

The Radix Mini-Modular Reactors for Energy Supply

& an Overview of SMR Technology Offerings and Deployment Plans

Canadian Nuclear Society
Western Focus
Saskatoon, Saskatchewan, CA
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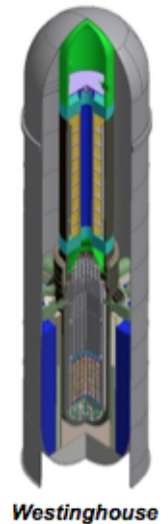
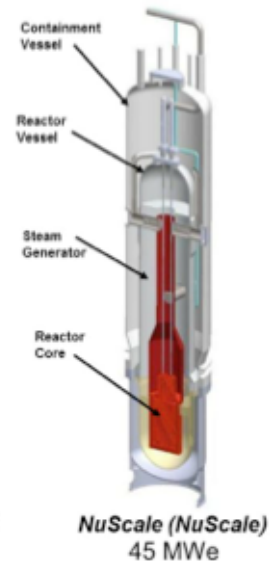
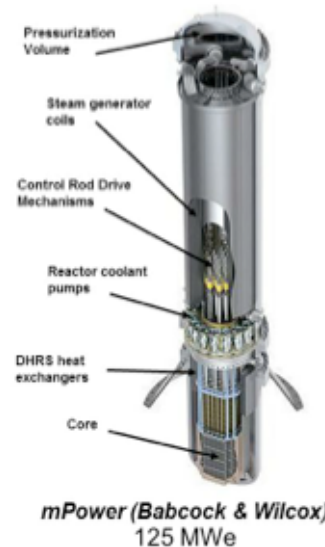
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Radix Power and Energy Corporation

Small Modular Reactors

Near-Term LWR Designs

Well Understood Technology

- LWR based designs
- Standard <5% UO₂ fuel
- Regulatory & operating experience
- Deployment in 10 years (2020)





“Complexity” Versus “Simplicity”

On-site Construction – “Complexity”



Transport SMR to Site
“Simplicity”

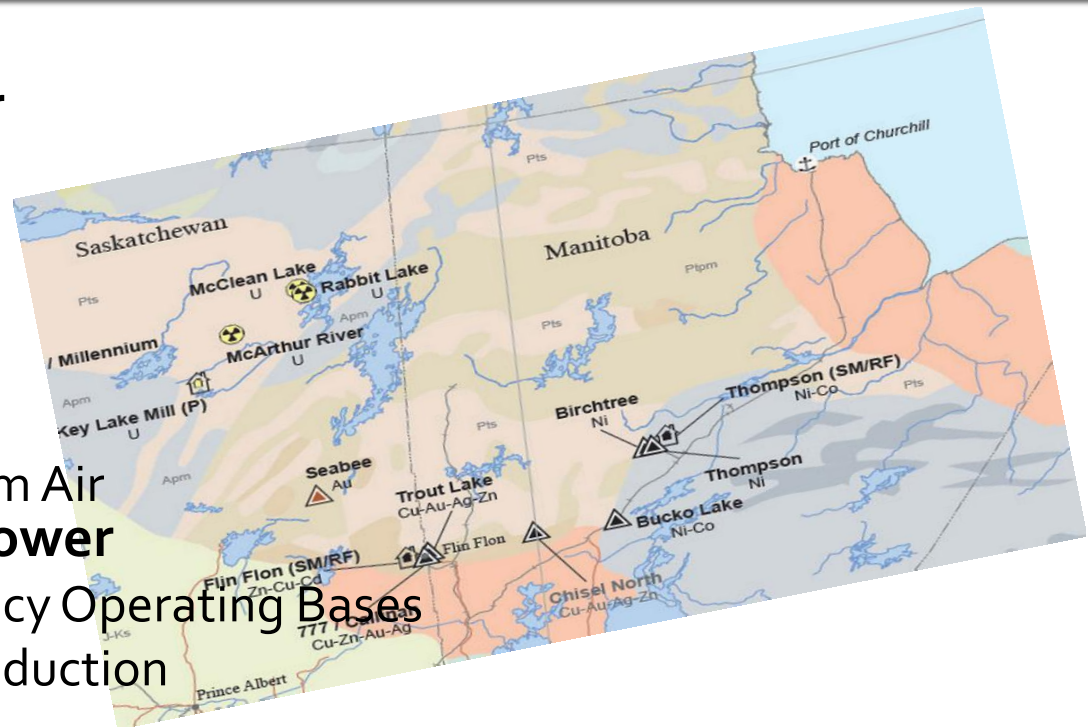


U.S. SMR Status

- DOE Funding Opportunity Announcement (\$452 million)
 - mPower (B&W), NuScale (Fluor), Westinghouse
- Savannah River Site
 - SMR-160 (Holtec) and Gen4 Module (Gen4 Energy), NuScale
- TRIDEC (Tri City Development Corporation) will present a proposal to the Department of Energy on June 20 at a forum organized by the Energy Communities Alliance. Proposals or comments also are expected from communities in Tennessee, South Carolina, Virginia, New Mexico, Idaho and possibly Kentucky.
- Necessary Components are:
 - Reactor design, location, utility, financing, license....

Non-Traditional Markets

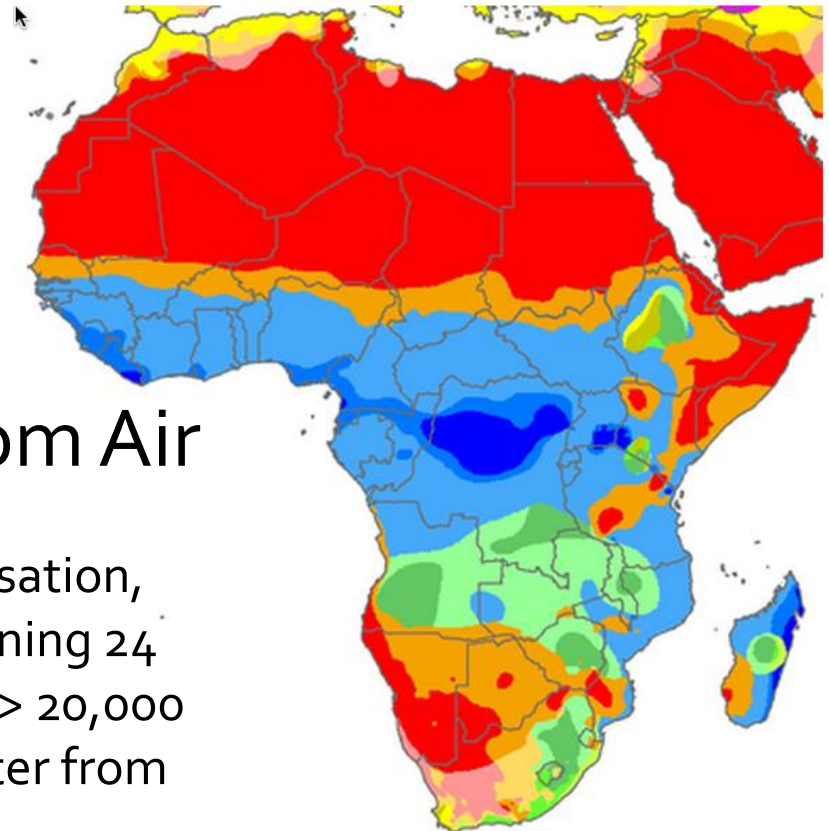
- **Off-Grid Electric Power**
 - Remote locations
 - Mining Operations
 - Emergent Economies
- **Potable Water**
 - Desalination
 - Extraction of Water from Air
- **(Non-Naval) Military Power**
 - Forward and Contingency Operating Bases
 - Vehicle (liquid) Fuel Production
 - Domestic Bases
- **Among the Hurdles to Overcome**
 - Other choices in developed areas
 - Nuclear Regulatory Infrastructure for new nuclear entrants
 - Nuclear Proliferation concerns



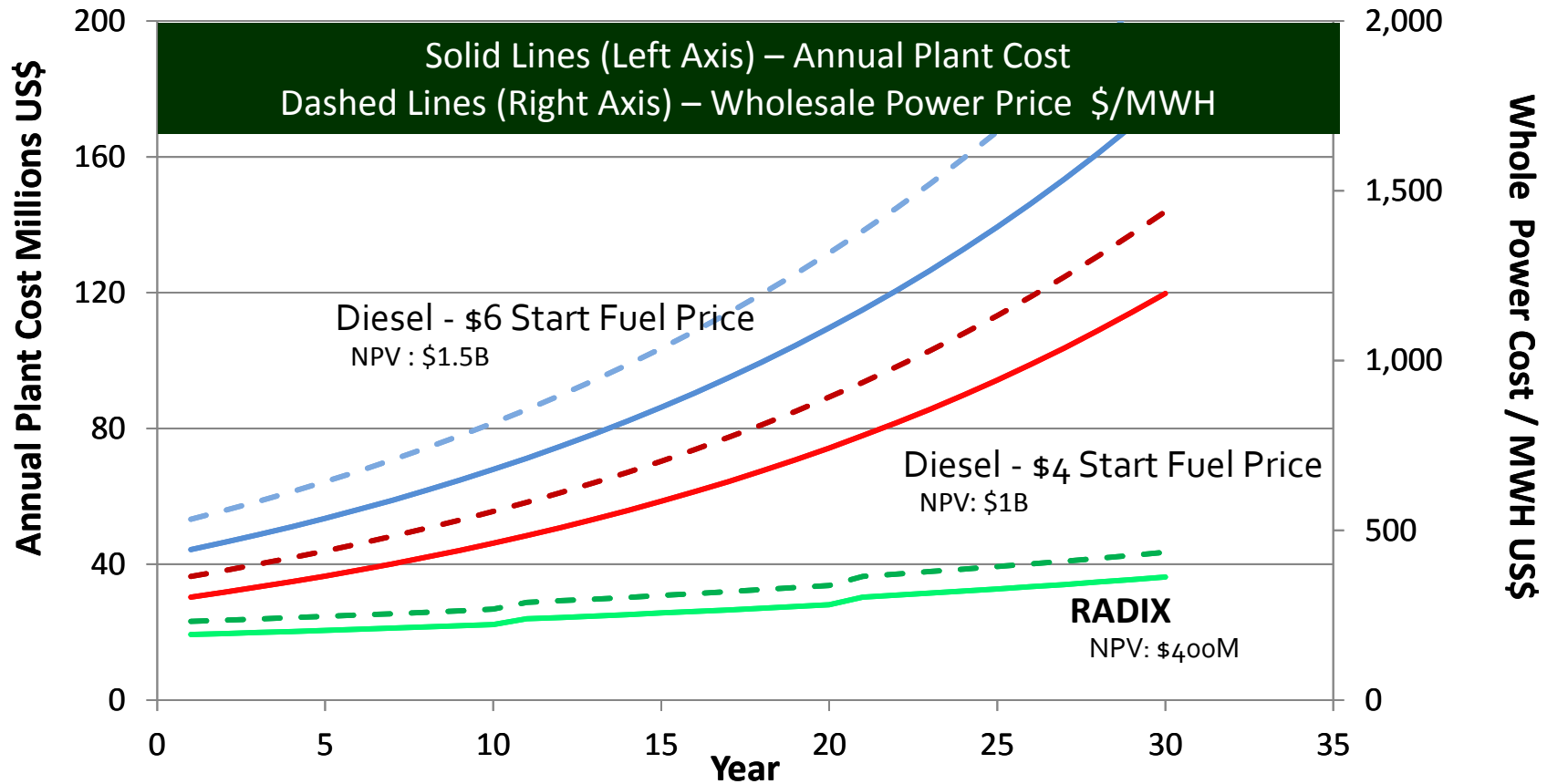
Potable Water

- Desalination
 - Coastal Regions
 - Drought stricken areas
- Extraction of Water from Air

Using air refrigeration-condensation, 500 kW of electrical power running 24 hours per day would generate > 20,000 gallons per day of drinking water from air initially at 40 C and 23% RH.



Cost of 10 MWe Nuclear Power vs Diesel



Diesel costs based on 2011 market values of \$4/gal and > \$6/gal in remote areas. Assumes diesel price increases 5% per year equivalent to a real year 30 price of \$134 a barrel of oil. Based on 800 GPH for 10 MW Diesel-Electric

National Security

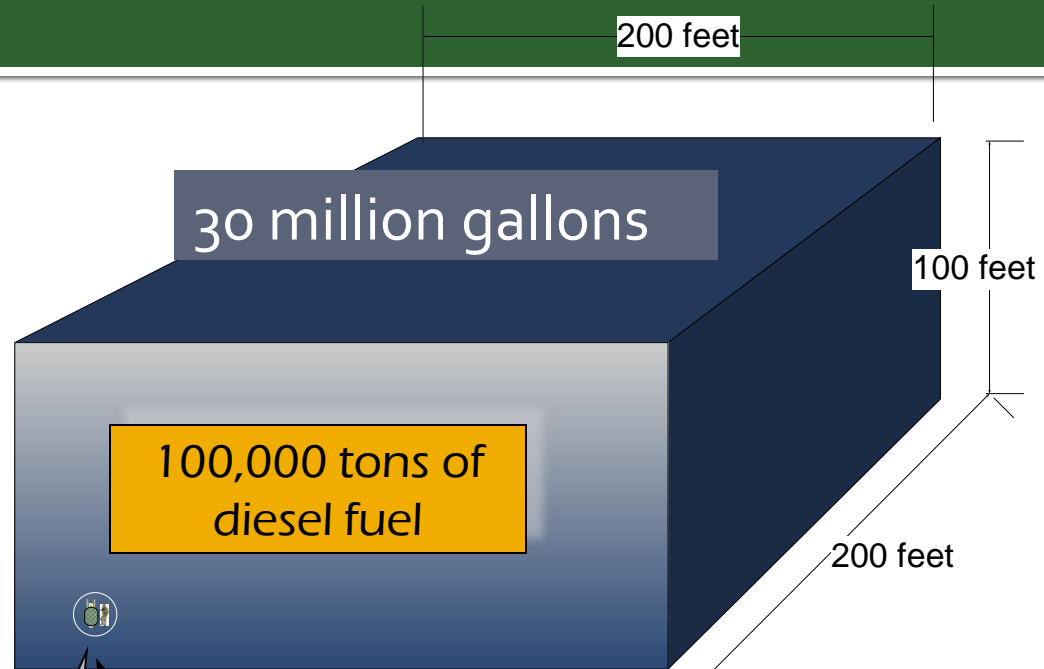
- Domestic Bases
 - US Defense Department is concerned about its use of energy and the security of domestic bases against grid failure natural events or terrorist attack by cyber or physical means.
 - SMRs located on or near the base can mitigate that risk.
- FOBs
 - Forward operating bases depend on transport of fossil fuel and potable water over long distances to support their operations.
 - Deployable nuclear power can be used to produce potable water and liquid (vehicle) fuel to reduce the logistic burden.

Economics and Logistics

Volume of diesel fuel needed to produce the same amount of power per year as a **50 Megawatt Reactor**

16 MWe and can produce 5000 gallons of JP8 fuel per 24 hour day

50 Megawatt RADIX facility



Fuel cost of \$50 to \$100 per gallon

600,000 gallons per week

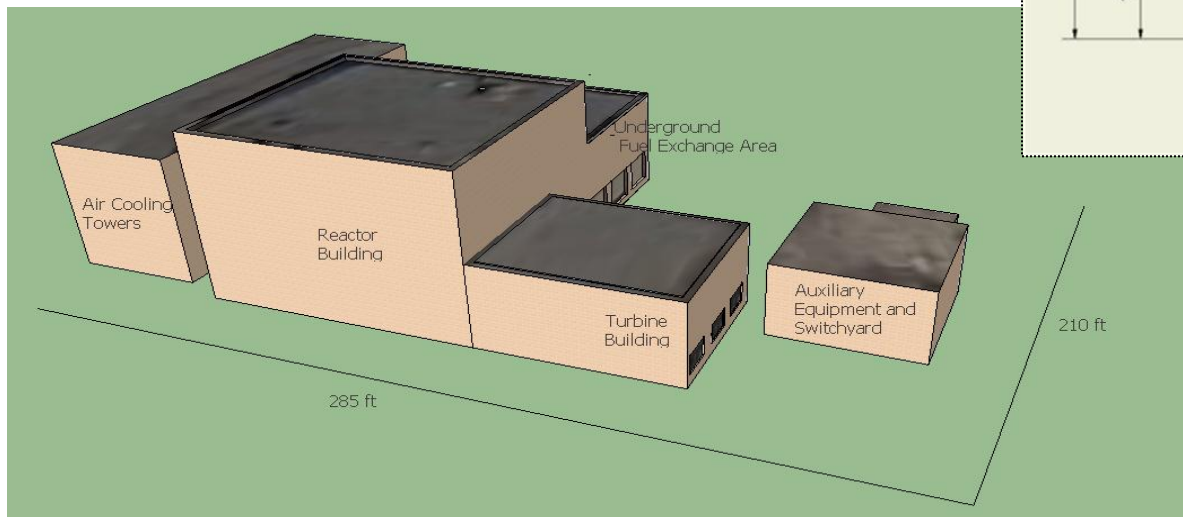
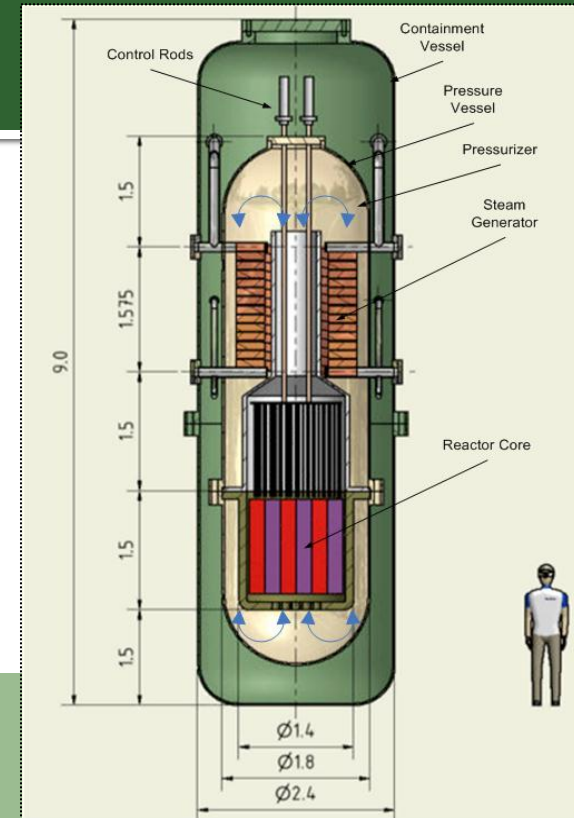
The RADIX Difference

- **The RADIX Market is Off-Grid Applications**
 - Mining operations, Remote locations, Government bases that demand secure, safe, 24/7 reliable power, and Emergent economies.
- **Design is Traditional (“licensable”) LWR**
 - 10 MWe per module with 10 year fuel cycle
 - 100 MWe module with 18 month fuel cycle*
 - Integral PWR (core, steam generator, pressurizer)
 - ~ 20% enriched U235
 - 150-200 GWd/ t U

* Scaled up version for oil extraction.

The RADIX Mini Modular Reactor

- 10 MWe (40MW_t) IPWR
- Scalable & Deployable
- Powers approx. 10,000 to 14,000 residences
- Gen III+ Passive Safety & Economics
- Triga[®] UZrH_{1.6} - enriched 19.75% U-235
- Fuel cycle 10 years
- Air or Water Cooled



Hurdles to Overcome

- Initial projects to demonstrate business case
- First of a Kind Regulatory approval!
 - International Market
 - Nuclear Infrastructure (IAEA guidelines)
- Fuel cycle
 - Mature Fuel bank structure
- Skilled construction craft

Summary

- Markets exist now for MMR in traditional and non-traditional applications
- Economic case when competing with liquid fuel is very strong
- Hurdles can be overcome