IV. UPDATE ON WORKING GROUPS AND DISCUSSION

Jan 21, 2020
ESP WORKING GROUPS

1. Power systems: safety, valuation and warranties
2. Test bed for knowledge dissemination and capacity building
3. Testing protocols and validation of performance
4. Flexible sector coupling
5. Decentralized energy storage solutions
6. Enabling policies and procurement frameworks
7. Recycling systems and standards
**Objective**: address power systems related challenges to sustainably integrating energy storage

**WG Lead**: National Research Council Canada (Adam Tuck) and World Bank (Fernando de Sisternes)

<table>
<thead>
<tr>
<th>Task</th>
<th>Progress</th>
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<tbody>
<tr>
<td>1. Produce a common <strong>guide</strong> for safe operation of energy storage systems</td>
<td>• Prepared draft outline of document summarizing standards and best practices on safe operation of BESS in developing countries. Feedback needed</td>
</tr>
<tr>
<td>2. Develop <strong>cost-benefit valuation methods</strong> and a catalogue of applications</td>
<td>• Collecting key documents/guidelines on cost benefit valuation (pending confirmation from partner)</td>
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<tr>
<td>3. Identify <strong>warranties</strong> that are suited for applications in <strong>developing countries</strong></td>
<td>• Produced draft presentation with key aspects of energy storage warranties for developing countries</td>
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**Objective**: increase knowledge about how different storage technologies can behave in developing countries, as well as capacity to operate storage systems

**WG Lead**: CSIR (Mkhulu Mathe)

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<tbody>
<tr>
<td>1. Host an <strong>energy storage testbed</strong> in challenging climatic conditions</td>
<td>• Continue exchanges between partners around viable testbed models for the conditions / locations of each Partner</td>
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<td></td>
<td>• Continue engagement with donors and prospective partners to raise resources for advancing testbed concept development</td>
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<tr>
<td>2. Contribute to research, monitoring and <strong>building capacity</strong> in developing countries</td>
<td>• Organized study tours to test beds and battery facilities in the margins of ESP meetings</td>
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**Objective**: reduce performance uncertainty of energy storage systems in developing countries

**WG Lead**: U.S. National Renewable Energy Laboratory (Nate Blair)

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</table>
| 1. Investigate discrepancies between specifications of energy storage systems and actual performance in developing countries | • Assessing 5-6 pilot PV + BESS mini-grids sites in Nigeria (NREL and Faraday Institution)  
• Collecting key documents such as reports from BERA and NREL |
World Bank Energy Storage Partnership

Working Group 3

Nate Blair, NREL

Manuel Jose Millan Sanchez World Bank (coordinator), Tony Burrell (NREL), Matt Keyser (NREL), Ian Ellerington (Faraday), Leen Govaerts (BERA), Patrick Hendrick (BERA), Thomas Polfliet (BERA)
Existing Working Group members from June

• US National Renewable Energy Lab
  – Deep experience in battery testing, thermal storage and system performance analysis
  – Nate Blair – NREL Energy Storage Analysis coordinator
  – Tony Burrell – NREL Chief Scientist focused on energy storage
  – Matt Keyser – Electrochemical energy storage group within the Mobility Center

• Faraday Institution
  – UK’s independent institute for electrochemical energy storage research and skills development
  – Ian Ellerington – Head of Technology Transfer

• The Belgian Energy Research Alliance
  – Coordinating energy storage research across Belgium
  – Leen Govaerts
  – Patrick Hendrick
  – Thomas Polfliet
Investigate discrepancies between specifications of energy storage systems and actual performance in developing countries

- #1 Report on different experience and results for ESP
- Summarize test capabilities and facilities
- Identify gaps
To date, the working group has had several key calls and conversations.

A variety of relevant documents have been communicated between the teams.
Final Product Proposal

- Collection of Test data in a public repository including the Shell Foundation set of sites in Nigeria
- Best Practices for Testing Batteries and other energy storage equipment
- Best Practices for setting up a battery testing center
- Internationally known experts available for commissioning testing laboratories
- Alignment with the testbed working group
Objective: better understand and analyze sector coupling opportunities enabled by energy storage

WG Lead: IEA Technology Collaboration Program – Energy Storage (Andreas Hauer)

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<tr>
<td>1. Expand Annex 35 on <strong>flexible sector coupling to developing countries</strong></td>
<td>• Defining a deliverable based on internal discussions with the group</td>
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</table>
Flexible Sector Coupling

Renewables
- Wind
- PV

Electricity

Energy Storage

Heating/Cooling

Agriculture

Mobility
Energy storage solutions have to be adapted to their actual application!

<table>
<thead>
<tr>
<th>Renewable Energy Source</th>
<th>Autarcic Systems/Island Solutions</th>
<th>Rural Structures/Districts/Mini Grids</th>
<th>Central Structures/Cities/Grid</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV / Wind</td>
<td>Energy Storage Technologies</td>
<td>PV / Wind</td>
<td>PV / Wind</td>
</tr>
<tr>
<td>Biomass</td>
<td>EES / TES</td>
<td>CSP / Biomass</td>
<td>CSP / Geothermal</td>
</tr>
<tr>
<td>Solarthermal</td>
<td>P2G</td>
<td>Solarthermal</td>
<td>Solarthermal</td>
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<tr>
<td></td>
<td></td>
<td>Geothermal</td>
<td>Geothermal</td>
</tr>
<tr>
<td>Demand/Energy Consumption</td>
<td>Heating/</td>
<td>Heating/</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Cooling</td>
<td>Cooling</td>
<td>(supply from grid)</td>
</tr>
<tr>
<td></td>
<td>Mobility</td>
<td>Mobility</td>
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**Objective**: support the design of mini-grid projects

**WG Lead**: Loughborough University / UK Low Carbon Energy for Development Network (Ed Brown)

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<tr>
<td>1. Develop new models for the role of storage in mini-grids that will be available in open course</td>
<td>tbd</td>
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<tr>
<td>2. Study on what type of battery is needed for different types of mini-grids depending on the load connected</td>
<td>• Drafting outline of the study</td>
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<td>• Secured funds and preparing desk review for mini-grids study</td>
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**Objective**: better understand best practices on policies, regulations and procurement for energy storage

**WG Lead**: World Bank (Zuzana Dobrotkova)

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<tr>
<td>1. Produce a paper identifying policies and regulations to enable energy storage</td>
<td>• <strong>Paper on energy storage regulations and policies</strong>: outline of high-level paper drafted (storage technology agnostic), inviting suggestions for case studies</td>
</tr>
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</table>
| 2. Produce a paper on best practices on service purchase agreements (PSPAs) for energy storage | • **Literature review** paper about existing solar plus storage PPA’s – under preparation  
• **Best-practice summary** of procurement TORs for BESS – under preparation |
**Objective:** disseminate best practices recycling different battery technologies

**WG Lead:** World Bank (Kirsten Hund and John Drexhage) and Global Battery Alliance/WEF

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<td>1. Identify most relevant technology attributes for environmental sustainability</td>
<td>• Preparing structure of the future report, methodology, and distribution of work</td>
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<tr>
<td></td>
<td>• Collecting data and conduct literature review, including reports form WG members</td>
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<td>• Gathering insights through dialogue with different stakeholders, including the private sector</td>
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<td>2. Take stock of current recycling practices</td>
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<td>3. Identify successful models for recycling systems</td>
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Report for 3rd meeting of ESP in June

Environmental sustainability of energy storage batteries: re use and recycling (focus on developing countries). Full life cycle, cradle-to-gate approach

- technology attributes most relevant for environmental sustainability
- taking stock of current practices/models
- identifying successful models for energy systems
- future work/recommendations

Audience:
- World Bank project managers
- Public policy and decision makers
- Recycling/re use Practitioners
- Energy suppliers
• Key gaps in integrating recycling/reuse practices in developing countries?
• How instructive is experience of lead batteries for lithium and storage batteries?
• To what extent can recycling/re-use be incorporated in design of storage batteries?
• How critical is recycling/re-use in delivering 1.5c Paris goal and managing other impacts?
CONTACTS
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