

U.S. DEPARTMENT OF
ENERGY

Office of
NUCLEAR ENERGY

Advances in Nuclear Energy

Florie Knauf

Associate Deputy Assistant Secretary for Nuclear Reactors

September 17, 2024



U.S. DEPARTMENT OF
ENERGY

Office of
NUCLEAR ENERGY

The Office of Energy Efficiency and Renewable Energy (EERE) The Office of Clean Energy Demonstrations (OCED)

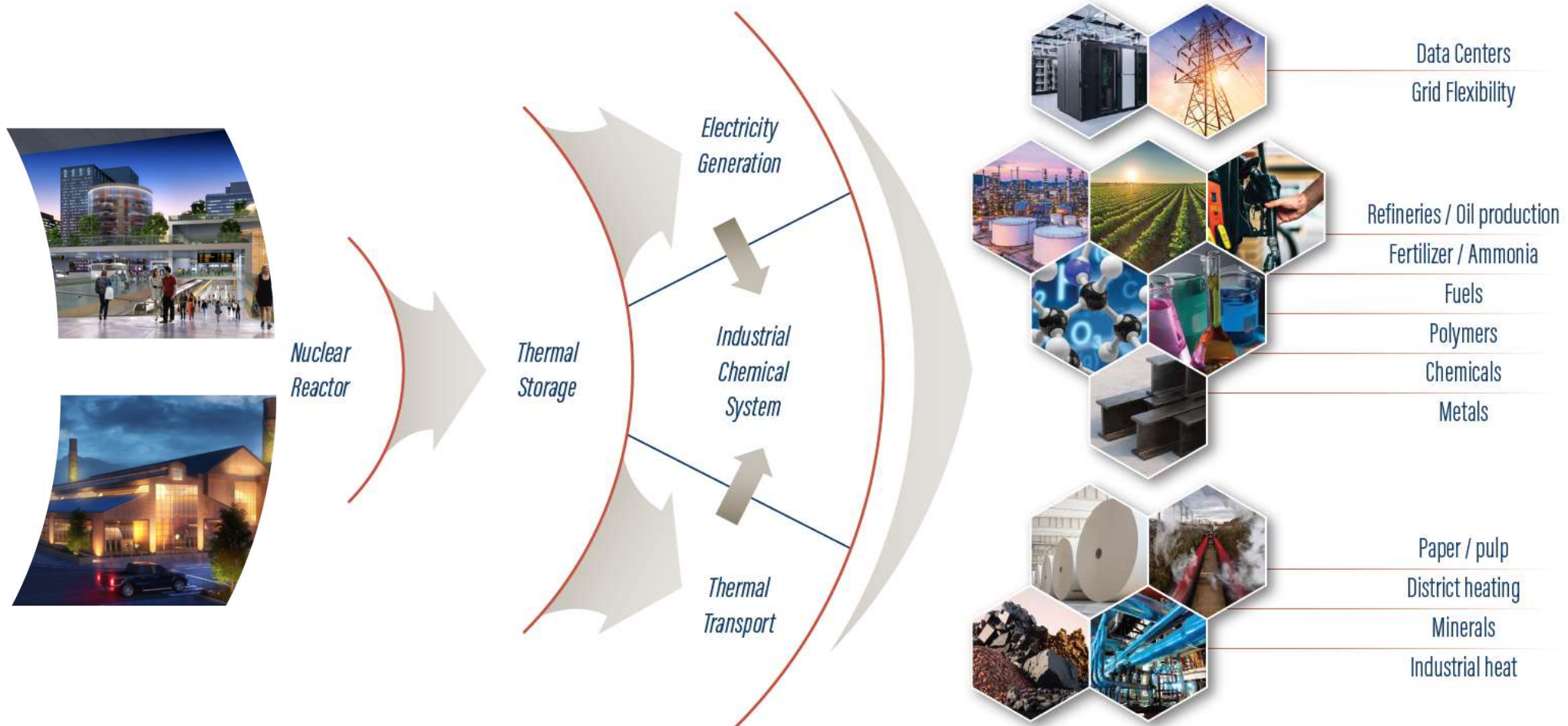
Nuclear Reimagined

(images from thirdway)

- Liquid coolants enable low pressure cooling systems. (e.g. molten salt, liquid metal)
- Higher temperature reactors enable more efficient and broader industrial use, as well as dry cooling. (e.g. molten salt, liquid metal, high temperature gas)
- Fast reactors can be technically capable of making their own fuel inside the reactor core, and burning high-level waste.
- Passive cooling and reactivity control enable walk-away safety.
- Smaller Emergency Planning Zone allows close proximity to industrial applications
- High power density results in low land-use and low embodied emissions.
- High availability and reliability– high capacity factor / good economics.
- 200 GW new nuclear expected by 2050 (DOE Nuclear Liffort Report).



The Future Landscape for Nuclear Energy Systems



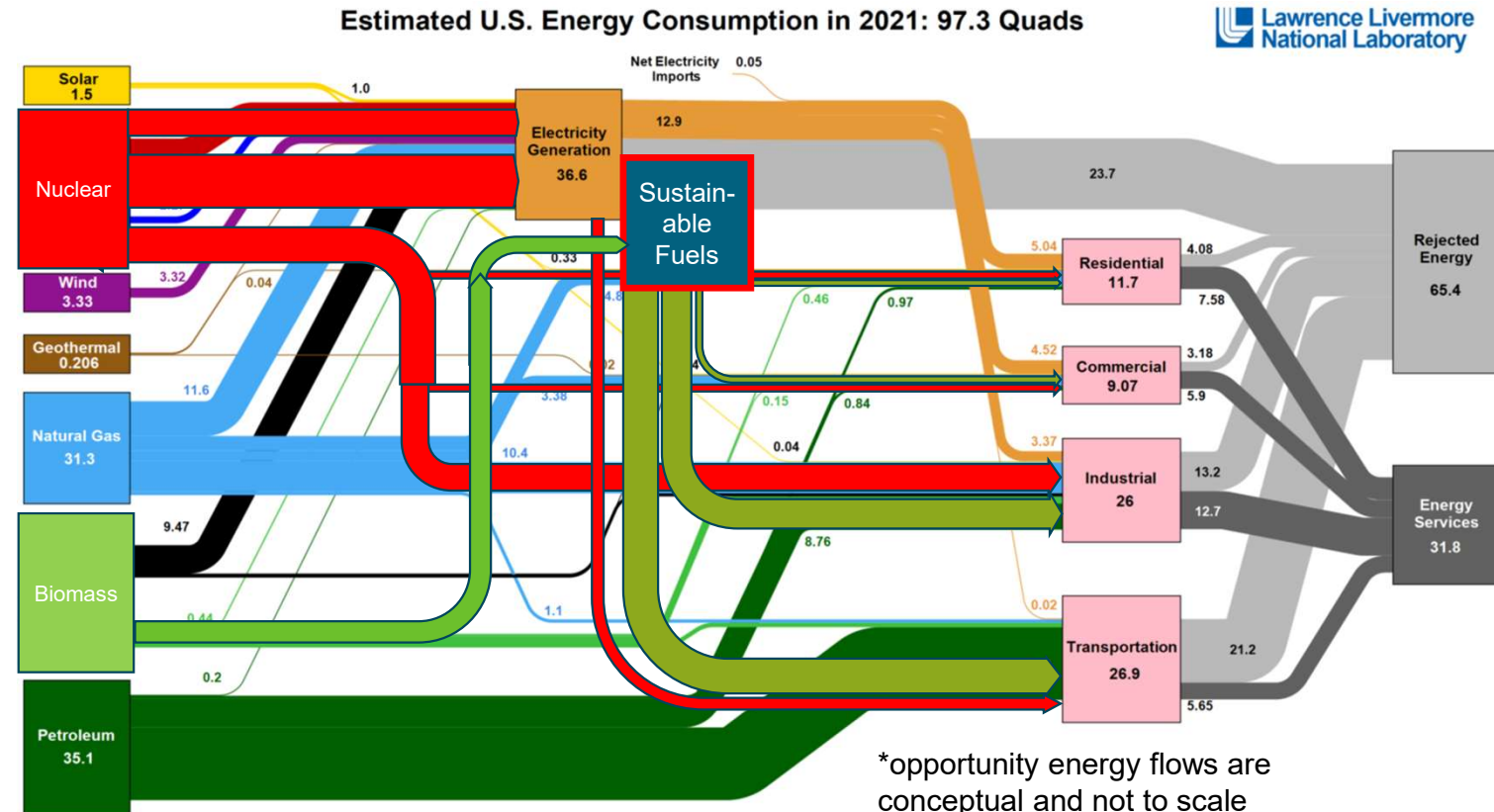
Significant opportunities for nuclear energy expansion:

Chemical, electrical and thermal energy to Transportation, Industrial, Commercial and Residential Sectors.

Future Opportunities for Nuclear Energy in U.S.

- ✓ Heat for residential, commercial, industry use
- ✓ Flexible electricity
- ✓ Electricity for transportation
- ✓ Fuels for industry
- ✓ Fuels for transportation
- ✓ Fuels for commercial
- ✓ Fuels for residential

Biomass / carbon resources are critical for the future energy system...



Source: LLNL March, 2022. Data is based on DOE/EIA MER (2021). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 21% for the transportation sector and 49% for the industrial sector, which was updated in 2017 to reflect DOE's analysis of manufacturing. Totals may not equal sum of components due to independent rounding. LLNL-MI-410527



THANK YOU

U.S. DEPARTMENT OF
ENERGY

Office of
NUCLEAR ENERGY