Portfolio Reliability Analysis

2025 Integrated Resource Plan

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Topics

2025 Integrated Resource Plan Preliminary Reliability Results

- Integrated Resource Plan Relevance
- Model Calibration Process
- Preliminary Base Portfolio Reliability Assessment
- Comparison of Preliminary Portfolios

Helpful Acronyms

Acronym	Meaning
BESS	Battery Energy Storage System
CCS	Carbon Capture Sequestration
EE	Energy Efficiency
ELCC	Effective Load Carrying Capability
EPA	Environmental Protection Agency
IRP	Integrated Resource Plan
LOLE	Loss of Load Expectation
LOLH	Loss of Load Hour

Acronym	Meaning
LOLP	Loss of Load Probability
L&R	Load & Resource
LTCE	Long-Term Capacity Expansion
MW	Megawatt
NG	Natural Gas
PRB	Powder River Basin
PRM	Planning Reserve Margin
RCAT	Reliability & Capacity Assessment Tool

Idaho Power Integrated Resource Plan Acronym List Link

IRP Educational Resources

Home › Energy and the Environment › Energy › Planning and Electrical Projects › Our 20-Year Plan › Educational Resources

IRP Questions and Responses

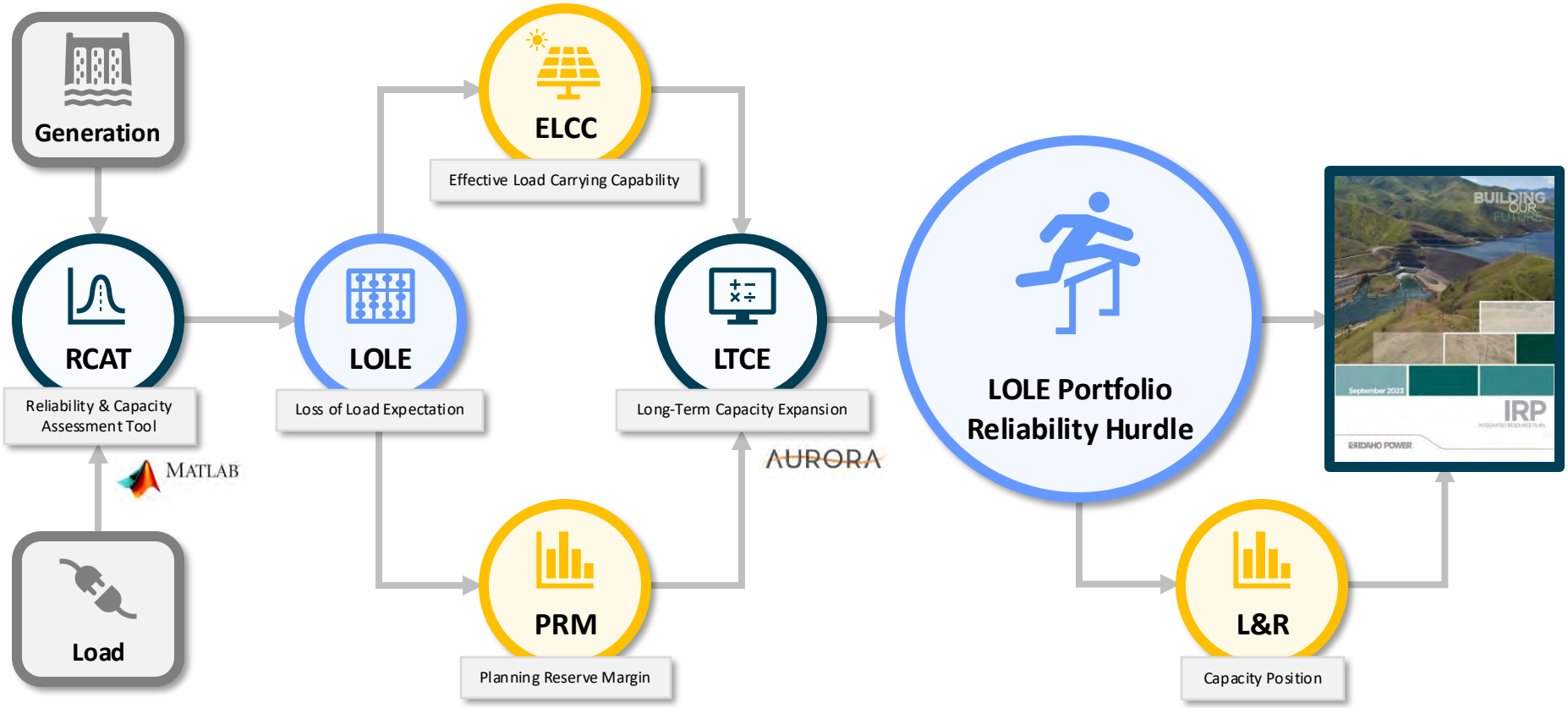
Educational Resources

Idaho Power has compiled these resources to help those participating in our *Integrated Resource Plan* (IRP) process or anyone who wants to know more about how their energy is generated and delivered. We will add links, presentations and videos as they become available.

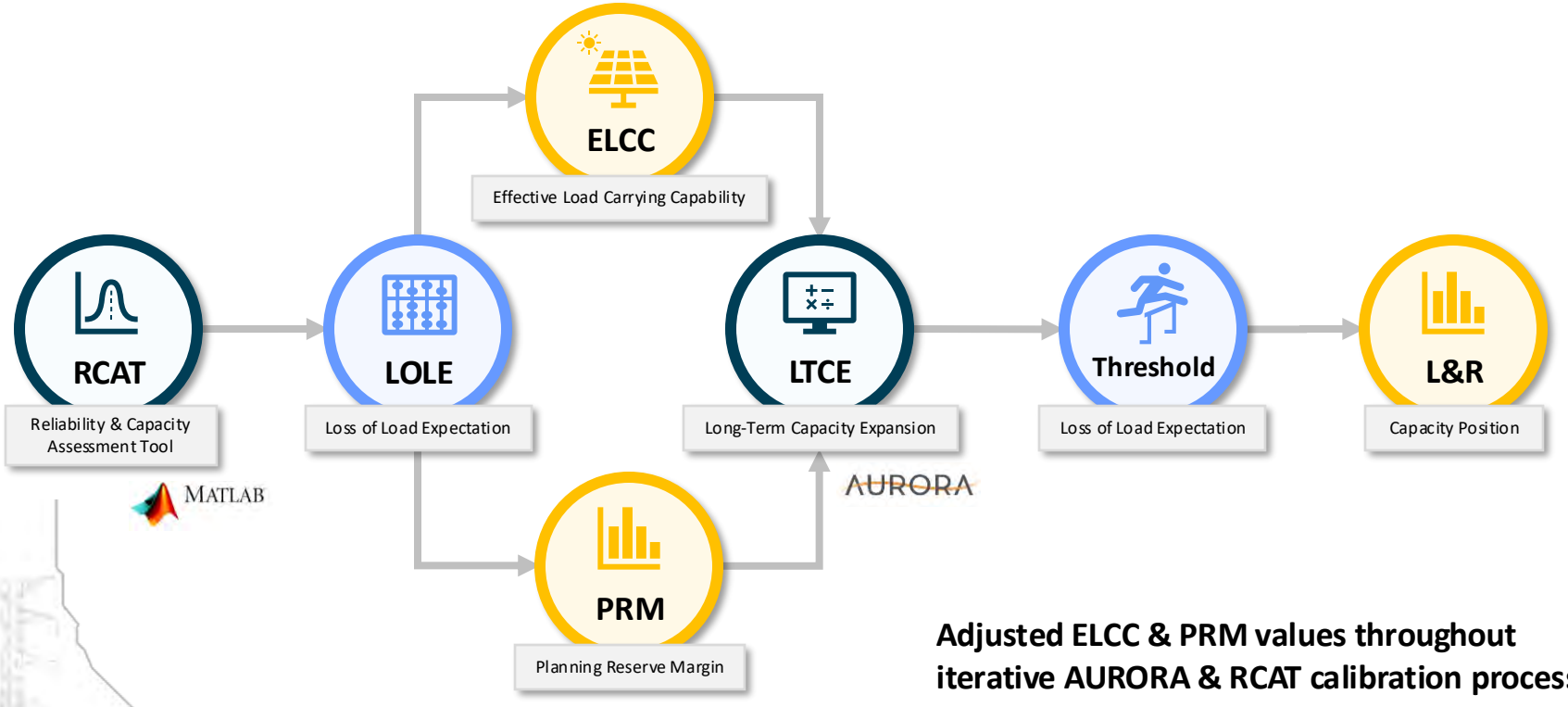
A Deep Dive into How Idaho Power Assesses Reliability & Capacity in the IRP

Idaho Power Educational Resources Link

IRP Relevance



2025 IRP Model Calibration



Adjusted ELCC & PRM values throughout iterative AURORA & RCAT calibration process

Preliminary Base Portfolio

Bridger Natural Gas with EPA 111(d) Rule Included

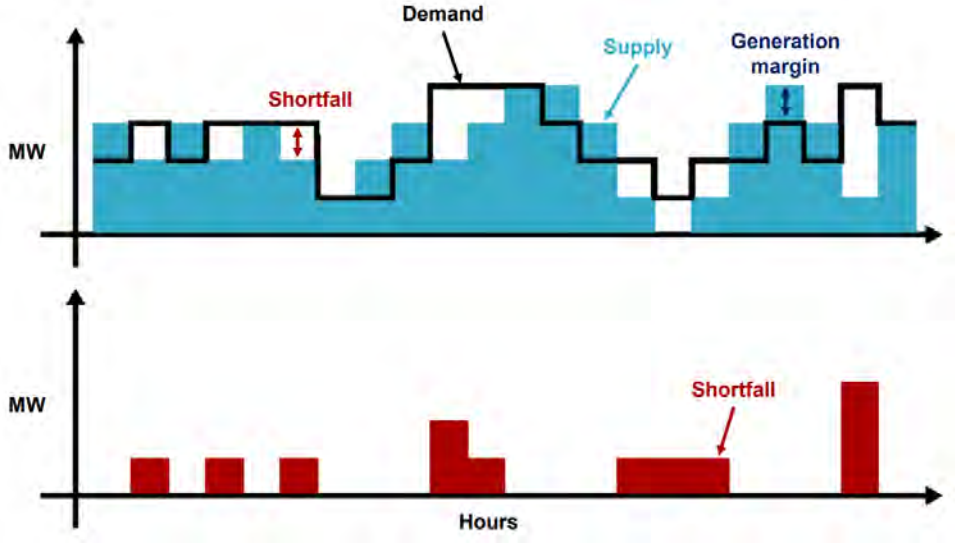
Year	Transmission	Coal	Converted Gas	New Gas	Hydrogen	Wind	Solar	4-Hour BESS	8-Hour BESS	100-Hour BESS	Geothermal	Pumped Hydro	Nuclear	Demand Response	EE Bundles
2026	0	(134)	261	0	0	0	125	250	0	0	0	0	0	0	0
2027	0	0	0	0	0	600	420	100	0	0	0	0	0	0	0
2028	B2H / 4C	0	0	0	0	0	100	200	0	0	0	0	0	0	0
2029	SWIP-N	0	0	150	0	100	0	155	0	0	0	0	0	10	0
2030	0	(350)	350	300	0	0	100	0	0	0	0	0	0	0	0
2031	0	0	0	0	0	0	400	0	0	0	0	0	0	0	8
2032	0	0	0	0	0	0	200	0	0	0	0	0	0	0	0
2033	0	0	0	0	0	0	100	50	0	0	0	0	0	0	21
2034	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
2035	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
2036	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
2037	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2038	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2039	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2040	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
2041	0	0	0	50	0	0	0	5	0	0	0	0	0	0	0
2042	0	0	0	0	0	0	0	5	0	0	0	0	0	10	3
2043	0	0	0	50	0	0	0	5	0	0	0	0	0	0	0
2044	0	0	0	0	0	0	0	55	0	0	0	0	0	0	7
2045	0	0	0	0	0	0	0	5	0	50	0	0	0	0	2
Change		(484)	611	550	0	700	1,445	835	0	50	0	0	0	20	58

Loss of Load Hour Metric

Loss of Load Hour

LOLH: the expected number of hours per time period when a system's hourly demand is projected to exceed the generating capacity

$$LOLH = \sum_{i=1}^{H} LOLP_i$$



From 2024 IEEE Fundamentals of Resource Adequacy for Modern Power Systems Morning Session

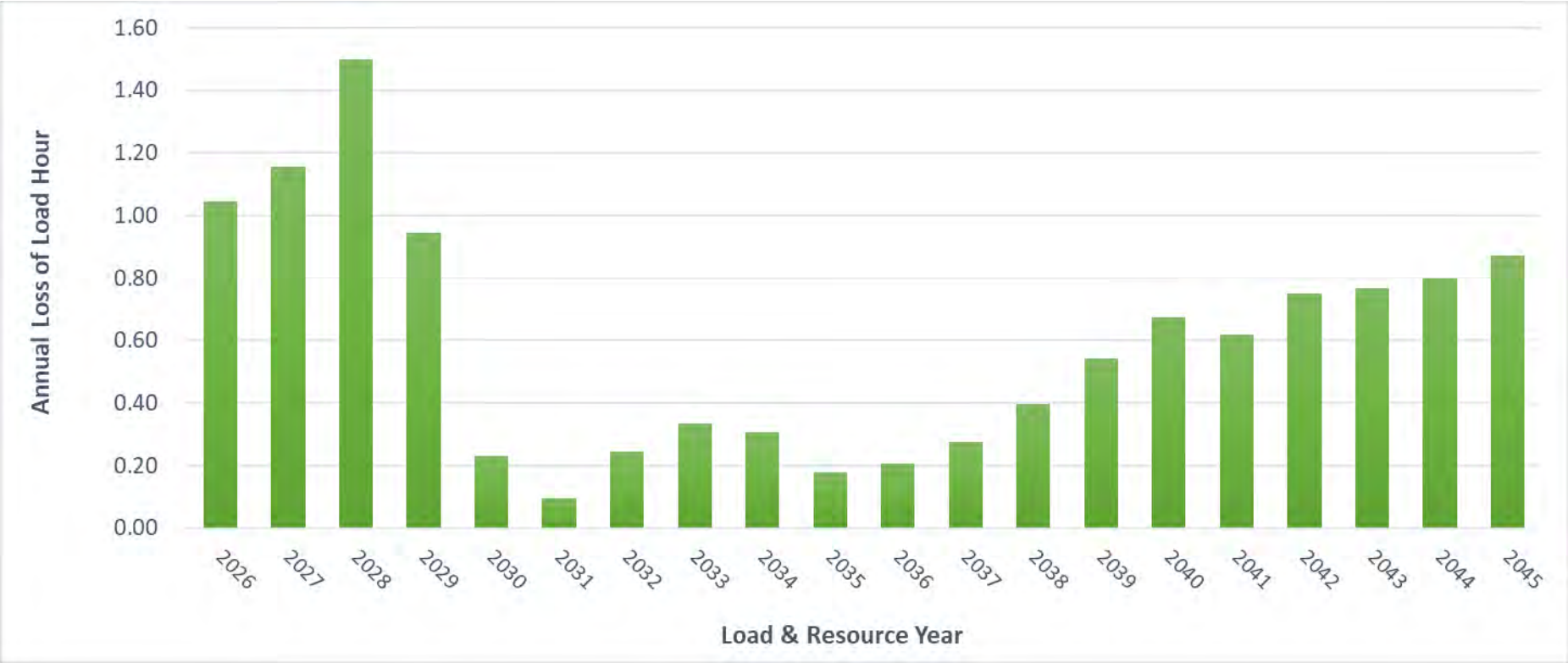
From the above Basic Example

Total Hours of Shortfall = 9 Hours

Shortfall Event Count = 6 Events

Annual Loss of Load Hour

Preliminary Base Bridger Natural Gas with EPA 111(d) Rule Included

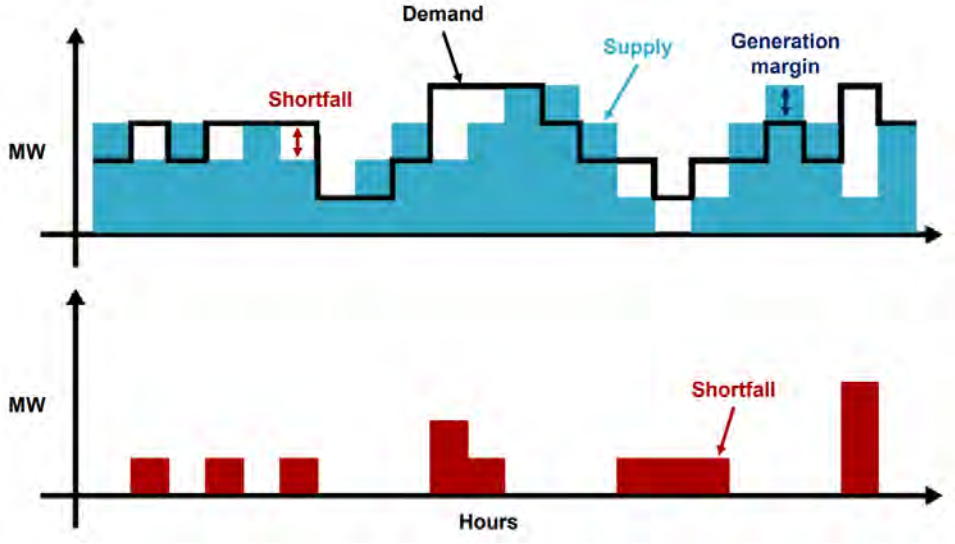


Loss of Load Expectation Metric

Loss of Load Expectation

LOLE: the expected number of days per time period for which the available generation capacity is insufficient to serve the demand at least once per day

$$LOLE = \sum_{d=1}^{D} \max[{}_{i=1}^{H}(LOLP_i)]$$



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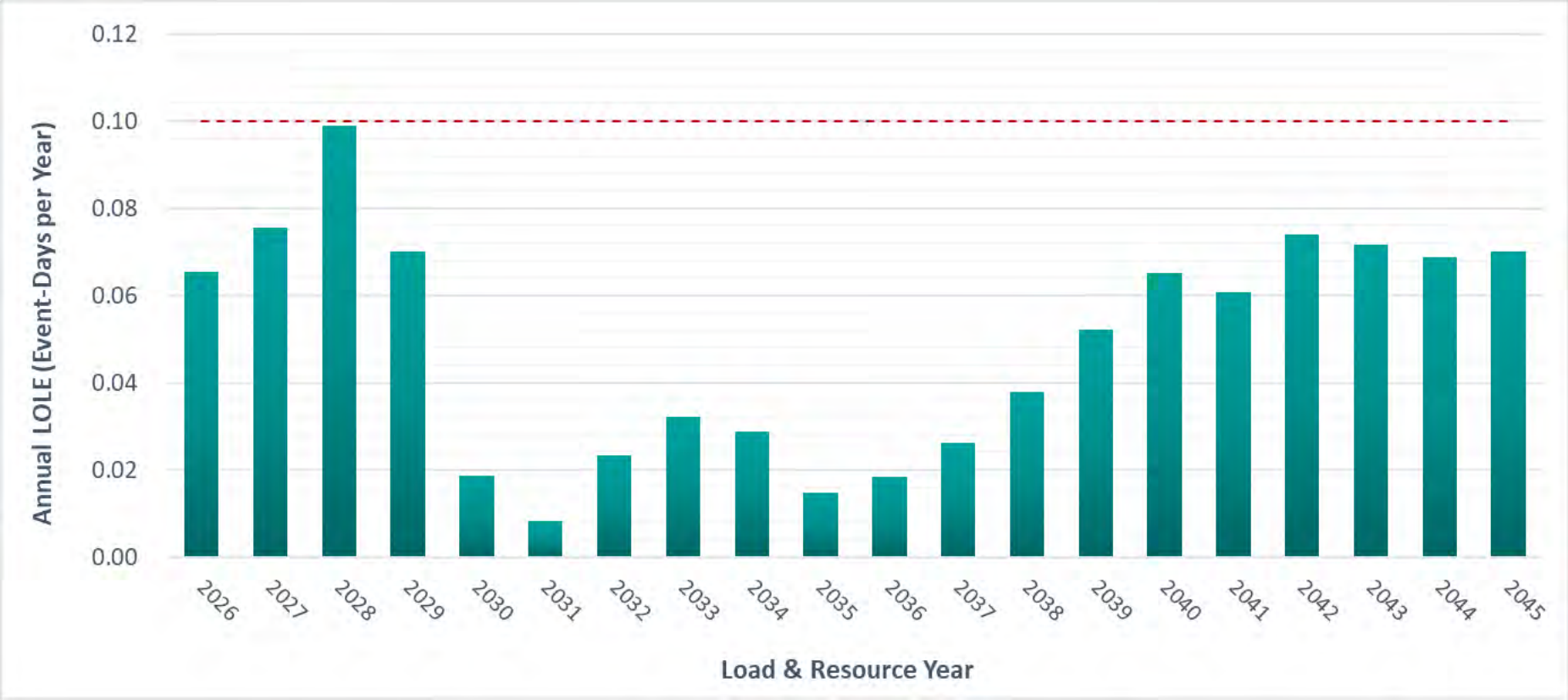
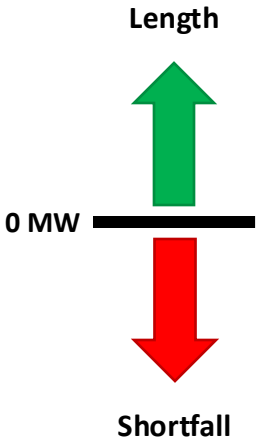
Annual Loss of Load Expectation



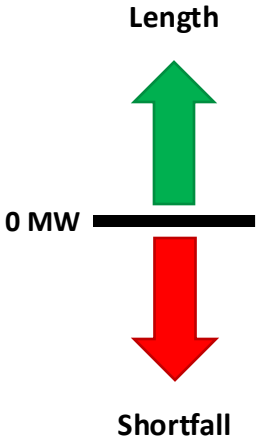
Annual Capacity Positions

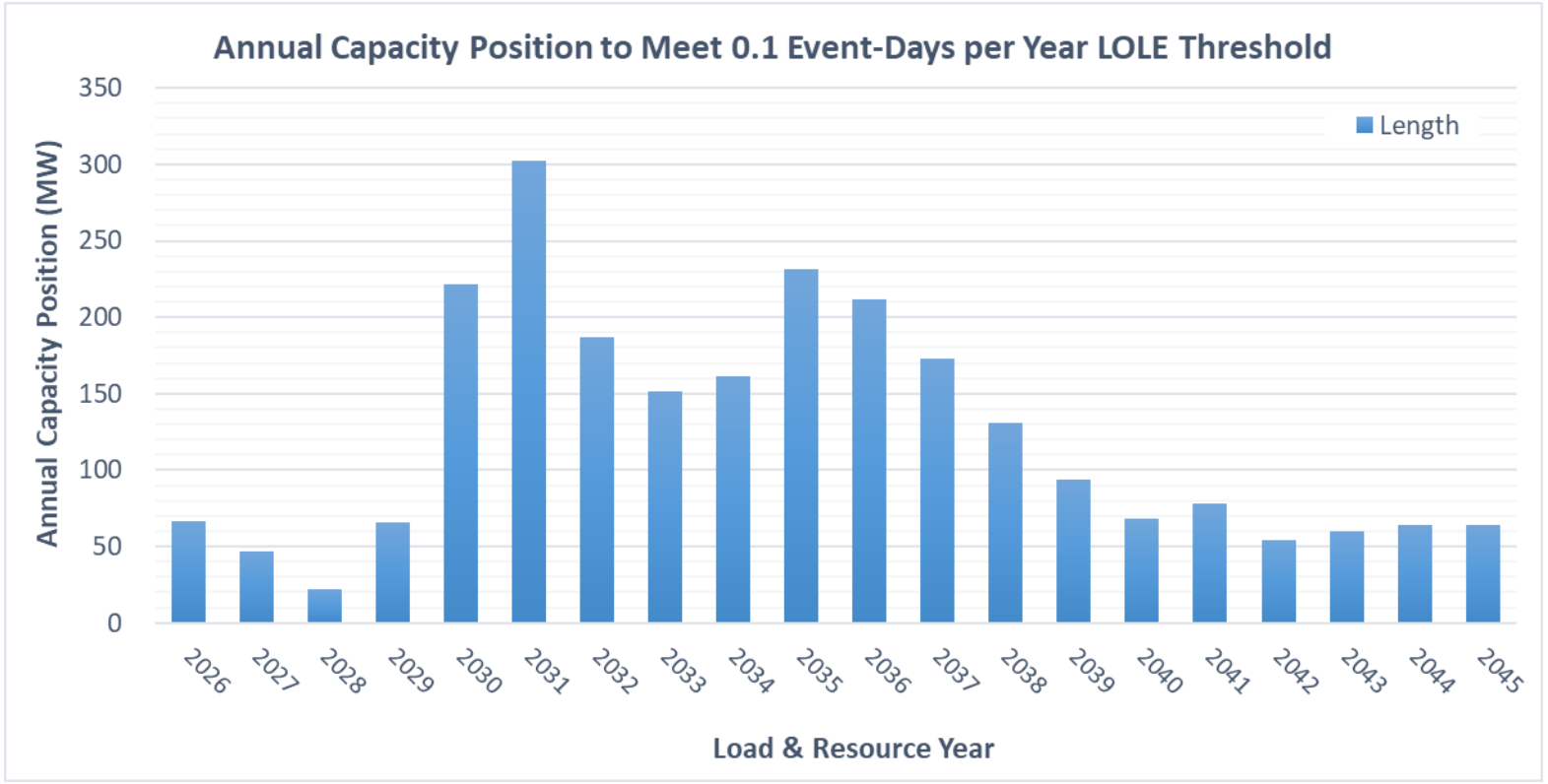


- **All main case portfolios must be in a position of capacity length for each year in the planning horizon to be deemed reliable**
- **Capacity length does not represent surplus capacity**
  - Capacity length is the Company's annual position to meet the 0.1 event-days per year Loss of Load Expectation ("LOLE") threshold for a tuned-portfolio
  - The capacity position calculation considers all fully-subscribed firm transmission, meaning capacity length reflects a decreased need in capacity-driven market imports

Annual Capacity Positions

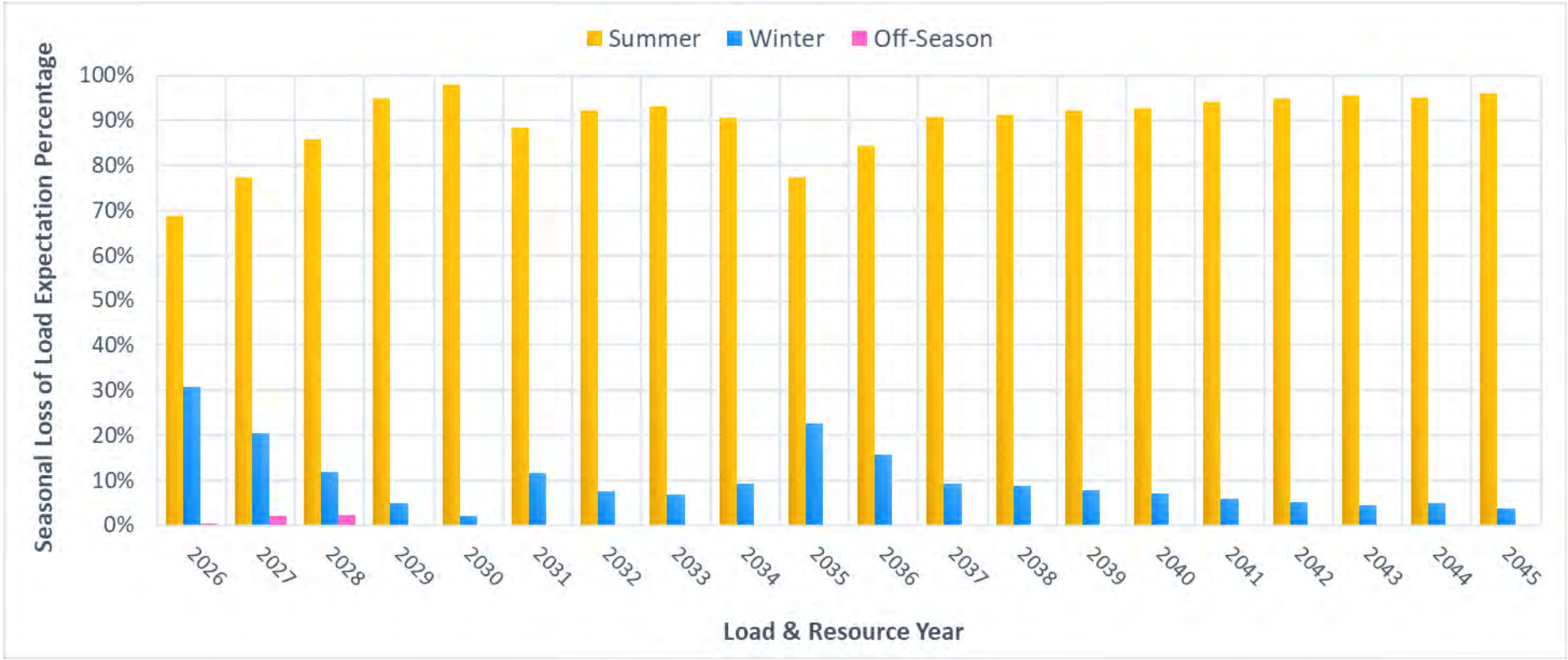
Preliminary Base Bridger Natural Gas with EPA 111(d) Rule Included





Seasonal Loss of Load Expectation

Preliminary Base Bridger Natural Gas with EPA 111(d) Rule Included



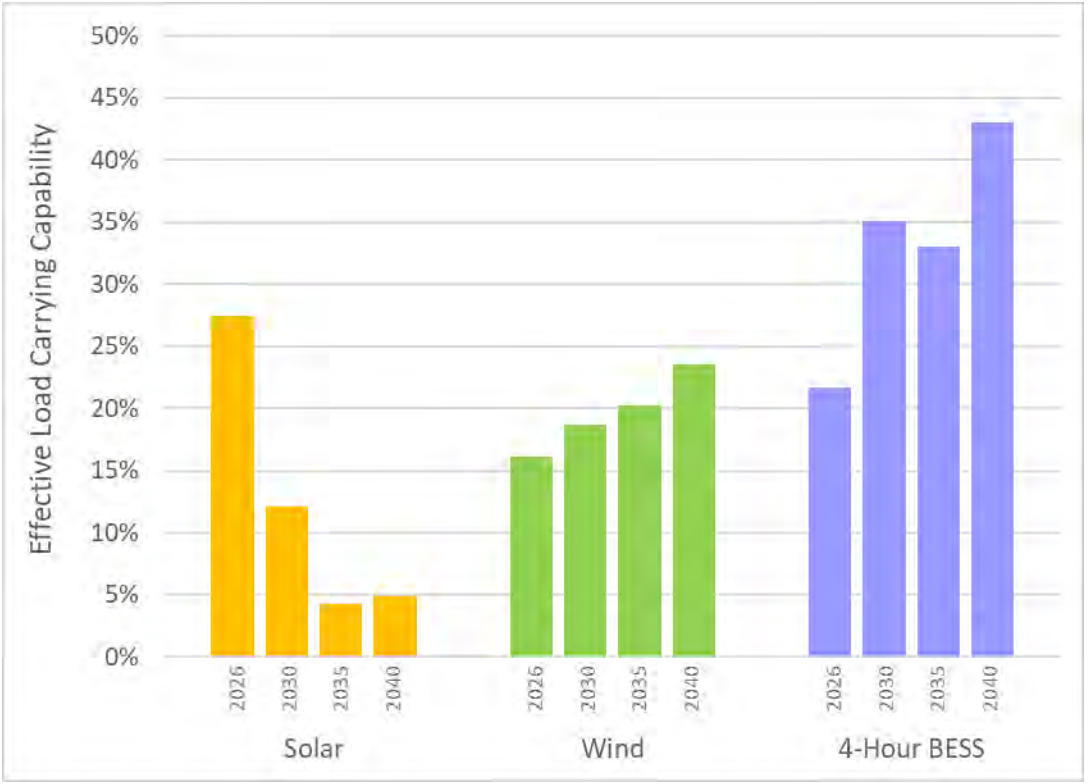
Effective Load Carrying Capability

Preliminary Base Bridger Natural Gas with EPA 111(d) Rule Included

Year	Solar	Wind	4-Hour BESS
2026	125	0	250
2027	420	600	100
2028	100	0	200
2029	0	100	155
2030	100	0	0
2031	400	0	0
2032	200	0	0
2033	100	0	50
2034	0	0	0
2035	0	0	0
2036	0	0	0
2037	0	0	0
2038	0	0	0
2039	0	0	0
2040	0	0	5
2041	0	0	5
2042	0	0	5
2043	0	0	5
2044	0	0	55
2045	0	0	5
Change	1,445	700	835

- The Effective Load Carrying Capability ("ELCC") is a reliability-based metric that assesses an individual resource's contribution to the overall system reliability
- The ELCC calculation is driven by the timing of high Loss of Load Probability ("LOLP") hours & is a function of the resource buildout

Calculating the ELCC of the next 100 MW



Annual Loss of Load Expectation

All Preliminary Portfolios

Base Portfolios

- With 111(d) Rule
  - Bridger NG Conversion
  - Bridger No Conversion
  - Bridger CCS Conversion
  - Bridger NG Conversion No Gas 2029
  - Bridger NG Conversion No Gas 2029/2030
  - Bridger NG Conversion Smaller Gas 2030
- Without 111(d) Rule
  - Bridger PRB Conversion
  - Bridger NG Conversion
- Large Load Cases with 111(d) Rule
  - 300 MW Large Load
  - 500 MW Large Load
- Clean by 2045

All listed preliminary portfolios meet Idaho Power's reliability threshold & are in a position of capacity length for the entire planning horizon

Annual Loss of Load Expectation

All Preliminary Portfolios