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# Feasibility of Nuclear Power on U.S. Military Installations

20 September 2011

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# Outline

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- Study tasking and objective
- Appropriate size of nuclear power plant
- Feasibility
  - Contribute to DoD missions?
  - Safety, certification, licensing, construction and operation?
  - Economic viability?
- Summary of findings

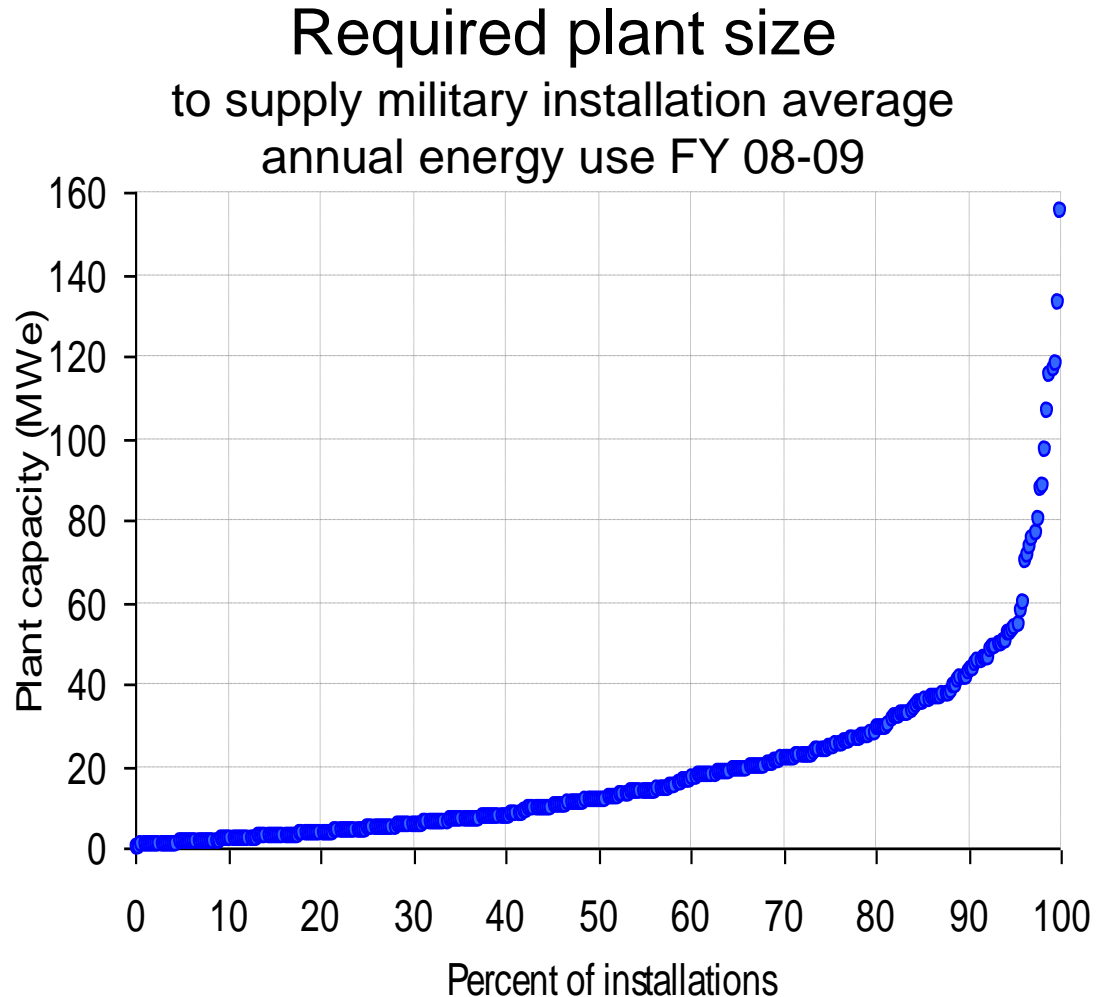
# Tasking and objectives

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- Congressional tasking
  - Congress directed DoD, in section 2845 of the National Defense Authorization Act of 2010, to “conduct a study to assess the feasibility of developing nuclear power plants on military installations”
  - Office of the Deputy Under Secretary of Defense for Installations and Environment, DUSD(I&E), asked CNA to conduct feasibility study
  - Steering group consisting of representatives from DUSD (I&E), DOE, NRC, DOE Labs, and each of the military departments
- Quick study to provide clearly articulated reasons for DoD to
  - Move forward—be willing to consider specific proposals
  - Defer—explain why DoD is not willing to consider specific proposals
  - Like discussing college with a freshman in high school

# Appropriate size of nuclear power plant

- Commercial nuclear power plants are >1000 MWe
- New designs for small modular reactors (SMRs) <300MWe
  - Improved safety
  - Factory manufacture
  - Use as single, or group



# Feasibility

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## Focus on three questions:

- Could nuclear power plants contribute to DoD missions?
- What are the significant issues related to safety, certification, licensing, construction, and operations?
- Could a nuclear power plant on a military installation be constructed and operated in a cost effective manner?

# Contribute to DoD missions

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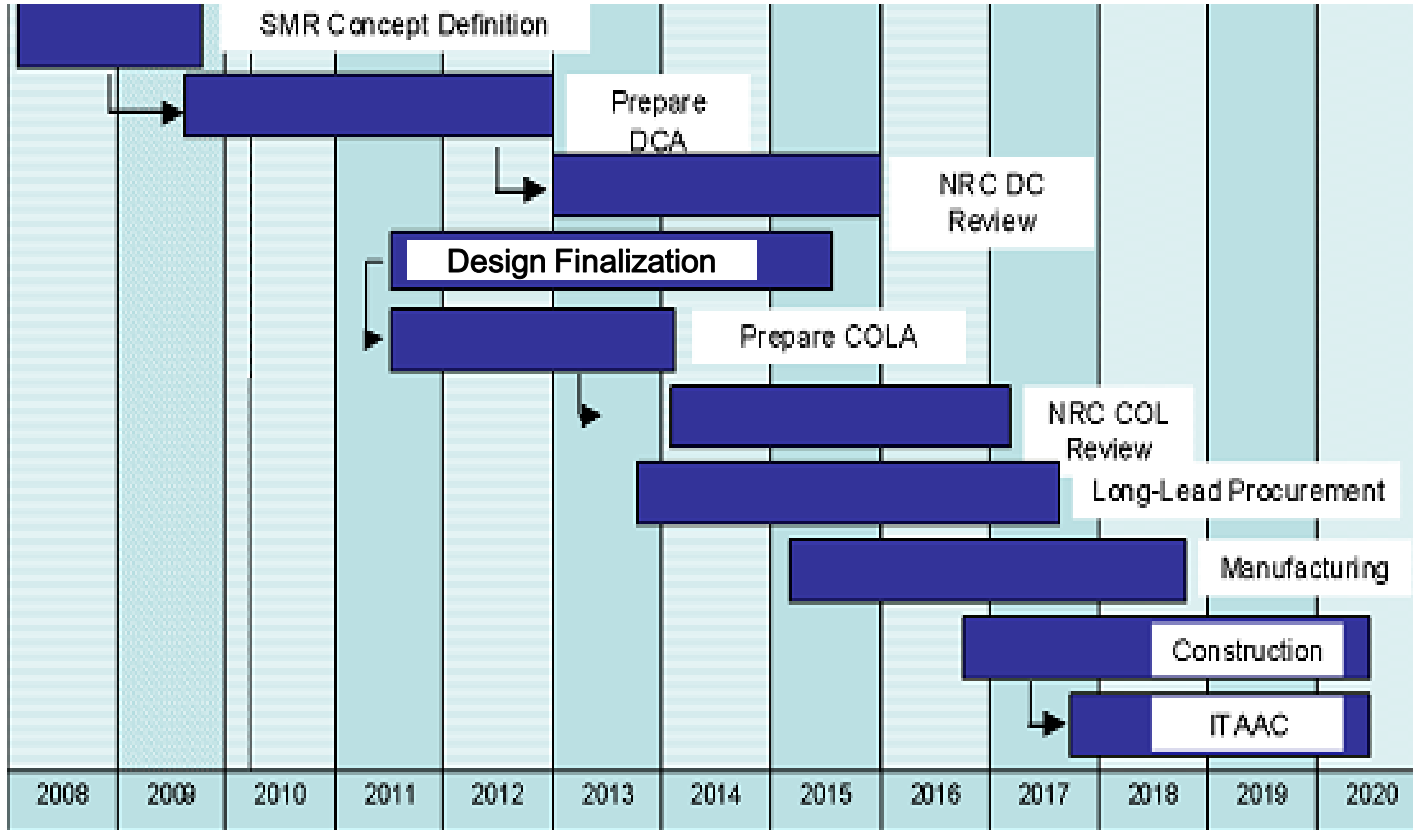
- Electric energy assurance for critical military facilities (more reliable at more stable cost)
- Address mandates to reduce reliance on fossil fuels for electricity
- Address mandates to reduce greenhouse gas emissions

# Safety, certification, licensing, construction, and operation

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- Safety always a concern for nuclear power
  - Commercial nuclear power plants have excellent safety record
  - SMRs designed to be more safe
  - First of a kind (FOAK) certification and licensing issues—require years and will be expensive
- Finding specific sites on military installations will be challenging
  - Geology, seismology, hydrology, weather, exclusion area, population, emergency planning, ecology, noise, socioeconomics, etc.
- Construction and operation will affect installation – tradeoffs required

# Timeline (DOE projections)



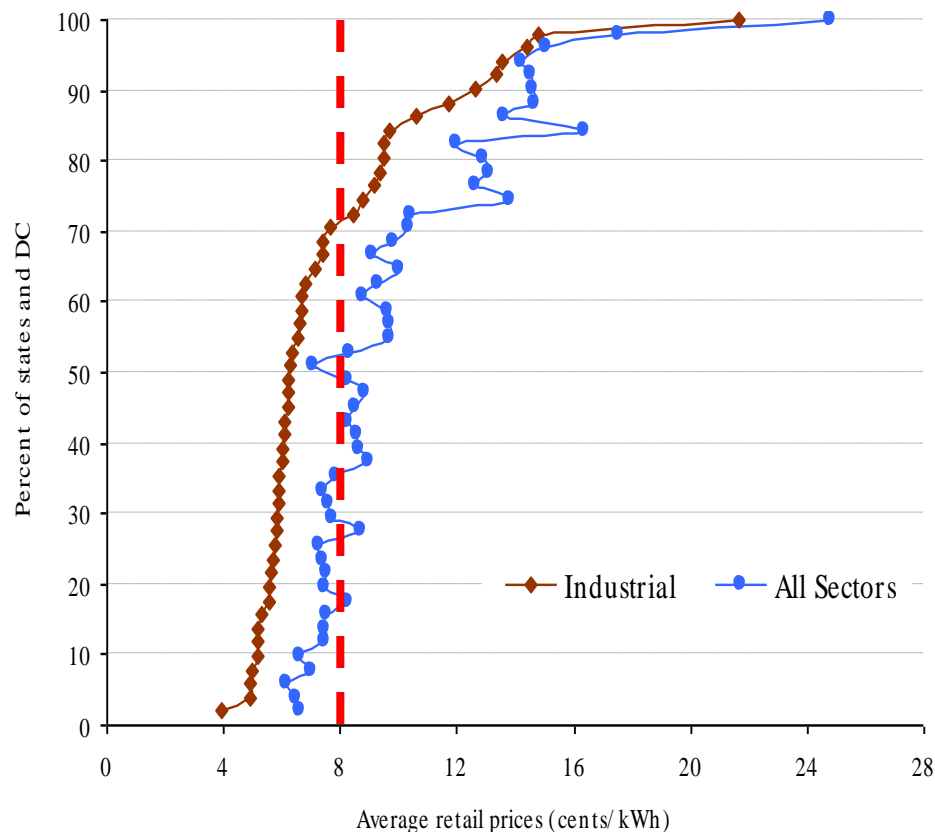
DCA: Design Certification Application

COLA: Combined Operating License Application

ITAAC: Inspections, Tests, Analyses, and Acceptance Criteria

# Economic viability

- Substantial FOAK expenses  
~ \$800 million
- FOAK expenses can be paid by some combination of DOE, vendors, and direct congressional funding
- If FOAK expenses are not included, estimated levelized cost of electricity produced by a SMR power plant is about \$0.08 per kWh



# Sensitivity to input parameters

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- Plant capacity
- **Capacity factor *important parameter***
- **First of a kind expense (FOAK expenses) *critical parameter***
- **Manufacture & construction costs *important parameter***
- Reactor operating life
- Decommissioning
- Fuel, waste fee, & variable O&M
- Fixed O&M factor
- Equity share
- Tax rate
- **Debt interest rate & Equity rate of return *important parameter***
- Discount rate

# Summary: SMR power plants a feasible option if DoD does not assume FOAK expenses

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- Contribute to DoD missions by increasing energy assurance while reducing carbon emissions and reliance on fossil fuels for electricity
- Resolving safety, certification, licensing, construction and operations issues will take time and resources
- An SMR could provide electricity at a price that would make it a viable option for a DoD installation, as long as DoD does not assume FOAK expenses

# Administrative

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- Study sponsor: Mr. Joseph K. Sikes Director, Facilities Energy
  - Sponsor POC: Lisa Jung, OSD\_ATL (Neil Midkiff)
- CNA study team:
  - Ronald J. Filadelfo, Environment and Energy Team Leader
  - R. LaVar Huntzinger, Project Director
  - Ed McGrady, Reviewer
  - Marcus King, Research Analyst/ co-directing
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  - George Baldwin, Associate Research Analyst