

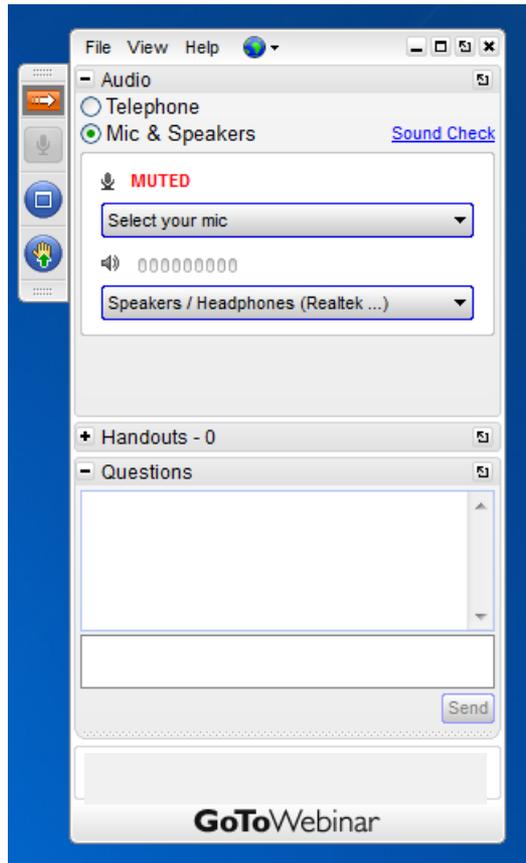
Energy Storage Safety Plan Implementation Kickoff

Web Meeting
July 8, 2015

Hosted by

DOE-OE Energy Storage Program
Sandia National Laboratories
Pacific Northwest National Laboratory

Go to Webinar Housekeeping



- All participants are in a listen only mode.
- The webinar is being recorded.
- Q&A will be conducted through the Questions section of the menu. Please submit your questions at any time through out the presentation, and we will address them at the end of the hour.

Energy Storage Safety Working Group (ESSWG) Webinar Agenda



1:00 pm – 1:05 pm	Welcome and GotoWebinar House Keeping (<i>Allyson Beck, SNL</i>)
1:05 pm – 1:10 pm	Welcome and Introductory Comments (<i>Stan Atcitty, SNL</i>) <ul style="list-style-type: none">- Introductions- Agenda Overview
1:10 pm – 1:20 pm	Opening Remarks (<i>Imre Gyuk, DOE-OE</i>)
1:20 pm – 1:30 pm	ESSWG Background and Drivers (<i>Stan Atcitty, SNL</i>)
1:30 pm – 1:40 pm	Codes and Standards (<i>David Conover, PNNL</i>)
1:40 pm – 1:45 pm	Safety Outreach and Incident Response (<i>David Rosewater, SNL</i>)
1:45 pm – 1:50 pm	Safety Validation and Risk Assessment R&D (<i>Summer Ferreira, SNL</i>)
1:50 pm – 2:00 pm	Questions

Overview



Purposes of the meeting

- To provide an overview of the DOE ESS Safety Plan
- Describe the activities envisioned as part of the plan
- Explain how these activities will be organized and conducted

Expected Outcomes

- Understand what is to be accomplished
- Who will be involved
- How activities will be planned and executed
- Knowledge of critical dates

“Facilitating the timely development and deployment of safe ESS by implementing the DOE ESS Safety Plan through collaboration of all interested parties and key stakeholders”

Thank You:

Dr. Imre Gyuk

U.S. Department of Energy,
Office of Electricity Delivery and Energy
Reliability

Designing for Safety in Energy Storage Systems

IMRE GYUK, PROGRAM MANAGER
ENERGY STORAGE RESEARCH, DOE

**To reach full acceptance as
a component of the electric grid
Energy Storage must demonstrate:**

- Technical Feasibility
- Competitive Cost
- A Regulatory Framework
- **Safety!!**

We need to avoid this!



Not fully considering safety will:

- Endanger Life
- Lead to Loss of Property
- Damage the Provider's Reputation
- Lead to Costly Litigation
- Decrease Confidence in Storage

DOE Office of Electricity Safety Meeting February 17, 2014 Albuquerque, NM

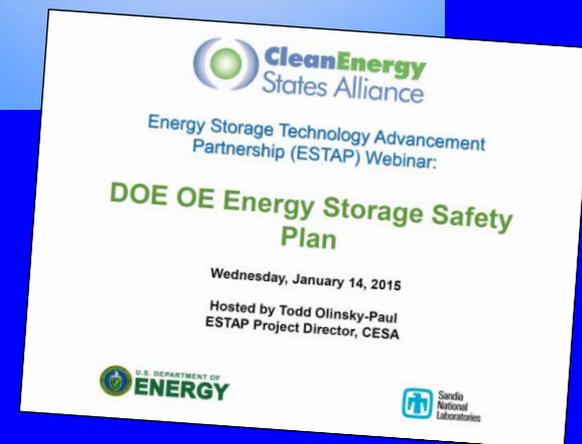
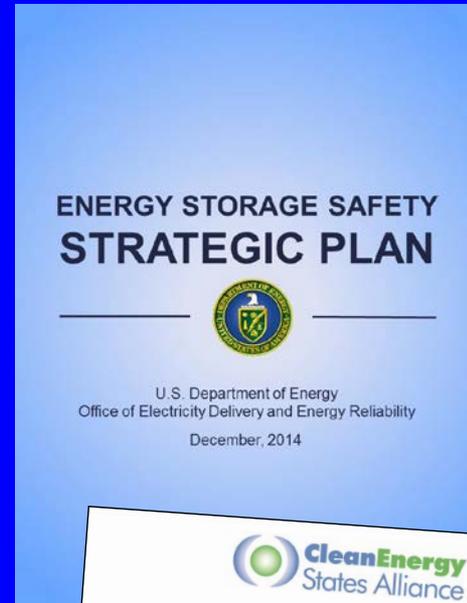
- **Manufacturers** must be confident in the safety of their products.
- **Regulators** must review installations in terms of application, ownership, risk, and potential litigation.
- **Insurers** must develop applicable risk assessment methodologies
- **First Responders** must respond to incidents safely and successfully

**Safety is an overarching concern
that needs to involve diverse partners!**

Need for a Strategic Plan to Address Energy Storage Safety Concerns

Urgency is underscored by:

- Increasing Deployment of Storage
- Increasing Number of Vendors
- Increasing Number of Applications
- Increasing Number of Technologies



DOE Office of Electricity ESS Safety Activities Timeline

DOE OE WORKSHOP FOR GRID ENERGY STORAGE SAFETY

- Attended by 70 thought leaders from stakeholder groups across the energy storage industry

INVENTORY OF SAFETY RELATED CODES AND STANDARDS PUBLISHED

ENERGY STORAGE TECHNOLOGY ADVANCEMENT PARTNERSHIP (ESTAP) WEBINAR

- Introduced the strategic plan and next steps

ESA ANNUAL CONFERENCE WORKSHOP

technical and procedural aspects associated with documenting and verifying ESS safety

2014

FEB

AUG

SEP

DEC

2015

JAN

MAR

APR

MAY

OVERVIEW OF DEVELOPMENT AND DEPLOYMENT OF CODES, STANDARDS, AND REGULATIONS AFFECTING ESS SAFETY PUBLISHED

GRID ENERGY STORAGE SAFETY STRATEGIC PLAN PUBLISHED

- Based upon outcomes of the DOE OE Workshop for Grid Energy Storage Safety
- Outlines a path forward for ESS safety initiatives

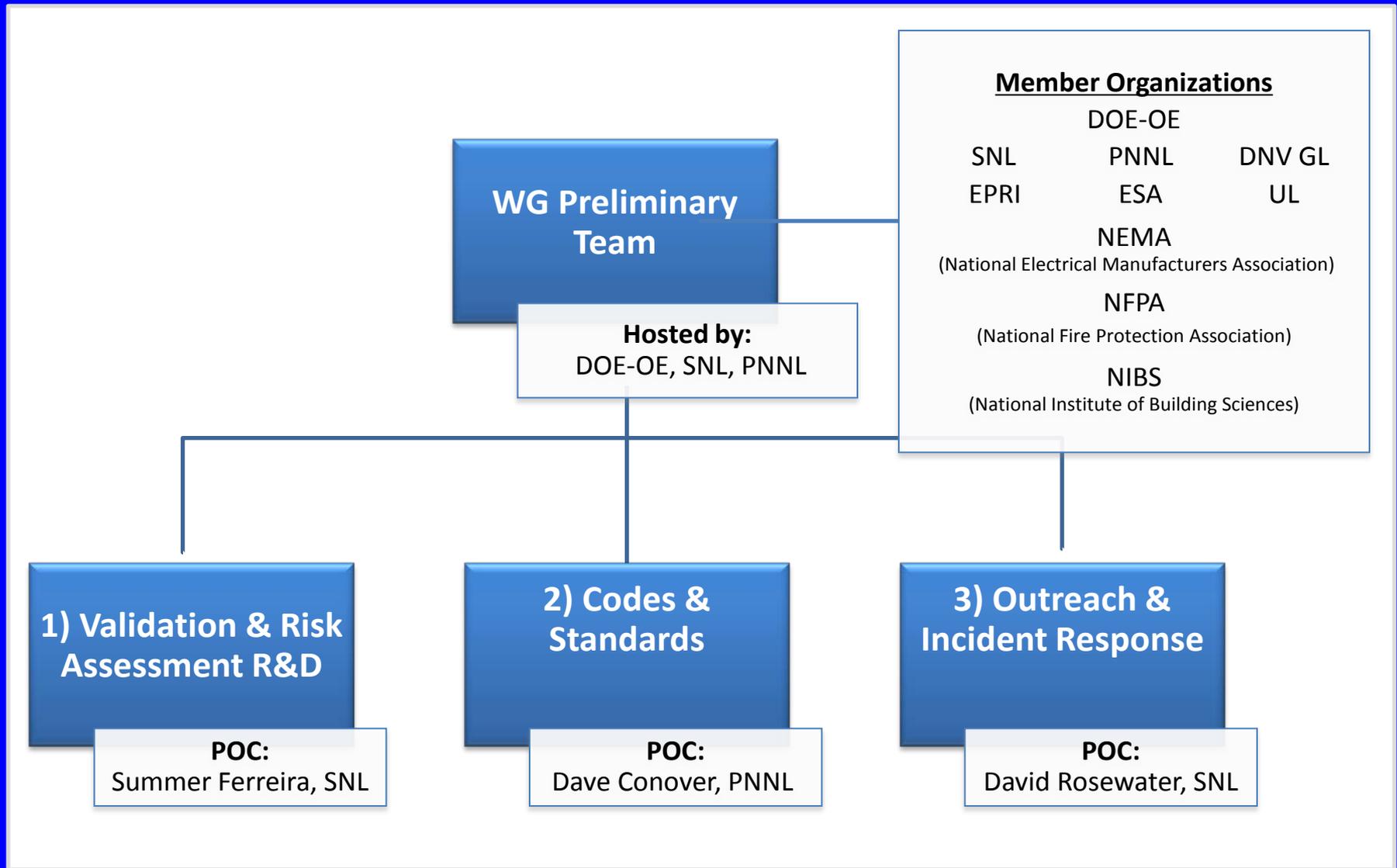
ENERGY STORAGE SAFETY PRELIMINARY TEAM WEB MEETINGS

- Identified and prioritized safety gaps related to energy storage:
 - safety validation and risk assessment R&D,
 - codes and standards, and
 - safety outreach and incident response

Focus Areas determined by ABQ Meeting and DOE Strategic Plan were addressed by an industry-wide Preliminary Working Group to identify top priorities in each area.

- Research and development to improve safety technologies and tools for risk assessment and management
- Updating relevant codes, standards, and regulations
- Working with first responders on incident preparedness

Energy Storage Safety Working Group (ESSWG)



Identified three immediate subject areas and a short list of top priorities in each area.

07-08-2015, Webmeeting to establish 3 Working Groups

All stakeholders are invited to participate in the 3 ESS safety working groups.

Each WG will establish a path forward and work towards relevant goals as outlined in the slides on R&D, CSR and Outreach.

Work will start immediately so please get involved. Working groups will continue to accept active members

sandia.gov/ess/safety.html

Energy Storage Safety Working Group (ESSWG) Mission and Vision



Mission

Establish a DOE-facilitated Energy Storage Safety Working Group (ESSWG) involving representatives of the stakeholder community having key competencies and an interest in energy storage system (ESS) development and deployment to plan and execute paths forward to address safety gaps, previously identified and prioritized by the Energy Storage Safety Preliminary Team (ESSPT), needed to support the timely and safe deployment of stationary energy storage systems.

Vision

The ESSWG enables timely deployment of safe energy storage systems consistent with the December 2014 [DOE OE Energy Storage Safety Strategy](#) by following the framework outlined by the ESSPT, which specifically prioritizes the work needed to address gaps in the knowledge associated with energy storage system safety, and carrying out safety related research, education and training, technical support, and codes/standards development activities.

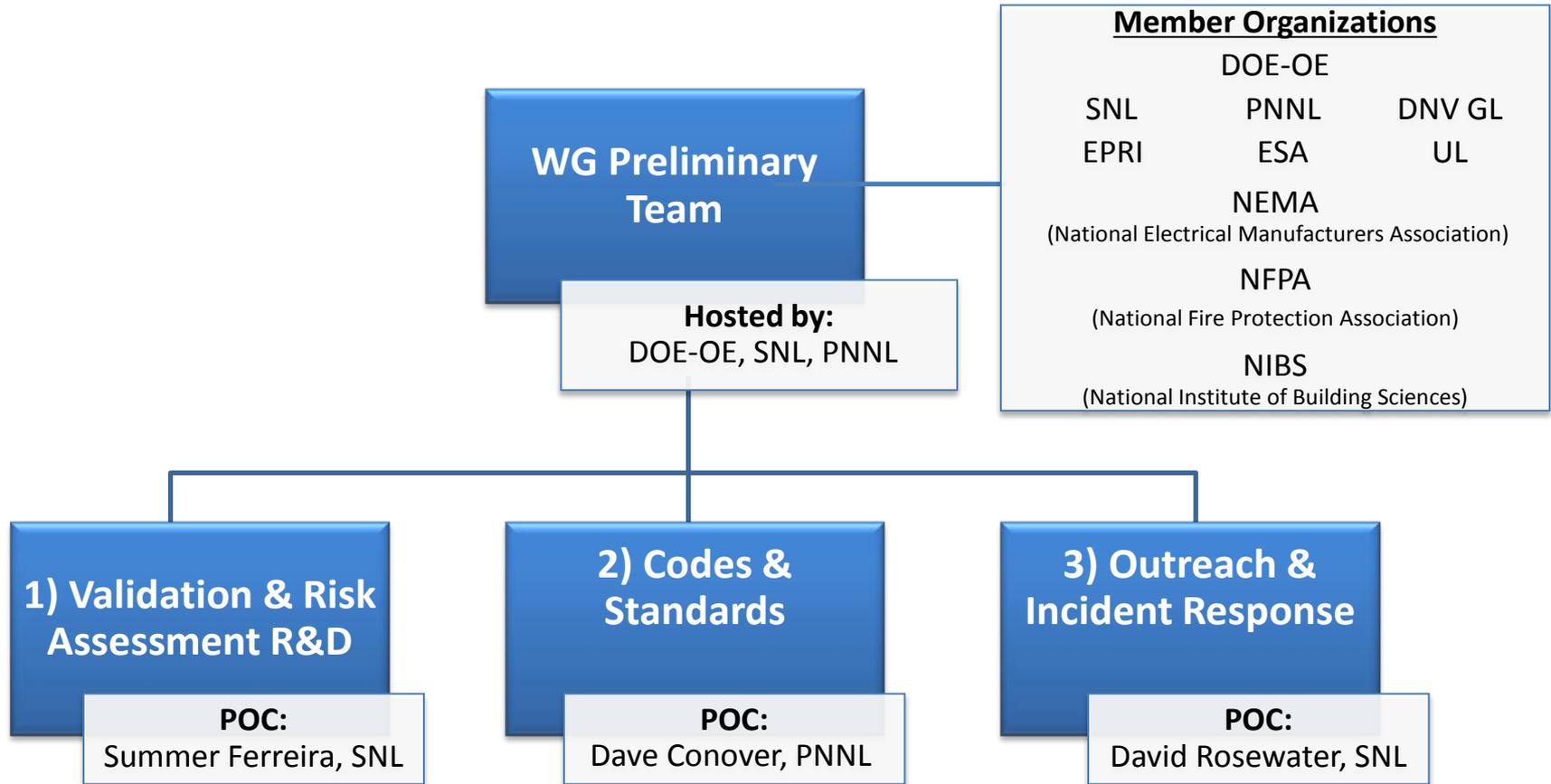
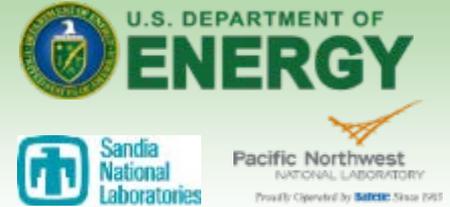
Energy Storage Safety Working Group (ESSWG) Scope of Work



Focused on the safety of all stationary ESSs, and projects to address the gaps identified are going to be organized and conducted through coordinated actions focusing on the priority gaps identified by the ESSPT in each of three ESSWG areas:

- *Safety Validation and Risk Assessment*
- *Codes and Standards*
- *Safety Outreach and Incident Response*

Energy Storage Safety Working Group (ESSWG) Organizational Structure



Identified three immediate subject areas and a short list of top priorities in each area.

Energy Storage Safety Working Group (ESSWG) Prioritization



Prioritization Process

- A survey of the safety challenges was conducted by the ESSPT to collect a list of the **issues and issue categories**.
- The issues were then sorted into the strategic objective areas Safety Validation and Risk Assessment Issues, Codes and Standards issues, and Safety Outreach and incident Response issues
- A second survey was then performed which asked the ESSPT to provide **Ease** and **Impact** rankings for each issue
- The responses were then collected and reviewed as a group to **identify the top issues in each strategic objective area**

R&D Prioritization



Key need – Identify R&D efforts that will have the largest impact on the safety of the industry.

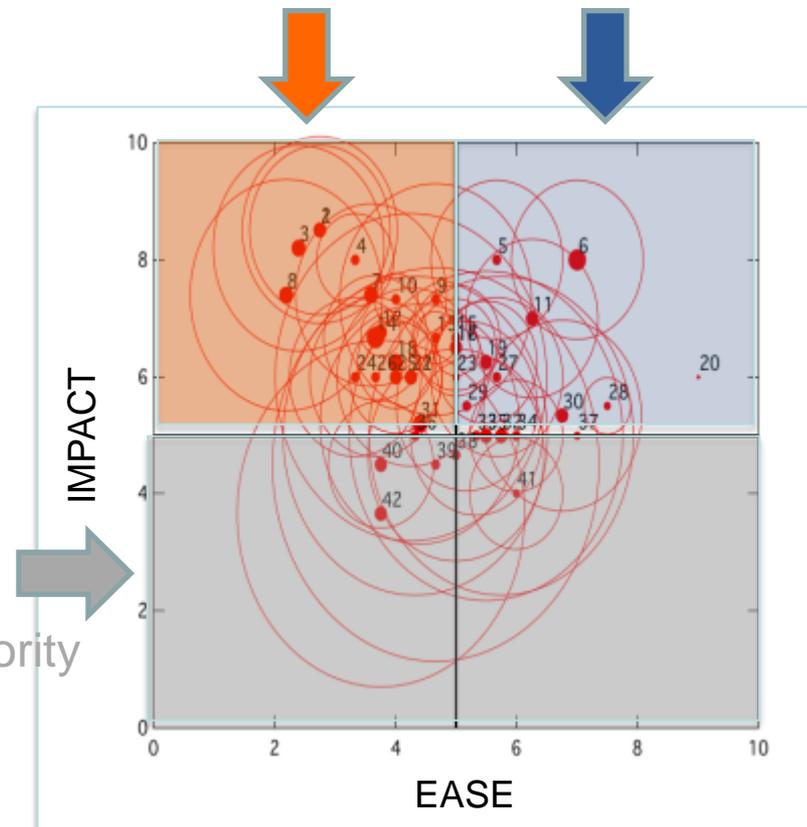
- Work to date
 - Ongoing work in labs, industry and academia address safety in an ad hoc manner.
 - Focused largely on performance of single cells
- Short term priorities identified:
 - **Fire Suppression testing** and analysis
 - **Thermal runaway** research
 - **System scale burn test**
 - **Commodity classification** development
 - **Fire and vent gas modeling** and analysis
- Longer term priorities: as resources allow.
 - DC fusing recommendations
 - How to handle stranded energy
 - Access control guidance
 - Guide to ESS safety analysis
 - R&D to address gaps found in standards

Safety Validation and Risk Assessment

Quad Chart

Federal R&D

Industry



Codes Standards and Regulations Prioritization



Top Opportunities through Codes and Standards

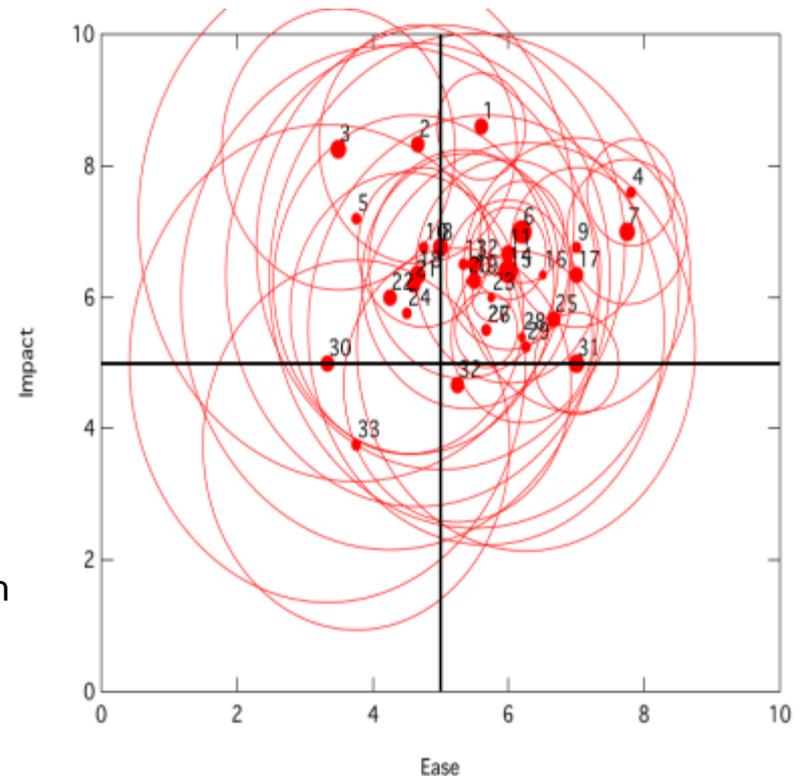
- A single standard is needed to cover energy storage system installations
 - A single source reference standard would be the most impactful means of ensuring safety in new energy storage installations.
 - A pre-standard developed now may expedite the typically lengthy development process
- Triage and develop updates to existing codes and standards
 - Existing standards and model codes be updated based on the developed source document as applicable to energy storage systems
- Develop guidance for documenting and validating energy storage system safety under existing codes and standards
 - Document and verify the acceptability of energy storage systems under current standards and model codes

Outreach Prioritization

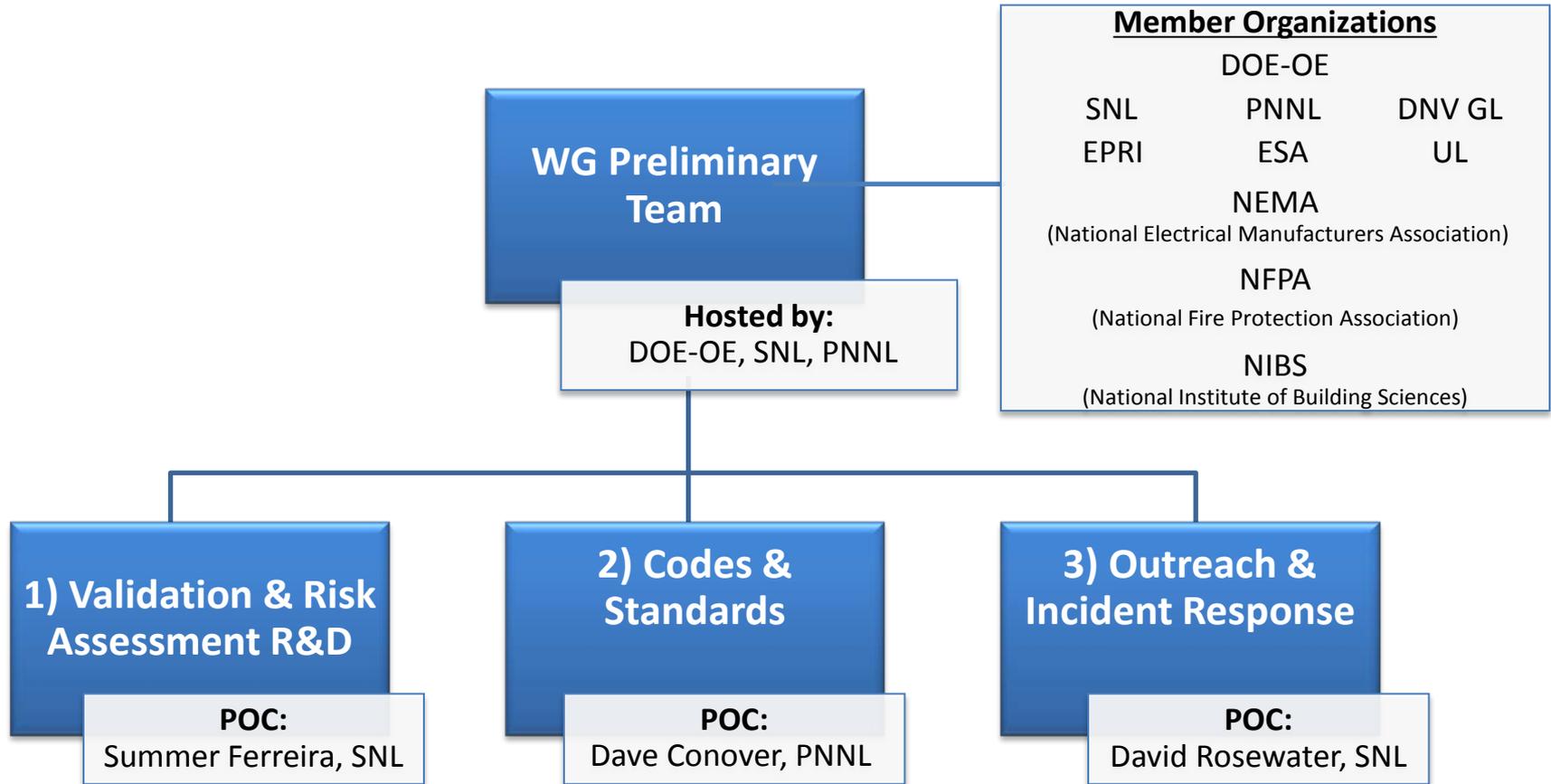
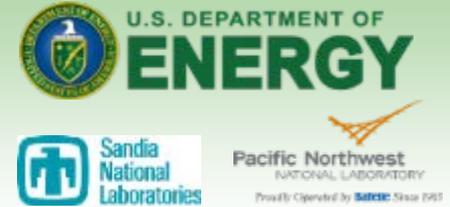


- Key need – the ability to make safety critical information accessible to all stakeholders including first responders, inspectors, and regulators
- Work to date
 - Energy Storage Safety Meeting
 - Energy Storage Safety Strategic Plan
 - Ad-hoc engagement and collaboration between national labs, and industry on safety
- Short term activities
 - Guidance and information on ESS installation and protection design
 - Guidance and information operational safety
 - Develop first responder training material
- Longer term activities
 - First responder knowledge and confidence through demonstrations, videos, guides, and courses
 - Guidance and information on safe transportation

Safety Outreach and Incident Response
Quad Chart



Energy Storage Safety Working Group (ESSWG) Organizational Structure



Identified three immediate subject areas and a short list of top priorities in each area.

Energy Storage Safety Codes and Standards Working Group

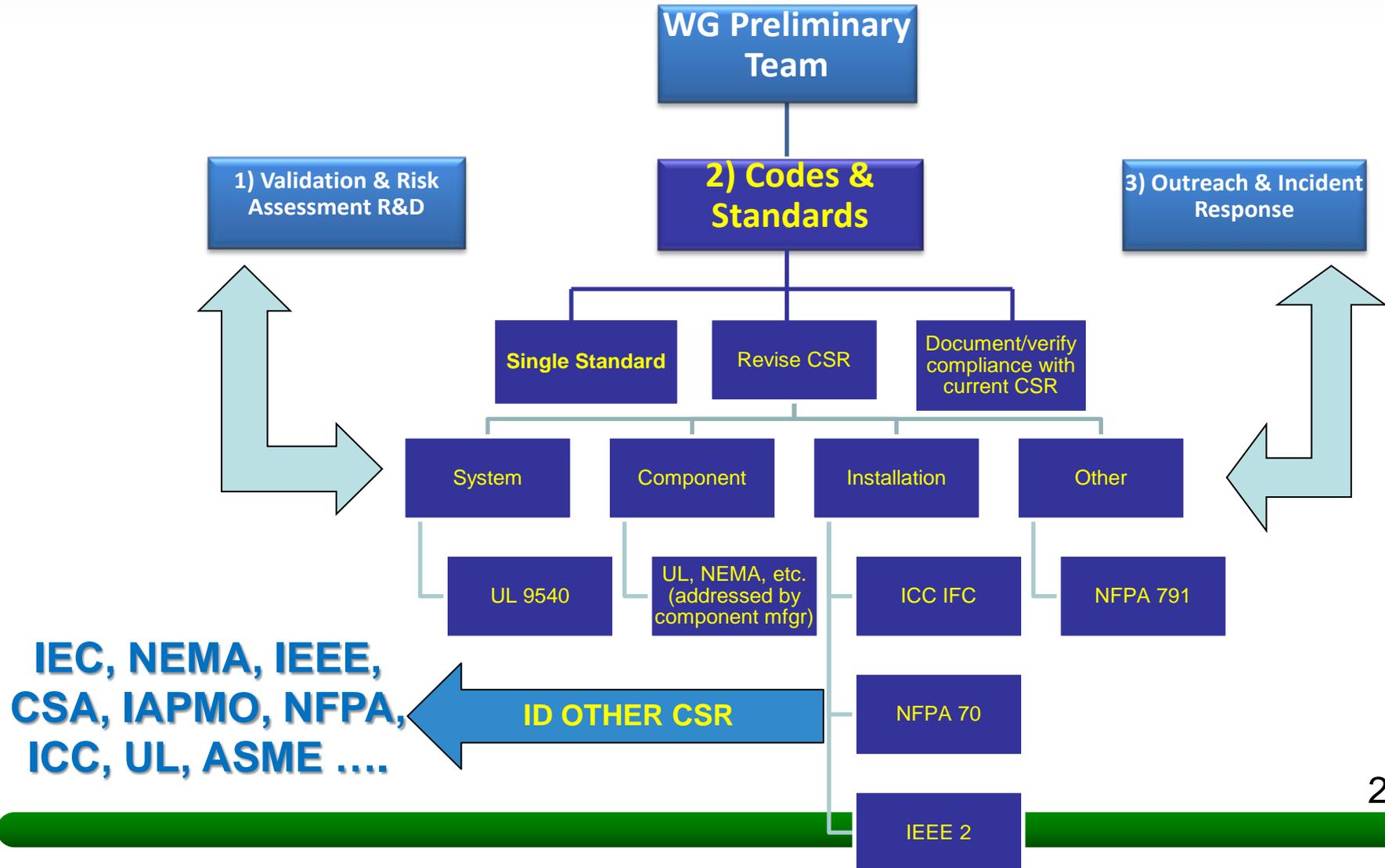
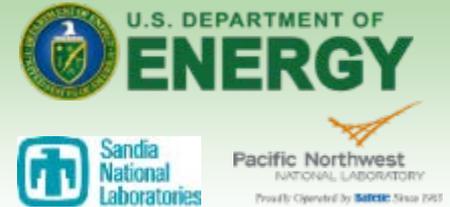


Working groups will be guided by volunteers with expertise in the topical areas and conducted through a coordinated effort. WG's will address highest priorities as identified by the ESSPT.

Topical Area - Codes, Standards and Regulations (CSR)

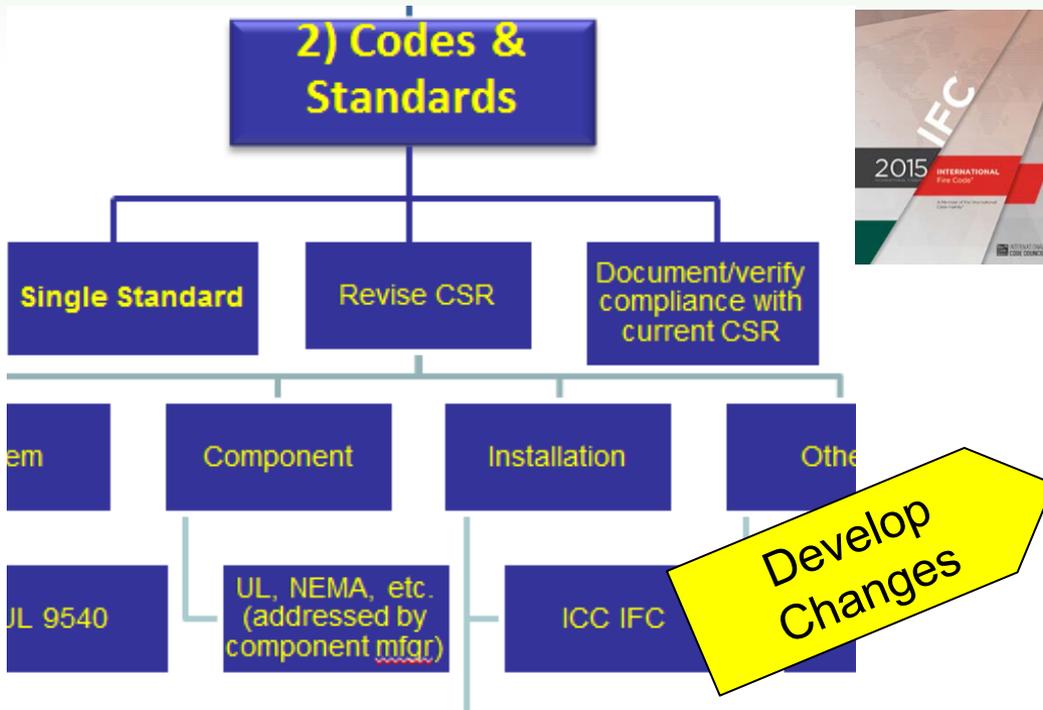
- Using the queue of gaps in existing codes and standards generated by the ESSPT
 - revise existing CSR and develop new CSR to effectively guide energy storage system safety
 - ensure CSR facilitate timely deployment of safe ESS and do not act as barriers to system deployment
 - help identify knowledge gaps associated with CSR
 - foster the development of materials to support application of CSR to secure approval of ESS

Energy Storage Safety Codes and Standards Working Group



Energy Storage Safety CS WG

Specific TG Example



- Coordinate with and through ICC IFC Code Action Committee ESS WG
- Develop DRAFT proposed code changes and supporting rationale
- ID areas where further information is needed and secure
- Engage all interested stakeholders
- Internet meetings to review proposed code changes and ID areas needing revision
- Revise and enhance code changes
- Submit to ICC January 2016
- Support approval during the 2016 code development cycle

Develop Changes

IEC, NEMA, IEEE, CSA, IAPMO, NFPA, ICC, UL, ASME

← ID CSR OF OTHER SDOS

Energy Storage Safety Outreach and Education Working Group



POC: David Rosewater, Email: dmrose@sandia.gov, Phone: 505 844 3722

Topical Area - Safety Outreach and Incident Response

- **Outline and implement a plan to educate, engage, and train stakeholder communities** on applying criteria and practices to ensure that systems are safe when placed into service and the first-responder community is equipped to respond, if there is an incident.

Proposed Organization

- Facilitated Web-Based Meetings Held Monthly (at first)
- Tackle the Top Issues First
- Work Closely with the Other Working Groups
- Materials will be reviewed by Sandia/PNNL and made available on the Sandia ESS / ESA websites
- **Most Important:** Materials will be made available to key stakeholders (fire-fighters, electrical inspectors, regulators, etc.)

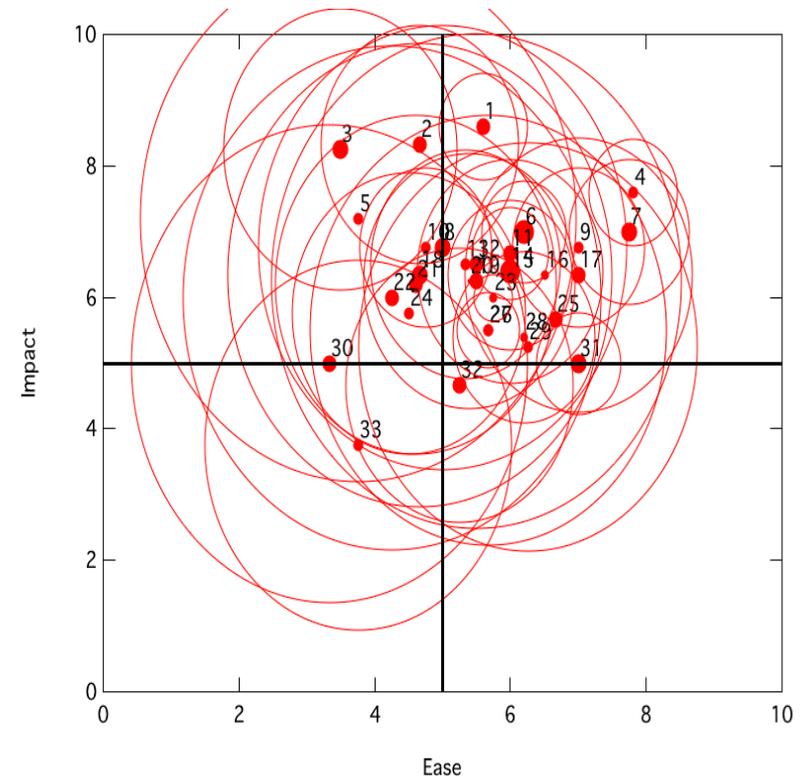
Energy Storage Safety Outreach and Education Working Group (cont'd)



Top Issues in Safety Outreach and Incident Response

1. Provide guidance and information on ESS installation and protection design
2. Provide guidance and information operational safety including thermal management
3. Develop first responder training material for responding to an ESS fire
4. Develop guidance and information on ESS safety analysis through energy storage websites, the ESS Handbook, and by offering safety analysis courses to developers and startups
5. Promote first responder knowledge and confidence by developing a template for providing information to and working with local fire departments and by make safe methods available to first responder groups through demonstration (practice system fire), videos, guides, and courses.
6. Provide links to educational material on cyber security on energy storage websites
7. Provide guidance and information on the safe transportation/delivery of energy storage systems

Safety Outreach and Incident Response Quad Chart



Energy Storage Safety Validation & Risk Assessment R&D Working Group

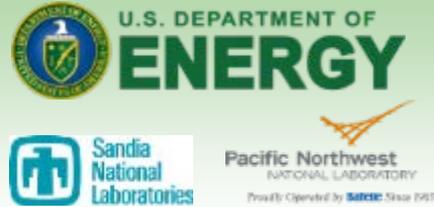


WG's intent is to address highest priorities as identified by the ESSPT.

- Coordinate with other WG's to **maintain prioritized list of research and development** focuses critical to the industry.
 - Suppression testing and analysis
 - Thermal runaway research
 - System scale burn test
 - Commodity classification development
 - Fire and vent gas modeling and analysis
- Share knowledge of R&D efforts and funding opportunities in the key initiatives
- Hold a quarterly call to review status, and share information of relevant feedback from the CSR and outreach groups and their impact on R&D, and identify any appropriate feedback out to these groups.
- Identify upcoming deadlines for conferences, and events relevant to ESS safety R&D.

Questions & Answers

Energy Storage Safety Working Group (ESSWG) Open Invitation



- All ESS stakeholders are invited to participate in any or all of these three working groups or task groups that may be established under them.
- Each WG will establish a path forward and work towards relevant goals as outlined in the slides on R&D, CSR and Outreach.
- Work will start immediately so please get involved.
- Look for a communication from the POC of the area(s) where you have expressed an interest in participating within the next week.
- **Send an e-mail to energystorage@sandia.gov to indicate which working group(s) you want to participate in so the support staff for each group can send you the information needed to get you involved.**

www.sandia.gov/ess/safety