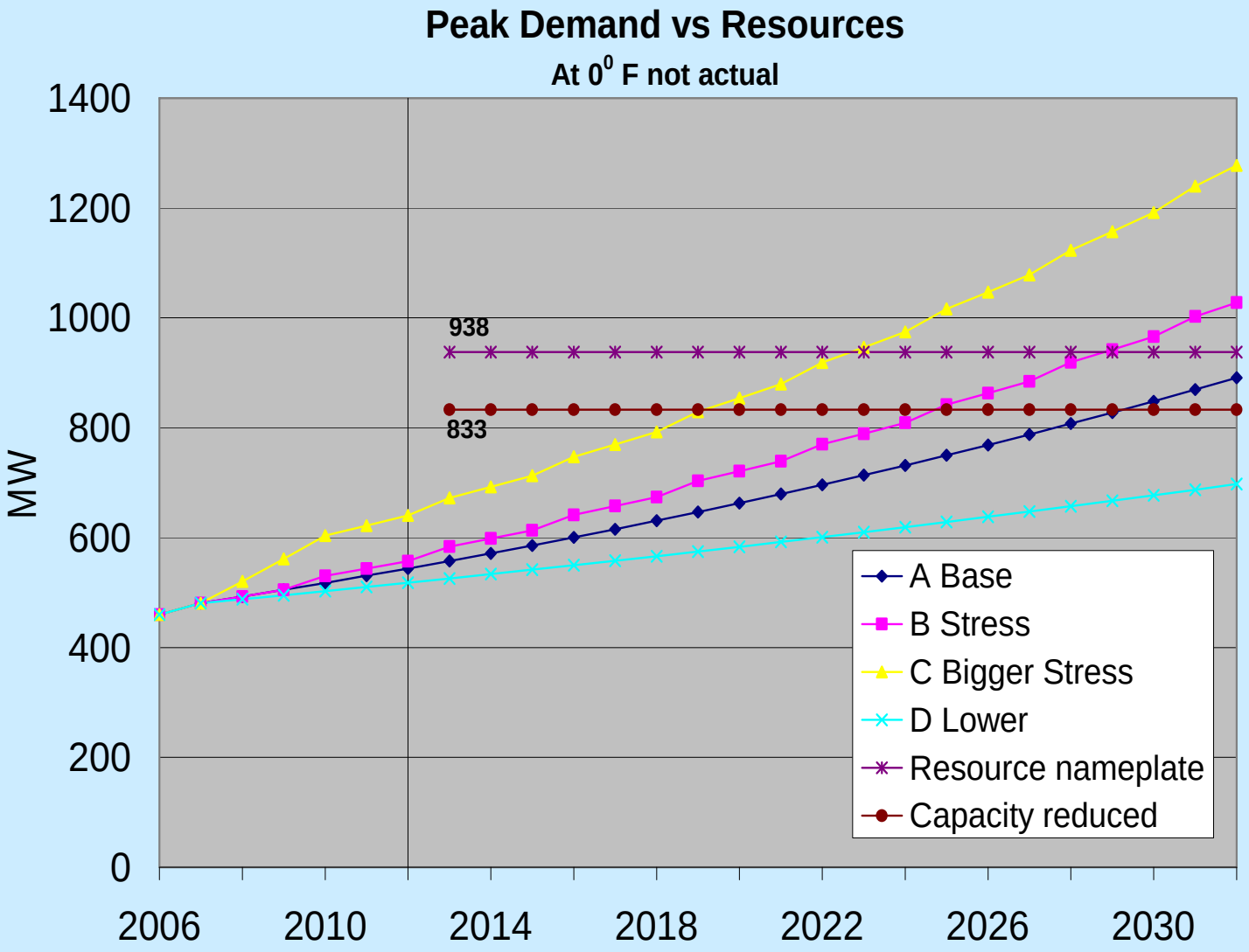
- Based on the assumptions listed the slice of resources noted should be adequate to meet loads in all 4 scenarios through 2032. Scenario C – Big Stress may have a few months in which the PUD could be deficit based on water and load variability.

Load Group

- K Carlson
- B King
- W Fields
- C Rissman

Peak Demand – Assumptions

- Peak Demand
  - 60 minute system peak at zero degrees F.
  - Starts with current forecast for winter 06-07 per Load Group
  - Then grow peak at the same annual rate as energy scenarios annual growth rate
    - Implies current load mix continues into the future
    - Implies no changes to load time of day shifting or peak shaving
- Capacity Resources to meet Peak Demand
  - 50% share of nameplate capacity for hydros, no capacity assumed for 9-Canyon wind farm
  - Reduction for Douglas PUD 5.54% share of Rocky Reach
  - Assumes continuation of the benefits of Mid-C Hourly Coordination Agreement to access District share of the nameplate capacity
  - Capacity reduced: based on 1 unit out at RR, RI and LC all at the same time



Peak Demand Scenarios

Peak Demand Comments / Conclusions

- Based on the assumptions listed the slice of resources noted may not be adequate to meet Peak Demand in all 4 scenarios.
- Scenario C – Bigger Stress has the most potential stress starting in year 2023.
- Stresses are set at zero degrees and the probability of that happening on an annual basis has not been evaluated.

Load Group

- K Carlson
- B King
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Load & Capacity Factors

Added observation

- Chelan County currently has a very low load factor shown by comparing annual energy need vs. 1 hr peak demand = 40%
  - 40% = 182 aMW Energy / 460 MW PeakDemand (forecast @ 0^0 in 06-07)
  - Seattle's was 61% (1046 / 1715 in 2005)
  - Puget's was 55% (2568 / 4684 in 2005)

- The hydro's capacity factor = 55% (519 energy / 938 capacity share in 2013)

- Observation
  - If the load factor is less than the capacity factor, then capacity requirements will stress the hydro system before the energy requirements
    - This is currently represented in all four scenarios
  - If the load factor and capacity factors were equal, then as load grows both capacity and energy will stress the hydro resources at the same time

Conclusions – Energy & Peak Demand

- Under most circumstances resources are sufficient to meet energy requirements, even under the Bigger Stress scenario C.
- Peak resources on the other hand are inadequate in later years in the higher stress scenarios B and C.

- Future mitigating options under high stress scenarios:
  - Acquire peaking capacity either through contracts or resources
  - Peak load pricing
  - Demand side management programs
    - Peak shaving
    - Peak shifting
  - Conservation programs
    - Cold climate heat pump