

Washington State Clean Energy Transition

Greg Cullen, Vice President, Energy Services and Development

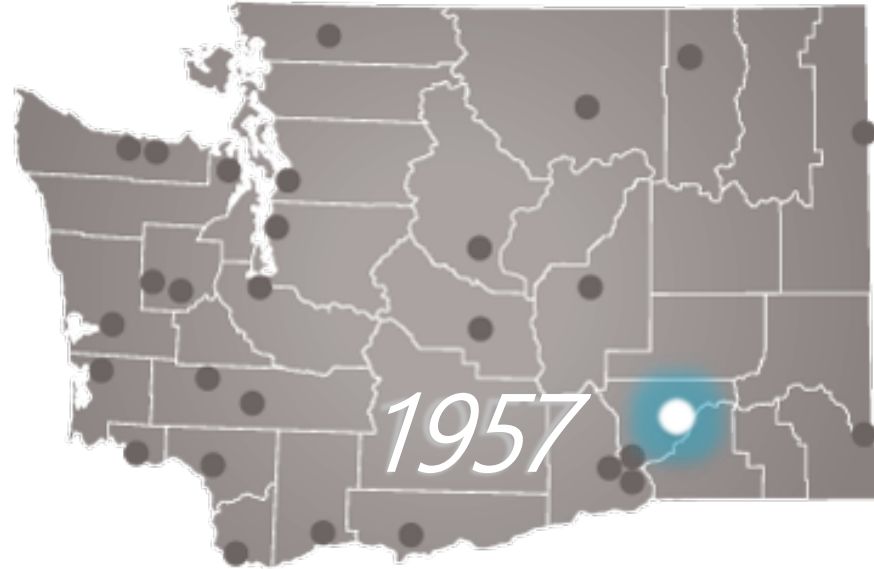
GAIN – Shaping our Carbon-free Future

Enabling the Transition to a Clean Energy Economy

March 2, 2021

Energy Northwest

A not-for-profit
Municipal Corporation



Asotin County PUD

Benton County PUD

Chelan County PUD

City of Port Angeles

City of Richland

City of Centralia

Clallam County PUD 1

Clark Public Utilities

Ferry County PUD

Franklin County PUD

Grant County PUD

Grays Harbor County PUD

Jefferson County PUD

Kittitas County PUD

Klickitat County PUD

Lewis County PUD

Mason County PUD 1

Mason County PUD 3

Okanogan County PUD

Pacific County PUD

Pend Oreille County PUD

Seattle City Light

Skamania County PUD

Snohomish County PUD

Tacoma Public Utilities

Wahkiakum County PUD

Whatcom County PUD

100% Clean Generating Portfolio



**Nine Canyon Wind Project
(96 MW)**



**Columbia Generating
Station (1,207 MW)**



**Horn Rapids Solar, Storage
& Training Project (4 MW)**



**White Bluffs Solar Station
(38 KW)**



**Portland Hydroelectric
Project (37.5 MW)**



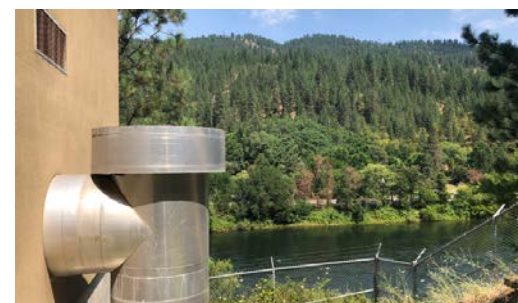
**Tieton Hydroelectric
Project (15 MW)**



**Packwood Lake Hydroelectric
Project (27 MW)**



**Stone Creek Hydroelectric
Project (12 MW)**



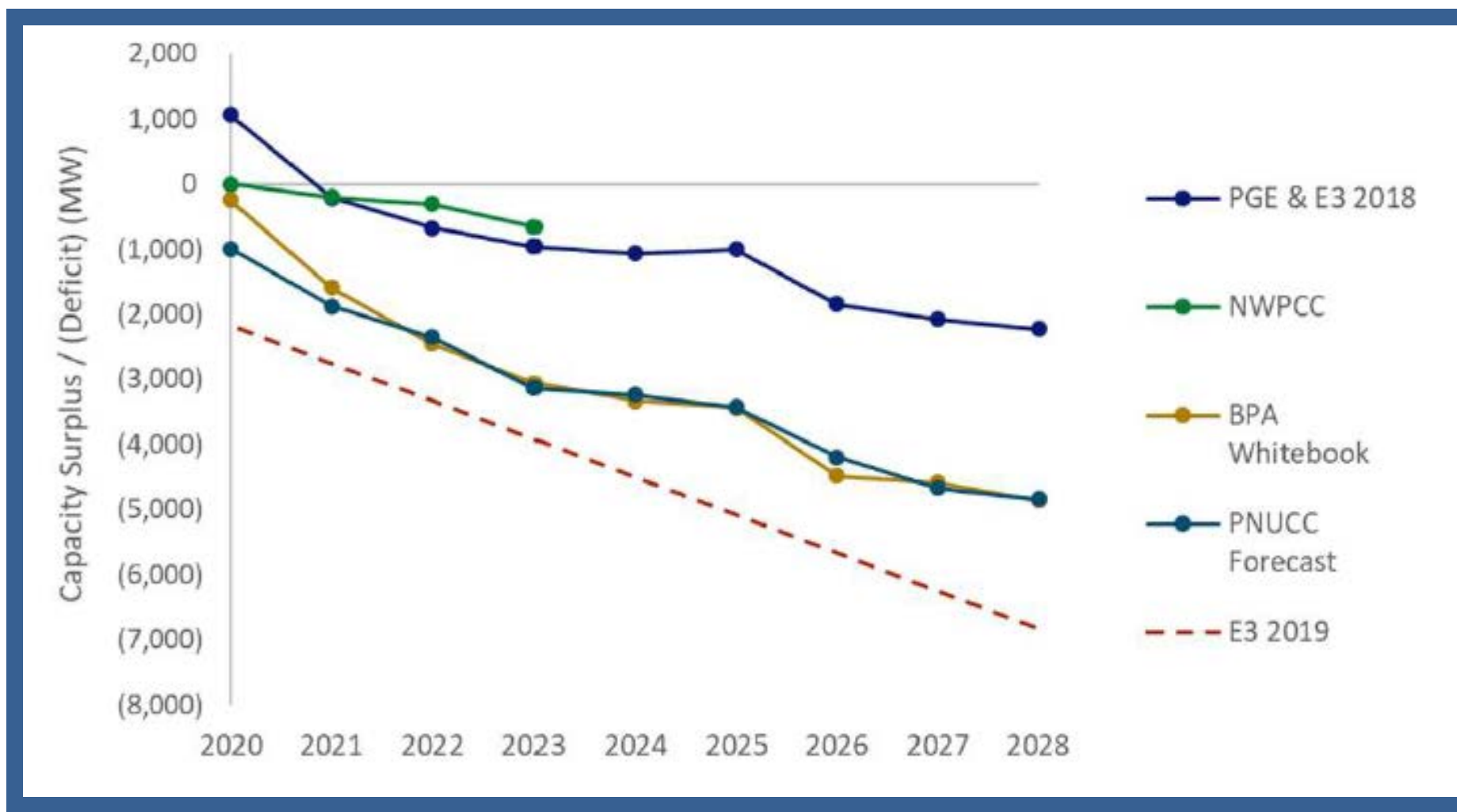
**Dworshak Sidestream
Hydroelectric Project (3 MW)**

WA Clean Energy Transformation Act (CETA)

- **Zero Coal by 2025**
- **100% Carbon Neutral by 2030**
 - 80% of power must come from “non-emitting electric generation and electricity from renewable resources.”
 - The other 20 percent of the obligation can be satisfied in one of three ways:
 - Renewable energy credits (RECs), i.e., vouchers certifying that someone else generated clean energy
 - Energy Transformation Projects (ETPs)
 - includes such things as electric car infrastructure, weatherization, or renewable natural gas projects
 - An administrative penalty based on tons remaining uncovered (which effectively amounts to a \$100 per ton carbon tax)
- **100% Clean Energy by 2045**



NW Capacity Surplus/ Deficit in Recent Studies





Energy+Environmental Economics

Resource Adequacy in the Pacific Northwest

Serving Load Reliably under a Changing
Resource Mix

January 2019

Arne Olson, Sr. Partner
Zach Ming, Managing Consultant



2018 Load and Resource Balance

	2018
Load (GW)	
Peak Load	43
PRM (%)	12%
PRM	5
Total Load Requirement	48

Resources / Effective Capacity (GW)	
Coal	11
Gas	12
Bio/Geo	1
Imports	3
Nuclear	1
DR	0.3
Hydro	18
Wind	0.5
Solar	0.2
Storage	0
Total Supply	47

**Wind and solar contribute
little effective capacity
with ELCC* of 7% and 12%**



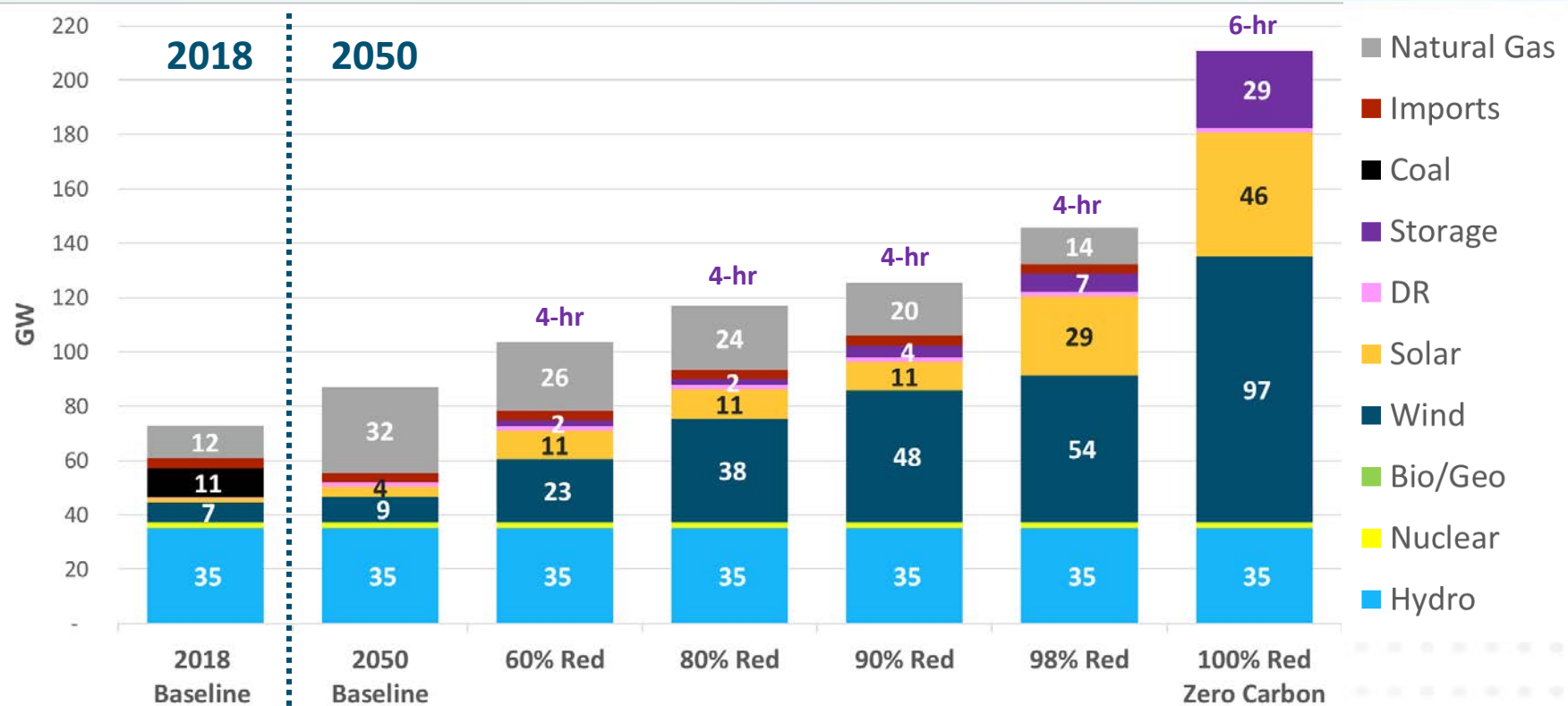
Nameplate Capacity (GW)	ELCC* (%)	Capacity Factor (%)
35	53%	44%
7.1	7%	26%
1.6	12%	27%

**ELCC = Effective Load Carrying Capability =
firm contribution to system peak load*



Scenario Summary

2050 Resource Use



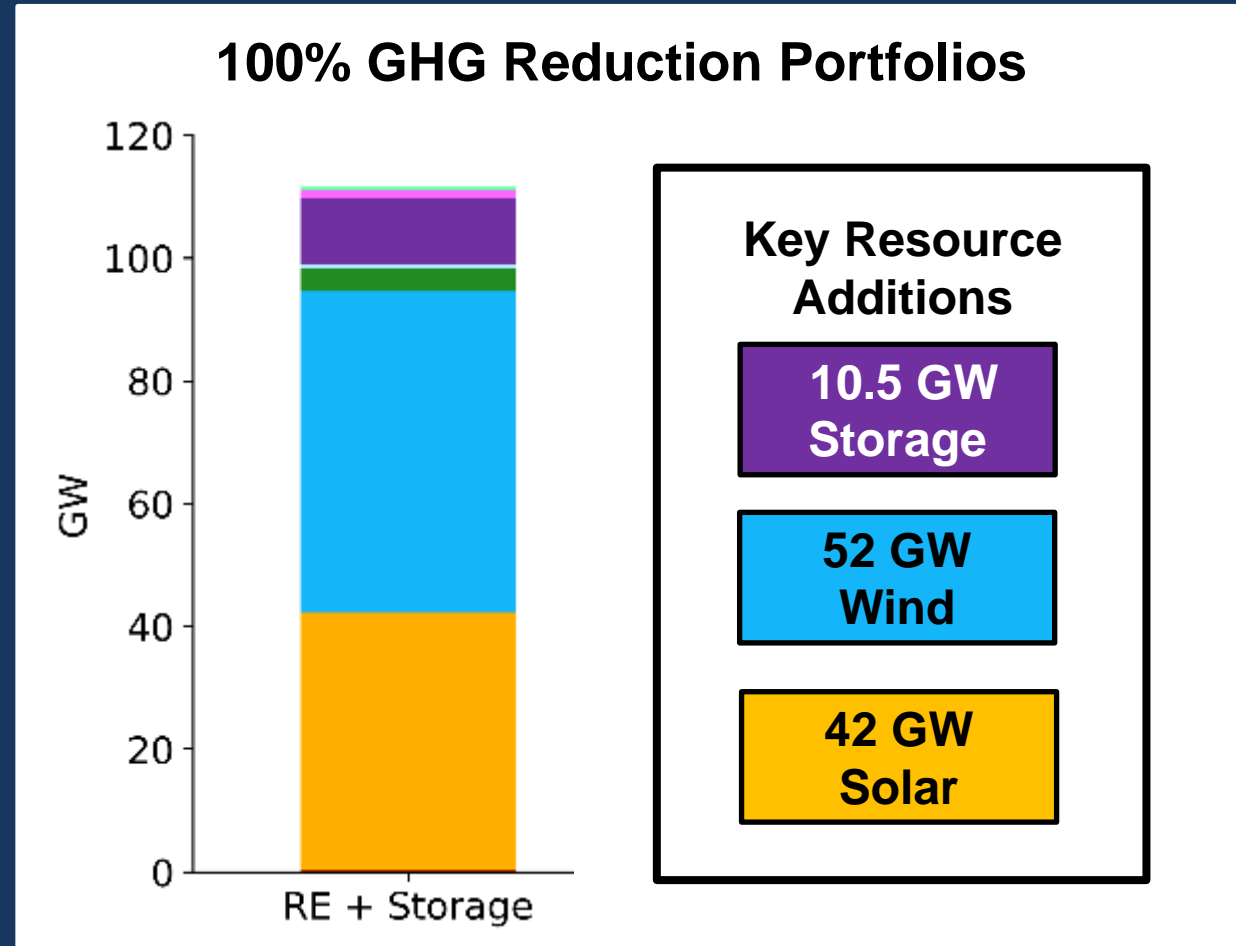
Renewable Capacity (GW)	13	34	49	59	83	143
Annual Renewable Curtailment (%)	Low	Low	4%	10%	21%	47%
Gas Capacity (GW)	32	26	24	20	14	0
Gas Capacity Factor (%)	46%	27%	16%	9%	3%	0%

Pacific Northwest Zero-Emitting Resources Study

Dan Aas, Managing Consultant
Oluwafemi Sawyerr, Consultant
Clea Kolster, Consultant
Patrick O'Neill, Consultant
Arne Olson, Senior Partner

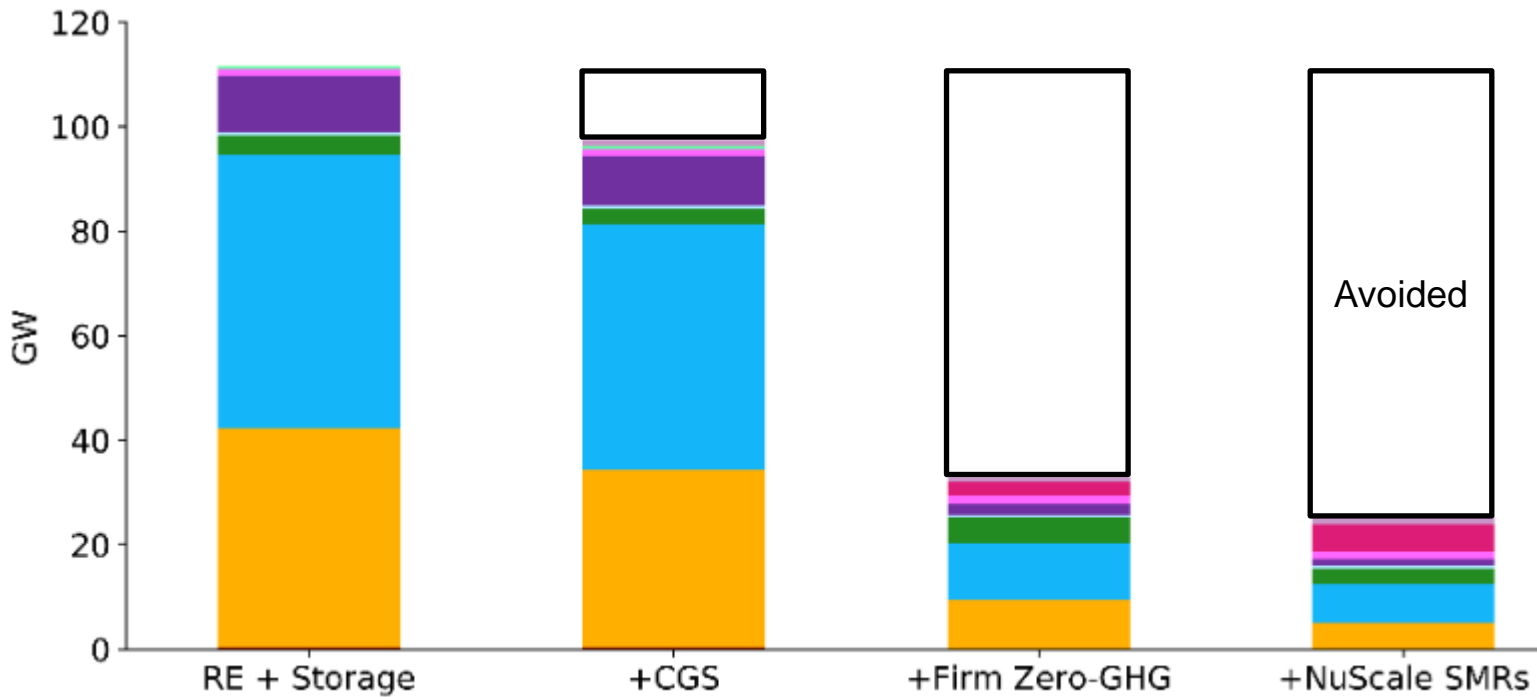
Benefits of zero-emitting firm capacity at 100% GHG reductions

A system that largely relies on wind, water, solar and battery storage (RE + Storage) requires over 100 GW of new capacity additions in 2045 to maintain reliability



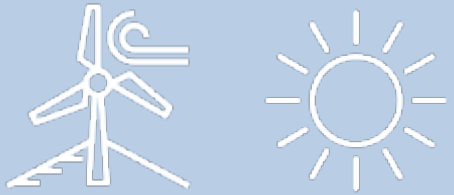
Benefits of zero-emitting firm capacity at 100% GHG reductions

100% GHG Reduction Portfolios



Adding	Avoids
+1.2 GW CGS	-9.5 GW Storage
+5.3 GW SMRs	-44.8 GW Wind
	-37 GW Solar
+6.5 GW Firm	-91 GW Non-firm
CGS + NuScale SMRs reduce system costs by almost \$8B per year relative to RE + Storage	

Optimal Resource Mix under CETA



Wind & Solar
(w/ storage)



Hydro



Existing Nuclear
(Columbia)



New Nuclear

Federal Funding for New Nuclear Demonstration Projects

UAMPS Carbon Free
Power Project
(NuScale)

Versatile Test Reactor
Sodium Fast Reactor
(TerraPower/GEH)

Advanced Reactor Demonstration Program (ARDP)

ARDP Demonstration
Project 1
(TerraPower/GEH)

ARDP Demonstration
Project 2
(X-energy)