



AVENER

Battery Energy Storage System

Sustaining India's Energy Goals

Industry Report

December 2024

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The India Opportunity



Battery Energy Storage System

BESS to expand to 66 GW capacity from <0.2 GW

BESS in India on the Cusp of Significant Growth



7x

Growth

₹ 5 Lakh Cr

Opportunity

India's Goals & Schemes supporting BESS Growth



4% Energy Storage Obligations by 2030 from 1% in 2024



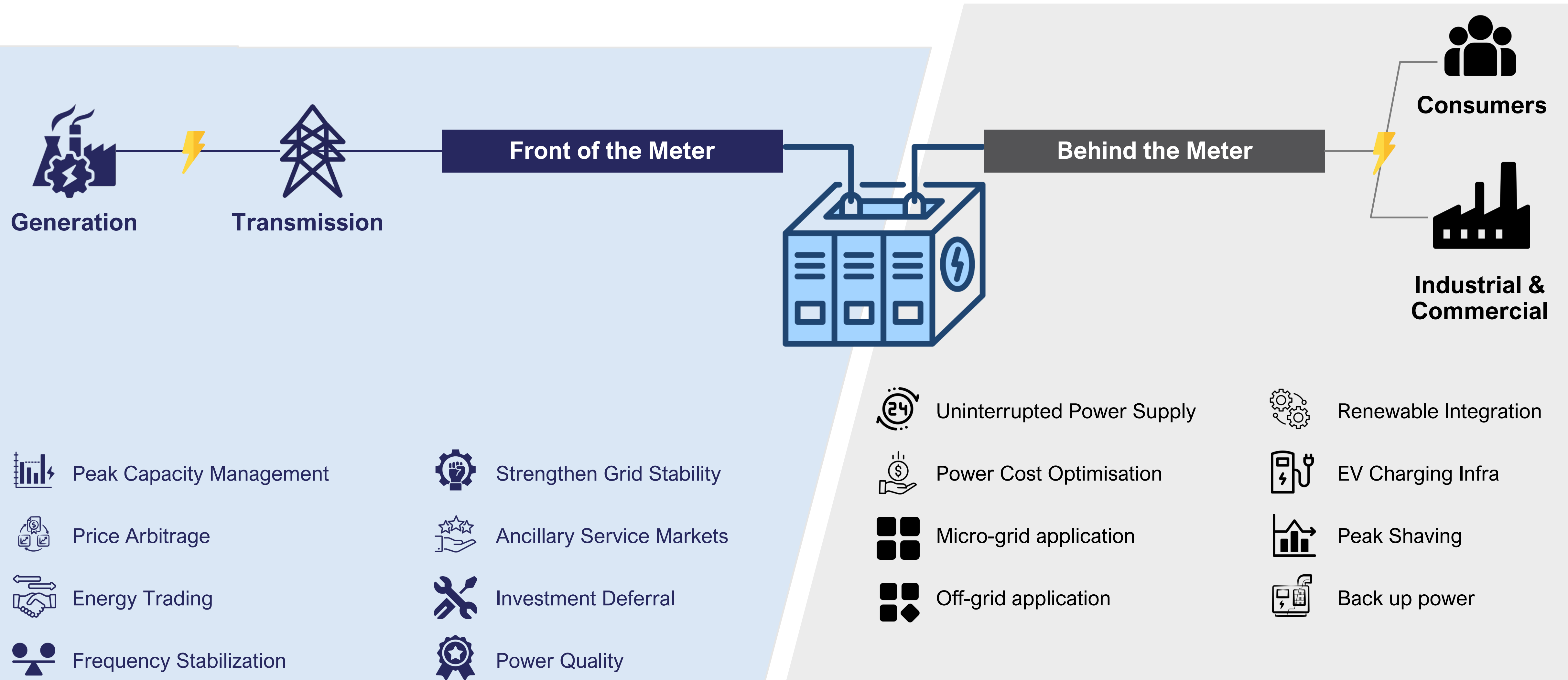
PLI ~5 GWh for battery manufacturing



Net Zero by 2070

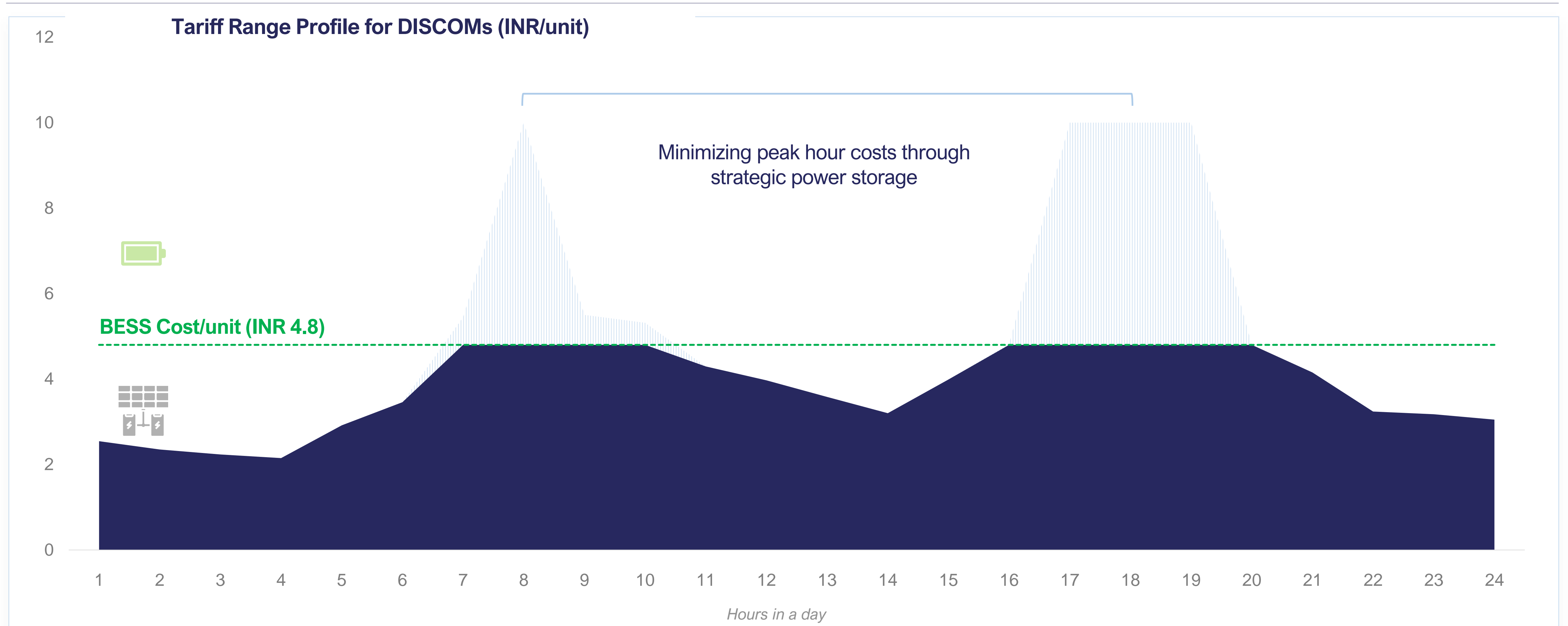
Value Chain

BESS' utility is present across the value chain



Optimizing Energy Costs with BESS

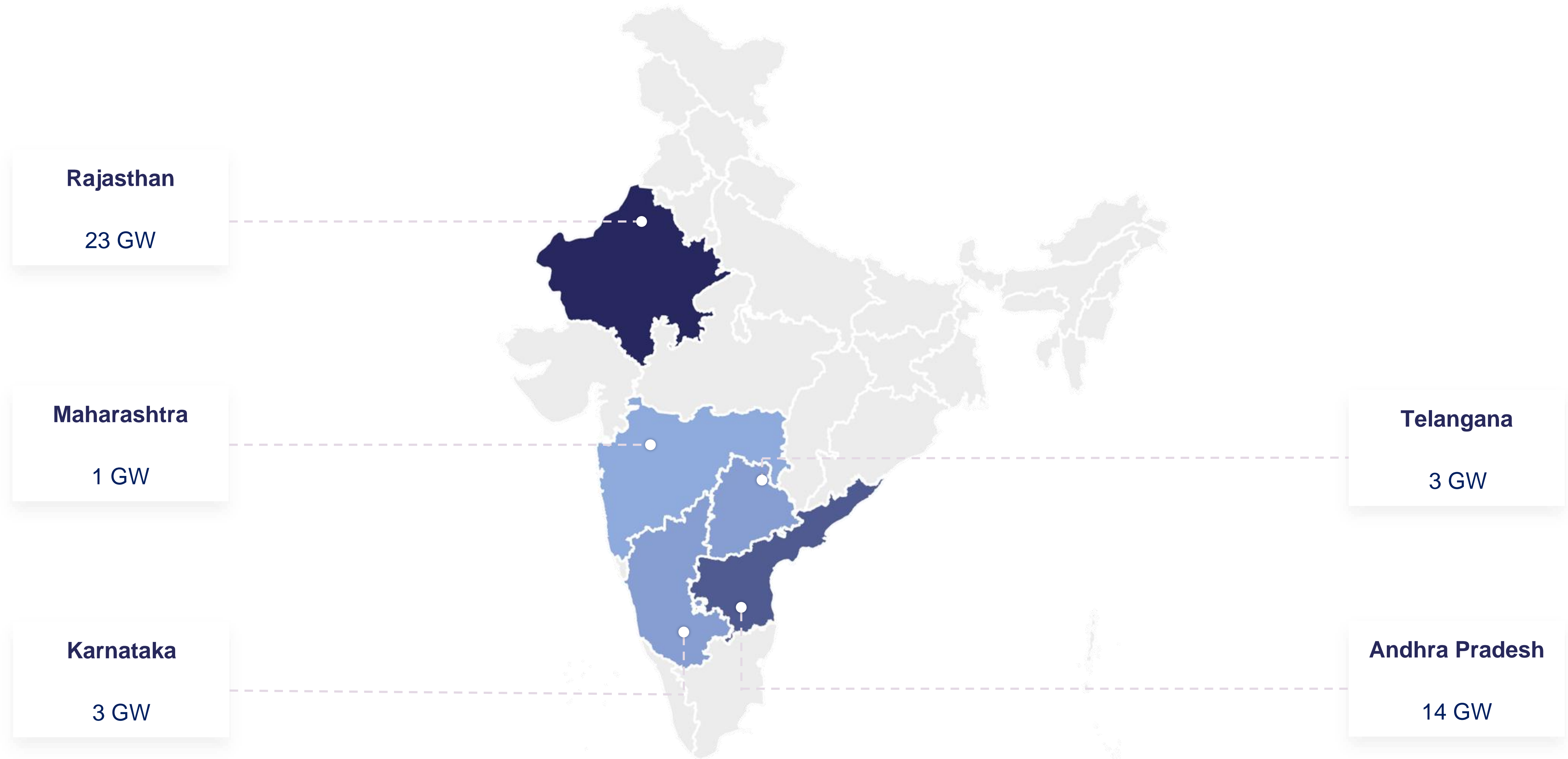
Cost-effective power management by DISCOMs through peak shaving, capping the energy costs at INR 4.8/unit



BESS integration enables DISCOMs to achieve strategic cost efficiency, mitigate peak hour expenses and ensure reliable energy at optimized rates

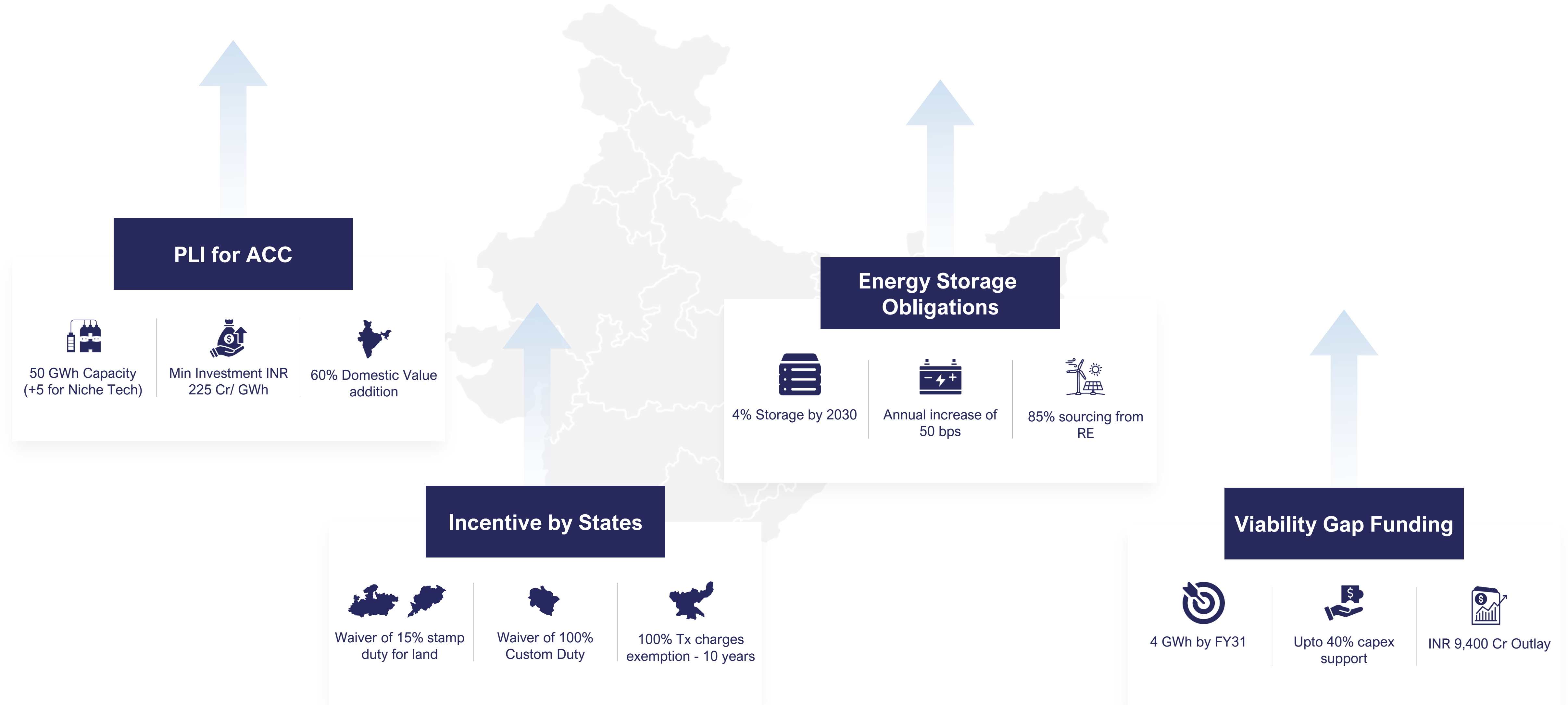
India Plans BESS Addition of 44+ GW by 2030

Energy independence by 2047 and net zero by 2070 will require a significant BESS infrastructure in India



Governmental Push for BESS

Accelerating Energy Storage Growth: Policies and Incentives Driving BESS Development



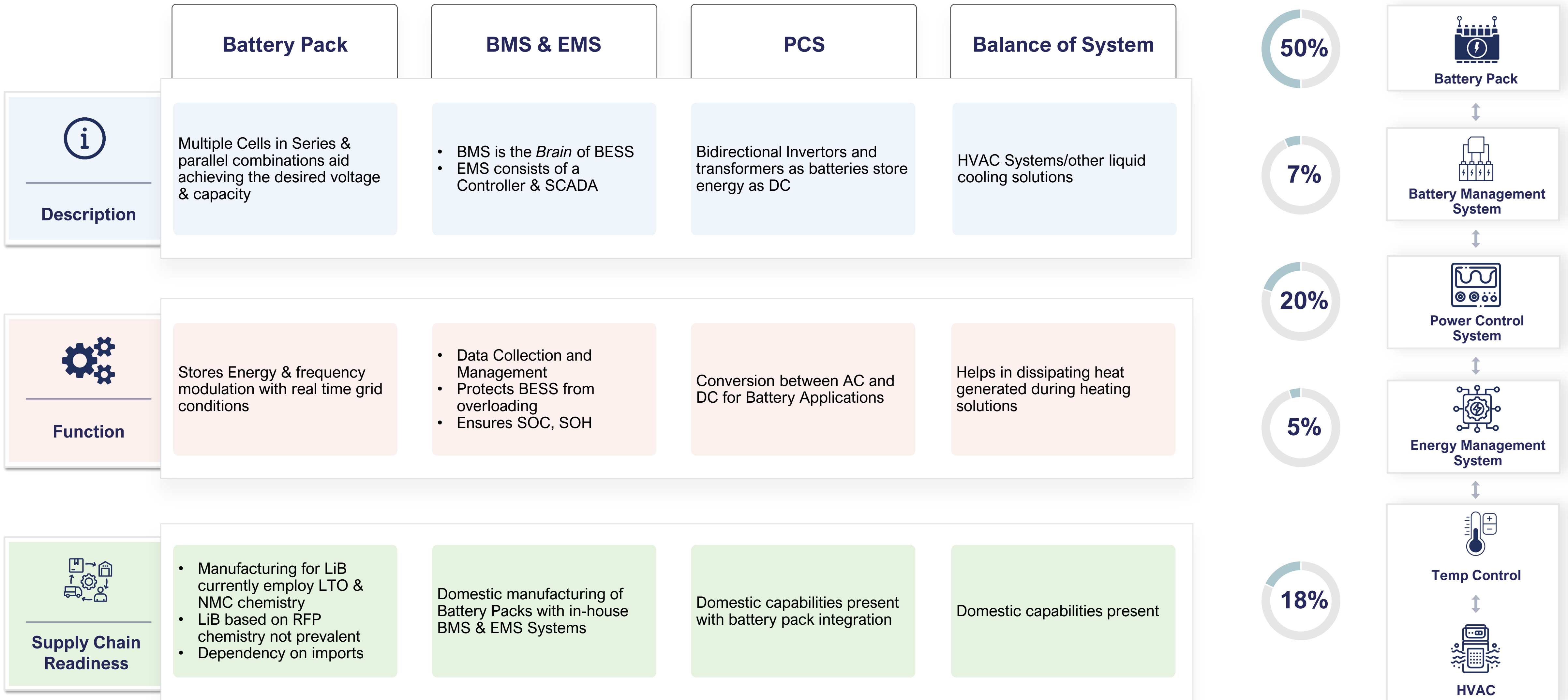
Tx: Transmission, PLI for ACC: Production Linked Incentive for Advanced Chemistry Cells

Operating Mechanics



Description & Functions of BESS Components

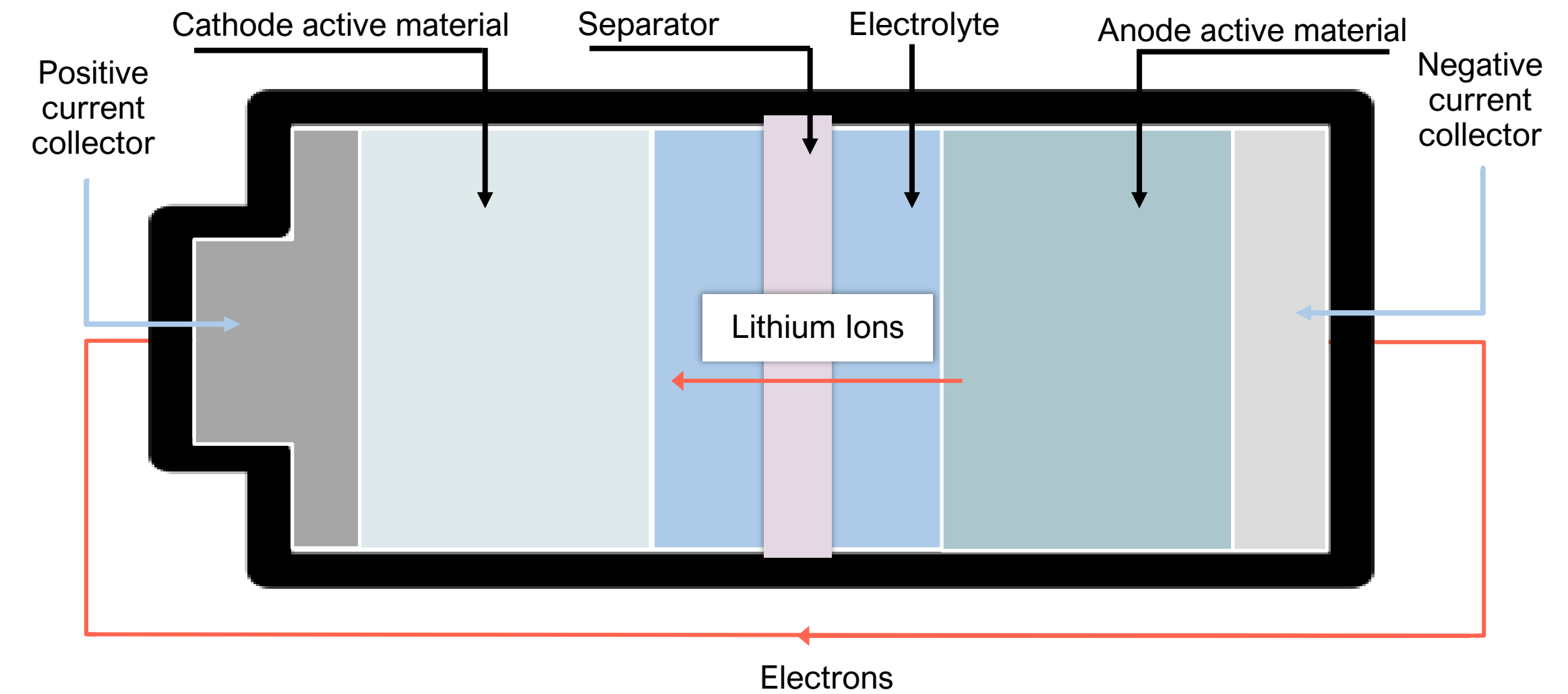
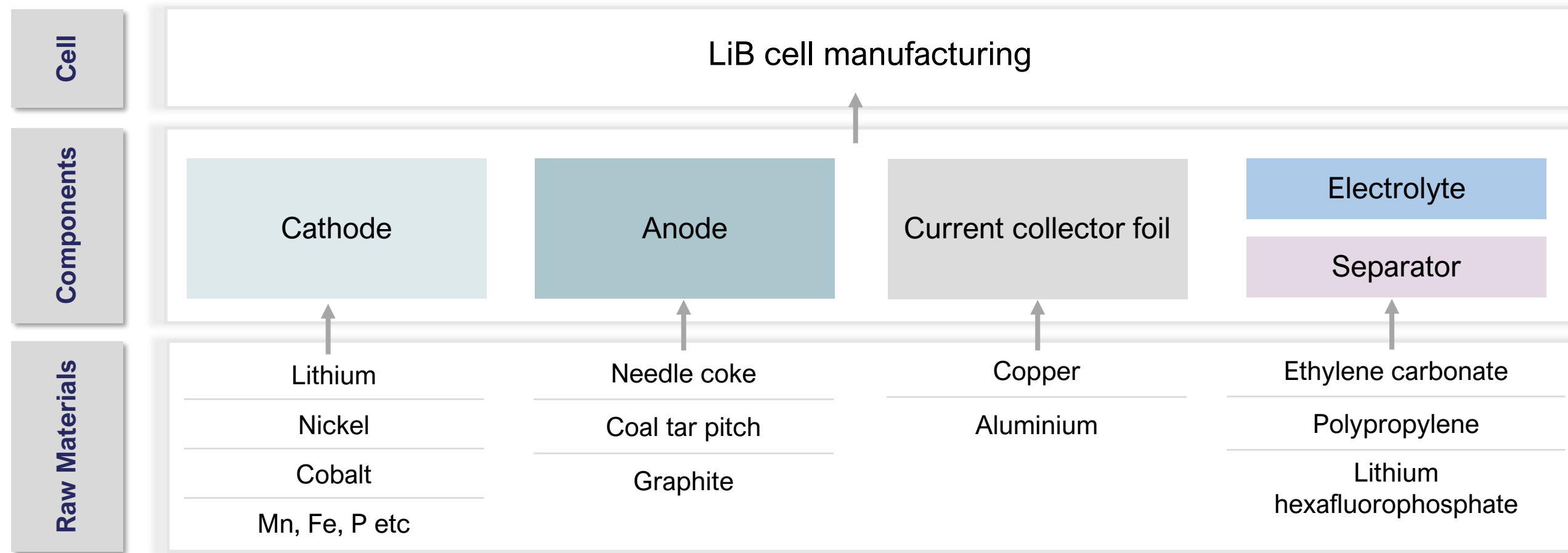
Evaluating the various components of BESS & supply chain readiness of these components



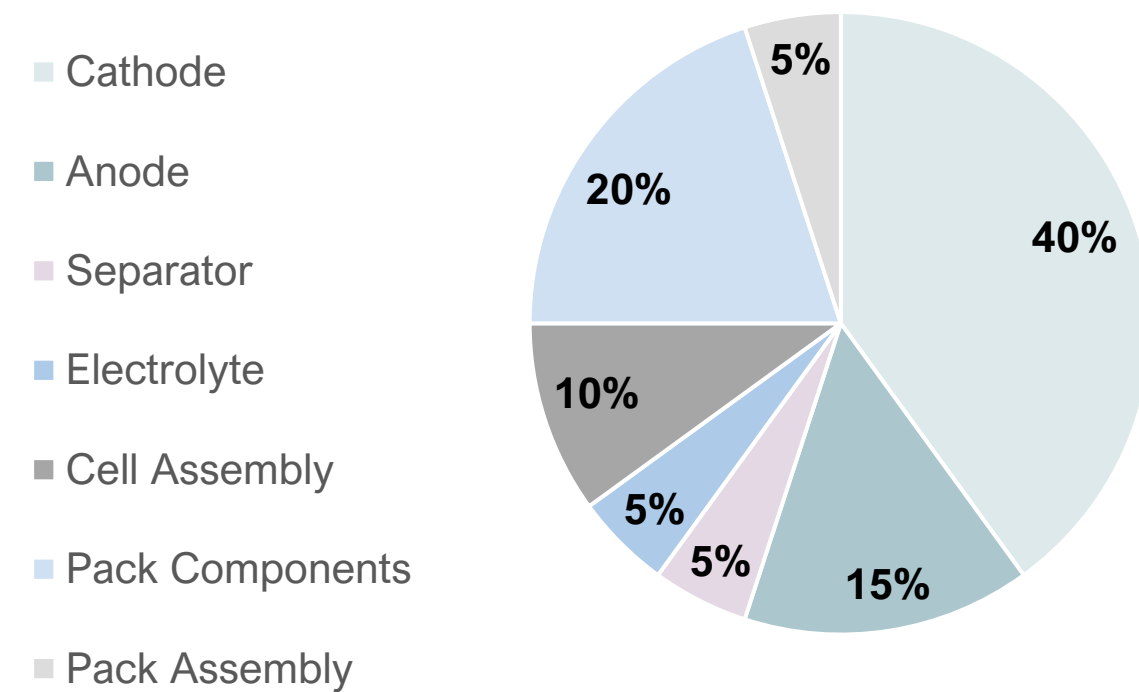
Key Components of a LiB Cell

Description of the various cell chemistries prevalent in LiB and properties

LiB Manufacturing Value Chain



Li Fe-Phosphate Cathode (Li LFP)



Excellent Thermal Stability

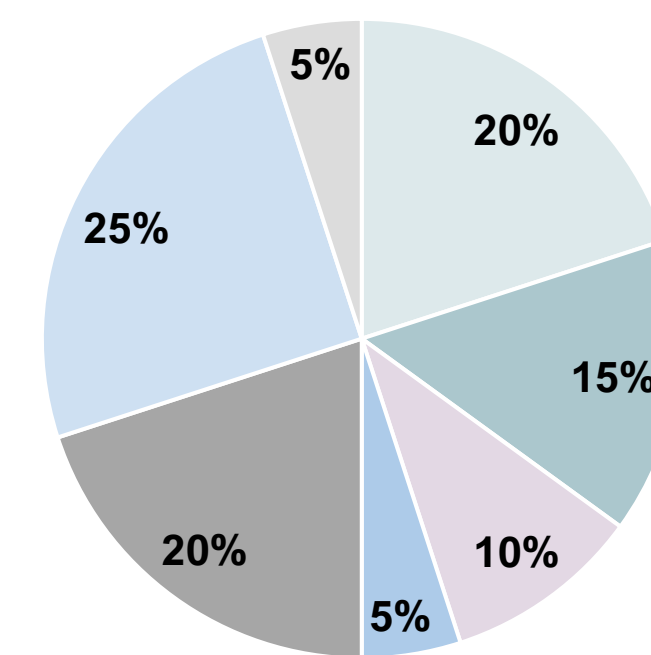
2000-6000 Cycles

Cost is lower due to simpler materials

Suitable for Stationary Storage

High Safety Profile

Li Ni-Mn-Co Alloy Cathode (Li NMC)



Lesser Thermal Stability vs LFP

500-1000 Cycles

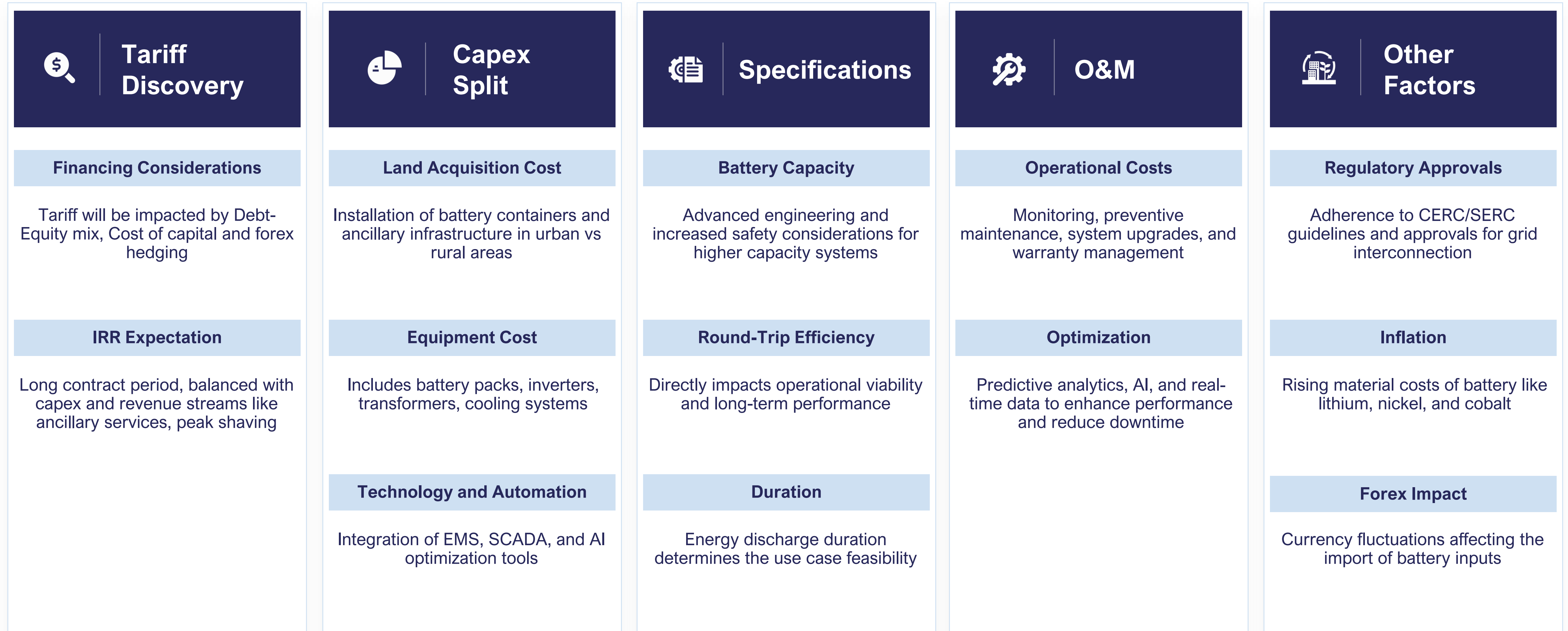
Higher Cost due to Ni & Co

Ideal for EVs & portable electronics

Moderate Safety Profile

Key Considerations for a BESS Project

Determination of Capex & Tariff involves comprehensive assessment of various factors



Salient Features of the Battery Energy Storage Purchase Agreement

Key terms governing a battery energy storage purchase agreement between developer and Utilities

Features	BESPA terms		
Contract Period	12 years from Scheduled Commissioning Date / date of full commissioning, whichever is later		In case of Force Majeure, extension of scheduled commissioning date and expiry date is permitted
Tariff Price and Incentives	Bid tariff fixed for the entire term	Maintain Annual 95% Availability	Maintain 85% RtE. RtE>85%, Incentive of INR 0.5 per unit of excess discharge
Performance Security	Performance bank guarantee/ Payment on order instrument of predetermined value to be deposited by developer in favor of SECI		
Implementation Schedule	Project will take approximately 18-24 months (as applicable) to get completed from the effective date		
Force Majeure	SECI/ BESSD excused to perform obligations for 180 days, can be extended on mutual agreement	Extension of contract period is allowed for FM events affecting SECI/ Buying entities/ BESSD	
Damages / Penalties	Availability <95%, Developer shall pay liquidated damages as per BESPA	RtE <85%, liquidated damages applicable	Delay SCD results in liquidated damages, event of default and BESPA can be terminated
Miscellaneous	Developer to achieve financial closure in 9 months	Developer not allowed to schedule pre-decided cycles/day	Developer is responsible to obtain land/ consents, permits and clearance/ connectivity with CTU
CIL Claims	BESPA provides pre-defined formula for increase in tariff corresponding to increase in project costs for Change in Law		

Risk & Return Dynamics



Operating Cycle with Returns, Risks & Mitigants

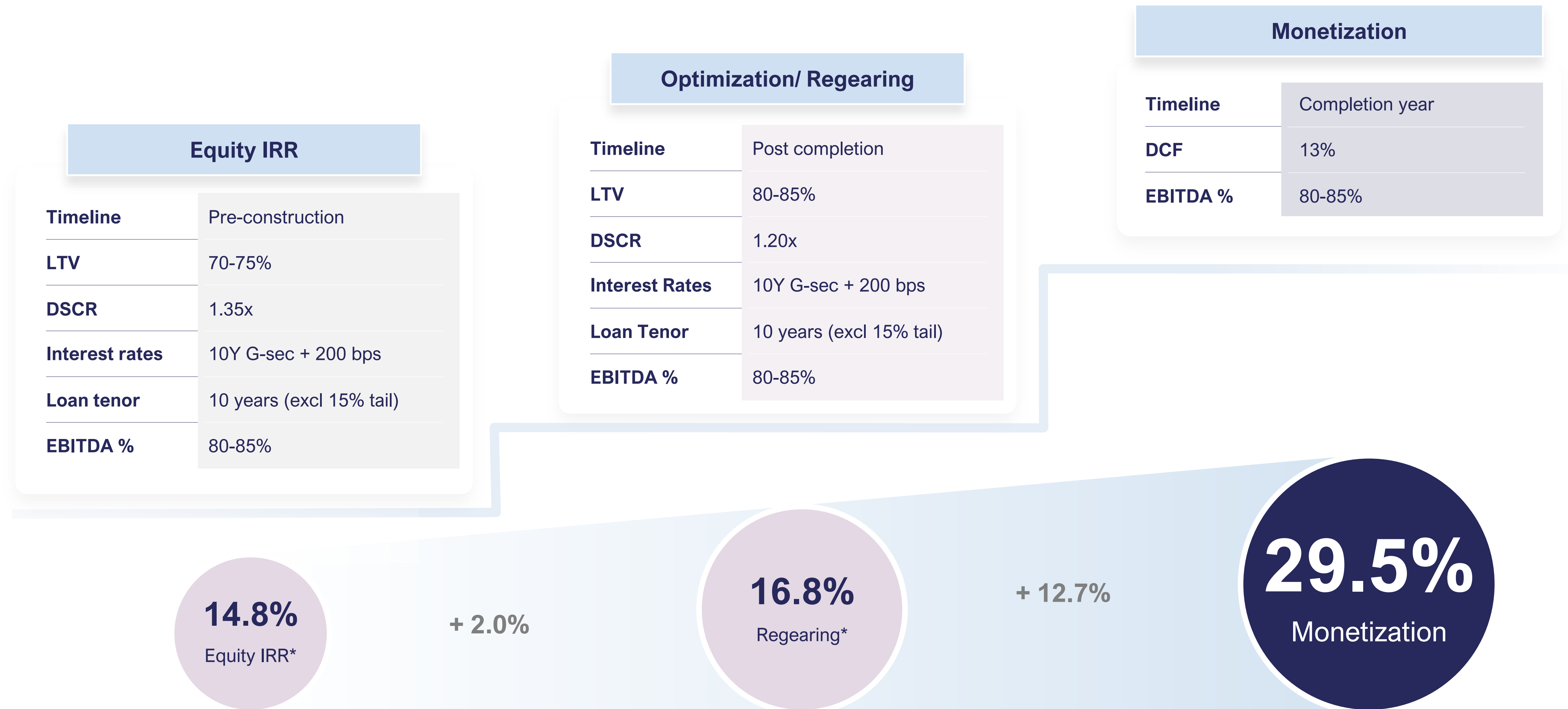
Operating cycle visualised with evaluation of the value pockets of Standalone BESS ecosystem



Approximate returns and margins

Unlocking Value through Cap Rate Compression

Optimized construction timelines and monetization drive quicker capital redeployment



(*): Post tax

Market Mapping










BESS: Value Chain

Current Landscape of India's evolving Battery Storage Value Chain

Raw Material Processing								
Anode & Cathode Materials								
Electrolytes & Separators								
Cell Manufacturing								
Battery Pack Recycling & Assembly								
Battery Tech, Mgt Systems & BOS								
Developers								








Key Emerging Players in the BESS

Massive capex pipeline is resulting in rapid scaling up by existing as well as new players

Companies	Description	Scale	Market Cap	Revenue	EBITDA	Net Debt	Rating	Updates
	On-site, off-site solar, battery storage, and hawk AI energy monitoring system	2GW+ solar capacity	Private Company	710	41	-	Crisil AA+	First mover in the Indian industry to establish Battery Integrated Solar energy solution for C&I customers under OPEX model
	Manufacturing and supplying of polyethylene and phenolic resin battery separators	NA	Private Company	353	87	331	NA	NA
	Supplies Flow Batteries to 9 countries across 5 continents (North America, Europe, Australia, Asia and Africa) ranging from 10 kWh to multi-MWh capacity	NA	Private Company	6	1	3	NA	Awarded contract by NTPC to implement 3MWh Vanadium Redox Flow Battery (VRFB) based BESS project
	Manufacturing of lead-acid batteries for residential, commercial, EV applications. Sells its batteries under brand name; 'Addo' and 'Eastman'	4M+ annual battery manufacturing capacity	Private Company	2,334	157	365	Acuite AA-	Largest manufacturer of solar tubular batteries in India. Contract manufacturing for clients such as Fujiyama, Lucas Amara Raja
	Manufacturing of coal tar derivatives and carbon black products. Products include carbon black, specialty carbon derivatives and focus on Anode materials	Carbon black production cap-1,15,000 TPA	Private Company	3,006	699	-	Crisil A+	Plants of 30,000 tons each in US & India, largest anode facility outside China \$1.1 Bn MoU with Karnataka Government for EV Battery component production
	Manufacturer of automotive lead-acid batteries and a provider of stored energy solutions	346 KMT p.a of Lead Recycling Capacity	38,471	16,770	1,907	697	ICRA AAA	invested INR 100 Cr in EV subsidiary to fund a greenfield lithium-ion battery manufacturing
	Manufacturing of online ups, offline ups, inverters, battery chargers, solar management units, solar charge controllers, and batteries	1GW capacity, plans to expand to 5GW	Private Company	665	55	198	Care BBB+	UTL Solar, its subsidiary plans to set 5GW Capacity Unit in Madhya Pradesh and investment of INR 500 Cr








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Companies	Description	Scale	Market Cap	Revenue	EBITDA	Net Debt	Rating	Updates
 GENSOL	Solar EPC engaged in providing solar designing and engineering services	770 MW+	3,026	3,890	1,485	167	ICRA BBB-	Won the 500 MW/ 1000 MWh standalone battery storage by GUVNL including GS Option 70 MW/140 MWh BESS project from GUVNL
 GODI	Engaged in designing and manufacturing batteries, rechargeable li-ion batteries, NA-ion batteries, all solid-state batteries, one of the largest R&D teams in India in sector	2.5 GWh capacity, plan to expand to 12.5 GWh	Private Company	1	-5	2	NA	MoU with Telangana Government to set up 12.5 GWh lithium-ion cell manufacturing unit with investment of ~INR 8,000 Cr
 M.G. INFR A ENGG. LIMITED	Road EPC player , has currently won tenders for battery storage	10 HAM Projects	8,675	5,378	1,064	1,513	ICRA AA-	Recently won a RE + Storage tender of ~200 MW
 Astemo	Manufacturing electronic powertrain systems. Its products include motors, inverters and battery control units	Reputed auto cos are customers	Private Company	1,790	323	1,470	Care A	
 JAY Jayram Industries India Pvt Ltd	Electrical infrastructure company, experience in deploying grid-connected and off-grid BESS Turnkey Solar, Electric Infra, Railways and management consultancy for Oil & gas	Cumm. installed capacity ~150 kW	Private Company	NA	NA	NA	NA	Secured BESS contract from NTPC: 250kW/1,200 kWh in Khavda
 JSW Energy	PSP, BESS, green hydrogen	4.2 GWh of locked-in through BESS, PSP	Private Company	1,389	-48	-	ICRA AA	Secured 500 MW/1000 MWh capacity in SECI's 1,000 MW/2,000 MWh Battery Energy Storage Systems (BESS) auction (largest of such kind)
 KINTECH A Joint Venture with Nature	EPC, provides technical consultation, project execution, installation and commissioning to power generation and distribution companies on a turnkey basis	NA	Private Company	177	14	28	CRISIL BBB+	Awarded 65 MW capacity in NVVN 500 MW/1000 MWh BESS auction Secured 100 MW capacity In GUVNL Phase IV Bess auction






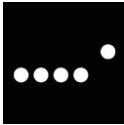

Key Emerging Players in the BESS

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Companies	Description	Scale	Market Cap	Revenue	EBITDA	Net Debt	Rating	Updates
 LOHUM	Manufactures lithium-ion battery packs: 3 wheeler battery packs, 2 wheeler battery packs, stationer segment battery pack etc	Recycling capacity: 2 GWh Reuse: 300 MWh	Private Company	308	24	48	Crisil BBB+	To set up 30 Mn battery processing plant In US, \$100 Mn capex plan to expand 2nd life battery recycling
 MICROTEK	Manufactures power products, offers power back up solutions, voltage solution, solar energy and accessories	NA	Private Company	1,882	142	538	NA	-
 OKAYA	Mfg and supplier of electrical batteries, products incl inverter batteries, solar batteries, railway batteries, telecom batteries, wind power storage battery etc	Network of over 1,000 exclusive distributors	Private Company	1,046	22	128	NA	Sep'20: Bagged orders from BHEL for energy storage systems
 PACE DIGITEK	Design and mfg of industrial eqp, products incl solar inverter, pace solar power optimizer, power management unit, integrated power management system	NA	Private Company	516	41	192	NA	Mar'23, ~INR 7,033 Cr ordered (BSNL) for installation, O&M of telecom towers (7/14 circles)
 Prozeal Infra Engineering Private Limited	Green energy production, incl solar, EV, green hydrogen, clean energy solutions, and turnkey projects	EPC Solar: ~1.1 GW	Private Company	341	66	63	NA	Secured BESS tender
	Solar EPC, offers solar park and projects, operation and maintenance, rooftop solar, energy storage, and energy retail	EPC Solar: ~1 GW	Private Company	733	78	31	NA	Oct'24: Won 600 kW/3000 kWh VRFB System tender (NTPC) Jul'24: Raised INR ~1.3 Bn
 Schneider Electric	Products for low voltage, access to energy, solar and energy storage. Sectors :industrial, buildings, DCs, residential and smart cities segments	31 mfg plants	19,860	14,707	3,377	-	Crisil AAA	Launched a new BESS for microgrids








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Companies	Description	Scale	Market Cap	Revenue	EBITDA	Net Debt	Rating	Updates
	Presence in aerospace, airports, automotive manufacturing, battery manufacturing, data centers, distributors, electronics industry etc	INR ~1,000 Cr capex for mfg facilities	2,69,257	3,104	684	-	Crisil AAA	Deploying a large-scale BESS with a capacity ~160 MWh in Ireland
	Mfg of inverters incl string inverter, central inverter, power conversion system/hybrid inverter, BESS, loading body, inverter and booster floating platform and accessories	Installed 605 GW of power eqp globally	Private Company	496	36	-	NA	1 GWh contract in Texas, 100MW/400MWh partnership for BESS in Malaysia
	Manufacturing lithium-ion batteries, battery module, battery management system, start and stop system devices	Exp to each 50 GWh global capacity soon	Private Company	4,277	159	423	NA	partnering with Gryphon Energy to develop a 1.6 GWh battery energy storage project,
	Mfg and supplying of lithium-ion batteries to automotive sector. JV between Toshiba Corporation (40%), Denso Corporation (10%) and Suzuki Motor Cor (50%)	Plan to expand to 30 Mn cells/year	Private Company	1,494	507	NA	NA	Export lithium-ion battery cells and modules INR ~750 crore, Parent signed MoU with Gujarat govt to invest INR ~5k crore
	Leader in Flake Graphite mfg over 2 decades. Into Graphite mines and processing plant. Partnership to build Mines and processing plant in Madagascar.	To est. 24,000 TPA graphite processing facility	Private Company	NA	NA	NA	NA	Commences full-scale operations at Vatomina graphite project
	RE company, backed by EQT. Generation and energy storage technologies, including solar, wind, batteries and green hydrogen	Target: 5.3 GW	Private Company	19	14	11	NA	Currently have 3 GW
	Mfg batteries, power electronic products and precision engineering parts	11 mfg facilities, 50+ Mn units annual prodn. capacity	23,480	11,708	1,769	6,799	Crisil AA+	Plans to increase its current lithium-ion cell manufacturing capacity to 25 GWh/year








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Companies	Description	Scale	Market Cap	Revenue	EBITDA	Net Debt	Rating	Updates
	Offers nanotechnology products including oil sorbent, graphene composite filtration media, post-purification filter	Li cell 50 MWh, battery pack 250+ MWh	Private Company	72	-65	138	NA	Partnership to support next-gen EV Powertrain technology with Musachi, Jupiter Wagons acquired Railway & Electric truck battery division
	Manufactures electric vehicles and core components for electric vehicles. These components include battery packs, motors, and vehicle frames	Gigafactory Initial size 5GWh, expand to 100GWh	41,118	5,010	-1,034	5,363	ICRA A	Plans to use self manufactured batteries in EV segment
	Manufactures bromine and lithium-based organic and organo-metallic compounds	Organic chem 4.6 Mn cu. Mt, Inorganic, 39 Mn cu.mt.	5,546	691	118	394	Crisil A	Building a battery material facility in Gujarat, producing 30,000 MT electrolytes & 3,000 MT electrolyte salts
	Development of Green Energy Technologies & Products and its manufacturing- Li-ion cell technologies and product	Aim to scale to 30 GWh+	Private Company	1,052	153	303	NA	Completed its commissioning 600MWh annual capacity LFP cylindrical cell manufacturing
	Manufacturing graphite electrodes and electric power, In carbon specialty, it offers activated carbon fabric (ACF)	Planned 2k crore capex by FY25	Private Company	2,393	382	619	NA	World's Largest Single Site Graphite Electrode Plant under one roof with a capacity of 80,000 tons pa
	Manufacturing of carbon black. Its products are carbon black, specialty black, power	Carbon black mfg, capacity 770 kT	Private Company	6,420	1,037	4,983	NA	PCBL & Kindia -51:49 JV agreement in Nanovace for developing Nano-Silicon products to be used in anodes of Li-Ion batteries
	Manufacturing lithium-ion batteries. Its services include digital collection, testing and grading, cell auditing, repurposing, refabrication, sales and battery swapping	NA	Private Company	82	62	52	NA	-








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Companies	Description	Scale	Market Cap	Revenue	EBITDA	Net Debt	Rating	Updates
 BATX	Mining services, incl Black Mass, Lithium, Nickel, cobalt, magnesium, secondary products, and manganese; battery grade materials by recycling end-of-life Li-batteries	NA	Private Company	21	-	-	NA	Partnered with LW3 to transform battery lifecycle management for energy storage system
 ANALOG DEVICES	Manufactures semiconductors, specializes in analog, digital, and software technologies, provides battery management systems (BMS) and other products for the battery industry	~1.7 Bn R&D investments made at group level	Private Company	672	124	-	NA	Strategic alliance with Tata group for expanding facilities
 BHILWARA GROUP	Conglomerate, leading textile company in India Hydro-based, wind, thermal power generation	Commissioned 2 Hydro power, 2 wind power plants	Private Company	10,104	1,633	-	NA	Won GUVNL BESS tender in Dec'24
 ADVAIT INFRA TECH LIMITED	Product solutions for power transmission, sub-stations and telecom infra	200 MW Electrolysers capacity planned	1,600	209	36	16	Crisil BBB	Won GUVNL BESS tender in Dec'24
 EXICOM POWER SOLUTIONS	Mfg of power systems in EV batteries, power systems, RE & grid hybrid systems	4.5+ Lakh Li-ion Batteries deployed	Private Company	1,020	131	30	NA	Aug'24: Potential acquisition of Australian EV Charging company
 Himadri	Manufacturing of carbon materials and chemicals, key player across battery materials, coal tar pitch, carbon black, naphthalene, SNF	Panned 20,000 MT advance carbon material capacity	28,150	4,185	645	-	ICRA AA-	Acquired 40% stake in Li-ion battery material startup Invati Plan to invest INR 220 Cr in carbon black
 ALTMIN	Mfg battery materials- cathode & anode	Target: 6GWH by 2026	Private Company	NA	NA	NA	NA	Jan'24: Aims to invest USD ~100 Mn in cathode mfg over next 5 years




Key Emerging Players in the BESS

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Companies	Description	Scale	Market Cap	Revenue	EBITDA	Net Debt	Rating	Updates
	World's leading sustainable manufacturer and supplier of carbon black additives and largest producer and supplier in carbon black	382,200 TPA production capacity	Private Company	4,145	739	-	CRISIL AA	USD 1 Bn investment to build synthetic graphite and supplying battery materials for EV battery and defense
	Mfg chemicals, wholly owned subsidiary GFCL EV raised INR 1,000 Cr to expand its battery material capacity	1,800 TPA Li plant recently commissioned	1,069	4	-8	-	CRISIL AA	GFCL EV raised 1,000 Cr to expand its battery material capacity, supporting ~5-6 GWh production
	Production of specialty films relevant to battery storage applications, developed chemical recycling processes	Thin PET 1,86,000 MTPA, thick PET 28,800 MTPA	4,187	6,307	366	42	IND AA-	-
	Jindal renewable energy is into BESS component manufacturing like battery packs, cell manufacturing etc	To expand cell manufacturing cap. To 5GWh by 2027	NA	NA	NA	NA	NA	Plans to establish a 1 GWh battery pack assembly line using lithium iron phosphate (LFP) chemistry by 2025
	Production of specialty chemicals, including inks and adhesives, which are essential for various applications in battery storage and packaging	Global manufacturing capacity 1 Mn+ MTPA	4,116	13,364	1,387	5,874i	IND AA-	-
	Custom mfg of specialty chemicals, including agrochem & pharma intermediates for use in battery tech, involved in fluoropolymers for battery casing and lithium applications	27,200 MTA manufacturing capacity	8,092	1,475	381	781	IND AA-	Acquired 26% of specialty fluorides chemical manufacturing business Tanfac from Birla Group Holdings
	Involved in the production of specialty chemicals and carbon black, exploring new technologies and processes to enhance their product offerings in the battery sector	36,661 MTPA for speciality chemicals	68,236	13,139	2,584	4,623	CRISIL AA+	Investing ~INR 15,000 Crs to expand facilities

Key Emerging Players in the BESS


















Massive capex pipeline is resulting in rapid scaling up by existing as well as new players

Companies	Description	Scale	Market Cap	Revenue	EBITDA	Net Debt	Rating	Updates
AGRATAS	Mfg of lithium-ion cells for electric vehicles, Subsidiary of Tata Sons Ltd.	Planned capacity: 20GWh	Private Company	-	-33	-	Care AA+	Jan'24: Planned to raise green loan of USD ~500 Mn
	Battery mfg, solar solution provider, offers ev-2 wheeler, e-rickshaws battery, solar hybrid solutions and ESS	Production Capacity: 1.2GWh	Private Company	47	-6	22	NA	Sep'24: Cygni Energy partners with XDLE for energy storage solutions Aug'22: Raised USD 12.5 Mn to drive growth and expansion
	Mfg auto electrical parts, offers automotive products. JV between Lucas Plc. UK and TVS Group. Set up ~10 GW LiB factory in partnership with 24M	Presence in 5 countries	Private Company	4,185	324	-	Crisil AA+	Apr'24: Bid for Govt's ACC PLI Scheme Sep'21: Built a LiB factory with US Co tie up, capex INR ~2,500 Cr
	Engaged in supply, installation and maintenance of smart meters for power distribution companies and trading in lithium cells	Target LFP: 5 GWh	Private Company	NA	53	30	Crisil BBB-	Awarded 80k smart meters projects- INR 155 Cr; Building capacity LFP cell plant of capacity 1 GWh, capex INR 1,100 in 3 years

Capitalizing on the Opportunity



Recent Awards in Standalone Battery Energy Storage

	Dec'24	Nov'24	Mar'24	Nov'23	Sep'23	Apr'23	Oct'22	Apr'22	Apr'22
Winners									
Capacity MW	500	500	500	250	20	0.3	50	10	500
Capacity MWh	1,000	1,000	1,000	500	40	1.2	200	20	1,000
Tendering Authority									
Winning Quote INR /MW/ Month	INR 2.26 Lakh	INR 2.37 Lakh	INR 2.37 Lakh	INR 4.49 Lakh	INR 4.75 Lakh	NA	INR 11.80 Lakh	INR 11.25 Lakh	INR 10.83 Lakh

About
AVENER



Investment Banking | Infrastructure & Real Assets

Leading financial advisors in the Infrastructure & Real Assets space in India


Renowned experts in Indian Infrastructure and Real Assets space

 <p>70+ Platform, equity, M&A and debt transaction closures by the team till date</p>	 <p>\$ 15 Bn+ Total fund raising by the team till date</p>	 <p>25+ Among the largest teams in the country dedicated towards the Infra space</p>	 <p>Policy Formulation Part of committees of various regulatory bodies</p>
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Transaction Footprint in FY24

<p>18 Total deals</p> <p>\$ 4.6 Bn Total deal value</p>	<p>06 M&A/ Private Equity Value: \$ 1.3 Bn</p>	<p>04 Project Finance Value: \$ 1.4 Bn</p>	<p>08 Refinancing/ Structured Debt Value: \$ 1.9 Bn</p>
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Accolades

-  Ranked 5th in M&A & 7th in PE in YTD24
-  Ranked 8th in PE in 2021 & 2019
-  Ranked among the Top 10 advisors for Asia & Australia by Finance Asia in 2023
-  Ranked among the Top 25 bookrunners in Asia by Thomson Reuters in 2019

Key Clientele - Leaders of Respective Sectors



Avener's Connects

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