JOINT PROGRAMMING EVENT AND PILOT MULTILATERAL MICALL19 WORKSHOP

SIDE EVENT AT THE FOURTH MISSION INNOVATION MINISTERIAL

Vancouver, May 27, 2019

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1 OVERVIEW

1.1 Background and Purpose

This side event to the Fourth Mission Innovation Ministerial brought together public funding partners from around the world to discuss opportunities for multilateral collaboration. Representatives of interested MI countries and their funding institutions came to meet and join the core group that has started to prepare the first Mission Innovation multilateral call (MICall19). This call for RDD projects will be launched in autumn 2019.

This event, as a first global gathering of the initiative for the MICall19, aimed to set the grounds for a learning environment to gain experiences on which further MI development and decisions can be based.

Opportunities were highlighted to close gaps in the innovation chain by connecting different networks and initiatives on a Joint Programming Platform (JPP). Furthermore, it provided first matchmaking possibilities among researchers, solution providers and need owners in cooperation with the Mission Innovation (MI) Innovation Challenges (IC).

Participants gained deep insights in the principles and expected outcome of Joint Programming Platforms as future prone innovative multilateral collaborative funding mechanisms facilitating global cooperation in RDD projects. This public-public-private partnership format enables the initiation and joint funding of applied, collaborative projects in the Research, Development and Innovation (RDI) world.

The discussed approach is based on the development and results of the Joint Programming Platform Smart Energy Systems (JPP SES). This initiative started in 2014, based on former experiences from the European ERA-Net Smart Grids initiative, in order to establish a sustainable multilateral collaboration platform for public funding programs. Starting with a group of European countries, the intention was from the beginning to expand activities beyond Europe at some point. For JPP SES, Mission Innovation is an ideal framework to take this next step and to develop a global collaboration platform for public funders. At the same time, MICall19 is an opportunity for Mission Innovation countries to jump on a successful ongoing activity, delivering quick results and gaining collective experience and learnings.

Parties interested in applying with a project for the MICall19 can register at the cooperation and networking platform and stay tuned for more information.

The entire recording of the MICall19 event can be watched online. You can download the presentation slides here. More information about JPP SES is available from www.eranet-smartenergysystems.eu.

1.2 Participants

Name	Institution	Country
Andren, Robert	Energimyndigheten	Sweden
Aredarski, Bartlomiej	Fraunhofer Institute IFF	Germany
Ayoub, Josef	Canmet Energy	Canada
Baeza, Tomás	CORFO - Comité Solar	Chile
Bahr Ljungdell, Josephine	Swedish Energy Agency	Sweden
Bajpai, Sanjay	Head Technology Mission Division	India
Barnholt Klepper, Karina	Nordic Energy Research	Norway
Bieser, Hemma	Avant Smart	Austria
Börner, Laura	B.A.U.M. Consult GmbH	Germany
Brunner, Helfried	AIT Austrian Institute of Technology GmbH	Austria
Clark, Morag	Scottish Enterprise	UK
de Nigris, Michele	RSE	Italy
de Sisternes, Fernando	World Bank	USA
Dekker, Roy	Ministry of Economic Affairs and Climate Policy	Netherlands
Drew, Christian	Dep. of Business, Energy an Industrial Strategy (BEIS)	UK
El Mrabet, Rachid	IRESEN	Morocco
Eklind, Jonas	Azelio	Sweden
Fessl, Thomas	Austrian Federal Economic Chamber	Austria
Fraser, Simon	AVL Fuel Cell Canada	Canada
Gahleitner, Bernhard	Austrian Institute of Technology	Austria
Girard, Francois	National Research Council Canada	Canada
Glenck, Emmanuel	FFG Austrian Research and Promotion Agency	Austria
Goding, Louise	Government Officer of Sweden	Sweden
Guldbrand, Lars	Ministry of Infrastructure	Sweden
Heinonen, Jarmo	Business Finland	Finland
Hernes, Birgit	The Research Council of Norway	Norway
Herold, Irmgard	Austrian Institute of Technology	Austria
Hoffmann, Mathias	Forschungszentrum Jülich GmbH	Germany
Hribernik, Wolfgang	Austria Institute of Technology	Austria
Hübner, Michael	Federal Ministry for Transport, Innovation and Technology	Austria
Ikken, Badr	IRESEN	Morocco
Jordan, Paul	Energysystems Catapult	UK
Lee, Euy-Joon	Korean Institute of Energy Research	Korea
Lei, Mingyu	Institute of Electrical Engineering, CAS	China
Madkour, Yehia	Perkins & Will	Canada
Magnuson, Ann	Uppsala University	Sweden
Mäkinen, Tuula	VTT Technical Research Centre of Finland	Finland
Mitter, Sabine	Federal Ministry for Transport, Innovation and Technology	Austria
Moryto, Theodore	Canadian Nuclear Laboratories	Canada
Myslikova, Zdenka	Tufts	USA
Nordström, Senja	Swedish Energy Agency	Sweden
O'Neil, Kathleen	Standing Wave Reformers Inc.	USA
Paula, Michael	Federal Ministry for Transport, Innovation and Technology	Austria
Quan, Grace	Hydrogen in Motion	Canada
Salokoski, Pia	Business Finland	Finland
Schädler, Ingolf	Federal Ministry for Transport, Innovation and Technology	Austria

Name	Institution	Country
Segerstam, Jan	Empower	Finland
Tjarks, Geert	NOW GmbH	Germany
Tuck, Adam	NRC	Canada
Vach, Peter	Federal Ministry for Economic Affairs and Energy	Germany
Vlajnic, Goran	CMC Research Institute	Canada
Vogel, Theresia	Managing Director, Climate and Energy Fund	Austria
Vuorelma, Maria	Swedish Energy Agency	Sweden
Wang, Yibo	Chinese Academy of Science	China
Wong, Steven	Canmet Energy	Canada
Yao, Yuanqing	Institute of Electrical Engineering, CAS	China
Zeicu, Margareta	Swedish Energy Agency	Sweden
Zhang, Jia	Institute of Electrical Engineering, CAS	China

2 PLENARY SESSION

In this session, the initiative's pilot multilateral call and first global Mission Innovation call for collaborative RDD projects (including research and industry), was pre-announced and the JPP model presented.

Opening panel (from left to right): Ingolf Schädler, Deputy Director General Innovation and Technology, Austrian Ministry of Transport, Innovation and Technology; Robert Andrén, Director-General, Swedish Energy Agency; Michael Hübner, Austrian Ministry of Transport, Innovation and Technology

The plan is to launch the call in September 2019. The vision of the initiative is to be able to present a prototype for a multilateral funding collaboration mechanism and a first set of jointly financed MI projects at MI#5 in Chile in Spring 2020. Processes and models of MICall19 can rely on existing structures which have been developed and refined within Joint Programming Platform ERA-Net Smart Energy Systems (JPP SES).

The multilateral funding concept will include a distinguished process for initiating, jointly financing and monitoring projects. Furthermore, it integrates a model for forming an active knowledge community of families of projects, together with associated partners from regional business clusters, need owners and technology adopters. With the associated partner model, the platform the existing JPP SES has also started to develop a mechanism to involve additional funds and financers in order to help closing the gap from research and development towards market introduction.

Representatives from Morocco, Austria, India, Sweden, Germany and China, just having committed to form a core group to prepare the first multilateral call for RDD projects within the framework of Mission Innovation (MICall19)

2.1 Governance Panels

Representatives of each country present could communicate their approaches and expectations towards a collaboration within MICall19.

Governance panel 1 (from top left to bottom right): Sanjay Bajpai, Head Technology Mission Division, Energy, Water & All others, Government of India; Peter Vach, Policy Officer, German Federal Ministry for Economic Affairs and Energy; Yibo Wang, Chinese Academy Of Science; Aziz Rabbah, Minister of Energy, Mines and Sustainable Development, Morocco

Governance panel 2 (from top left to bottom right): Theresia Vogel, Managing Director, Climate and Energy Fund of the Austrian Federal Government; Josephine Bahr Ljungdell, Director of Int. Affairs, Swedish Energy Agency; Adam Tuck, National Research Council Canada; Rachid El Mrabet, IRESEN, Morocco; Seth Schultz, Urban Breakthroughs, Global Covenant of Mayors on Science & Innovation; Morag Clark, Scottish Enterprise, JPP Smart Energy Systems Coordination Team

2.2 Stakeholder Panel

A varied group of stakeholders were invited to share their perspective.

Participants of the Stakeholder Panel (from left to right: Moderator Ludwig Karg, B.A.U.M.; Christian Holter, Solid GmbH (Austria); Yehia Madkour, LEED AP BD+C (Canada); Tuula Mäkinen, Vice President, VTT Technical Research Centre of Finland Ltd (Finland); Jan Segerstam, Empower IM Oy (Finland); Jonas Eklind, CEO and president Azelio AB (Sweden)

3 CO-CREATION AND MATCHMAKING WORKSHOP

In preparation of the multilateral call, this co-creation session invited representatives of need owners such as communities or infrastructure operators to voice their needs and requirements for future energy technology from a user perspective. The workshop offered the opportunity of a first matchmaking for MI-IC participants and stakeholders from industry and research, representatives of interested MI countries and their funding institutions.

3.1 Format

At 6 tables organized around the Innovation Challenges of Mission Innovation, moderated groups started creating ideas for multilateral projects related to the respective IC and considering the user needs.:

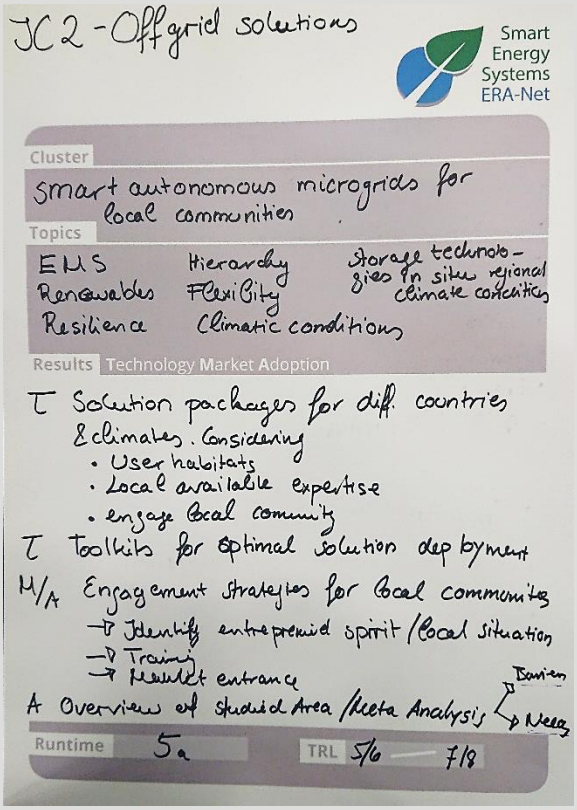
- IC1– Smart Grids
  Chair: Lucciano Martini, RSE Italy and Yibo Wang, Chinese Academy Of Science,
  Co-moderator: Helfried Brunner, Austrian Institute of Technology
- IC2 – Offgrid Solutions
  Moderator: Laura Boerner, JPP SES Knowledge Community
- IC5 – Converting Sunlight
  Chair: Peter Vach, Policy Officer, Federal Ministry for Economic Affairs and Energy,
  Co-moderator: Rachid El Mrabet, IRESEN - Institut de Recherche en Énergie Solaire et Énergies Nouvelles, Morocco
- IC6 – Clean Energy Materials
  Moderator: Morag Clark, Scottish Enterprise
- IC7 – Heating and Cooling of Buildings
  Chair: Emina Pasic, Swedish Energy Agency;
  Co-moderator: Hemma Bieser, avantsmart
- IC8 – Renewable and Clean Hydrogen
  Chair: Geert Tjarks, NOW GmbH;
  Co-moderator: Elvira Lutter, Austrian Climate and Energy Fund

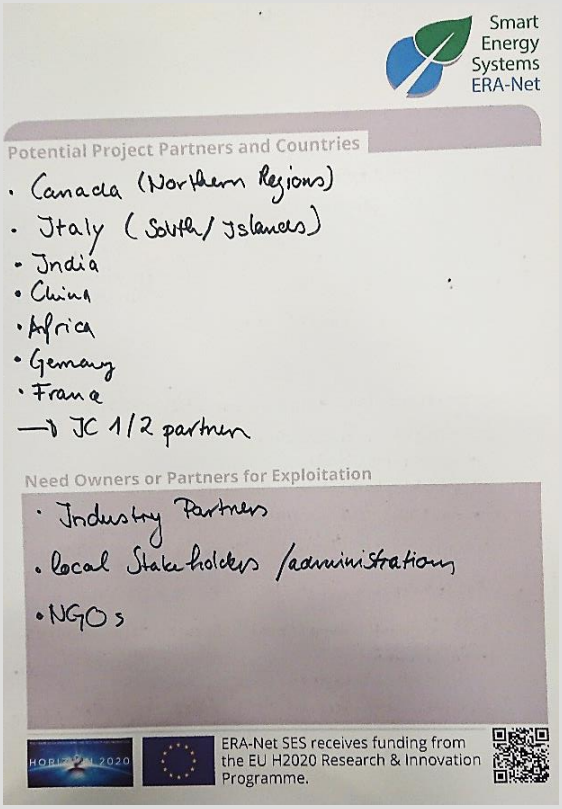
Further project ideas have been elaborated in sub-sequent bilateral meetings of various stakeholders (see chap. 0)

3.2 Project Ideas

The following project ideas have been sketched throughout the co-creation sessions.

Project idea
Cluster: Smart autonomous microgrids for local communities Runtime: 5 years TRL: 5/6 – 7/8

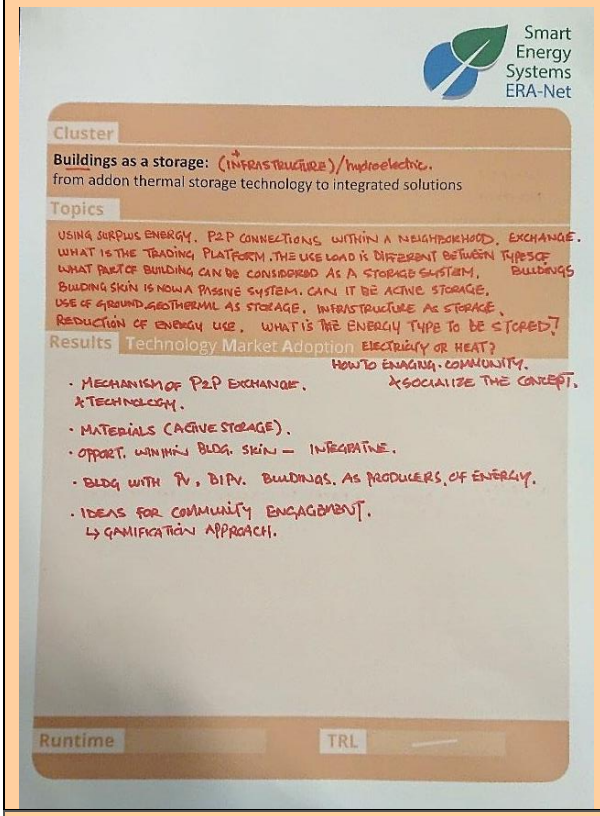


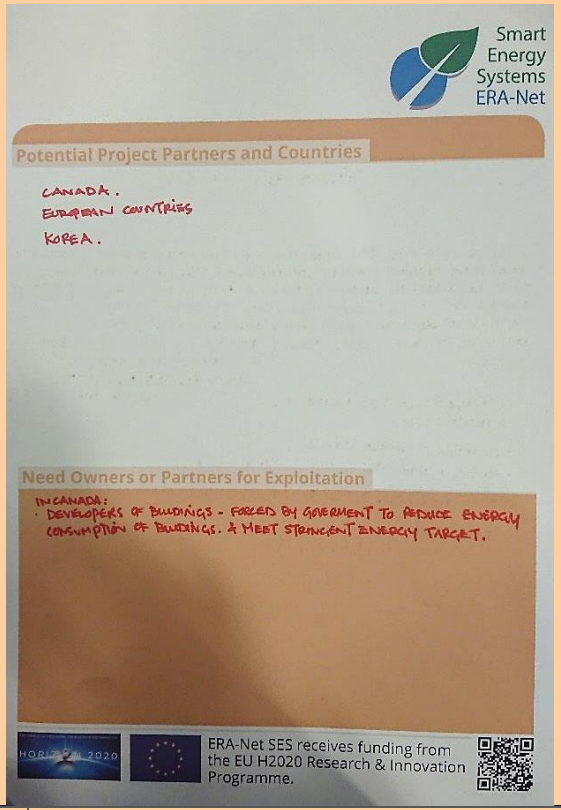


Topics	**Potential Project Partners and Countries**
• EMS • Renewables • Resilience • Hierarchy • Flexibility • Climatic conditions • Storage technologies in situ regional climate conditions	• Canada (Northern regions) • Italy (South/ Islands) • India • China • Africa • Germany • France -> IC 1&2 partners
Results	**Need Owners or Partners for Exploitation**
<u>Technology</u> • Solution packages for different countries & climates considering • User habitats • Local available expertise • Engage local community • Toolkits for optimal solutions deployment	• Industry partners • Local stakeholders/ administration • NGOs

Market and Adoption • Engagement strategies for local communities • Identify entrepreneurial spirit/ local situation • Training • Market entrance Adoption • Overview of studied area/ meta-analysis • Barriers • Needs	

Project idea
Cluster: Buildings as a storage Runtime: TRL:



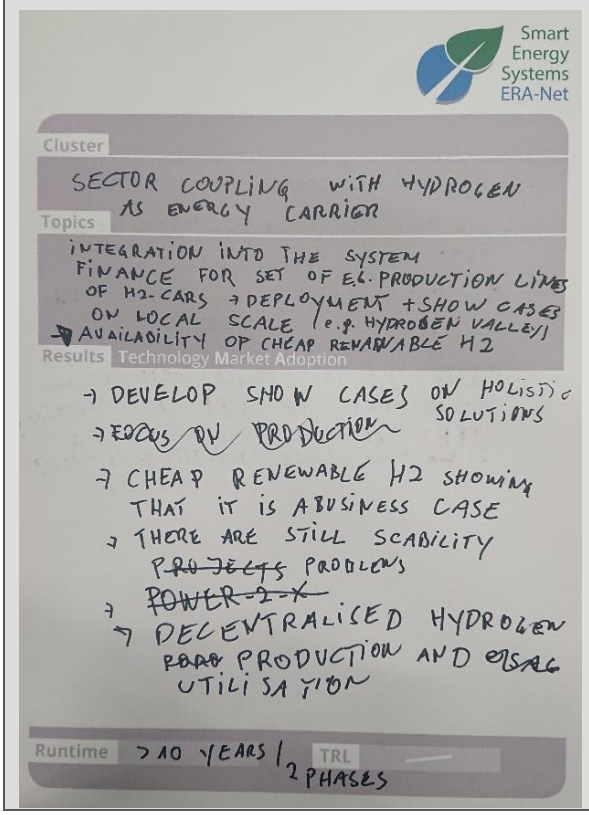


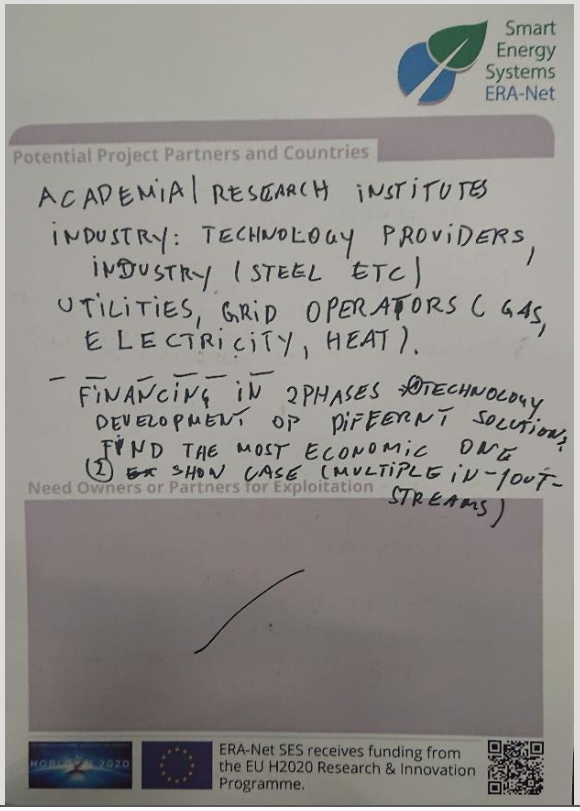
Topics	**Potential Project Partners and Countries**
• Using surplus energy • P2P connections within neighbourhood • Exchange • What is the trading platform? • The use load is different between types of buildings • What part of building can be considered as a storage system?	• Canada • European countries • Korea

Topics	Potential Project Partners and Countries
• Building skin is now a passive system • Can it be active storage? • Use of ground geothermal as storage • Infrastructure as storage • Reduction of energy use • What is the energy type to be stored? Electricity or heat? • How to engage community? • Socialize the concept	
Results	**Need Owners or Partners for Exploitation**
• Mechanisms of P2P exchange • Technology • Materials (active storage) • Opportunity within building skin- integrative • Building with PV, BIPV, buildings as producers of energy • Ideas for community engagement: gamification approach	In Canada: • Developers of buildings- forced by government to reduce energy consumption of buildings and meet stringent energy target

Project idea

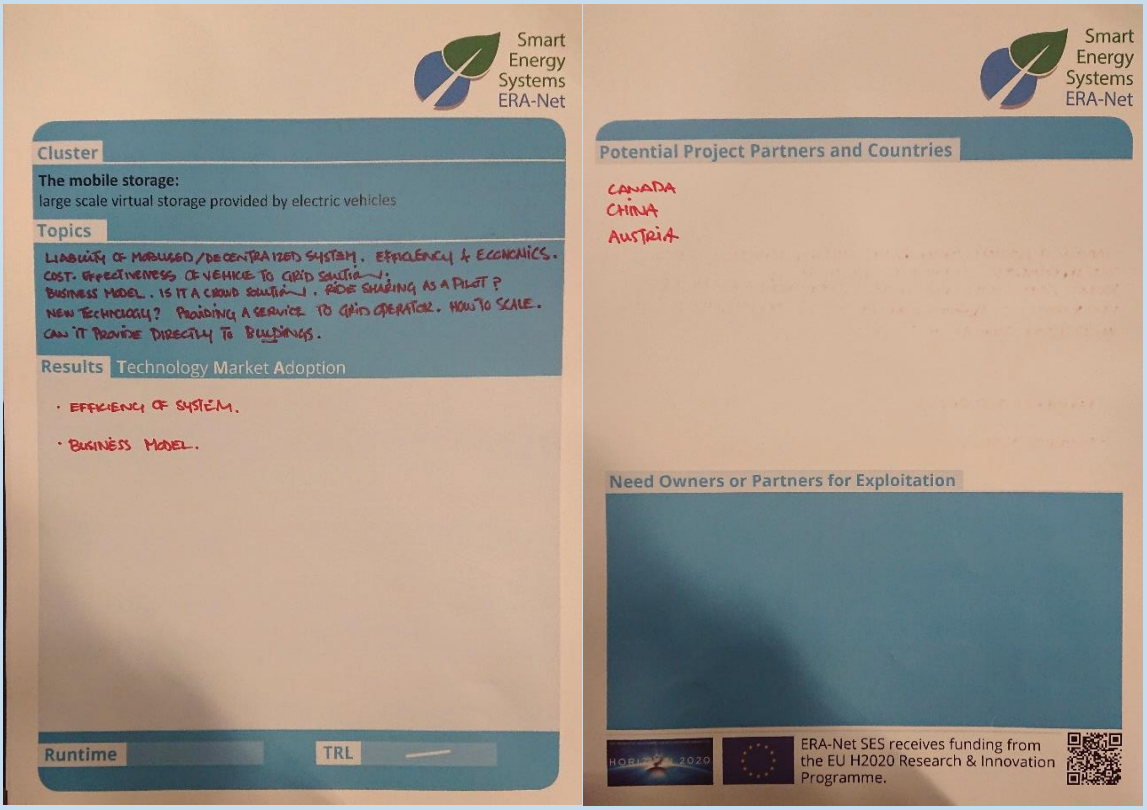
Cluster: Sector coupling with hydrogen as energy carrier
Runtime: > 10 years, 2 phases
TRL:





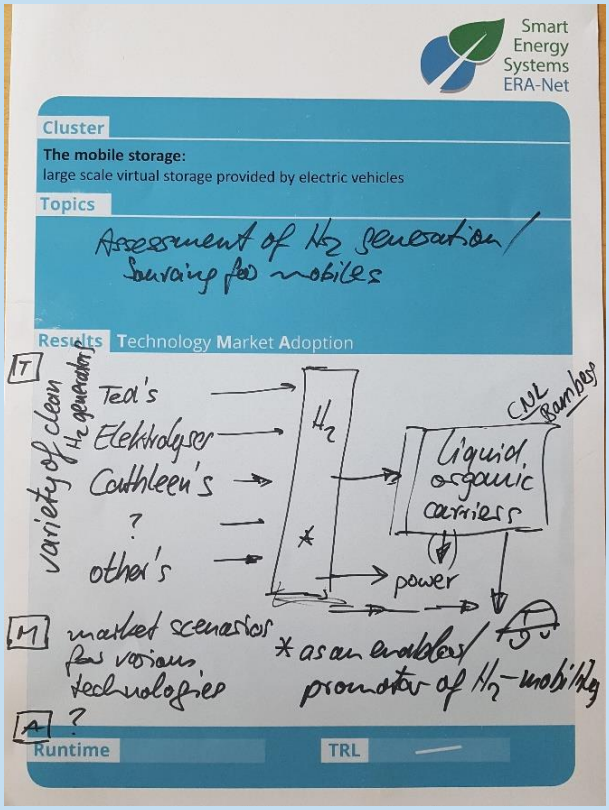
Topics	Potential Project Partners and Countries
• Integration into the system • Finance for set of e.g. production lines of H_2 cars -> deployment + show cases on local scale (e.g. hydrogen valley) • Availability of cheap renewable H_2	• Academia, research institutions • Industry: technology providers, steel etc • Utilities, grid operators (gas, electricity, heat) • Financing in 2 phases • Technology development of different solutions • Find the most economic DNE • Show case (multiple in / out-streams)
Results	**Need Owners or Partners for Exploitation**
• Develop show cases on holistic solutions • Cheap renewable H_2 showing that it is a business case • There are still scalability problems • Decentralized hydrogen production and utilisation	

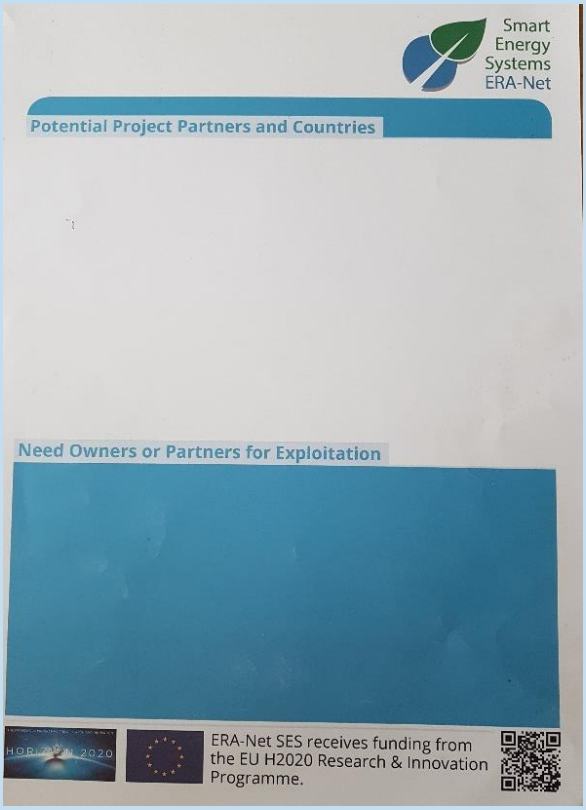
Project idea
Cluster: The mobile storage: large scale virtual storage provided by electric vehicles Runtime: TRL:



Topics	Potential Project Partners and Countries
• Liability of mobilised/ decentralised system • Efficiency and economics • Cost-effectiveness of vehicle to grid solution • Business model • Is it a crowd solution? • Ride-sharing as a pilot? • New technology? • Providing service to grid-operator • How to scale? • Can it provide directly to buildings?	• Canada • China • Austria
Results	**Need Owners or Partners for Exploitation**
• Efficiency of system • Business model	

Project idea
Cluster: The mobile storage: large scale virtual storage provided by electric vehicles Runtime: TRL:

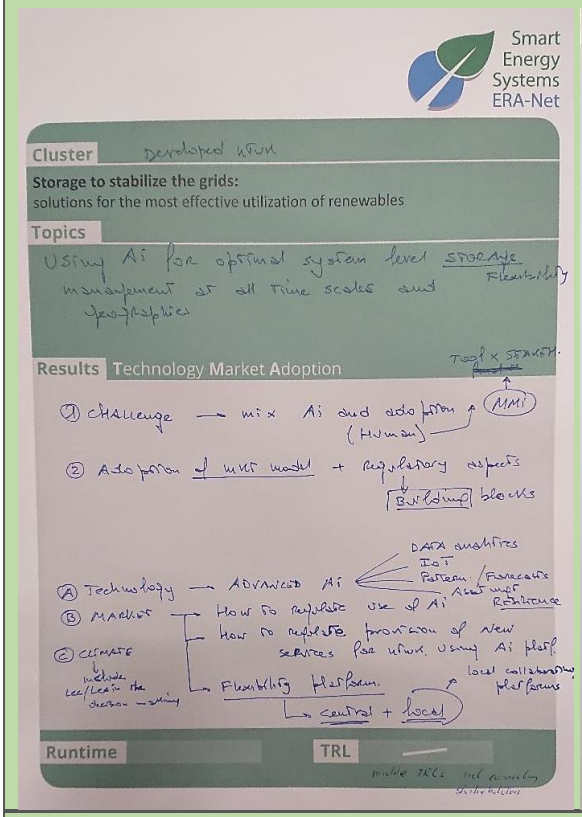


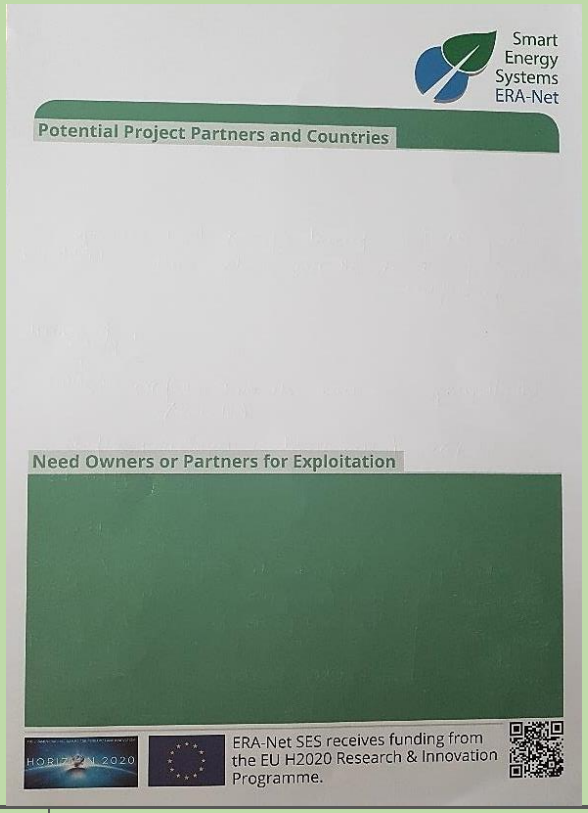


Topics	Potential Project Partners and Countries
• Assessment of H_2 generation/ saving for mobiles	
Results	**Need Owners or Partners for Exploitation**

• Variety of clean H_2 generators
  ○ Ted's
  ○ Electrolyses
  ○ Cathleen's
  ○ Other's
• H_2 as enabler/ promotor of H_2 mobility
• H_2 as liquid organic carrier
• Market scenario for various technologies	

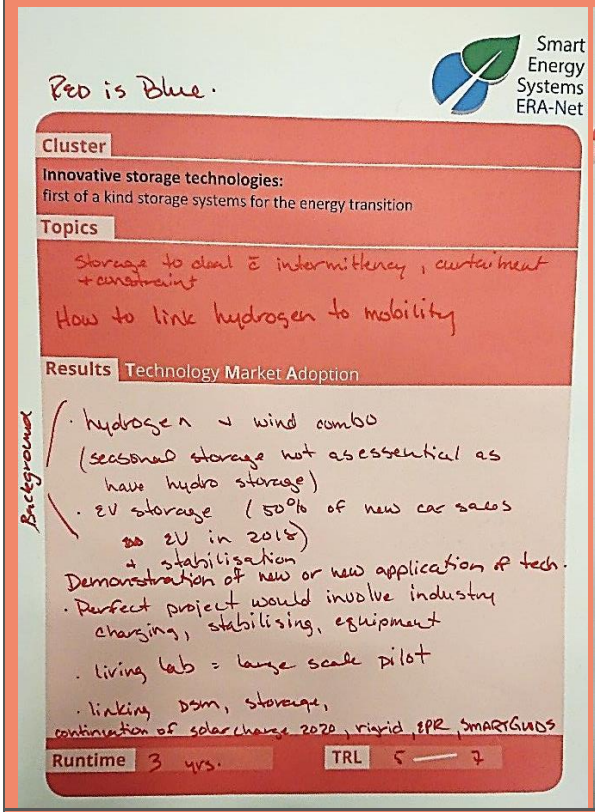
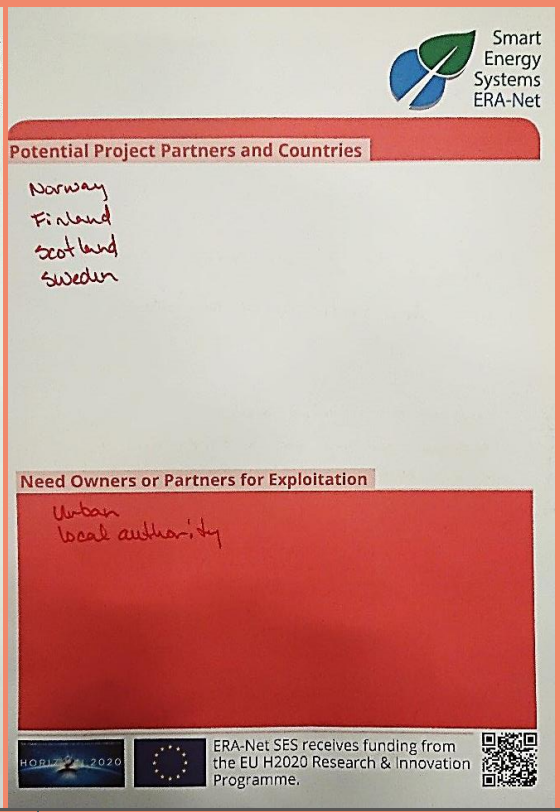
Project idea
Cluster: Storage to stabilize the grids Runtime: 5 years TRL: middle TRL including connecting stakeholders



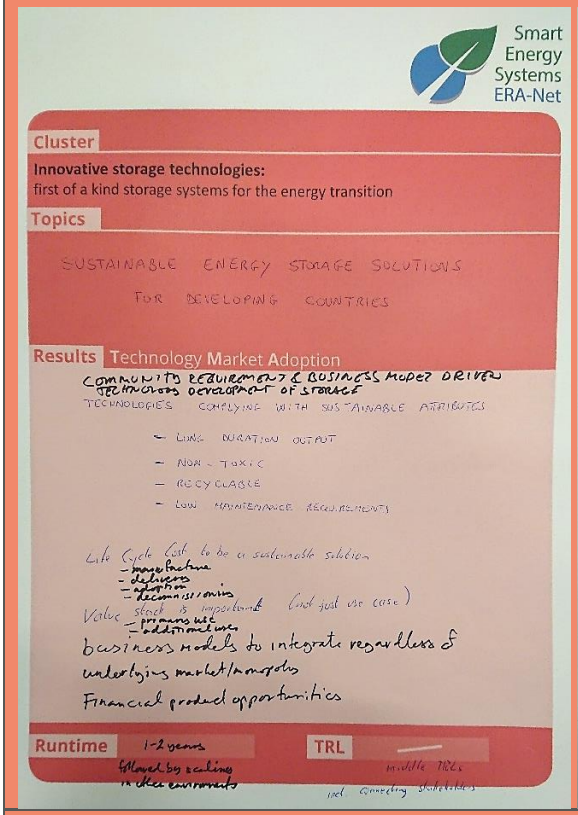
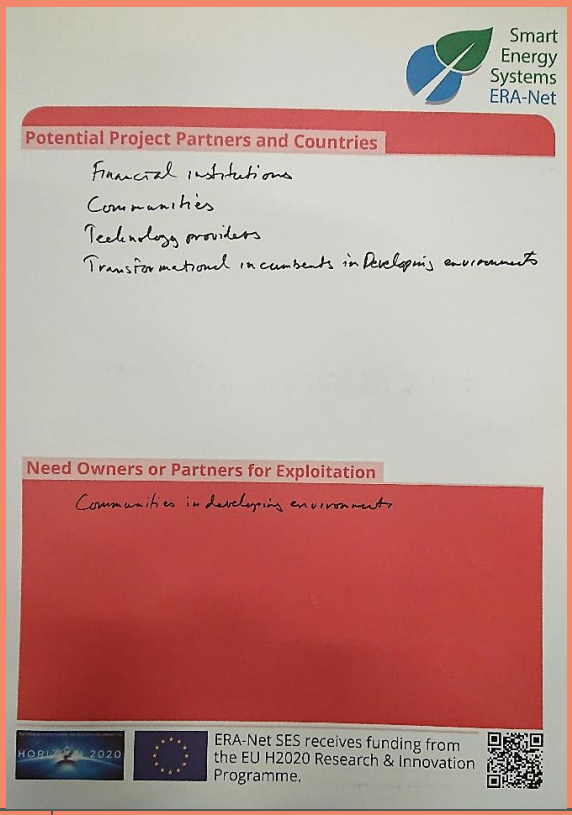


Topics	Potential Project Partners and Countries
• Using AI for optimal system level storage flexibility management at all time scales and geographies	
Results	**Need Owners or Partners for Exploitation**
• Challenge: mix AI and human intelligence • Adoption of [market] model + regulatory aspects -> building blocks	

(A) Technology-> advanced AI: data analytics, IoT, pattern/ forecasts, asset [manager], resilience (B) Market: • how to regulate use of AI • how to regulate provision of new services for [network] using AI platform • flexibility platform: central and local -> local collaborating platforms (C) Climate: include LEC/LEA in the decision making	

Project idea	
Cluster: Innovative Storage Technologies (first of a kind storage system for energy transition) Runtime: 3 years TRL: 5 – 7	
	
Topics	**Potential Project Partners and Countries**
• Storage to del E intermittency, curtailment + constraint • How to link hydrogen to mobility	• Norway • Finland • Scotland • Sweden
Results	**Need Owners or Partners for Exploitation**
• Background • Hydrogen + wind combined (seasonal storage not as essential as have hydro storage)	• Urban • Local authority

• EV storage (50% of new car sales EV in 2018) + stabilization • Demonstration of new or new application of tech. • Perfect project would involve industry charging, stabilising, equipment • Living lab: large scale pilot • Linking DSM, storage • Continuation of Solarcharge 2020, RIGRID, EPR, SmartGuide	

Project idea	
Cluster: Innovative Storage Technologies (first of a kind storage system for energy transition) Runtime: 1-2 years TRL: middle TRLs, incl. connecting stakeholders	
	
Topics	**Potential Project Partners and Countries**
• Sustainable energy storage solutions for developing countries	• Financial institutions • Communities • Technology providers • Transformational incumbents in developing environments
Results	**Need Owners or Partners for Exploitation**
• Community requirement & business model driver technology development of storage	• Communities in developing environments

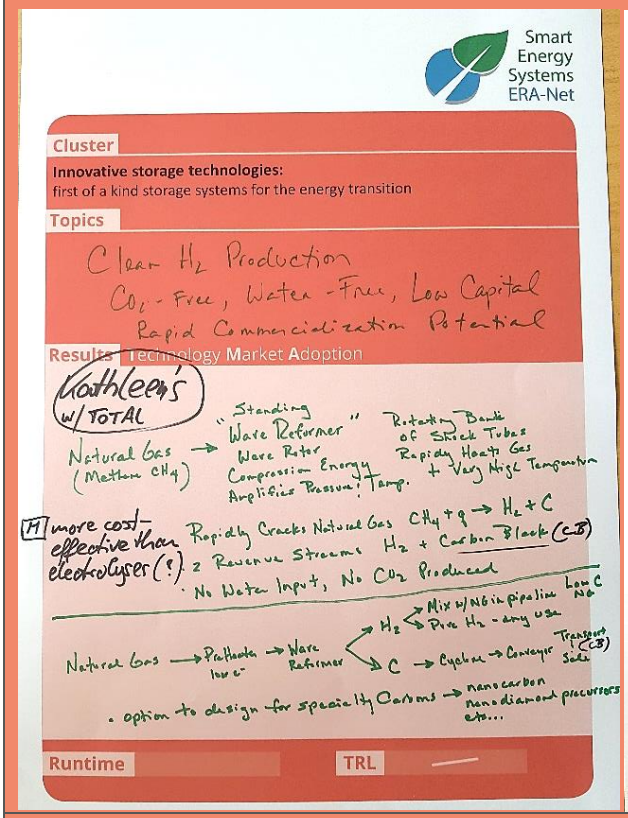
• Technologies complying with sustainable attributes • Long duration output • Non-toxic • Recyclable • Low maintenance requirement • Life-cycle cost to be a sustainable solution • Manufacture • Delivery • Adoption • Decommissions • Value stock is important (not just use case) • Primary use • Additional use • Business model to integrate regardless of underlying market /monopoly • Financial product opportunities	

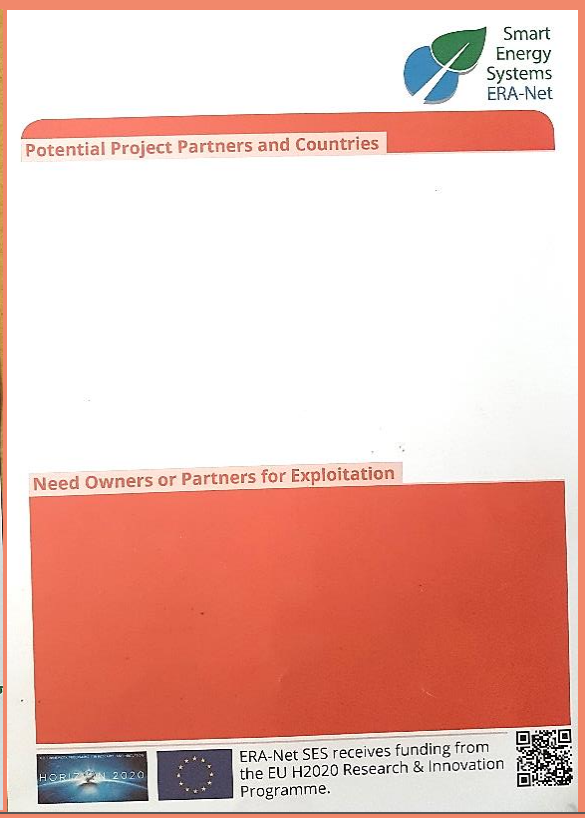
4 WORKING MEETING FOR FUNDING PARTNERS AND BILATERAL MATCHMAKING FOR STAKEHOLDERS

Research needs and further project ideas on storage for smart and sustainable energy systems have been developed in an interactive workshop.

Project idea

Cluster: Innovative Storage Technologies (first of a kind storage system for energy transition)
Runtime: x
TRL: x

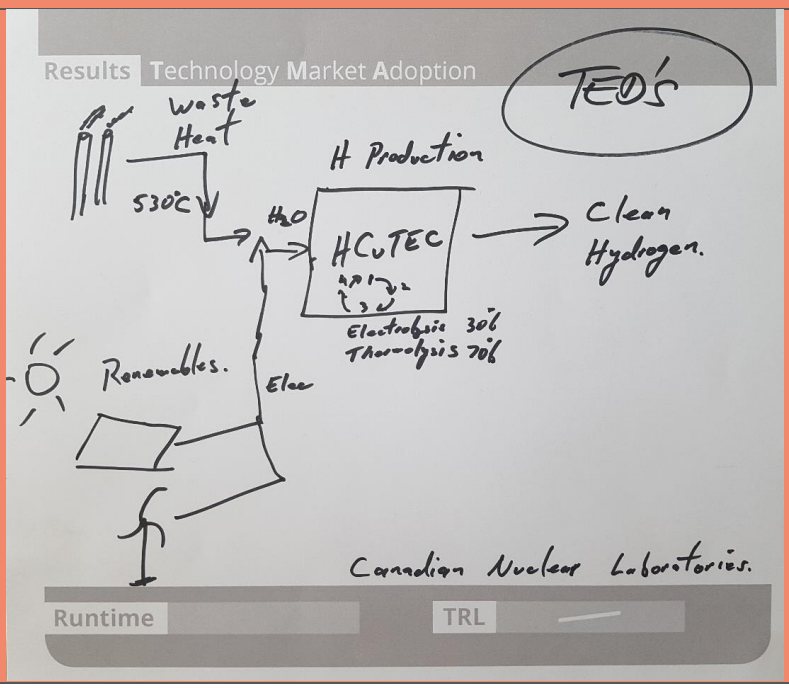




Topics	Potential Project Partners and Countries
• Clean H_2 production • CO_2 free, water-free, low capital • Rapid commercialisation potential	
Results	**Need Owners or Partners for Exploitation**
• Natural gas (Methan CH_4) -> “standing wave re-former”, wave rotor, compression energy, ampli-fies pressure, Temp. -> rotating bank of shock tubes, rapidly heats gas + very high temperature • Rapidly cracks natural gas: $CH_4 + q$ -> $H_2 + C$ • 2 revenue streams: H_2 + Carbon Black (CB) • No water input, no CO_2 produced • Natural gas -> pre-heater -> wave reformer → H_2	

• mix w/ NG in pipeline, low C NG • pure H2 - any use → C -> cyclone-> conveyor transport… sale (CB) • Option to design for specialty carbons: nanocarbon, nanodiamond precursors etc.	

Project idea	
Cluster:	Innovative Storage Technologies (first of a kind storage system for energy transition)
Runtime:	x
TRL:	x



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ERA-NET SES REGSYS FUNDING PARTNERS

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