LDES USE CASE DEVELOPMENT PANEL

Moderator: ZHIWEN MA

Panelists: KELYN WOOD (EPRI), LESLIE PONDER (B&V), WALT VERNON (MAZZETTI), TIM KOWALCHIK (UOED)

Introduction





Panelists:

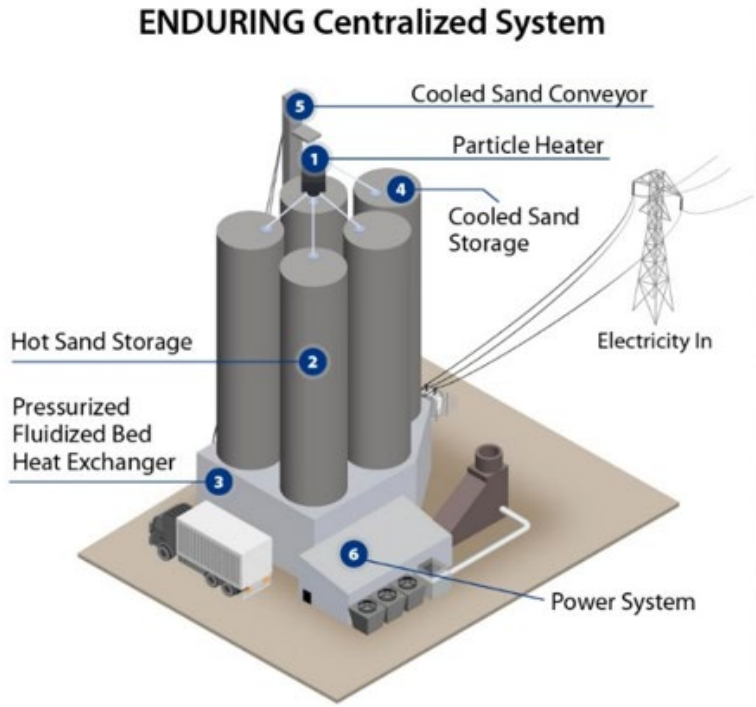
Kelyn Wood (EPRI), Leslie Ponder (B&V), Walt Vernon (MAZZETTI), Tim Kowalchik (UOED

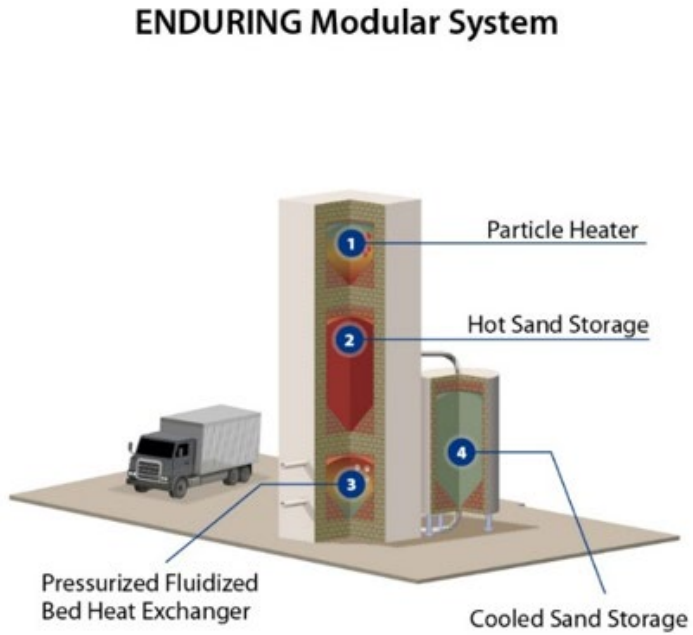
Moderator: Zhiwen Ma

Technical background:

Zhiwen Ma, Ph.D.
National Laboratory the Rockies (NLR)
NLR Distinguished Member of Research Staff
ASME Fellow

- Works on energy storage, hydrogen production, and concentrating solar power technologies
- Capability node lead in DOE Energy Material Network HydroGEN Advanced Water Splitting Material consortium.
- Research focuses on long duration energy storage using thermal energy storage and long-term energy storage using hydrogen.
- 80 peer-reviewed publications and 14 awarded patents.





Use Case Descriptions

Seven Use Cases:	Descriptions/Example Applications	Technology Types	Stakeholders/Users
1. Load management Services/Energy Load Management	Behind-the-meter siting: • Peak shaving demand response, winter peak, resource adequacy, gas-electric coordination	Electrochemical energy storage, mechanical energy storage (Pumped storage hydro-PSH, etc.)	Large energy consumers (e.g., distribution centers, Industrials, Data center, peaking power, etc.), Energy services players
2. Firming for PPAs/ Improve Power Quality, Supply Reliability	LDES with a low LCOS will be necessary energy resilience: • Operating reserve • balancing demand/supply	Electrochemical energy storage (batteries/flow batteries), thermal/ chemical energy storage	Leading ESG (Environmental, Social, and Governance) customers
3. Microgrid resiliency/ Access to Electricity for Isolated Locations	Ensure reliable power and provide energy in times of a resiliency event, • Island black start • Islanded microgrids	Electrochemical energy storage (batteries/flow batteries), chemical energy storage	Local power authorities in isolated areas or island grid, Microgrid developers or integrators.
4. Utility Resource Planning/Outage Mitigation	Utility assets for flexibility and reliability, needs for firm, dispatchable power to balance energy demand/supply	Electrochemical energy storage (Various types of batteries), chemical energy (hydrogen, etc.)	Vertically integrated & T&D utilities
5. Transmission and Distribution Infrastructure Deferral	Energy storage as transmission with a longer nominal duration, fast ramp rate, and fast response time	Thermal/chemical energy storage, mechanical energy storage (PSH, Compressed Air Energy Storage	Utilities, T&D developers, Equity infrastructure investors
6. Energy Market Participation/Reduced Electricity Supply Costs	Serve resource adequacy and reliability needs in shifting electricity from times of high supply to times of high demand	Electrochemical energy storage (batteries/flow batteries), thermal/ chemical energy storage	RES / T&D developers, Asset owners (IPPs), Debt investors
7. Integration with Nuclear/ Electrification	Transportation (EV) • Electrified mobility, industry processes heat	Li-ion battery, thermal/chemical energy storage,	Transportation, heating, manufacturing, and buildings

P221: Bulk Energy Storage

Mission

Provide actionable research and innovation to advance large-scale, long-duration energy storage (LDES) with a focus on chemical, mechanical, and thermal technologies

Why EPRI's Bulk Energy Storage?

Value of Collaboration

The Bulk Energy Storage program works closely with multiple programs in the Generation and ED&CS sectors, 100+ energy storage technology developers, and leading R&D and government teams.

Program Manager
Justin Raade
+1 408-515-2983
jraade@epri.com

www.epri.co/bes

Research Focus Areas

- Independent performance testing of LDES pilot plants and demonstrations
- Feasibility studies of energy storage projects
- Strategic insights on emerging LDES technology
- Design and safety reviews
- Energy storage integration to thermal power plants and industrial processes
- Request for proposal support
- Techno-economic and benefit assessments

Unique Insights

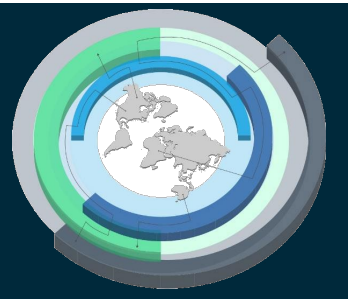
- 8 staff (3 Technical Executives) with total of 9 advanced degrees and 85 years experience combined at EPRI
- 500+ member meetings on energy storage in 2025
- 600+ papers, articles, and other published works

Impactful Content

- **Web-based software:** Energy Storage Technology Database and Pilots and Demonstrations Database
- **Cost and Benefits assessments:** 3002032493, 3002034550
- **Performance studies:** 3002029757, 3002034105, 3002034104, and 3002029725

Technology Application

- Energy Dome Commercial Plant Testing
- Hydrostor Goderich Site Visit
- Commercial Readiness Levels for LDES
- O&M Guidelines for Bulk Energy Storage



BLACK & VEATCH TODAY

8,000
ACTIVE PROJECTS WORLDWIDE ON 6 CONTINENTS

100+
OFFICE LOCATIONS WORLDWIDE

DEPTH OF EXPERIENCE: ELECTRONS, MOLECULES & MINERALS

100+
YEARS IN WATER

FOUNDED IN
1915

~$5B
ANNUAL REVENUE

100+
YEARS IN POWER

80+
YEARS IN PROCESS

6th largest
100% EMPLOYEE-OWNED COMPANY IN THE UNITED STATES

~13,000
GLOBAL WORKFORCE

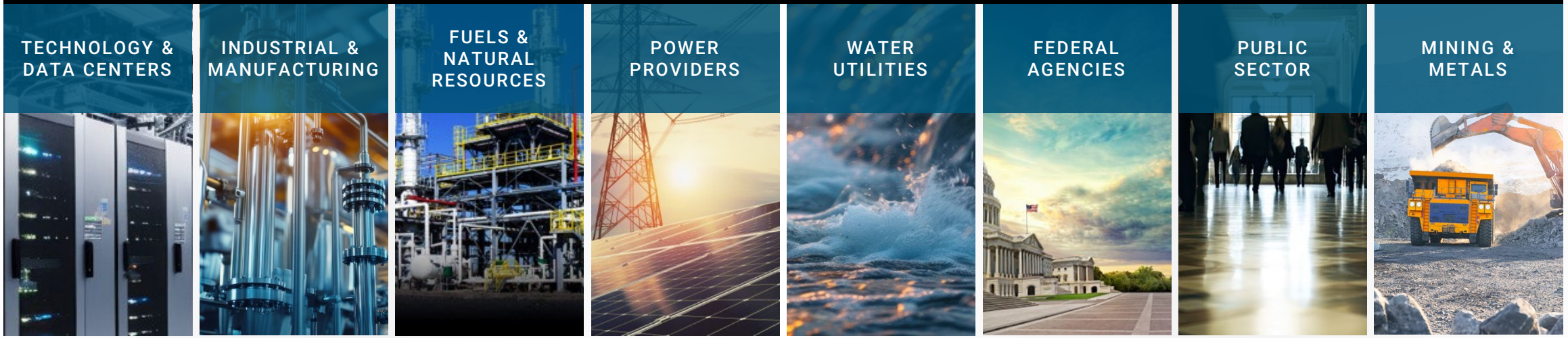
2026 America's Top Management Consulting Firms
FORBES

#14
TOP 500 DESIGN FIRMS, ENR

#13
TOP 200 ENVIRONMENTAL FIRMS

WHO WE SERVE. WHAT WE DO.

Market segments



SOLUTIONS & SPECTRUM OF PROJECT LIFECYCLE SERVICES

POWER GENERATION	WATER	POWER DELIVERY/GRID	OPERATING ASSETS	INFRASTRUCTURE DEVELOPMENT
MISSION CRITICAL	PROCESS SOLUTIONS	LIQUEFIED NATURAL GAS	ENVIRONMENTAL SERVICES	CYBERSECURITY & RESILIENCY

INFRASTRUCTURE ADVISORY

STRATEGY → PLANNING & PROJECT DEVELOPMENT → ENGINEERING → PROCUREMENT → CONSTRUCTION → OPERATIONS → MODERNIZATION → DECOMMISSIONING

BLACK & VEATCH SOLUTIONS PORTFOLIOS

OUR INTEGRATED SOLUTIONS TRANSFORM INFRASTRUCTURE

Infrastructure advisory

Industry-leading consulting services to support technology, operational, financial and regulatory challenges.

Infrastructure development

Site development, actionable plans and road maps to help clients meet their goals with the right tools, technology and resources.

Power generation

Integrated solutions that address our clients' most pressing issues around energy transition.

Power delivery

Preparing for long-term, sustainable growth through the planning, designing and building of an intelligent, secure and resilient grid.

Operating assets

Optimizing infrastructure for heavy asset owners. Combining industry knowledge, lifecycle experience and proven processes to streamline management.

Water

Complete and customizable technical, management and delivery expertise to solve any water infrastructure-related need.

Process solutions

Sustainable process solutions help clients lead the transition of resilient and affordable energy while accelerating pathways to global decarbonization.

LNG

Innovative and cost-effectives solutions across the value chain leveraging decades of expertise, proprietary technologies (PRICO®) and partnerships for safe, on time EPC.

Environmental services

Solve complex environmental challenges by reducing regulatory complexity and compliance needs and ensuring budget and project schedules are met successfully.

Cybersecurity & resiliency

Providing operational cyber strategy and modernization solutions to serve the needs of complex technology ecosystems and improve the security of critical infrastructure.

MAZZETTI

Walt Vernon
PE, LEED AP, MBA, JD, LLM
CEO Mazzetti
CEO Sextant
President, International Federation of Healthcare Engineering
Leadership Team, LDES

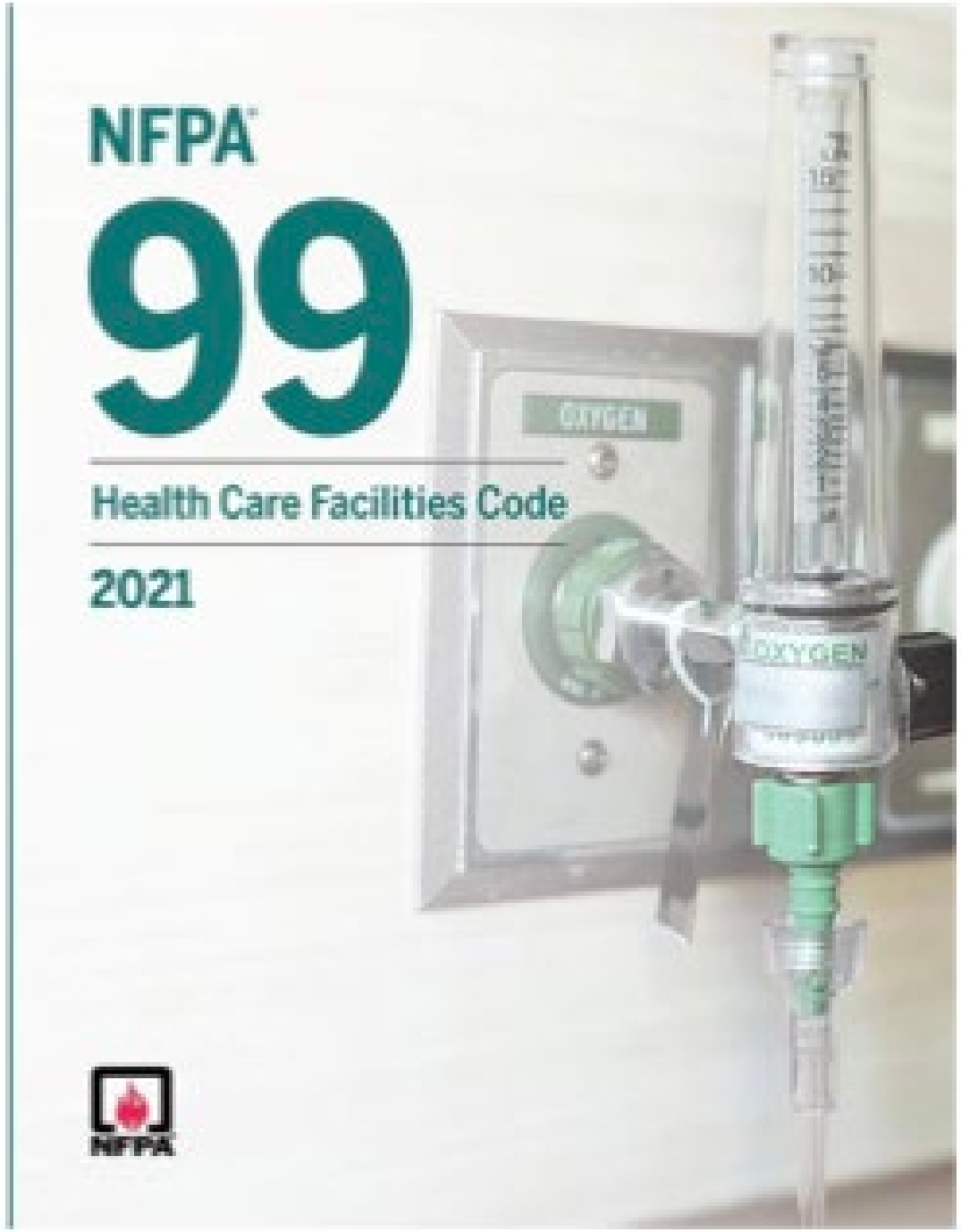
walterv@mazzetti.com

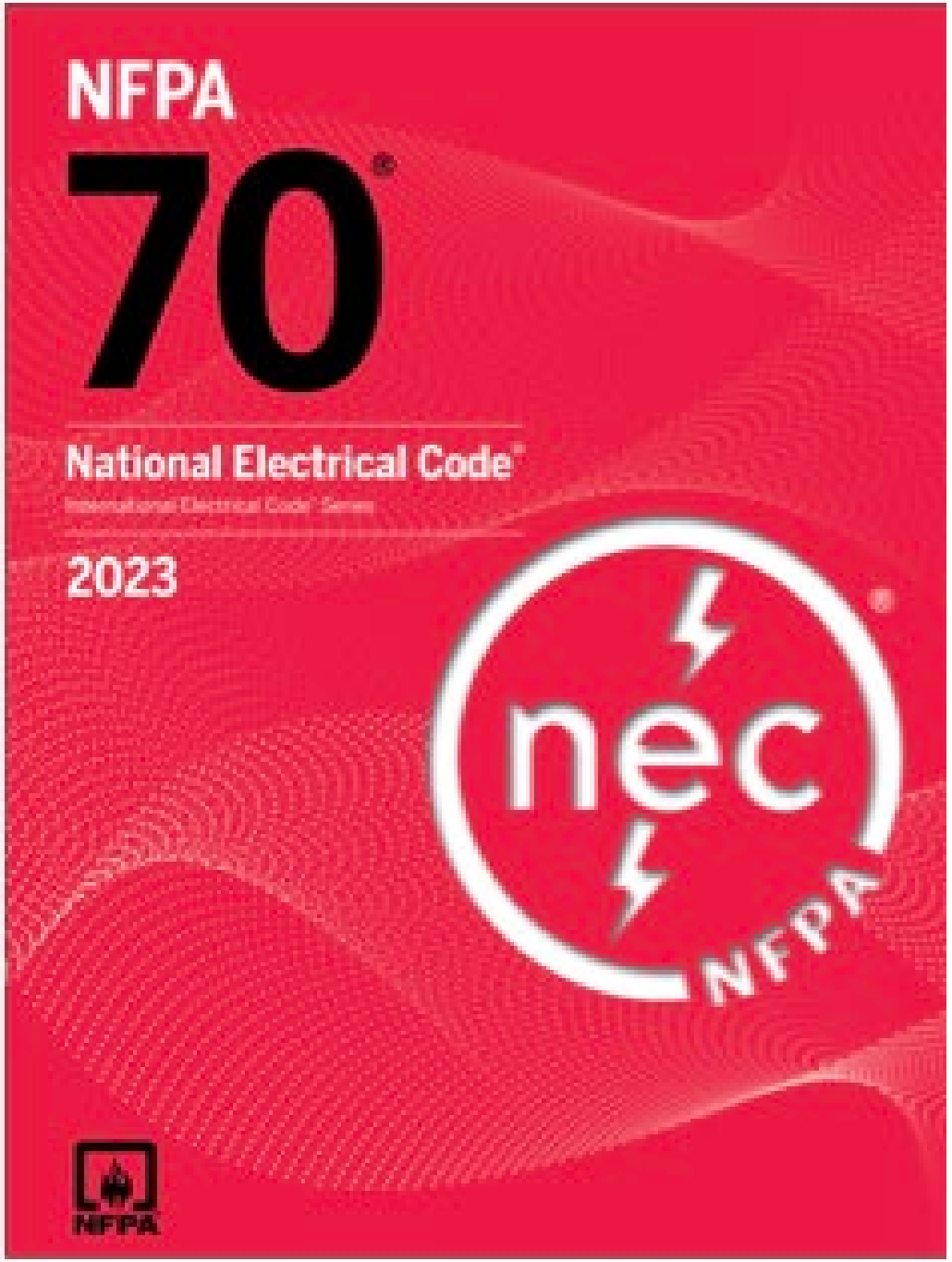
LDES NATIONAL CONSORTIUM

Kaiser Hospital,
Ontario, CA
9 MWH LDES

Valley Children's Hospital,
Madera, CA
15 MWH LDES

LDES NATIONAL CONSORTIUM


NFPA
99
Health Care Facilities Code
2021
OXYGEN
NFPA


NFPA
70
National Electrical Code
2023
nec
NFPA
NFPA

Introduction

Research Director, Utah Office of Energy Development, 2025 – Present

Emerging Technology Strategist, UOED, 2024 – Present

B.S, M.S, Ph.D. (2024) Mechanical Engineering, University of Utah

Nanofabrication → Energy Storage

Outside Work: Climbing, Camping, Cooking, Skiing

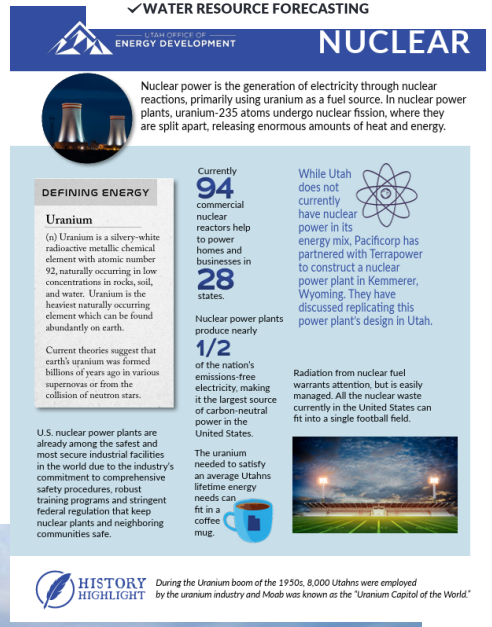
Utah Office of Energy Development

Two main portions of the Office

Programs and Grants – Federal and state incentive, grants, education efforts
- High cost infrastructure tax credit, rural EV infrastructure, education

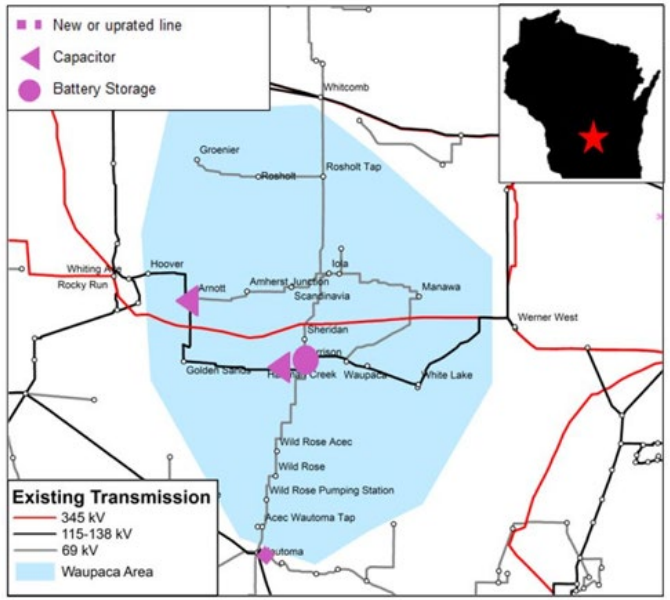
Research – In-house expertise on energy issues, guiding policy and initiatives
- Operation Gigawatt, Publications, Strategic Energy Plan, Data Analysis

Self-contained entities
- San Rafael Energy Research Center – Research center for energy-related projects like lithium recycling, supercritical CO_2
- Nuclear Consortium
- Advanced Energy and Nuclear Institute



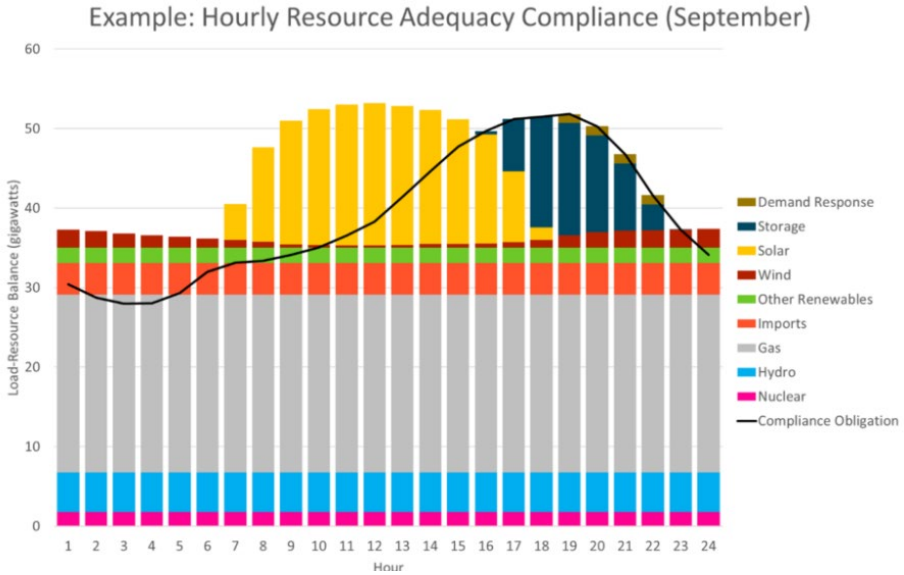
Opportunities

Transmission alternatives

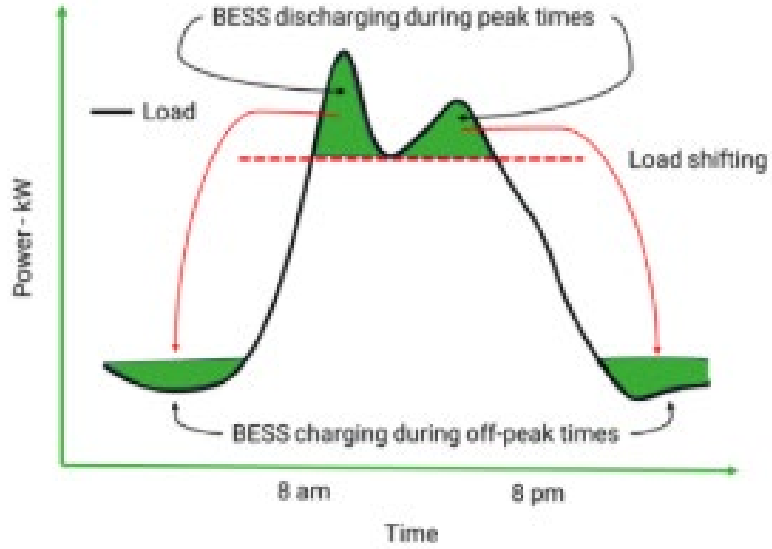


MTEP 2019

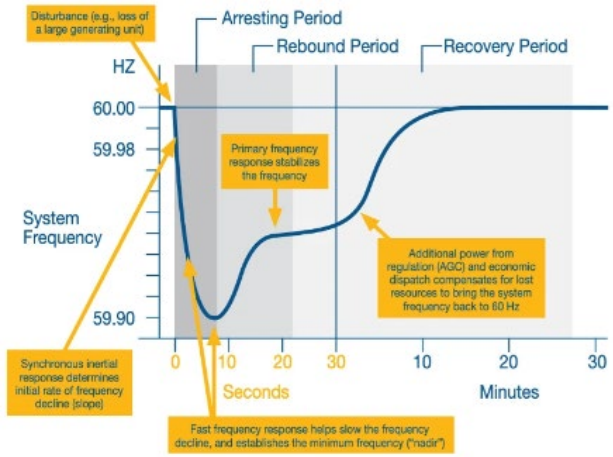
Resource adequacy



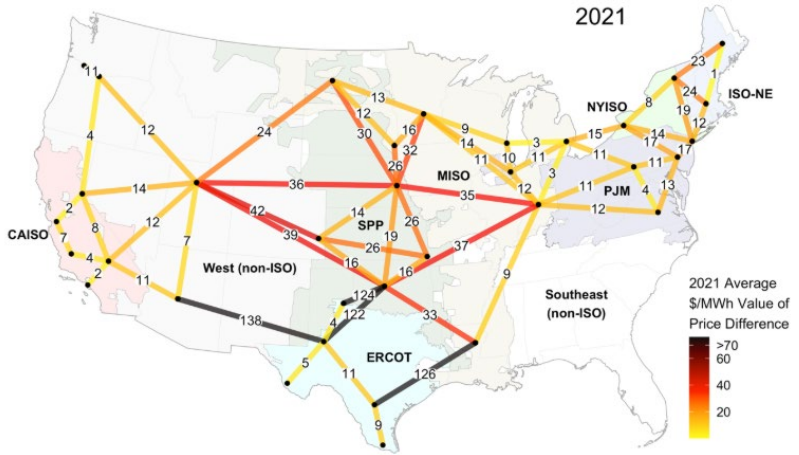
Demand shifting



Operational reliability



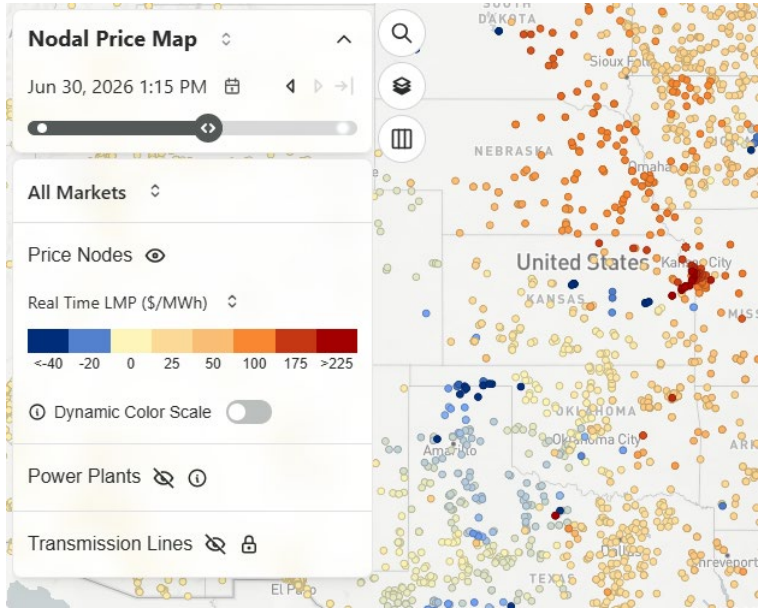
System utilization



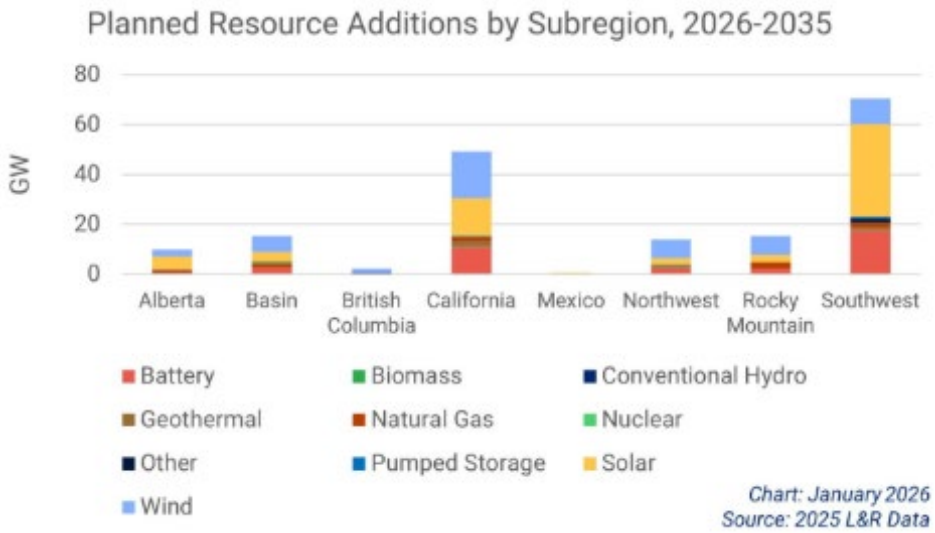
https://pubs.naruc.org/pub/87107D6D-C75A-2471-5F9D-68885685F3C2
https://energyinnovation.org/expert-voice/the-future-of-operational-grid-reliability-can-be-bright-with-clean-energy/
https://blog.ucs.org/mark-specht/changes-to-californias-resource-adequacy-program-will-have-huge-consequences-for-the-power-grid/
https://www.power-sonic.com/the-power-of-peak-shaving-a-complete-guide/
https://emp.lbl.gov/news/regional-and-interregional

Barriers in Scale

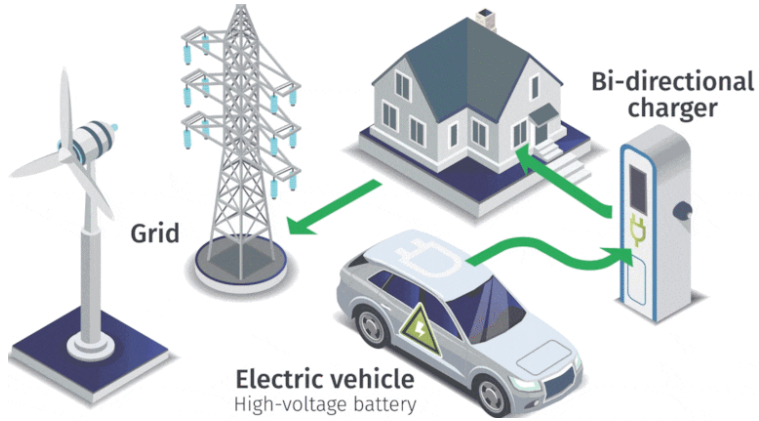
Data Transfer



Modeling and Simulation



Economics and Markets



Regulatory lag
Operational experience
Supporting infrastructure

Pilot data to utilities
Utility needs expertise
Quantification of benefit

Access to market/services
Cost recovery and incentives
Compete with all other storage

https://www.gridstatus.io/map?ref=blog.gridstatus.io
https://feature.wecc.org/2025wara/index.html
https://www.cbc.ca/news/science/ev-to-grid-1.6100454

Suggested Discussion Points

1. LDES Technology Approach
2. LDES Uses Cases
3. LDES Customer Adoption
4. Utility Resource Planning
5. Economic/Environmental Impacts of LDES
6. LDES Community Benefits
7. Open Questions and Dialogue with Audiences