IV. UPDATE ON WORKING GROUPS AND DISCUSSION

Jan 21, 2020

WORLD BANK GROUP
Energy & Extractives

ESMAP

ESP WORKING GROUPS

WORKING GROUP 1: POWER SYSTEMS

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)

Task	Progress
1. Produce a common **guide** for **safe operation** of energy storage systems	• Prepared draft outline of document summarizing standards and best practices on safe operation of BESS in developing countries. Feedback needed
2. Develop **cost-benefit valuation methods** and a catalogue of applications	• Collecting key documents/guidelines on cost benefit valuation (pending confirmation from partner)
3. Identify **warranties** that are suited for applications in **developing countries**	• Produced draft presentation with key aspects of energy storage warranties for developing countries

National Research Council Canada | Conseil national de recherches Canada | SAESA South African Energy Storage Association | WORLD BANK GROUP

WORKING GROUP 2: TESTBED

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)

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

masen

BERA Belgian Energy Research Alliance

CSIR our future through science

WORKING GROUP 3: TESTING PROTOCOLS AND VALIDATION OF PERFORMANCE

Objective: reduce performance uncertainty of energy storage systems in developing countries

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

Task	Progress
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

U.S. National Renewable Energy Laboratory – NREL

BERA Belgian Energy Research Alliance

THE FARADAY INSTITUTION

SAESA South African Energy Storage Association

NPL National Physical Laboratory

KBIA Korea Battery Industry Association

CNESA China Energy Storage Alliance

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

Working group Goals as stated last June

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

Key Products from Participants

- 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

WORKING GROUP 4: FLEXIBLE SECTOR COUPLING

Objective: better understand and analyze sector coupling opportunities enabled by energy storage

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

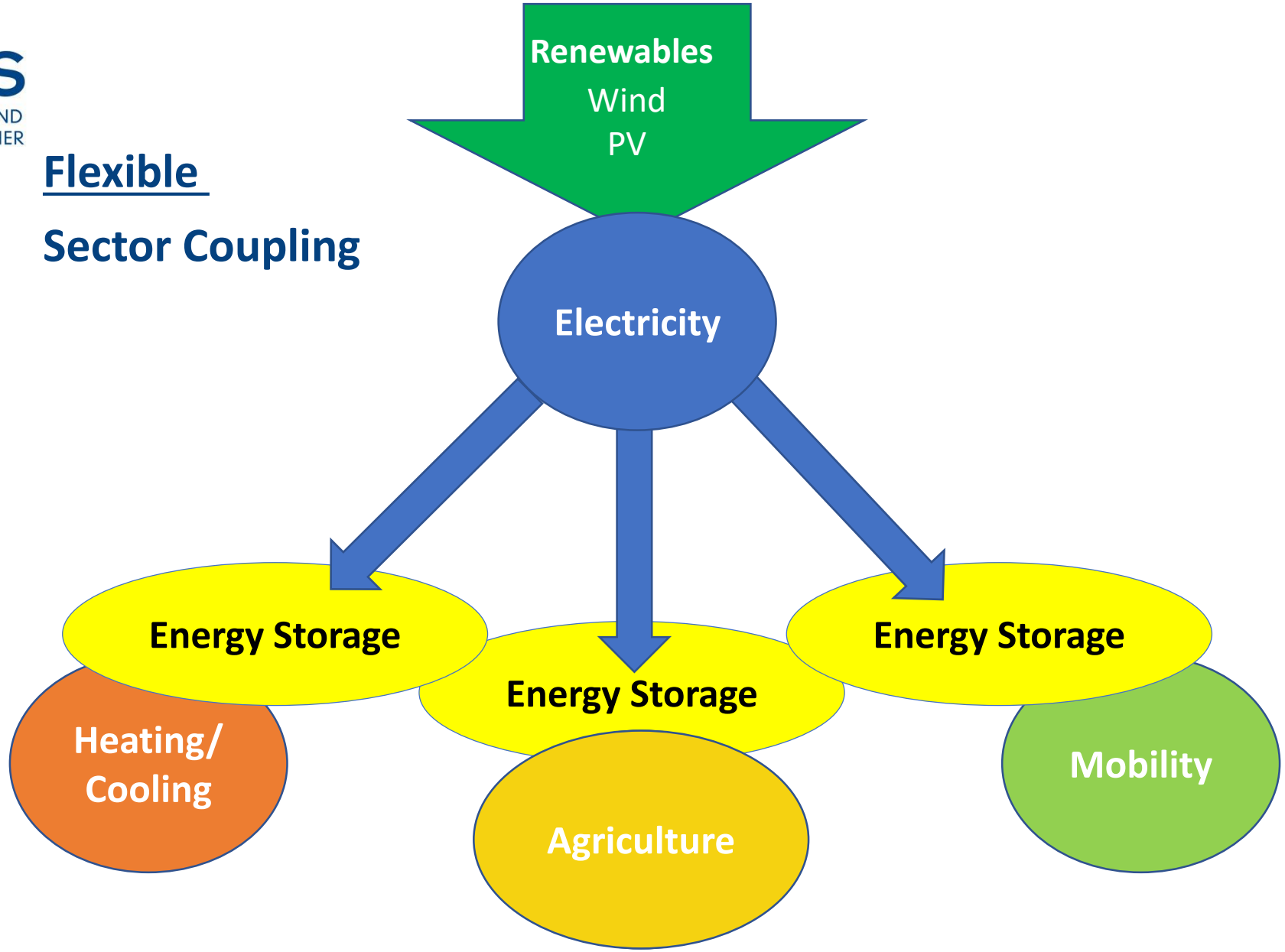
Task	Progress
1. Expand Annex 35 on **flexible sector coupling to developing countries**	• Defining a deliverable based on internal discussions with the group

BVES
BUNDESVERBAND
ENERGIESPEICHER

ZAE BAYERN
Bayerisches Zentrum
für Angewandte
Energieforschung

Flexible

Sector Coupling



CONFIGURATION RELATED STORAGE TECHNOLOGY SPECIFICATIONS

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

BVES BUNDESVERBAND ENERGIESPEICHER

	Autarcic Systems/ Island Solutions	Rural Structures/ Districts/Mini Grids	Central Structures/ Cities/Grid
Renewable Energy Source	PV / Wind Biomass Solarthermal	PV / Wind CSP / Biomass Solarthermal Geothermal	PV / Wind CSP / Geothermal
Energy Storage Technologies	EES / TES P2G P2F	EES / TES P2G P2F	EES
Demand/ Energy Consumption	Heating/ Cooling Mobility	Heating/ Cooling Mobility	All (supply from grid)

EES = Electrical Energy Storage, TES = Thermal Energy Storage, P2G = Power-to-Gas; P2F = Power-to-Fuel, CSP = Concentrated Solar Power

WORKING GROUP 5: DECENTRALIZED ENERGY STORAGE SOLUTIONS

Objective: support the design of mini-grid projects

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

Task	Progress
1. Develop new models for the role of storage in mini-grids that will be available in open course	tbd
2. Study on what type of battery is needed for different types of mini-grids depending on the load connected	• Drafting outline of the study • Secured funds and preparing desk review for mini-grids study

IESA India Energy Storage Alliance

Alliance for Rural Electrification

Loughborough University

WORLD BANK GROUP

WORKING GROUP 6: ENABLING POLICIES, REGULATIONS, AND PROCUREMENT

Objective: better understand best practices on policies, regulations and procurement for energy storage

WG Lead: World Bank (Zuzana Dobrotkova)

Task	Progress
1. Produce a paper identifying policies and regulations to enable energy storage	• **Paper on energy storage regulations and policies**: outline of high-level paper drafted (storage technology agnostic), inviting suggestions for case studies
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

WORKING GROUP 7: RECYCLING SYSTEMS AND STANDARDS

Objective: disseminate best practices recycling different battery technologies

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

Task	Progress
1. Identify most relevant technology attributes for environmental sustainability	• Preparing structure of the future report, methodology, and distribution of work • Collecting data and conduct literature review, including reports form WG members • Gathering insights through dialogue with different stakeholders, including the private sector
2. Take stock of current recycling practices	
3. Identify successful models for recycling systems	

中国化学与物理电源行业协会储能应用分会
Energy Storage Applications Branch of China Industrial Association of Power Sources

IESA India Energy Storage Alliance

KBIA Korea Battery Industry Association

GLOBAL BATTERY ALLIANCE

THE FARADAY INSTITUTION

NPL National Physical Laboratory

WORLD BANK GROUP

WG 7: DELIVERABLE

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

FEW KEY QUESTIONS

- Key gaps in integrating recycling/re use practices in developing countries?
- How instructive is experience of lead batteries for li ion 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

Heather Worley: hworley@worldbank.org

Fernando de Sisternes: fsisternes@worldbank.org

WORLD BANK GROUP
Energy & Extractives

ESMAP