



# NATRIUM

Energy Community Alliance (ECA) Meeting  
May 4, 2021  
Olu Omotowa



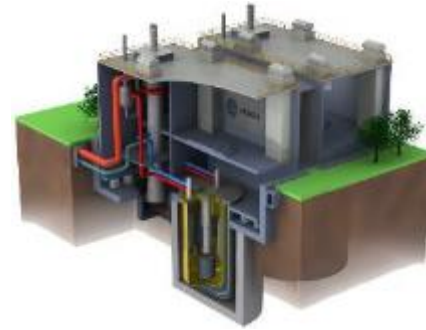
HITACHI



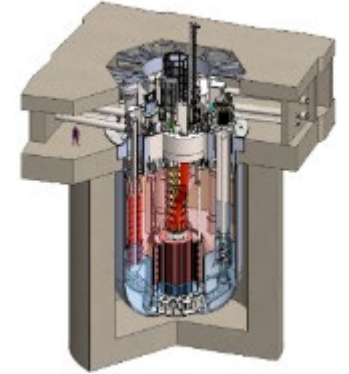
# Strong team formed with complementary expertise



**HITACHI**



**TerraPower**



- Nuclear Design Experience
  - PRISM (SFR), BWR designs
  - Licensing Success
  - Mature Nuclear Culture
- Fuel Fabricator, Nuclear Services
- OEM Supplier and Supply Chain
- Established Presence in International Markets
- GE Corporate Experience
  - Steam Power Generation & Services
  - Portfolio of Energy Solutions

- Nuclear Design Experience
  - TWR (SFR), MCFR designs
- Technology Development, Component and System Testing
- SFR Fuel Development and Qualification
- Advanced Computational Tools for Integrated Design of Nuclear Reactors
- Strong Mission-Driven and Innovation Culture
- Access to Partners and Private Capital

## Shared Expertise

Government Affairs

DOE Project Experience

International Reach/Experience

Engineering Depth



**HITACHI**

**TerraPower**

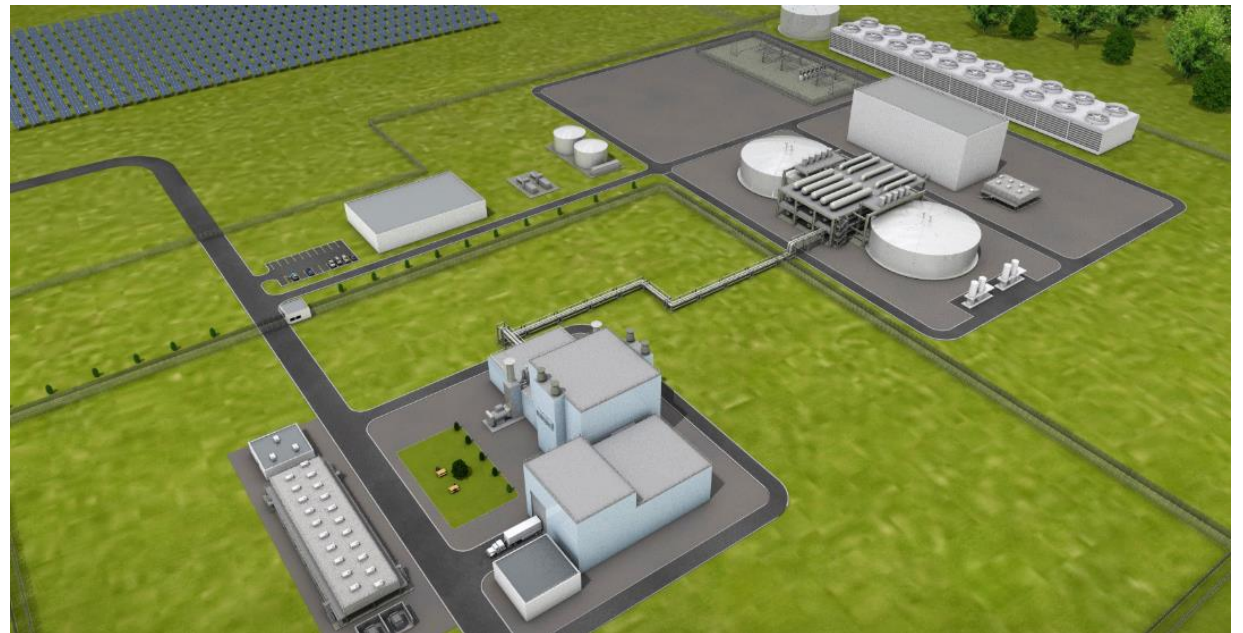
# Rethinking What Nuclear Can Be

## Nuclear redefined

- Eliminates nuclear “sprawl”
  - Design to cost
  - Simplicity
  - Rapid construction
  - Design-specific staffing
- ~41% net thermal efficiency

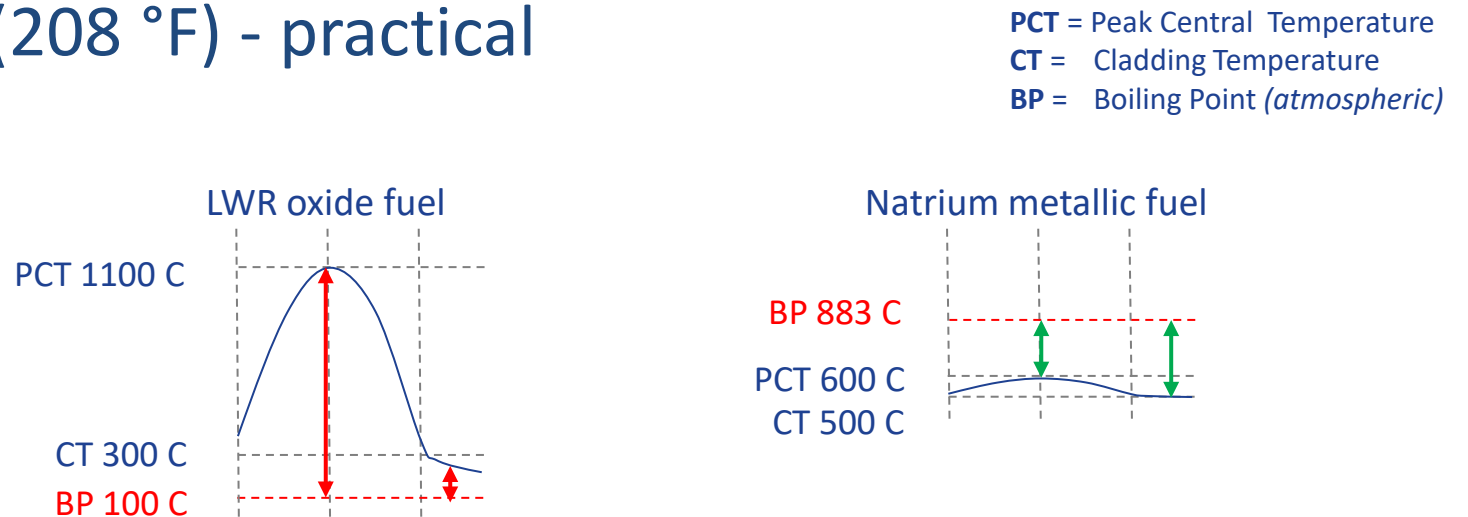
## Integrating with renewables

- Zero-emission, dispatchable resource
- Price follower with reactor at 100% power 24/7
- 345 MWe nominal
- Flex to 500 MWe for 5.5 hours with energy storage



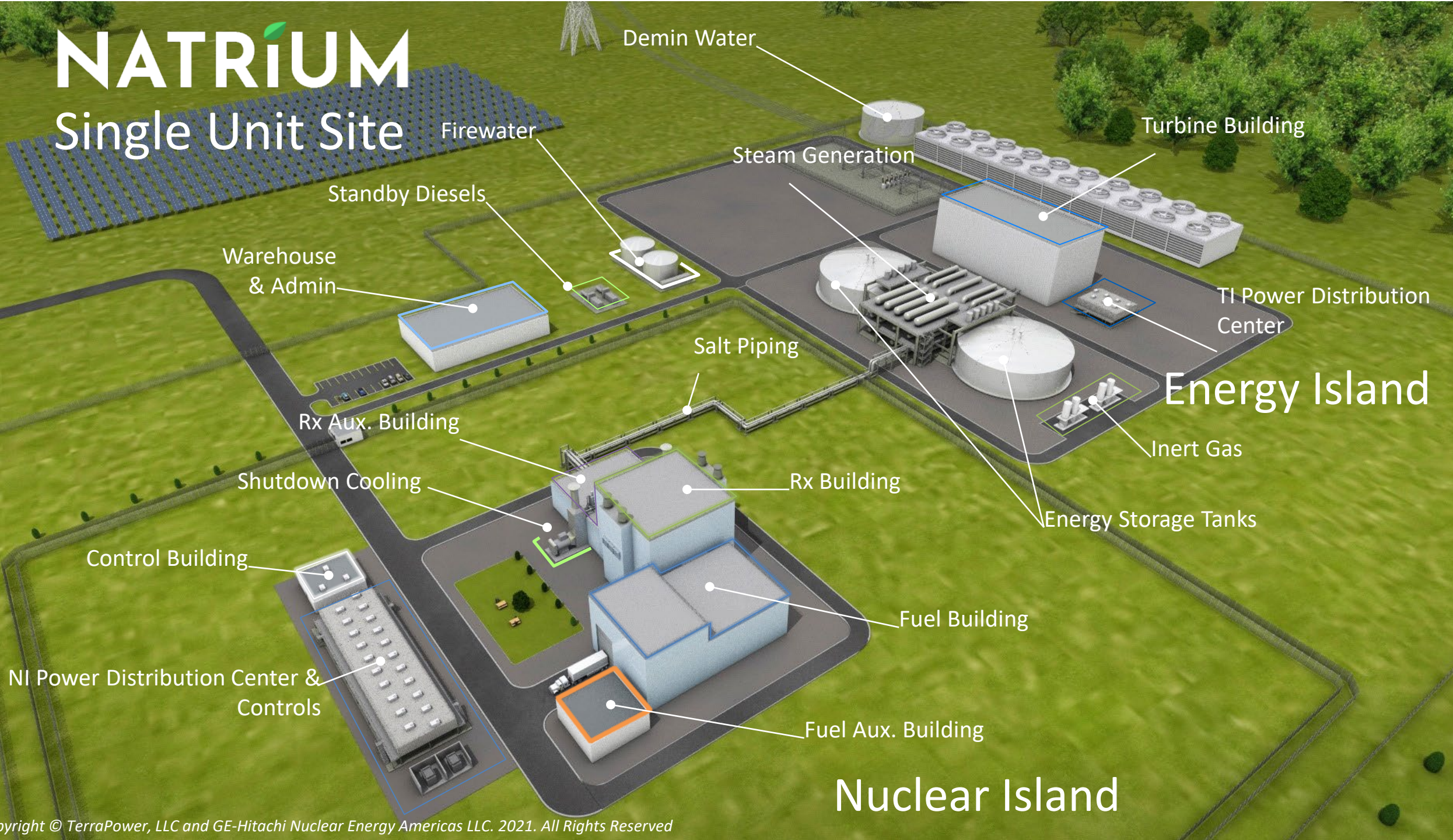
# Why we chose to use Sodium Coolant

- High heat capacity – moderate flow rate & easy decay heat removal
- High heat transfer – small core and easy decay heat removal
- High boiling point 883 °C (1,621 °F) – atmospheric pressure
- Low melting point 98 °C (208 °F) - practical
- Density similar to water
- Lack of corrosion
- Limited auxiliaries



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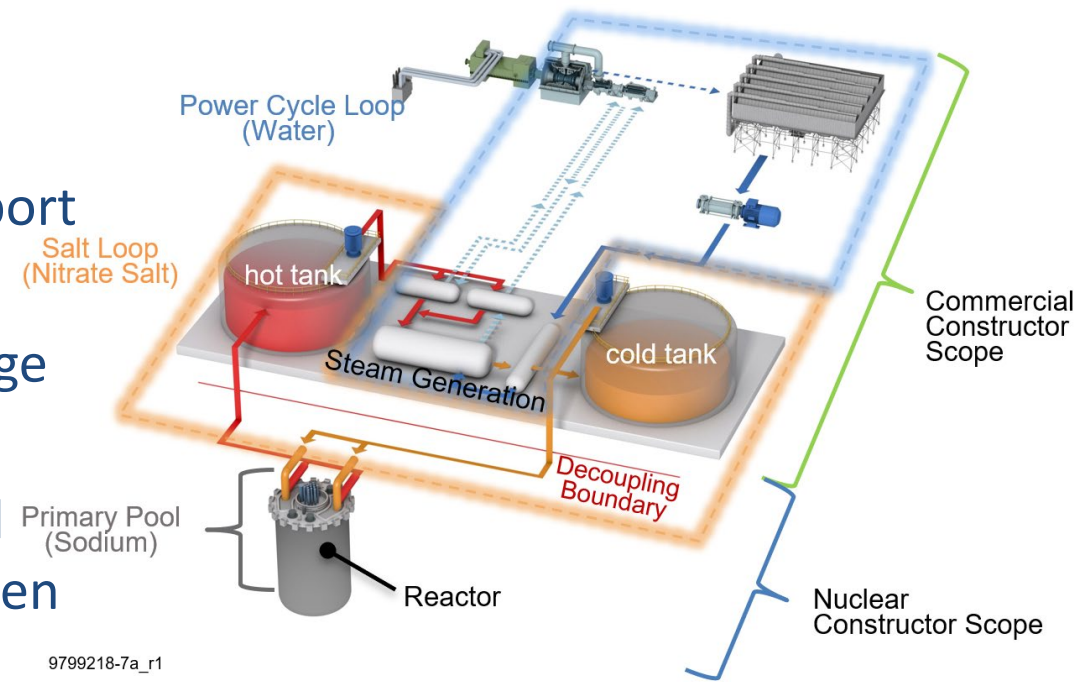
## Single Unit Site



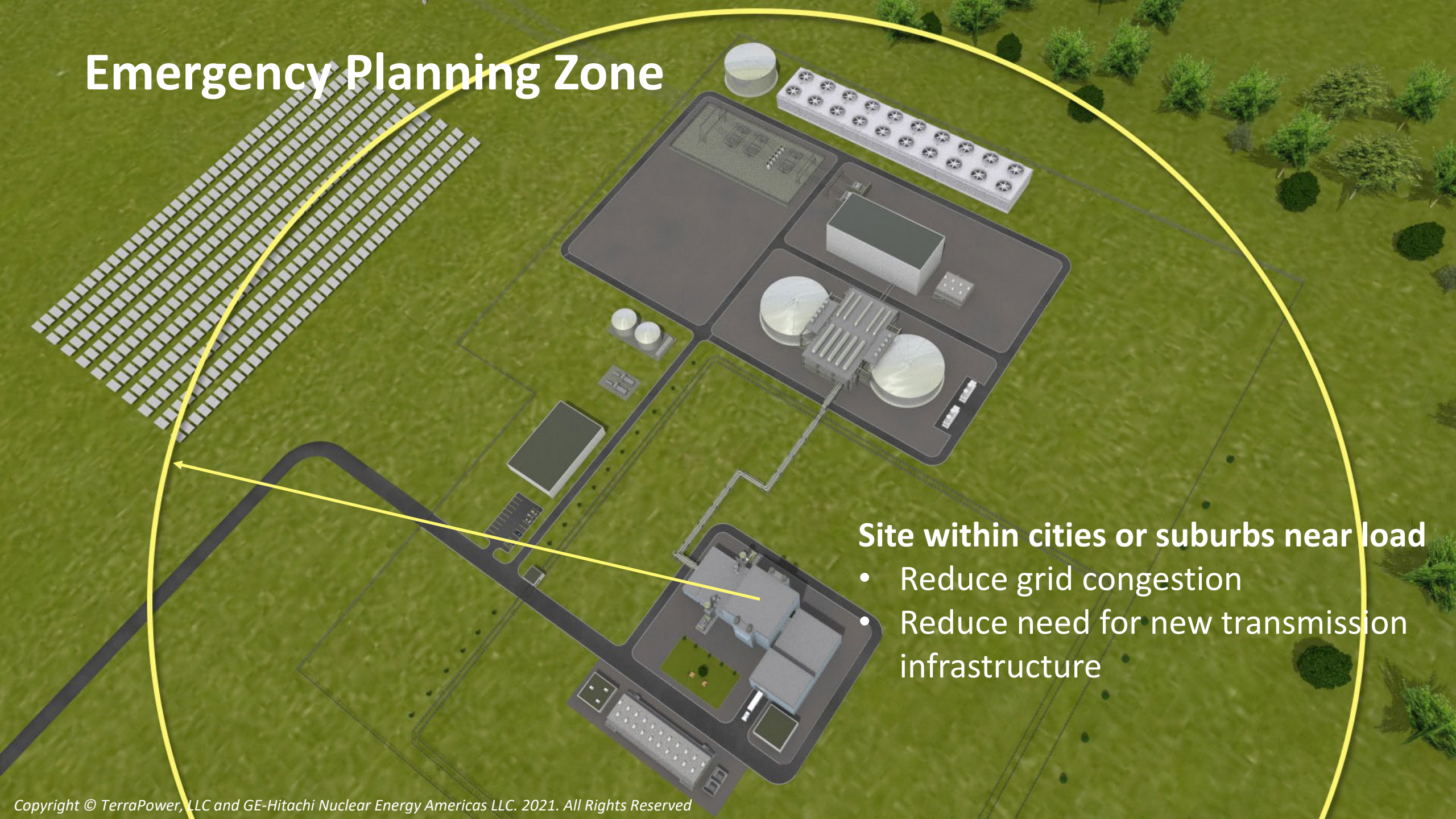
# Integrated Energy System (IES)

## SFR with Salt Intermediate Loop + Storage

- Simplified nuclear construction scope; reduces cost
- Storage system provides greatly needed flexible generation capability to nuclear power
- Enables use of high temperature nuclear heat to support zero-carbon industrial processes; better than LWRs
- Applies recent developments in thermal energy storage to complement intermittent renewables
- Reactor runs at 100% ... store heat when demand and electricity price are low and generate extra power when demand and electricity price are high
- Eliminates sodium-heated steam generator development cost



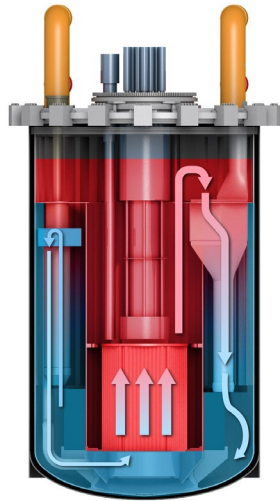
# Emergency Planning Zone



**Site within cities or suburbs near load**

- Reduce grid congestion
- Reduce need for new transmission infrastructure

# Natrium™ Architectural Innovations



Simple Nuclear System

## Cost Competitive

### Decoupled

- Bulk of plant constructed without nuclear practices

### Simple Nuclear Buildings

- 20 vs. 105  $\frac{m^3}{MWe}$  nuclear concrete

### Simple Nuclear Construction

- Steel sided buildings
- Below ground reactor
- Minimal engineered backfill

### Efficient Construction Layout

- High degree of parallel work

### Efficient Energy Storage

- 2X energy with 1/6 salt of CSP
- GWh vs. MWh scale storage

- Concentrated Solar Power
- Tunneling
- Combined Cycle
- EBR-II

Adjacent Industry Innovations

## Flexible

345 MWe nominal  
Fast burst 500 MWe for 5.5 hours



# What are we looking for in our Site Selection

- Each site must meet regulatory requirements (*10 CFR 100; NUREG-1555*)
- Each site must fit within our Plant Parameter Envelope
- Strong need for flexible energy – good if there is a high percentage of solar energy in play
- Strong state and local government support
- Transmission lines accessible and available for use
- Transportation and ease of access for hauling heavy equipment during construction
- Water rights and availability
- Knowledgeable work force
- Strong public support



# How can ECA help us?

- TerraPower and the Sodium team understands sodium fast reactor design, NRC licensing, construction, startup and to a lesser extent operations and maintenance.
- We are challenged by how to integrate the plant design into the utility IRP structure, how transmission is accessed and the interconnection process, how to obtain water rights locally, and permitting processes
- We also don't have a strong understanding of the power centers in the state and local governments, what are the local needs and how a new power plant fits into that community, and what might local indigenous peoples be concerned with (recent surveys will be helpful)



# Conclusions/Next Steps

- For a new nuclear site to be successful, it is critical that the owner/operator and the construction company form a solid partnership with the community.
- We appreciate that ECA has reached out to help us in this area.
- Look forward to future interactions.



# NATRIUM

## Competitive Clean Energy

### Simple Nuclear System

- Exceptional heat transfer
- Passive air cooling
- Low pressure
- Optimized layout

### Flexible Power Generation

- Dispatchable power
- Energy storage and price following
- Integrate with renewables
- Process heat

### Adjacent Innovations

- Concentrated solar power industry
- Tunneling industry (vertical cut)
- Combined cycle gas turbine industry