

Nuclear is Back!

...(Really)

LLW Forum, Reno, NV
Bruce Montgomery

October 10, 2024



Nuclear Policy Forum, Philadelphia, May 2024



“We are living in dynamic times...I am proud to say that nuclear energy remains the key: Not just to unlocking a cleaner, more secure future, but satisfying demand, powering progress, and improving the lives of people around the world.”

Maria Korsnick, NEI President

The Demand Side

Projections are for an overwhelming increase in energy demand:

- Last year, grid planners nearly doubled the 5-year load growth forecast.
- A recent study from Grid Strategies predicts the grid will need to add 38 GW, or more, of new electricity during the next five years, driven by advanced computing, artificial intelligence, and the electrification of the manufacturing and transportation sectors.

Example Load Growth Factors

	Data Centers	Industrial Facilities	Hydrogen Plants	Electrification
ERCOT	●	●		
PJM	●			
Duke Energy	●	●		
Georgia Power	●	●		
NYISO	●	●	●	●
Arizona Public Service	●	●		
CAISO				●
Portland General Electric	●	●		

Your Factoid for the Day

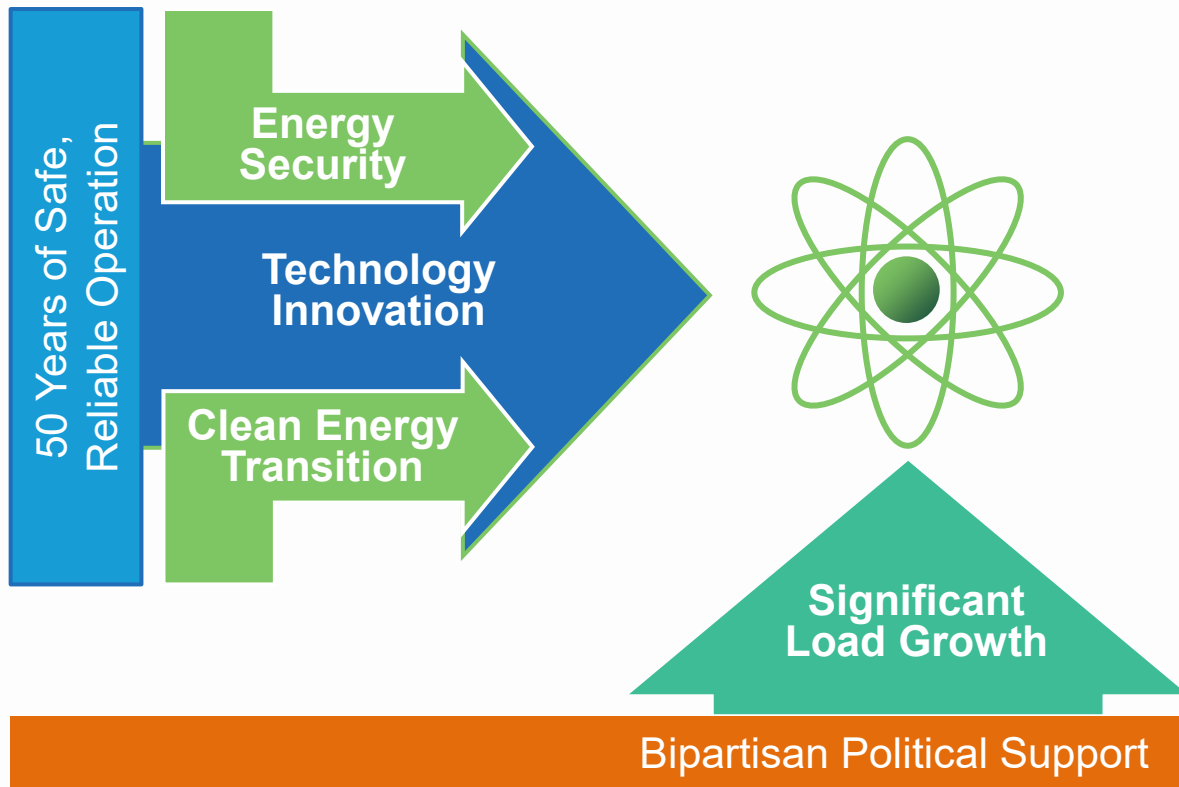
- As technology evolves, **power demand from data processing is expected to double nationwide in three years.** One small example of this demand surge — OpenAI's ChatGPT requires 2.9 watt-hours per request, and that's nearly 10 times more power than a typical Google search.

25 countries pledged to triple nuclear power by 2050



The Supply Side

Nuclear's Future: A Confluence of Drivers



Nuclear Power
Uniquely Suited
for this Moment

- Resilient
- Firm
- Clean
- Versatile
- Proven
- Scalable

How will Nuclear Serve this Demand?

- License renewals: from 60 to 80-years...beyond?
- Power Uprates: what can we derive from our existing fleet?
- 24-month fuel cycles: getting the rest of the PWR fleet there.
- And...restarts of decommissioning reactors: Really? who had predicted this one?
- And...

...and of Course, New Build!

...Including new Gigawatt scale reactors to serve major grid needs.

Post-Vogtle 3 & 4 coming online, interest in more of these reactors is palpable, even in the southeast U.S.



...and Small Modular Reactors

- 20 SMR companies!
- Interest by several major utilities, evidenced by recently published Integrated Resource Plans
- Well-suited for near term deployment at existing sites
- Right-sized for Cooperatives, large military bases



Who will lead in the world of advanced nuclear?



...and of course, the Microreactors

- Serving small loads, transportable, possibly autonomous
- Suited for remote locations on a micro-grid

Isolated communities

Mining sites

Military bases



It is a different world than we have become so accustomed to:

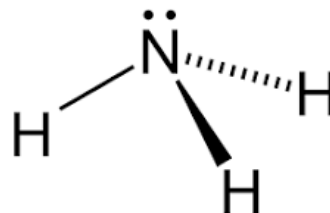
The nuclear industry no longer finds itself needing to push its product to a consumer.

The nuclear companies in the field are now finding that the pull for their products from various sectors is intense, deliberate and highly discerning.

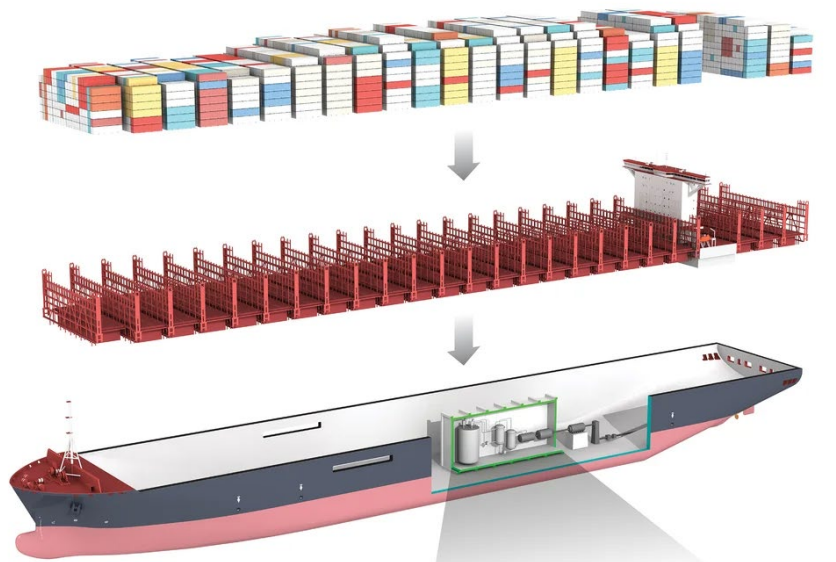
Besides the low margins in the grid and the hyperscale datacenters build-out, where is this pull coming from?

The Heavy Industry Effect

- Hydrogen
- Steel
- Cement
- Chemicals
- Ammonia



The Transportation Effect

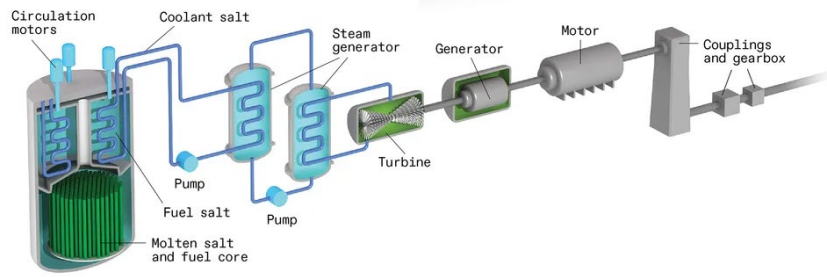


New grid demand:

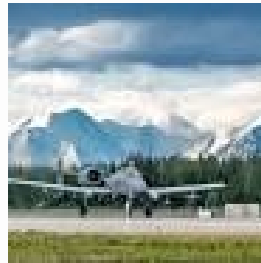
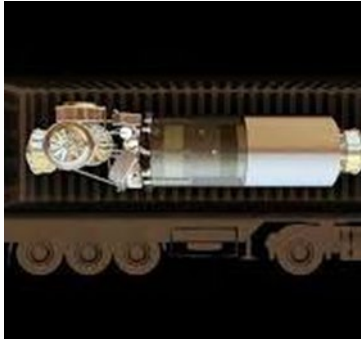
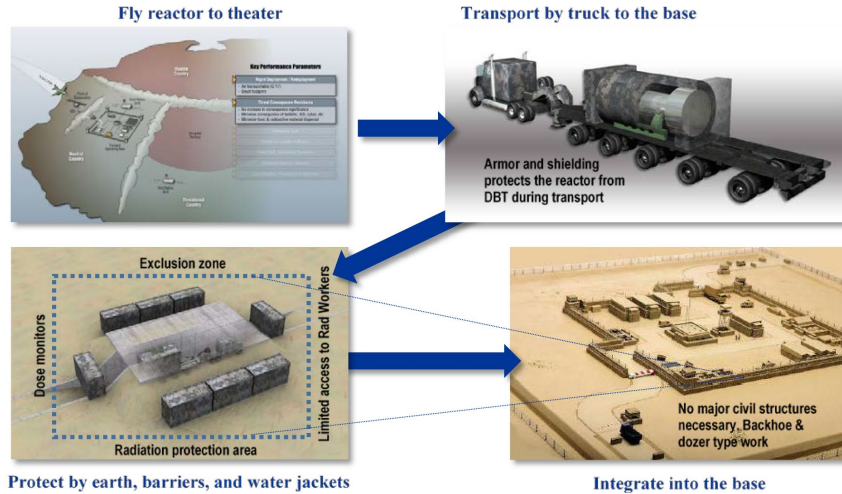
- Electric Vehicles
- Heavy Haul EV's

Off grid demand (Merchant Shipping):

- Hyundai (South Korea)
- NuProShip (Norway)
- Fincantieri (Italy)
- Imabari (Japan)
- Core Power (UK)

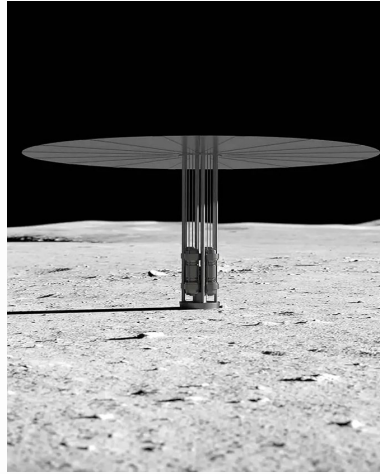
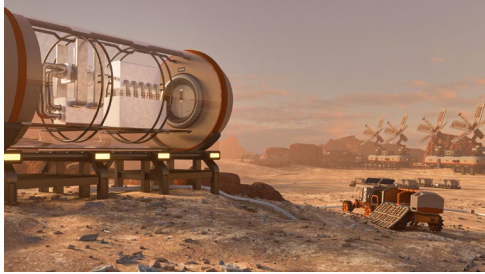


The Military Effect



Military bases are increasingly investing in energy resilience technologies to ensure they can continue to support critical missions during outages, cyberattacks, and other events.

The Army plans to build microgrids at all of its 130 bases worldwide by 2035.

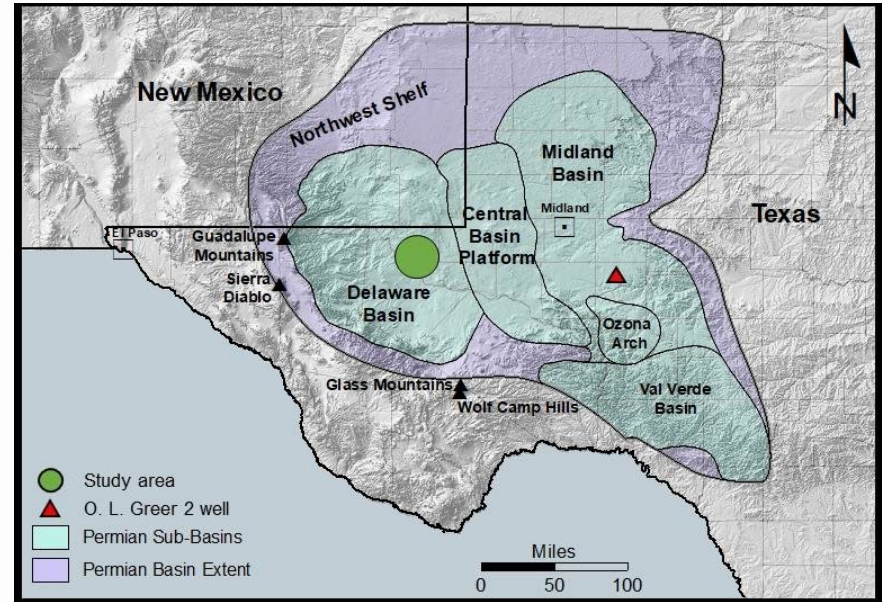


The Space Effect

NASA's Space Nuclear Propulsion (SNP) Office aims to revolutionize space travel by developing and demonstrating higher performance propulsion systems to achieve the agency's ambitious science and exploration goals. Within this effort, NASA is exploring two propulsion systems – nuclear thermal and nuclear electric – each providing unique and complementary capabilities.

The Shepherd Power Effect

- Single purpose company established under NOV (major oil and gas service company)
- Decarbonize oil and gas extraction
- Hundreds to Thousands of Microreactors deployed by 2050
- Business Case Requirements:
 - ✓ Less than 180 days from specific site identification to operations
 - ✓ Regulatory costs are less than 1% of capital and O&M



We think the Banks will Show us the Money



“ We're supporting the French initiative to encourage the World Bank and other development banks to eliminate the restriction on funding nuclear.”

JOHN PODESTA
Senior Advisor to the U.S. President for
Clean Energy Innovation and Implementation

Bipartisan ADVANCE Act

Operating Fleet Benefits

- Efficiency in oversight
- Use of technology
- Focus on safety significance
- Timeliness of DPV program

Advanced Reactor Fleet Benefits

- Reduced review fees
- Prizes for first licensees
- Expedited COLs
- Micro reactor requirements

Foundational Changes

- NRC Mission to include efficiency
- NRR mandate for timely & efficient licensing actions
- Workforce traineeships & planning
- Streamlining environmental reviews

The “Back Side”

Resurgence Impact on Decommissioning

The list of active projects in the U.S. is getting shorter.

- Humboldt Bay, Lacrosse, Zion licenses terminated.
- Diablo Canyon operation extended.
- Palisades working to a fall 2025 restart.
- TMI-1 to restart in 2028.
- Duane Arnold next??



NEI Decommissioning Keys

- Facilitate timely unrestricted release of shutdown sites for potential reuse.
- Demonstrate the efficacy of the U.S. decommissioning regulatory, financial and technological frameworks.
- KEY FOCUS 2022-2025:
 - Improve efficiency of license termination process.
 - Export services overseas
- Put our learnings “on the shelf” until needed again in the U.S..

MRC Disposal: A new Waste Stream

NRC will consider requests to use NDT funds to dispose of major radioactive components during the operating phase.

On the order of 200 MRCs are stored at existing sites.

Expenditures for disposal estimated @ \$10-20M+ per site.



Waste Management Futures

- **High Level Waste** (hope for movement in 2025?)
 - Private CIS
 - Federal CIS, disposal (two new bills introduced in Congress)
 - ◆ New independent management organization
 - ◆ Study of recycling
- **Low Level Waste**
 - Revised 10 CFR Part 61 rule (finally!)
 - ◆ GTCC, DU solution?
 - ◆ Will it impact existing sites not accepting GTCC, DU?

Closing

“That feeling—that sense of possibility and excitement—is palpable in nuclear right now. We’re like Detroit at the beginning of the 20th century. Or Silicon Valley at the end of it. We’re on the ground floor going up fast.”

Maria Korsnick, NEI,
May 16, 2024

What questions can I answer?

