

Prioritising Measures for EV Integration

- Insights from Asian Emerging EV Markets



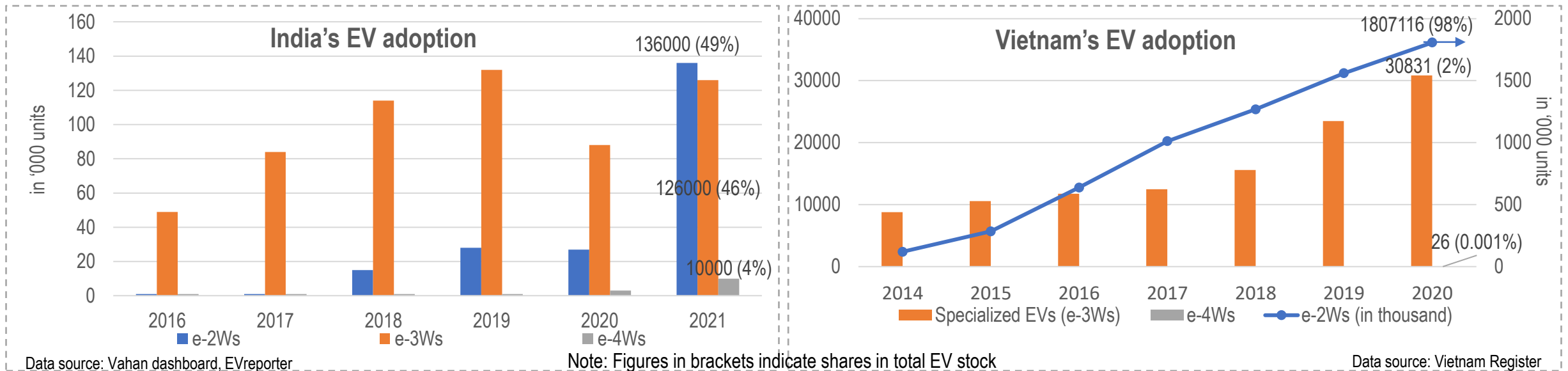
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EV stock dominated by LDVs.. Will managing EV charging load be a challenge?

- Two representative EV markets: India, Vietnam



Note: Figures in brackets indicate shares in total EV stock

What are the risks?

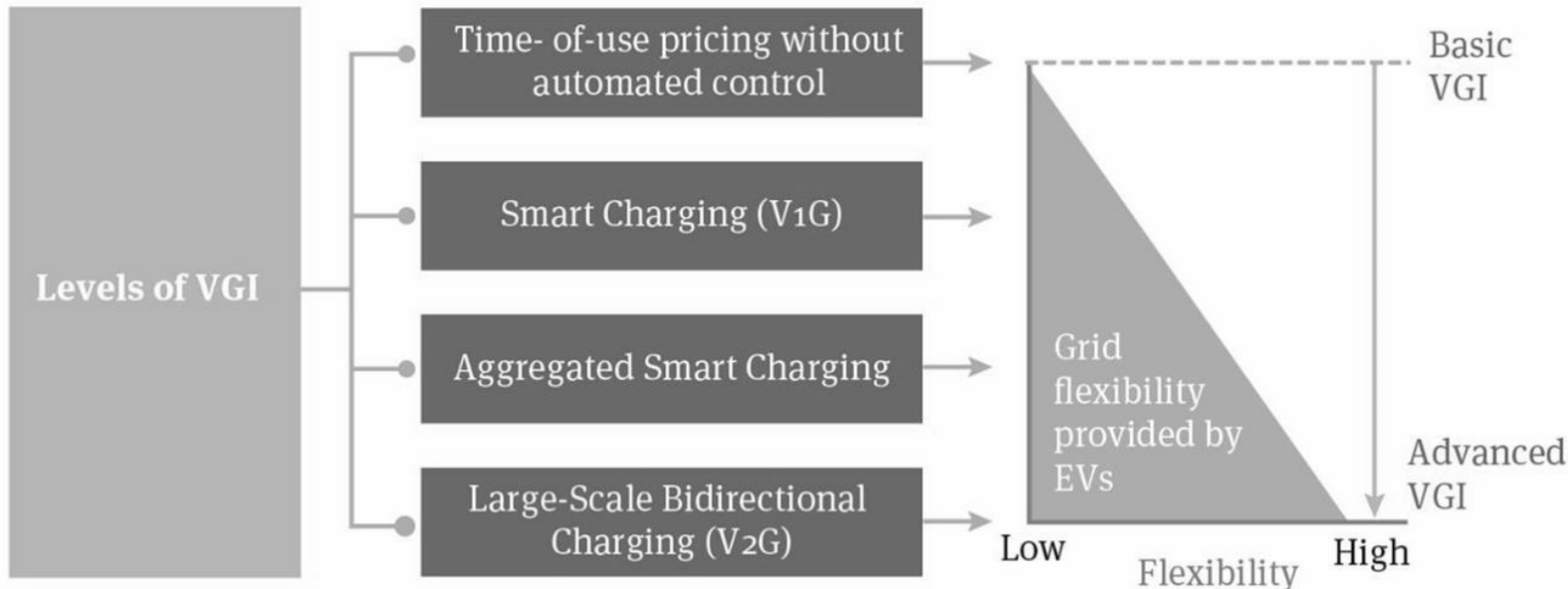
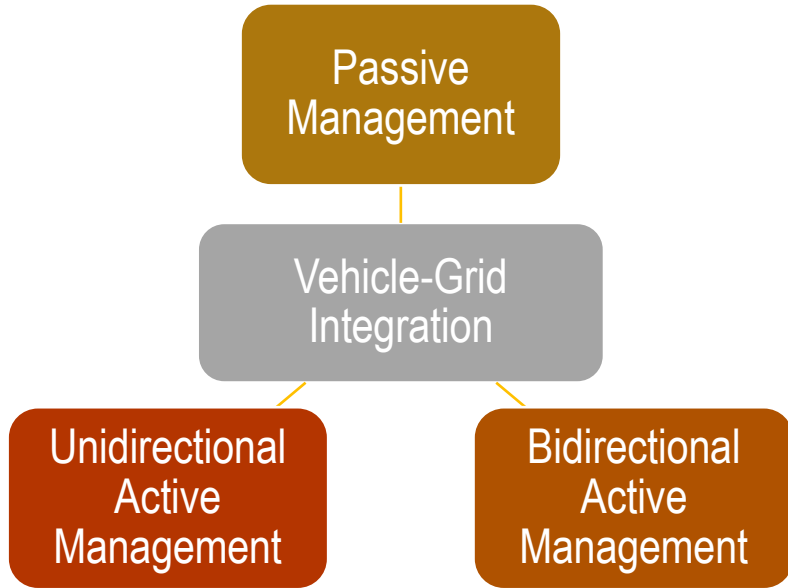
Exacerbating existing evening peak demand and/ or causing night-time secondary peak

- Majority of distribution utilities experience evening peaks which may also be the time when large number of EVs will get charged

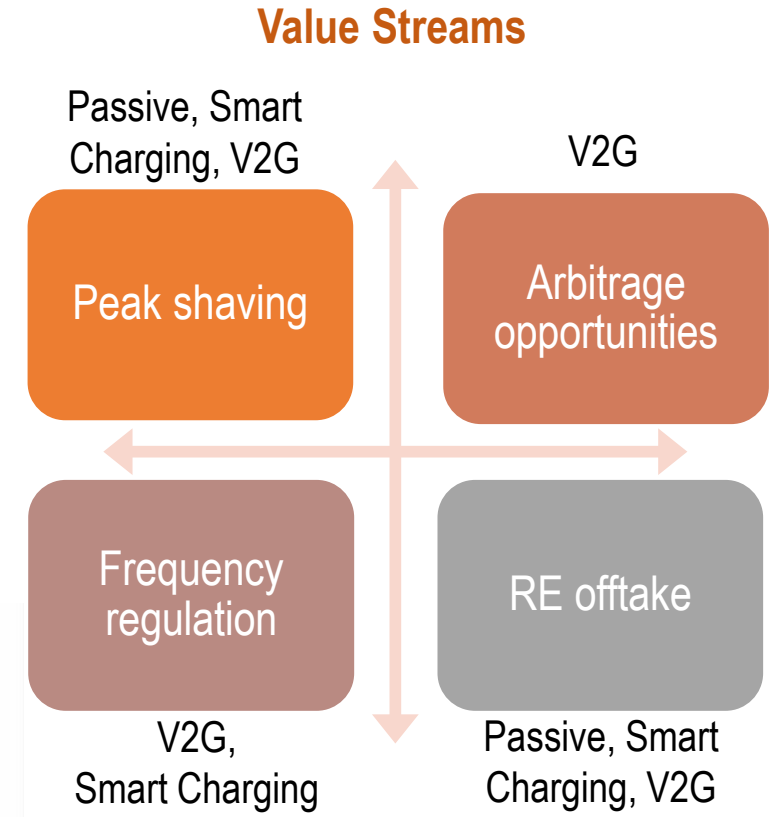
Overloading at the distribution level

- Ageing distribution network; low available hosting capacity of many feeders
- Private chargers for e-2Ws/ e-3Ws having limited communication & control capability; concentration of such charging in residential locality
- Possible less use of dedicated EV charging connection; distribution utility to have limited visibility of new load

Ways for smooth integration with grid



Value in Grid Flexibility Services

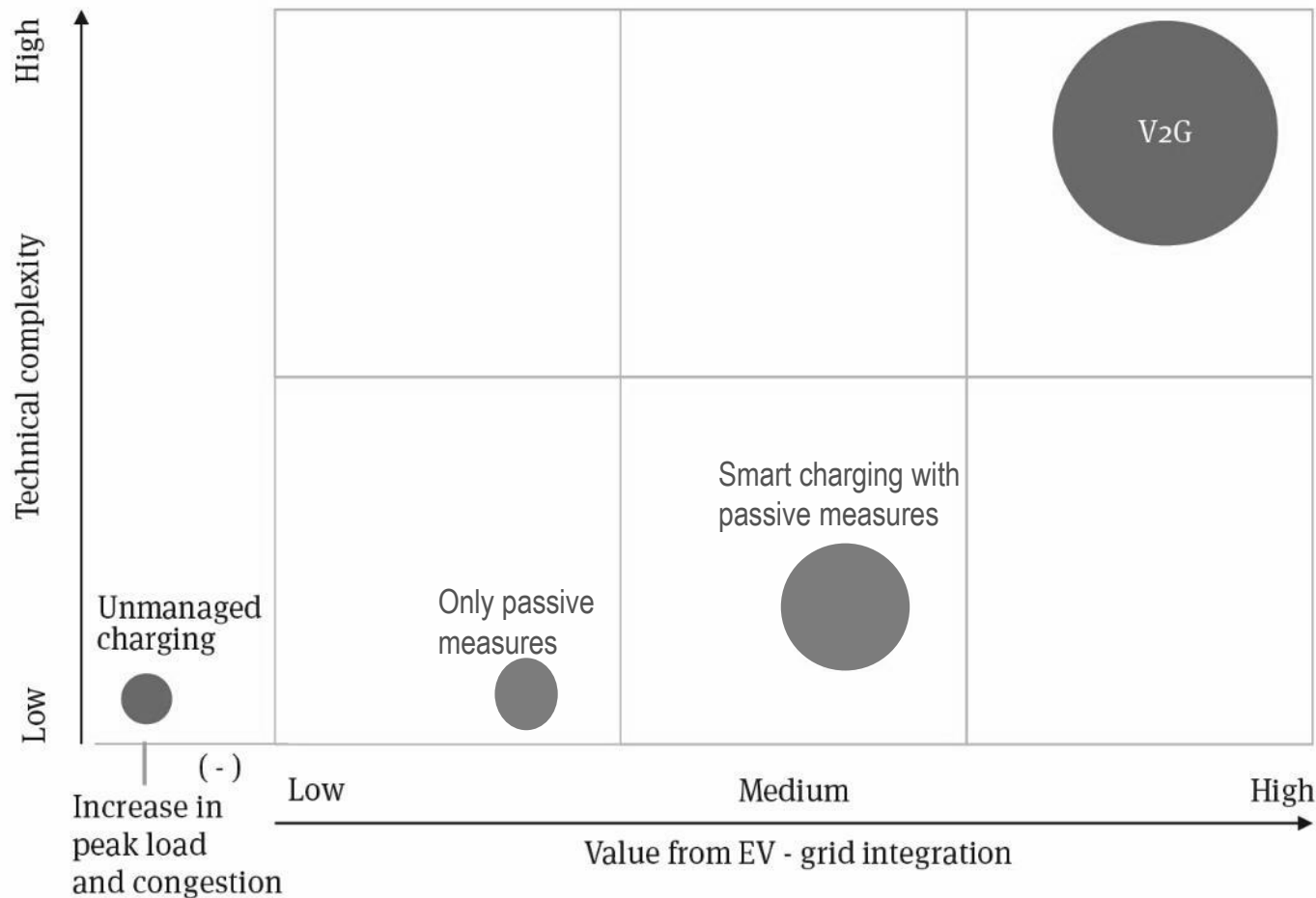


Three primary use-cases:

- Passive Measures
- Aggregated Smart Charging with Passive Measures
- Large-Scale V2G

Techno-economic comparison

Size of a bubble depicts the relative cost of implementation



- V2G enables a **greater range and value** of grid flexibility services, but involves **highly complex technological factors** → **higher cost** of implementation
- Passive measures like ToD tariffs are **easy to implement**, but **offer limited grid benefits** unless complemented by smart charging → a near-term solution
- Smart charging supported by passive measures is apparently an **attractive proposition**.
- Important that **distribution utilities, regulators, CPOs, and policymakers** in developing countries take note of techno-economic advantages and challenges
 - Should consider **local context**, which varies from country to country and province to province

As-is analysis - select Asian developing countries

Key requirements	India	Vietnam
<u>Passive Measures</u>		
ToD/ ToU tariffs	<ul style="list-style-type: none"> For certain consumer types in some states; no dynamic ToU 	<ul style="list-style-type: none"> Specific consumer categories; no dynamic ToU
Demand charges	<ul style="list-style-type: none"> Currently applicable in some states (recommendation from Ministry to waive off till March 2025) 	<ul style="list-style-type: none"> Currently not applicable
Dedicated metered electricity connections	<ul style="list-style-type: none"> Not mandatory (conditional in states where there is separate EV tariff) 	<ul style="list-style-type: none"> Very few PCS installed currently; no regulatory requirement
<u>Aggregated Smart Charging</u>		
Programmable chargers	<ul style="list-style-type: none"> Limited adoption, mostly for e-4W charging (smart control features disabled in most cases) 	<ul style="list-style-type: none"> No reported adoption; very few PCS installed currently
Adoption of uniform communication protocols at different levels	<ul style="list-style-type: none"> Yet to be formally recognised (OCPP, OCPI and OpenADR expected to be adopted) 	<ul style="list-style-type: none"> No consideration currently
<u>Large-scale V2G</u>		
Ancillary service market	<ul style="list-style-type: none"> Yet to mature (required regulation notified in January 2022); resource aggregation not clearly recognised 	<ul style="list-style-type: none"> Does not exist
V2G supporting EVSE and EV	<ul style="list-style-type: none"> Not available 	<ul style="list-style-type: none"> Not available
Pilot projects	<ul style="list-style-type: none"> Few initiatives by technical institutions 	<ul style="list-style-type: none"> No reported case

Possible roadmap for emerging EV markets (1/2)

Guiding principles

Cost-effective implementation

Uncomplicated participation of EV users, CPOs and distribution utilities

Alignment with existing laws and regulations

Avoiding immediate need for expensive grid upgrades

Possible roadmap for emerging EV markets (2/2)

Pathway for EV-grid integration

Passive Management (Inception Phase)

- ToD tariffs for EV
- Interconnectivity regulations
- Standards for programmable chargers
- Stipulation on data sharing and monitoring
- Guidelines for private and public EV charging
- Programmable, inexpensive chargers (with pre-set charging functions) for private charging
- Mode 3/ Mode 4 EVSEs for e-4W charging
- Smart meters at facility level

Aggregated Smart Charging

- Demand charges (on actual recorded load)
- Real-time ToU tariffs
- OCPP for EVSE-charging network comm.
- OCPI for e-roaming
- OpenADR for communication with distribution utility
- Distributed Energy Resources Management System for utility to manage and leverage DERs
- Aggregation of resource and access to multiple markets (including ancillary)
- OCPP-compliant smart charging infrastructure with remote monitoring and control facility
- Advanced telematics in EVs

Large-scale V2G

- Access to all types of power markets
- Net/ gross metering regulations
- Regulation on vehicle warranty
- Widespread deployment of V2G-enabled charging system
 - Bidirectional inverter; control units for reliable and safe battery charging & discharging; Loss of Mains protection equipment; two-way metering capability
- EV models with V2G functionality
 - Capable to discharge DC or AC power; with advanced BMS

Incremental regulations requirement

Incremental technology requirement

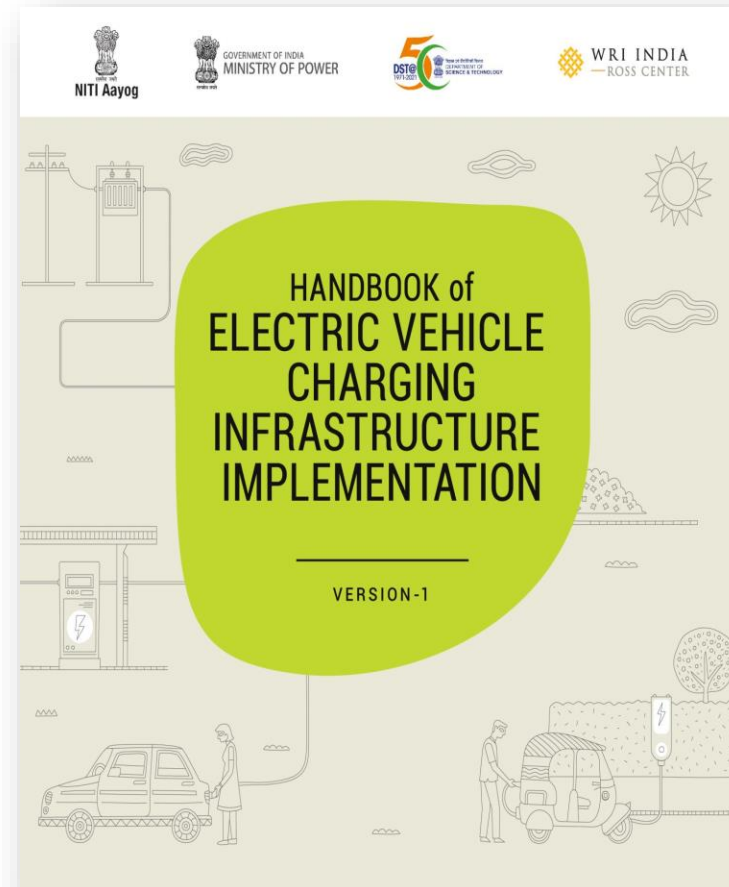
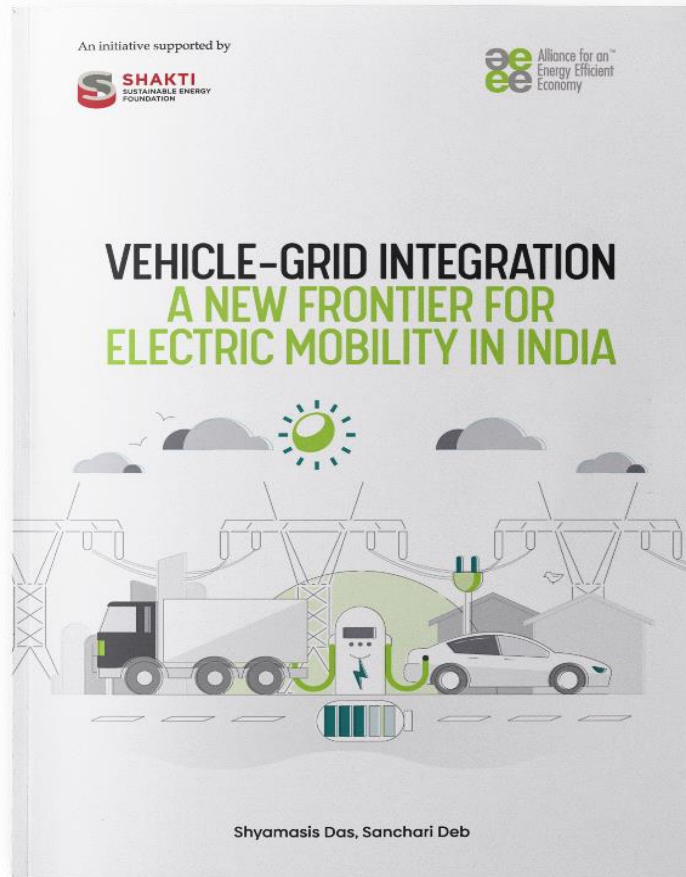
Basis:

- Level of maturity of the local e-mobility and power markets
- Status of VGI internationally
- Unique set of challenges and value proposition for each intervention
 - Achievement of one regarded as the stepping-stone to the next level.
- Smart charging is neither contingent on complex and expensive new EV or charging technologies nor requires significant regulatory and market reforms
 - Price signals the most important tool

Distributed charging infrastructure with battery swapping to complement

- Concentration of charging points, especially of high-power chargers, increases feeder-level loading.
- Providing charging points in a distributed manner helps limit local power demand, enables use of ubiquitous low-voltage lines.
- Battery charging outside EVs for swapping allows controlled charging at low power.
- These are viable options for Asian developing countries considering the high share of e-2Ws and e-3Ws.

For details, please refer to:





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Q&A

