UAMPS
Utah Associated Municipal Power Systems

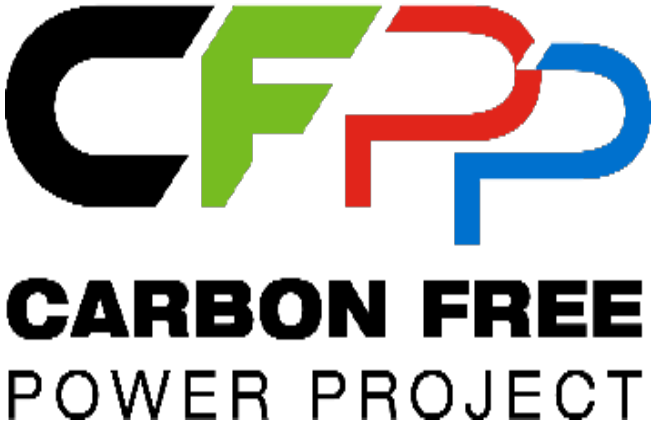
SMARTENERGY

PUET COMMITTEE
CARBON FREE TECHNOLOGIES OPPORTUNITIES AND CHALLENGES

OCTOBER 20, 2021

OVERVIEW

- UAMPS members
- UAMPS resource profile from 2019-2030
- Mechanics/dispatchability
- Baseload power supplies
- Land use
- Transmission
- Cost
- Jobs/Economic development



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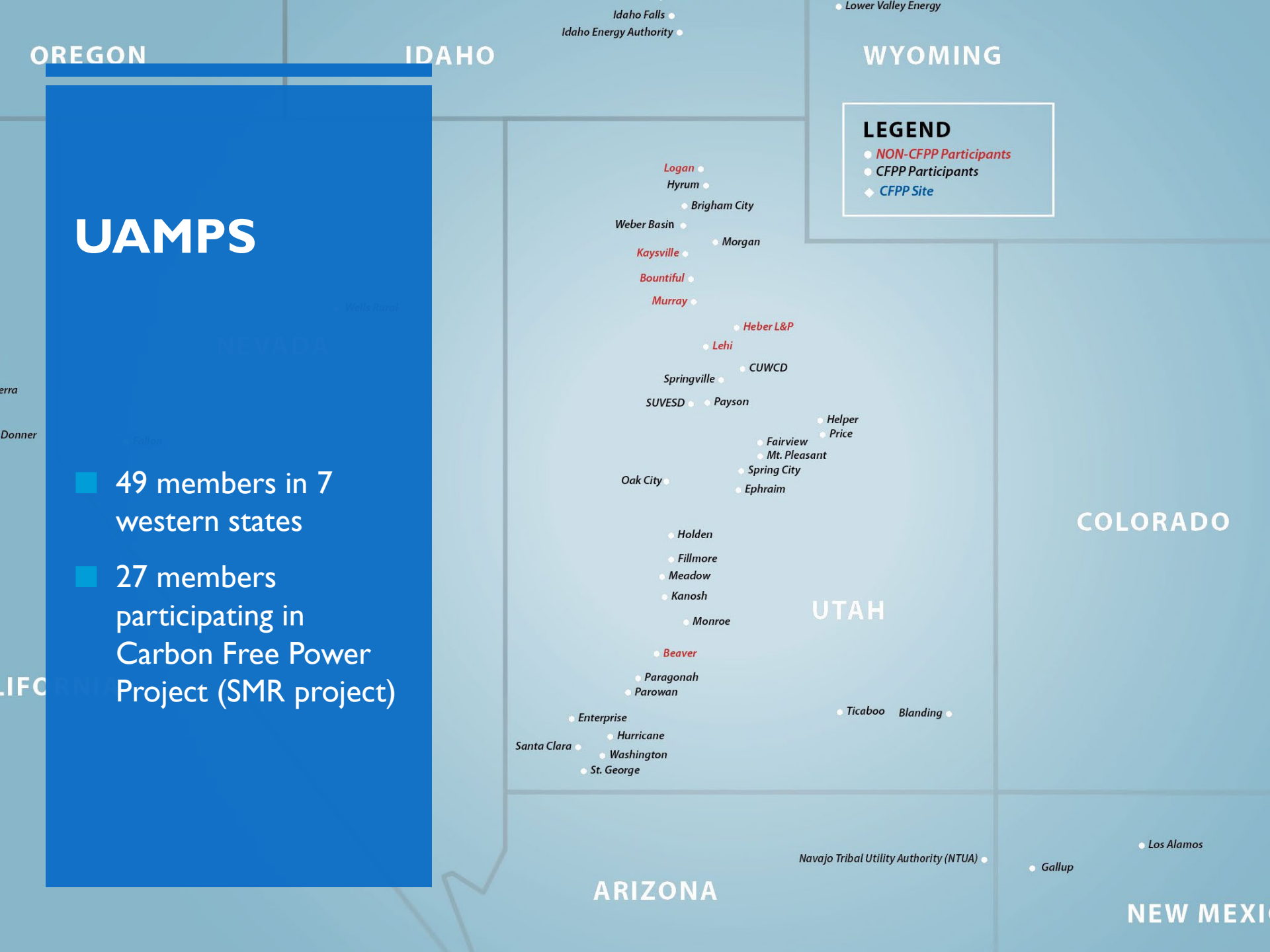


UAMPS

- 49 members in 7 western states
- 27 members participating in Carbon Free Power Project (SMR project)

UAMPS PROJECTS

Transmission Projects

Hunter Project – *coal-fired*

San Juan Project – *coal-fired*

IPP Project – *coal fired*

Payson Project – *natural gas*

Natural Gas Project

CRSP Project – *hydro*

- **Provo River** - *hydro*
- **Olmsted** - *hydro*

Horse Butte Wind Project – *wind*

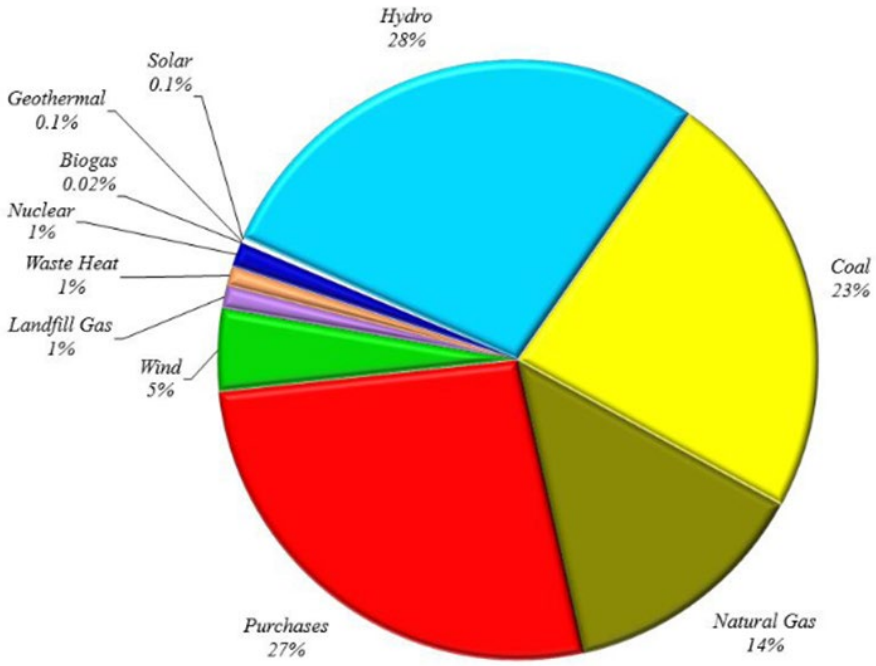
- **HBW 2** - *wind*

Firm Power Supply Project

- **Pleasant Valley** – *wind*
- **Patua** – *geothermal and solar*
- **Red Mesa Tapaha** –*solar*
- **Steel** –*solar*
- **Enchant** – *carbon capture sequestration*

Veyo Project – *waste heat*

Carbon Free Power Project – *small modular nuclear reactors*



UAMPS Resources by Types: 2020

(includes member owned/contract resources)

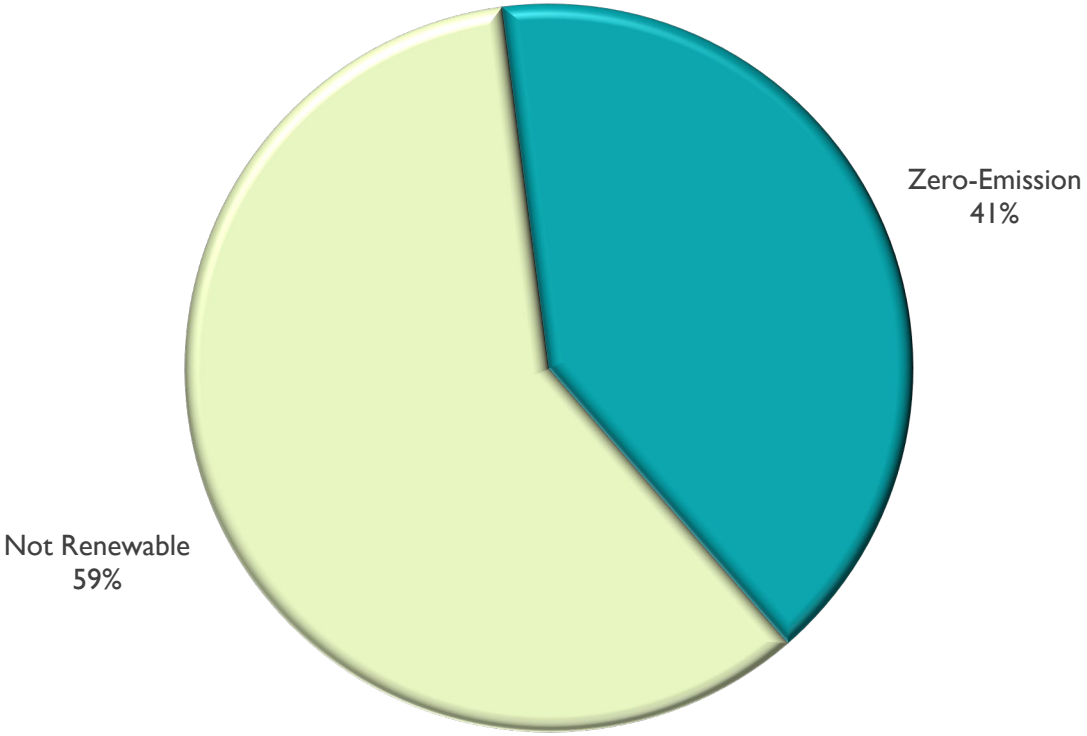
Transmission Projects

Central-St. George Project

Craig-Mona Transmission Project

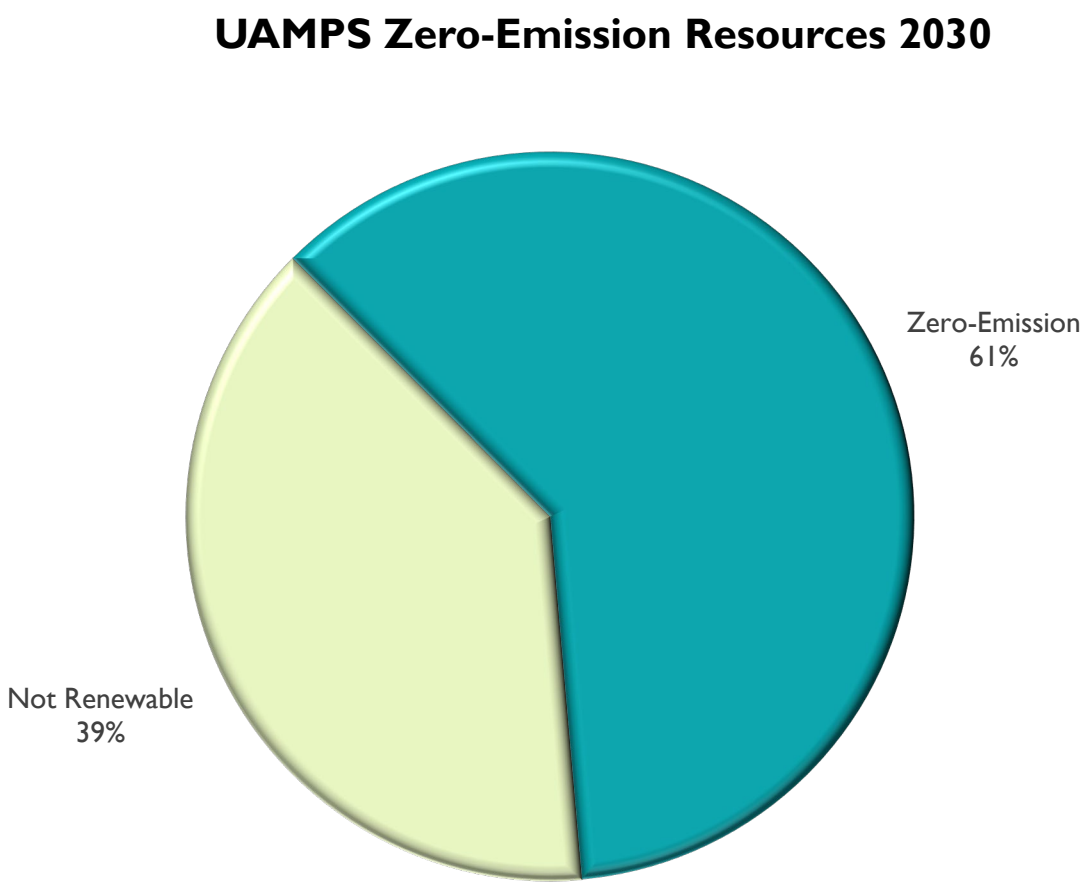
UAMPS RESOURCE PROFILE 2019

UAMPS Zero-Emission Resources 2019



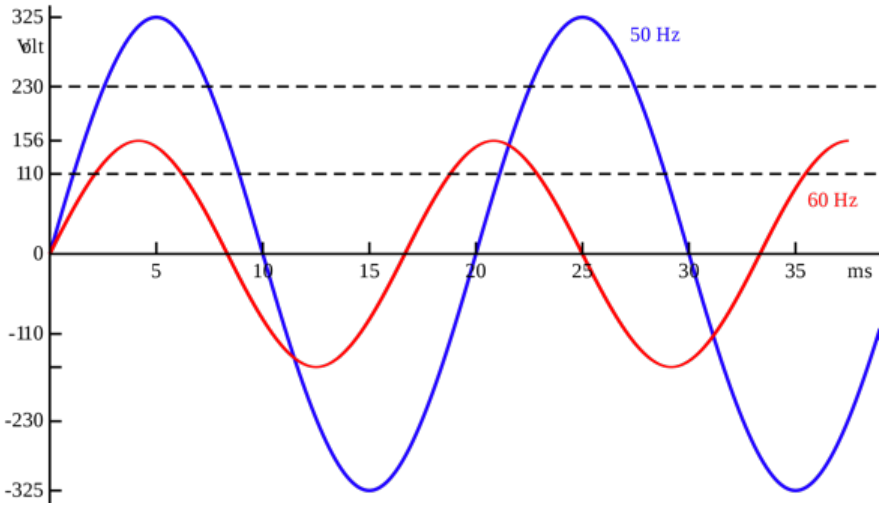
[NOTE: 31% Hydro and 59% Coal/Natural gas – 90% dispatchable resources]

UAMPS RESOURCE PROFILE 2030 (WITH NUCLEAR AND OTHER RENEWABLES)



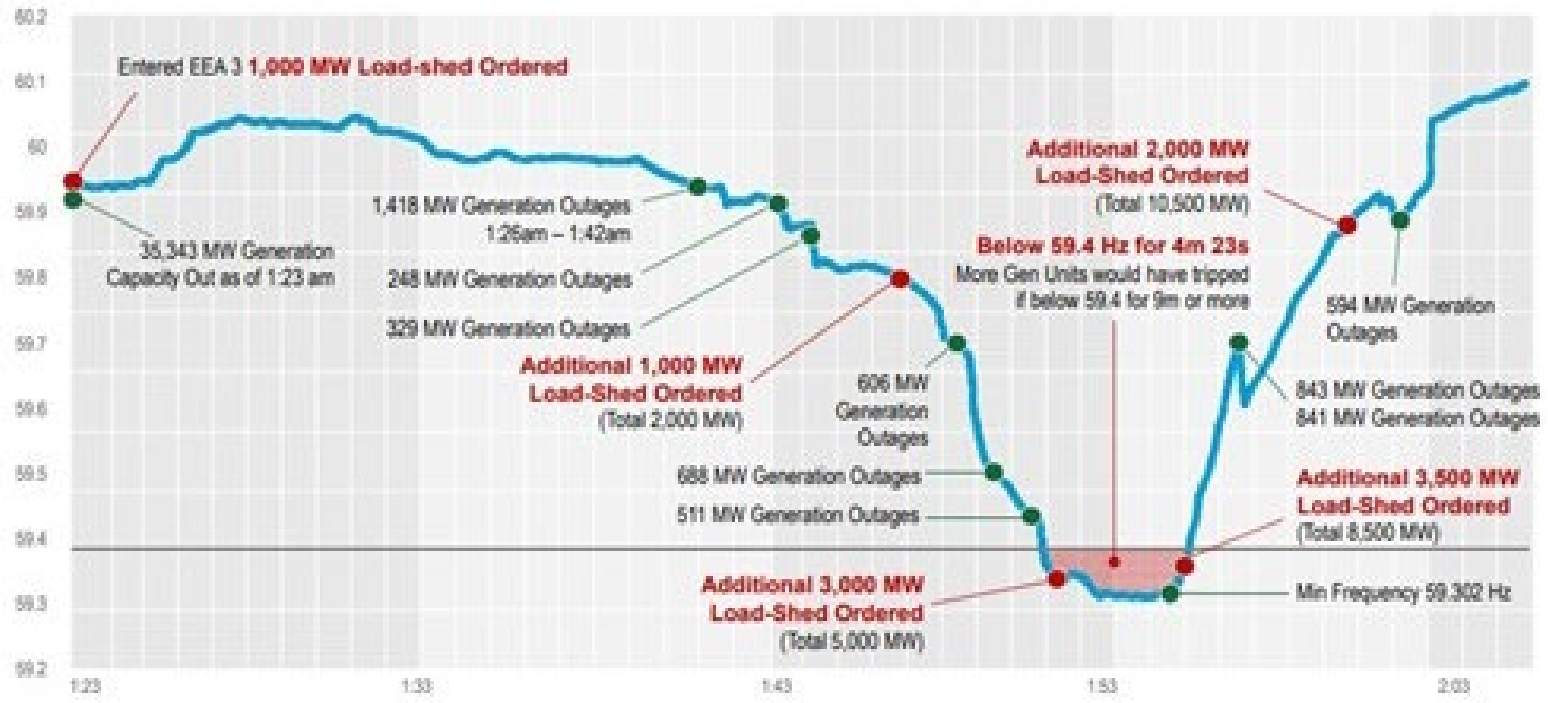
THE MECHANICS OF POWER MATTER – IT IS SCIENCE

- The electric grid must always be balanced – load must balance
- Balance or grid stability is measured by an equilibrium point, a frequency of 60 Hertz
- A slight imbalance can lead to blackouts - **no less than 59.95 Hz or more than 60.05 Hz**
- Balance is maintained by grid operators and baseload
- Renewables intermittency if not planned can risk imbalance



TEXAS TEST CASE

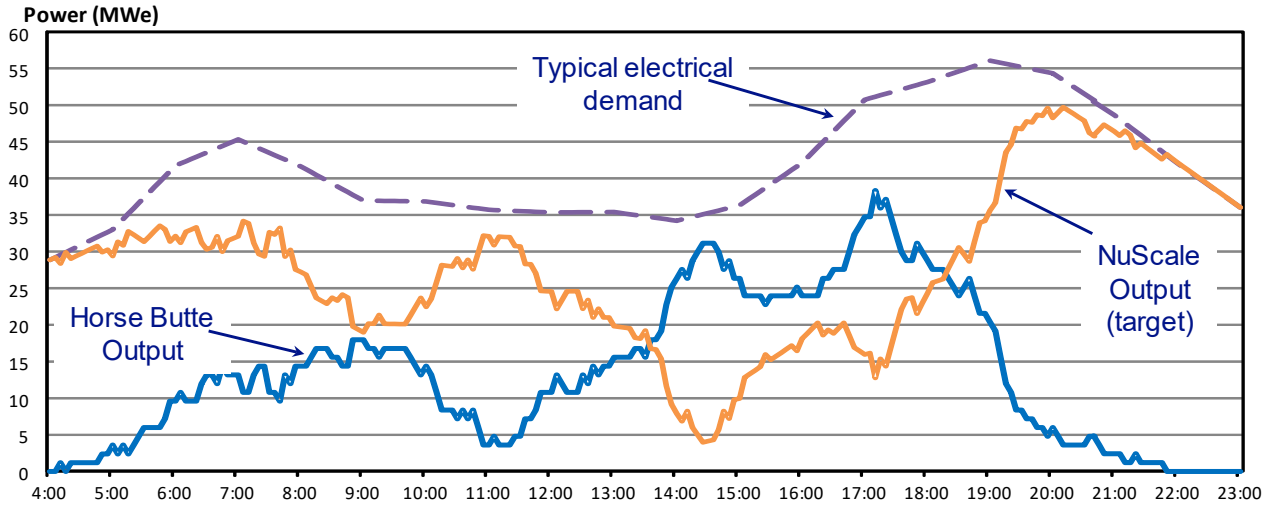
Rapid Decrease in Generation Causes Frequency Drop



Source: ERCOT

RENEWABLES NEED FIRMING – HORSE BUTTE WIND FARM EXAMPLE

"Renewable sources exacerbate challenges to frequency stability and grid reliability because of their variable and uncertain operation"[1] NREL



NuScale's SMR is able to ramp quickly allowing for higher penetration of renewables

- Study used Typical Electrical Demand based on 24 hour output (Nov. 11, 2014)
- NuScale design meets or exceeds EPRI Utility Requirements Document (URD), Rev. 13, load following and other ancillary service requirements.

1. Folgueras, M. et al, NREL: Grid Frequency Extreme Event Analysis and Modeling October 2017

LAND USE

Design Update:

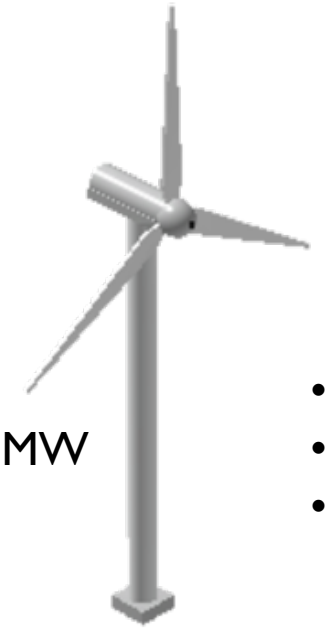
- Uprated NuScale Power Module to 77MWe
- 6 Nuclear Power Modules - 462MWe
- Adopted Air Cooled Condensers into Standard Design – reduces water use 95%

2113’ x 13,406’ or roughly 65 acres

ENERGY/LAND USE COMPARISON

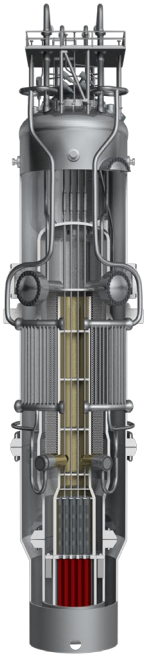
UAMPS Horse Butte Wind Farm

- Acres: 17,600
- Nameplate capacity: 57.6 MW
- Capacity factor: 30-35%

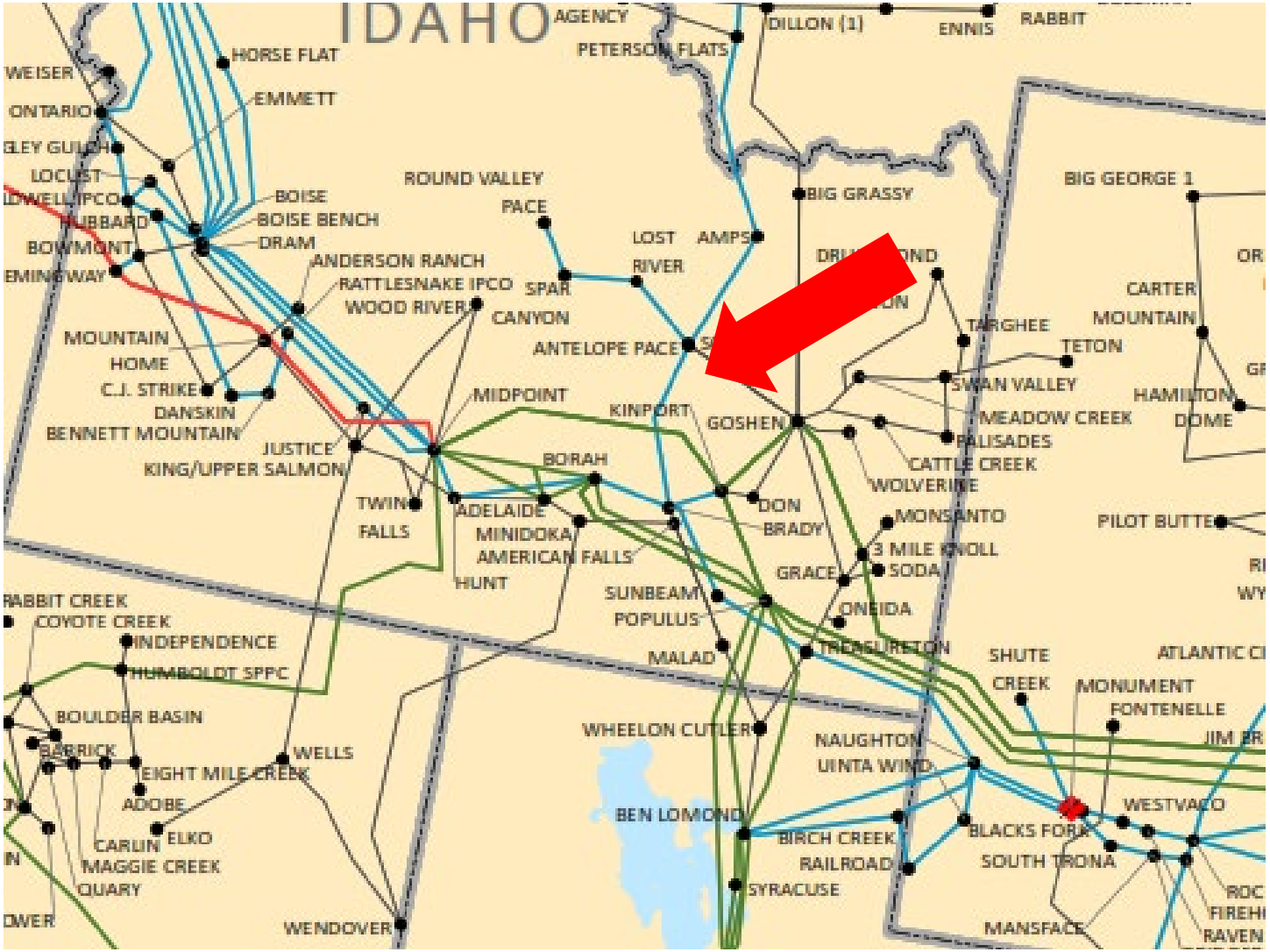


NuScale SMR

- Acres: 65
- Nameplate capacity: 462 MW
- Capacity factor: 95%



TRANSMISSION



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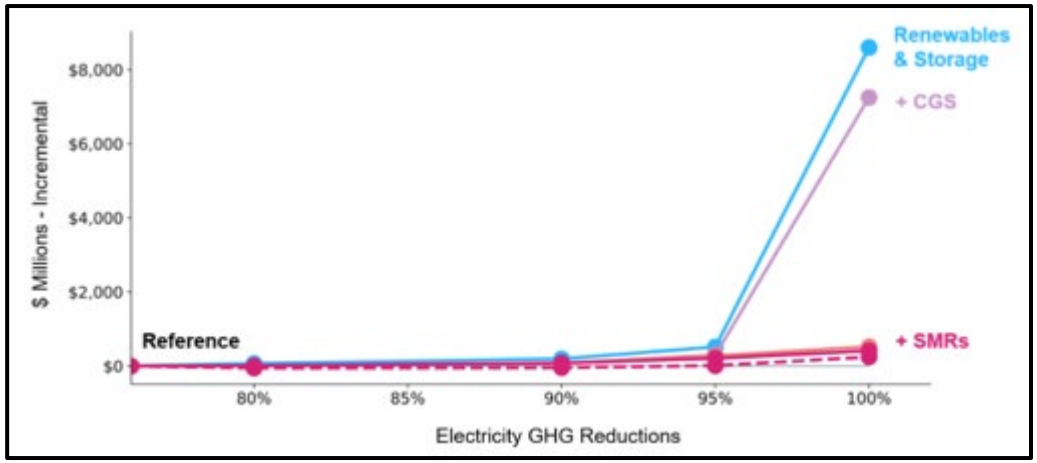
ECONOMIC COST STABILITY

- Forecasting the price of electricity can be difficult and especially in a carbon-constrained regulatory environment
- Least cost method evaluating replacement for coal generation
- $58/MWh became the benchmark LCOE cost
- UAMPS and its members continue to invest in renewables and that part of the generation mix is increasing
- Batteries and renewables will at current rates prove to be more expensive according to E3 study in Northwest

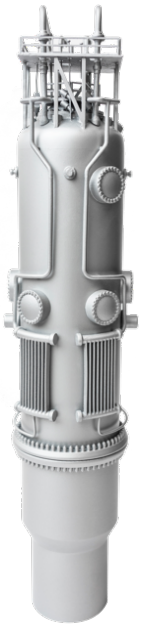


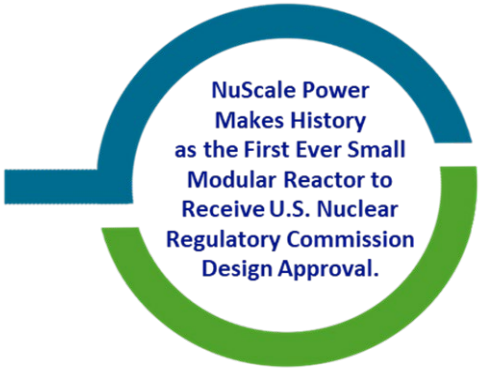
Relative costs to decarbonize with SMRs versus

Source: E3: Pacific Northwest Zero-Emitting Resources Study (2017)

NRC Licensing

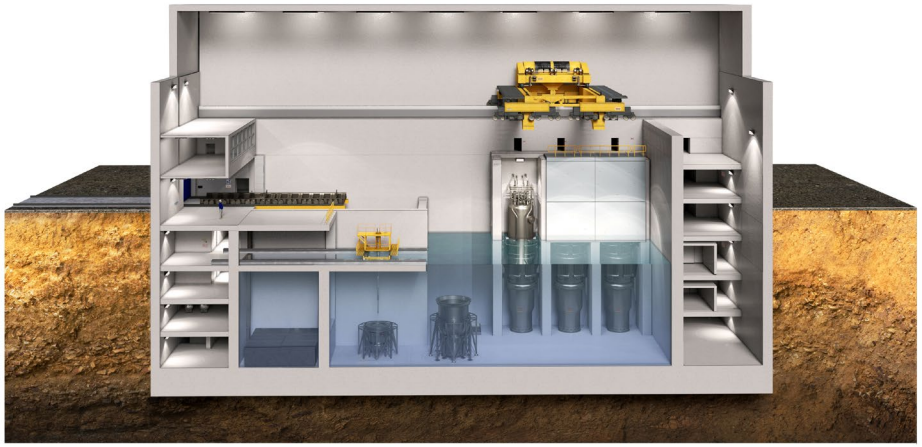
- **August 2020 NPM Design Approval:** NRC issues "Final Safety Evaluation Report" (FSER)
- **August 2021:** Anticipated date by which NuScale will receive full design certification
- **2022:** Anticipated date for "Standard Design Application" (SDA) for 77 MW-per-module design
- **2024:** Anticipated date for "Combined License Application" (COLA)





6-PACK CONFIGURATION DECISION

- Total gross output of 462MWe
- Easier path to 100% subscription
- Price Target at $58/MWh
- Economies of scale are slightly reduced with 6 NPM Configuration at $58/MWh
  - LCOE calculation (MWhs) decreases by 25% while the numerator ($ costs) decreases by 20.9%
  - 100% reimbursement up to Combined License Application (COLA) submittal
- LCOE is still an exceptional price for carbon-free, dispatchable (always available) electric power



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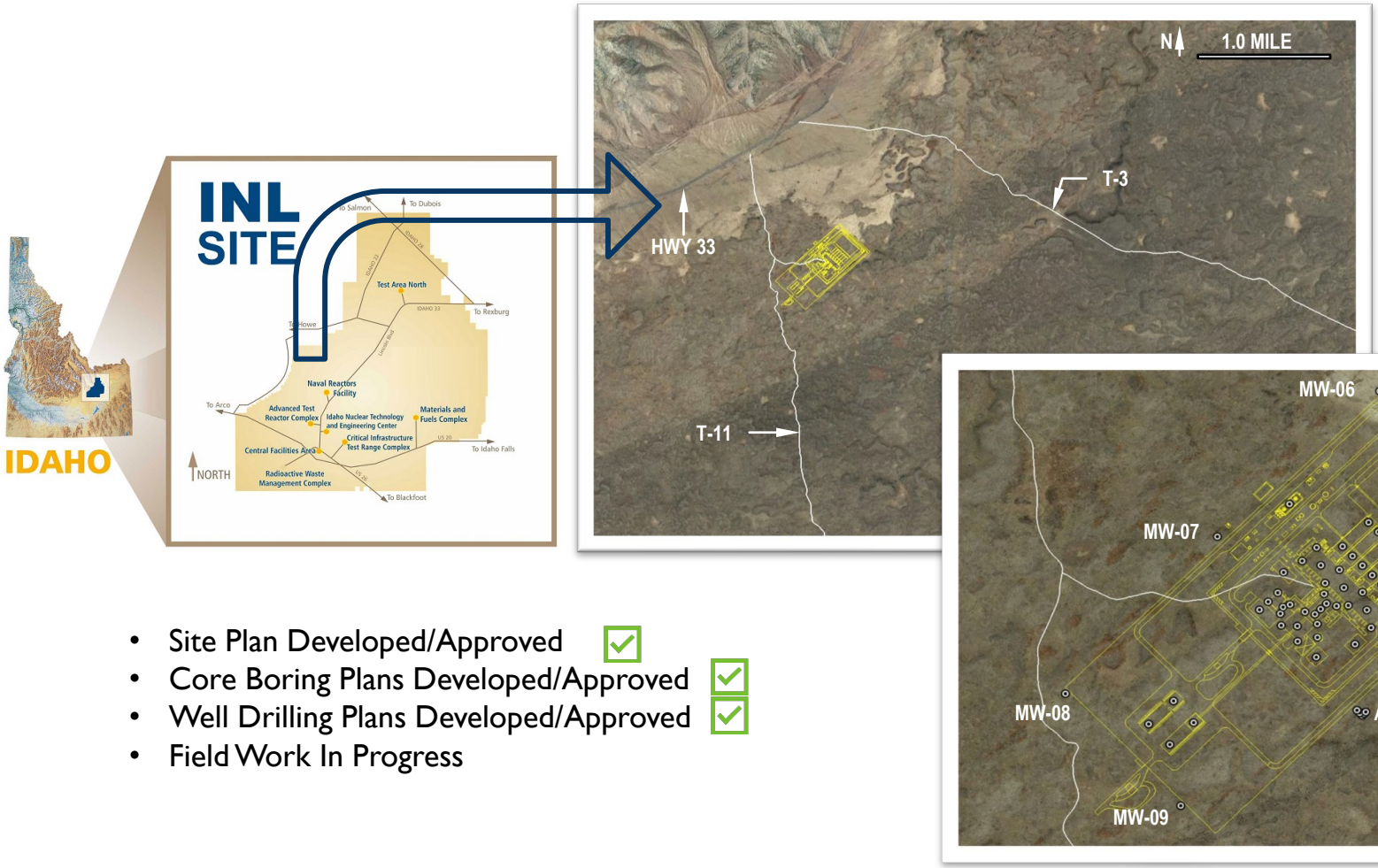
SITE CHARACTERIZATION WORK CONTINUES ON SCHEDULE



- Site Plan Developed/Approved ☑
- Core Boring Plans Developed/Approved ☑
- Well Drilling Plans Developed/Approved ☑
- Field Work In Progress

SUBSCRIPTION STATUS

27* UAMPS Members Signed PSC	101 MW
1 Washington Utility Signed LOI	150 MW
1 Arizona Utility Signed LOI	25 MW
7 Other Utilities Working on LOI's	237 MW
Current TOTAL Interest	513 MW

PSC - Power Sales Contract

LOI - Letter of Intent (used for due diligence process between UAMPS and interested parties)

*Beaver City rejoined the project and Lassen Municipal Utility District

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QUESTIONS?