



Advancing Net Zero Markets



Energy



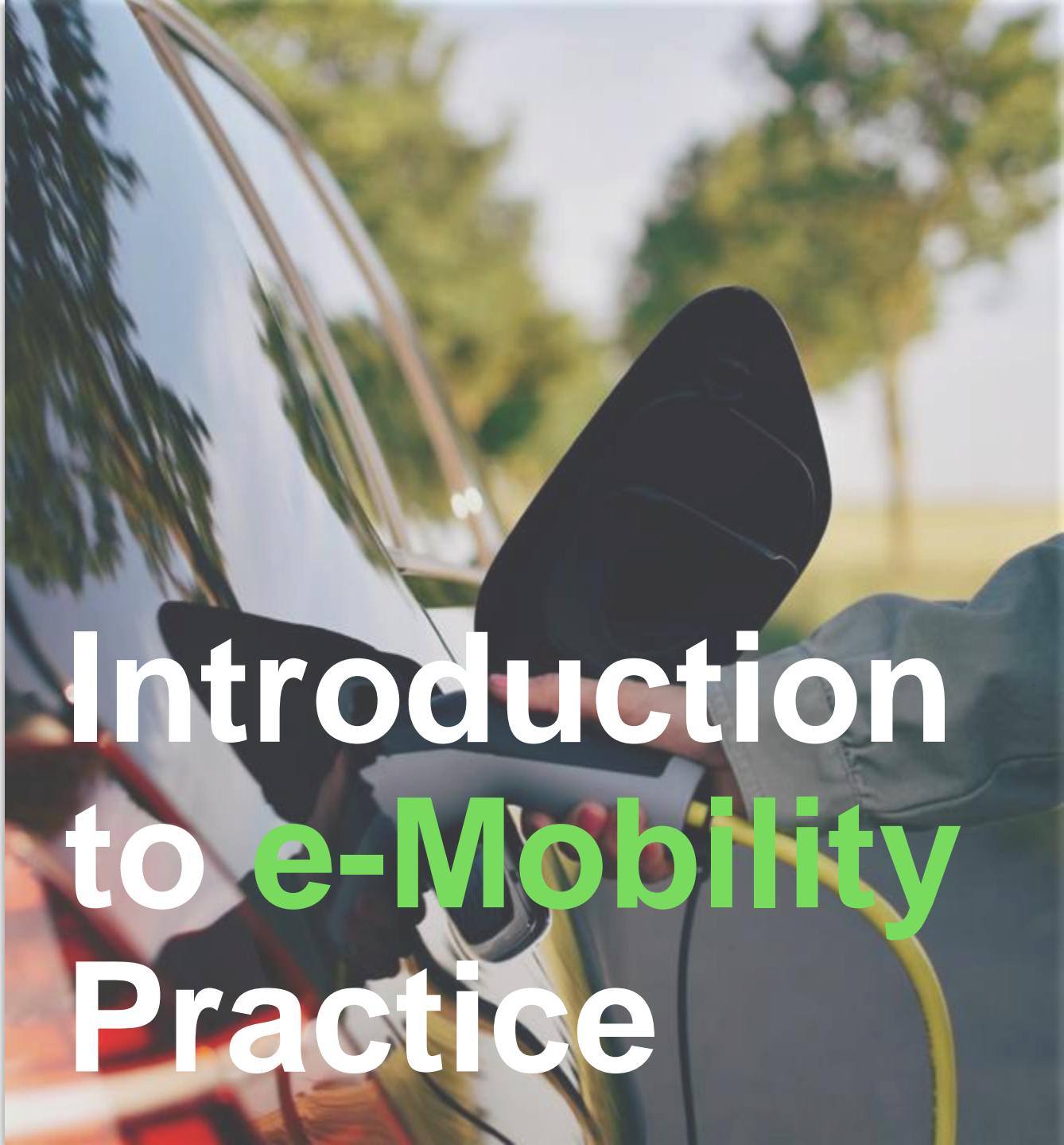
Transport



e-Mobility



Hydrogen



Introduction to e-Mobility Practice

Who we are **and what we do?**

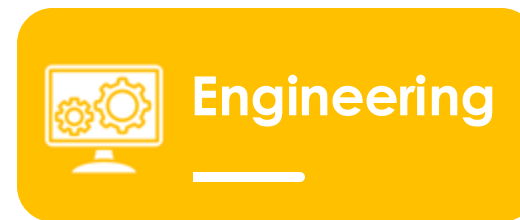
A **Strategic Consulting & Advisory** company focused on **e-Mobility, New Energy, Transport & Hydrogen** helping **countries, cities, industries and institutions** define, innovate and transform their solutions, services, business models, and policies for **faster climate & sustainability reforms**, higher customer experience and profitable market growth



- Energy & Transport, De-carbonisation Roadmaps
- Climate Transition Plans, Policies & Standards
- Techno-commercial feasibility studies
- Climate Financing



- Specialised and targeted research – Technologies, Markets, Customers
- GTM strategy
- Customer Experience Strategy



- Technical Due Diligence
- Model-based EV Design & Product Development support
- EVs Validation, Testing & Integration support



- Training Needs Assessment
- Training Program & Content Development
- EV Lab/CoE Setup
- ToTs, Training Execution
- Impact Assessment

Growing Impact



350+ Consulting Projects completed
(**150+** in e-Mobility)

➔ **50+** Countries

...

Our experience across countries



Coverage

Vehicle Segments

- 2Ws
- 3Ws
- 4Ws
- Buses
- Trucks (L-M-H)
- Ships

Applications

- Personal
- Public Transport (PT)
- Commercial passenger
- Freight

Value Chain

- Batteries
- PEMD
- Charging Infra
- Utilities, RE
- Recycling

Areas

- Technologies
- Markets
- Demand (adoption)
- Supply (localisation)
- Policies
- Biz Models, PPPs
- Climate Financing
- EV Product Design
- Manufacturing
- Technical Standards
- Skills

National/ Regional/ City e-Mobility & Decarbonisation Roadmap studies

SAARC

Policy support, standards development for EV Infrastructure for 8 SAARC countries

Nigeria

National, City & Rural e-Mobility Policy Framework & Roadmap

Zimbabwe

National e-Mobility Policy Framework & Roadmap

Sierra Leone

National e-Mobility Strategy, Policies, Business Models, & Investment Plans

Cambodia

National Policy Framework on EVs & liaison with relevant stakeholders

India

- Impact assessment of large-scale integration of **EV Charging Infra**
- Electric Vehicle and Charging Infrastructure (National & City level)
- Scaling up Electric Vehicle Adoption for **Last-Mile Logistics** and Preparing for **First-Mile and Mid-Mile Transition**
- Development of **Zero Emission Bus Market** Investor's Guide
- Electric Vehicles Program Management Cell under GoI

Mongolia

- Preparation of a regulatory framework for EV battery recycling and second use

Maldives

- National e-Mobility Plan development and Localisation to Male region

Bhutan

Development of Surface Transport LEDS 2021-2050 and EV Roadmap

Laos

Policy & technical standards development for EVs; Readiness Assessment to transition into Low Carbon Pathway

Philippines

National e-Mobility Development & Deployment for **PT electrification**

Tonga

Tonga Energy Road Map 2021-2035

Solomon Islands

National policy on EV for land transport

Samoa

Development of Energy Sector Plan



EV Fleet Techno-Commercial Feasibility studies

Pan Africa

Scaling up of 3 technologies (e-Buses, e-2/3 wheelers, cable cars) in 7 countries

Nigeria

Techno-commercial feasibility for introduction to e-Buses and charging infra in Lagos city

Ghana & Zimbabwe

Market feasibility study for 150+ inter-city & intra-city e-Buses in Harare, Accra, Kumasi

South Africa

Preparation of GEF CEO Endorsement Document and Annexures for funding of 50 electric buses across 3 cities

Kazakhstan

Scoping study to understand existing Bus ecosystem on the deployment of e-buses in the city of Almaty



India

- **Training Needs Assessment (TNA)** for Electric Buses in India;
- Development of the India Zero Emission **Bus** Market Investor's Guide
- Design of India's **Zero Emission Vehicle** Mandate
- Feasibility of Electric Vehicles in First Mile, Last Mile, and Long-Haul Segments
- Due Diligence and Feasibility assessment for Electric Vehicles (**2Ws, 3Ws**)
- Industry Assessment and Roadmap for Zero-Emission **Medium- and Heavy-Duty Trucks**

Nepal

- Feasibility of Electric Buses & Routes in two cities, Pokhara and Bharatpur

Lebanon

Technical Feasibility Assessment, Tendering, Procurement & Commissioning support for e-Bus and Solar PV Charging System

Philippines

Technical Feasibility Assessment for 3 corridors electrification with **e-Buses & e-Jeepneys** in Bataan; Metro Manila corridor e-Bus electrification detailed planning

Solomon Islands

e-Mobility roadmap development and pilot design for e-Buses

Fiji

Techno-economic feasibility study on electrification of shuttle bus transport in Valelevu; decarbonisation study of Govt. Fleet

Tonga

High impact e-Bus Fleet Planning & Funding Proposal

e-Mobility Climate Funding/ Financing proposals

Jordan

Development of **PPF Concept Notes** for the GCF Readiness Program

Ghana

Market feasibility & **GCF financing proposal** for 100 e-Buses in Accra and Kumasi

Zimbabwe

Market feasibility & **GCF financing proposal** for 50 e-Buses in Harare

South Africa

Preparation of **GEF CEO Endorsement** document for 50 e-Buses in 3 cities

Pan-Africa

Preparation of **GCF Funding Proposal** by developing economic & financial models to support scale up of e-Buses, e-2Ws & e-3Ws



India

- Preparation of Techno-Economic feasibility report on the establishment of EV Tech Park
- **GEF-7 e-Mobility CEO endorsement** document preparation for India

Indonesia

- Development of Project Concept Note (PCN) and Funding Proposal (FP) for GCF and stakeholder consultations at National and Project levels

Philippines

2 Project Information Notes (PINs) development for Climate Accelerator Funding for RE Integrated 500 e-Jeepneys & 400 e-Trikes for e-Commerce Freight

Tonga

EV Pilot project planning & Investment Proposal

Solomon Islands

e-Buses Pilot planning & Funding proposal

Maldives

Preparation of **GEF CEO Endorsement** document and related annexures



EVs Local Industry, Technical Standards, Circularity Policy, Gender & Just Transition studies

UK

Scoping study in **PEMD** for UK & India collaborations

LMICs

UNEP Used EV and Retrofit Assessment to accelerate EV adoption in Global South

São Tomé and Príncipe

Fuel and vehicle standards, compliance framework and regulations

India

- **EV Charging Infra Technical Standards** recommendations for India
- EVs **Smart Charging Architecture design** for India (Residential, Office, Kerb side charging)
- **Battery Reuse and Recycling technologies** benchmarking and feasibility
- **Just Transition on e-Trucking** transition and its impact in India

Bhutan

- Strategies and Roadmap for the **Localisation of EV components** in Bhutan

Sub-Saharan Africa & South Asia

PM/BLDC Motors Market Assessment, Characterisation & Standardisation

Laos

EVs & Chargers **Homologation & Testing Standards**

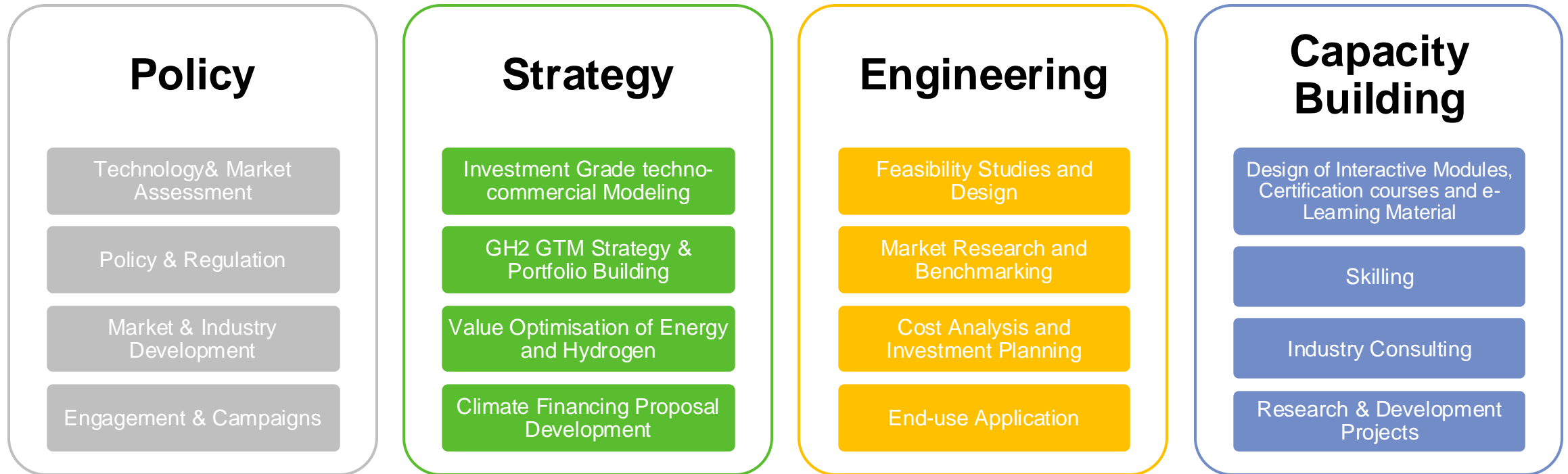
Fiji

Vehicle Emission Standards development & Policy brief preparation



Green Hydrogen Services – Policy, Strategy, Engineering & Capacity Building

We support decision making for **Hydrogen Technologies** and **Pathways** across the **Value Chain**



India

- Development of Internationally Compatible Green Hydrogen Standards in India
- Techno-commercial feasibility of Hydrogen (H2 ICE & H2 Fuel cells) in Medium & Heavy-Duty Trucking in India and Phase-out Strategy

EV Systems Engineering Services - Technical Due-Diligence, Go-To-Market Strategy & Model-Based Design Simulation

Technical Due Diligence

Product Assessment

Process Capability & Capacity Assessment

Suitability Assessment

Go-To-Market Strategy

Competition Assessment

Value Proposition & Positioning

Strategic Interventions

Model-Based Product Development

Design Parameters
Conceptualization

Simulation & Testing

Optimization & Integration

India

- **15+ Technical Due Diligence** studies for powertrain sub-systems/ components suppliers including swap battery manufacturer, charger manufacturer, 6 motor manufacturer, 1 motor controller manufacturer
- **Duty Cycle development** for **LCVs** in e-Commerce delivery
- Due Diligence and Feasibility assessment in relation to setting up Business to market **Battery Swapping** solution for Electric Vehicles (2Ws, 3Ws) for an oil major in India
- Technical evaluation of 25+ motor models (Hub & Mid) of 4 EV **motor manufacturing start-ups** for an Indian wheel major company
- Technical Due Diligence of **Swap Battery Manufacturer**
- Technical Due Diligence of **Motor** and **SRM controller** supplier

India

- **GTM strategy development** for a company venturing into Motors for Automotive and Non-Automotive applications

Nigeria

- Study on **Techno-commercial Feasibility and Market Assessment** of EV Products

India

- Setting up a model-based product development process for a **e-2W** start-up
- Motor & Battery Sizing, Packaging, garage mechanics for electrification of a **1960 VW Beetle**
- Motor selection and Commonisation for **LCV Retrofit** using model-based design
- **e-3W Retrofitment kit** design and development

EVs Technical Due-Diligence Services

Product Assessment

- **Product Capabilities**
 - Product Specifications
 - Regulatory Requirements
 - Maturity of Technology
 - Applicable Standards
- **Product Performance**
 - Specifications v/s Actual
 - Product Robustness
 - Durability & Maintainability
 - Standardization Potential
- **Competitive Benchmarking**
- **Recycling & Disposal Liabilities**

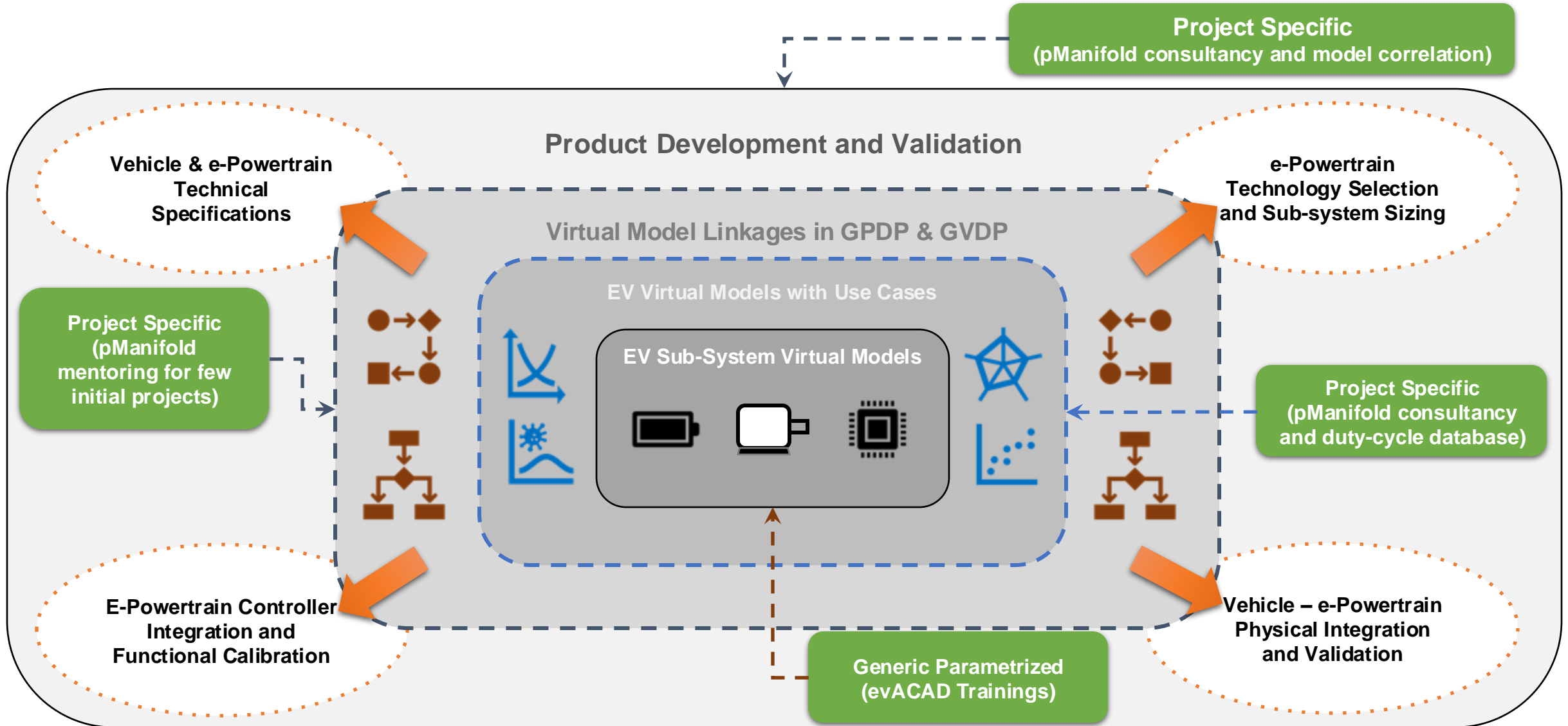
Process Capability & Capacity Assessment

- **Engineering Processes**
 - Design & Development
 - Integration & Validation
 - FMEA & Risk Mitigation
- **Manufacturing & Sourcing**
 - Capacity & Scalability
 - Workforce Skills
 - Storage & Inventory
 - Sourcing Strategy
- **Quality**
 - Overall Framework
 - Performance Spread
 - Issue Resolution Process

Suitability Assessment

- **Techno-commercial Viability**
- **Comparison with Competing Technologies**
 - IC Engines Products
 - Other Competing Technology
- **Adoption**
 - Current Partnerships
 - Deployment Status
 - Levers for Adoption
- **Safety & RoHS Compliance**

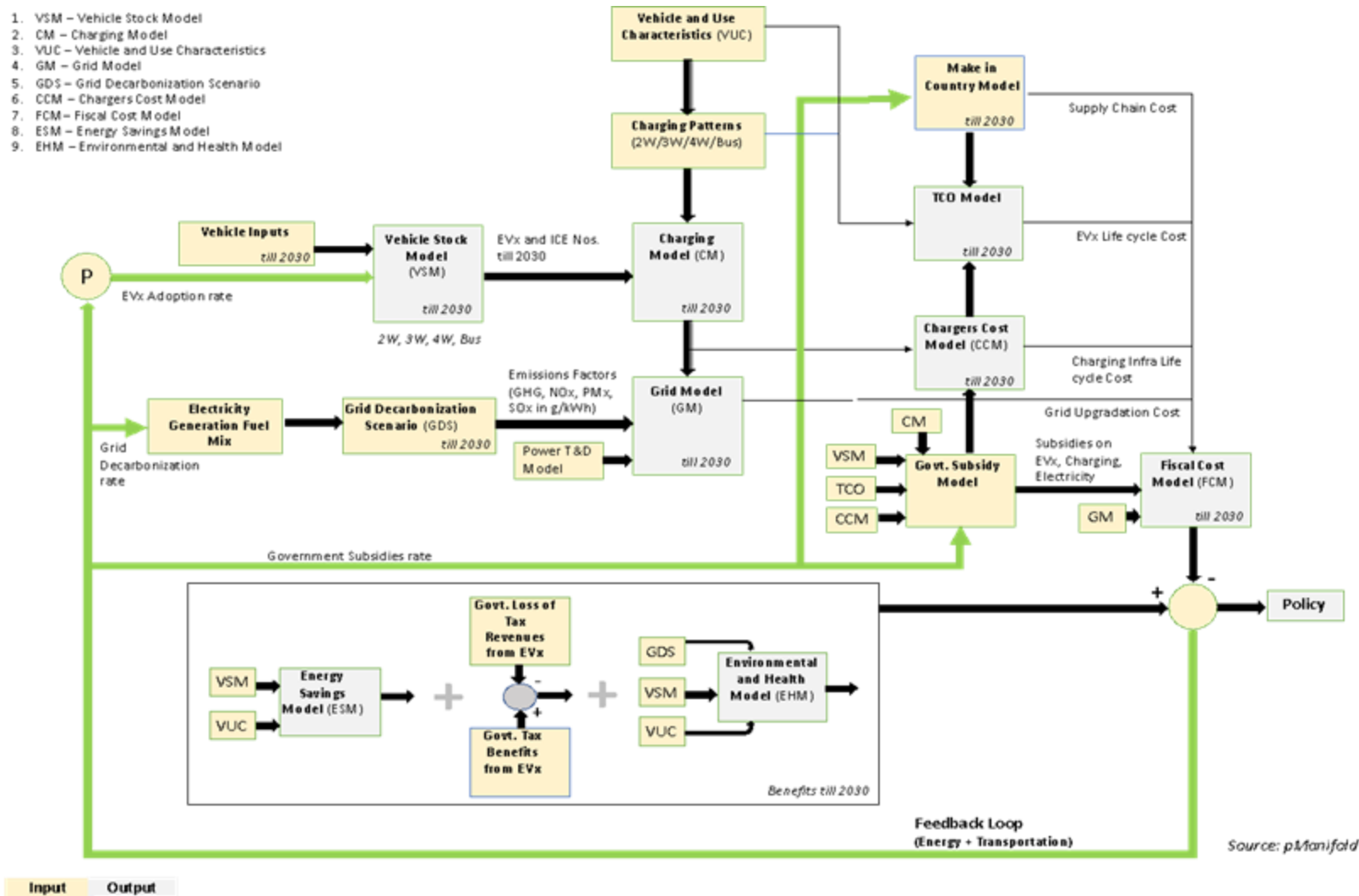
EVs Model-based Product Development Services



GPDP – Global Powertrain Development Process, GVDP – Global Vehicle Development Process

pManifold e-Mobility Tools - IETEM© Model

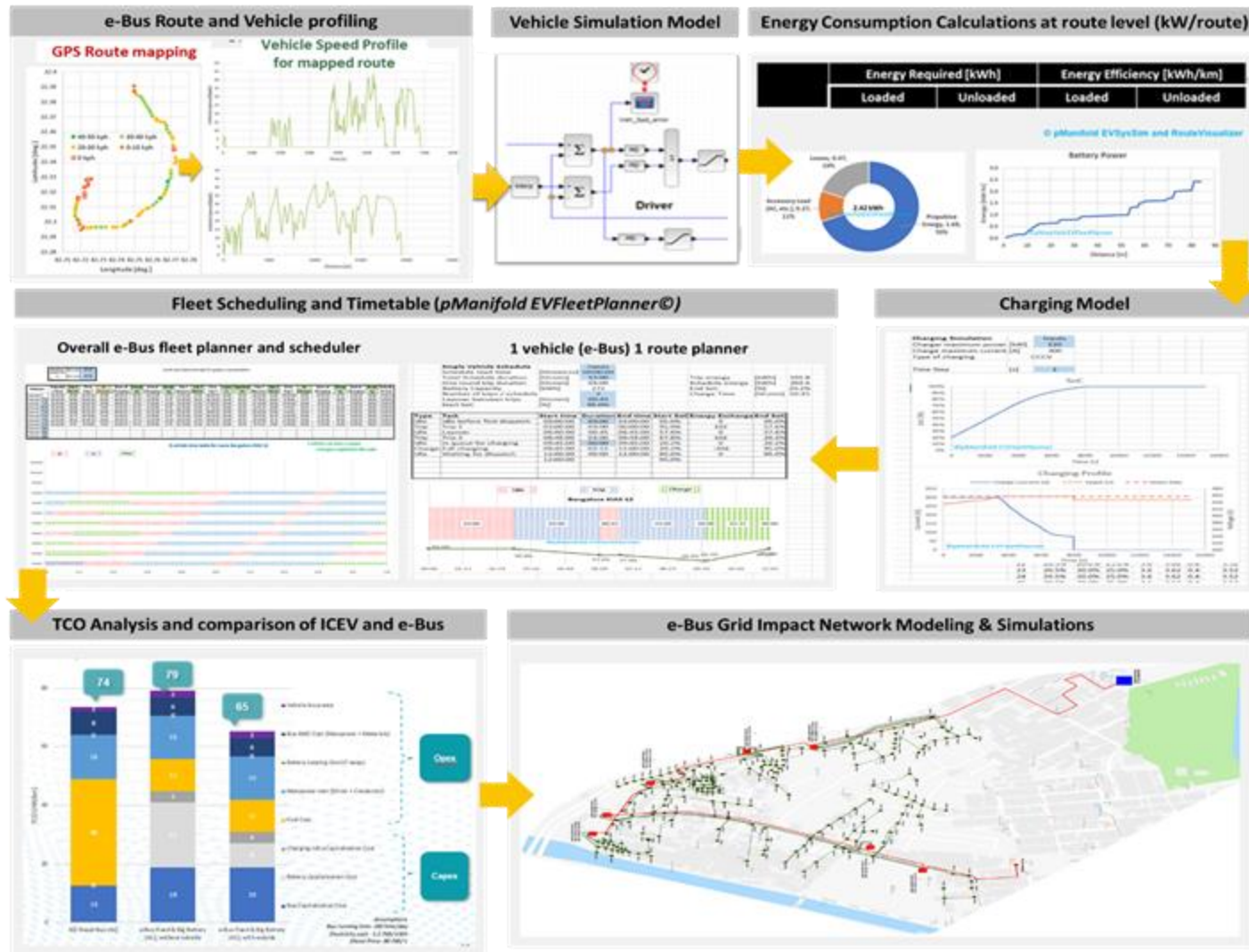
1. VSM – Vehicle Stock Model
2. CM – Charging Model
3. VUC – Vehicle and Use Characteristics
4. GM – Grid Model
5. GDS – Grid Decarbonization Scenario
6. CCM – Chargers Cost Model
7. FCM – Fiscal Cost Model
8. ESM – Energy Savings Model
9. EHM – Environmental and Health Model



pManifold IETEM© - Integrated Energy & Transport e-Mobility Model

- EVs growth projections (different segments)
- Charging infra requirements
- Grid Impact
- Grid upgradation requirements
- Grid energy mix planning
- GHG estimation
- Health impact estimation
- TCO analysis
- Govt. budget & fiscal incentives planning
- ...

pManifold e-Mobility Tools – EV Fleet Planner©

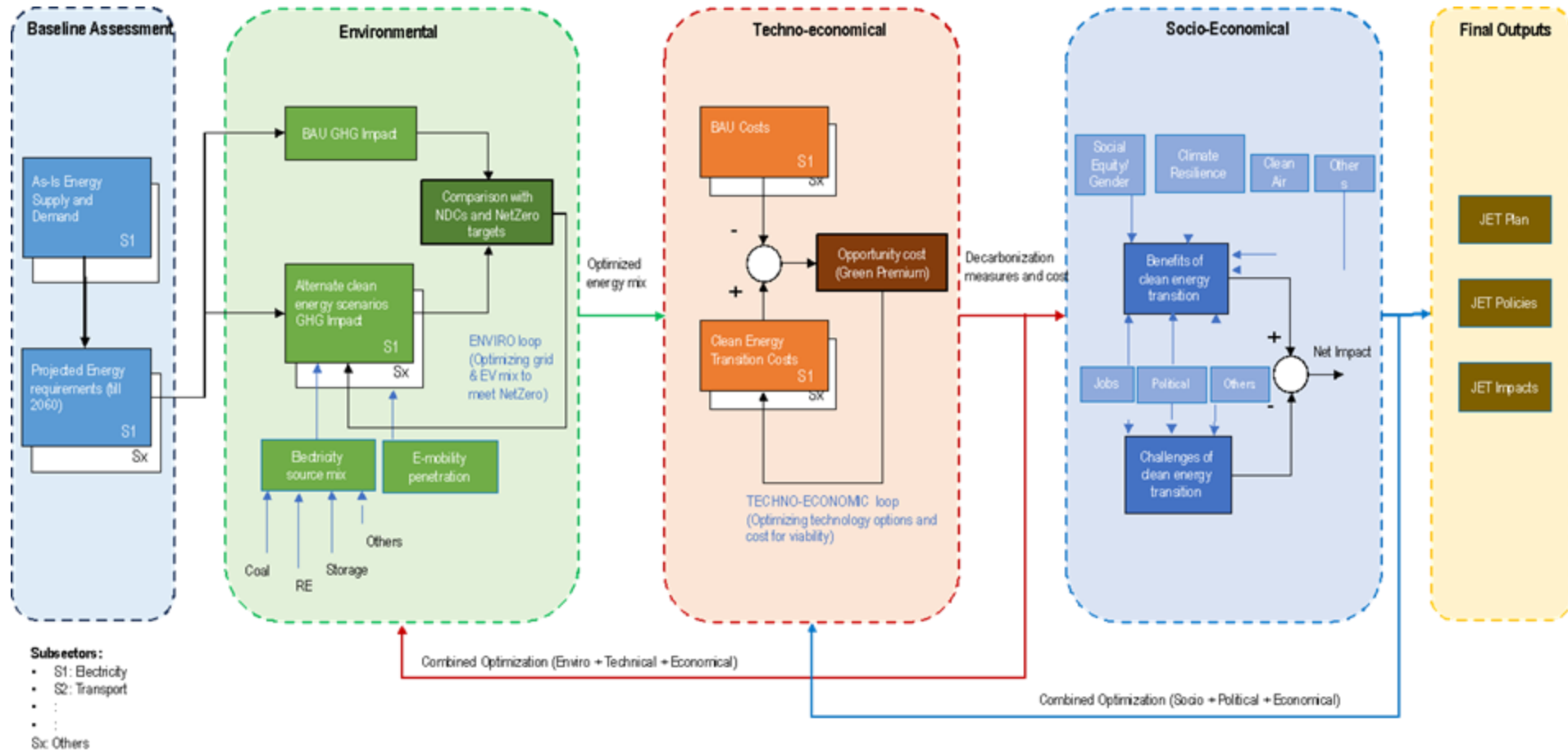


pManifold EV Fleet Planner©

- Route duty cycle development
- EV Energy consumption analysis
- Battery types & size design
- Charger types & size design
- Charging strategy design
- Grid ancillaries design
- Grid impact analysis
- EV operations and scheduling
- TCO analysis
- GHG emissions saving
- ...

pManifold e-Mobility Tools – PMO-JET©

pManifold Multiloop Optimization Just Energy Transition



PMO-JET© -
 pManifold Multiloop Optimization Just Energy Transition Model provides analysis of various energy transition scenarios and assessing its impact on environmental, technological and socio-economical aspects

Our select Clients

<p>DFIs, Institutions, Corporates</p>	
<p>Consultants</p>	
<p>Government & Academia</p>	
<p>Utilities</p>	

350+
projects in e-Mobility, New Energy & Utilities spanning sectors, value chain, geography, size, countries

+ many more..

Our Management Team



Rahul Bagdia

Co-founder & CMD



Vikrant Vaidya

Senior Partner
EV Systems Engg.



Uma Bagdia

Senior Partner
Investments



Raghavendra P

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Carbon Technologies, Trading &
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Barsha Paul

e-Mobility, Hydrogen &
ZET Specialist

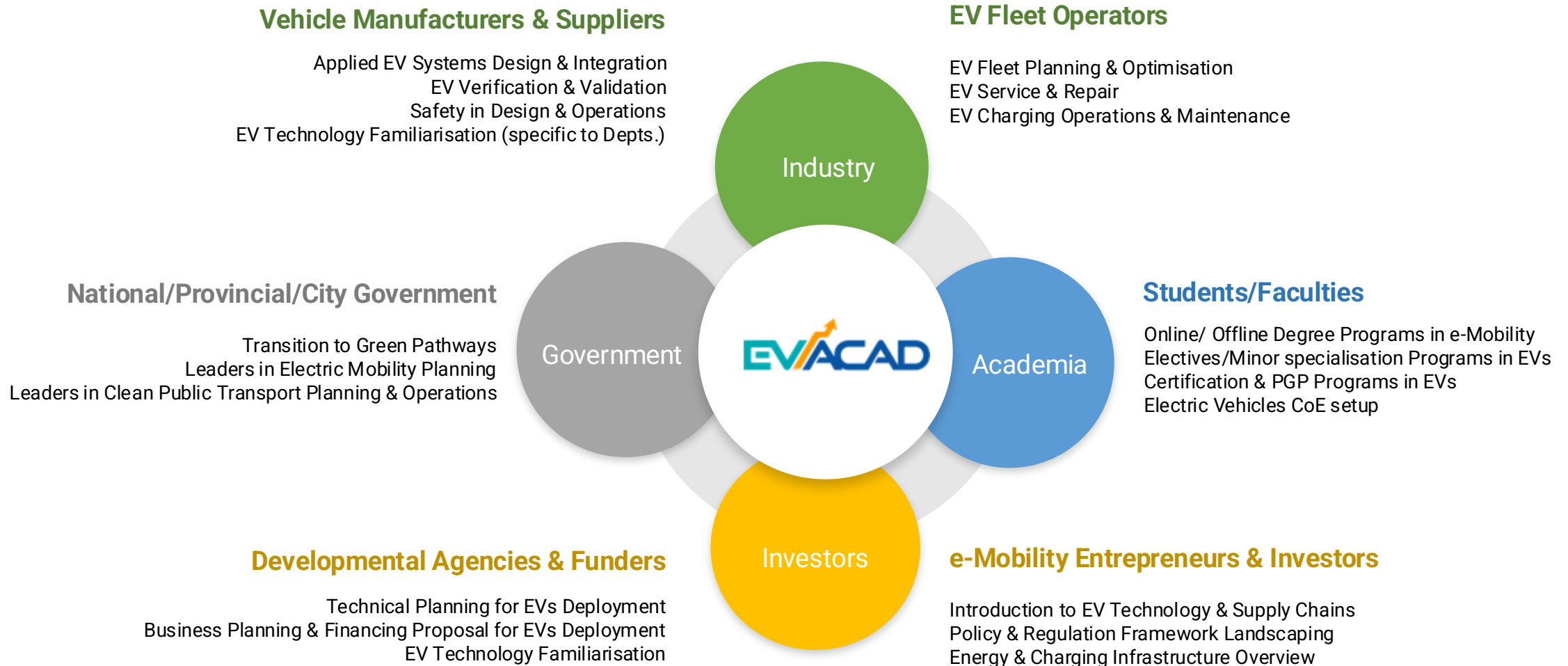




Building e-Mobility Talent

A  **MANIFOLD** Venture Company

Our EV Training Services



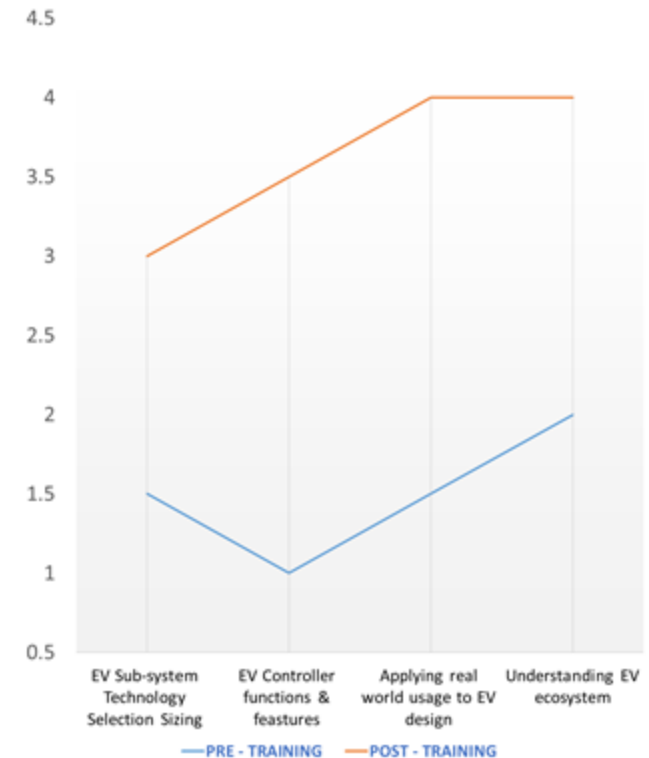
Growing Impact



Trainee Countries



Pre & Post Training Trainee skills



Our Training Portfolio

	B2C	B2B	B2I
Programs	<ul style="list-style-type: none"> Applied EV Design and Integration e-Mobility for Leaders e-Bus Planning and Optimization Battery Modelling and Simulation 	<ul style="list-style-type: none"> EV Systems Engineering (customized for Motor/ LCV/ Truck/ Retrofit cos.) EVs Design, Validation & Testing Other custom programs based on TNA for OEMs, Suppliers, Consulting cos., Fleet Operators and others 	<ul style="list-style-type: none"> Certification programs: PGC, PGD, others EV Degree programs: BTech, MTech, Minor/ Open Electives/ Specialisation EV Lab/ CoE setup EV Curriculum Development, Faculty Development
Proposition	<ul style="list-style-type: none"> Global EV expert Trainers Applied learning with model-based-design and hands-on Lab Industry relevant projects Online Hybrid learning platform EV Career support 	<ul style="list-style-type: none"> One stop solution for all EV training needs Custom trainings based on identified needs Flexible training hours & channels to integrate easily with work schedule Projects aligned with work responsibility 	<ul style="list-style-type: none"> Integrated services: EV Degree program + FDP + EV Lab + Industry Projects/ Internship + Career support Applied Industry-ready curriculum + best Industry expert Trainers + industry projects + internship/ placement support
Credentials	<ul style="list-style-type: none"> 20+ Courses (most are industry first ones globally) 40+ Countries 5,000+ Learners 	<ul style="list-style-type: none"> 20+ organizations worldwide OEMs: Hella, Tata Motors, Daimler, Precision Camshaft, others Govt.: Vanuatu, Bhutan, Rwanda, Zimbabwe, Ghana, Philippines, others DFAs: UNDP, GGGI, CTCN, others 	<ul style="list-style-type: none"> EV BTech program for ATRIA University + FDP EV Minor Program for VNIT + EV CoE setup FDP for Manipal University Jaipur

Global Participation in Trainings



Global Participation in Trainings

Fleet Operators	
Consultants & Planners	
Businesses	
Academia	



Thank You

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