ENERGY NORTHWEST

Energy Northwest Overview

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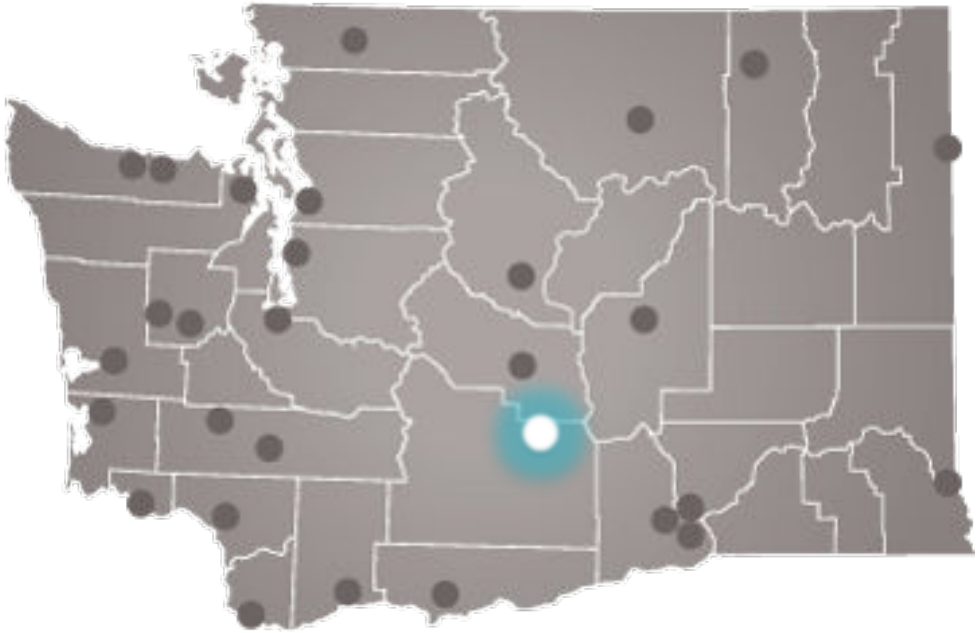
ENERGY NORTHWEST



Our Members

- 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
- Cowlitz County PUD
- Douglas County PUD
- 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

About Energy Northwest

- Energy Northwest is a Joint Operating Agency of the state of Washington
- We operate electric generating facilities or provide energy services in states across the western U.S.
- Our 29 members are all public power utilities in Washington state
- The energy facilities we own and operate provide power to utilities in 6 states:
  - Washington
  - Oregon
  - California
  - Idaho
  - Montana
  - Wyoming

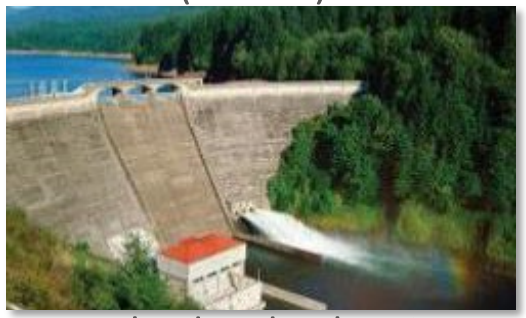
100% Clean Generating Portfolio

Packwood Lake Hydro Project (27 MW)

Nine Canyon Wind Project (96 MW)

Tieton Hydroelectric Project (15 MW)

Columbia Generating Station (1,207 MW)



Portland Hydroelectric Project (37.5 MW)

Stone Creek Hydro Project (12 MW)

White Bluffs Solar Station (38 KW)

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

Ruby Flats Solar Project (127 MW)

Why Nuclear Energy

West Coast Carbon & Climate Policies

Washington's Clean Energy Transformation Act (CETA)

- Zero Coal by 2025
- Carbon neutral by 2030
- Carbon-free by 2045

Oregon Clean Energy Standard (H.B. 2021)

- Requires utilities to reduce emissions by 80% from a baseline amount by 2030, 90% by 2035 and 100% by 2040
- 50% of electricity must come from renewable resources

California Renewable Portfolio Standard/Clean Energy Standard

- RPS is increased to 50% by 2025 and 60% by 2030
- 100% carbon-free electricity by 2045

ENERGY NORTHWEST

Energy+Environmental Economics

Pacific Northwest Zero-Emitting Resources Study

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

2018 Load and Resource Balance

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

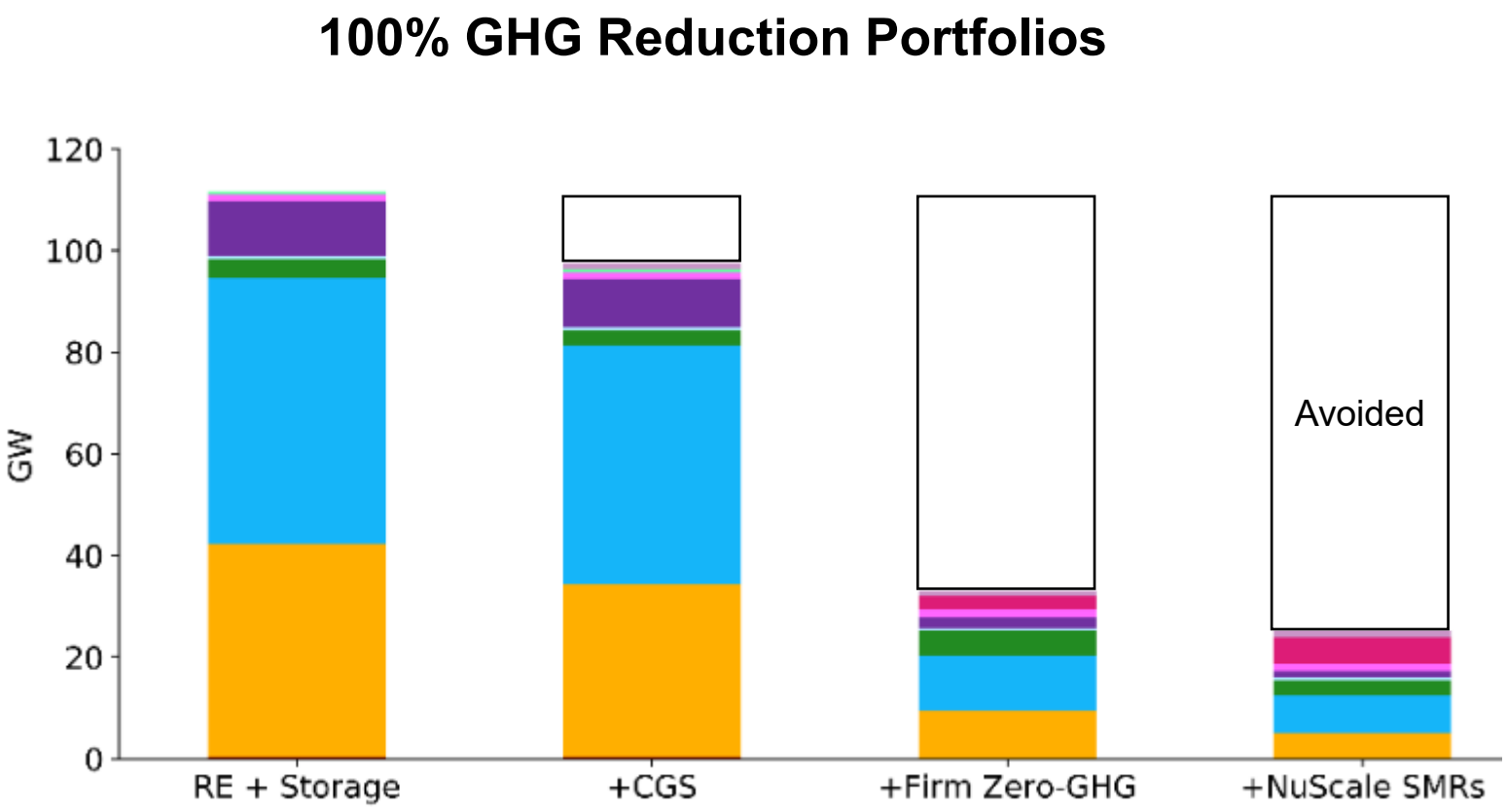
Resources / Effective Capacity (GW)	
Coal	11
Gas	12
Bio/Geo	1
Imports	3
Nuclear	1
DR	0.3
Hydro	18
Wind	0.5
Solar	0.2
Storage	0
Total Supply	47

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*

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



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

But Isn't Nuclear More Expensive?

Without Nuclear

- Significant overbuild of renewables
- Significant energy storage required
- Significant transmission buildout
- Dependence on the market during peak net load times
- Hydrogen economy development

With Nuclear

- Lower system cost
- Higher capacity
- Less land impact
- Less transmission buildout
- Lower environmental impact
  Mining
  Waste disposal

Cost Comparisons

- Ruby Flats – 127.5MW Solar
- Horn Rapids
  - Solar
  - Battery Energy Storage System
- Mid C Forecasting
- WA Carbon Credit Auction

CALENDAR PEAK AND OFF-PEAK FORWARDS

Strip	Peak	Off Peak
2017	25.53	16.66
2018	36.10	23.72
2019	37.52	33.28
2020	24.57	16.99
2021	56.00	38.00
2022	93.30	68.20
2023	*113.37*	*79.62*
2024	*108.11*	*70.92*
2025	*101.92*	*73.55*
2026	*96.09*	*71.19*
2027	*86.42*	*70.89*

Forwards are marked by ICE
Updated 3/10/2023

TEA

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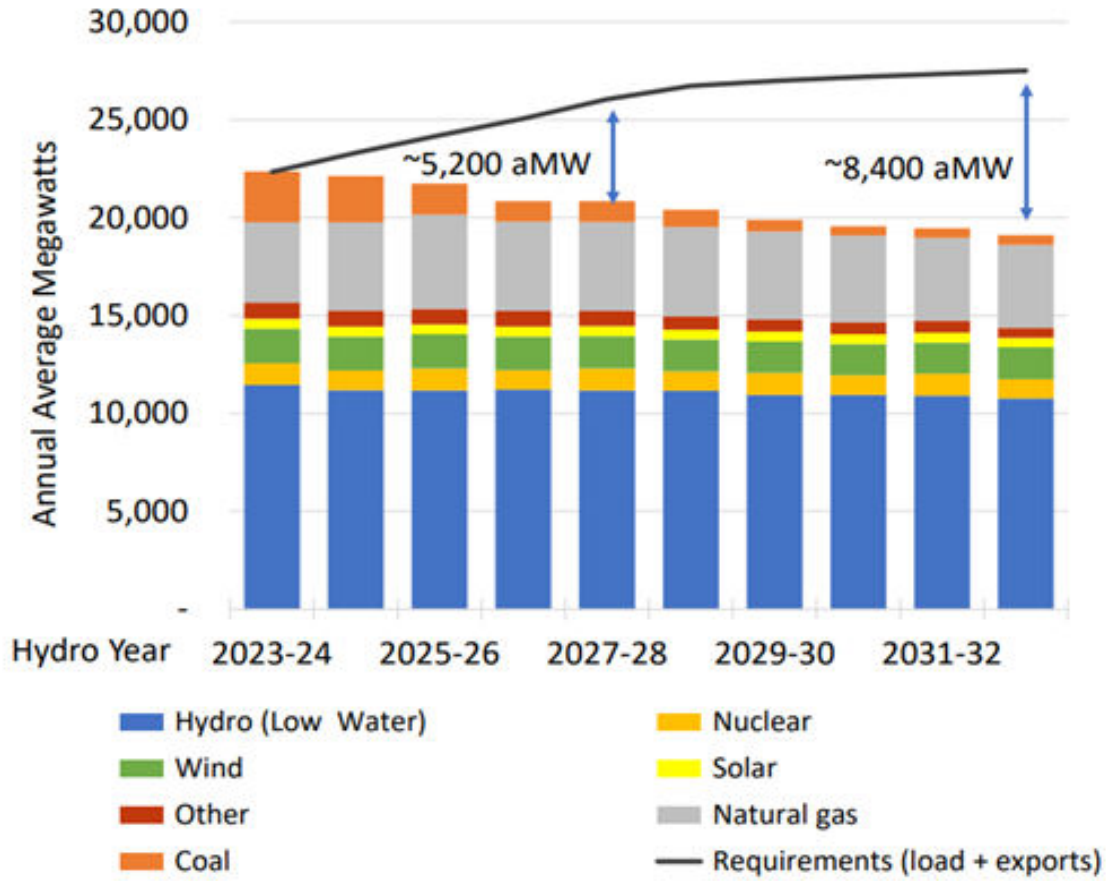
Projected Energy Shortfalls

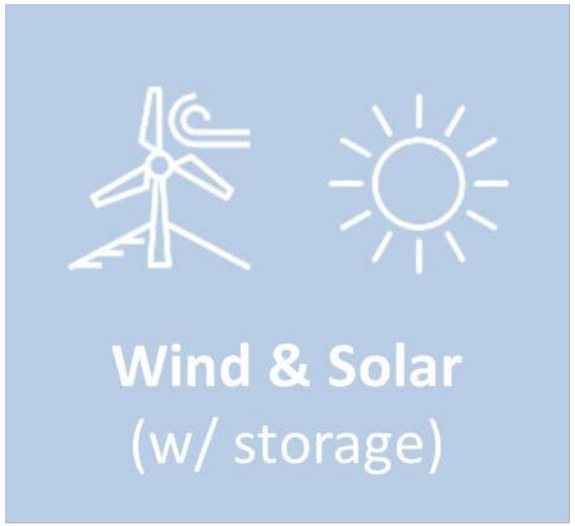
- Aggregation of NW utility IRPs
- Projected capacity shortfalls are higher

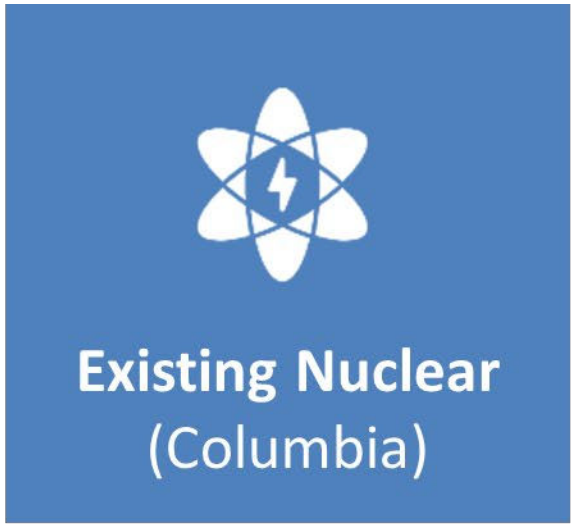
https://www.pnucc.org/system-planning/northwest-regional-forecast/



PNUCC

The Right Mix for the Northwest





Nuclear Development: Micro & Small Modular

Partnering on eVinci Deployment

Westinghouse

ENERGY NORTHWEST

Superior Technology

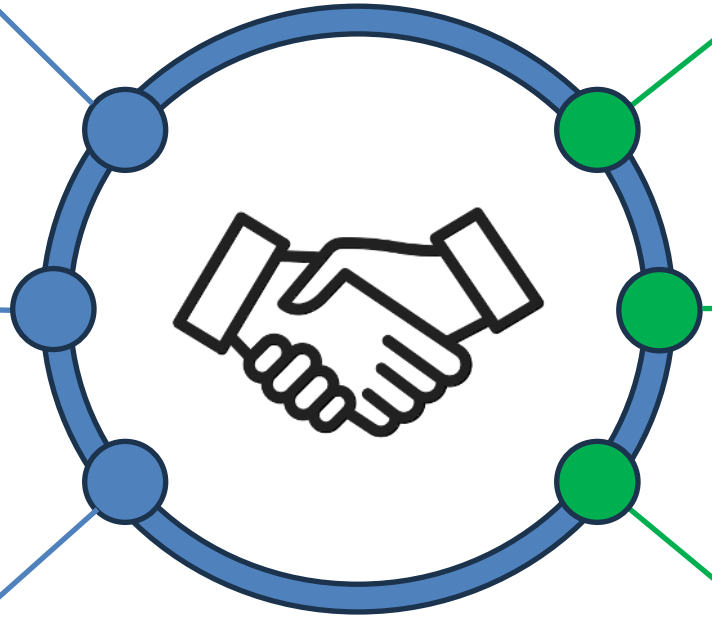
- Transportable
- Passively cooled
- Scalable
- Small facility footprint

Development Commitment

- Ownership alignment
- New accelerator facility
- Procuring and testing components

Experience

- Licensing and manufacturing
- Globally deployed reactor technologies
- Established and tested nuclear safety culture
- Deep nuclear supply chain



World Class Nuclear Operator

- INPO/WANO top tier
- Operates the most reliable CE asset in WA

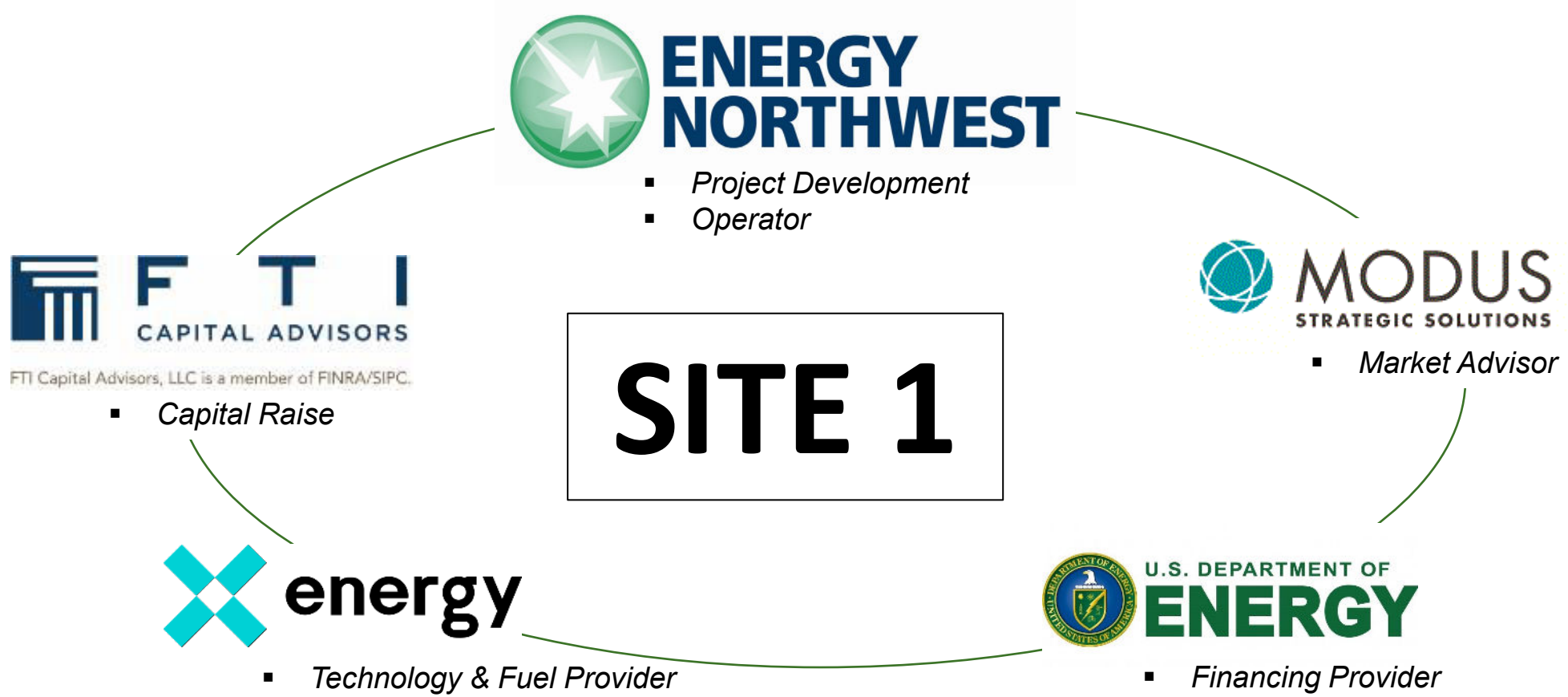
Leader in Advanced Nuclear

- 10+ years of new nuclear engagement
- Existing team of highly qualified personnel

Commitment to Clean Energy

- 100% carbon free generation portfolio
- Regional leader in deploying new clean tech

Energy Northwest SMR Development: Building a bench that supports the realization of small modular reactor (SMR) development in the Pacific Northwest



X-energy Value Proposition

- Grid Stability
- Scalable Technology
- Supply Chain Support
- Manufacturing Capability
- Fuel Design & Manufacturing
- Key Integration

X-energy Benefits

- Full suite of technology engineering, development and operations resources
- Current project development and DOE LPO support

Funding

- $8M brought to project by Energy Northwest
- $1M from 17 Public Utilities & Cooperatives
- $10M from Puget Sound Energy
- $25M from the State of Washington
- FTI continuing conversations with potential investors
- Big Tech investors expressing interest in Early Funding Agreement (EFA) + negotiating off-take terms

Thank You

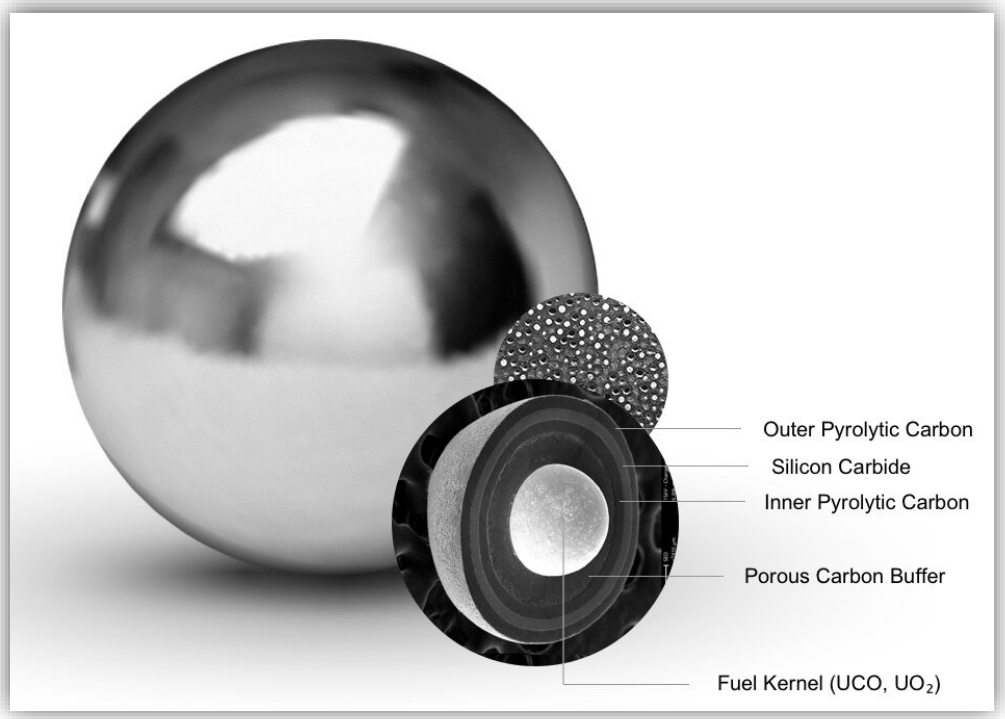
Back Up Slides

X-energy Technology

Technology Highlight – X-energy

XE-100

- High Temperature Gas Reactor (HTGR)
  - Helium cooled
  - TRISO fuel
- 1-12 Modules
- 80 MWe/module (net)
- 60-year design life; 100+ year asset
- Continuous on-line refueling
- Fuel as a variable cost
- Walk-away-safe, meltdown proof
- Modularized components built off-site, transportable via rail/road

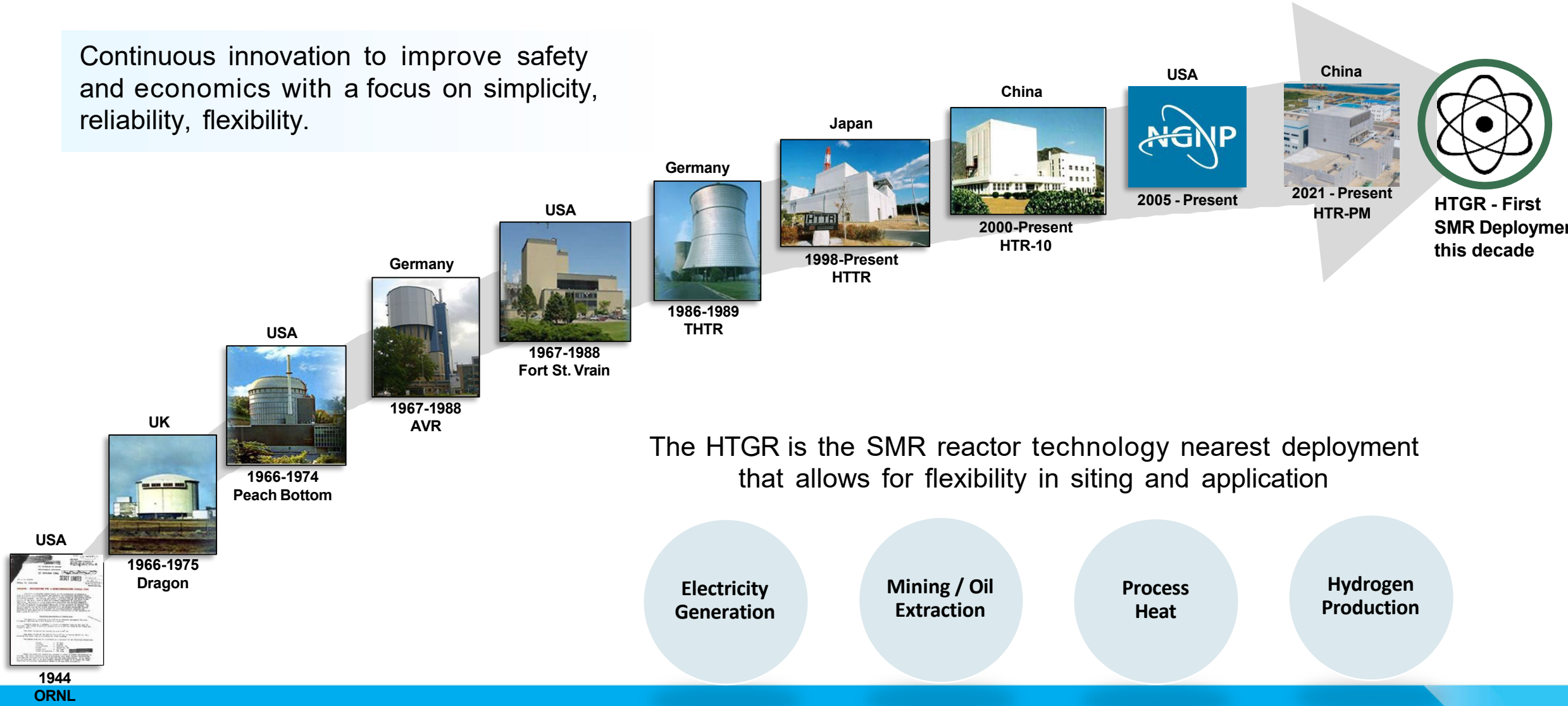


Every X-energy reactor is powered by proprietary tri-structural isotropic (TRISO) coated particle fuel, called TRISO-X, which:

- Is made in a unique coated fuel particle manufacturing process that decreases unusable scrap and ensures quality
- Cannot melt in the Xe-100 reactor… period
- Is the reactor containment, locking in 99.999% of all fission products
- Enables the safety and economic case of the Xe-100 by simplifying the design and operations, while requiring far fewer components

HTGRs Leverage Proven Technology with Novel

Continuous innovation to improve safety and economics with a focus on simplicity, reliability, flexibility.



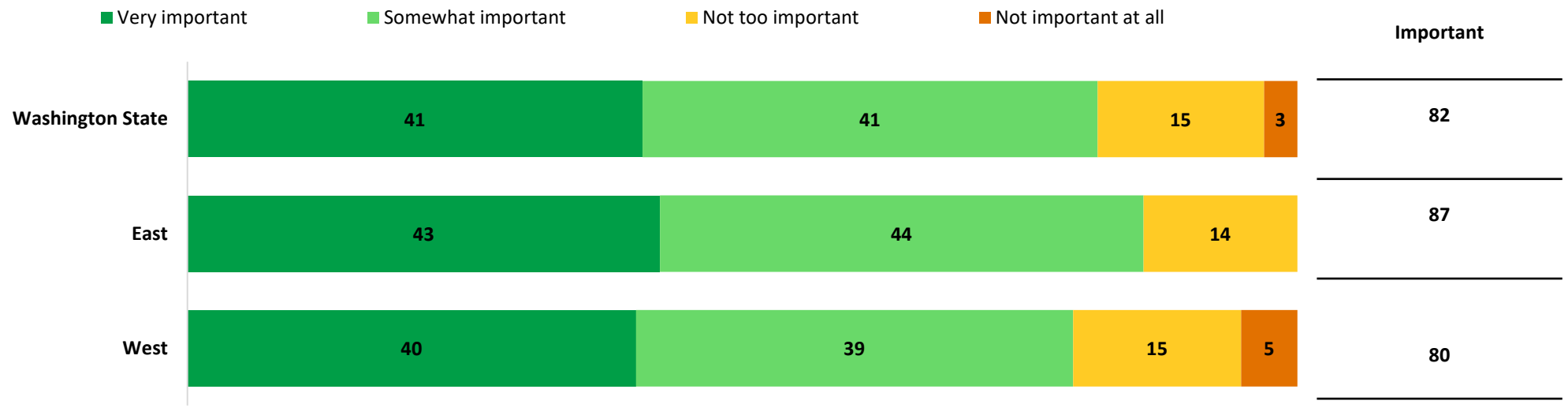
The HTGR is the SMR reactor technology nearest deployment that allows for flexibility in siting and application

- Electricity Generation
- Mining / Oil Extraction
- Process Heat
- Hydrogen Production

Statewide Favorability of Nuclear Energy

Nuclear Energy's Importance for Meeting Washington's Electricity Needs = 82%

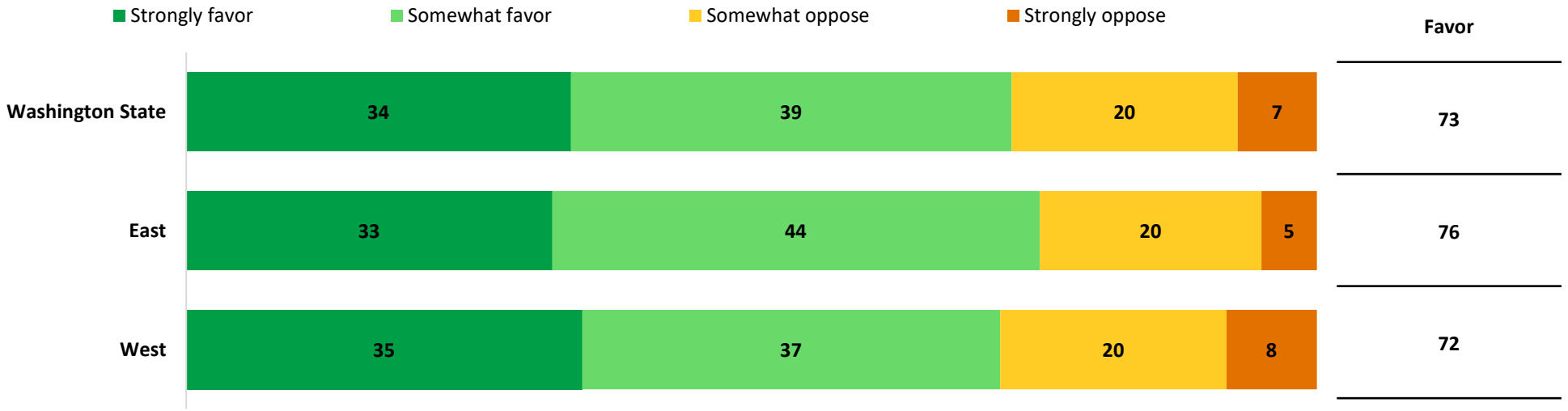
Q: *How important do you think nuclear energy will be in meeting Washington state's electricity needs in the years ahead? (%)*



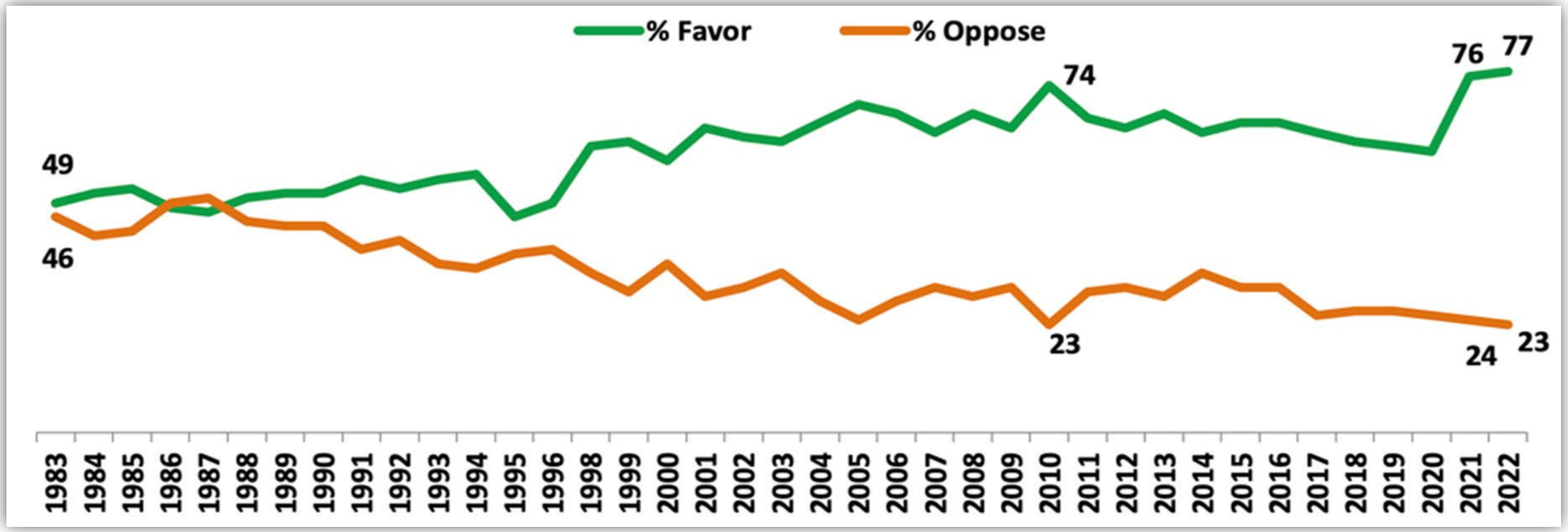
Statewide Favorability of Nuclear Energy

Nuclear Energy's 'favorability rating' in Washington State = 73%

Q: *Overall, do you strongly favor, somewhat favor, somewhat oppose, or strongly oppose the use of nuclear energy as one of the ways to provide electricity in Washington state? (%)*



Favorability to Nuclear Energy Increases Nationally



Favorability to Nuclear Energy (%) 1983-2022

Used Nuclear Fuel Storage

Used Fuel

*CGS = Columbia Generating Station
*ISFSI = Independent Spent Fuel Storage Installation (at CGS)

From 60 Years of Industry Commercial Operations

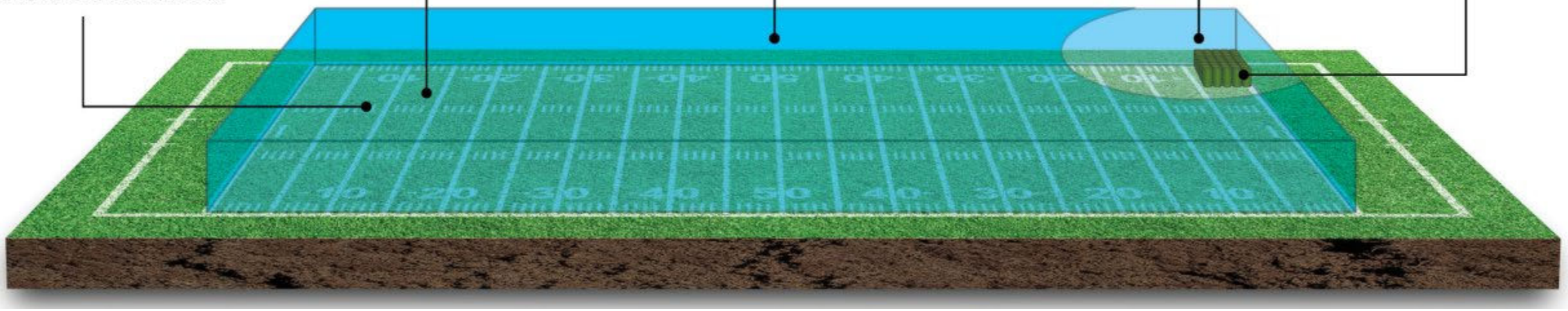
A standard football field is 360 ft. x 160 ft. = 57,600 sq. ft.

The entirety of the United States used fuel footprint would cover a football field 24' deep.

Number of casks currently loaded and fully processed at Columbia's ISFSI: 54

ISFSI currently covers an area that is approximately 342 ft. x 468 ft. = 160,056 sq. ft. ISFSI's security fence, which is what most people consider to be the ISFSI, covers an area that is 260 ft. x 390 ft. = 101,400 sq. ft. or roughly 1-3/4 football fields.

Number of fuel bundles per cask: 68 (total bundles currently stored at the CGS ISFSI: 68 x 54 = 3,672 used fuel bundles in dry storage)



Used Fuel Reprocessing

THE SOLUTION

RECYCLING: WHY IT MATTERS!

- **Incredible reduction** in isolation time.
- Makes interim storage and Yucca Mountain **obsolete**
- **Permanent solution** to nuclear waste
- **NuCycle™ can tap into TRU reserve** within the waste and produce the fuel of the future
- More than **1500 tons of plutonium** fuel = **1.5%** of global natural gas reserves - that's a lot of energy!
- With proper method, left over waste is no longer a concern to humanity

GEOLOGIC ISOLATION

to cool below background level (in years)

Status quo	partial TRU removal	only FP in waste
130k	1,500	270

Targeted cost of recycling per metric ton

$0.5M

reduction in waste volume if only uranium removed