#IRENAinnovation

IRENA
International Renewable Energy Agency

IRENA INNOVATION WEEK

The Age of Renewable Power

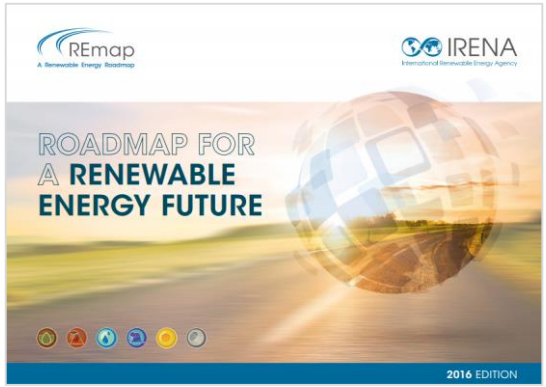
DEEPDIVE SEESIONS:
Energy Storage and Electric Vehicles
11:00-13:00, Thursday 12 May

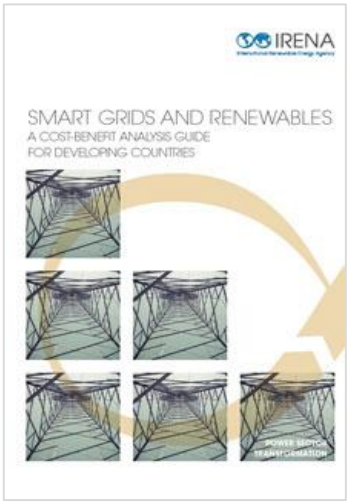
11 – 13 MAY 2016 • BONN, GERMANY

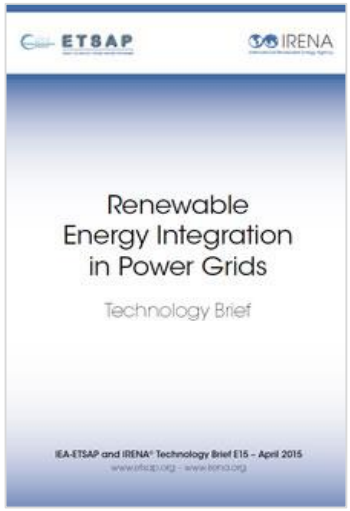
1 Introduction Energy Storage & Electric Vehicles

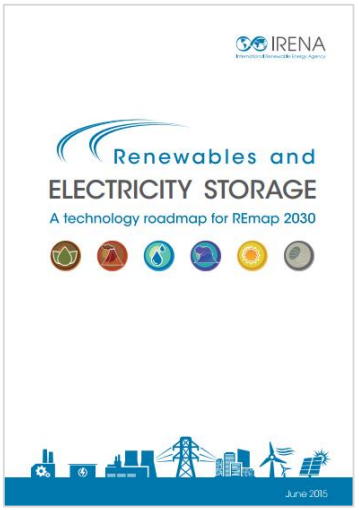
IRENA Activities in Energy Storage and EV

- Some insights from ongoing projects
  - REmap – Roadmap for a renewable energy future
  - REmap Transport Action Team
  - Regional action plan on RE mini-grids
  - Trainings on Grid Integration
  - Outlook report for heating and cooling energy storage
  - Small Island Developing States' (SIDS) Lighthouses
  - Global Renewable Energy Islands Networks (GREIN)
  - Technology briefs Publications
  - Power system transformation and impacts of storage





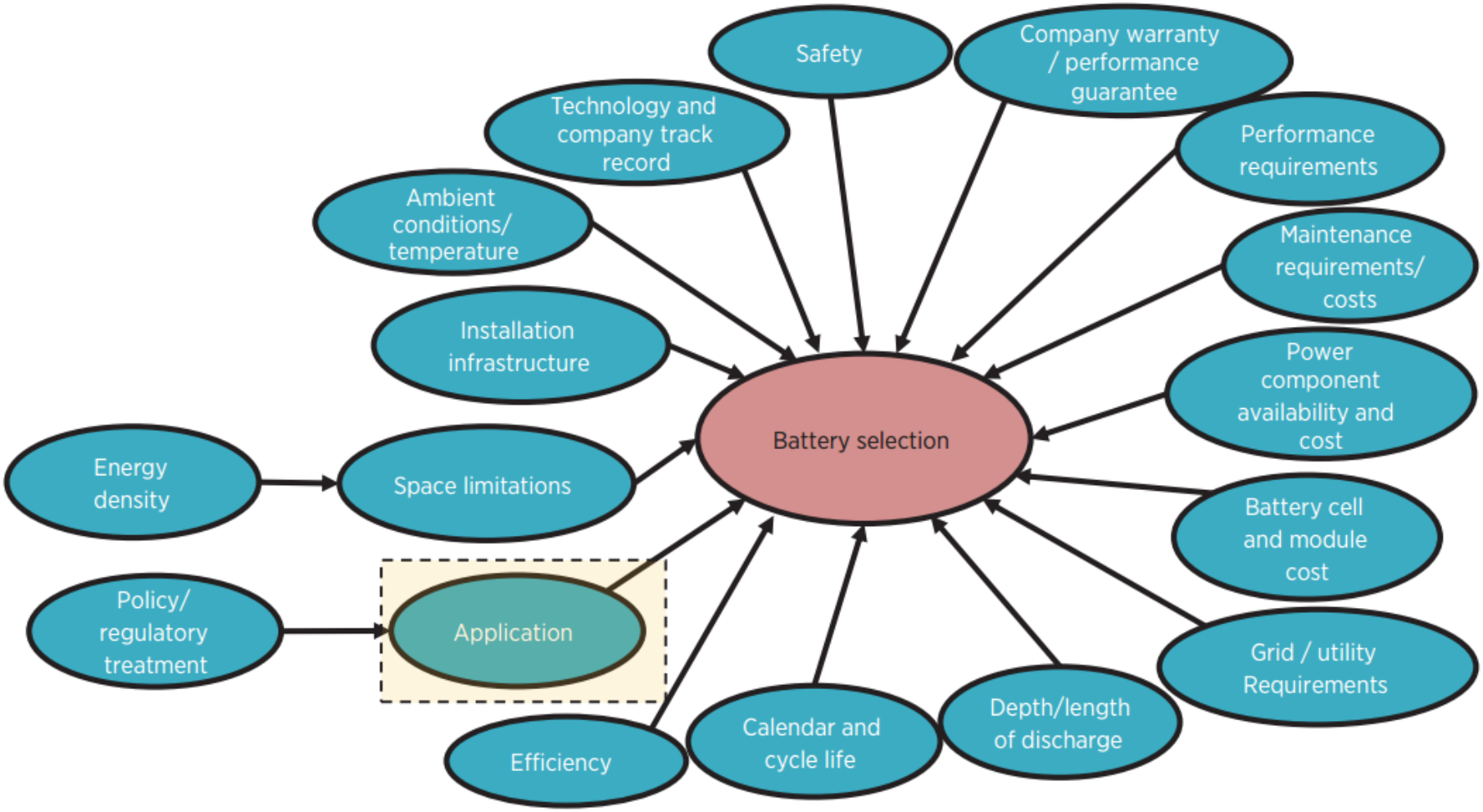




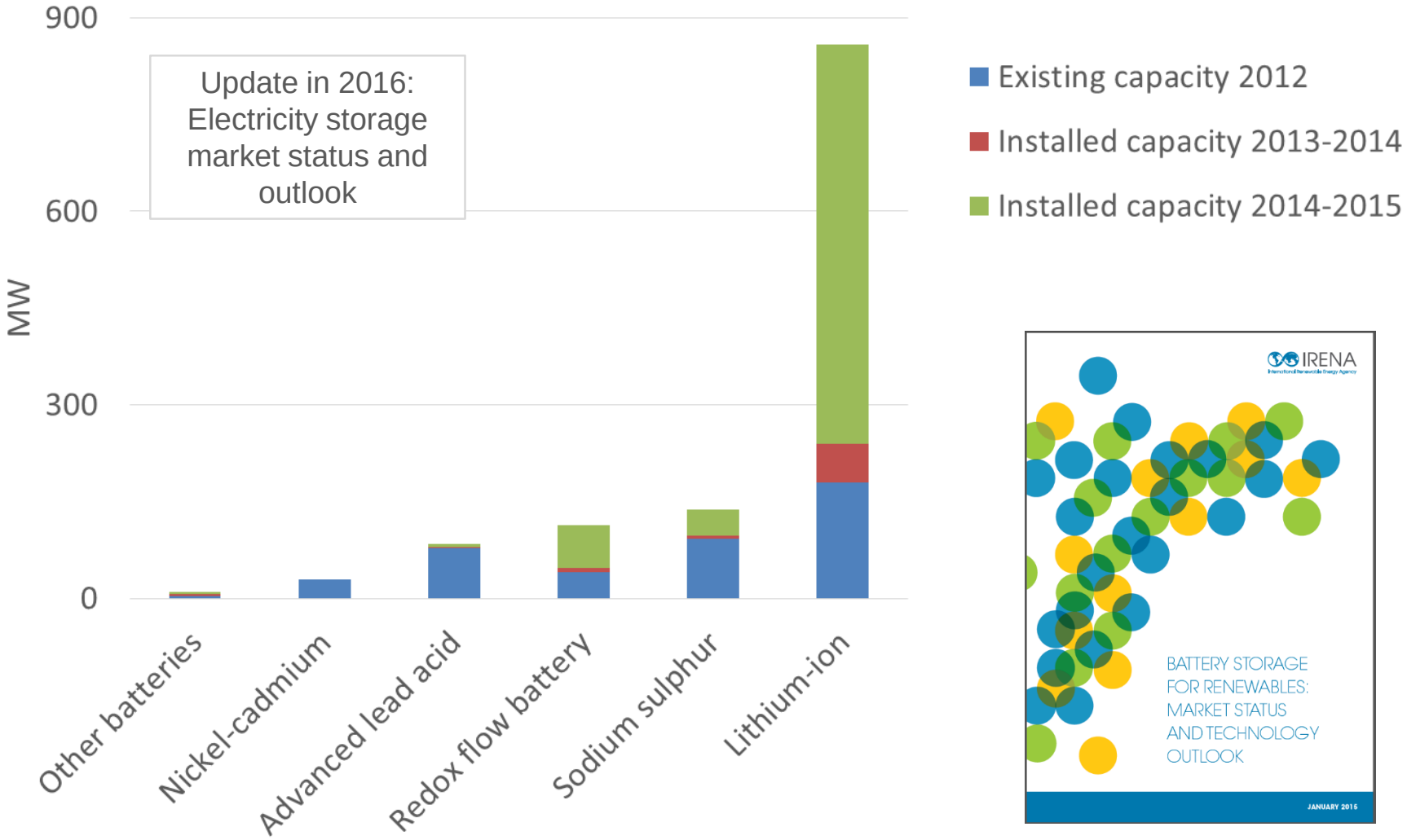
Electricity storage technologies

Principle	Subcategory	Technology
Mechanical		Pumped hydro / Compressed air (CAES) / Flywheels
Chemical		Hydrogen
Electro-chemical	Conventional	(Advanced) Lead acid / Nickel Cadmium (NiCad)/ Lithium ion (Li-ion)
	High temperature	Sodium Sulphur (NaS) / Nickel / Aluminiumchloride
	Flow batteries	Vanadium Redox (VRB) /Zinc Bromine (ZnBr)
	Metal air	Zinc / Aluminium / Lithium / Iron
Electric field		Supercapacitors
Magnetic		Superconducting magnetic coils
Thermal		Molten Salt /Cement

Considerations for Battery Selection



Latest Deployment Data for Stationary Battery



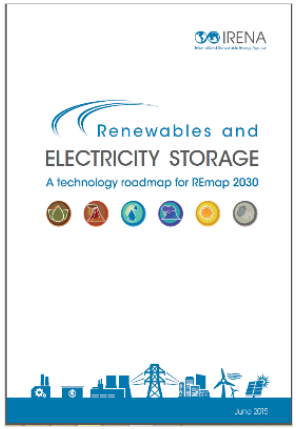
Electricity Storage Roadmap Structure

SYSTEM ANALYSIS FOR STORAGE

•Engage and guide policy makers

•Provide systemic economic assessment models

•Support system analysis of electricity/heat/fuel/ productive uses as storage options



STORAGE IN ISLANDS AND REMOTE AREAS

- Facilitate financing
- Create local value chains
- Develop a global database with practical example
- Guide policy makers to the required tools

CONSUMER-LOCATED STORAGE

- Comparative information sheets and labelling
- Accelerate standards on safety and recycling
- (Data) ownership and liability regulation

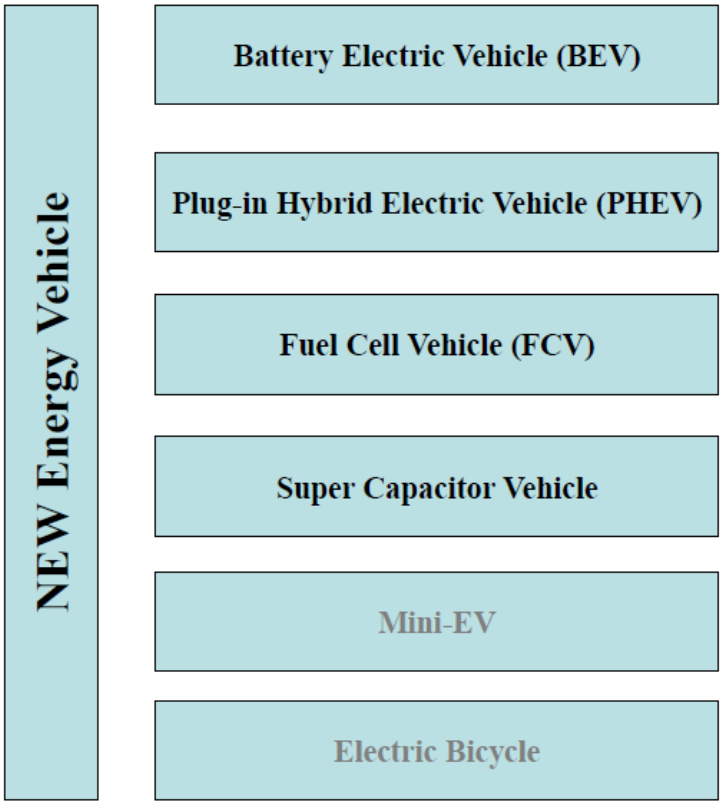
GENERATOR-LOCATED STORAGE

- Support the development of innovative regulation
- Support for localised/distributed systems

GRID-LOCATED STORAGE (TRANSM. & DISTR.)

- Pumped hydro and compressed air energy storage (CAES) analysis
- Demonstration projects for new business models

Electric Vehicles Technologies



- BEVs → electric motor and battery, ~160 km
- PHEVs →ICE, electric motor and battery, ~15 – 60 km
- FCVs → fuel cell and electric drivetrain
- Currently sales are concentrated in locations with strong incentives: West Coast US, Northern Europe, Japan & China

Source: (China National Renewable Energy Center / Energy Research Institute National Development and Reform Commission (NDRC) , 2015), (Institute of Transportation Studies, University of California, 2014) & (Energy Pathways (STEPS), UC Davis, 2015)

Electric Vehicles Outlook

- Electric Vehicles are still in their early potential (REmap)
  - Transport is the sector with the smallest share of renewables ~3%

In reference case:
RE share will rise to 5%

With Remap options:
RE share increase to 11%

	Units	2013/ 2014	Reference Case	REmap	Doubling
TRANSPORT					
Electric Vehicles	million vehicles	0.8	60	160	173
- Passenger vehicles	million vehicles	*0.8*	*59*	*158*	*158*
- Buses	million vehicles	*0.01*	*0.5*	*1.4*	*11*
- Light duty vehicles	million vehicles	*0.004*	*0.3*	*0.9*	*5*

  - EVs will grow significantly, from ~0.5 to ~10 million (10% of world fleet)

- REmap Transport Action Team – expert network (email REmap@irena.org if interested)
- REmap Transport Sector Working Paper (forthcoming)

Source: (Roadmap for a Renewable Energy Future, 2016)

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Invited Speakers

Deepdive Session Structure

Topics	Speaker
Innovation in energy storage for renewables integration	Yoshiaki Shibata, IEEJ
Innovation in electric vehicle technologies	Guy Fournier, Pforzheim University
Electric vehicles for renewable energy integration	Bert Witkamp, AVERE
Electric vehicles in China: Technological development and policy priorities	Qunhong Shen, Tsinghua University
Contrasting technology pathways and policies for electric mobility in Europe and Asia	Tilman Altenburg, DIE

3 Questions & Answers

Guiding questions for the discussion (1/2)

- What are the priority innovation needs in which researchers should focus to close main technological gaps in:
  - Costs
  - Performance
  - Infrastructure
  - Storage usage for RE integration
  - Software and control systems

- Which ones of these innovations can be expected to be commercialized in the next 15 years? And in the next 30 years?

Guiding questions for the discussion (2/2)

- What will be the implications for energy and transport systems in 2030 and beyond?
- What kind of regulatory changes and policies are appropriate to accelerate the development and deployment of energy storage and electric vehicle technologies?
- Where (sectors/applications/countries) could we expect these innovations to emerge?

Thank you

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