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Nuclear Industry/Next Generation Reactors Update

NPPD Board of Directors Meeting

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Nebraska Public Power District
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Common Terminology

- Small Modular Reactor(SMR)/Microreactor
  - Refers to the size of a single unit
    - Less than 20 MW – Microreactor
    - 20 to 300 MW - SMR
    - >300 MW – Full Size Reactor
- Light Water/High Temperature Gas/Liquid Metal/Molten Salt Reactors
  - Types of Reactors
    - Refers to the coolant/heat transfer mechanism from the nuclear core
      - Existing commercial reactors in the US are Light water
      - Original Hallam plant was a liquid metal reactor
      - Molten Salt contains heat storage capabilities
- Next Generation Nuclear/Advanced Nuclear
  - Refers to the evolution stage of reactor (existing fleet in US is generation II)
    - Next generation - generation III or above
    - Advanced Reactor is generation IV

Next Generation Nuclear

Courtesy of DOE, Office of Nuclear Energy

Generation I

Early Prototype Reactors

- Shippingport
- Dresden, Fermi I
- Magnox

Generation II

Commercial Power Reactors

- LWR-PWR, BWR
- CANDU
- VVER/RBMK

Generation III

Advanced LWRs

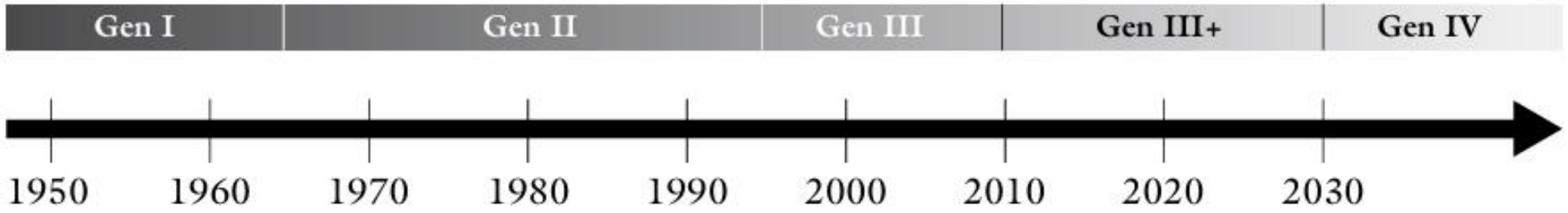
- ABWR
- System 80+
- AP600
- EPR

Near-Term Deployment

Generation III+ Evolutionary Designs Offering Improved Economics

Generation IV

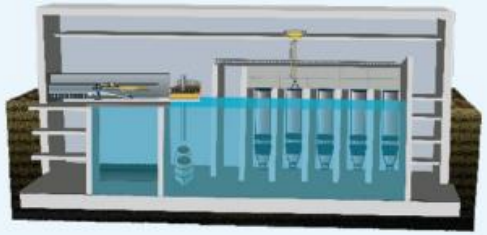
- Highly Economical
- Enhanced Safety
- Minimal Waste
- Proliferation Resistant



Next Generation Reactor Sizes

Microreactors
Range: 1 MW to 20 MW
Can fit on a flatbed truck, and are mobile and deployable.

Small Modular Reactors
Range: 20 MW to 300 MW
Can be scaled up or down by adding more units.



Full-Size Reactors Range:
300 MW to 1,000+MW
Can provide reliable, emissions-free baseload power.

Advantages

- SMRs simplify construction, reduce costs, and shorten construction time
  - Gen III+ and Gen IV have passive safety features
    - Walk Away Design
  - Factory built components vice mega-construction site
  - Smaller footprint (both physically and water use)
  - Smaller Emergency Planning Zones (EPZ) at Site Boundary vs 10 Mile Radius
  - Standardized design quickly moves costs to "n^{th} of a kind" levels
  - Smaller staff results in lower fixed costs
  - Increased flexibility in operation
    - Ability to match with intermittent forms of generation
      - Lower dispatch threshold, heat storage, ability to load follow, etc.
    - Advanced reactors have higher thermal and fuel efficiencies
      - Potentially use existing used fuel.
- Although based on proven technology, need to demonstrate ability to scale

Current Industry Status

- Nuclear Energy Institute (NEI)
  - Over 60 commercial projects planned/considered in the USA and Canada
  - Approx. 30 Vendors are members of Advanced Nuclear Designers group
- Nuclear Regulatory Commission (NRC) reviews
  - 23 new designs (6 Gen III+, 15 Gen IV)
  - 7 Construction Permits (3 sites submitted, 4 future applications)
    - TVA/GE BWRX-300 (Clinch River Site - actual Construction for 4 started in Canada)
    - Terra Power Natrium Site (Kennemer Wyoming)
    - Dow Chemical/X-Energy Site (Houston Texas)
  - 3 Early Site Permits being considered (not yet submitted)
- State of Nebraska
  - Siting Study
  - Great Plains New Nuclear Consortium

Nebraska SMR Siting Study

- Phase 1 of study to identify best 16 sites - **COMPLETE**

- Phase 2 of study to identify top sites – **On-track for release 3/31/26**
  - Technical Evaluation by Consultant - In Progress
    - Included field walkdowns, transmission injection study, water usage study, etc.
  - Public Engagement – In Progress
    - Initial engagement - Complete
    - Follow Up Engagement – On going

New Nuclear In Nebraska

- Additional efforts being considered/pursued
  - Position ourselves to move quickly (fast follower)
    - Derisk deployment
      - Down Select Technology
      - Exploring preliminary site license
      - Form Consortium with Like Minded Utilities
      - Assess other beneficial partnership opportunities
    - Move fast once licensing, construction cost & schedule risks are understood
    - Form value added partnerships
    - Leverage history & experience as a nuclear operating utility

Great Plains New Nuclear Consortium

- Collaborative effort of public power utilities operating in SPP footprint
  - Explore the feasibility/development of plans to deploy new nuclear in Nebraska
- Memorandum of Understanding (MOU) signed
  - Nebraska Public Power District
  - Omaha Public Power District
  - Lincoln Electric System
  - Grand River Dam Authority (Oklahoma)
- MOU provides framework of cooperation
  - Coordinated by steering committee led by NPPD with each utility represented
    - Each utility will self fund its own early-stage work
    - Any future steps will follow each utilities independent board approval process

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Questions?

Stay connected with us.

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