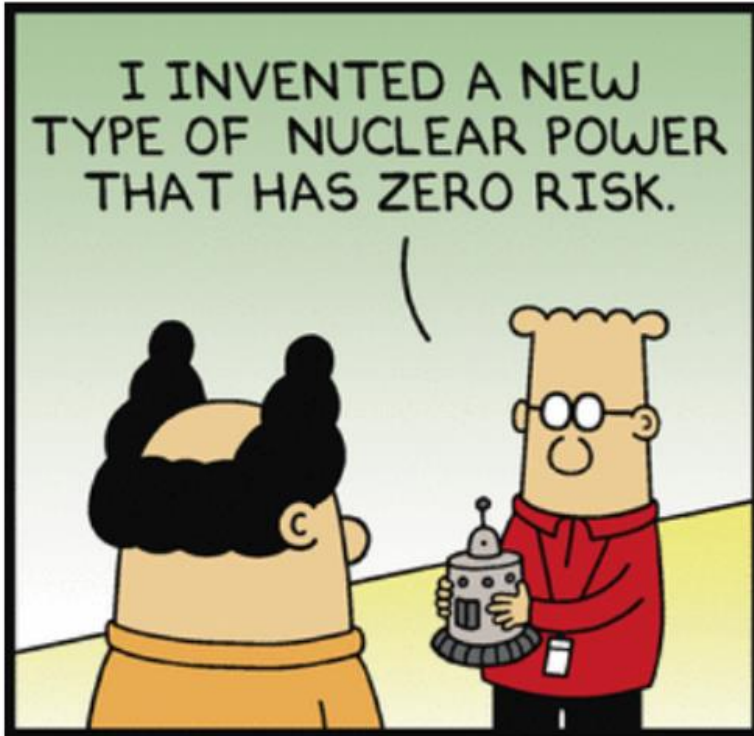




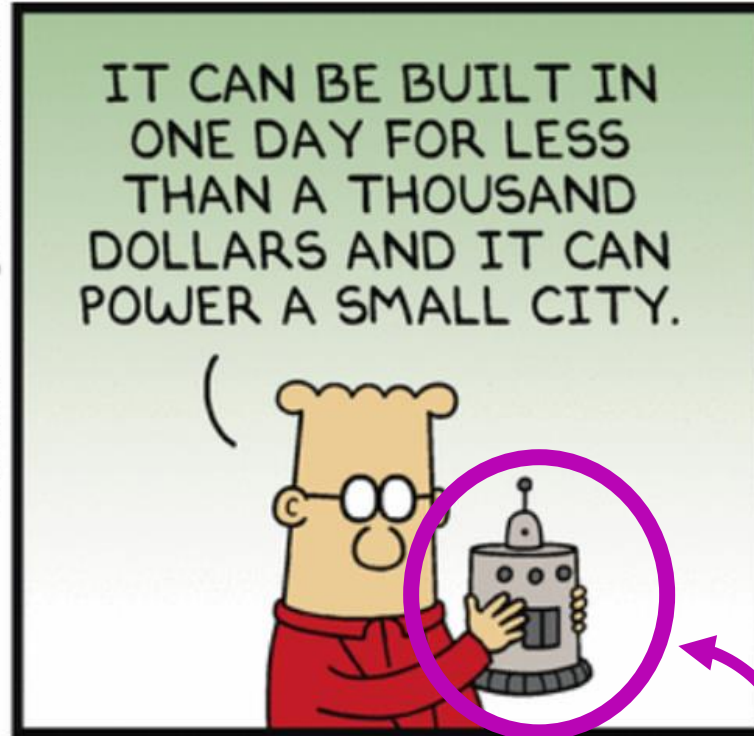
arctic development expo
Inuvik Northwest Territories Canada



Micro-Nuclear Energy Development Update

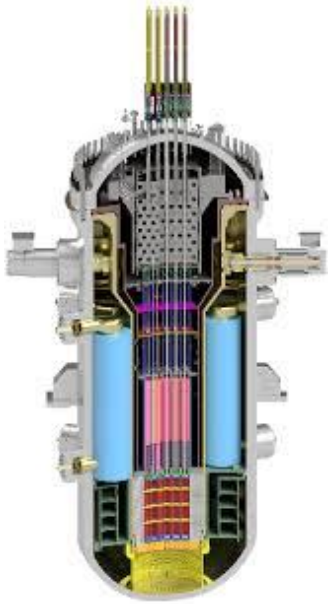


DILBERT.COM @SCOTTADAMSSAYS



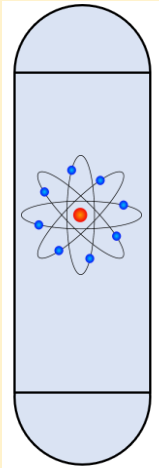
4-1-19 2019 Scott Adams, Inc./Dist. by Andrews McMeel

Micro-reactor



Small **M**odular **R**eactor

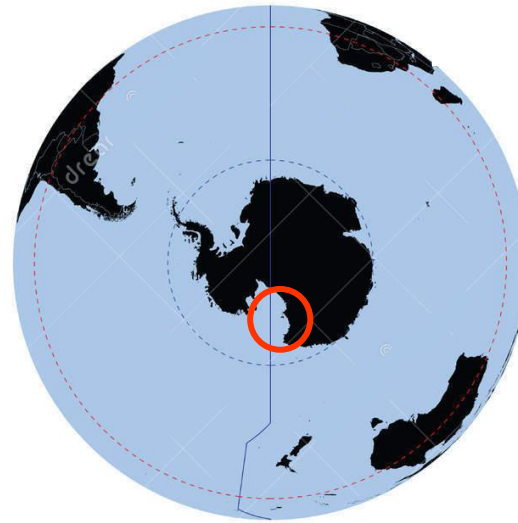
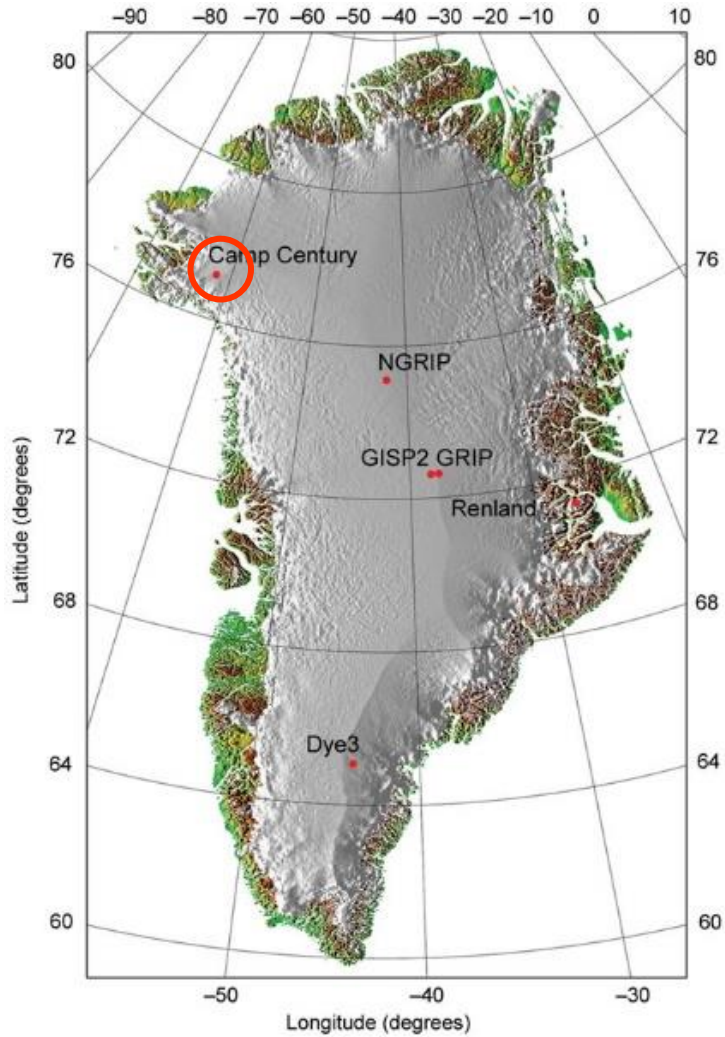
SMR is 300 MWe or less



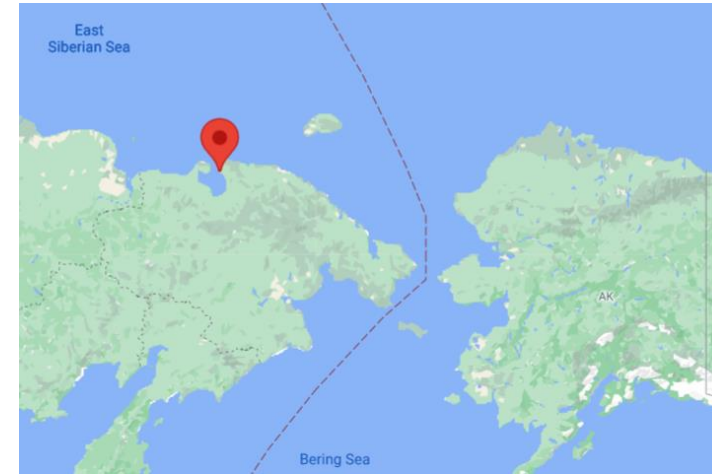
Micro-reactor

MR is \approx 15 MWe or less

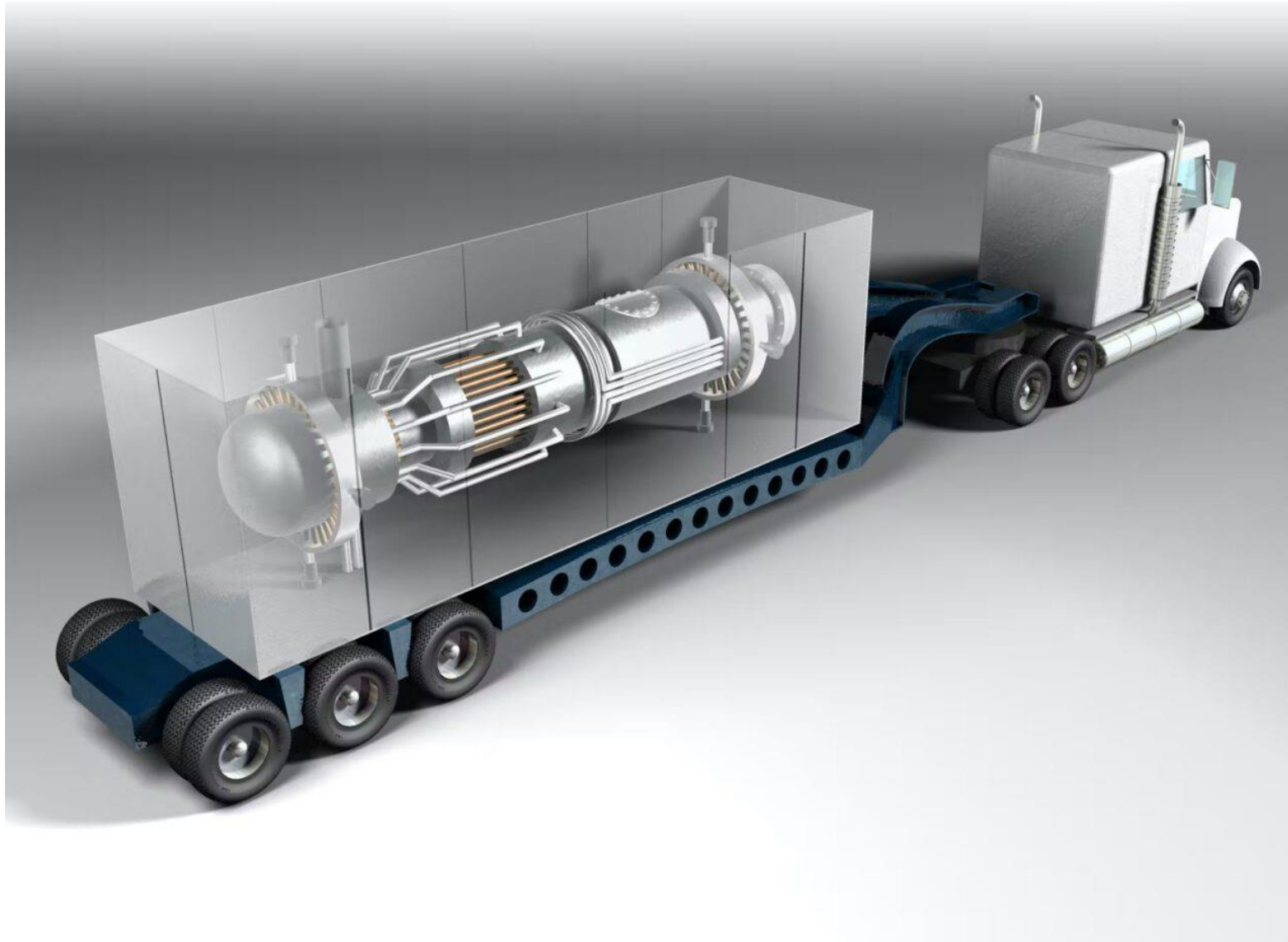
Camp Century



Pevek



BWXT Micro Reactor



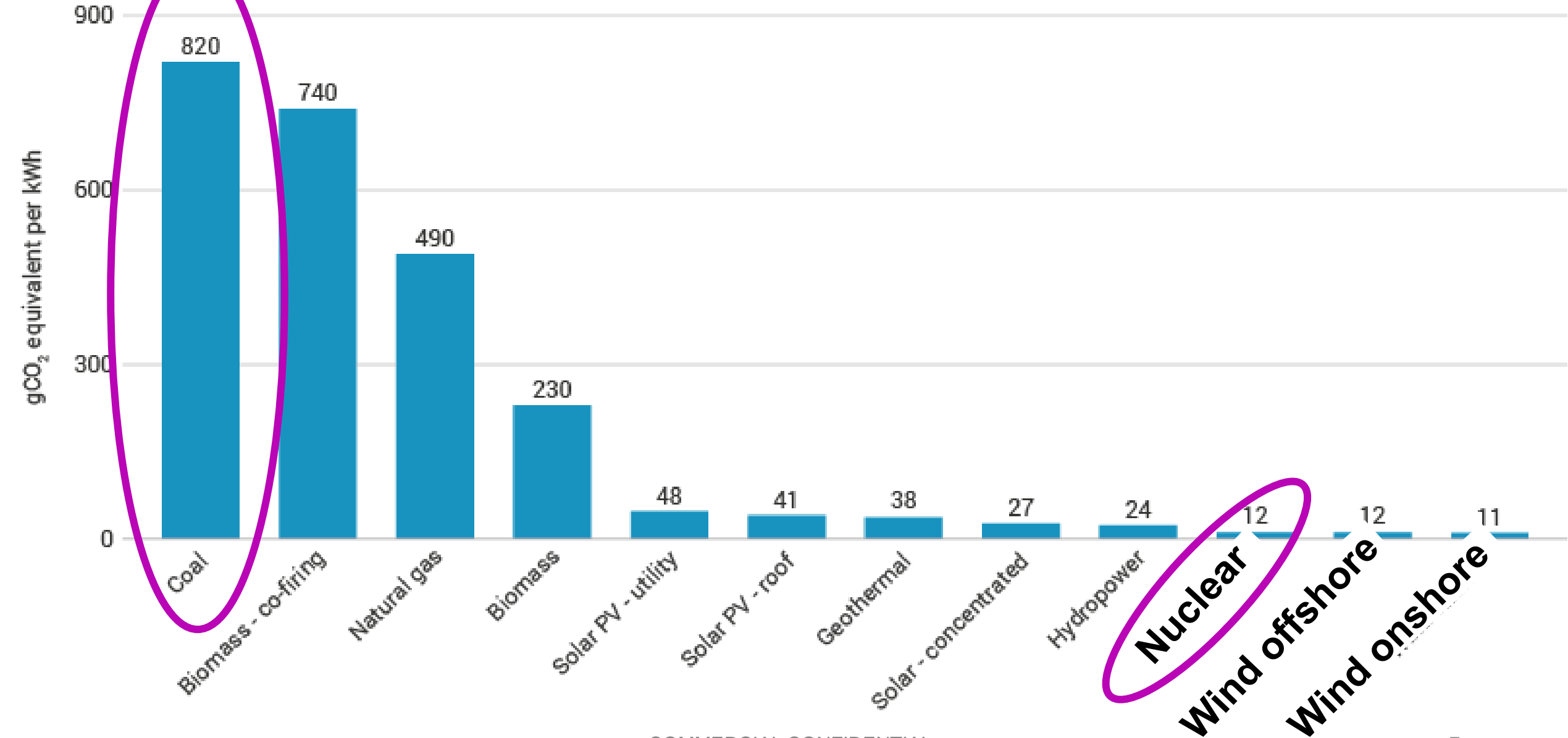
Eielson to receive Air Force's first nuclear microreactor

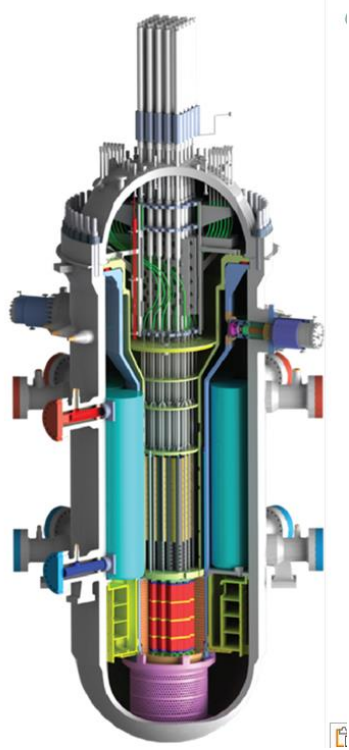


<https://www.eielson.af.mil/microreactor/>

Average Full Life Cycle CO₂e emissions

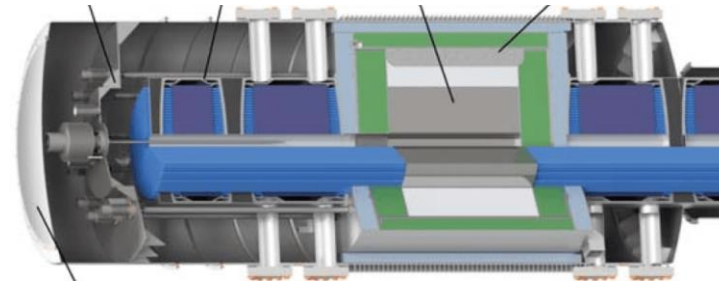
Source IPCC





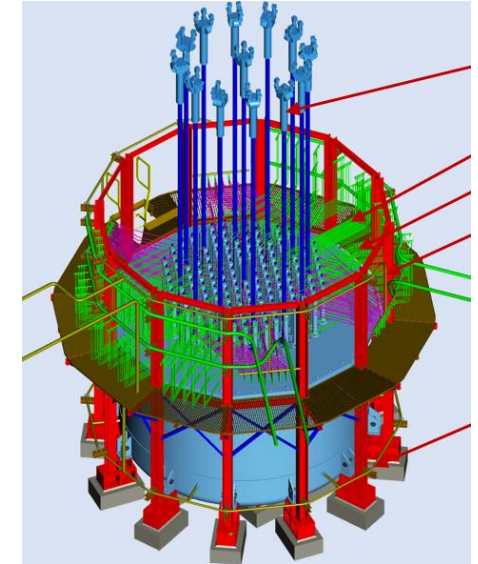
Ultra Safe
MMR[®]

5 MWe



Westinghouse
eVinci[™] Micro Reactor

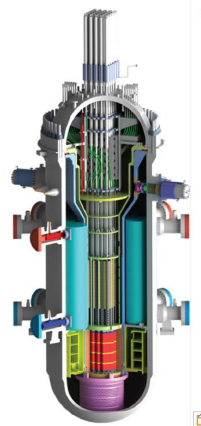
5 MWe



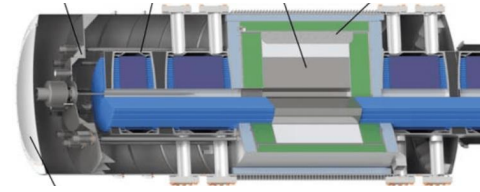
Dunedin
Canadian Thermal
Battery[™]

600 kWe

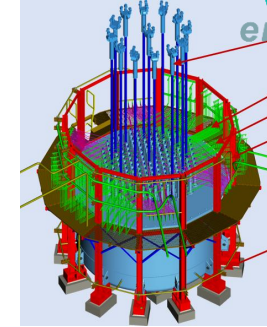
Features in common:



MMR



eVinci



CDN Thermal Battery

Core

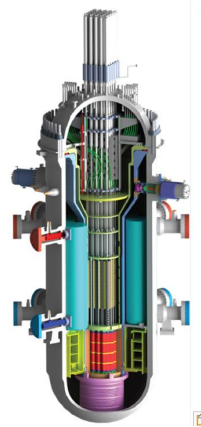
Solid Core

Solid Core

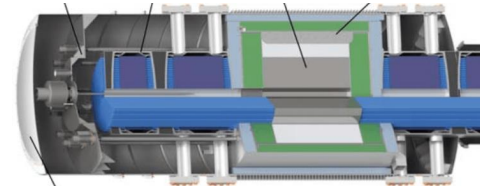
Solid Core



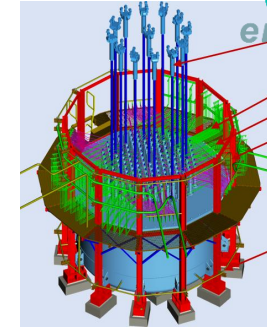
Features in common:



MMR



eVinci



CDN Thermal Battery

Core
Refueling cycle

Solid Core
20+ yrs.

Solid Core
8+ yrs.

Solid Core
20+ yrs.

Diesel Fuel \$CDN/Litre (NWT)





2003
2023

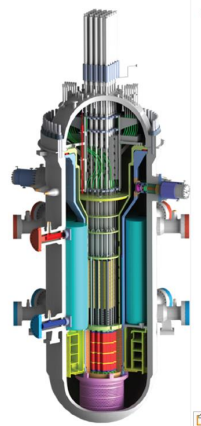
2008

2013

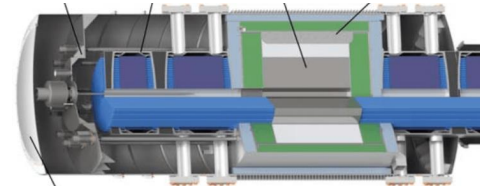
2018

COMMERCIAL CONFIDENTIAL

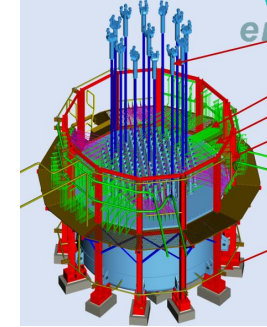
Features in common:



MMR



eVinci

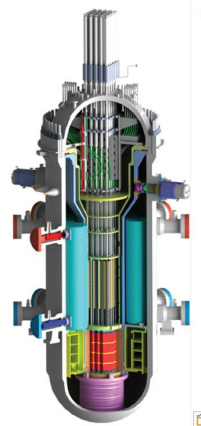


CDN Thermal Battery

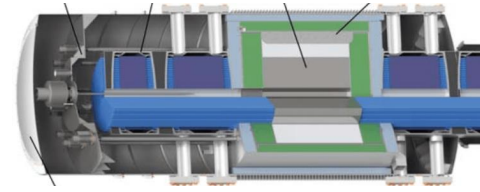
Core	Solid Core	Solid Core	Solid Core
Refueling cycle	20 yrs.	8+ yrs.	20 yrs.
Condenser	air-cooled	air-cooled	air-cooled



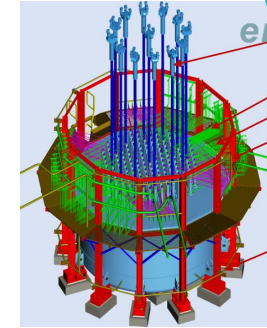
Features in common:



MMR



eVinci



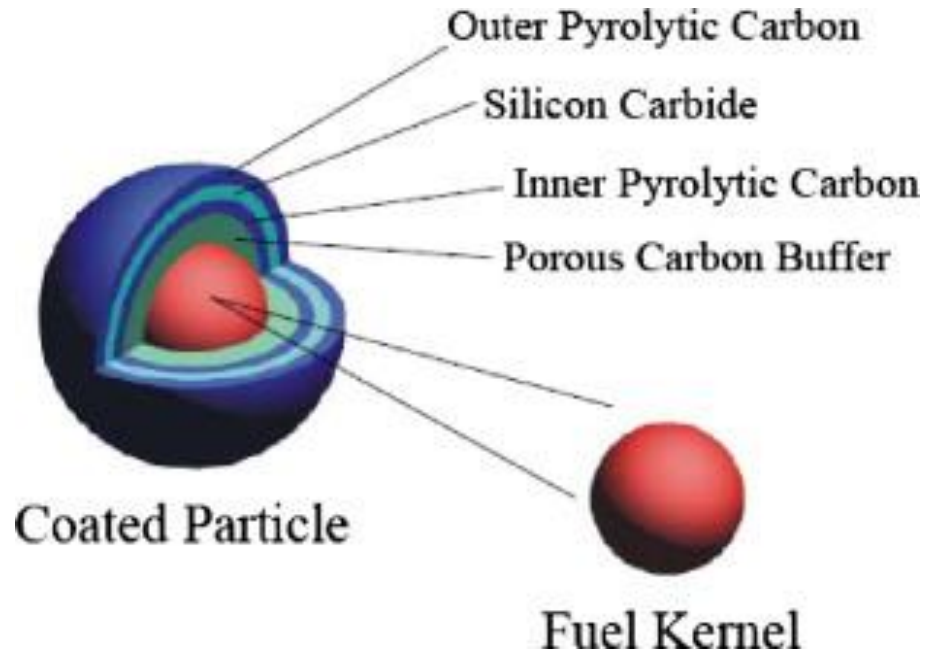
CDN Thermal Battery

Core	Solid Core	Solid Core	Solid Core
Refueling cycle	20 yrs.	8+ yrs.	20 yrs.
Condenser	air-cooled	air-cooled	air-cooled
Fuel	TRISO+	TRISO	TRISO

TRISO Particles: The Most Robust Nuclear Fuel on Earth

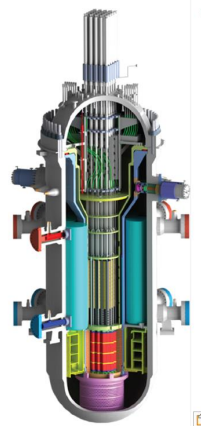
JULY 9, 2019

<https://www.energy.gov/ne/articles/triso-particles-most-robust-nuclear-fuel-earth>

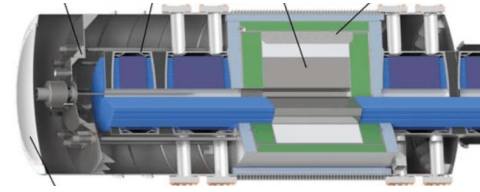


*“Simply put, **TRISO particles** can withstand extreme temperatures and **cannot melt in a reactor**”*

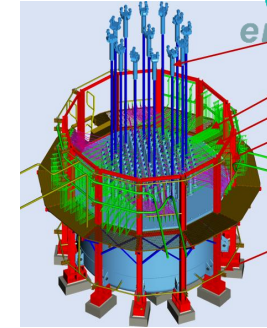
Features in common:



MMR



eVinci



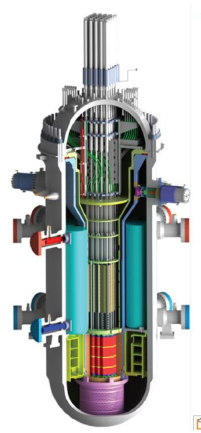
CDN Thermal Battery

Core	Solid Core	Solid Core	Solid Core
Refueling cycle	20 yrs.	8+ yrs.	20 yrs.
Condenser	air-cooled	air-cooled	air-cooled
Fuel	TRISO+	TRISO	TRISO
Safety	inherent/passive	Inherent/passive	inherent/passive

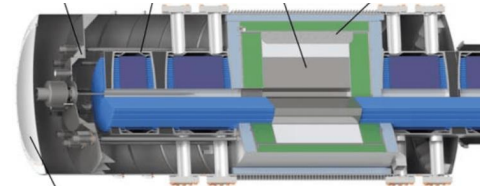


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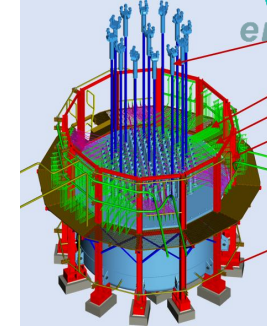
Features in common:



MMR



eVinci



CDN Thermal Battery

Core	Solid Core	Solid Core	Solid Core
Refueling cycle	20 yrs.	8+ yrs.	20 yrs.
Condenser	air-cooled	air-cooled	air-cooled
Fuel	TRISO+	TRISO	TRISO
Safety	inherent/passive	Inherent/passive	inherent/passive
Co-generation	yes	yes	yes

Power and Heat co-generation and distribution



Four Principal Applications for Micro-reactors in the North

Large Communities

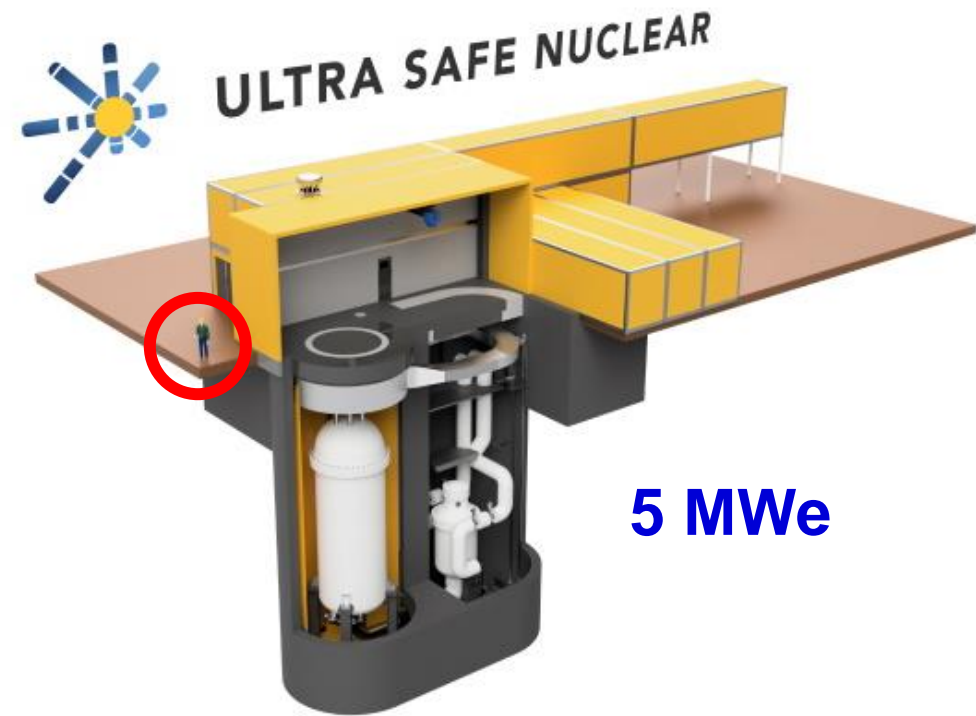
Mines

Small Communities

Military Installations

Four Principal Applications for Micro-reactors in the North

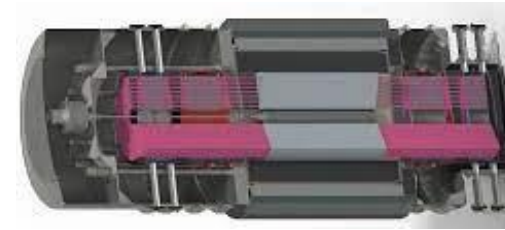
Large Communities





Four Principal Applications for Micro-reactors in the North

Mines

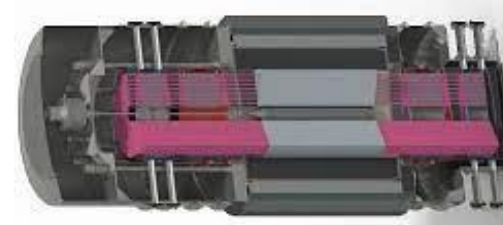


eVinci™



Four Principal Applications for Micro-reactors in the North

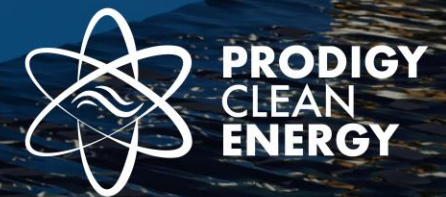
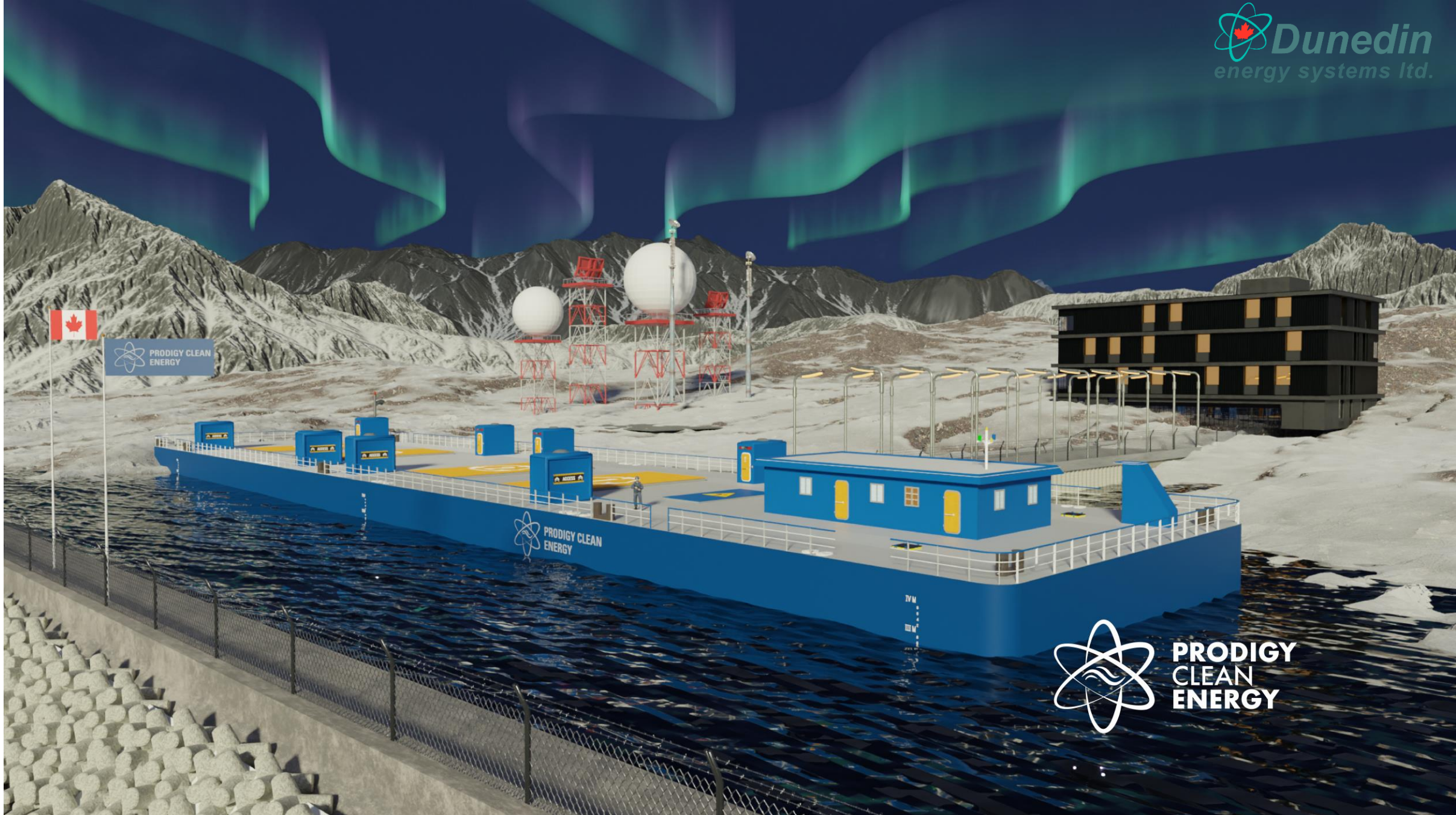
Mines



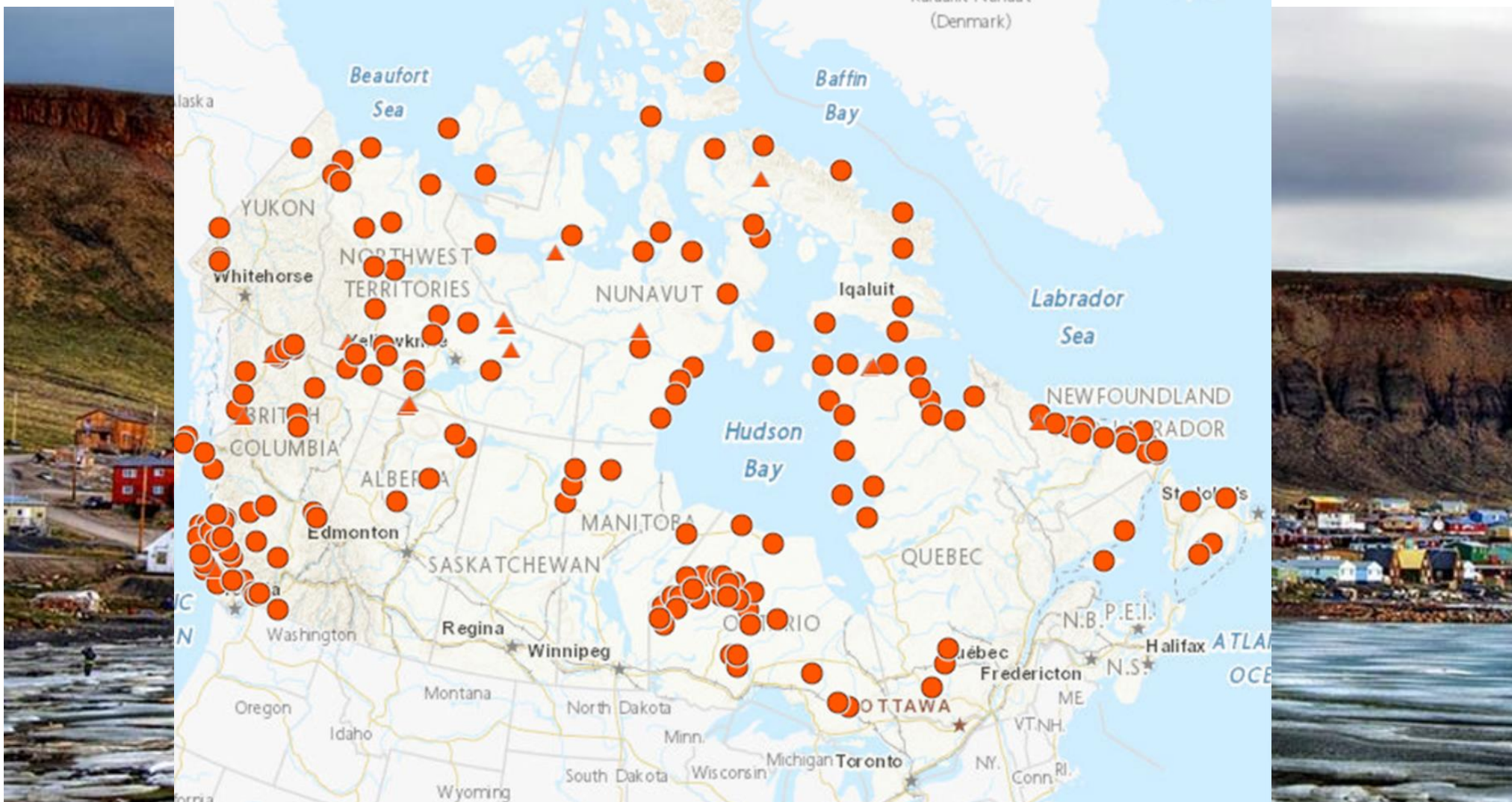
eVinci™

<https://www.westinghousenuclear.com/energy-systems/evinci-microreactor>



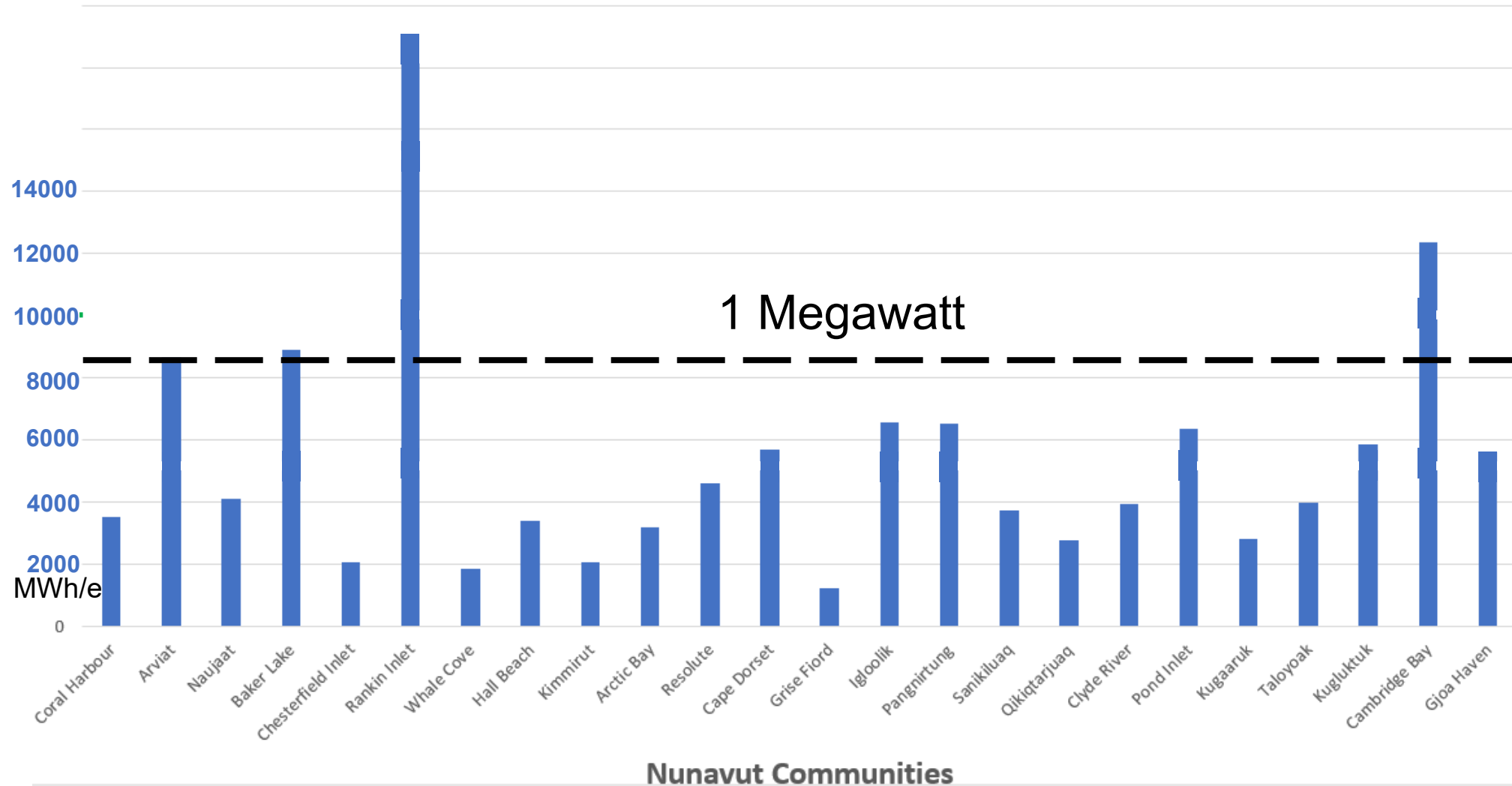


Small Communities





Annual Nunavut Electricity Production



BY JESSA GAMBLE

KICKING DIESEL

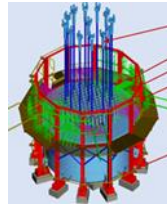
DIESEL MAY NOT BE THE NORTH'S FUEL OF CHOICE, BUT IT'S THE FUEL WE RELY ON. IT'S THE DEVIL WE KNOW—BUT SURELY THERE'S A BETTER WAY.



SUMMER 2018 UP HERE BUSINESS 55

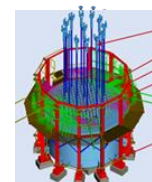
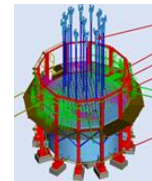
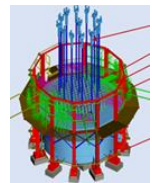
“You’re not going to be able to put a five-megawatt nuclear plant on a 500 kilowatt system. That’s overkill for generation.”

Dr. Michael Ross, NSERC Industrial Research Chair in Northern Energy Innovation Yukon University



The Canadian Thermal Battery™ has a maximum electrical output of 600 kW

Annual Nunavut Electricity Production



60000
50000
40000
30000
20000
10000
MWh/t

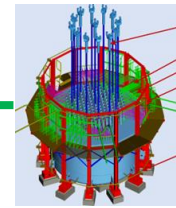
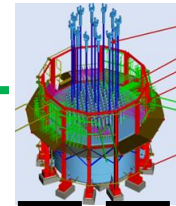
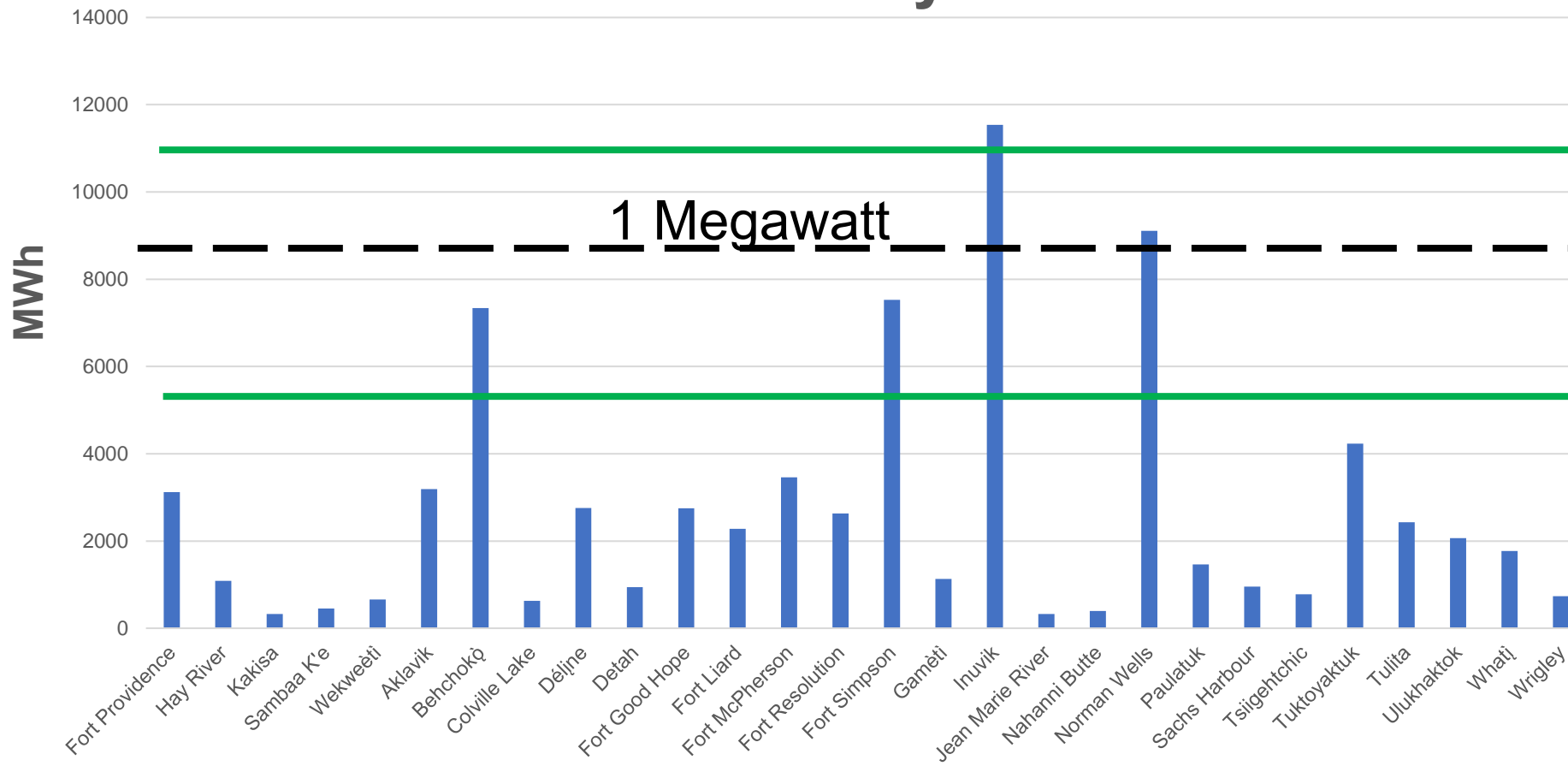
14000
12000
10000
8000
6000
4000
2000
0
MWh/e

Coral Harbour Arviat Nauyasat Baker Lake Chesterfield Inlet Rankin Inlet Whale Cove Hall Beach Kimmirut Arctic Bay Resolute Cape Dorset Grise Fiord Igloodik Pangnirtung Sanikiluaq Qikiqtarjuaq Clyde River Pond Inlet Kugaaruk Taloyoak Kugluktuk Cambridge Bay Gjoa Haven

Nunavut Communities

COMMERCIAL CONFIDENTIAL

NWT Diesel Communities Annual Electricity



Arctic Military Installations

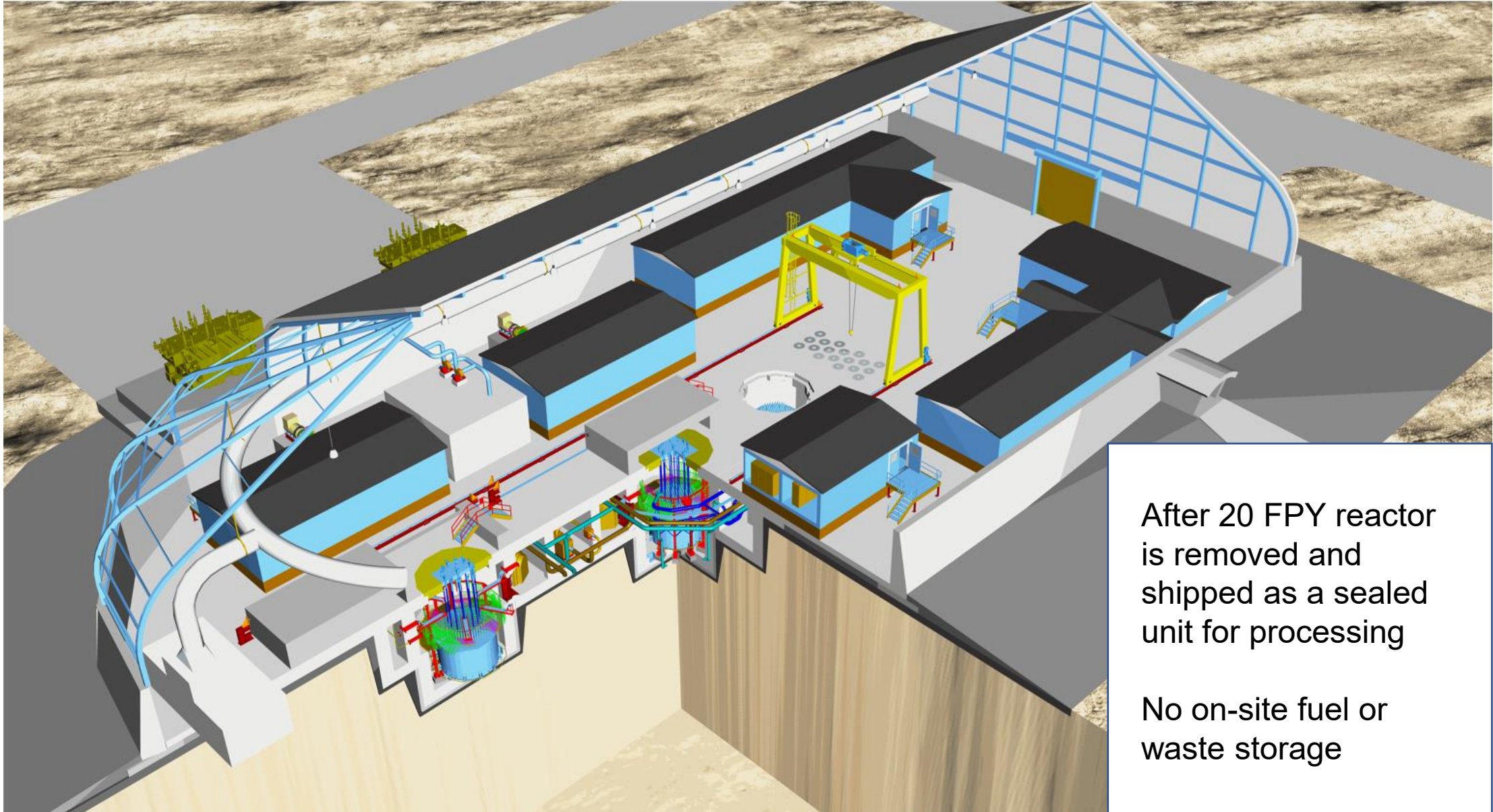


OPERATION BOXTOP



C-130 flights





After 20 FPY reactor is removed and shipped as a sealed unit for processing

No on-site fuel or waste storage

So where are they in their development cycle?



Ultra Safe MMR[®]

+ **ONTARIO** **POWER**
GENERATION

=



<https://globalfirstpower.com/>

ADVERTISEMENT

OTTAWA | News

World's first micro-modular reactor to be built in Chalk River, Ont.

<https://ottawa.ctvnews.ca/world-s-first-micro-modular-reactor-to-be-built-in-chalk-river-ont-1.6395109>



Dylan Dyson
CTV News Ottawa
Skilled Journalist

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Updated March 1, 2024
10:30 a.m. EDT
Published March 1, 2024
10:30 p.m. EDT

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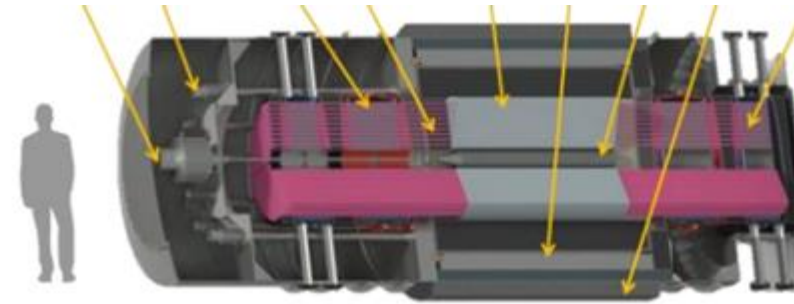
Canadian
the site for

air-based

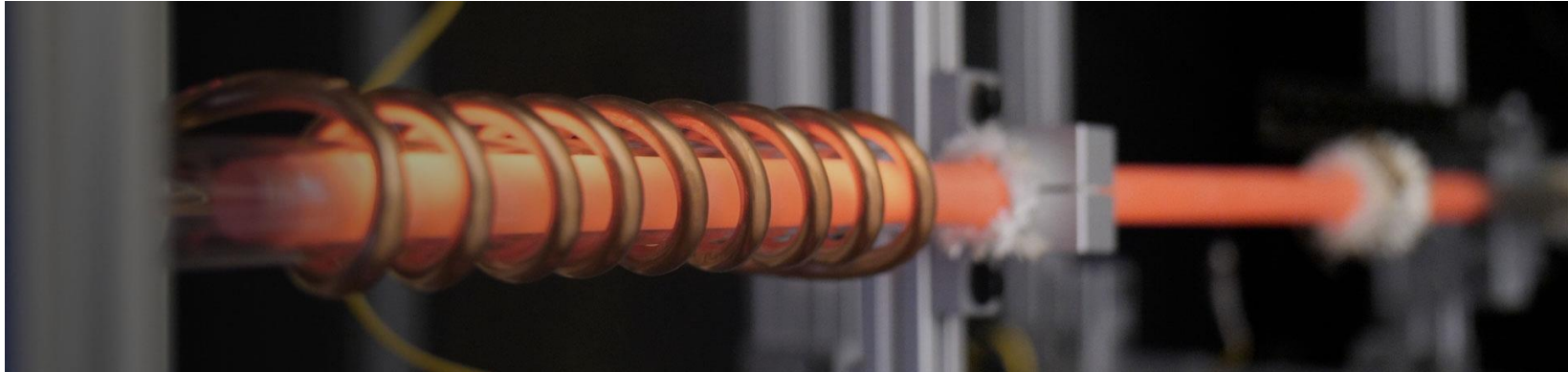
will have about
First Power

off grid and

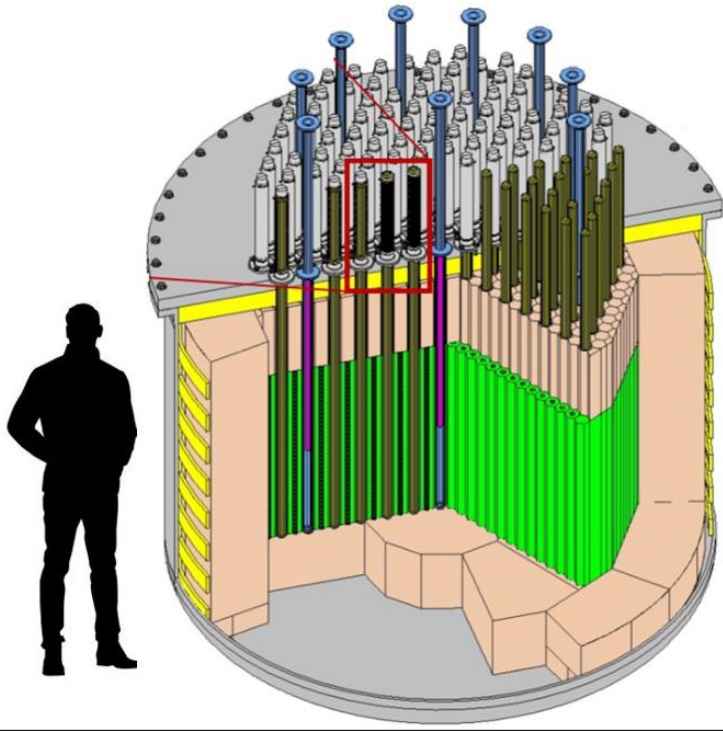
Westinghouse eVinci™




Canadian Nuclear Safety Commission
Phase 1&2 Vendor Design Review



Dunedin Energy – Canadian Thermal Battery



 National Défense nationale



Leading The Way



CANADIAN
SMALL
MODULAR
REACTORS

SMR
Action Plan

Canada

SUMMARY

Arctic Canada has an energy problem

Power *and* Heat

An environmental problem

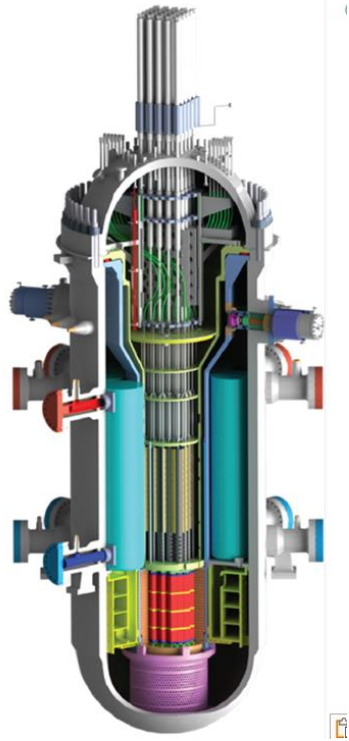
A Logistics problem

A cost problem

Four distinct markets:

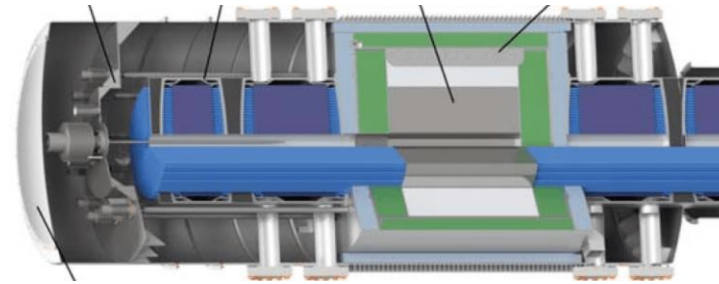
- Large Communities**
- Mines**
- Small Communities**
- Military Installations**

Micro-Reactors can be part of the solution



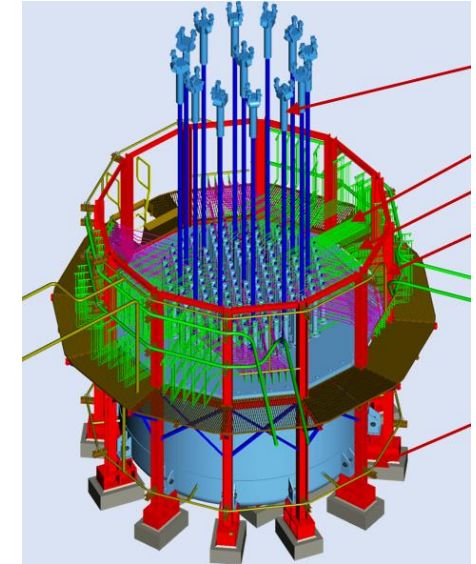
Ultra Safe
MMR[®]

5 MWe



Westinghouse
eVinci[™] Micro Reactor

5 MWe



Dunedin
Canadian Thermal
Battery[™]

600 kWe



Good ideas are not adopted automatically. They must be driven into practice with courageous impatience

— *Admiral Hyman Rickover* —

Father of the United States Nuclear Navy

- **500 Reactor cores**
- **5,400 Reactor years of operation**
- **0 Reactor accidents**