System Analysis Advisory Committee

June 23, 2014

Current SAAC Members

- Clint Kalich, AVISTA
- Mike McCoy, BECKER CAPITAL
- Marty Howard, BMH3 (CONSULTANT)
- Ehud Abadi, BPA
- Robert J Petty, BPA
- John Scott, EPIS
- Sibyl Geiselman, EWEB
- Kevin Nordt, GCPUD
- Rick Sterling, IDAHO PUC
- Mark Stokes, IDAHO POWER
- Jim Litchfield, LITCHFIELD CONSULTING (CONSULTANT)
- Fred Huette, NW ENERGY COALITION
- Diane Broad, ODOE
- Mike Hoffman, PNL
- Michael Deen, PPC
- Dick Adams, PNUCC
- Sima Beitinjaneh, PORTLAND GENERAL ELECTRIC
- Villamor B Gamponia, PSE
- Phillip. Popoff, PSE
- Dave LeVee, PwrCast
- Mark Dyson, ROCKY MOUNTAIN INSTITUE
- Tom Chisholm, USACE

Since the last SAAC…

- Changes to the model have been required based on updated peak load forecast and needs assessment
- Staff have focused on 2021 and 2026 as the critical outcomes for the 7th Plan

Timeline of Load Changes

- After April SAAC, concerns on how peak loads were represented were brought to Council staff by SAAC members
- Council staff upon review revised the peak forecast from using peak load based on weather-normalized load to expected peak load method presented in the May SAAC
- The 7th Plan needs assessment was revised to be consistent with the expected peak method

Timeline of Load Changes

- The ARMs from the needs assessment varied based on the relationship between peak and energy, staff took the average of the ARMs for the 2026 Needs Assessment runs in Genesys as the input for RPM
- New peaks loads made adequacy builds more frequent in the 1B and 2C scenarios, but in many cases the model was hitting a penalty value rather than building

Timeline of Load Changes

- Through the June Council meeting results presented had substantial penalty payments, caveats were given that there was still work to be done on loads

Timeline of Load Changes

- Staff found three model drivers for this phenomena
  - Some penalties were unavoidable at the beginning of the study because the resources that could be built, including conservation, were not sufficient to remove the penalties
  - The penalty was set too low at $1 Million per MW per year, which translated into $250,000 per quarter whereas the most expensive resource cost just under $6 Million per MW per quarter
  - The internal agent-based load forecast was biased to under-forecast most peak needs and thus even when options were available to avoid paying penalties, the LP in the model would not build

Timeline of Load Changes

- Staff revised the model to address issues raised by the updated peak-load forecast methodology

Model Revisions

- The penalty was changed to only apply to capacity that can be addressed by the resources in the model, i.e. penalties are not added into the NPV unless it's possible for the model to avoid them
  - The model still tends to have some penalty because some build decisions are very expensive, e.g. high-cost conservation

Model Revisions

- The input penalty was changed from $1 Million per MW per year to $24 Million per MW per year
  - This guarantees that paying the penalty **every period** is more expensive than building any of the resources
  - Paying the penalty in one future and for one period could potentially be less expensive than available build options

Model Revisions

- The internal LP was given perfect foresight rather than an internal load forecast model strictly for adequacy decisions
  - This is seen as an interim change for the draft plan, staff anticipates further refinement for the final

Model Results

- Generally with these revisions there are
  - More resource builds including demand response and thermals
  - Immediate needs for capacity resources to meet the adequacy standard drives early builds of expensive resources
  - The options coming out the model tend to fall into three categories:
    - Built within every future
    - Built frequently (around 50% of the time)
    - Optioned for a handful of extreme futures

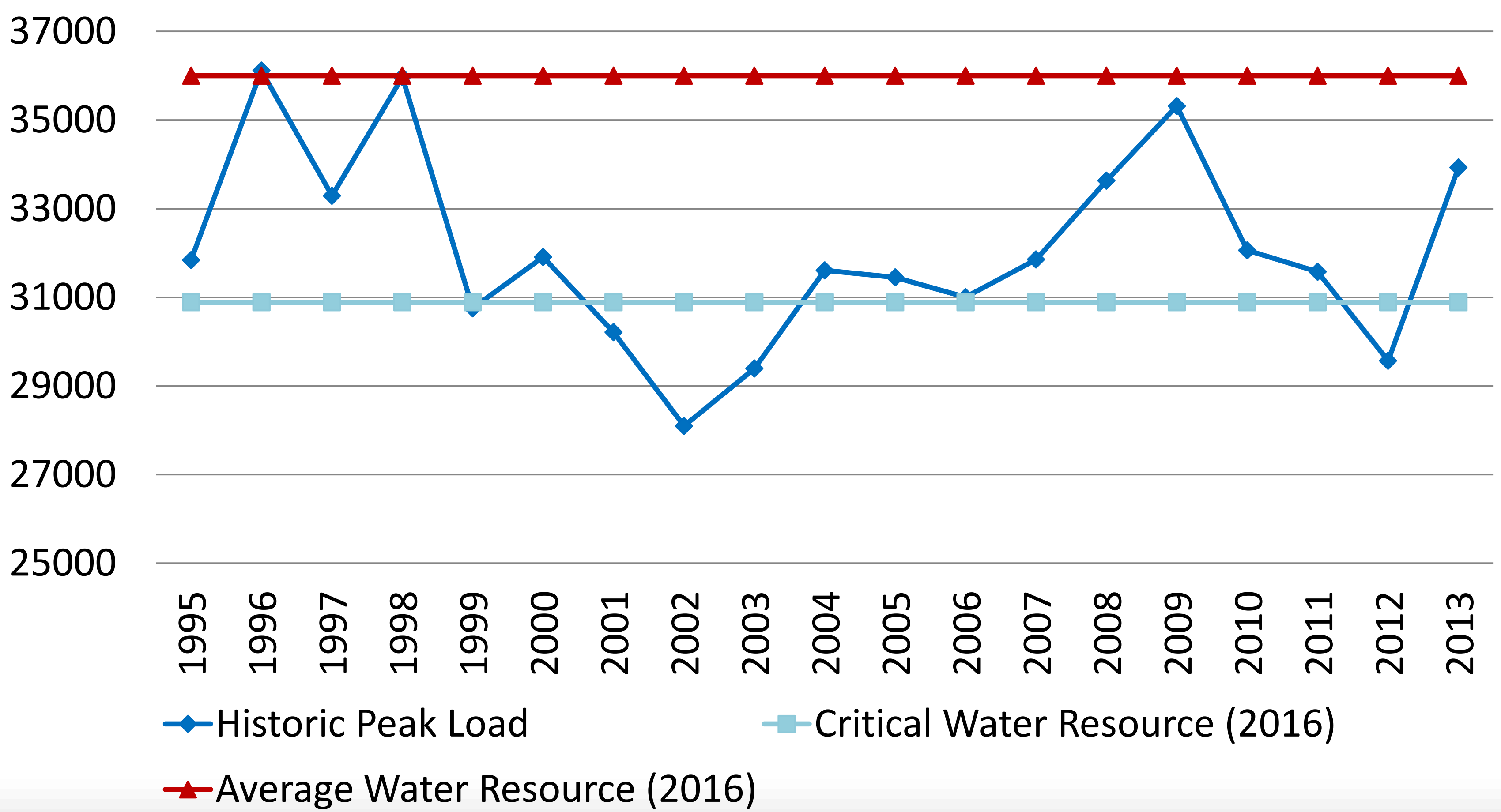
Critical Water Resource Capacity Winter 2016

Resource Type	MW Capacity
Thermal (Rate-Based)	12174
Wind	221
Critical Hydro	18785
Contracts	-289
TOTAL	30891

Average Water Resource Capacity Winter 2016

Resource Type	MW Capacity
Thermal (Rate-Based)	12174
Wind	221
Average Hydro	23898
Contracts	-289
TOTAL	36004

Historic Regional Peak Load



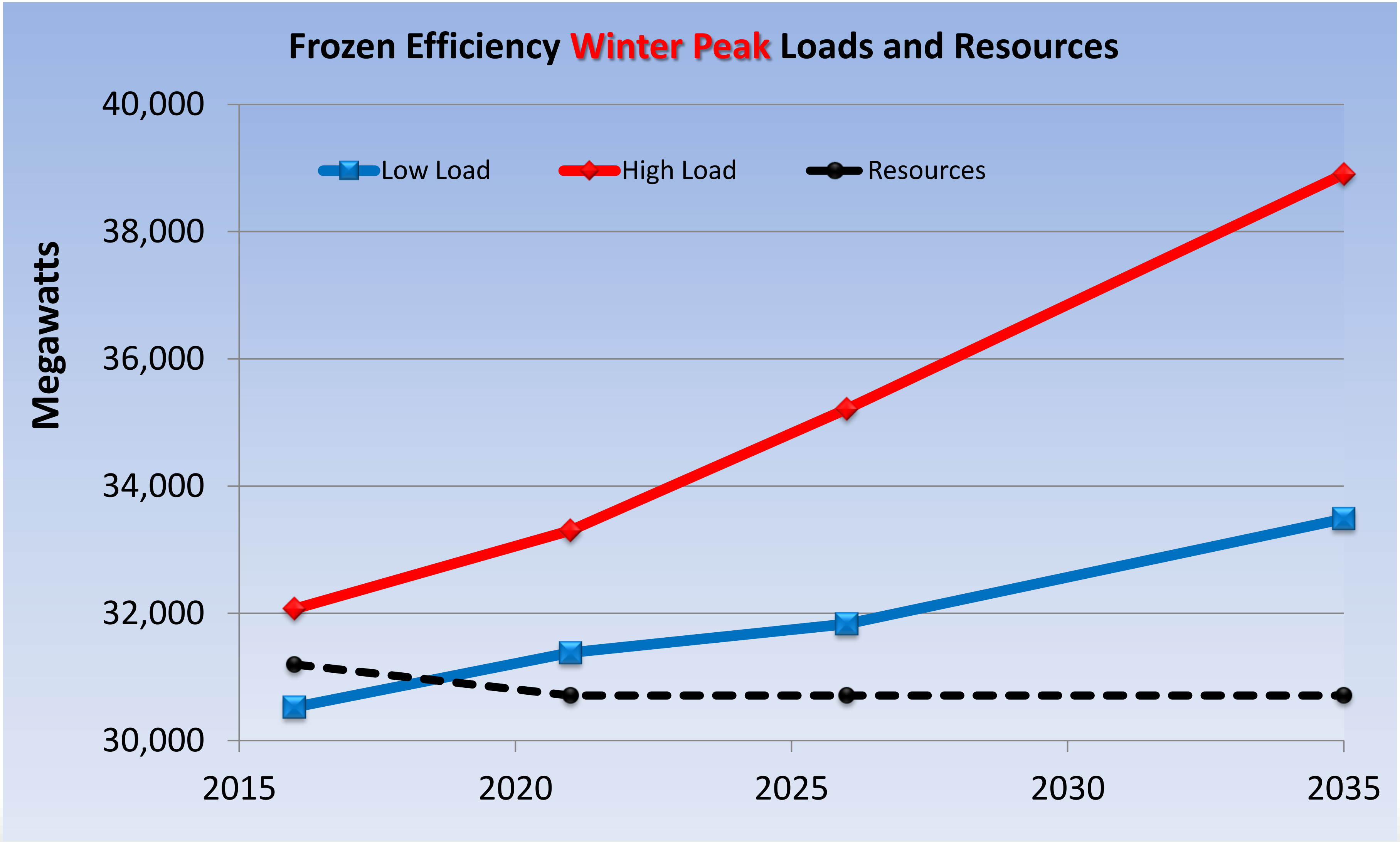
Gut Check
Since 2001…

- Added around 6000 MW of natural gas generation, retired around 650 MW
- Reached around 8900 MW of installed nameplate of wind generation (3000 MW for California)
- Gained around 1200 aMW of "historic weather-normalized load"
- Hydro expectation was reduced by around 500 aMW in winter

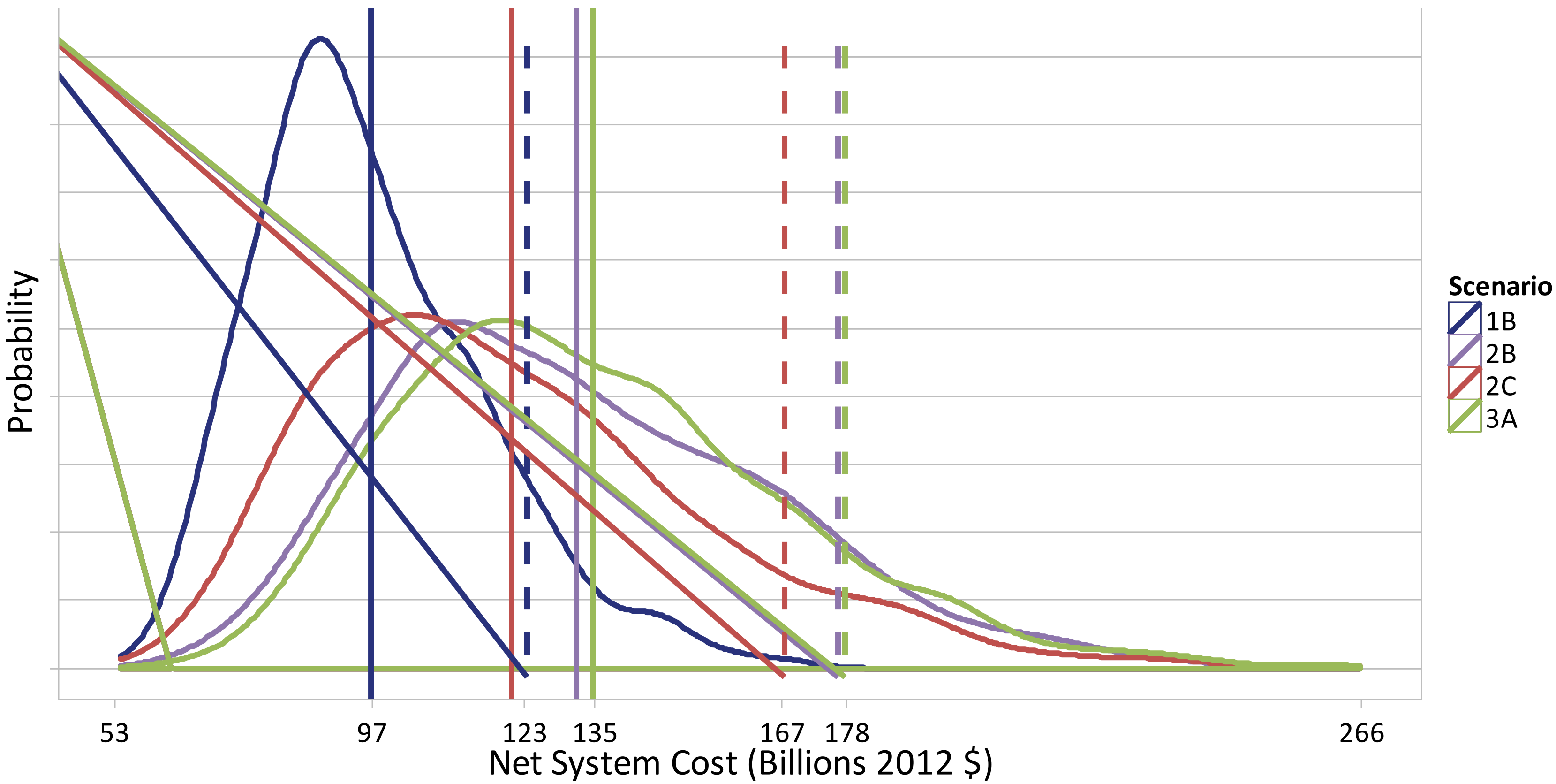
Gut Check
Since 2001 for capacity…

- **Rough** estimate of changes to load/resource balance:
  - + 6000 MW
  - - 650 MW
  - + 300 MW (5% wind)
  - - 1500 MW (rough estimate for wind integration)
  - - 500 MW (expected hydro estimate based on energy)
  - - 1550 MW (expected peak estimate)
- Increase of 2100 MW in capacity, estimates in 2001 were that the region was roughly 4000 aMW deficit

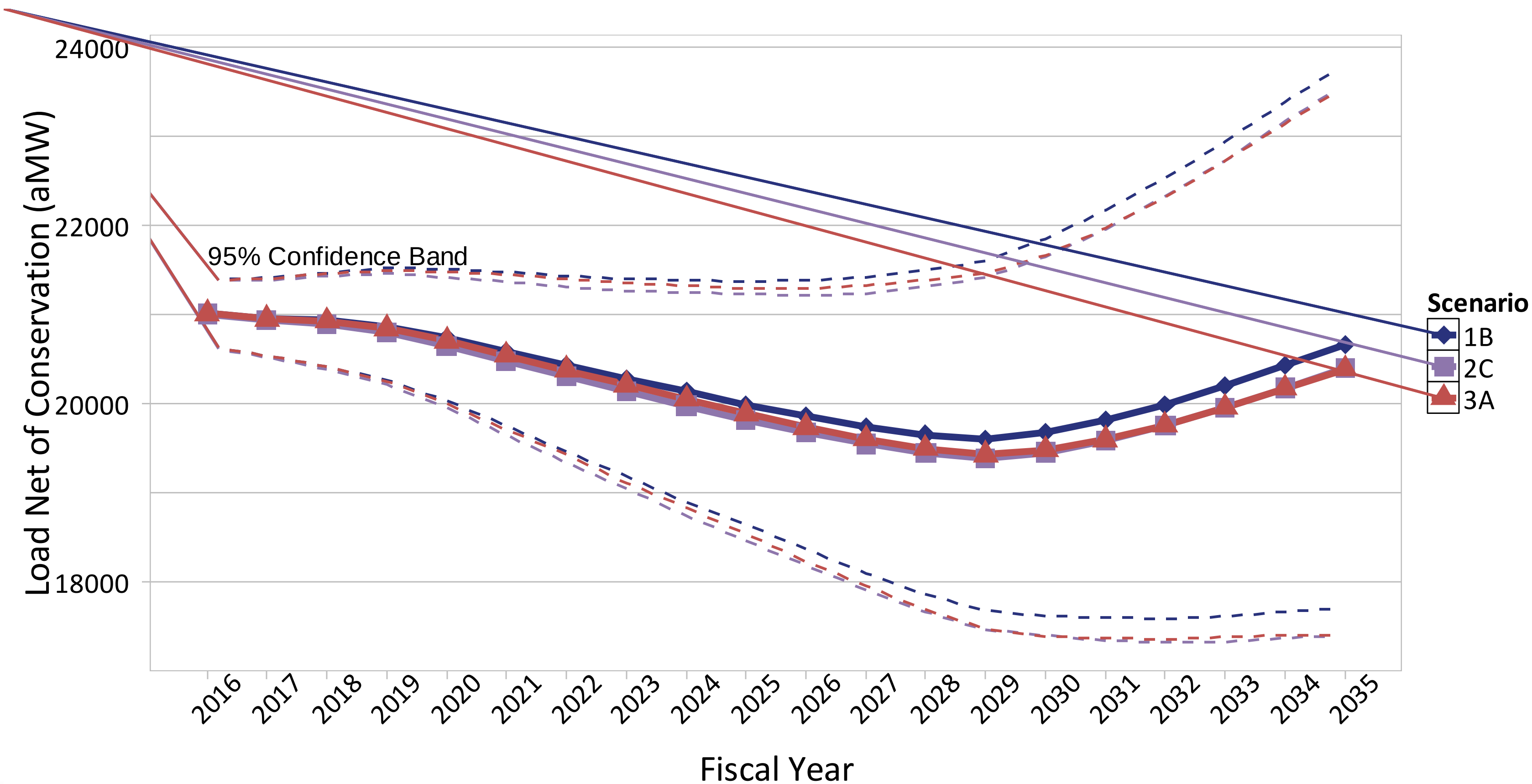
Capacity Loads & Resources 2016-35



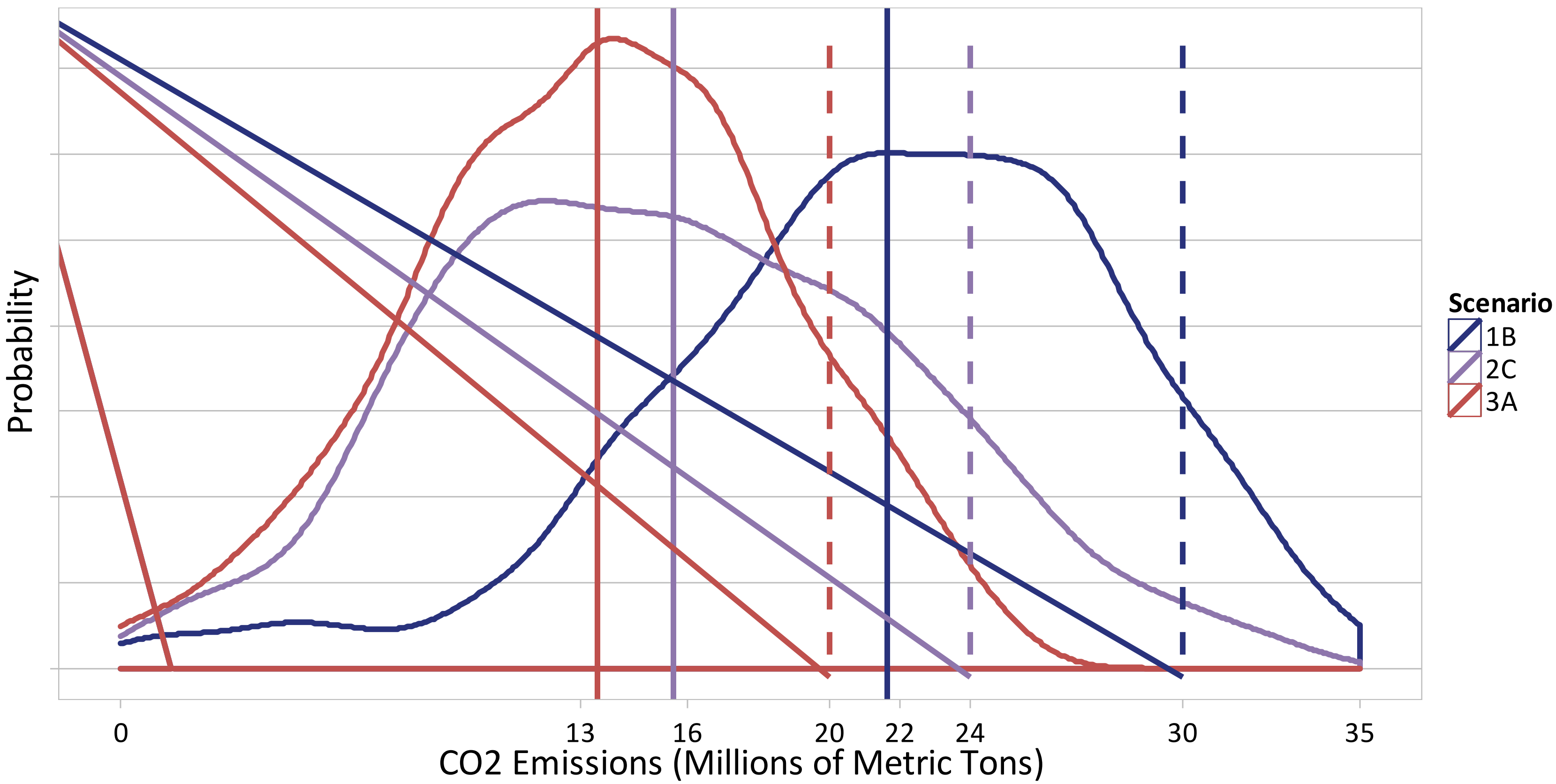
Net System Cost Scenario Comparison



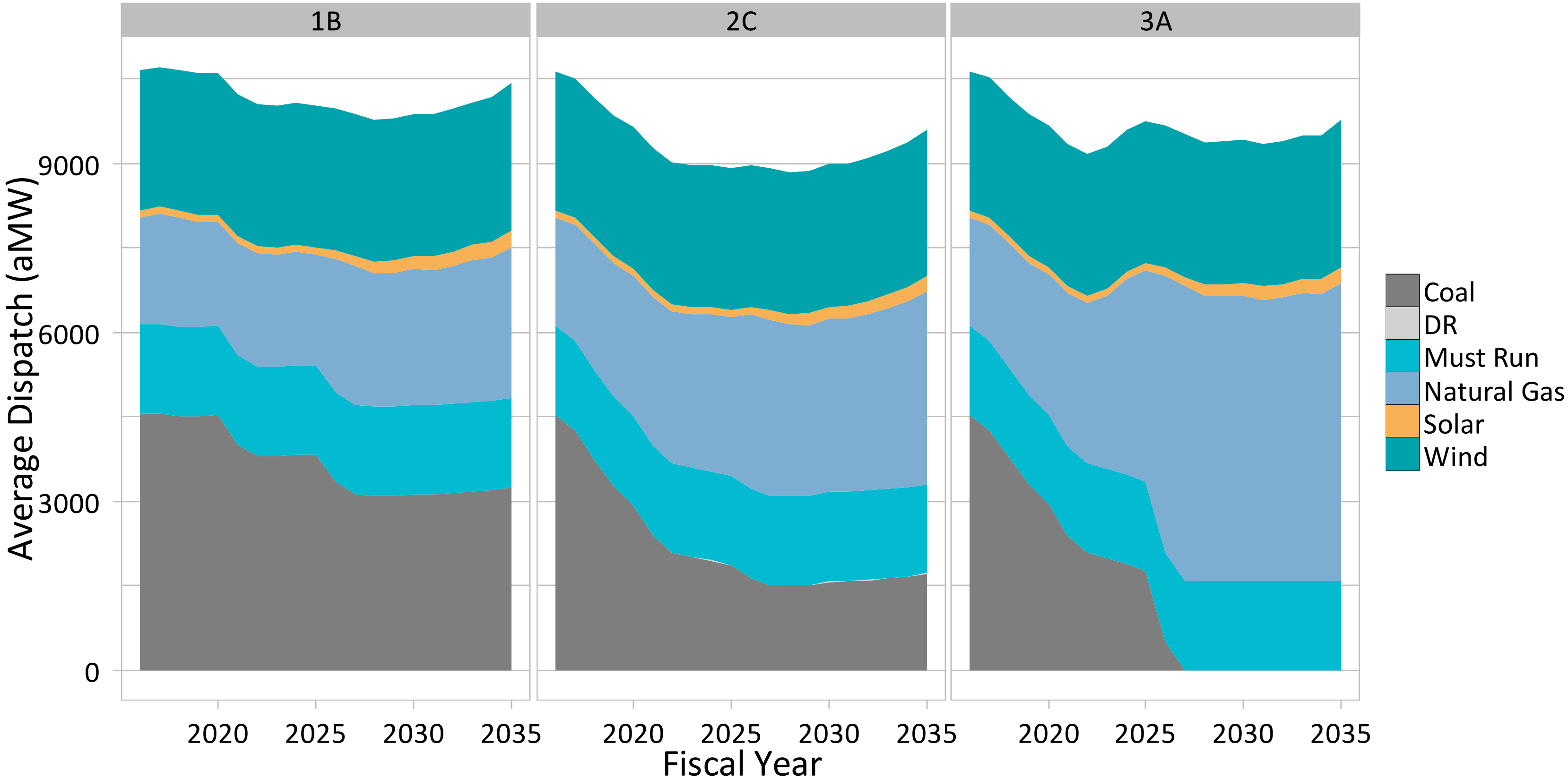
Load Net of Conservation Scenario Comparison



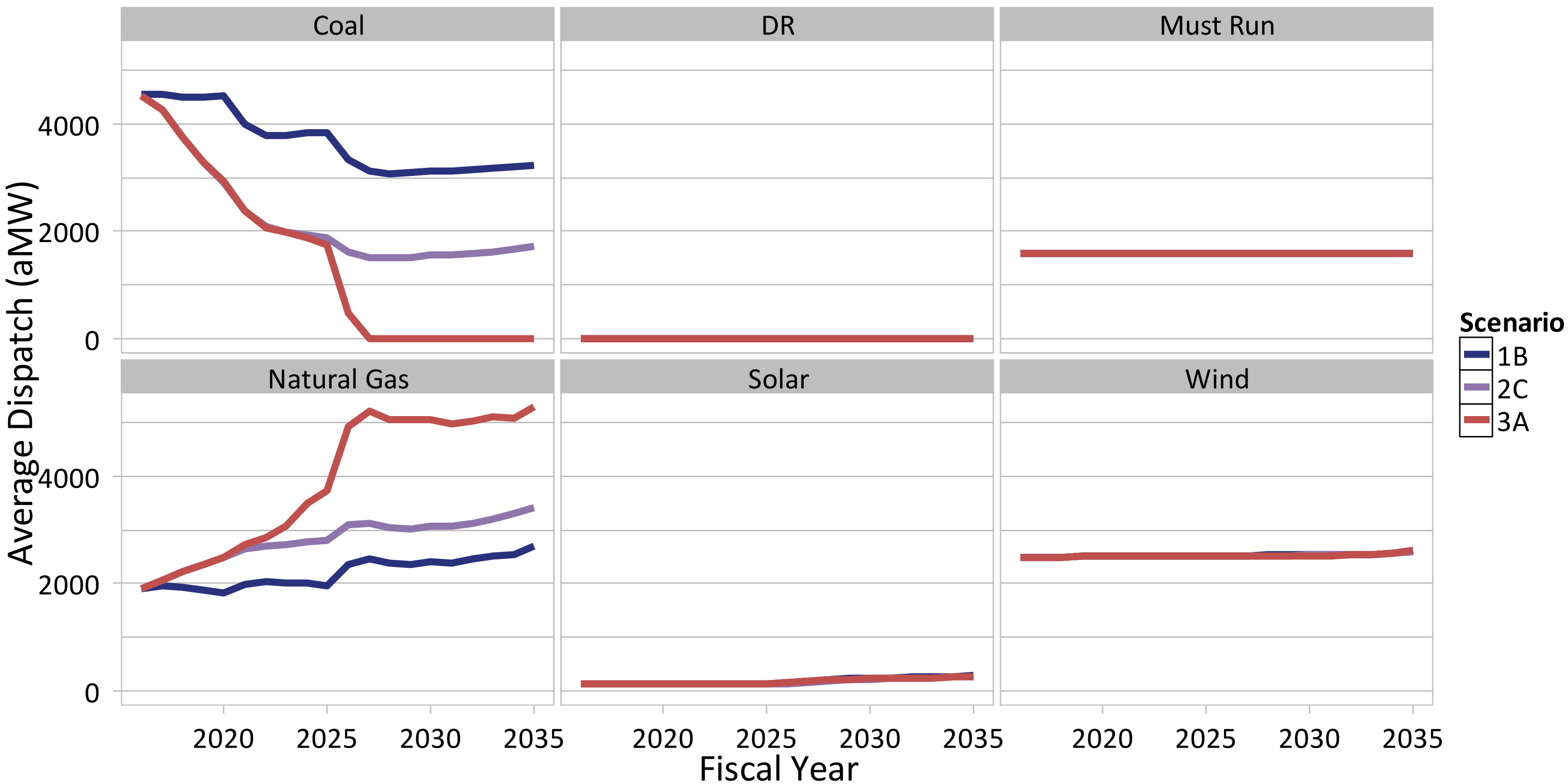
111(d) CO2 Emissions in 2030 Scenario Comparison



Non-Hydro Dispatch Scenario Comparioson

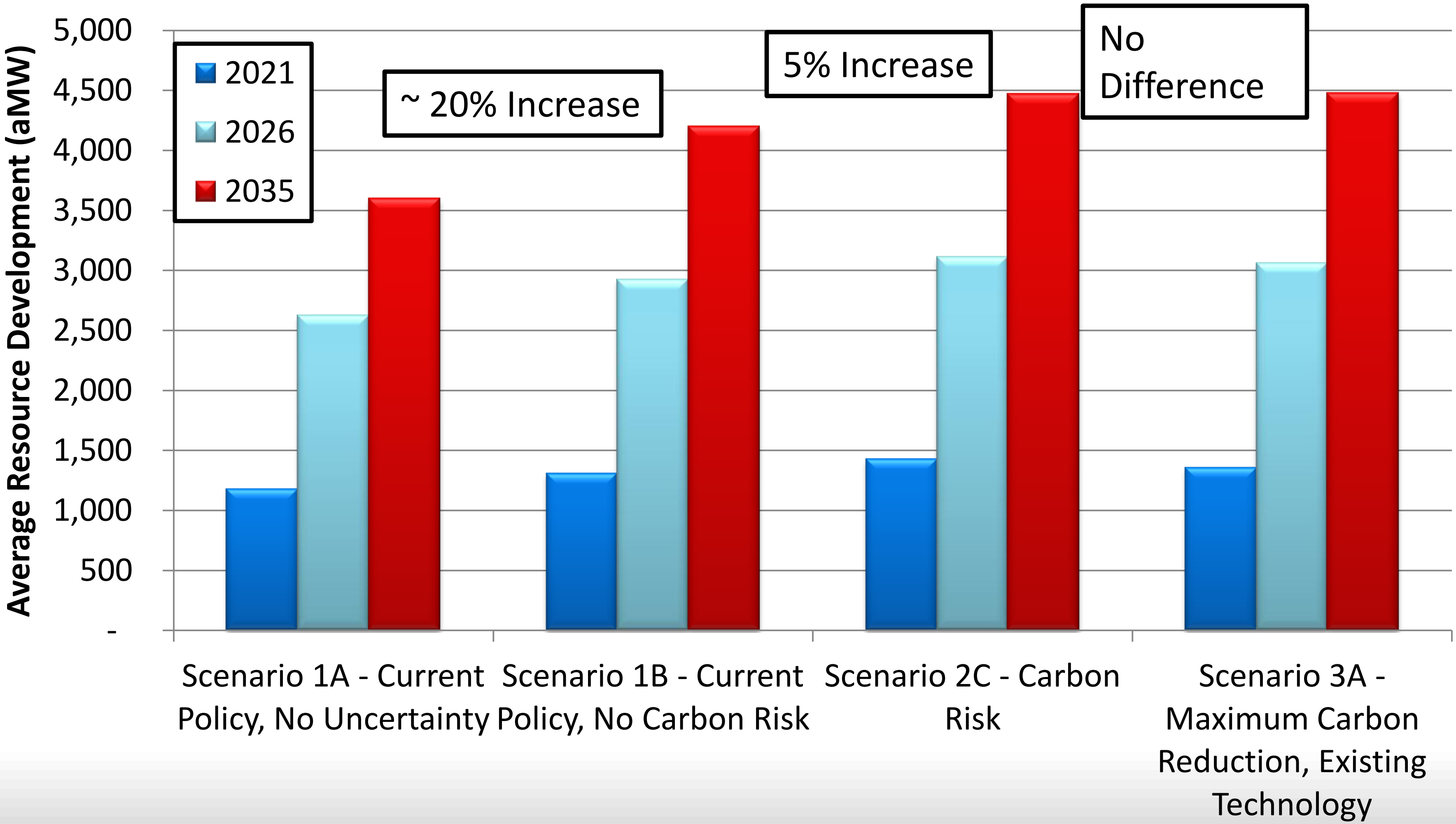


Non-Hydro Dispatch Scenario Comparison



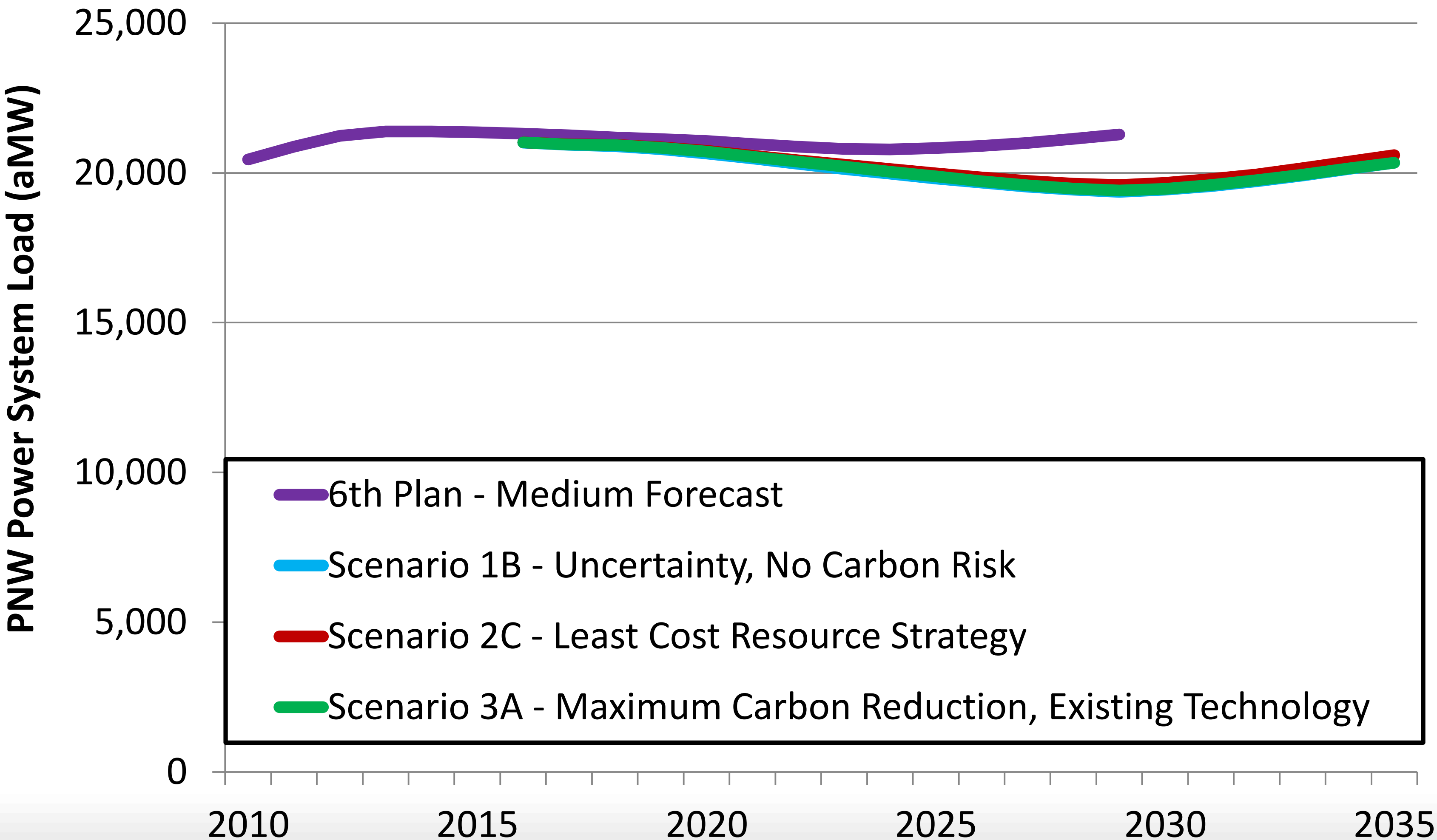
Average Conservation Development Across Scenarios Increases When Uncertainty and Carbon Risk Are Considered But Does Not Increase With Full Coal Retirement

Scenarios 1A,1B, 2C and 3A – Least Cost Resource Strategies

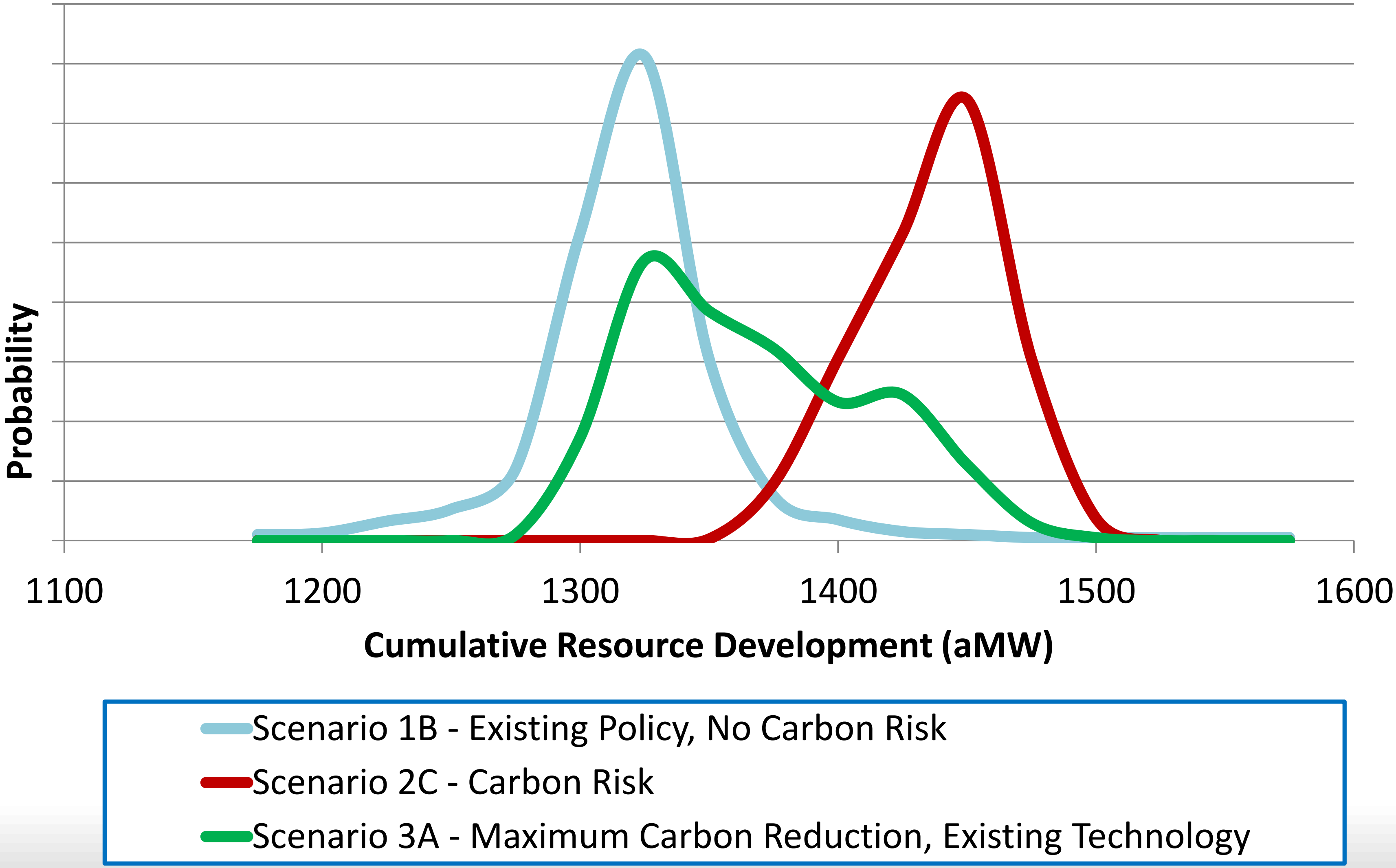


This Result is Very Similar To The 6th Plan

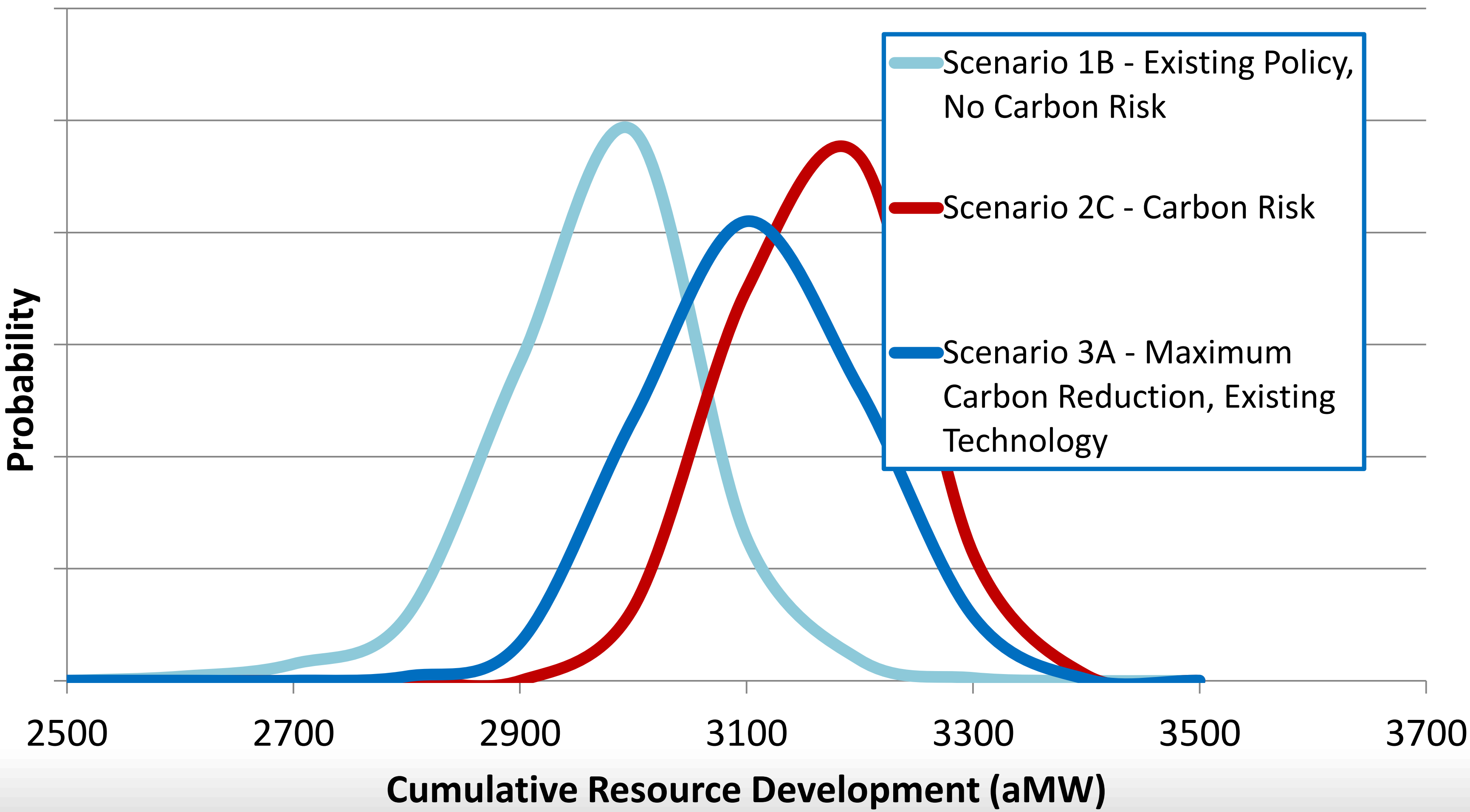
Net Load After Conservation Scenarios 1B, 2C and 3A Least Cost Strategy and 6th Plan



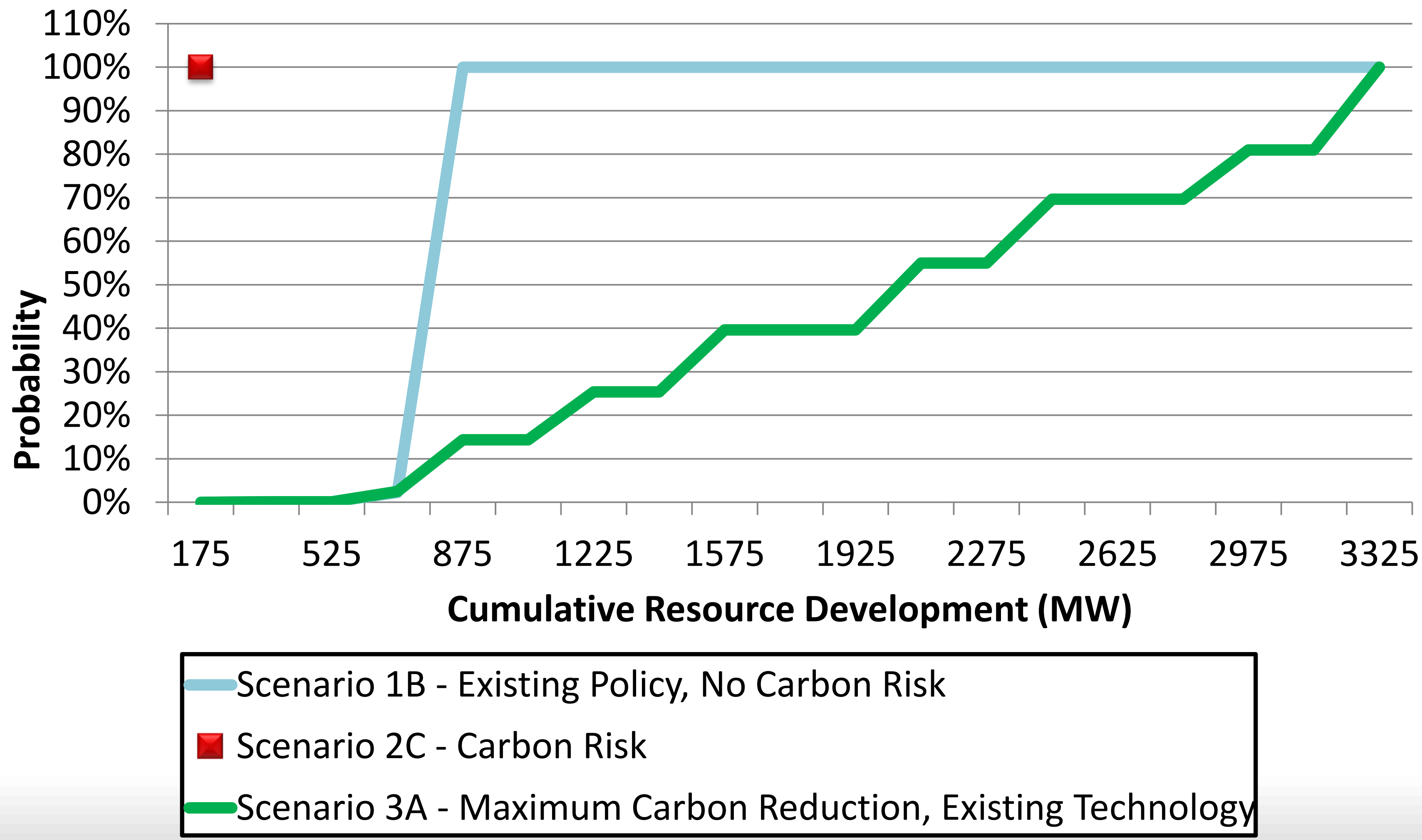
The Least Cost Strategies for Scenarios 1B, 2C and 3A Distributions of Conservation Development Through 2021



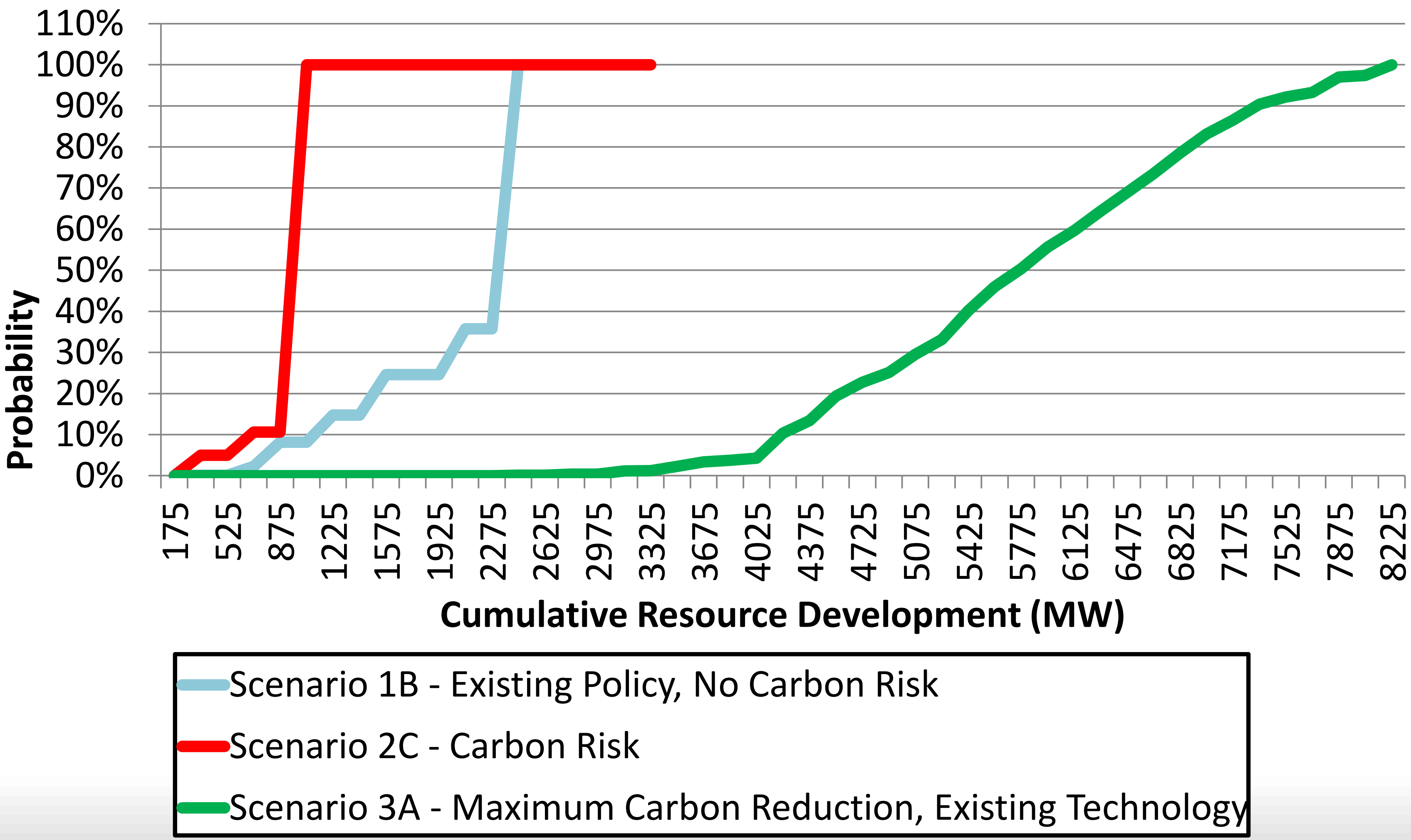
The Least Cost Strategies for Scenarios 1B, 2C and 3A Distributions of Conservation Development Through 2026



The Least Cost Strategies for Scenarios1B, 2C and 3A Distributions of Thermal Resource Development Through 2021 for Capacity



The Least Cost Strategies for Scenarios1B, 2C and 3A Distributions of Thermal Resource Development Through 2026 for Capacity



The Least Cost Strategies for Scenarios1B, 2C and 3A Distributions of Thermal Resource Development Through 2035 for Capacity