INFOCAST VIRTUAL | MASTER CLASS

CO-HOSTED WITH CleanTech Strategies

Increasing Storage Safety and Performance

*Part of the **Advancing Energy Storage at Scale** Series*

August 11 - 12, 2020 | 8:45 AM - 2:35 PM (PDT) | Digital Access

August 11, 2020

8:45-9:00 am PDT — Introduction & Opening Remarks

9:00-9:35 am — Session 1: **Assessing the Safety and Performance Levels of Today's Energy Storage Systems (ESS)**

There are now more than 3 gigawatts of stationary ESS deployed on the grid and at customer sites in the U.S. While almost all facilities have been safely operating throughout the world, some incidents have heightened concerns about the potential dangers associated with ESS. Also, as storage is increasingly deployed at scale the scrutiny is stricter regarding not only initial performance but full life-cycles. This session will review the current state of storage safety and performance.

- A brief look at safety failures to date
- Potential performance issues for ESS
  - Degradation
  - Cost to thermally manage
  - End-of-life management
  - Sourcing of ESS components in the US

Russ Weed, *President*, CLEANTECH STRATEGIES
Marshall Worth, *Senior Product Manager*, POWERSECURE, INC.

9:35-9:50 am — *Live Q&A*

9:50-10:00 am — *Break*

10:00-11:05 am — Session 2: **The Technical Readiness Level (TRL) Approach to Improving ESS**

The rigor and maturity of a system's safety and performance can be beneficially evaluated utilizing the technology readiness level (TRL) approach. This approach was first developed by NASA, and is now widely used to evaluate complex systems. This session will discuss how this approach can be used to evaluate and improve critical sub-systems of an ESS, including:

- Storage media
- Battery management system (BMS)
- Thermal management system (TMS)
- Gas detection system
- Ventilation
- Fire suppression
- Enclosure system

Nick Warner, *Founding Principal*, ENERGY STORAGE RESPONSE GROUP, LLC
Russ Weed, *President*, CLEANTECH STRATEGIES

11:05-11:20 am *Live Q&A*

11:20-11:30 am *Break*

11:30 am -12:35 pm Session 3: **Key Safety and Operational Metrics for ESS, Supported by Safety Standards and Best Practices**

The storage industry has progressed on safety standards, e.g. UL 9540 and 9540A, and also on best practices, e.g. EPRI's Energy Storage Integration Council, ESA's Corporate Responsibility Initiative, and the initiatives of companies. Now the storage industry needs to achieve substantial consensus on the key operational metrics for ESS. This session will discuss the status of metrics development and adoption for each critical ESS sub-system, including:

- Operational metrics for TMS
  - Watts of cooling energy per kWh of ESS discharge
  - Cost benchmarks per kWh of ESS energy capacity
- Operational metrics for BMS
- Status of standardization of key operational metrics for all of the ESS sub-systems
- Metrics for ESS's as integrated systems

Matt Paiss, *Technical Advisor, Battery Materials & Systems Group,* PACIFIC NORTHWEST NATIONAL LABORATORY (PNNL)
Charlie Vartanian, *Senior Technical Advisor, Storage Reliability and Integration*, PACIFIC NORTHWEST NATIONAL LABORATORY (PNNL)

12:35-12:50 pm Live Q&A

12:50-1:35 pm *Lunch*

1:35-2:10 pm Session 4: **Improving Thermal Management Systems to Enhance Safety and Performance of ESS**

The safety and performance of thermal management systems (TMS) have become a prime focus for ESS designers, and a concern for utilities, regulators and others evaluating proposals. This session will discuss the safety and performance advantages of traditional and emerging approaches to TMS in storage applications.

- Air cooling TMS design
  - Air conditioning needs and costs
  - Performance and safety impacts of rack, module and cell layout
  - Performance and safety limitations of air-cooling
- Emerging liquid-cooled TMS design
  - Advantages in addressing thermal runaway, degradation and cost to manage
  - Operational costs vs air-cooling
- Comparison of thermal capacity temperature stability, and parasitic loss

Joe Goggin, *Business Development Manager*, HOTSTART INC.
Mohamed Kassamali, *Energy Storage Consultant*, DNV GL

2:10-2:25 pm *Live Q&A/Day 1 Wrap Up*

August 12, 2020

9:00-10:05 am Session 5: **Improving Battery Management Systems to Enhance Safety and Performance of ESS**

The importance of BMS to lithium-ion and flow battery ESS systems cannot be overstated. At present, most BMS for ESS that include lithium-ion and flow technologies are proprietary, developed by each ESS company. This session will explore the advantages and disadvantages of various BMS approaches, and show how the TLR approach can be used to rigorously evaluate BMS.

- How the Scaling and electrical engineering of stationary ESS drive differences in BMS from those used in consumer electronics and vehicle applications
- Identifying known and unknown lapses
- Using TRL to improve both hardware and software in BMS
- Evaluating efforts to develop BMS that can safely manage different lithium-ion and flow systems

KJ Plank, *Senior Director of Product*, POWIN ENERGY
Michael Worry, *CEO*, NUVATION ENERGY

10:05-10:20 am *Live Q&A*

10:20-10:30 am *Break*

10:30-11:25 am Session 6: **Improving the Safety and Performance of ESS as an Integrated System**

This session will examine engineering efforts in the storage industry to master integration of the increasingly complex sub-systems as a means of creating ESS that perform better than a sum of their parts.

- Looking at the integrated system efforts of NEC, SAFT, Fluence (AES and Siemens), aa well as Honeywell and Li-ion Tamer
- Additional integrated system efforts that are emerging from the storage industry
- Lessons being learned

C. Michael Hoff, *Consultant*; formerly with NEC ENERGY SOLUTIONS
Joel Vyduna, *Director*, LUMINATE

11:25-11:40 am *Live Q&A*

11:40 am-12:30 pm *Lunch*

12:30-1:35 pm Session 7: **Driving Future Improvements in Safety and Performance Across the Storage Industry**

As storage continues to scale up, how will ongoing efforts to improve safety and performance advance in the future? The increase in system size and project scope and complexity is sparking and driving creative efforts to improve safety and performance. However, these efforts are not uniform in their foci, and access to their activities may be limited. This session will discuss the groups and forums advancing storage safety and performance, and how the industry can access these activities and their results.

- Understanding how leading efforts are advancing:
  - DOE's Safety and Reliability Forum
  - EPRI's Energy Storage Integration Council
  - ESA's Corporate Responsibility Initiative
- Identifying who is primarily working on what
- Best ways for storage organizations to participate in advancing the state of safety and performance across the industry

Kenneth Boyce, P.E., *Principal Engineer Director, Energy & Power Technologies*, UL LLC
Mike Simpson, *Senior Technical Leader, Energy Storage and Distributed Generation*, ELECTRIC POWER RESEARCH INSTITUTE (EPRI)
Russ Weed, *President*, CLEANTECH STRATEGIES

1:35-1:50 pm *Live Q&A/Day 2 Wrap Up*

1:50-1:55 pm *Closing Remarks*