ACMA Executive Council Meeting - Jamshedpur

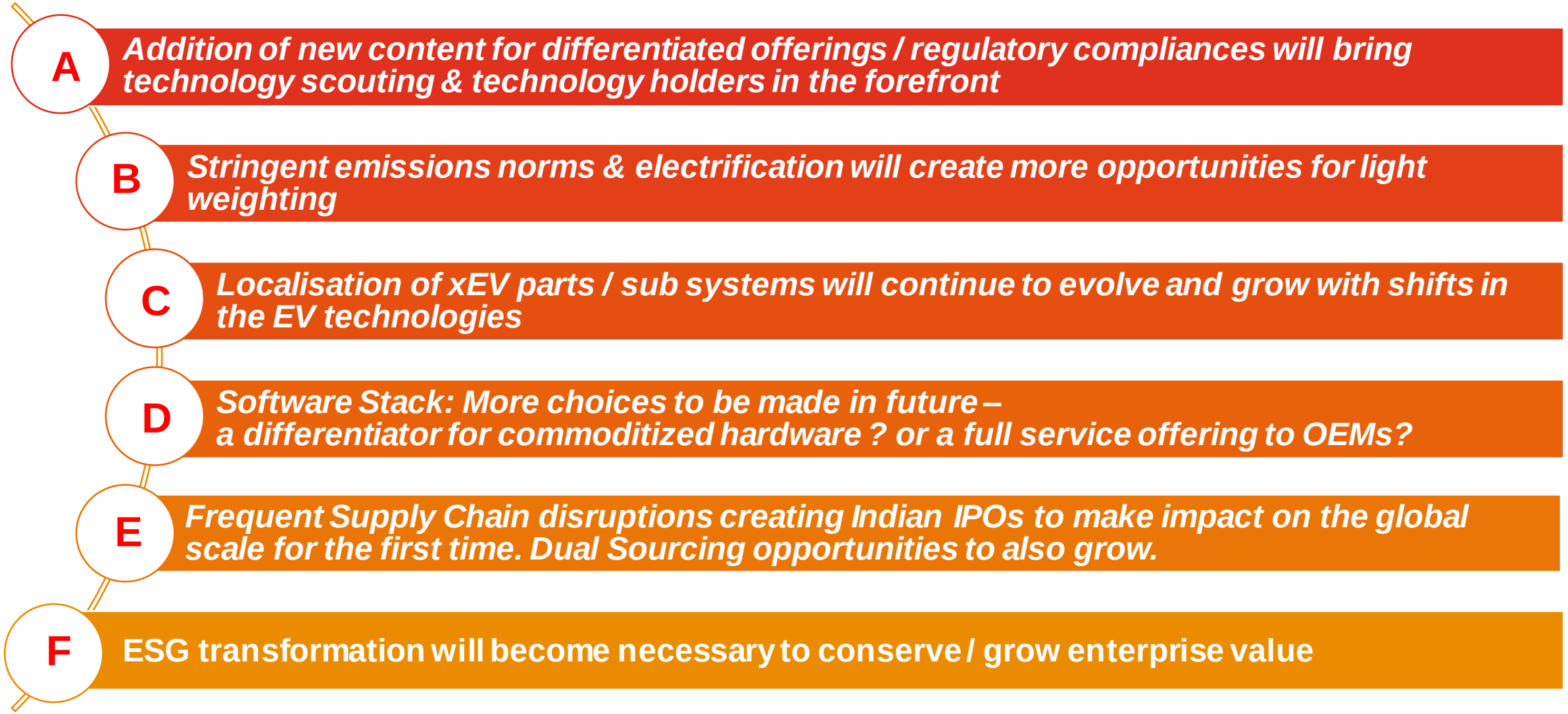
Automotive Market: Opportunities and Challenges for Suppliers

Presentation to EC

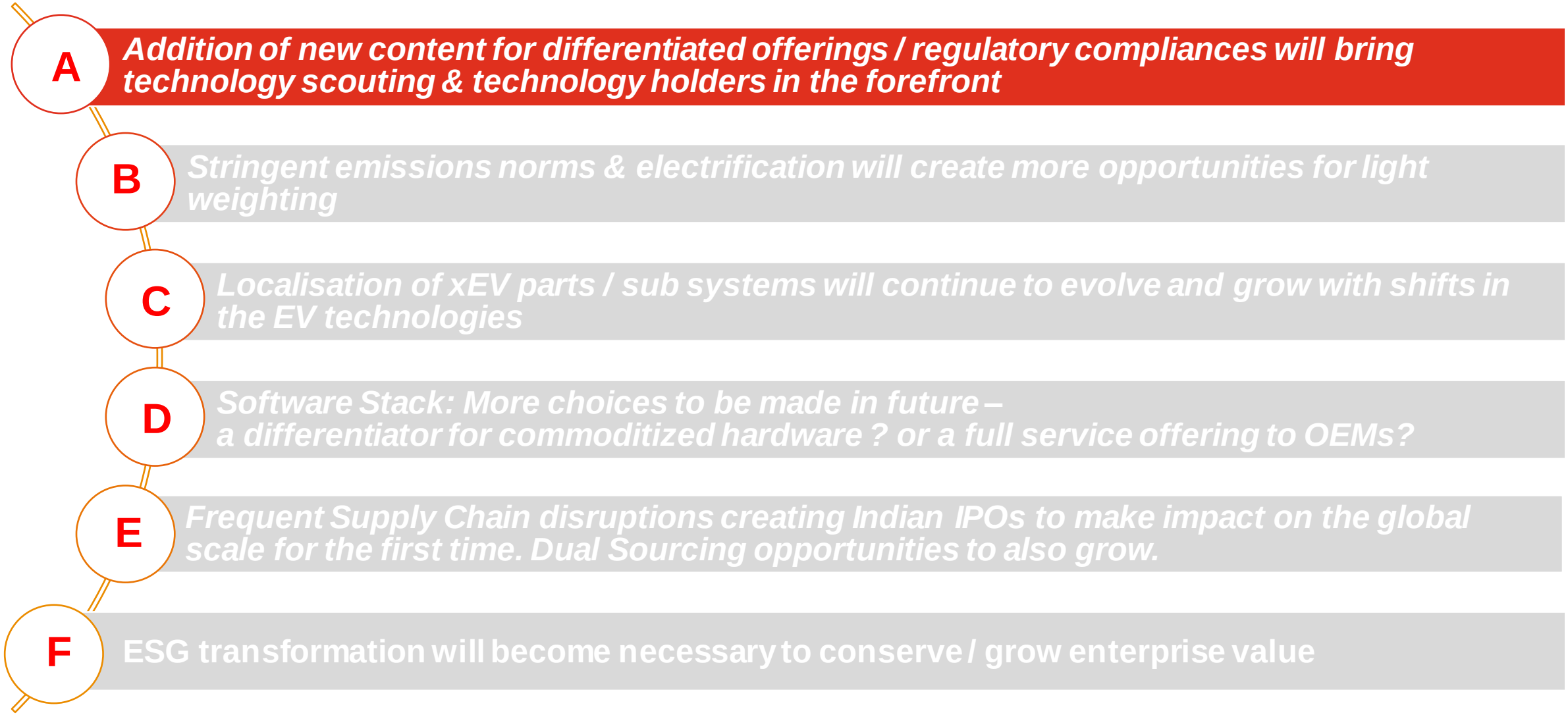
Feb 03, 2023

pwc

State of the Industry: New opportunities and Imperatives for Supplier



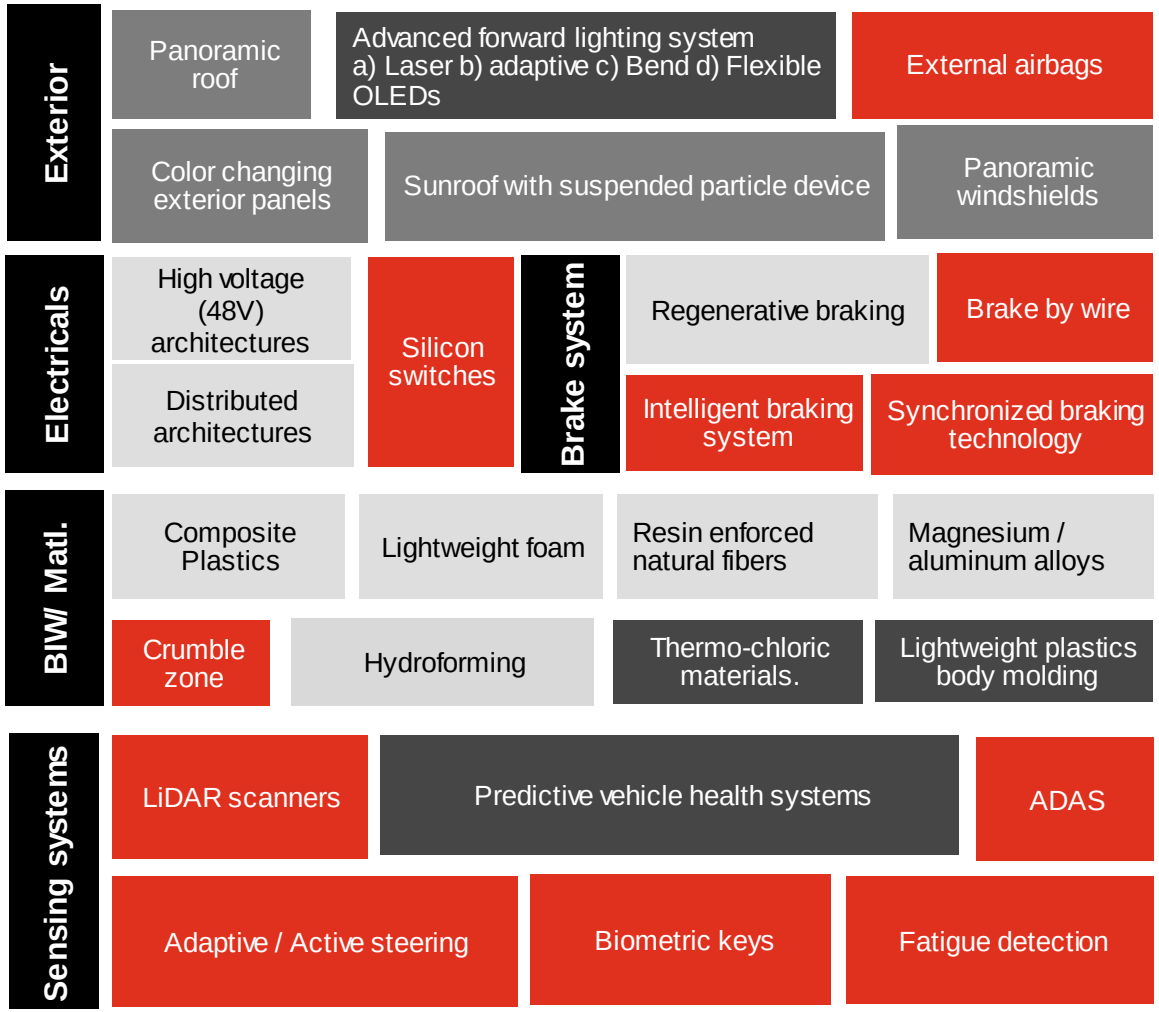
Source: PwC Analysis



Source: PwC Analysis

OEMs increasingly adding new technologies for differentiation and regulatory compliances

Implications on vehicle due to increasing tech. content



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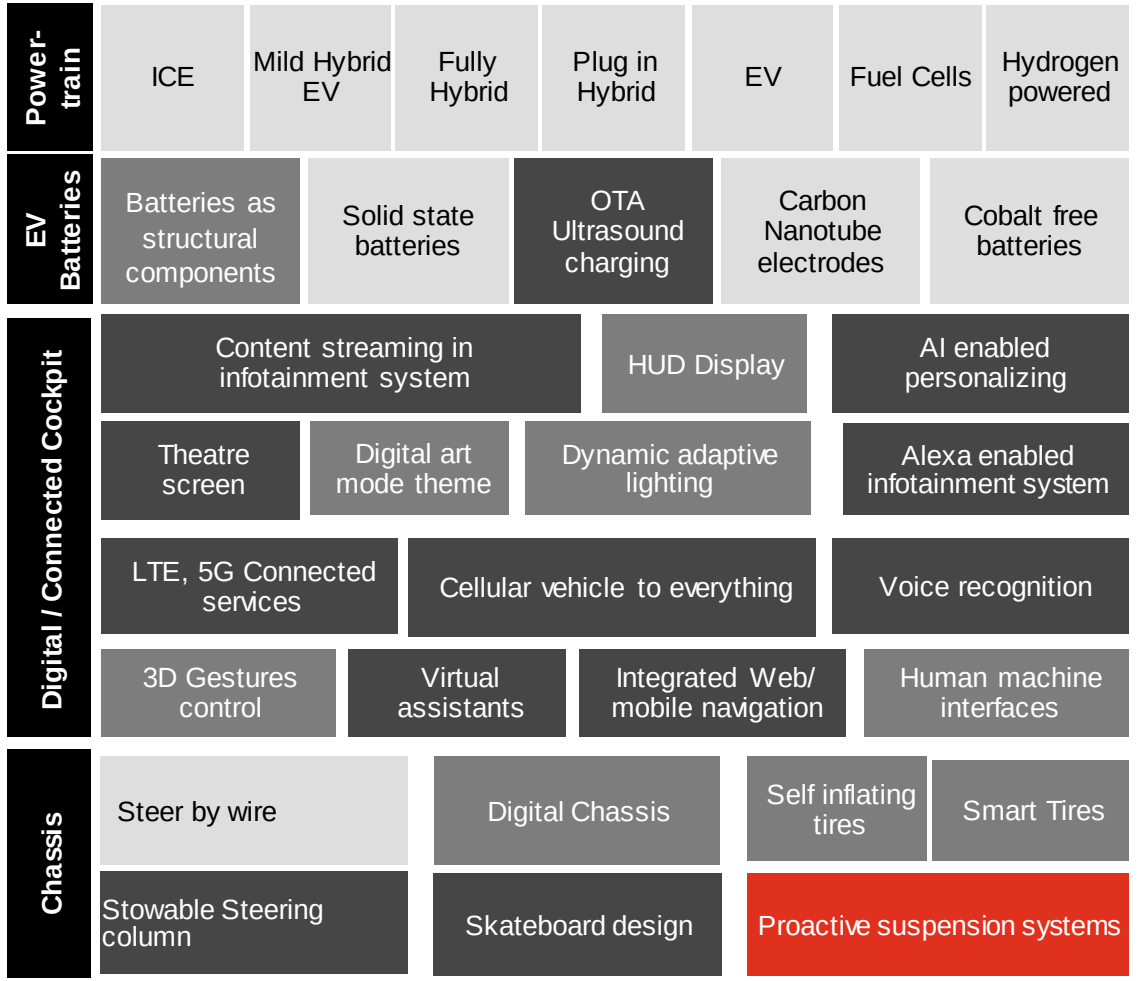


Multiple OEMs have engaged in technology scouting programs that focus on academia, scale-ups & traditional supplier collaborations

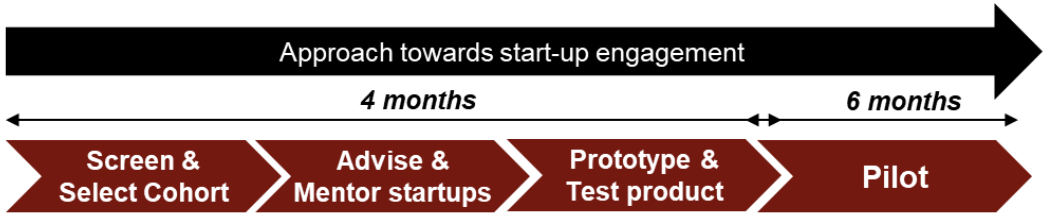
Illustrative

Case 1 – Scouting program only start-up focussed

Prominent *Passenger Vehicle* OEM in India

Scouting program - Runs a ***startup accelerator*** program over 4 months

Selects startup cohorts within focus areas & helps the startups optimize their business model and prototype their products.



Case 2 – Major innovation resources directed to start-ups

Leading *Global* OEM

Innovation initiative 1 - ***Startup incubator*** program to flesh out innovative ideas. Now divested as separate, privately owned organization

Innovation initiative 2 - ***Startup venture fund*** based in the Bay Area. Doubles up as open innovation platform

Innovation initiative 3 - ***Startup cooperation platform,*** similar to an accelerator. Selected startups pilot solutions with the OEM

Innovation initiative 4 – ***Internal & collaborative innovation,*** engaging employees for ideas & working with scale-ups & traditional suppliers

Case 3 – Scouting program only start-up focussed

Global *Passenger Vehicle* OEM's India Innovation Program

Scouting program - Runs a ***Digital Lab for startups.*** Has partnered with a large technology company.

Digital Lab India

- **Partner Scouting provider** - Startup Curation
- **Large tech. company** – Accelerator & mentorship
- **Platform Partner** – Dev. Platform & tooling
- **System Integrator** – OEM-startup-platform integration

Case 3 – Innovation resources purely start-up driven

Renowned *Performance Car* OEM

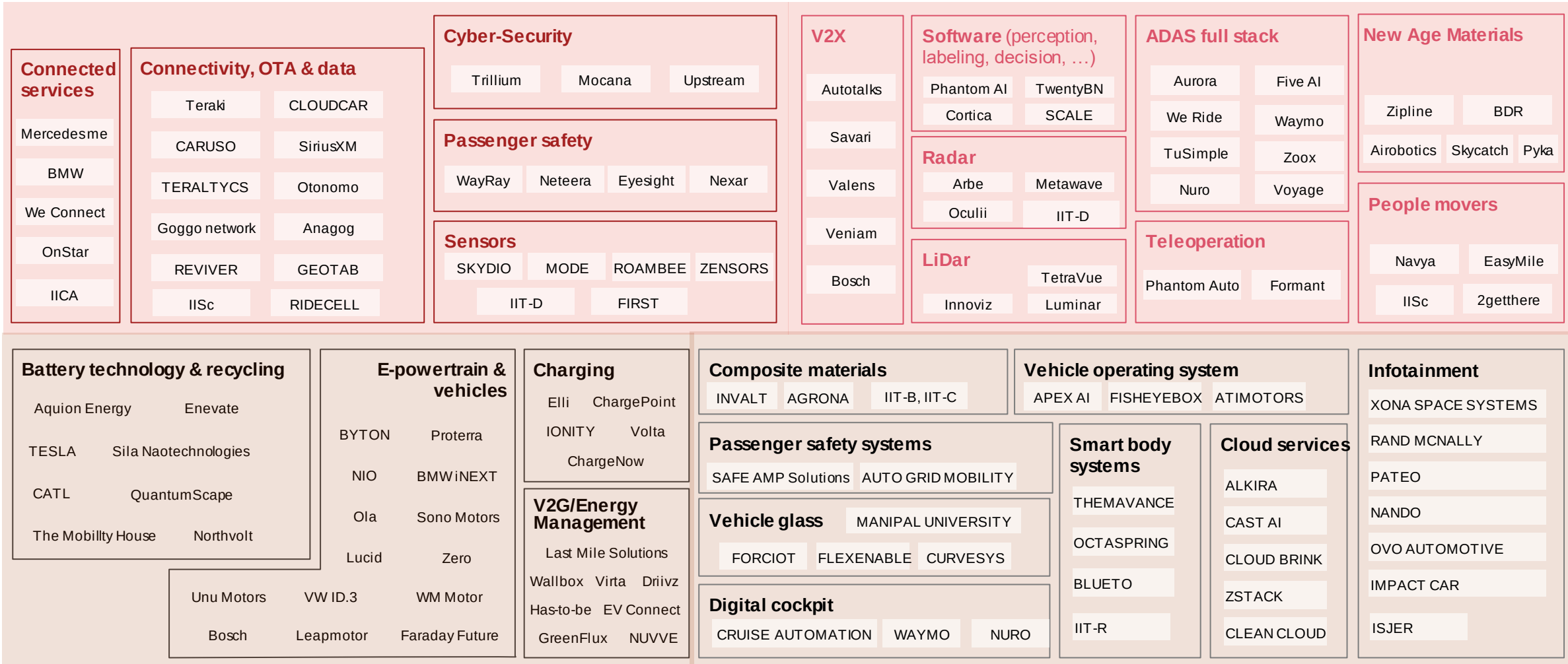
Innovation initiative – Corporate venture capital (CVC) fund exclusively for ***startups***

- Purpose is to develop digital experiences, new products, services & features
- Investments are strategic & not financial
- Invest corporate funds directly in external Startups

Growth in technology holders across the areas of new technologies

Map of technology players (selection)

Non- exhaustive



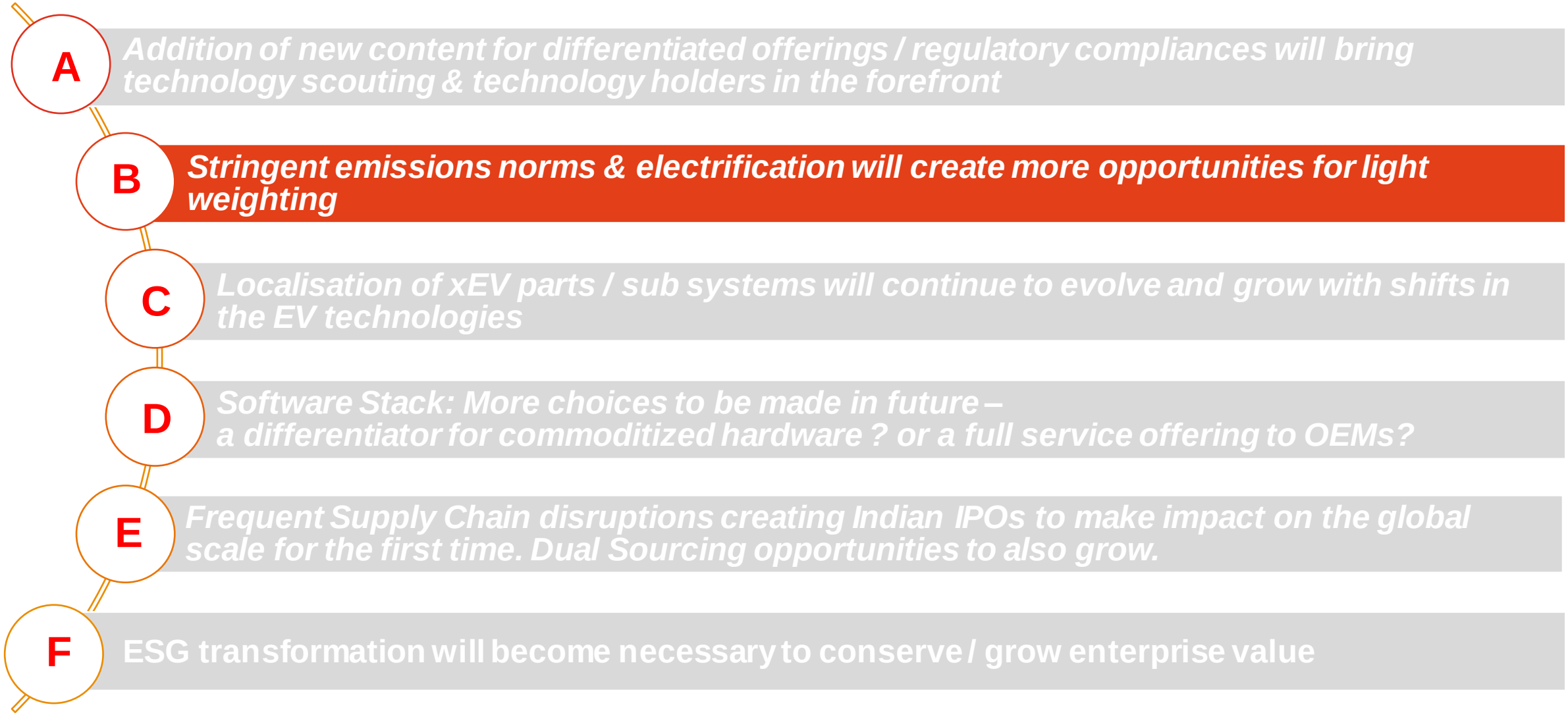
Auto component manufacturers must leverage ecosystem to take advantage of the increasing content per vehicle

Content Category	Drivers
❶ New Content per Vehicle	1. Regulations led content addition: *(BS VI, Emissions, safety, autonomous, …)* 2. Growth in xEVs 3. Increased premiumization in cars 4. Increase in connectivity-based features 5. Growth in software
❷ Shifts in Value Chain position	1. Full system supplier solutions 2. Tier-1 modules/aggregates supplier 3. Large scale tier-2/tier-3 supplier
❸ Diversify into New Capabilities	1. Technology shifts in sensors & electronics 2. Shifts in E/E architecture of vehicles 3. Data led offerings 4. Newer materials

Key Imperatives for Auto Suppliers

1. Make technology scouting a priority in core and new chosen areas of growth
2. Adapt to take small bets outside of core business
3. Build ecosystem of technology holders

Source: PwC Analysis



Source: PwC Analysis

Globally OEMs are under pressure to reduce CO2 content under regulatory push

Europe is setting global benchmarks in reducing carbon footprint

Carbon neutrality target year - 2050

- 10.5% GHG emissions in Europe are contributed by PV segment
- Europe has planned to reduce emissions from cars by 15% by 2025, 55% by 2030 and reach zero emissions by 2035

US has announced stringent targets given high emissions from transportation

Carbon neutrality target year - 2050

- 16.8% GHG emissions in US are contributed by LMV segment (Cars and Light duty trucks)
- US has planned to reduce GHG emissions by 28% between 2022 and 2026 and reach 50% sales of zero emission vehicles by 2030

PV OEMs have outlined their emission reduction roadmap in line with global targets

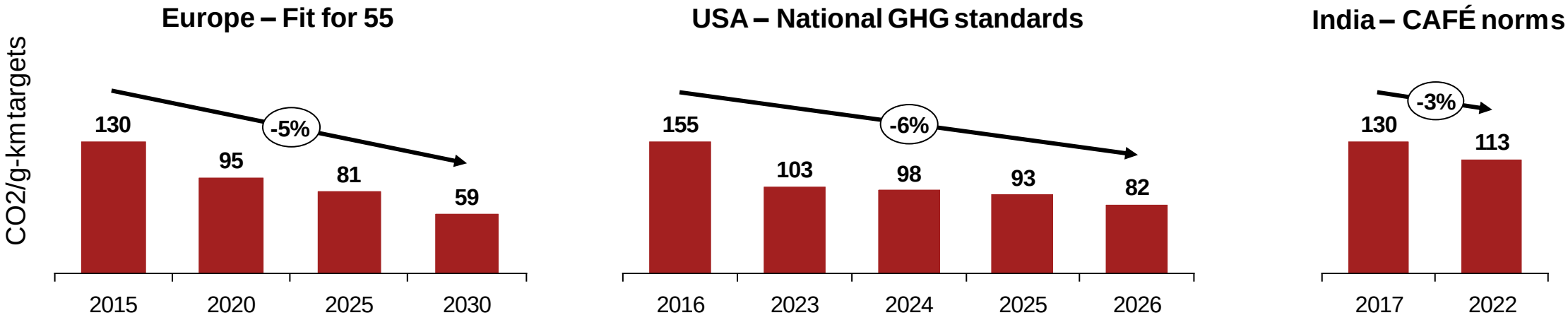
Europe

OEM	CO2 emission reduction roadmap
VW	Aims to cut emissions by 40% by 2030 compared to 2018 Carbon neutrality by 2050
Stellantis	Reduce Co2 emissions by 50% compared to 2021 figures Carbon neutrality by 2038
Hyundai	Reduce Co2 emissions from 2019 level by 75% by 2040 in global manufacturing
Renault	Reduce Co2 emissions from 2010 level by 50% by 2030 Carbon neutrality in Europe by 2040 and worldwide by 2050

USA

OEM	CO2 emission reduction roadmap
Ford	Reduce GHG emissions by 50% by 2035 and GHG emissions by 76% from global operations
GM	100% EV sales starting form 2035 Carbon Neutrality by 2040
Toyota	Reduce Co2 emissions by 90% by 2050 globally from 2010 baseline
Honda	Carbon neutrality by 2050, 100% utilization of renewable energy and resource circularity

Stringency in emission norms has been low but penalties may get imposed in future



We project new emission norms (expected between 2025 & 2027) to be more stringent and in line with EU & US level as observed in the past when India leaped from BSIV to BSVI in 3 years

Indian automakers are given super credits to offset targets for CO2 emissions, but their incremental impact will reduce with time

Power train related super credit

Vehicle Type	Volume derogation factor for Super Credit (v_i)
Strong Hybrid Electric Vehicles	2.0
Plug-in Hybrid Electric Vehicles / Range Extender Hybrid Electric Vehicles	2.5
Pure Electric Vehicles	3.0

CO2 Technology related super credits

CO2 reducing technologies	CO2 reducing technology derogation factor (c_i)
Regenerative braking	0.98
Start- Stop System	0.98
Tire Pressure Monitoring System	0.98
6 or more speed transmission	0.98

Maximum reduction through features is capped at 9 g/km per OEM. **Premium manufacturers like Mercedes, Volvo, JLR are claiming between 8-9 g flexibility credits.**

BEV related super credits have tapered down over the policy revision

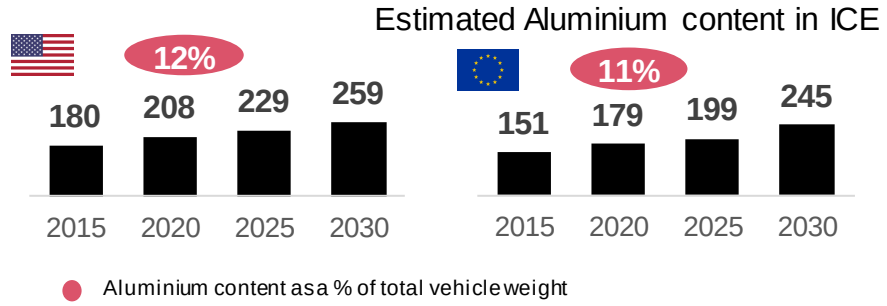
Geography	EV credits
Europe	2 credits in 2020, 1.67 credits in 2021, 1.33 credits in 2022, **no credits from 2023**
China	5 credits between 2012-17, 3 credits between 2018-19, 2 between 2020-21, 1.8 in 2022, 1.6 in 2023, 1.3 in 2024, **no credits from 2025**
USA (for BEV)	2 credits between 2017-19, 1.75 in 2020, 1.5 in 2021, **no credit from 2022**

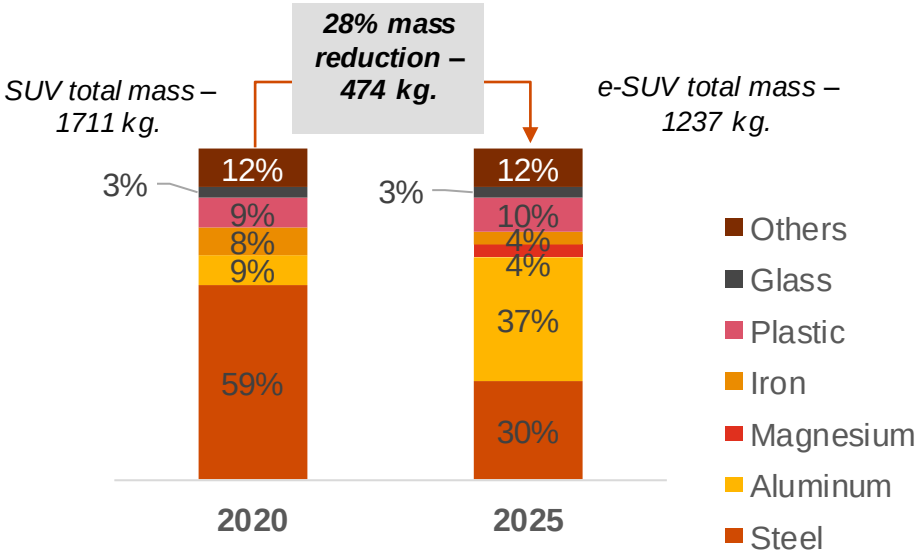
CAFÉ 2 targets (FY23)			
OEM	**CAFÉ 2 target (g/km)**	**CAFÉ 2 projected (g/km)**	**Light weighting requirement (kg)**
123	105	108.8	38
RFP	114.4	123.4	90
PQR	116.1	114.5	
ABC	139.9	158.4	255

Note – On every 100 kg reduction in weight, emissions reduce by 10 g/km for Petrol vehicles and 8 g/km for Diesel vehicles

Aluminium content is increasing across geographies and India will advance at an accelerated pace in pursuit of light weighting

Electrification & light weighting will increase Al. weight in PV due to transition from steel

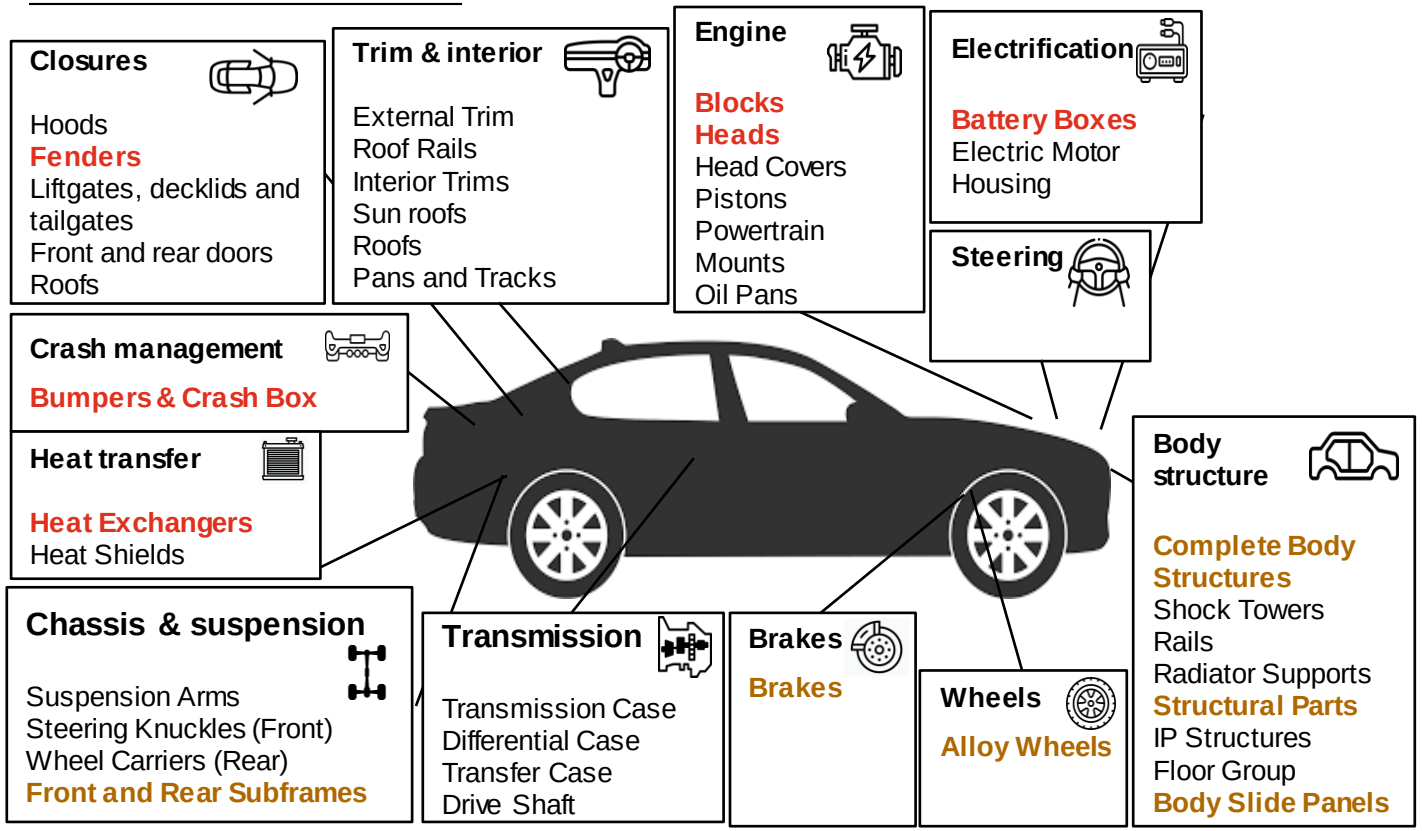




Within ICE, significant number of components are yet to shift to Aluminium if India is to follow EU in light weighting trend

Al. content in a PV - EU Vs India

Illustratve and Non- exhaustive



Note: The components of the car above encompasses all aluminium applications in a European passenger car and is based on the analysis of a car sample covering nearly 95% of total EU28 production

Components of a standard Indian car made from aluminium

Light Weighting will opportunity will evolve across multiple processes and materials

Key Imperatives

1. **Invest in multiple processes**
2. **Target IPOs**
3. **Build ecosystem of technology holders**

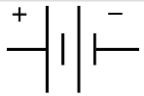
Source: PwC Analysis

Source: PwC Analysis

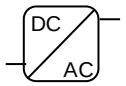
Increasing fleet electrification is creating new opportunities for players to localize manufacturing of power electronics

Power Electronics - Components

HV battery Junction Box

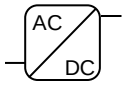


DC/AC inverter



Motor

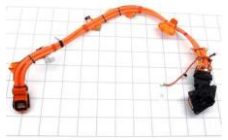
OBC



DC/DC converter

Wiring Harness

HV AC connector



HV DC connector

Charging port

DC AC

BDU

BDU

PDU

eA/C

eHeater

Integration

- Mechanical integration
- Electrical integration
- Thermal circuit (cooling/ heating)
- Functional component boundary

NOTE: eA/C – electric A/C compressor; eHeater – electric heater (air or coolant); PDU – Power distribution unit; BDU – Battery Disconnect Unit (contactors, fuses); OBC – On-Board-Charger

Source: PwC Analysis

High potential for localization of assembly & manufacturing

Local supply chain for these components is now evolving, with *investments driven by multiple push and pull factors*

Illustrative & Non- exhaustive

Aggregate	Sub-assemblies / Components	OEMs insourcing trends	PLI – coverage	PMP-led localization	Emerging landscape in India
Batteries	Battery pack assembly	High	No	Yes	Multiple players have emerged
	Cells manufacturing	Low	Yes	No (Can be imported)	Ongoing investments
	Materials for Anode / Cathode, Separators, etc.	Low	No	No (Can be imported)	Limited supply in India
E/E component	Integrated edrive / Motor &controllers	High	Yes (incl. wheel rim integration in 2W/3Ws)	Yes (incl. wheel rim integration in 2W/3Ws)	Multiple players investing & startups emerging
	PDUs	Low	Yes	Yes	Limited to assembly operations
	BMS	High	Yes	No (Can be imported)	
	On board charger HV	Low	Yes	Yes	
	WH assembly (HV)	Low	Yes	Yes	Multiple players
	WH components incl. HV (Connectors, Contactors/ circuit breakers, DC-DC convertors etc.)	Low	Yes	Partly (electric circuit breakers/ contactors, DC-DC convertors)	Some investments underway

Source: PwC Analysis

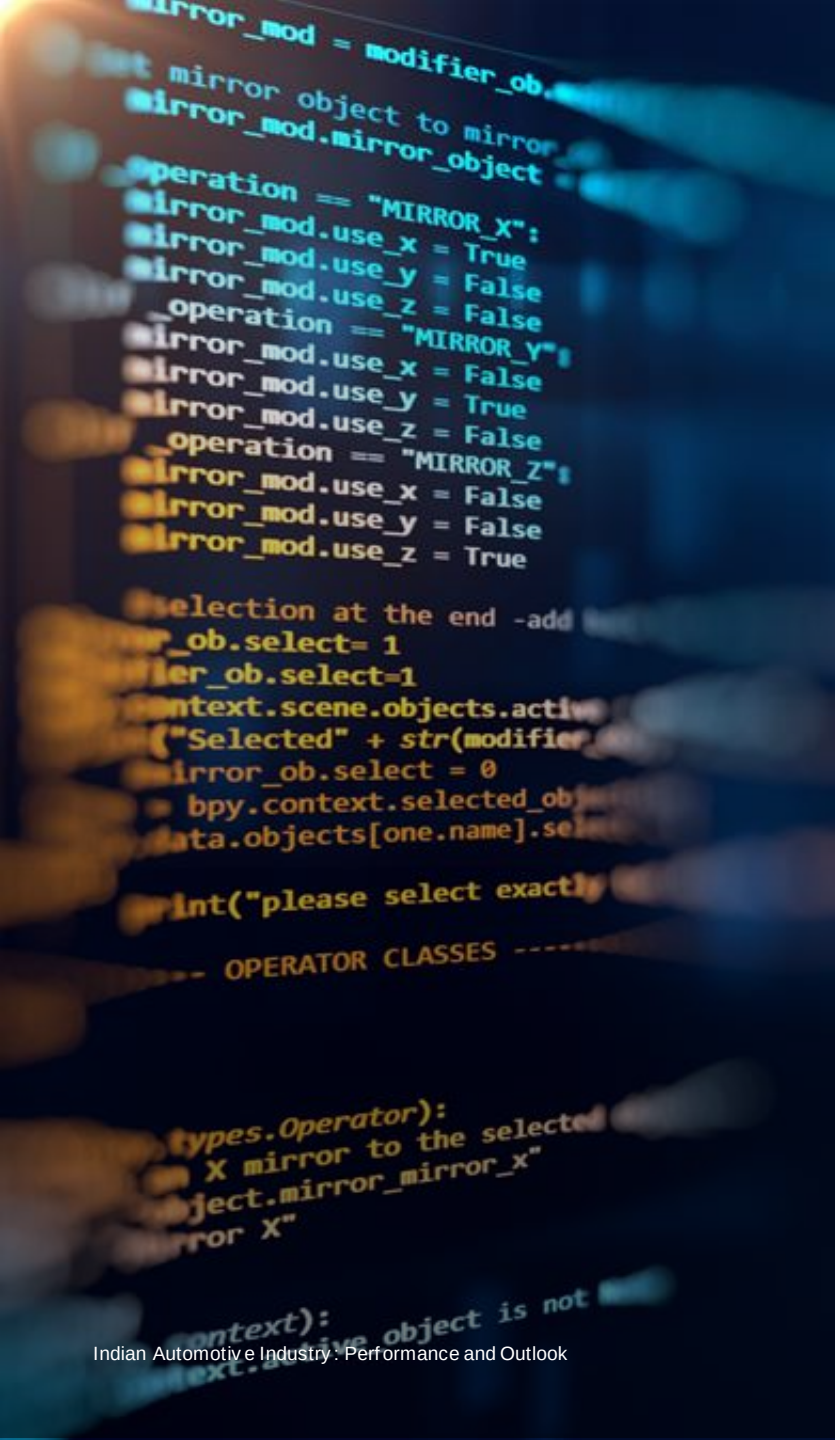
Localisation will continue to evolve and grow with shifts in the EV technologies

Key Imperatives

1. **Differentiation on EV components will eventually be driven by software algorithms and ability to refresh the products rapidly**
2. **Take small bets across emerging technology**
3. **Build ecosystem of technology holders**

Source: PwC Analysis

Source: PwC Analysis



Software has become the key differentiating factor for modern vehicles

Software in Automotive – Key trends

60%
of vehicle value add

Software will contribute up to **60%** to the **perceived value** of a vehicle in 2030. **Alternative ownership** models could **increase this value** even more

300%
software increase

Connected Vehicles, **Automated Driving, Smart Mobility** and **Electrification** increase the amount of vehicle software by **more than 300%**

3 months
software update cycle

Continuous development and **security patches** will trigger a software update at least every **3 months** in 2030

83%
growth in development costs

Software **development cost** per model series will **grow by 83%** within the next decade

Source: Strategy& analysis, Statista, IEEE, Morgan Stanley Research, Market Research Future, IHS

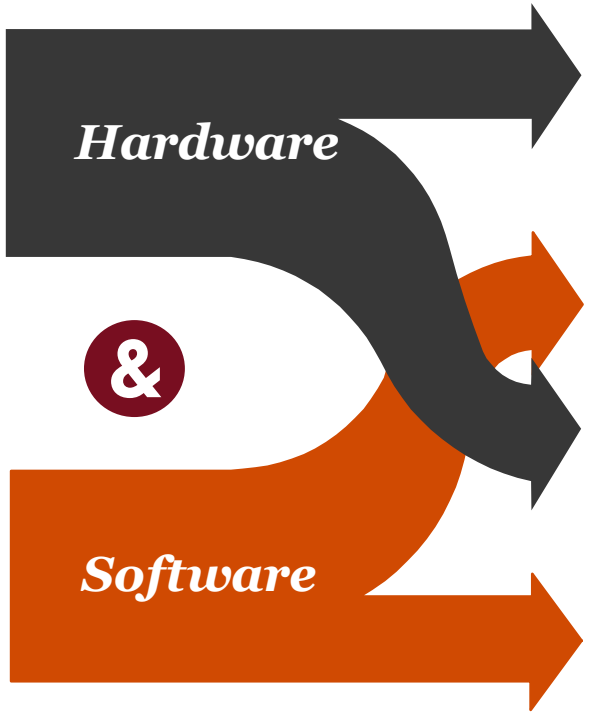
In future, the *enterprise value* for Tier-1 suppliers *will be created by regaining the control on content per vehicle*

Tier-1 sourcing model for electrical / electronics components & systems (e.g. Motors & controllers, ECUs, charging systems)

Traditional

Tier 1 fully responsible for H/W + S/W integration

- Fully integrated model with Tier-2 sourcing at discretion of Tier-1 suppliers
- Priced in unit cost + tooling. S/W generally black box to OEMs



New 'disintegrated' reality

- **3rd party S/W, OEM S/W**
- **OEM directed hardware**
- **S/W stack engg. & integration**
- **H/W design, H/W mfg.**

- Separation of value chain with hardware manufacturing, software design & integration
- Increase in sourcing content directed or sourced directly by OEMs like SoCs[1], microprocessors, software integration, etc,
- Service oriented architecture will emerge
- Digital trust and data security

H/W – Hardware. S/W- Software
[1]SOC- System on Chips

Thus, with rapid development the control is shifting towards hi-tech companies, innovative start-ups and software companies.

There are various elements in the digital technology stack – component players must pick their niches strategically

Elements of a Digital Technology Stack

User experience / Human-Machine Interface (HMI)
Compelling user experience, dashboards

Applications/ functions
Innovative software in fleet management, charging management, etc.

Cloud platform and cloud services
Enrich asset data and utilize cloud/edge computing resources

Backhaul connectivity and services
Secure V2X communication and OTA updates

Platforms and analytics
AI/ML based decision engines analyzing data

Vehicle/ fleet operating system
Management of in-vehicle computing resources & software services

Vehicle/ Charging management platform
Enabling software functionalities on powerful embedded hardware

In-vehicle connectivity and services
Secure communication between domain platform computers

Electronics and power components
Controlled electronics and embedded software components

Security and compliance
Automotive-grade cyber security & data compliance

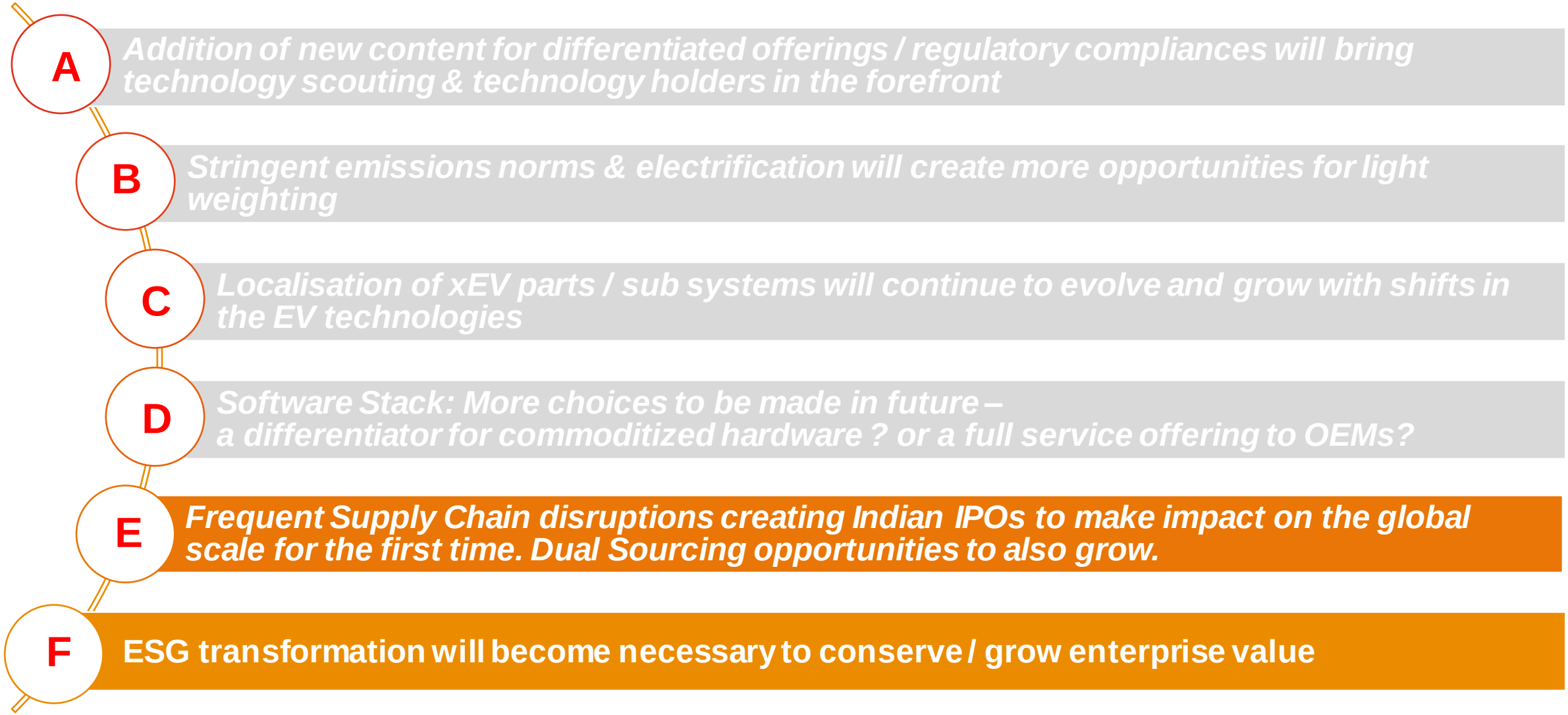
Most Areas of the technology stack with **high investment need** are driven by **technical complexity** and need for **innovation**

Being an **innovation leader** & **first to market** not be possible in all areas. Players need to **carefully select areas** for investment

Collaboration with **technology players** and **competitors** in **new forms of partnerships** will scale economies and present more available talent

Transforming employees' mindset – particularly in R&D, procurement, partner management and controlling – will be key for innovation

Source: PwC Analysis



Source: PwC Analysis

China Plus One strategy undertaken by developed economies will lead to the exponential growth of IPOs in India

Challenges

Strained geo-political relationships

- Between China and other nations

Overconcentration of business interests

- High supply chain risk exposure
- Increased ESG considerations

Diminishing cost advantage

- Increasing labor costs
- Cross-border tariffs reducing cost competitiveness

Strict data privacy laws

- Higher compliance costs
- Hefty fines

Unpredictable policy environment

- Zero covid-policy

Recent events have made OEMs reconsider their supply strategy

American semiconductor sanctions on China

- License requirement for companies exporting chips to China
- Prevention of US citizens and green card holders from working at Chinese chip companies

Zero-Covid Policy implemented by China resulted in supply chain disruptions

- **666** companies with manufacturing set-ups in China reported a loss in output
- **46** cities were in full or partial lockdown, contributing to **35%** of total GDP

Automakers building supply redundancies due to punitive & unpredictable tariff regimes

#	OEM	Manufacturing Strategy in China
1	Jeep	Termination of manufacturing activities
2	Opel	Halt in manufacturing capability expansion
3	Citroen	'Asset-light' strategy – gradual termination of manufacturing activities

Source: PwC Analysis

The ESG landscape spans across 10 buckets which suppliers will need to closely monitor to achieve high ESG ratings

Environmental – Minimising the impact of a firm on nature				**Social – The contribution of a company to fairness in society**				**Governance – Quality of processes for decision making**	
Climate Change	Natural Resources	Pollution & Waste	Environmental Opportunities	Human Capital	Product Liability	Stakeholder Opposition	Social Opportunities	Independence / Governance	Ethical Behavior
Carbon Emissions	Water Stress	Toxic Emissions	Opportunities in Clean Tech	Labor Management	Product Safety & Quality	Controversial Sourcing	Access to Communicatio n	Board Diversity	Business Ethics
Product Carbon Footprint	Biodiversity & Land Use;	Packaging & Construction Waste	Opportunities in Green Building	Health & Safety	Chemical Safety	Resettlement and rehabilitation	Access to Finance/Local employment	Remuneration	Anti-Competitive Practices
Financing net zero/carbon positive initiatives	Raw Material Sourcing	Electronic Waste	Renewable Energy	Human Capital Development	Financial Product Safety	Indigenous population/ tribal rights	Access to Health Care	Ownership	Corruption & Instability
		Municipal Waste		Supply Chain Labor Standards	Privacy & Data Security		Opportunities in Nutrition & Health	Reporting	Financial System Instability
Climate Change Vulnerability		Hazardous Waste			Responsible Investment		Technology Disruptions		Tax Transparency

OEMs have made public commitments to strengthen their ESG agenda; 5 immediate focus areas are evident for suppliers

Commitments made by OEMs

Non- exhaustive

DAIMLER	CO_2-neutral production plants in Germany; to be replicated in other countries
Ford	Committed to invest $11.5 billion to deliver a portfolio of cleaner vehicles
DENSO	Target of achieving a 50% reduction in CO2 emissions for production activities as well as products
BMW	Committed to creating working environment free of prejudice, combined with respectful coexistence

Key focus areas for auto-component suppliers

#	ESG material issues	KPIs
1	**Clean-technology**	• Clean-tech innovation capacity • Strategic development initiatives • Revenue from clean-tech sources
2	**Toxic emissions and waste management**	• Environment contamination and toxic emissions • Environmental management systems
3	**Product safety and quality**	• Recalls or product safety concerns • Strength of supply chain and sourcing systems • Quality management efforts in manufacturing • Responsible marketing practices
4	**Labour management**	• Complexity of the workforce • Labour relationship • Protection of workers' rights • Employee engagement
5	**Governance**	• Ownership and control • Board • Pay • Accounting practices • Tax transparency

ESG is about “Outcomes” and not just “Good intentions”

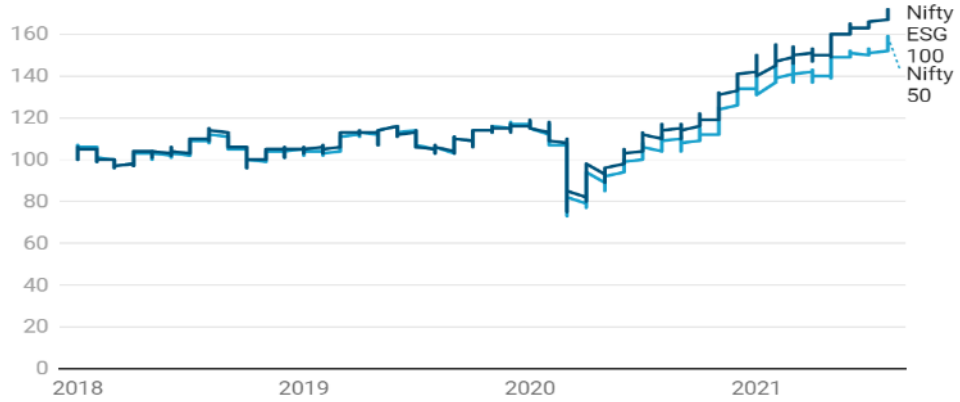
A strong ESG agenda can create value in 5 essential ways

Stakeholder Views

Revenue growth	***Build strong trust with customers both business and consumer segments***
Cost optimisation	***Lower operating costs by reducing waste and extra consumption will yield higher operational efficiencies***
Communities	***activism and public perception will impact businesses - the cost of non-compliance can be exorbitant***
Attract Talent	***are prioritizing purpose over salaries and publicly calling out irresponsible behavior***
Regulators	***are setting high ESG standards and Govts supporting with commitments and legislations***

NIFTY Index

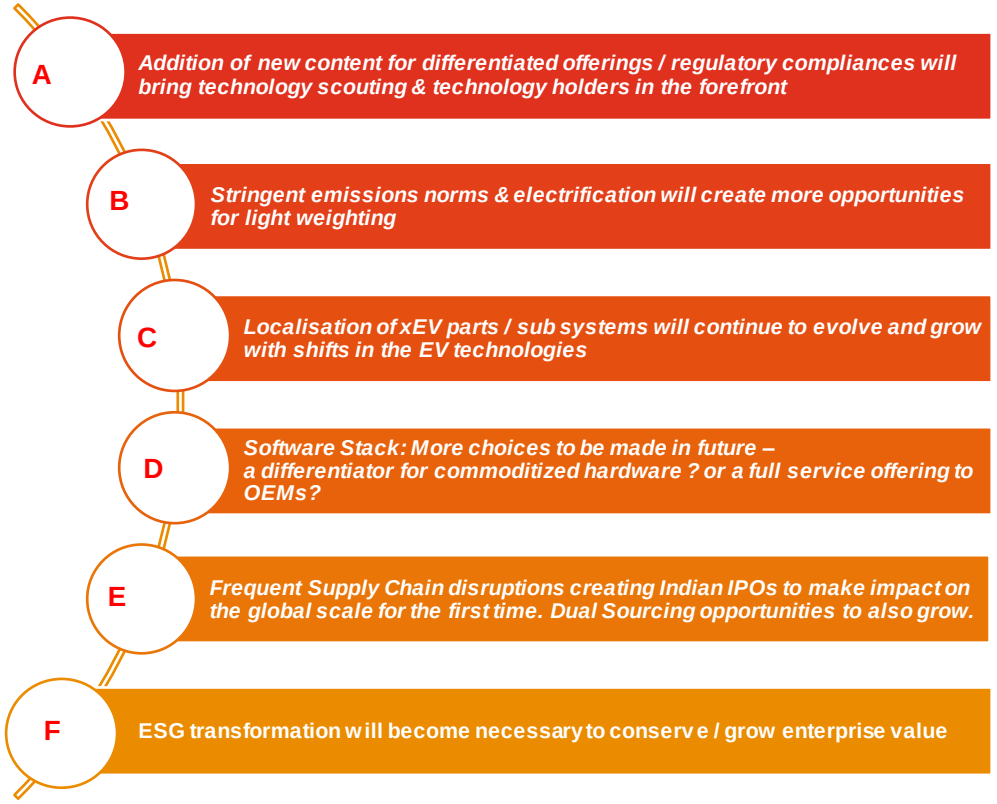
With rising popularity among investors, the Nifty ESG index has given good returns in the last one year, outperforming benchmark index Nifty50



79%	ESG risks are an important factor in investment decision-making
75%	Companies should address ESG issues, even if doing so reduces short-term profitability
68%	ESG performance measures and targets should be included in executive pay
49%	I am willing to divest from companies that aren’t taking sufficient action on ESG issues

Companies that are not listening to stakeholders will find it increasingly difficult to access markets, human capital and financial capital: with a growing cost for non-compliance

Summarising : Interplay of initiatives across the dimensions below will create the strong recipe for success in future for suppliers



1 Make strategic choices now

- Identify emerging, growth & mature technologies
- Expand to growth markets & segments
- Evaluate product-market mix
- Determine mobility ecosystem & digital plays in strategic mix

2 Rejig capital deployment and process

- Differentiate capital efficiency evaluation metrics for mature & growth initiatives
- Manage ROI vs investments for future readiness
- Distribute growth initiatives portfolio over incremental & disruptive bets

3 Make re-skilling a priority

- New technologies & New materials
- New Regulations and standards
- Increased software and electronics content
- New manufacturing and quality control standards
- Partnerships/ ventures for being future-ready

4 Embrace open innovation / alliances

- Open innovation platforms for co-creation
- Determine partnership models with start-up & academia ecosystems
- Co-pilot alliances for development & manufacturing with OEMs

Source: PwC Analysis

Thank you

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