ADVANCED NUCLEAR POWER IN THE UNITED STATES CAN SUPPORT A TRANSITION TO A CLEAN ECONOMY

Advanced grid planning tool shows that advanced nuclear power can reduce cumulative customer costs by $450 billion during the clean economy transition

Boulder, CO, June 21st, 2022 – A new study commissioned by the Nuclear Energy Institute (NEI) and performed by Vibrant Clean Energy, LLC demonstrates that a clean economy transition in the United States is achieved at substantially lower cost if advanced nuclear power is able to be deployed without delay to licensing by the Nuclear Regulatory Commission (NRC) and supply chains are ramped up quickly in response to demand ("nominal" scenario). The customer savings cumulates to nearly $450 billion through 2050 compared with decarbonizing the economy with delayed and stalled deployments of advanced nuclear ("constrained" scenario).

The installed capacity of advanced nuclear in the "nominal" scenario reaches almost 51 GW by 2035, while the "constrained" scenario barely achieves 12 GW over the same time period. Both scenarios are modeled using endogenous learning rates for installation costs of advanced nuclear from a first-of-a-kind (FOAK) cost. The learning rate is dependent upon the cumulative installed capacity and pilot projects. The 30 GW gap between the scenarios in 2035 rises to 277 GW by 2050, with the "nominal" scenario achieving over 336 GW of advanced nuclear deployed.

The nearly half-a-trillion dollars in savings emerges from the dramatic reduction in other generation technologies to cover the increasing demand, via electrification, and the retirement of fossil power plants, such as coal and natural gas. The overall net difference in capacity due to the additional 277 GW of advanced nuclear is a reduction of total installed capacity of 1,300 GW; more than the entire installed capacity connected to the electricity grid in 2022. The "nominal" scenario requires 572 GW of wind, 779 GW utility solar PV, 154 GW distributed solar PV, 22 GW grid storage with 5 hours of discharge, and 196 GW of back-up fossil generation capacity. This compares with the "constrained" scenario that needs all of the capacity from the "nominal" scenario and an additional 337 GW of wind, 855 GW of utility solar PV, 14 GW of distributed solar PV, 254 GW storage with another 3 hours of discharge, and 50 GW of back-up fossil generation capacity.

The nuclear power generation fleet (legacy and advanced) provide more than 40% of the total electricity demand by 2050 in the "nominal" scenario, while in the "constrained" scenario it is a little over 13%. The lower amount of generation from advanced nuclear leads to more market price volatility between variable resources such as wind and solar and their complement storage and dispatchable resources. To compensate for the lower installed capacity of advanced nuclear, the "constrained" scenario experiences very high deployment rates of wind and solar technologies, exceeding 100 GW for each technology for many years.

The study relied on a state-of-the art grid planning tool developed by Vibrant Clean Energy. The tool - called WIS:dom®-P and developed by Dr. Christopher T M Clack – analyzes trillions of data points including every potential energy resource and the direct costs and benefits associated with bringing the most cost-effective resource mix to the electric grid. The model deployed for the present study was augmented to include endogenous learning rates for capital costs, yearly investment periods for the capacity expansion module, advanced nuclear blended generation technology, and a 2020 initialization year.

The other key takeaways from the advanced modeling show:

- Deployment pace is a key factor in influencing the ultimate role that advanced nuclear will play. Electricity sector costs could be significantly higher if clean dispatchable generation like advanced nuclear is not available at scale.

- For advanced nuclear to become a significant part of the energy mix, it needs to be deployed on time with regulators, permitting and supply chains responding quickly.

- Delays in deployment of advanced nuclear will have outsized impact on share of generation. Ramping up deployments in the mid-2030s will be key.

- The capital cost of advanced nuclear plays a smaller role, compared with deployment rate, in amount of advanced nuclear deployed to the grid.

"This study indicates that advanced nuclear should be considered as an important component of future clean energy pathways," said Dr. Christopher T M Clack, founder and CEO of Vibrant Clean Energy. "Furthermore, support for advanced nuclear pilot projects, supply chains, and regulatory expedience is warranted to reduce the burden upon fewer generation technologies that increases the risk of potential failure to reach climate goals."

About Vibrant Clean Energy: A nationally recognized energy grid modeling firm based in Boulder, Colorado. VCE® creates computer optimization software to study pathways for energy systems futures. It also performs studies using WIS:dom® to provide expertise in new arenas of electrification, decarbonization and variable resources. The mission of VCE is to help facilitate universal, sustainable, and cheap energy for everyone. www.VibrantCleanEnergy.com

Media Contact: Sarah McKee (DOO Vibrant Clean Energy LLC), sarah@vibrantcleanenergy.com

The full technical study report can be downloaded:
https://www.vibrantcleanenergy.com/wp-content/uploads/2022/06/VCE-NEI-17June2022.pdf

The WIS:dom®-P model output summary spreadsheet for the "nominal" scenario can be downloaded:
https://www.vibrantcleanenergy.com/wp-content/uploads/2022/06/WISdomP_Full_Run_NEI_Yearly_RCP00_NominalScenario.xlsx

The WIS:dom®-P model output summary spreadsheet for the "constrained" scenario can be downloaded:
https://www.vibrantcleanenergy.com/wp-content/uploads/2022/06/WISdomP_Full_Run_NEI_Yearly_RCP00_ConstrainedScenario.xlsx