

## Summary

# Power Vision Workshop Series II: Data Centers and Surging U.S. Power Demand

The workshop (November 2024) began by examining the unprecedented growth in electricity demand projected across the United States, with particular attention to the rapid expansion of data center infrastructure. A stark comparison between California’s rising electricity prices and Florida’s stable rates highlighted how different energy mix choices (such as replacing traditional fuels with intermittent fuels like wind and solar) are affecting regional outcomes. It was suggested the national situation was due to a series of unforced errors, and that a reckoning was soon to come.

### Drivers of Rising Demand

Infrastructure development for data centers is proceeding at an extraordinary pace, with power reliability emerging as the primary bottleneck. Demand is increasingly driven by big tech companies called “hyperscalers” seeking massive facilities for their exclusive use. The scale of this demand has attracted significant financial institutional investment, with these investors prioritizing reliability above all other factors. This has led to a pattern where new data center construction is concentrated in areas with the best access to reliable power sources, particularly nuclear and gas facilities.

From an investment perspective, while artificial intelligence discussions often center on training costs, the true capital requirements lie in energy and electricity infrastructure. As one participant put succinctly, artificial intelligence needs energy infrastructure: there can be no AI without EI. The United States currently holds a commanding lead in data center capacity, with northern Virginia

alone exceeding the nearest international competitor by three to four times. This advantage is largely attributed to lower electricity costs, with Northern Virginia’s rates 30% below the national average.

*“Artificial intelligence needs energy infrastructure—there can be no AI without EI”*

Three key trends are reshaping the U.S. electricity landscape:

1. Data centers’ share of total electricity demand is projected to quadruple from 2-3% to 9-11% by 2030.
2. Natural gas, described as the “cardiovascular arteries” of the U.S. energy economy, is expected to see demand growth of 30%.
3. Investors have at present found no reasonable alternative sources of energy beyond this in the medium term.

There are sizable risks from potential failures to invest in new transportation and storage infrastructure for required natural gas production. Planned increased electric vehicle adoptions and industry electrification will also significantly contribute to an exponential increase in electric demand in a manner comparable with data centers.

### Nuclear Generation Timeframe

While nuclear power is often proposed as a solution, and multiple big technology companies are attempting to open new plants, this process isn’t proving as straightforward as initially hoped. The current nuclear fleet represents a significant por-

tion of baseload power supply (roughly 20% of generation) and will likely remain in service for the next 20-40 years.

The sector faces substantial hurdles in implementing new capacity. Small Modular Reactors (SMRs), despite currently having about 80 companies working on development, continue to face political risks and regulatory challenges. The capital costs for research and development in the U.S. nuclear sector remain prohibitively high without government support.

There are three key takeaways regarding the future role of nuclear power at meeting the energy demand challenge:

1. Investment in new nuclear generating capacity has too long a lead time to meet the immediate electricity demand explosion from data centers. In the short term, natural gas seems to be the only option.
2. Nuclear remains a viable long-term bet, especially because of the significant national security risks in an undiversified energy supply that would come from relying primarily on gas; and
3. The only viable way forward for nuclear development involves government intervention and federal support.

***Nuclear power development requires substantial government intervention and federal support to be viable, but its lead times are too long to address immediate data center demand growth.***

### **Future of Canadian Electricity Imports**

Analysis of Canadian markets, particularly Alberta and British Columbia, revealed critical insights about renewable transition challenges. Electrification has been a big issue in Canada as the government plans to go to 100% renewable generation in Alberta while increasing the proportion of electric

vehicles, which are a major demand stressor even without data centers. Hour-by-hour demand calculations (in contrast to the frequently misleading levelized cost of electricity) showed prohibitively high costs for completely phasing out coal generation. The study predicted potential blackouts during peak demand periods, raising concerns about electricity exports to California as data center demand grows.

***The average size of data center facilities under construction has increased dramatically from 80 MW to 600 MW in the past year, with no signs of slowing down.***

### **Water Resource Considerations**

Recent semiconductor industry relocations driven by CHIPS and IRA legislation have highlighted critical infrastructure challenges beyond electricity. Water management has emerged as a crucial factor, with cooling requirements for both data centers and semiconductor manufacturing creating significant demands on local freshwater resources. Regional differences in water availability could substantially impact facility operations, even when other factors appear similar on paper.

### **Roundtable Discussion**

Following the presentations, a roundtable discussion was held. A theme among the participants was the political nature of the challenges. Several key observations emerged:

- Local permitting processes present significant obstacles to infrastructure development, making politics out of any new project no matter how small.
- Electricity markets face unique challenges due to their noncompetitive nature, magnifying the effect of political failures.
- On the national level, policy makers have had a blind spot on this issue, and awareness of

these future national security challenges have come first from industry.

Furthermore, these political challenges extend beyond the nation's borders, to geopolitical disagreements between the developing and developed world. The most impactful effort to address climate change and reduce greenhouse gases will be getting developing countries to adopt cleaner energy policies, and they will not be incentivized to do that if the example set by developed countries is substantially more expensive or unreliable.

Finally, the workshop closed with a hopeful message, as it was noted that if the challenges were principally political in nature, the political change in the incoming administration makes the current moment as a major opportunity to address them.



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