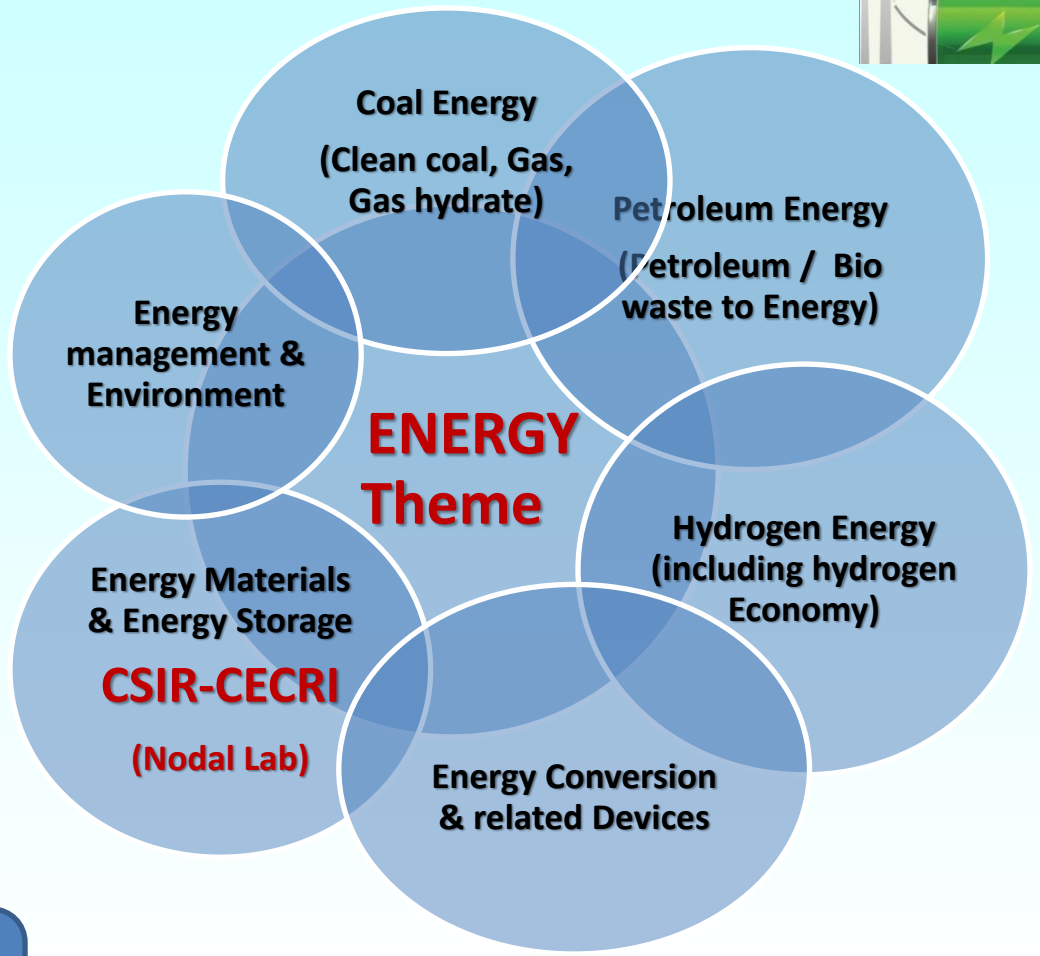
Energy Solutions with a focus on Battery Technology

CSIR-CECRI

CSIR in the Race of Sustainable Energy



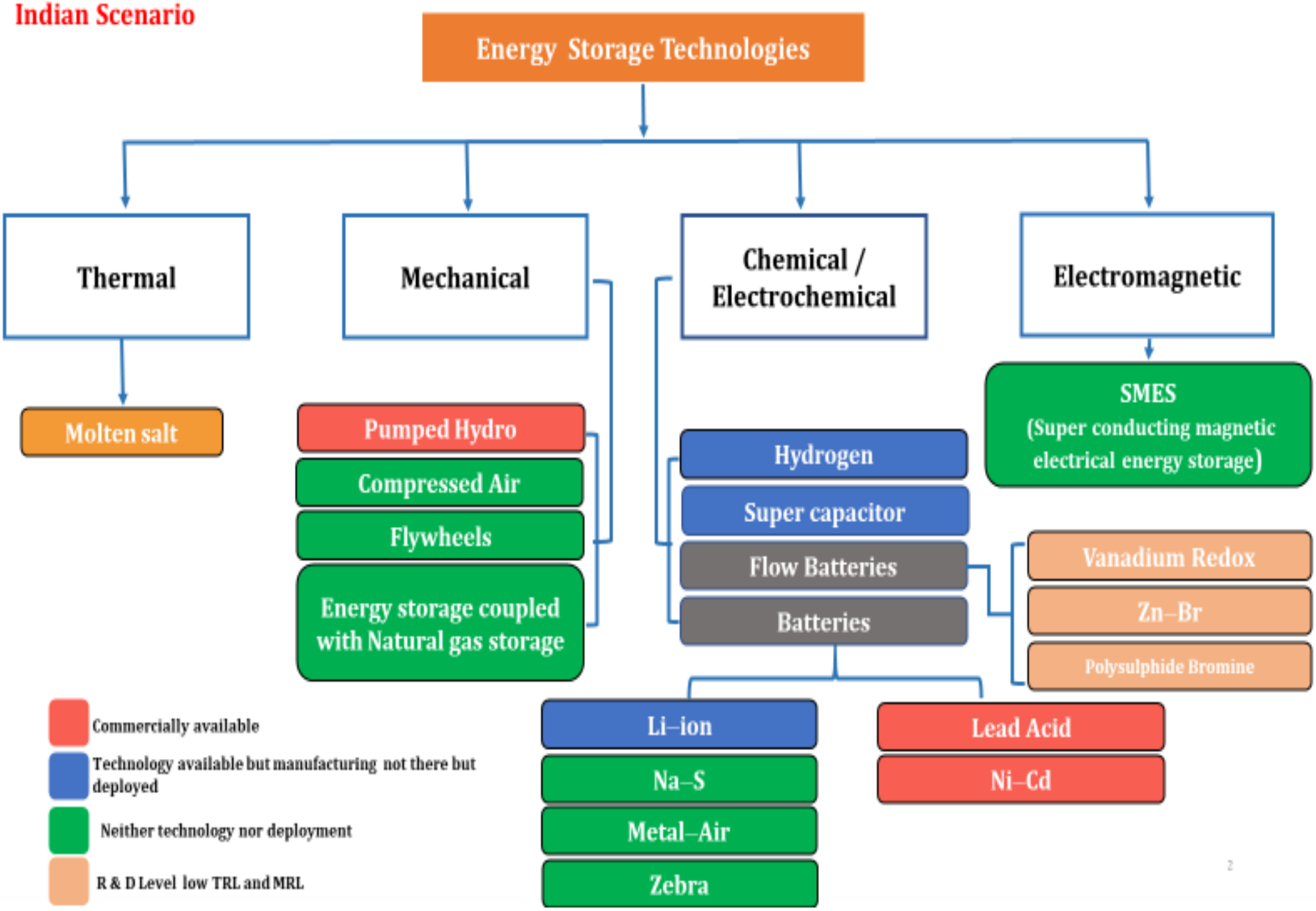
FOCAL THEME OF RESEARCH:

Clean, Green & Sustainable Energy for ALL

A. S. Prakash

Few Pictures / Figures were downloaded from Internet / Website for better illustration only

Indian Scenario



India's Storage Battery Deployment Scenario

Consolidated Energy Storage Roadmap					
	Application	**Energy Storage (GWh)**			
		2019-2022	**2022-2027**	**2027-2032**	**Total by 2032**
Stationary Storage	Gride MV/LV	10	24	33	67
	Support EHV	7	38	97	142
	Telecom Towers	25	51	78	154
	Data centres, UPS and Inverters	80	160	234	474
	Miscellaneous Application (Raliways, Rural Electrification, HVAC, application)	16	45	90	151
	DG Usage Minimization	-	4	11	14
	Total Stationary (GWh)	138	322	543	1,002
Electrical Vehicles	E2W	4	51	441	496
	E3W	26	43	67	136
	E4w	9	102	615	7252
	Electric Bus	2	11	44	57
	Total Electric Vehicles (GWh)	40	207	1,167	1,414
Total Energy Storage Demand (GWh)		178	529	1,710	2,416

Ref: Energy Storage Roadmap for India 2019-2032: NTPC, NETRA Website

LI-ion battery production under CSIR Innovation Center @ CECRI

- To enable indigenous Lithium ion battery technology (100MWh/year) under Make in India as well as Made in India policies to ensure Self Reliant India [Atma Nirbhar Bharat]

- Phase 1: LIB production 1000 cells / day (18650 type Cylindrical cells)

Status : Installation completed and Trail Production started

- Phase 2 : Facility for 100 MWh Li-ion battery production facility

Per day production of 15000 cells of 5 Ah 21700 type Cylindrical cells

Time line for completion of (Phase 2) facility – August 2023

Time line for Trail production (Phase 2) - March 2024

- Taking the existing Technology Readiness Level from Level 6 to ≥ 8

Objectives of the CSIR-Mission Mode Project (ICeNGESS)

- Augmentation of existing facility
- 100 MWh facility creation
- IPR and Technology development
- Scale-up and production of battery materials
- Next generation energy storage solutions
- Supply chain creation and Indigenization
- Lithium sustainability from Coal
- Public Private Partnership (PPP)

Technology Translation from Lab level to Pilot scale LIB Manufacturing

Anode Slurry Mixer

Anode Coating line

Cathode Slurry Mixer

Cathode Coating Machine

Electrode Slitting Machine

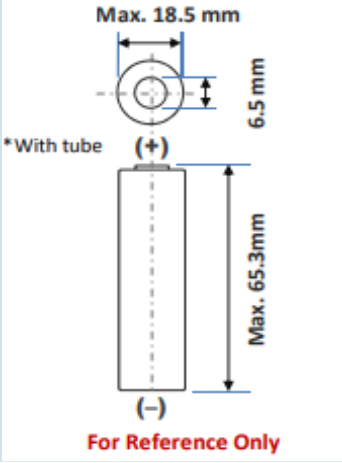
Assembly Line inside 1% RH Dry Room

Technology Bench marking

Technology/ Activity	Materials			Performance		
	CECRI's Current Status	CECRI's Commitment (2022)	Global Standard	CECRI's Current Status	CECRI's Commitment (2022)	Global Standard
Li-ion battery (18650) 532	2.3 -2.5 Ah	2.5 Ah	2.5 Ah	Up to C/2, 1C, 2C rate	5C rate	5C

Features & Benefits	Specifications	
• High energy and power density • Long stable, high power • High safety performance • Ideal for portable electronics, Robotics	capacity	2. 3 Ah
	Nominal voltage	3.6 V
	Charging	CC-CV mode, Rate : C/10 Voltage: 4.2- 2.8 V
	Weight	43.0 g
	Temperature	10 to +55° C
	Energy density	Volumetric: 526 Wh/l Gravimetric: 192 Wh/Kg

Dimensions



Batch No	Weight of the cell(kg)	Nominal voltage (V)	Capacity (mAh)	Gravimetric energy density (wh/kg)	Volumetric Energy density (wh/l)
CYNMCMK-5	0.043	3.6	2300	192	526
SAMSUNG 26FM	0.045	3.6	2500	205	560

CSIR- Indigenization Platform :Value Chain Creation

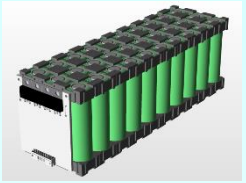
RAW MATERIALS → COMPONENTS → CELL Manufacturing → MANUFACTURING EQUIPMENT → PACK ASSEMBLY → AUTOMOTIVE OEM

Cathode, Anode
Solvents
Binders
Additive Carbons
Graphenes, CNTS

Aluminum
Copper
Components
Al/Ni Tabs
PTC Caps

Cells to pack
Engineering
BMS integration
Thermal
Management etc

Equipment
manufacturing
Automation
Process
integration



Pack to
Applications
Solar installation
EV-companies

Electric Vehicls
Two Whelers
E-Riksha
E-Bikes
Electric Cars
etc

About 15 Indian industries are participating and working closely with CSIR-CECRI under the Indenization platform to create Li-ion battery supply chain

Vision for ICeNGESS: Innovative Hub of Global Standard

2022

- Translation from R&D Innovation to semi manufacturing level (1000 cells /day)
- Gen 2 LIBs of 200 Wh/kg energy density

2024

- Creation of state of the art automated LIB manufacturing facility to the scale of 100 MWh/year under CSIR-Innovation centre.

2026

- Production of Indigenous LIBs for India specific applications in a commercially viable manner
- Gen 3 LIBs of 250 Wh/kg
- Supply chain creation

2028

- Gen 3 LIBs Energy density > 250 Wh/kg & sustainable SIB production > 140 Wh/kg

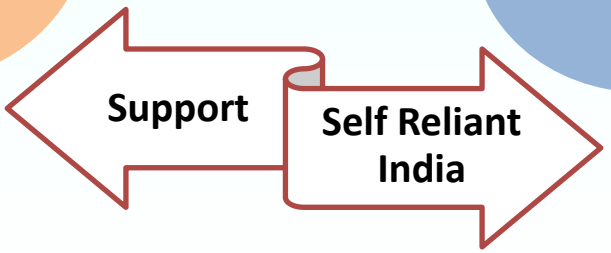
2030

- Self Reliant India for energy storage and establishment of complete supply chain

Value Addition

- Reduce Import/ dependence for strategic needs
- Battery for India Specific needs
- Create value chain/ support Indian industries

Market Penetration through Indian industries



- Electric Mobility
- Consumer Electronics
- Energy storage from Renewables

Summary: Li-ion battery Technology Progress

- Phase-1 of CSIR-ICeNGESS –Augmentation of facility successfully completed
- 1000 cells/day production trail run are in progress
- Under Public Private partnership –Godi Energy PVT. Ltd has partnered with CSIR-CECRI to produce the Li-ion batteries using CECRI Technology.

- CSIR-CECRI's technology offering
  - TRL 6
  - Various advanced cell chemistries
  - Differentiated NMC cathode process
  - Temperature tolerance suitable for Indian conditions
  - Strong IP portfolio and FTO for many components
- Scaling up

Thank you