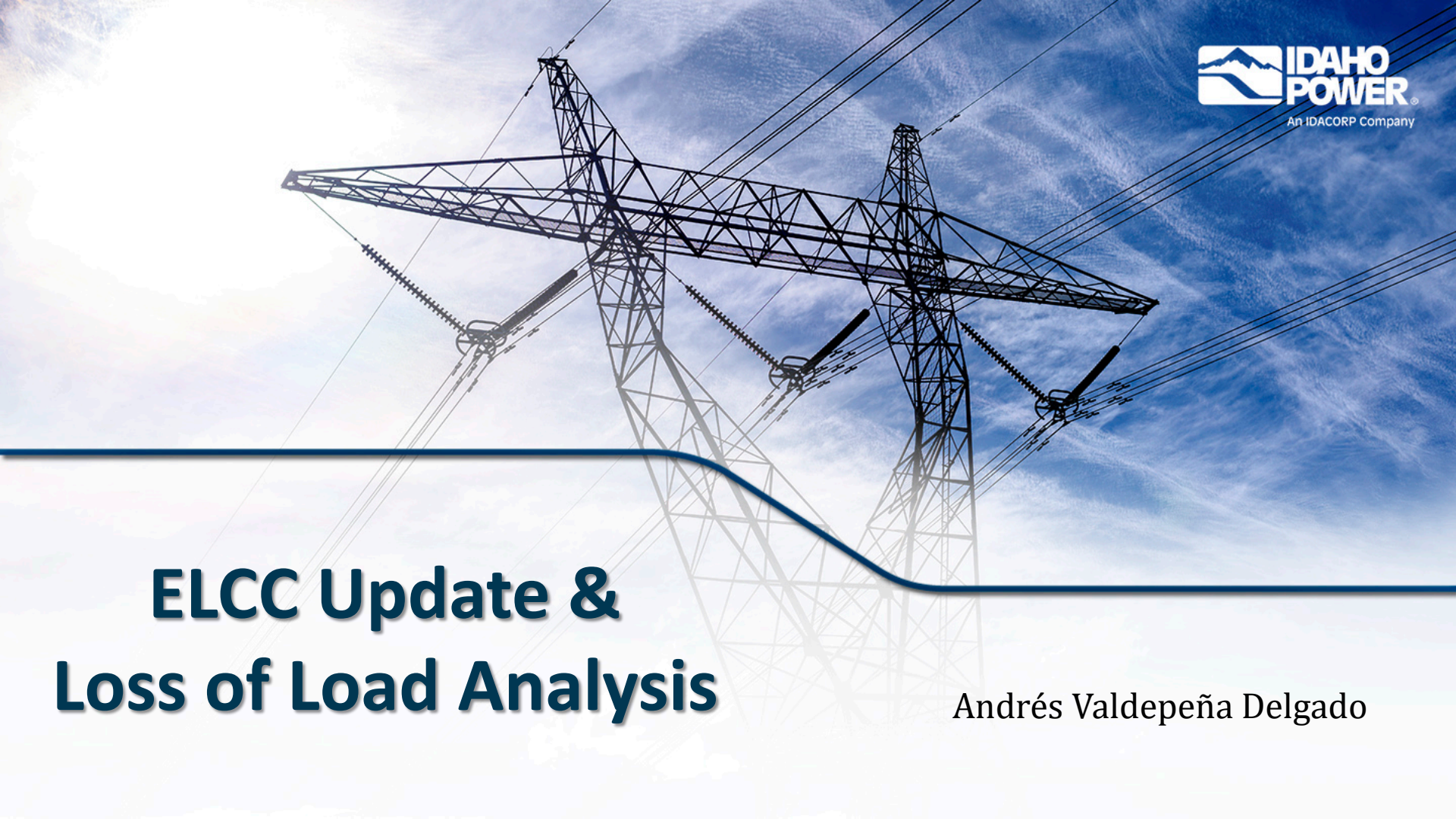

ELCC Update & Loss of Load Analysis

Andrés Valdepeña Delgado

Presentation Outline

- Introduction
- ELCC Update
- Loss of Load Analysis
- Planning Margin Update

Introduction

- This presentation introduces the most up-to-date ELCC values for the different VERs
- An updated planning margin is provided based upon the new ELCC values
- The proposed loss of load analysis to be used on the top performing portfolios is also described

Definitions

Acronym	Expansion
DR:	Demand Response
ELCC:	Effective Load Carrying Capability
LOLE:	Loss of Load Expectation
VER:	Variable Energy Resource

2021 IRP Relevance

Contribution to Peak

(ELCC)

Reliability Hurdle

(LOLE)

Presentation Outline

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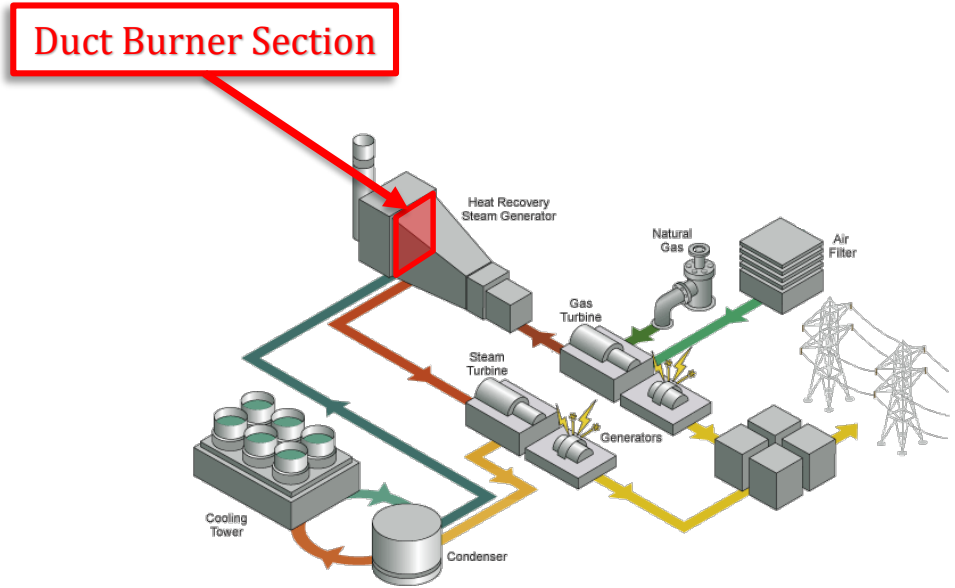
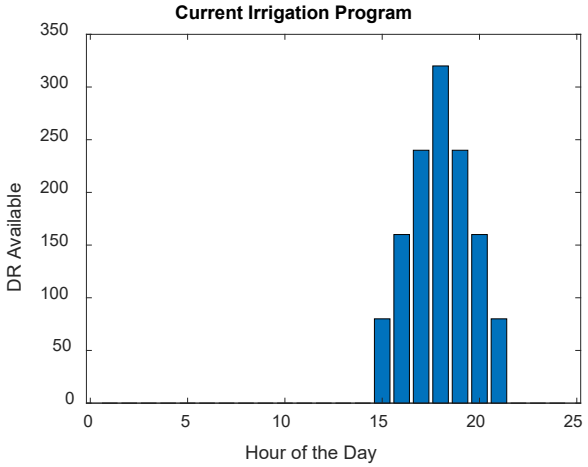
Langley Gulch Upgrades

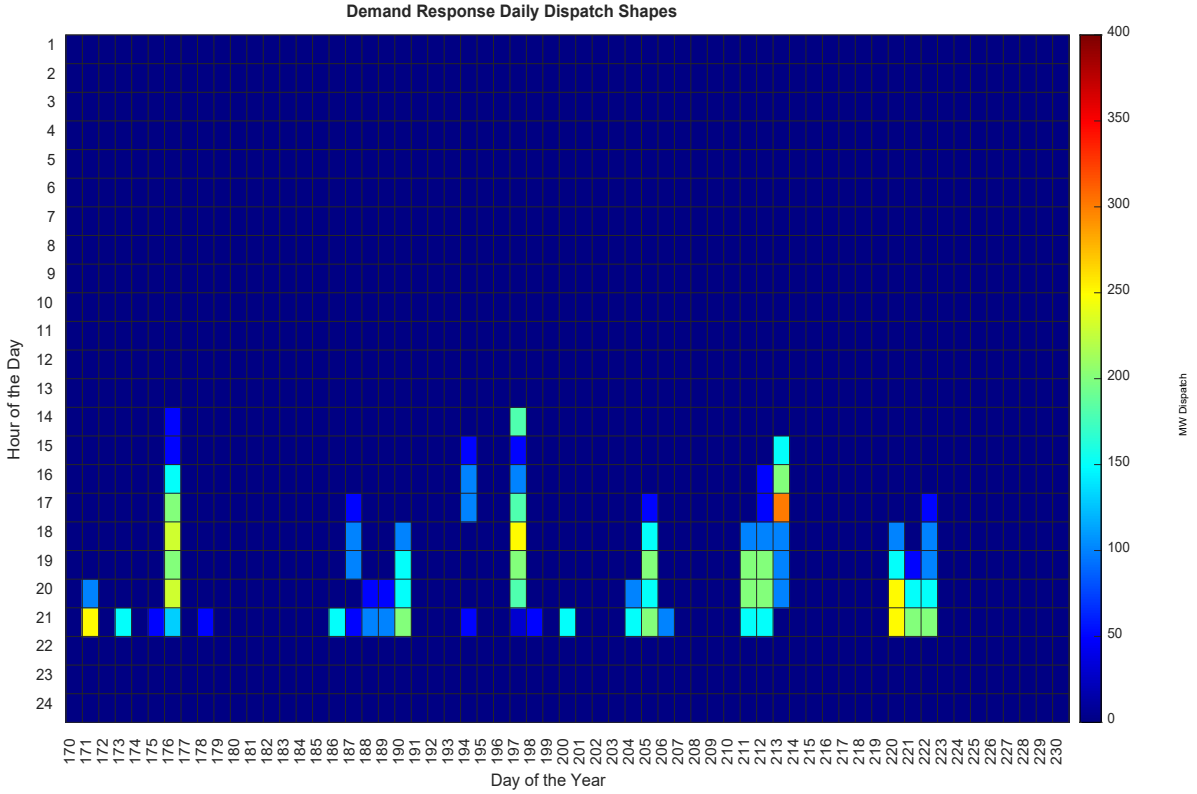
Turbine Upgrades: ~16 MW



Duct Burner: ~20 MW

DR Modeling Improvements





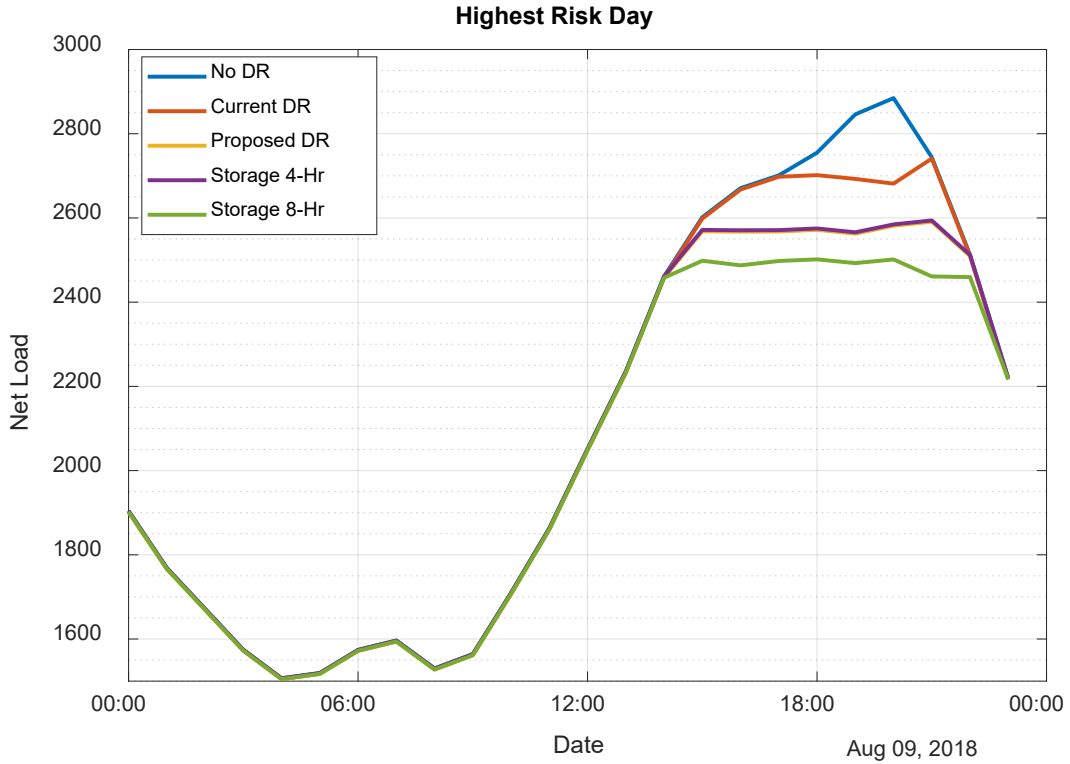
Why is the ELCC of DR Not 100%?

The following slides describe why the ELCC of our Demand Response program does not equate to 100% using various modeling scenarios:

Modeling Scenario	ELCC
Current DR Program	13.29%
Proposed DR Program	~60.00%
Storage 4-Hour	88.10%
Storage 8-Hour	97.00%

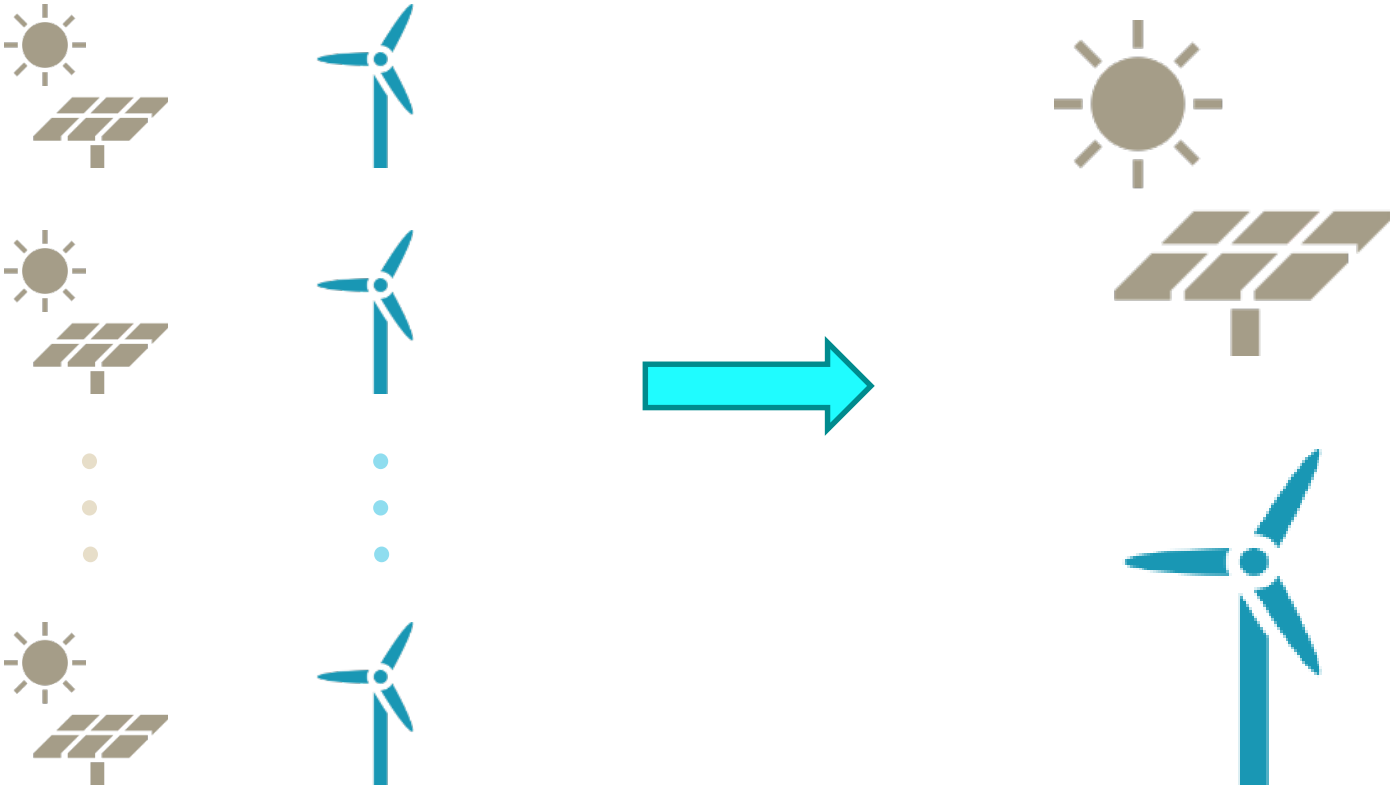
*Disclaimer: The information shown here has *not* been finalized.

DR ELCC Example



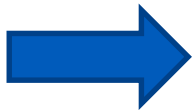
*Disclaimer: The information shown is for illustration purposes.

VER ELCC Update



ELCC Update (Solar)

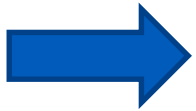
Project (100 MW)	ELCC
1	10.0%
2	7.0%
3	6.0%
4	6.0%
5	6.0%
AVG	**7.0%**



Project (100 MW)	ELCC
1-5	**10.20%**

ELCC Update (Wind)

Project (100 MW)	ELCC
1	10.0%
2	8.0%
3	8.0%
4	7.0%
5	7.0%
AVG	**8.0%**



Project (100 MW)	ELCC
1-5	**11.15%**

ELCC Update (Solar + Storage 4-Hour)

Project (100 MW)	ELCC
1	98.0%
2	88.0%
3	77.0%
4	64.0%
5	50.0%
AVG	**75.4%**

Project (100 MW)	ELCC
Solar	10.20%
Storage 4-Hour	86.80%
Solar + Storage	**97.00%**

ELCC Updates Summary

Resource	ELCC Value
Stand-Alone Solar	10.20%
Solar + Storage	Solar: 10.20% Storage: 86.80%
Wind	11.15%
Storage (4-Hour)	88.10%
Storage (8-Hour)	97%

Presentation Outline

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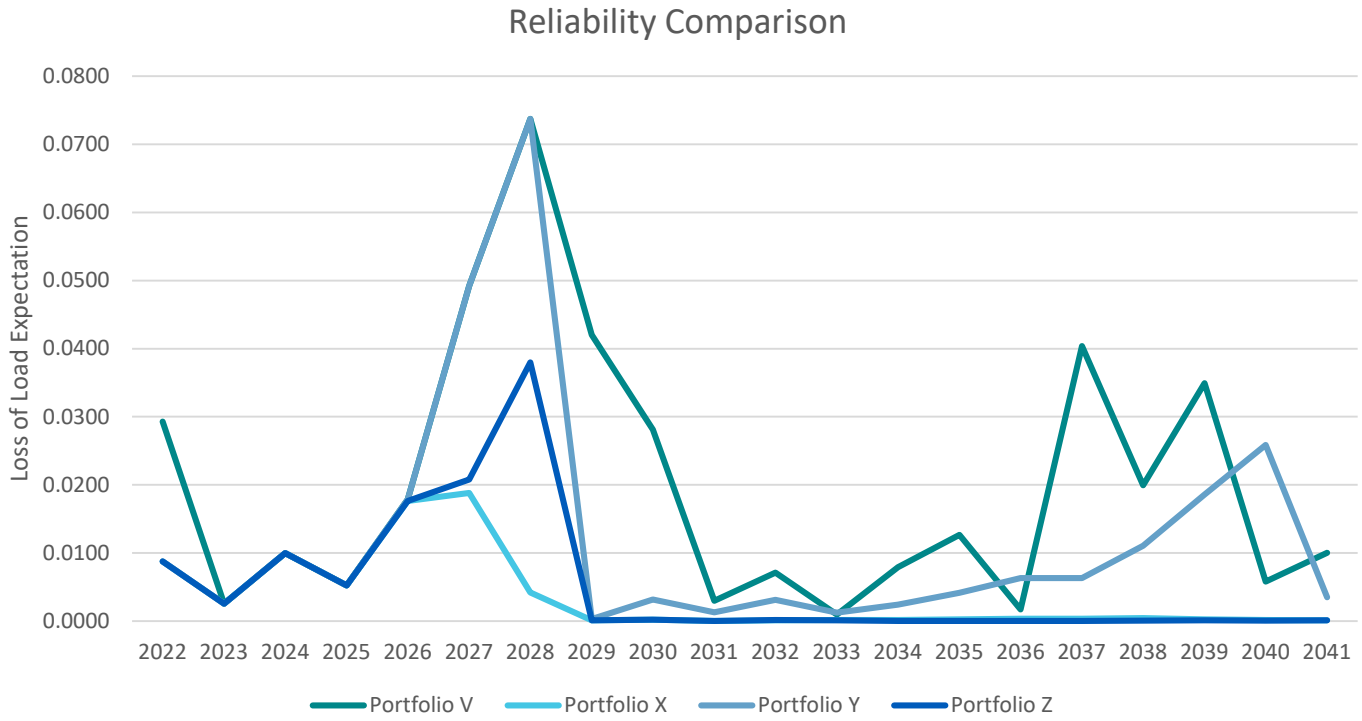
Loss of Load Analysis

- Check each qualified portfolio to verify that it meets the reliability threshold as measured by the LOLE
- Calculate last-in yearly ELCC to align with Oregon's UM 2011 General Capacity Investigation docket
- Finalized results are pending

Loss of Load Analysis



*Disclaimer: The information shown in the above graphic are for illustration purposes only; they are not actual results.

Last-In ELCC

- E3 Definition of Last-In ELCC
  - The marginal ELCC of each individual resource when taken in context of the full portfolio
- Proposed by Oregon in UM 2011

Source: N. Schlag, Z. Ming, A. Olson, L. Alagappan, B. Carron, K. Steinberger, and H. Jiang, "Capacity and Reliability Planning in the Era of Decarbonization: Practical Application of Effective Load Carrying Capability in Resource Adequacy," Energy and Environmental Economics, Inc., Aug. 2020

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Resource	Capacity (MW)	EFOR/ELCC	Peak Capacity (MW)
Hells Canyon Complex	1,100	3.6%	1,060
Coal	842	6.8%	785
Gas	697	3.8%	671
Run-of-River Hydro			295
CSPP Solar	319	50.5%	161
Jackpot Solar	120	21.5%	26
CSPP Wind	618	16.7%	103
Elkhorn Wind	100	16.7%	17
Demand Response Program	380	13.3%	51
CSPP (Other)			130
Raft River Geothermal			8
Neal Hot Springs			8
Clatskanie Exchange			11
Transmission + New Resource Need		5.0%	511
Request for Proposal (RFP)	80		
Demand Response Program Upgrade	170 (1)		
Emergency Transmission (CBM)			330
Total Resource			4,166
Total Load 50%			3,678
Planning Margin			**13.3%**

(1) The Demand Response Program Upgrade Capacity has not been finalized; the shown value is an approximation only and is subject to change

Thank you.