ESGC Overview and Recent Events

Presented to
NM Renewable Energy Transmission Authority
20 October, 2022

DOE/OE Electricity Advisory Committee
26 October, 2022

By Charles Hanley, Sandia National Labs
On behalf of the Lab Coordination Team:
ANL, ORNL, PNNL, SNL
ESGC Presentation Overview

- Overview of ESGC
- Some key accomplishments from national lab interactions
- Highlights from ESGC Summit: Sept 27-28
- Path Forward

December 2020
Bottom Line Up Front: ESGC is...

A means of better coordinating all energy storage-related activities
- Across DOE offices and programs
- Across National Labs

Lab Coordination Team: Comprised of a team from PNNL/ANL/ORNL/SNL
- not intended as a funding mechanism
- a way to recognize gaps and opportunities for DOE/Lab research and new collaborations
Energy Storage Grand Challenge
Unifying Efforts Across Technologies and Functions

Technologies
• Bidirectional Storage
• Flexible Generation and Controllable Loads
• Chemical and Thermal Storage

Functions
• Basic Science Research & Discovery
• Application Driven Materials Development
• Applied Device and System R&D
• Cost & Performance Metrics, Targets
• Demonstration and Performance Validation
• Systems Analysis and Valuation
• Commercialization Strategy

Offices
• Office of Electricity
• Energy Efficiency and Renewable Energy
• Office of Science
• Office of Technology Transitions
• Nuclear Energy
• Fossil Energy and Carbon Management
• Office of Policy
• ARPA-E
• Loan Programs Office
ESGC Roadmap: Track Structure and Missions

**Technology Development**
Maximize the pace of storage innovation through setting ambitious goals and rigorous evaluation metrics, focused on user-centric use cases and promising technology pathways to meet them.

**Manufacturing & Supply Chain**
Address major challenges to lowering manufacturing costs, accelerate scale up of manufacturing innovations, and enable reliable sourcing of critical materials and components across supply chains.

**Technology Transition**
1. Enhance external access to experts, facilities, and IP
2. Industry and market analysis
3. Industry and interagency collaboration and engagement
4. Develop real-world projects to demo and validate tech

**Policy & Valuation**
Develop a coordinated, DOE-wide analysis and technical assistance program to support effective energy storage policies, planning and regulation across the United States.

**Workforce Development**
Develop the broad workforce required for research, development, design, manufacture, and operation.
Year 2: ESGC Lab Coordination

ESGC and LDSS Coordination

Leadership Group

Co-Chairs

ESGC Lab Coordination

Technology Development

Manufacturing & Supply Chain

Technology Transition

Policy & Valuation

Workforce Development

Track Leads

Coordinators

Melissa Monk (EE)

Eric Hsieh (OE)

Rachel Pierson (S4)

Charlie Moroney (ANL)

Vladimir Koritarov (ANL)

Meredith Brouzas (ANL)

Joe Cresko (EE)

Diana Bauer (EE)

Mark Willey (PNNL)

Vladimir Koritarov (ANL)

John Vetrano (SC)

Xin Sun (ORNL)

Michael Pesin (OE)

Alejandro Moreno (EE)

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Expectations

• **Streamlined coordination and communications** – simplify points of contact while empowering the Lab coordination team to develop and implement their own coordination mechanisms with the other Labs.

• **Inclusion of expertise across the labs** – Labs not acting as coordinators have extremely valuable expertise that needs to be represented in all of the ESGC’s work.

• **Help develop strategy and fill in gaps** – we want the Lab coordinators to help us identify where we have research gaps and provide input on potential solutions.
Some ESGC Successes to Date

- Developed a matrix describing collective capabilities of national lab system
- Created a framework to accelerate lifetime determinations for new storage technologies (Rapid Operational Validation Initiative)
- Created DOE’s Lab Partnering Service and Visual Patent Search tools for industry stakeholders to more efficiently engage DOE expertise and IP.
- Held a series of multi-lab workshop and webinars to share energy storage programs and capabilities across DOE and National labs.
  - Publishing stakeholder guides as outputs
- Held a series of workforce development listening sessions with stakeholders to understand challenges and opportunities
- DOE released the **Long Duration Energy Storage Earthshot** in July, 2021, with the intent to aggressively enhance the role of storage technologies in our electric grid system
  - ...reduce the cost of grid-scale energy storage by 90% for systems that deliver 10+ hours of duration within the decade.

https://www.energy.gov/energy-storage-grand-challenge
Discover hundreds of Energy Storage technologies, experts, facilities, and success stories across the National Labs. Connect directly with the National Labs on their Energy Storage innovation and expertise.

Interested in advancing your work through partnership with National Lab resources and experts? Visit ESGC.Labpartnering.org to discover Energy Storage innovations, experts, and facilities across DOE!

**Energy Storage Grand Challenge Visual Patent Search**

Quickly explore nearly 2,000 Energy Storage patents and patent applications using the Visual Patent Search tool.
2nd Annual ESGC Summit: Sept 27-28

• Hosted by Argonne National Laboratory
  • 175 in-person, 250 virtual attendees (425 total)

• Focus on stakeholder input to DOE and labs
  • What can DOE provide to help address gaps?
  • How can we help to catalyze inter-disciplinary partnerships

• High-level DOE-led discussions
  • Numerous opportunity spaces discussed across offices
  • Emphasis on decarbonization, equity, partnering

• Sessions and breakouts based on 5 ESGC tracks
  • Excellent integration with SolarPaces around valuation of LDES

• (10 of ~90) Pitch sessions for technology pathways to LDES
Some Key Summit Takeaways

• Biggest commercialization barriers varied significantly by technology, but included **new business models** to monetize new storage, workforce availability, policy/regulations (particularly beyond Li), and technology readiness.

• **Access to financing is limiting**, either to enable large-scale demonstrations (50-100MW scale) or to enable collaborative development efforts.

• **Inadequate market rules and mechanisms** for LDES- Not compensated

• Need for DOE to help make **connections across development cycle**.

• In developing a sustainable workforce: lack of career awareness, connecting industry to academia and creating a **workforce development network**.
  
  • It is difficult to sustain a workforce when clean tech is consistently evolving, which creates a disconnect between the new technologies coming from R&D, training happening in academia, and the implementation by industry and deployment in local communities.

• Project **pre-development documentation** and validation, economic studies, cost and performance data entries, etc.

• Need for increased access to and awareness of **DOE/lab capabilities** that they can use.
Storage Innovations 2030

- Strategizing & accelerating the future of energy storage
- Developing industry consortia and enhancing collaboration
- Quantifying the benefits of RD&D activities for mature technologies
- Enabling emerging technologies
Storage Innovations 2030

Strategizing & accelerating the future of energy storage

SI – Flight Paths

SI - Framework

SI - Prize
DOE has supported 30+ storage technologies

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<th>Li-Ion &amp; Li-Metal</th>
<th>Na-Ion</th>
<th>Na-Metal</th>
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<td>Flexible Generation &amp; Loads</td>
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<td>Ramping</td>
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Taken from Energy Storage Grand Challenge Roadmap, Dec. 2020

Needed: a unified strategy for how technologies contribute to top-level objectives
Flight Paths & SI Timeline

September 2022
- Storage Summit 2022 – Live Pitch Sessions

November 2022
- Virtual Pitch Sessions
  - Flight Paths Technology Selection

October – December 2022
- Prize competition open

Framework Industry Engagement

December 2022 – March 2023
- Industry Outreach and Engagement Sessions

ESGC Strategy Reports

September 2022 – March 2023
Technologies Pitched at Summit (~10 of ~90)

- Flow
  - Zinc-Bromine
  - Vanadium
  - Aqueous
- Undersea Pumped Hydro
- Thermal – Rock packed bed
- Electrochemical
  - Liquid metal
  - Sodium

Characteristics discussed
- Technology readiness
- Commercial viability
- US manufacturing
- Supply chain
- Cost projections
Grid-based energy storage – so much going on…

- Infrastructure Investment and Jobs Act
- Inflation Reduction Act
- Long-Duration Energy Storage Earthshot
- Energy Storage Grand Challenge
- Storage Innovations 2030
- DOE-led National Lab Initiatives
  - Rapid Operational Validation Initiative
  - Long-Duration Energy Storage Demonstrations
- ***Energy Storage for Social Equity***

We are paving the way for new energy storage technologies to meet our electric grid goals: decarbonization, resilience, equity, stability...
Thank you...Questions?