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Battery storage cost reduction potentials & market outlook to 2030

IRENA COSTS
Renewable Energy Costs, Technologies and Markets

Power systems

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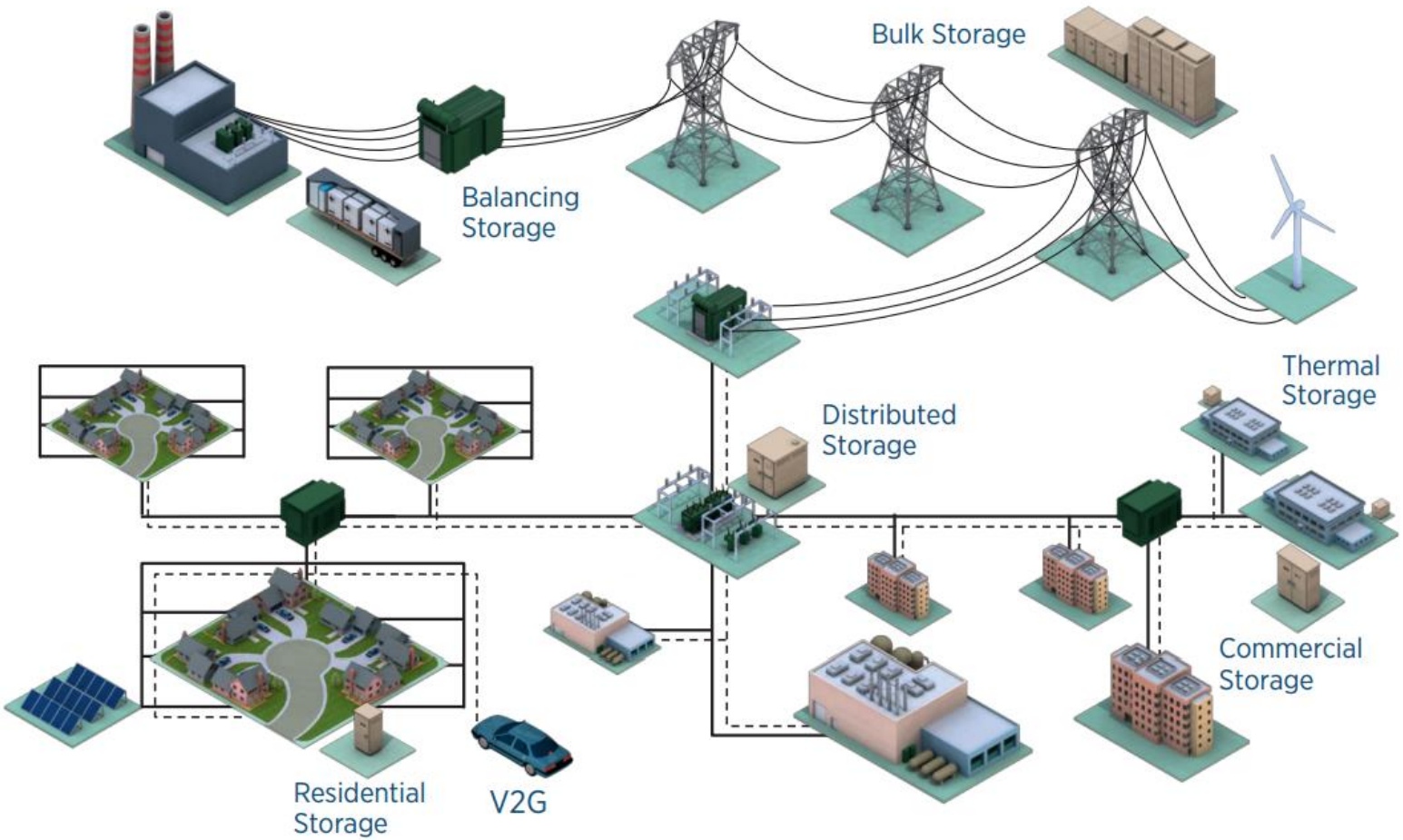
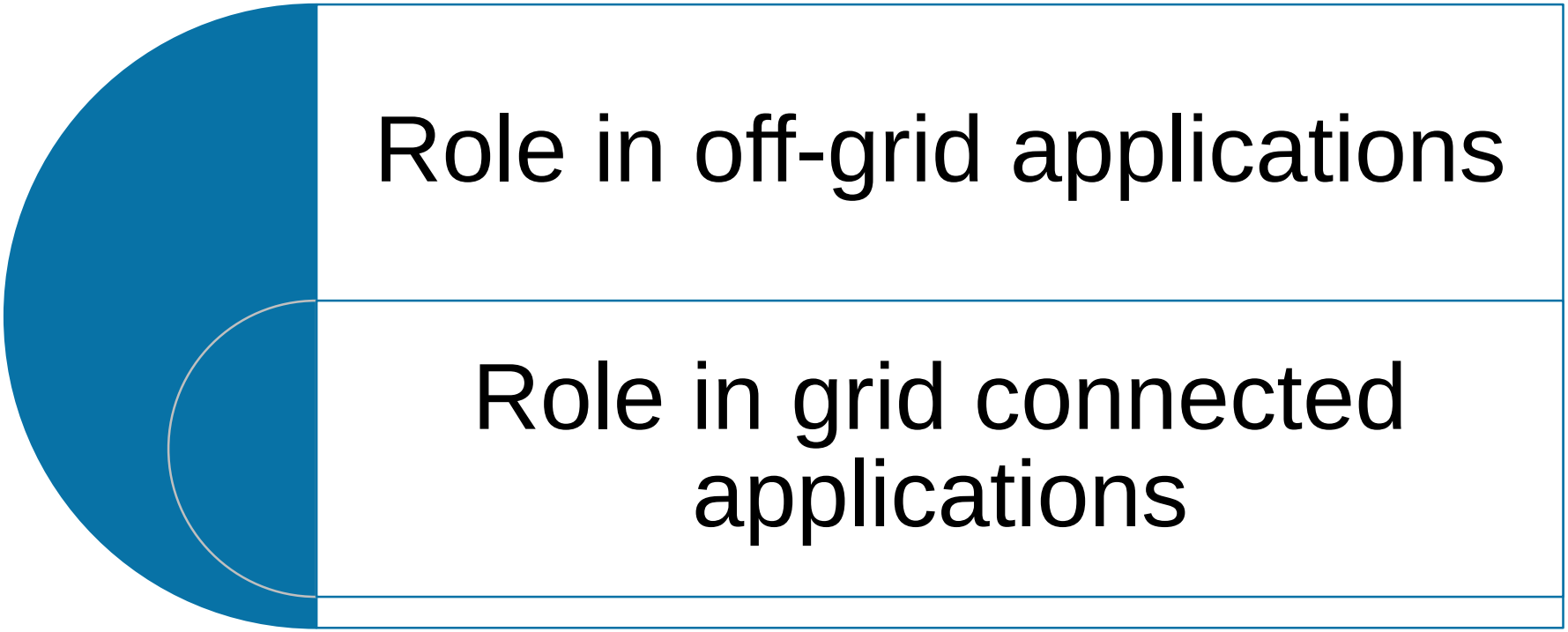
Potential locations and applications of electricity storage

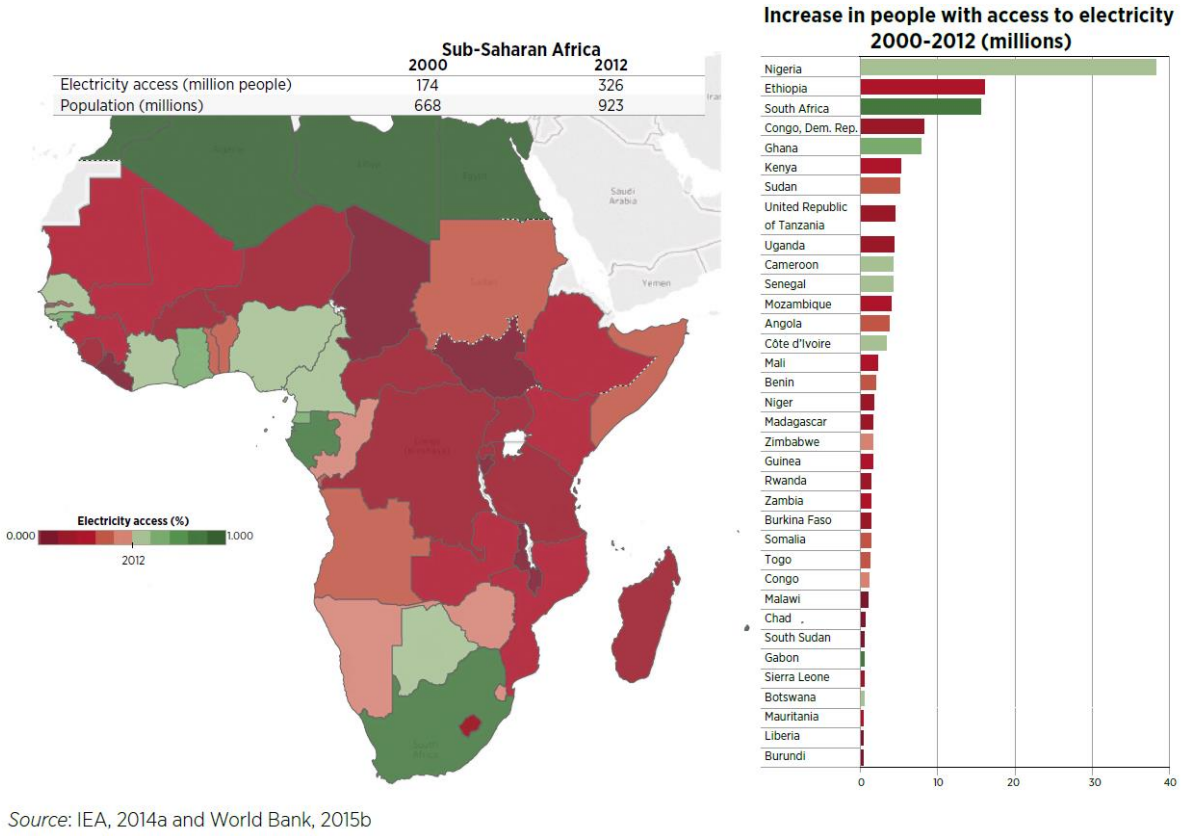


Context


Role in off-grid applications
Role in grid connected applications

Off-grid applications

Electrification rate in sub-Saharan Africa is the lowest of any developing region

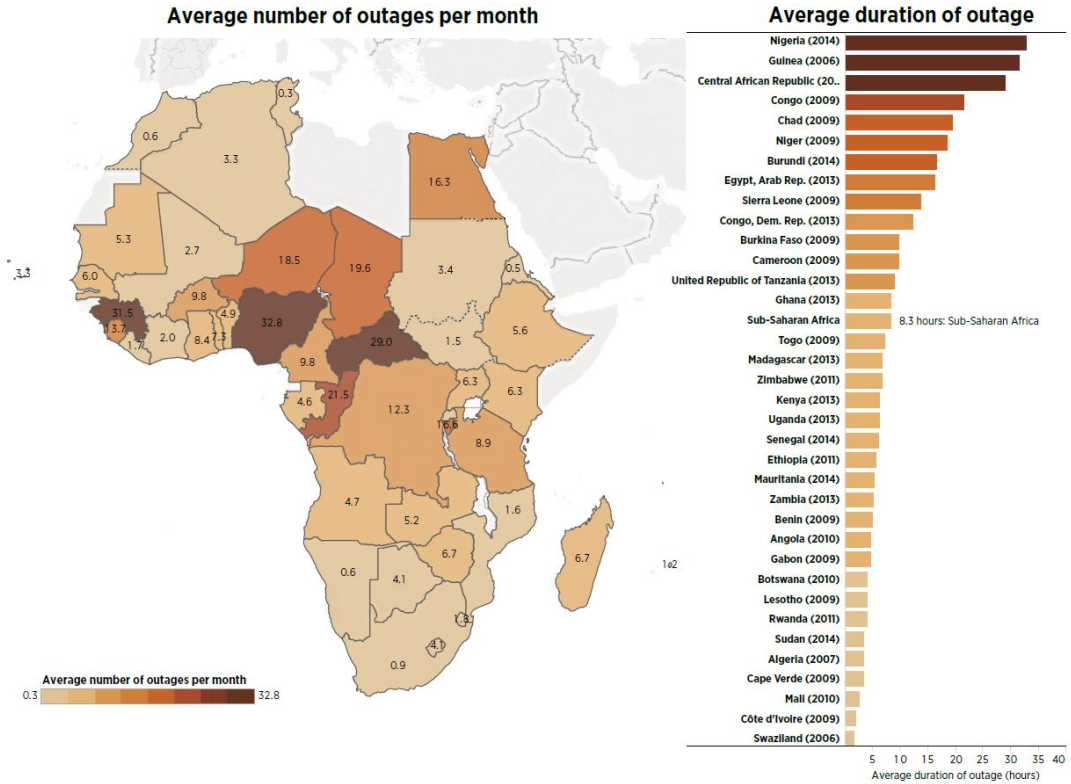


Source: IEA, 2014a and World Bank, 2015b

National electrification rates by country in Africa

Off-grid applications

Serious under investment in power generation capacity in sub-Saharan Africa

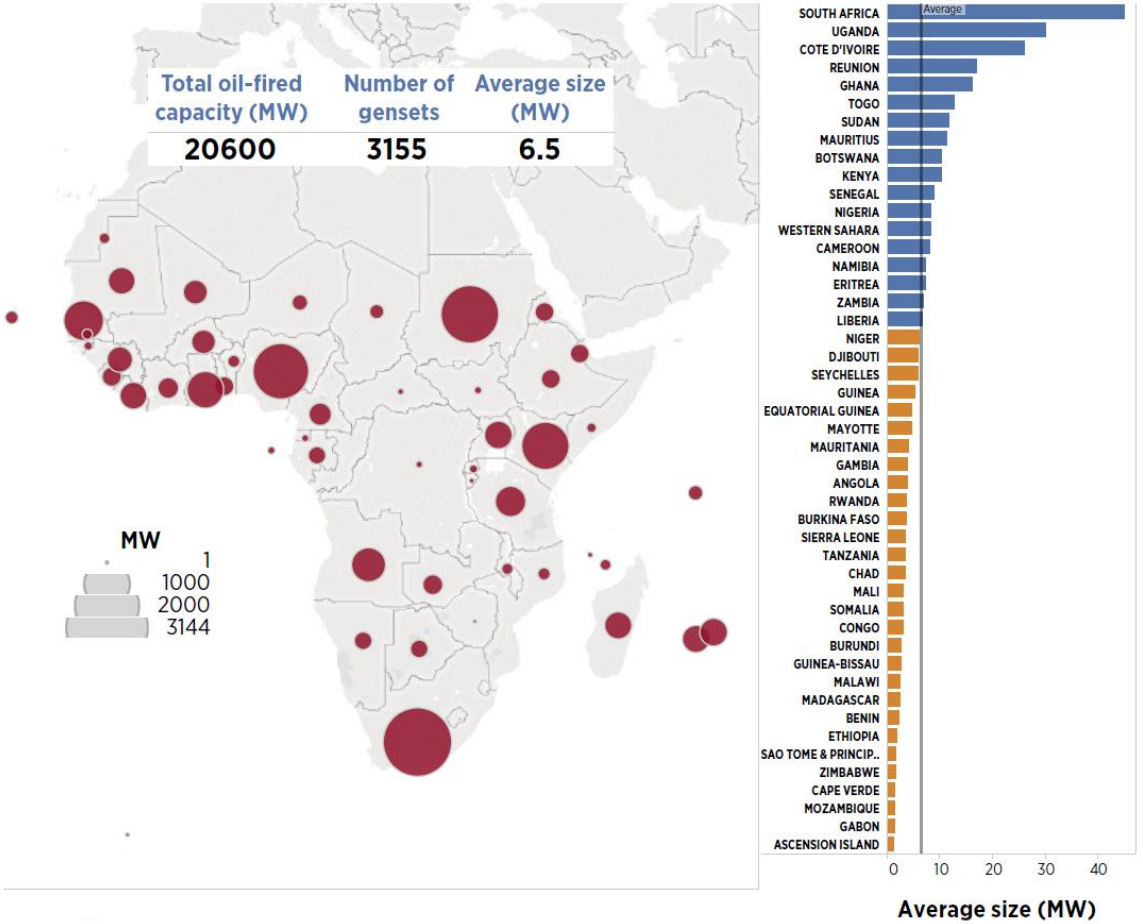


Source: World Bank, 2015a

Electrical outages per month and average duration in Africa

Off-grid applications

Huge untapped potential for PV storage mini-grids



Source: Platts, 2016

Existing oil /diesel generator capacity in sub-Saharan Africa
and average size per generator

Storage, key component

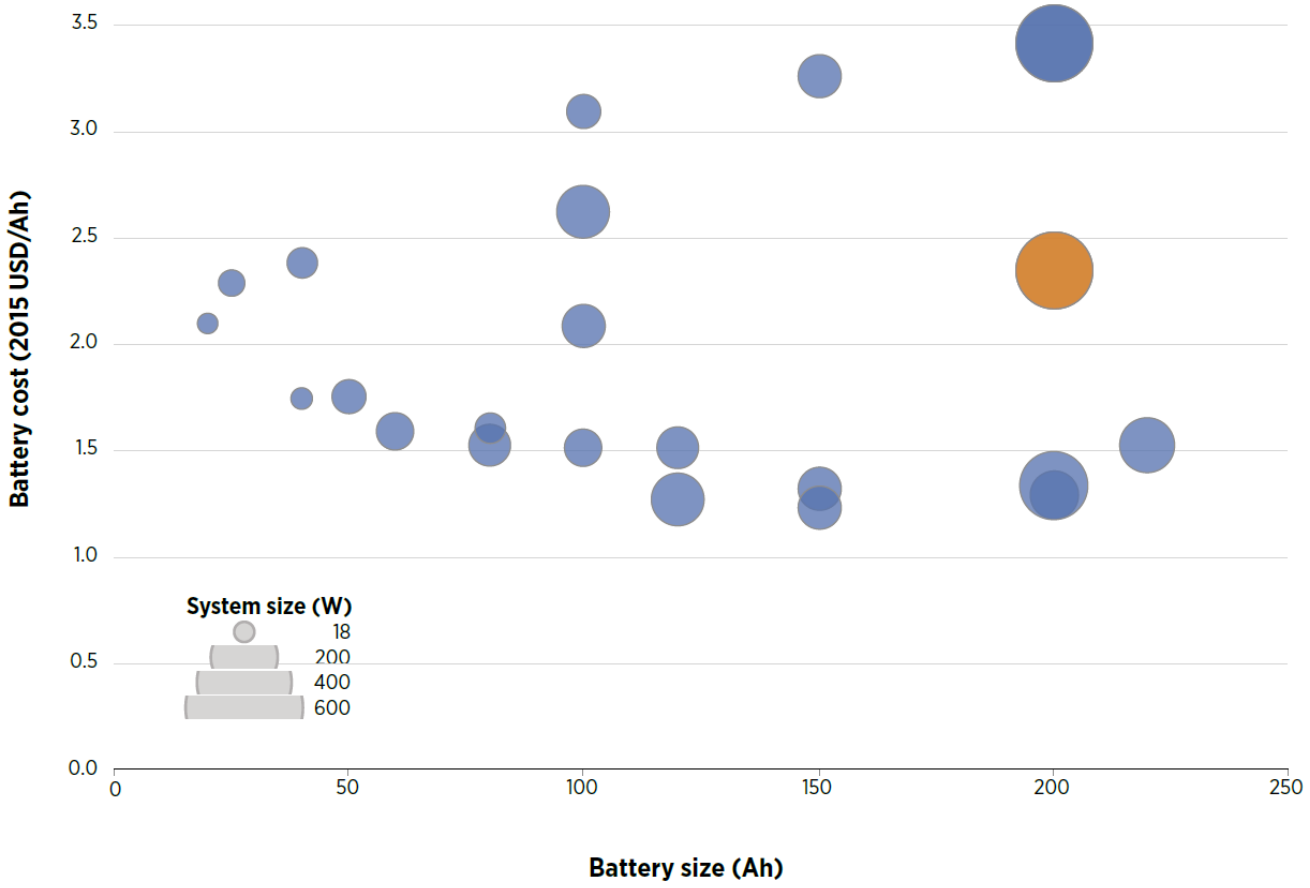
	Stand-alone			Grids		
	DC		AC	AC/DC		AC
System	**Solar lighting kits or lanterns**	**DC SHS**	**AC SHS: single-facility AC systems**	**Nano-grid Pico-grid**	**Micro-grid Mini-grid**	**National/regional grid**
Application	Off-grid			Off-grid or on-grid		On-grid
	Lighting	Lighting and appliances	Lighting and appliances	Lighting and appliances, emergency power	All uses (including industrial)	All uses (including industrial)
Key component	Generation, storage, lighting, cell charger	Generation, storage, DC special appliances	Generation, storage, lighting, AC appliances, building wiring	Generation plus single-phase distribution	Generation plus three-phase distribution plus controller	Generation plus three-phase distribution plus transmission
Typical size	0-10 W	11 W to 5 kW	100 W to below 5 kW	5 kW to 1 MW		Residential (100 W to <5 kW) mini-grid (5 kW to <1 MW) and utility-scale (>1 MW)

Source: Adapted from IRENA, 2015b

Note: "Typical size" categories were created for the convenience of cost analysis.

Storage, key component

Clearly reduced cost/Ah when battery size increases



Source: IRENA Renewable Cost Database, 2016

SHS battery costs relative to battery size and PV system size in Africa, 2012-2015

Storage, key component

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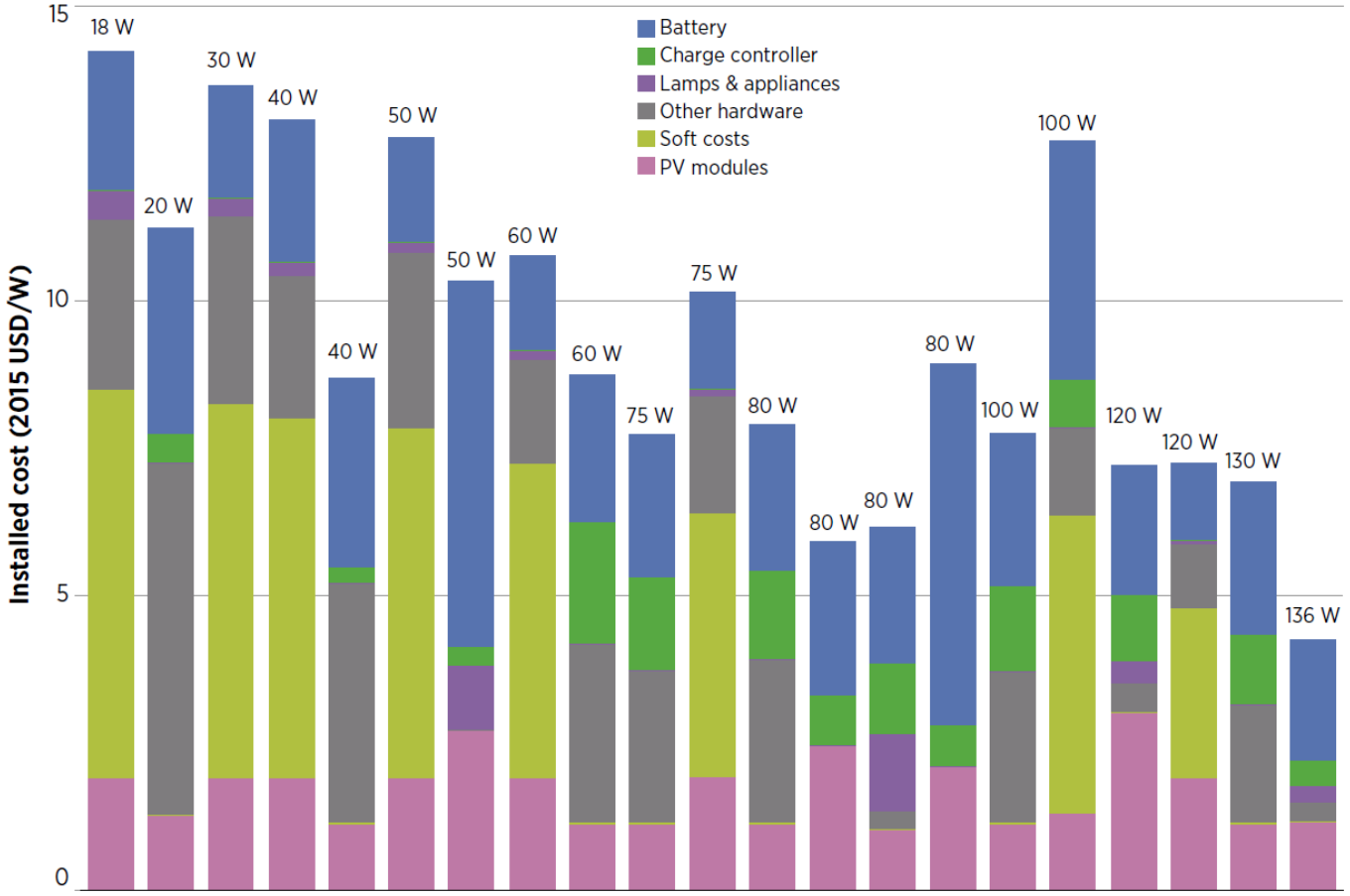
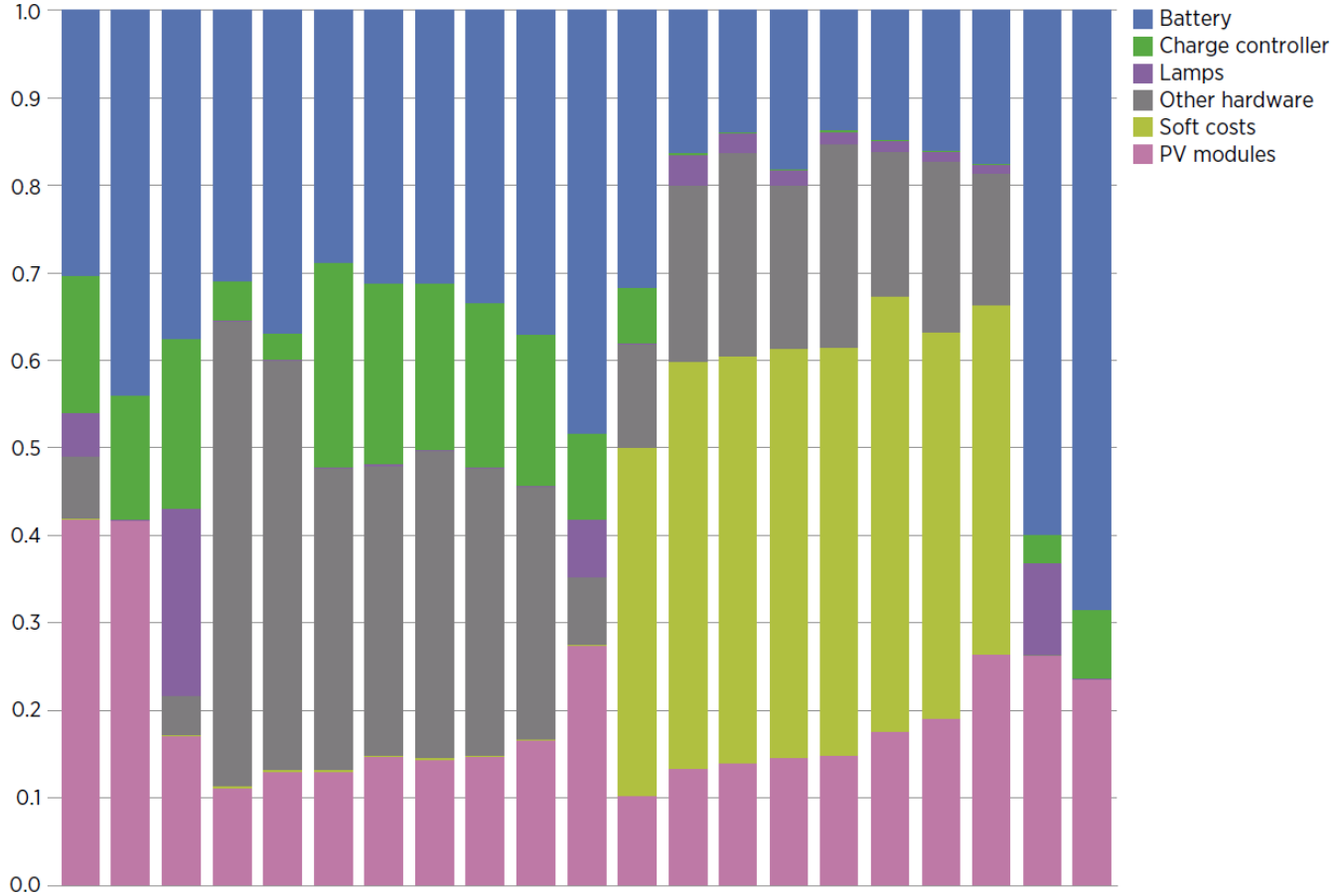
Battery cost account the largest single share of SHS 29% of total costs (USD 2.7/W)



Small SHS (<1kW) cost breakdown by cost component, 2012-2015

Storage, key component

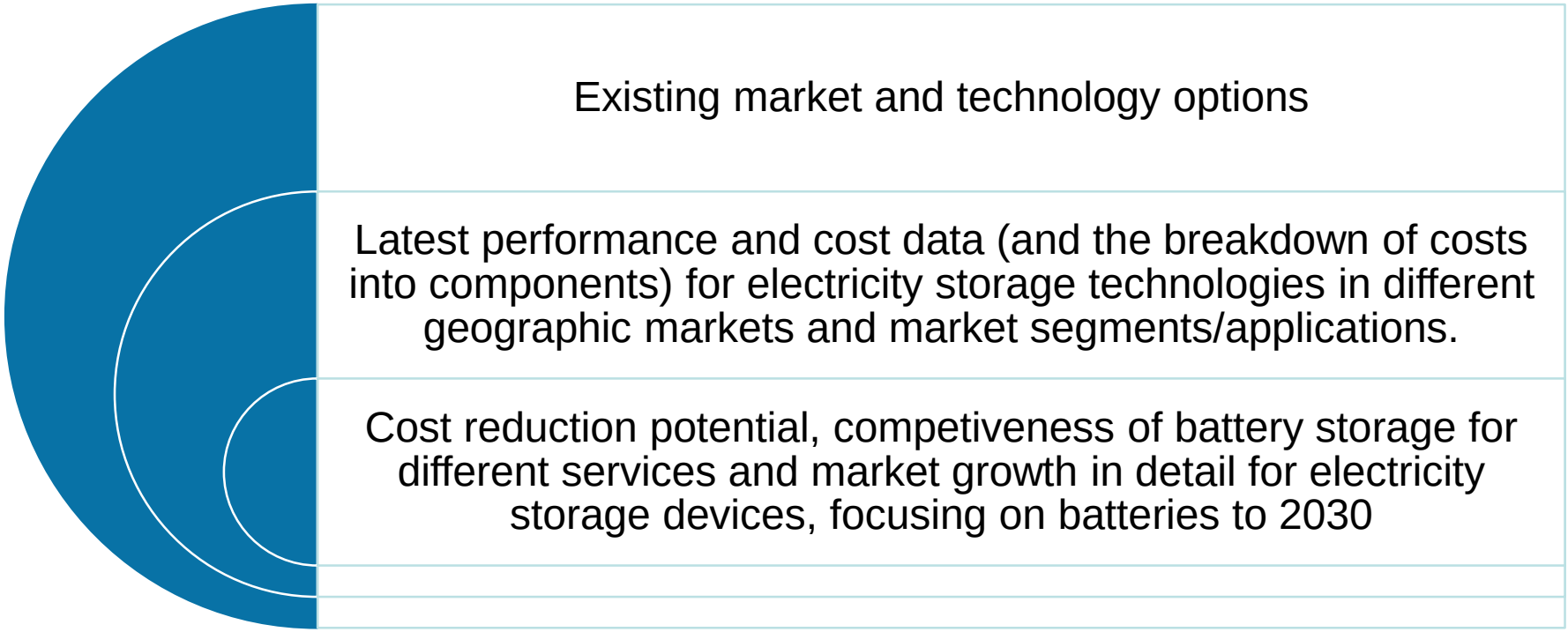
Battery costs account 14-69% of total installed costs



Small SHS (<1kW) cost breakdown by cost component shares, 2012-2015

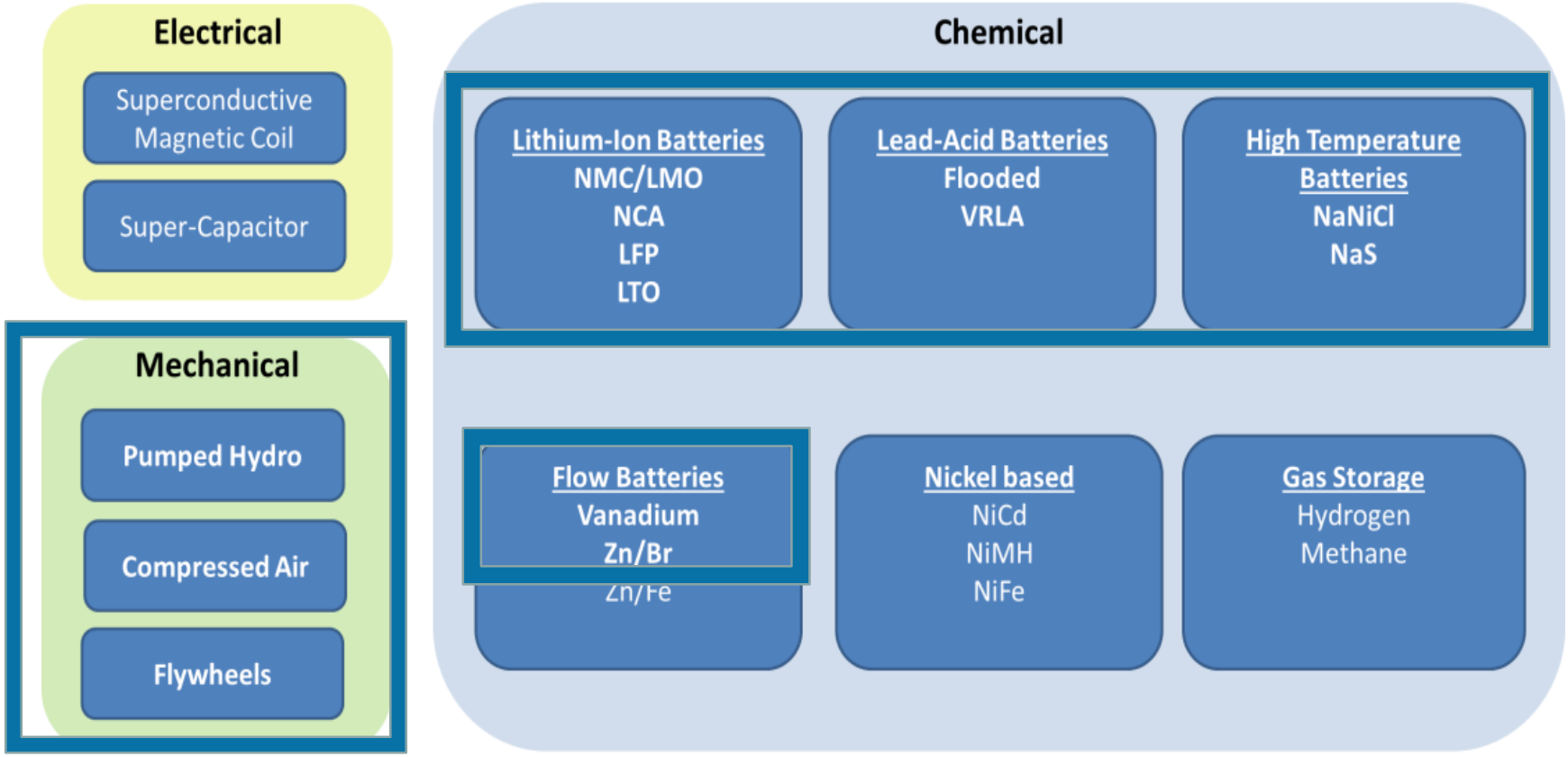
Context

IRENA's RE costs and markets team is preparing a study to analyze and discuss:



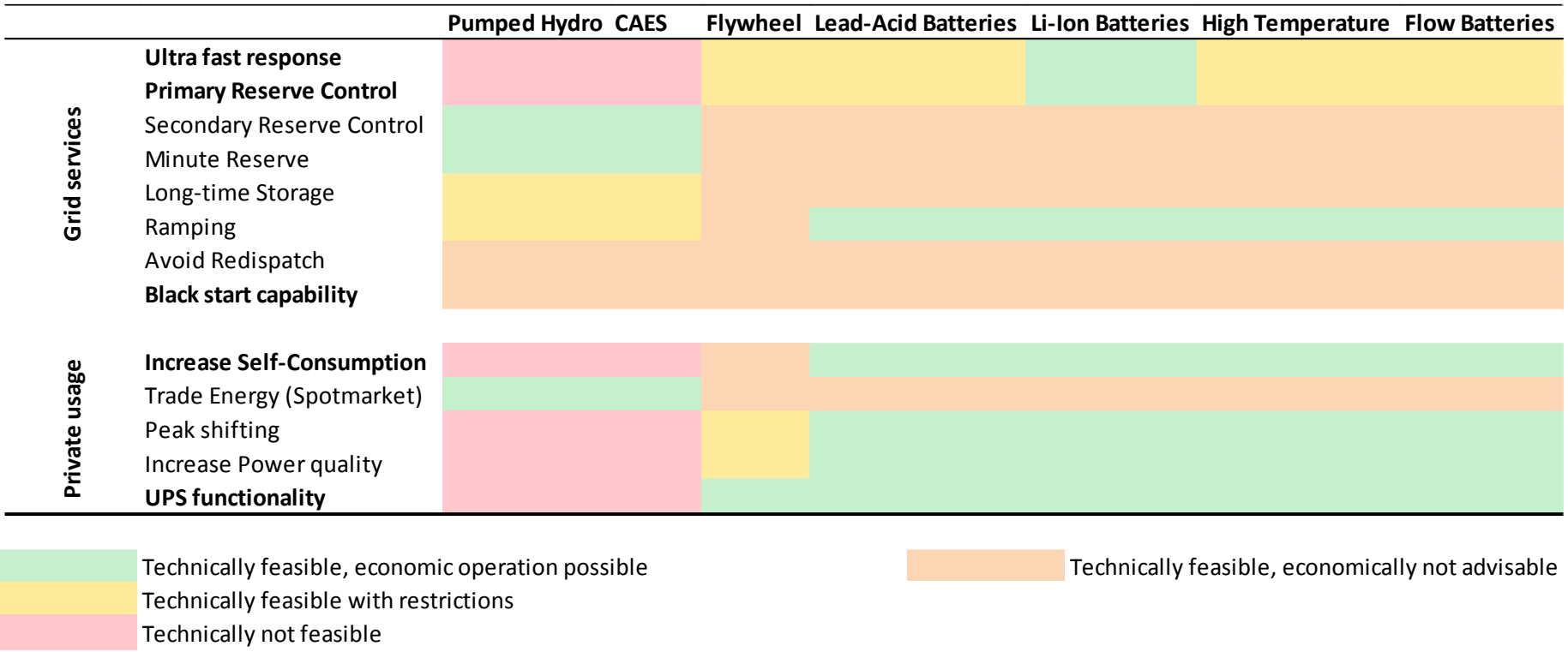
Technology overview

Scope of analysis



Feasibility

Applications examples



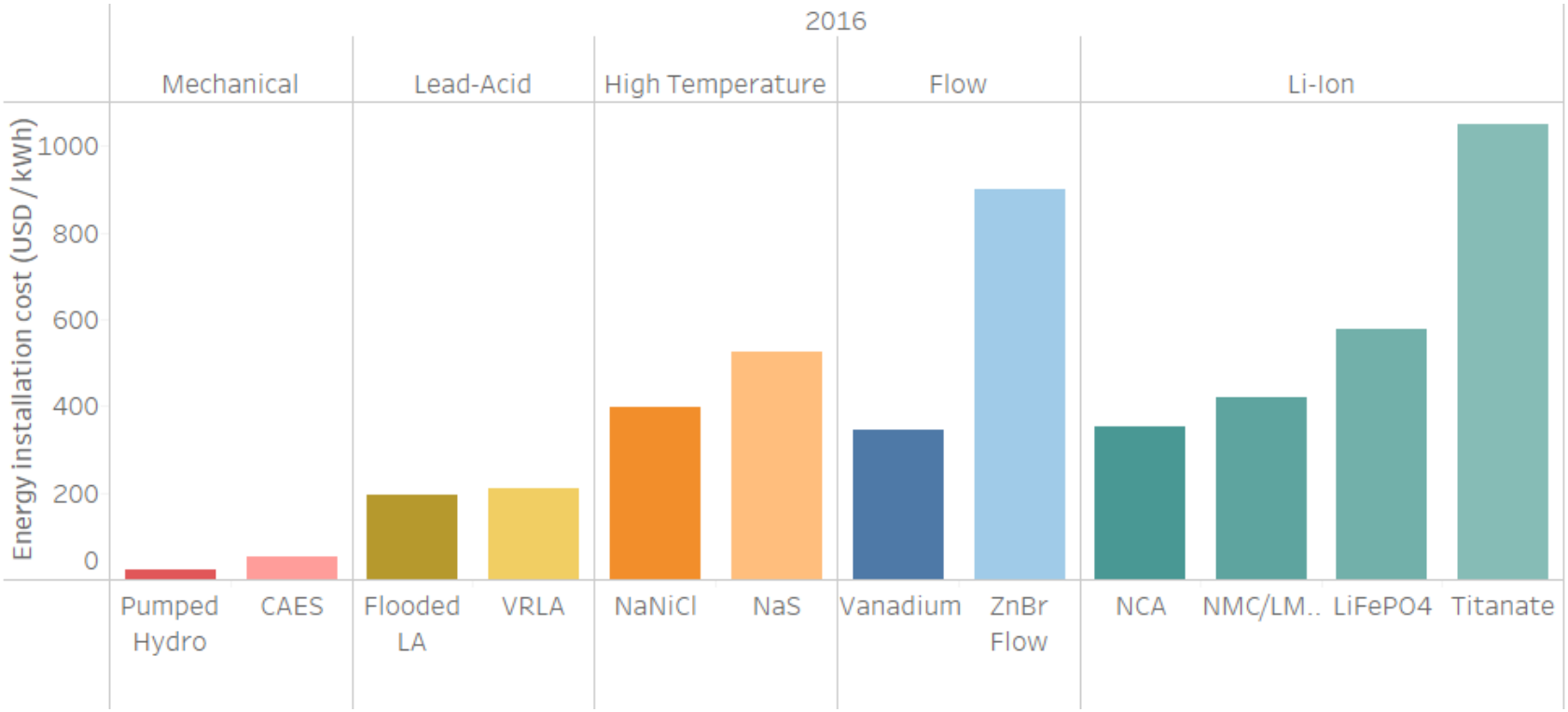
Electricity Storage

Current and future cost of battery electric storage for electric power

- Detailed descriptions of 13 storage technologies including their required balance of system
- Strengths and weaknesses of each technology are highlighted, possible development paths including opportunities and threads are discussed
- One of the most comprehensive technology overviews for stationary storage systems available on the market today.
- Typical system designs for 12 typical storage applications
- Excel Tool to calculate the Cost of Service of all storage technologies in different applications

Current prices of different storage technologies

Current energy installations costs (USD/kWh), reference case 2016

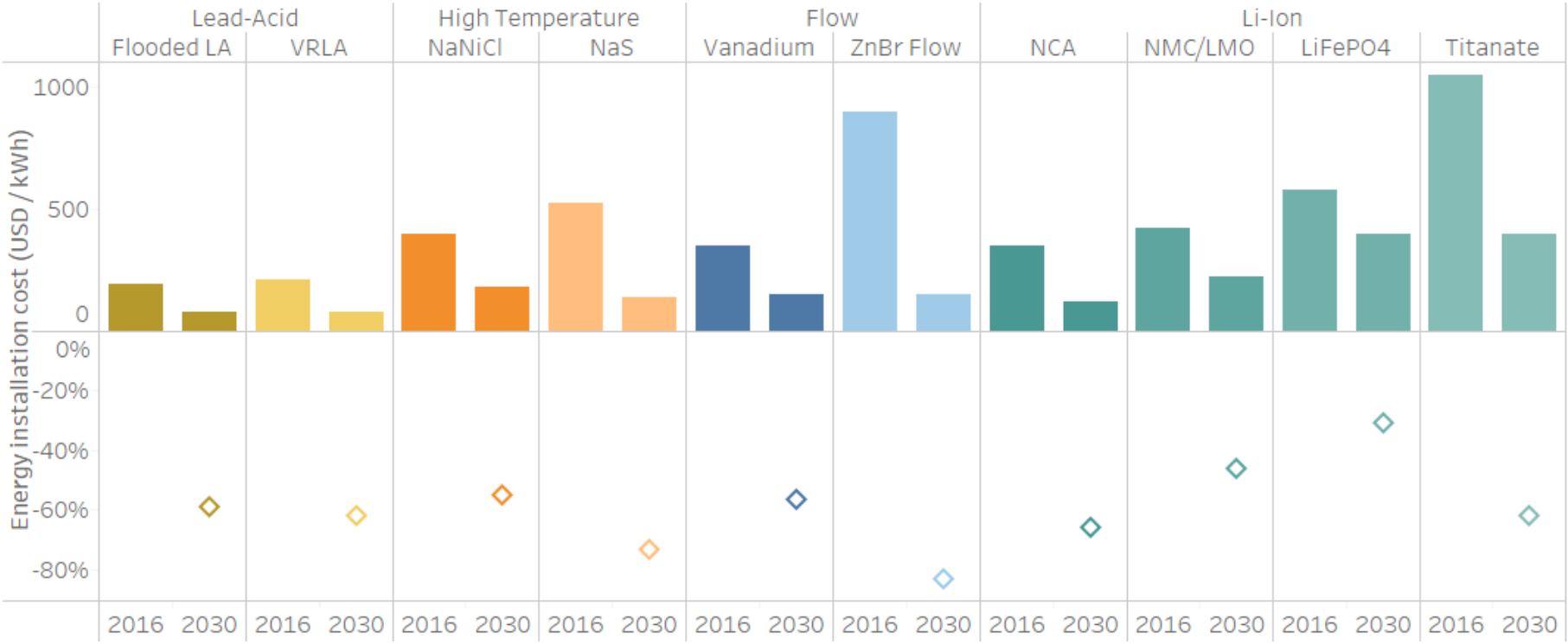


- High temperature ranging USD 400/kWh to USD 525/kWh
- Vanadium currently at USD 350/kWh and ZnBr at USD 900/kWh
- Current Li-ion costs ranging USD 350/kWh to USD 1050/kWh

Note: prices shown are for stationary applications and EV or specific residential applications could differ

Costs

Prices for storage systems are spiraling down: Until 2030 price cuts of more than 50% can be expected for many battery technologies

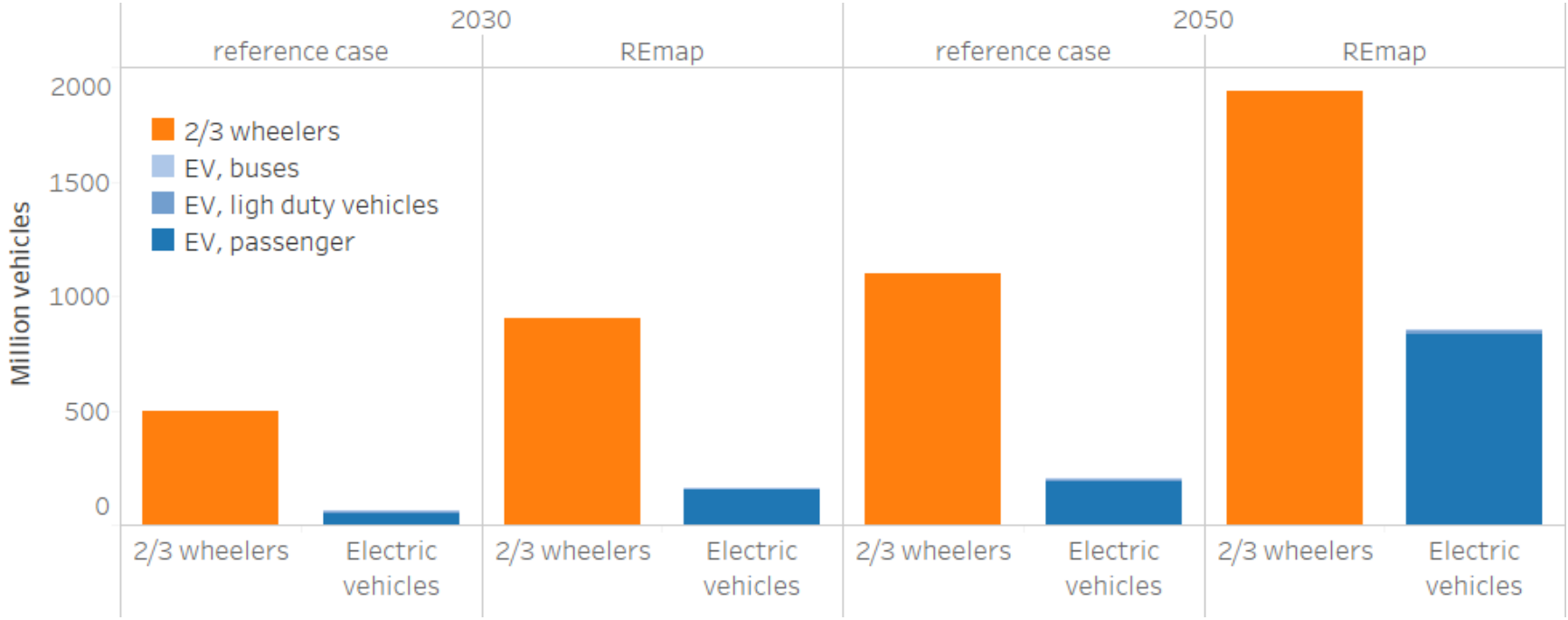


For the displayed technologies, prices in 2030 could range between USD 80 and 400/kWh down from between USD 190 to 1050/kWh in 2016

Costs

The EV fleet is expected to keep growing. The development of battery costs will play a key role in the growth rates of the EV fleet globally

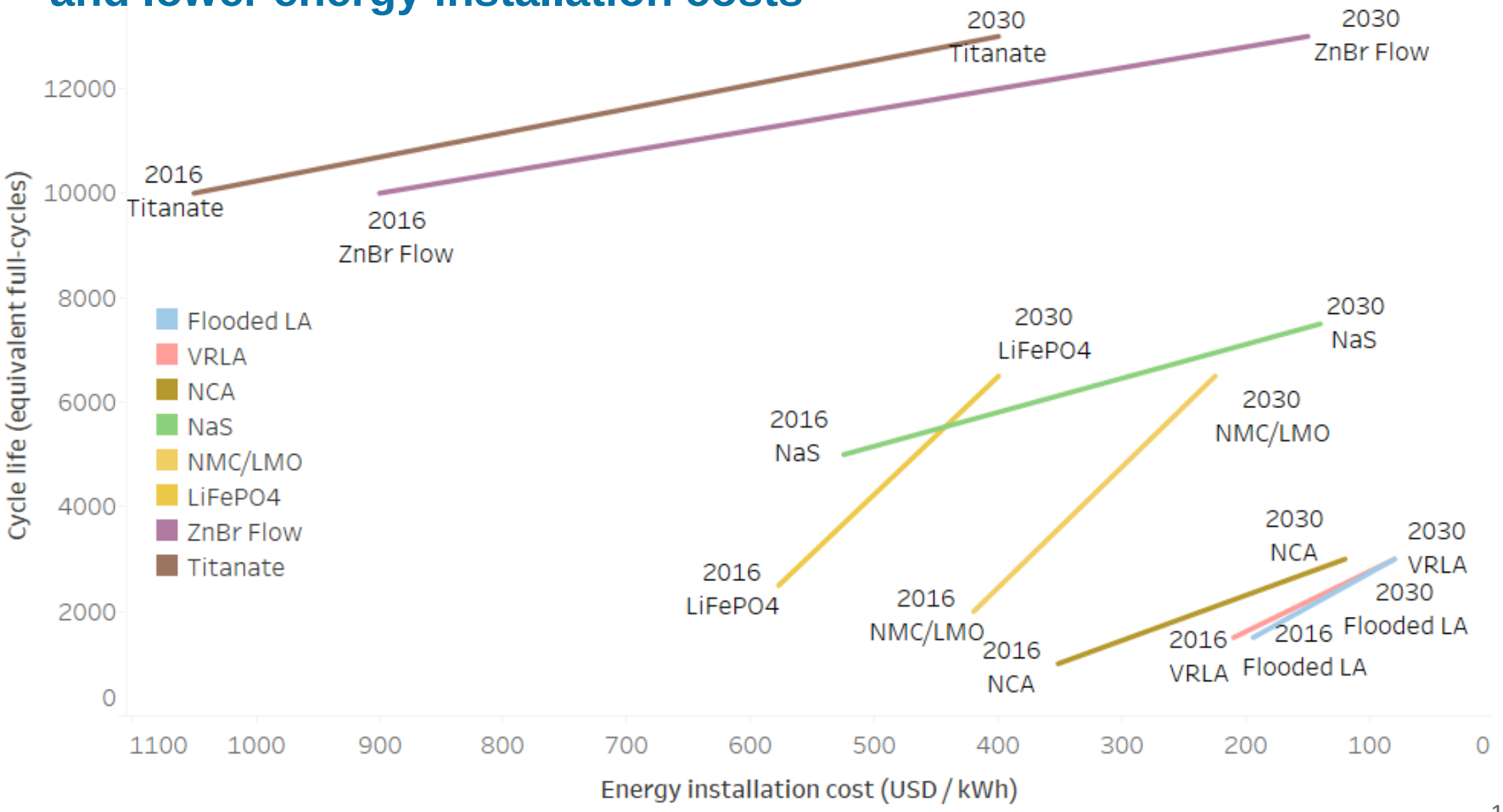
- By 2030 a total of 560 million vehicles can be expected in the reference case (REmap scenario foresees up to 1060 million by then)



- By 2050 these figures could be about 1300 million (reference case) and 2750 (Remap)

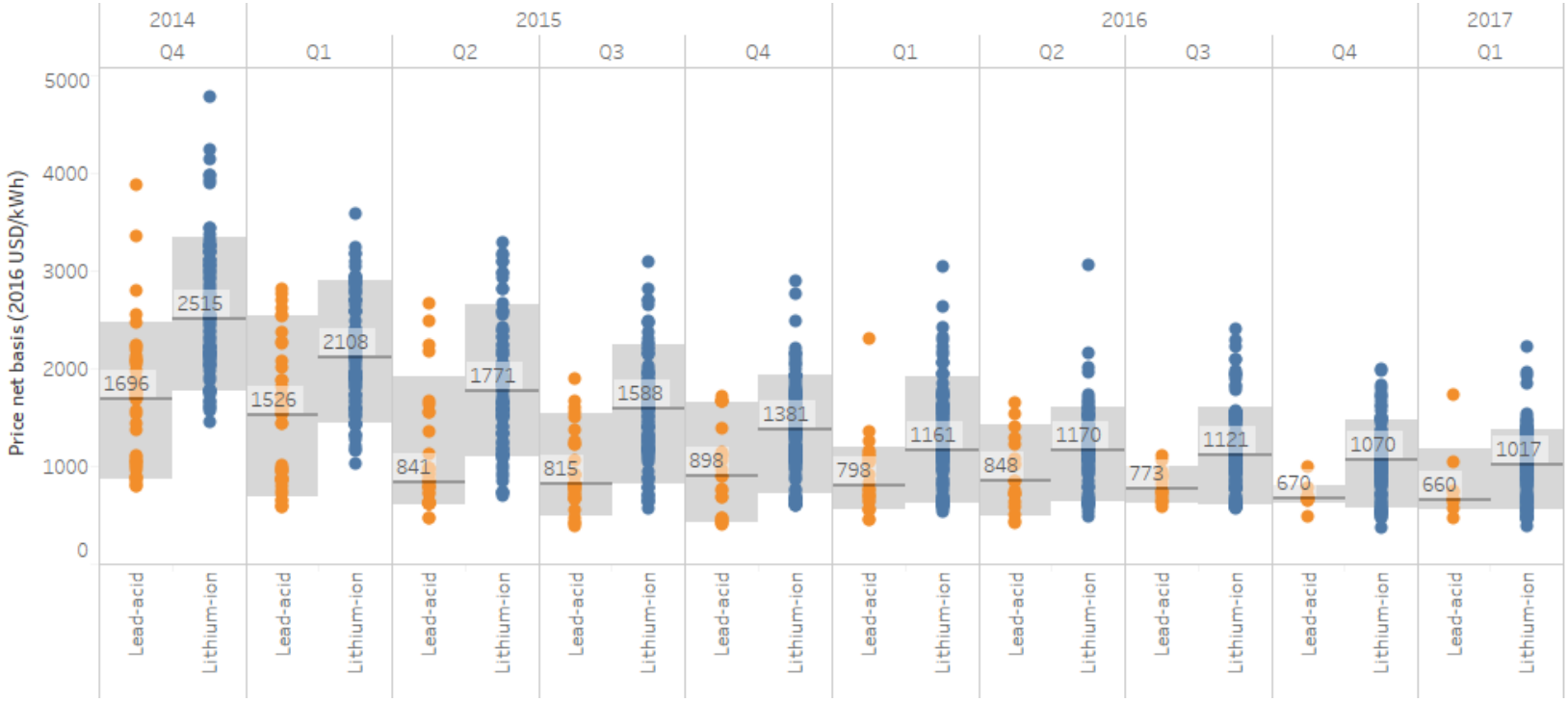
Performance

Opportunities arise also from the combined effect of higher lifetimes and lower energy installation costs



Rapidly falling prices

Home storage



Source: IRENA, EuPD Research

- Median prices for lithium-ion based residential storage system offers in **Germany** have declined roughly 60% during the displayed period of Q4 2016 to Q1 2017

Note: Horizontal bar shows median offer price, grey range 10th and 90th percentile.

Timeline

Report completion is underway

Stakeholder meetings during Energy Storage Europe (Düsseldorf) / Intersolar and others events and meetings to present draft results

Drafting of report: June 2017

Peer review: July 2017

Final report: October 2017