

PIDS DP 2021-15

Clean Energy Technology in the Philippines:
Case of the EV Industry
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Clean Energy Technology in the Philippines

Case of the EV Industry

Objectives

- Contribute to policy discussions on EV
- Examine the EV industry, current regulations & challenges
- Strengths, opportunities, weaknesses, threats
- Recommendations to maximize industry potentials

Outline of Paper

- Structure, performance & outlook
- Methodology: SWOT analysis
- Recommendations

Highlights

- Capabilities: assembly, production of parts especially electronic components
- Promising opportunities for participation in EV supply chain & EV development

Contribution

- First PIDS paper focusing on EV
- SWOT analysis: component of industry roadmap; input to the road mapping process

Observations and Some Points for Consideration

Supply

- Is there sufficient production capability to manufacture EV? High manufacturing cost
- Do we have the necessary raw materials, parts, & components? Supplier network-limited
- Do we have the required skills to build the EV industry?
- What is our position in the global value chain? Where are our strengths? Areas of comparative advantage?
 - Specialize in parts or EV manufacturing
- Where are the gaps in the supply and value chain?
- How can we upgrade and improve our GVC position?

Demand

- What are the factors that determine the demand for EV? Power costs, charging stations, safety concerns, battery cost, EV price
- What would hasten the shift from ICE to EV?
- Where will the potential demand come from? Passenger cars, Buses, Jeepneys, E-trikes, E-bikes
- Estimation of demand and understanding determinants : crucial in crafting policies and programs to promote EV development
- Subsidies? Levels? Elasticities

Others

- Market failures?
- Role of industrial policy

Methodology: SWOT

SWOT as main framework of the paper

- In the context of what you want to achieve, problem you want to solve, is this the best framework
- Synthesize all 4 factors into a strategic plan
- Strategy: huge task involving industry stakeholders & government consultations to define vision, goals, identify priority initiatives to realize objectives
- EV is a complex issue, need more in-depth analysis to make decisions
- Strategies must be based on reliable and robust analysis
- SWOT: prioritize results, provide solutions or offer alternative decisions?
- guide in strategy formulation; need more comprehensive research, data analysis

Foundation of a good strategy: data analysis, research

- More in-depth analysis of the state of the industry, environment in which firms operate, changing trends – consumption, technology
- Data on production, industry linkages, workers, cost competitiveness, productivity
- GVC analysis, exports and imports, tariffs, NTMs, FTAs, comparative advantage, investments, R&D, innovation
- EV ecosystem analysis: standards, testing, regulatory framework, R&D, HRD, investment, auto & auto parts companies, EV infrastructure, other players, consumers, gaps?

Recommendations of the Paper: emerge from the analysis, should be linked with findings: EV Act to provide the regulatory framework; Battery manufacturing ; Fiscal incentives to stimulate demand; EV council; EV cooperation & mission

Philippine Automotive Industry

The Philippines hosts Multinational and local manufacturing companies serving domestic and export markets.

369

Firms engaged in assembly and parts manufacturing

0.30%

Share to the Philippine economy in 2020

USD1.18B

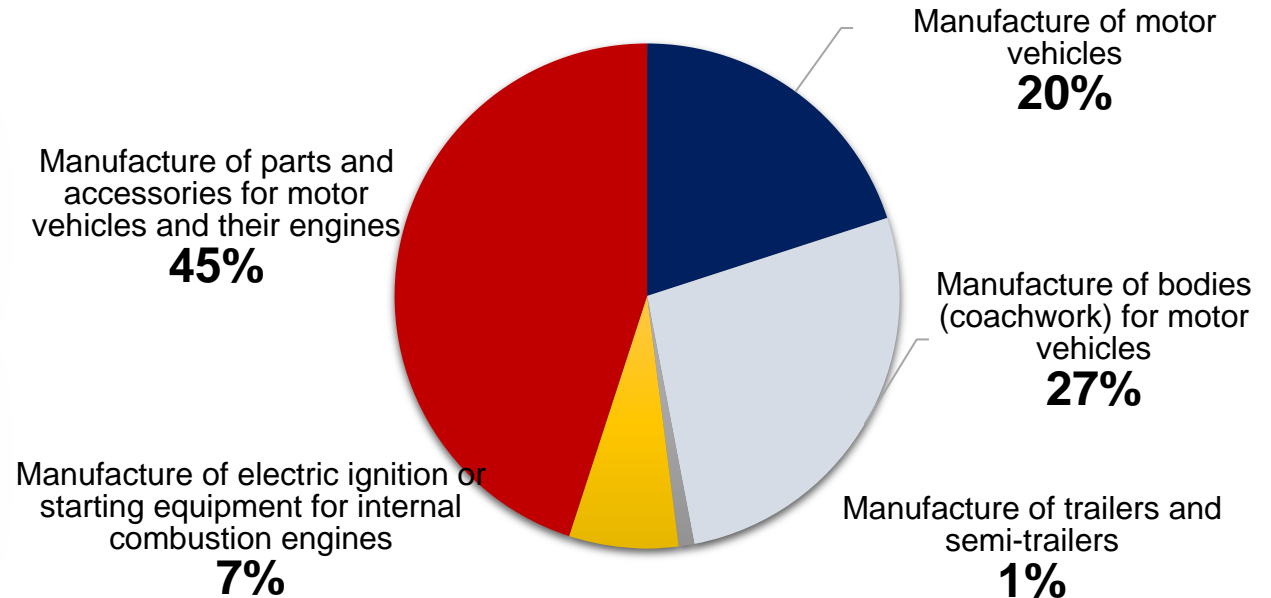
Gross Value-Added to the economy in 2020

80,501

Employment (January 2021)

Source: Philippine Statistics Authority (Processed)

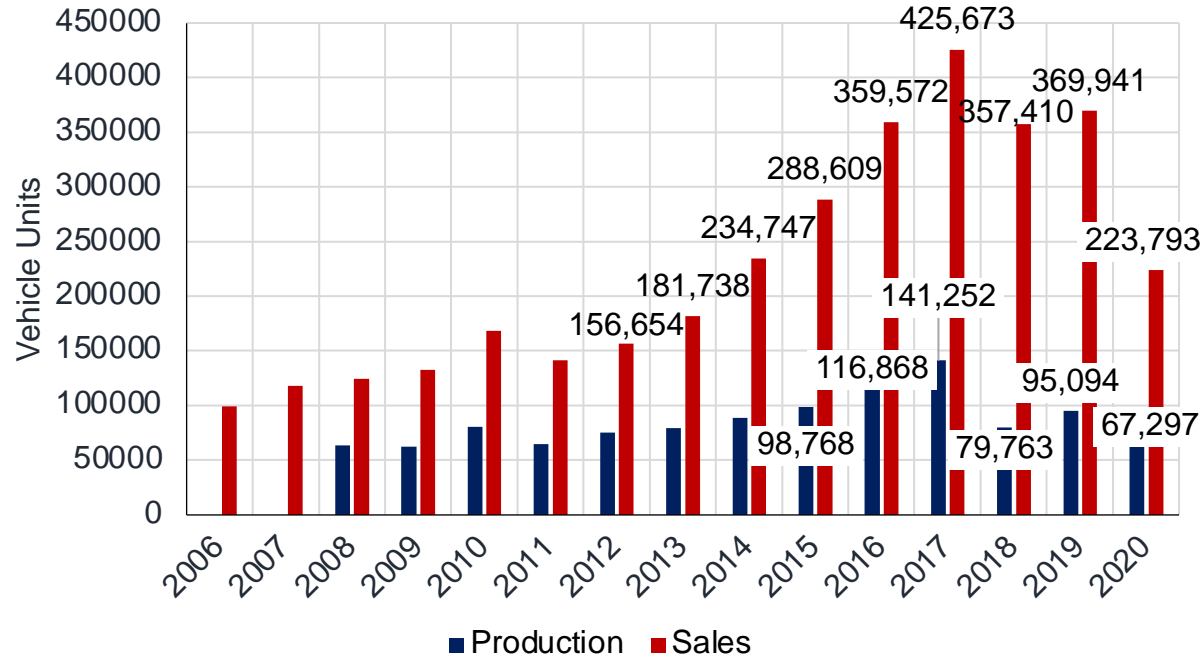
Distribution of Firms in the Industry



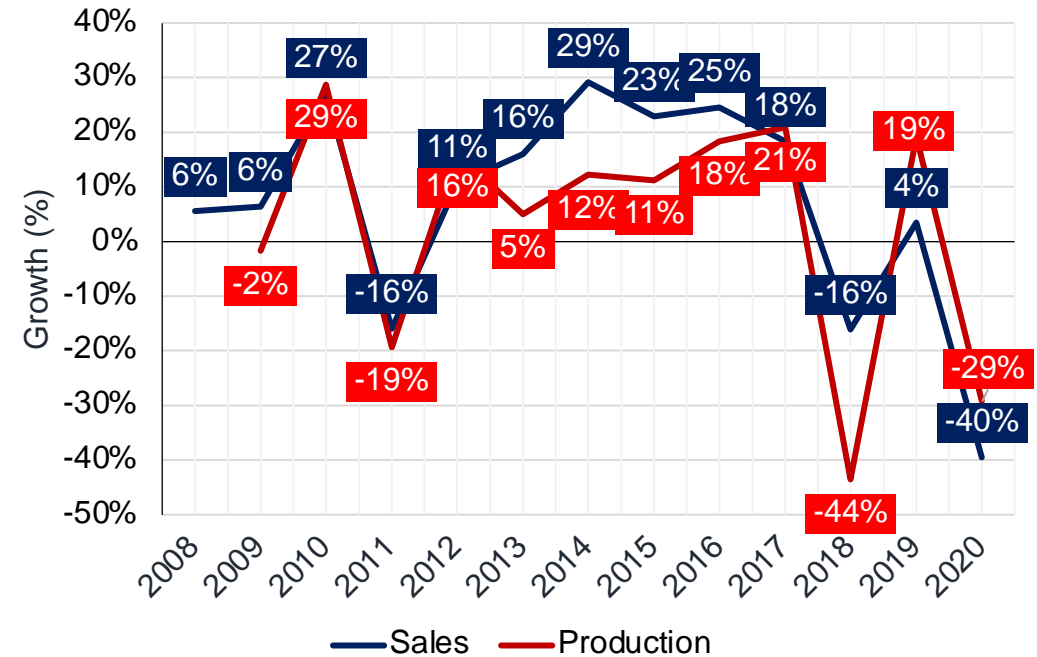
The Philippine automotive market was at the midst of a rapid acceleration prior to the pandemic

This is attributed to rapid economic growth, rising income, and growing middle-class in the country

Sales and Production Volume, 2006-2020



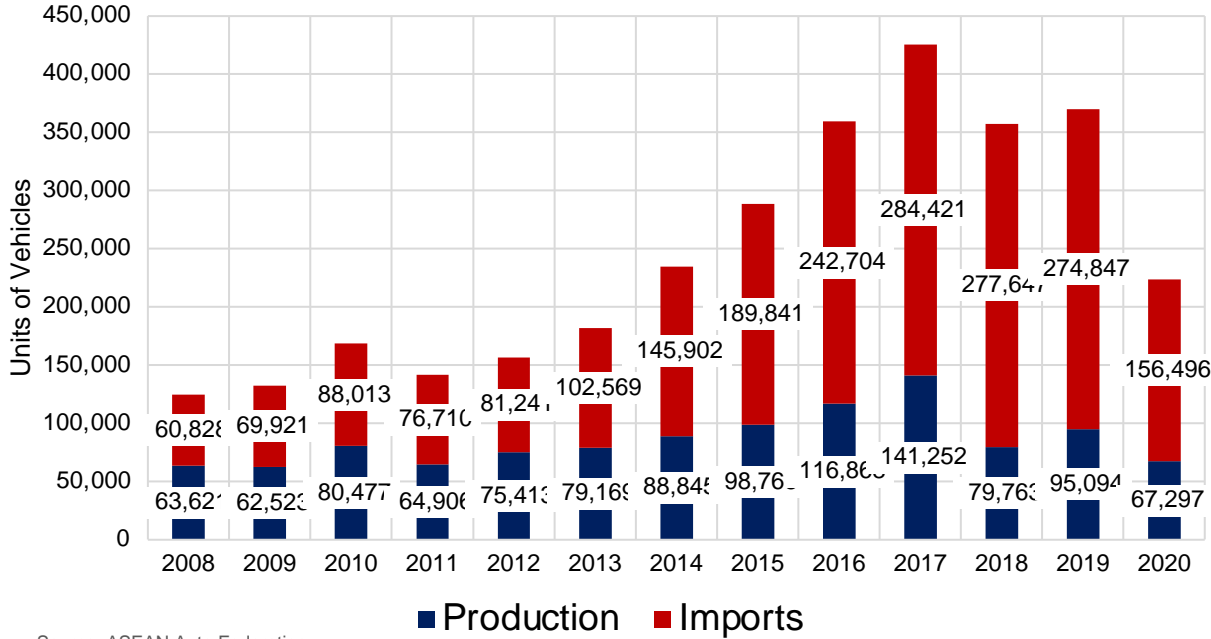
Sales and Production Growth, 2008-2020



- From 2010-2019 (pre-pandemic), vehicle sales posted an annual average growth of 12% (twice the country's GDP), while vehicle production growth posted an AAG of 7%.
- In 2017, **vehicle sales peaked at 426K** and **production was likewise at a historic high of 141K** due to the anticipation of imposition of higher excise taxes in 2018. 2018 figures dropped due to overproduction and oversales in 2017.
- In 2020, **sales dropped to 224K (40%)** and **production similarly dropped to 67,297 (29%)** due to the pandemic.

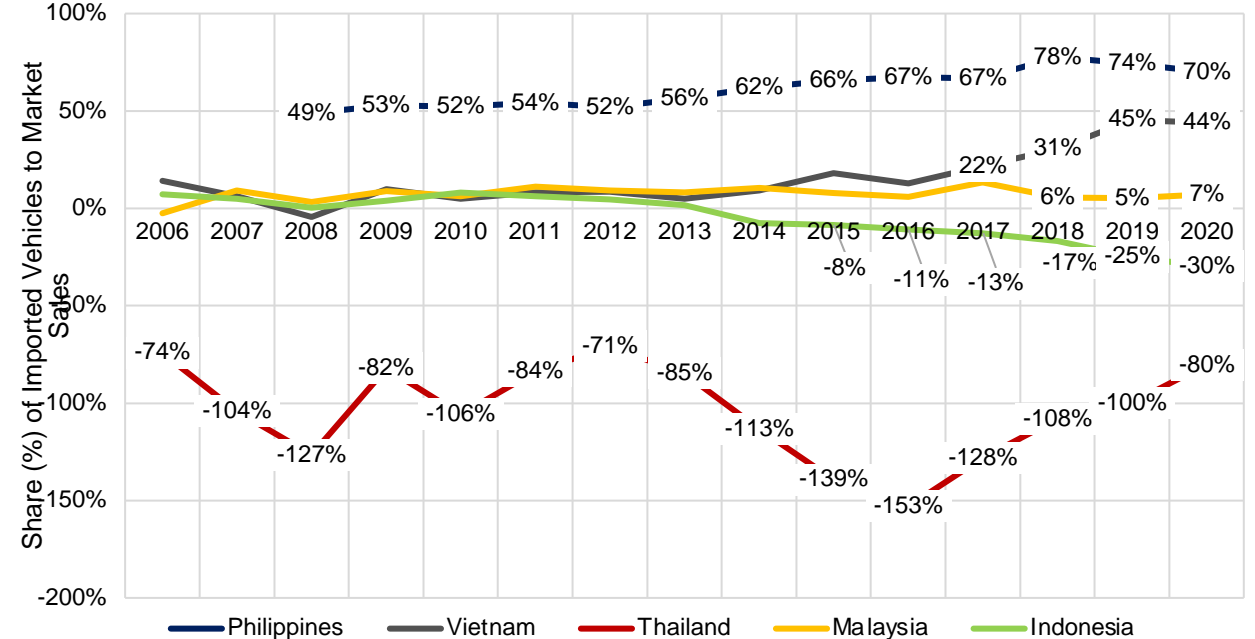
PH Automotive Industry exhibited greater import dependence in the past 13 years

PH: Vehicles Imported and Vehicles Produced, 2008-2020



Source: ASEAN Auto Federation

ASEAN Share of Imported Vehicles to Market Sales, 2006-2020



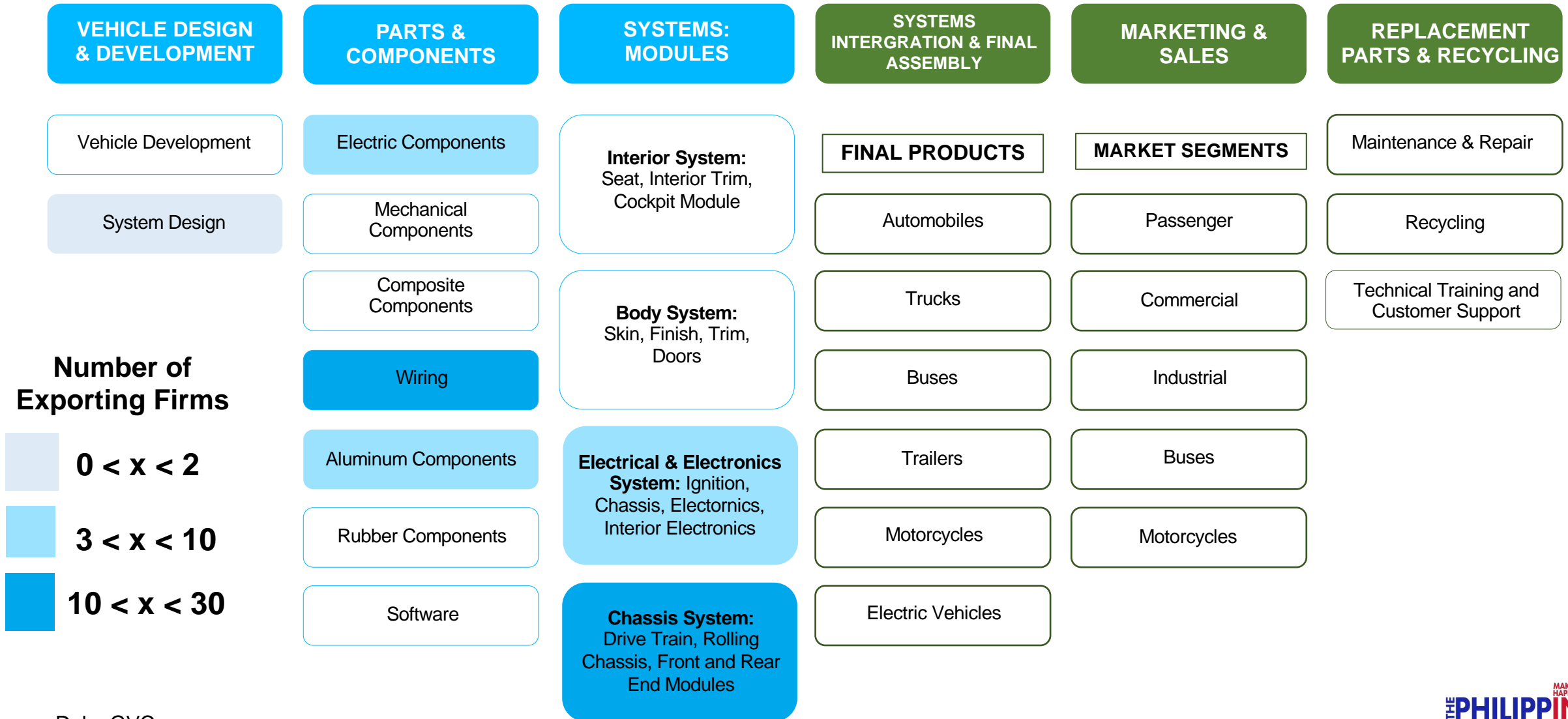
Source: ASEAN Auto Federation

Note: + Shares denotes import-dependent, -- Shares net exporter
2006 and 2007 data not available for the Philippines

- From **49% share of imported vehicles to total market sales in 2008**, this share steadily climbed to **70% in 2020** denoting greater import dependence.
- Since 2006, Thailand has been the top and net exporter of automotive vehicles in ASEAN. In 2015, Indonesia joined Thailand as a net exporter in the region.

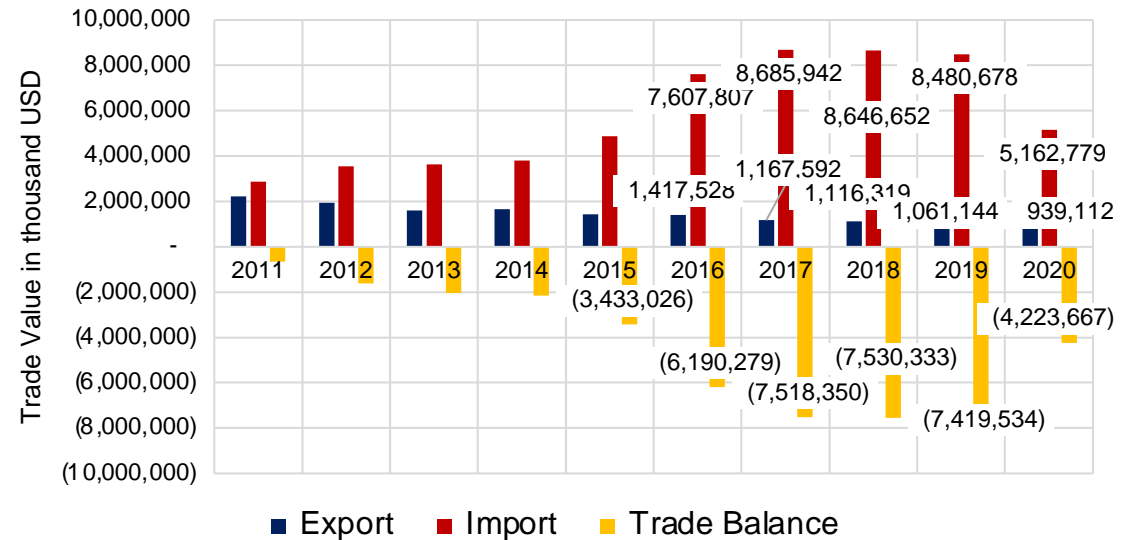
The country's strengths in the ICEV Global Value Chain are in E&E components

PH major automotive exports are electrical wiring harnesses, drivetrain, transmission, automotive electronics, seatbelts, heating, ventilation, air-conditioning, arm rests, gear boxes, front and rear end modules, steering wheels.

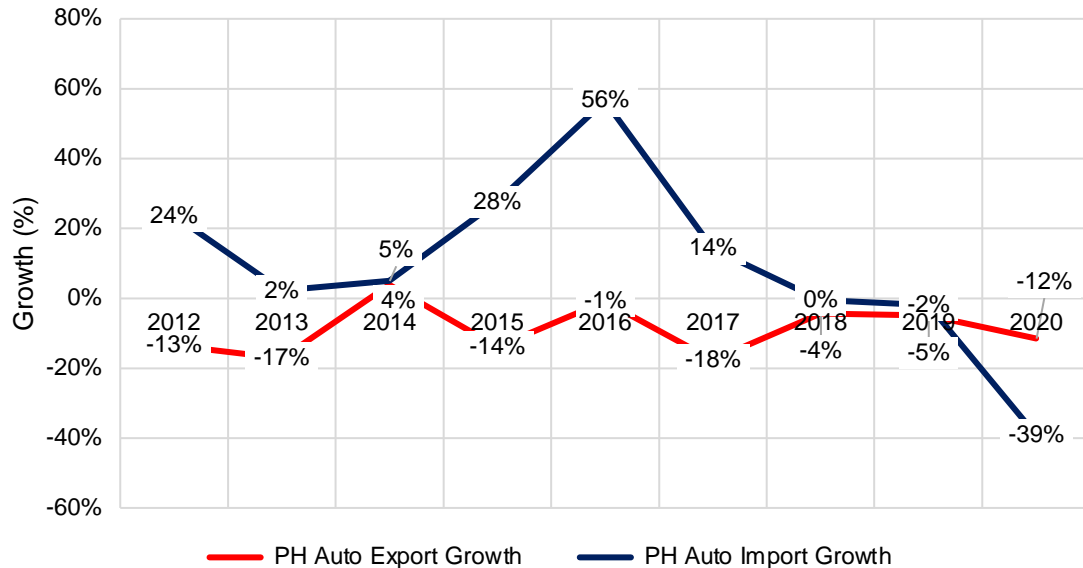


Automotive Industry (Parts & Vehicles) Trade Performance

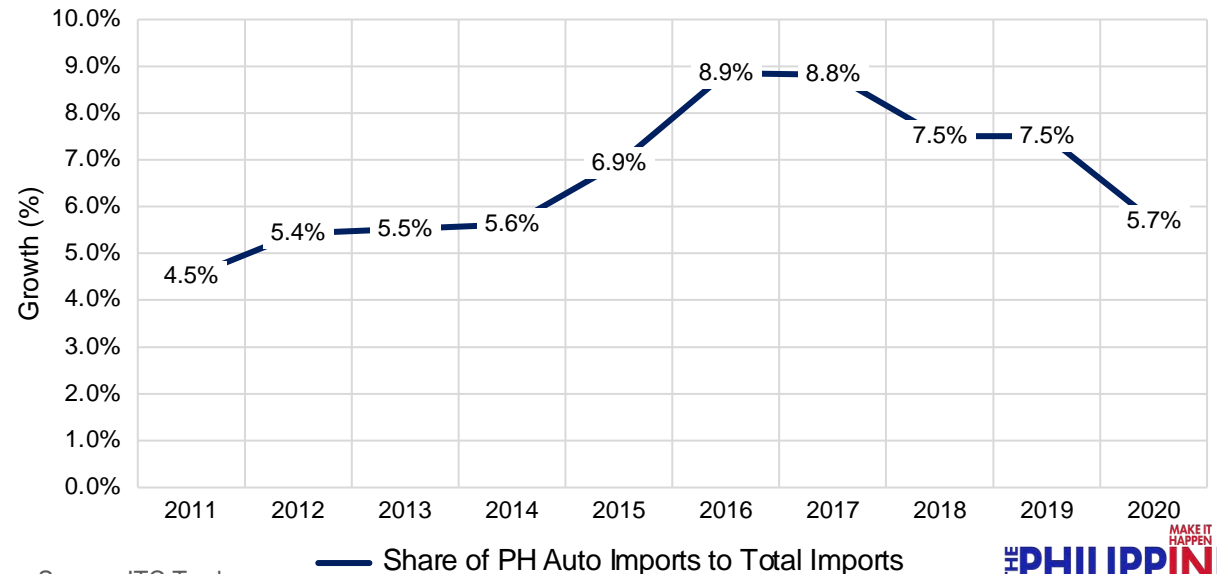
- In 2020, PH automotive industry posted **USD939M** of Exports, while imports registered **USD5.2B**, equivalent to a trade deficit of **USD4.2B**. Auto imports in 2020 comprised **5.7%** of total PH imports.
- Export growth has been lackluster in the past years continuously registering negative growth rates from 2012-2020, except in 2014 (+4%). In 2020, export declined by 12%.
- Import growth has sharply risen from 24% in 2012 to 56% in 2016. In 2020, it declined by 39%. **Top imports are CBUs across different vehicle segments.**
- Auto import share to total imports has also been rising from 4.5% in 2011 to a peak of 8.9% in 2016, then eventually decreased to 5.7%.



Source: ITC Trademap



Source: ITC Trademap



Source: ITC Trademap

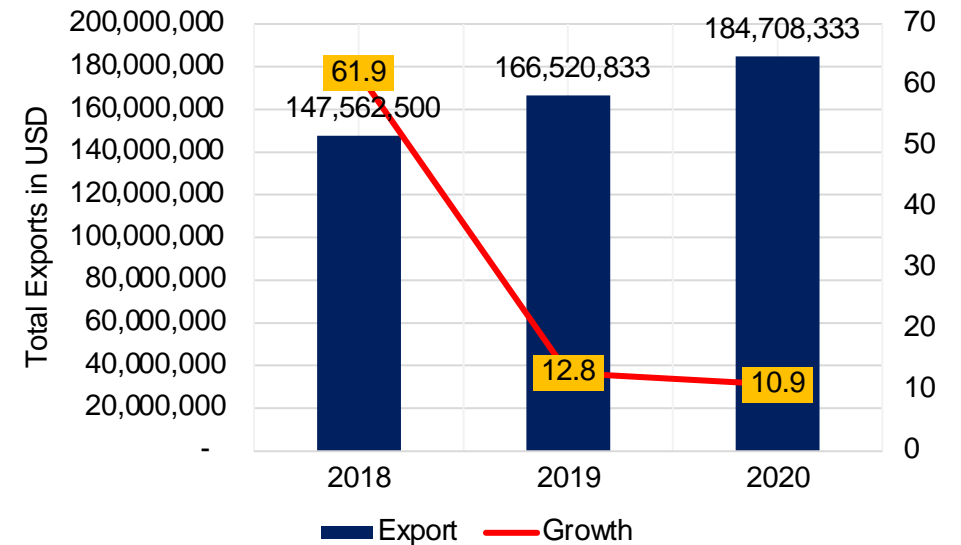
Export Performance of Automotive Parts & Components and Automotive Electronics

Automotive Parts & Components

Product label	Exported value in 2018	Exported value in 2019	Exported value in 2020	2020 Share (%)
Total Value	1,116,319	1,061,144	939,112	
Parts and accessories motor vehicles	1,028,912	960,339	840,376	89%
Parts and accessories for motorcycles and bicycles and for carriages for disabled	39,478	39,089	42,720	5%
Bicycles and other cycles, incl. delivery tricycles, not motorised	25,908	39,080	37,824	4%
Motorcycles, incl. mopeds, and cycles fitted with an auxiliary motor, with or without side-cars; side-cars	7,949	11,665	11,566	1%
Motor cars and other motor vehicles principally designed for the transport of persons, incl. station wagons and racing cars	8,849	3,294	1,616	0%

Source: ITC Trademap

Automotive Electronics



Source: Philippine Statistics Authority

Note: Wiring Harnesses not included in the PSA Autoelectronics classification

- **PH auto exports are mainly automotive parts and components of cars and motorcycles (94%).** These are comprised by gear boxes, by drive-axes, differential, transmission systems, arm rests, sun visors, and battery tray holders, among others. Top export destinations of these products are Thailand, Japan, United States, China, Indonesia, South Africa, Argentina, Malaysia.
- **Automotive electronics** (broadcast eqpmt, lighting & signalling, brakes) reached USD 184M in 2020 and has been one of the **fastest-growing segments in the electronics exports** of the country; 61.9% growth in 2018; 12.8% growth in 2019; and 10.9% growth in 2020 despite the pandemic.

Strategies to promote & stimulate participation in GVCs ...

Competitiveness enhancement measures: access to credit, industry supply chain gaps, common development facilities, management & technology upgrading, HRD

Policy reforms & incentives to build up domestic market & attract investments: critical parts, market expansion programs, trade & investment promotion

More predictable business environment: streamline procedures, customs clearance system, roads, economic zones, logistics, power, water, ports, seaports, communication

INTEGRATING THE PHILIPPINES IN THE AUTO GLOBAL VALUE CHAIN

**Integration of PH Auto
Industry into ASEAN
Production / Sales Network**

**STAGE 3
(2021-2027)**

**Full Integration with
ASEAN market & take
advantage of AEC**

Local Market Expansion

**CARS PROGRAM
STAGE 2**

(2016-2020)

**Investment &
Capacity Building**

**Auto Program Formulation
and Approval**

**STAGE 1
(2013-2015)**

**Government support
critical**

Transitioning to **Electric Vehicles**

We are positioning the Philippines as a regional manufacturing hub for EV and EV parts in ASEAN. We recognize that the future of transportation will be autonomous, connected, electric, and shared.

ELECTRIC VEHICLE INCENTIVE STRATEGY

Information, Education, and Communication

IEC program on EV regulation, operation, & technicalities; establish EV lead cities for the testing of concepts & awareness promotion

Research and Development

X EV & smart transport R&D



Regulations and Standards

Installation standards & permitting protocols, charging system requirements, align charging standard protocols with ASEAN; standards, testing, verification

Fiscal and Non-Fiscal Incentives

Excise Tax, CREATE, Expeditious Processing of Importation

Human Resource Development

EV HRD program to support both local & global requirements

PH Electric Vehicle Industry

54 MANUFACTURERS & IMPORTERS

19 CHARGING STATIONS

11 PARTS MANUFACTURERS

71,840 DIRECT &
INDIRECT EMPLOYMENT

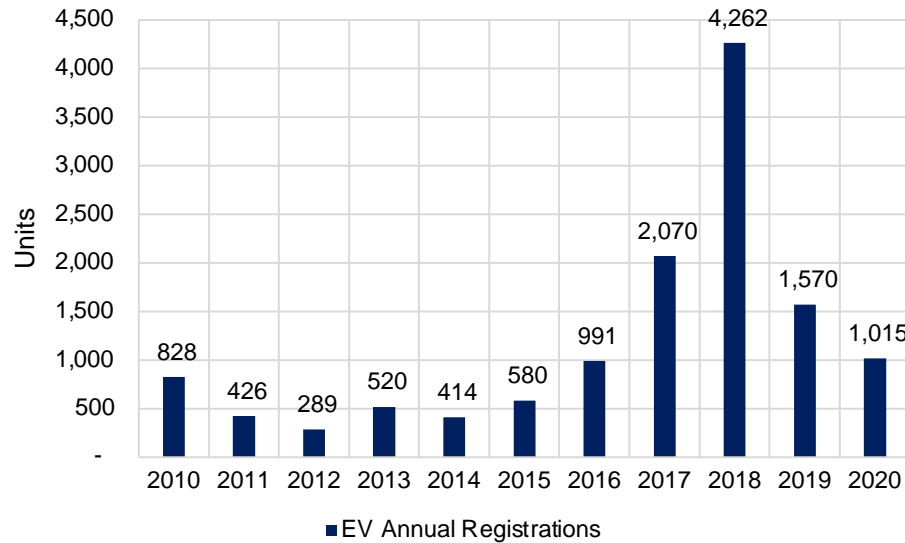
18 DEALERS &
TRADERS



(As of March 2020)

Electric Vehicles on the Road 2010-2020

Annual EV Registrations 2010-2020

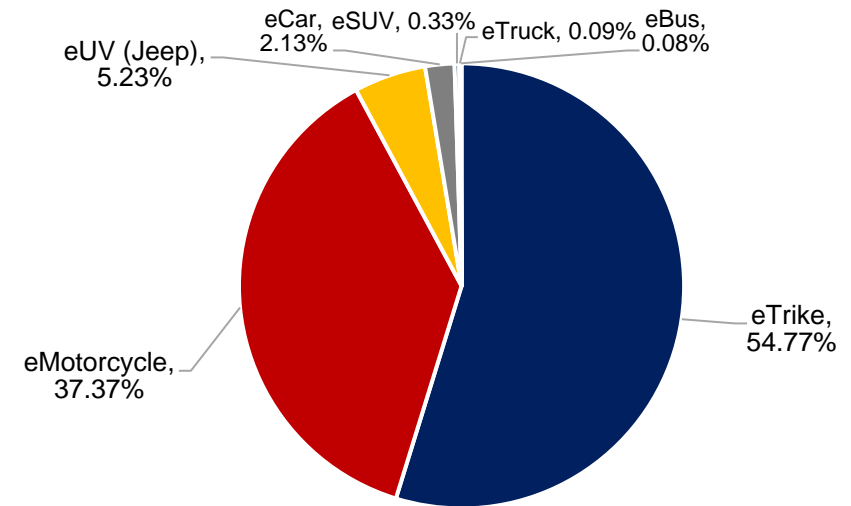


Source: LTO Data

*Does not include hybrid vehicles

**potential underestimation compared to actual due to unregistered EVs on the road

Structure of EV Stock, 2010-2020



Source: LTO Data

*Does not include hybrid vehicles

**potential underestimation compared to actual due to unregistered EVs on the road

- 12,964 electric vehicles were registered at the Land Transportation Office (LTO) from 2010-2020.
- Most EVs in the Philippines are electric motorcycles and electric tricycles, and a 5 percent share of electric jeepneys attributed to the PUV Modernization Program.
- EV annual registrations are steadily increasing surpassing more than 1,000 vehicles in 2017; peaked at 2018 with 4,262 vehicles registered during the year.

Electric Vehicle Industry Priorities

Activities critical to industry development and priorities for incentives for domestic and export markets

1



Electric Vehicle Assembly

Manufacturing of
E-jeepneys
E-trucks
E-buses
E-UVs
E-Cars
E-Tricycles and
E-Motorcycles

2



Automotive Electronics and other parts Manufacturing

Products for Advanced Driver Assistance Systems
High-precision sensors
AI-enabled parts;
Augmented Reality/Virtual Reality Technology-enabled parts;
Electric motor powertrains
Metal forging

3



EV Battery, Charging, Energy Storage Systems, and Recycling

Battery and Parts
Charging Equipment
Energy Storage
Systems utilizing local minerals in the Philippines for higher value upgrading, including recycling.

4



Engineering Service Outsourcing

Engineering Service Outsourcing; R&D; Automotive systems design & modelling; AI applications in autonomous vehicles

In the domestic market, we are projecting 6.6 million electric vehicles on PH roads by 2030

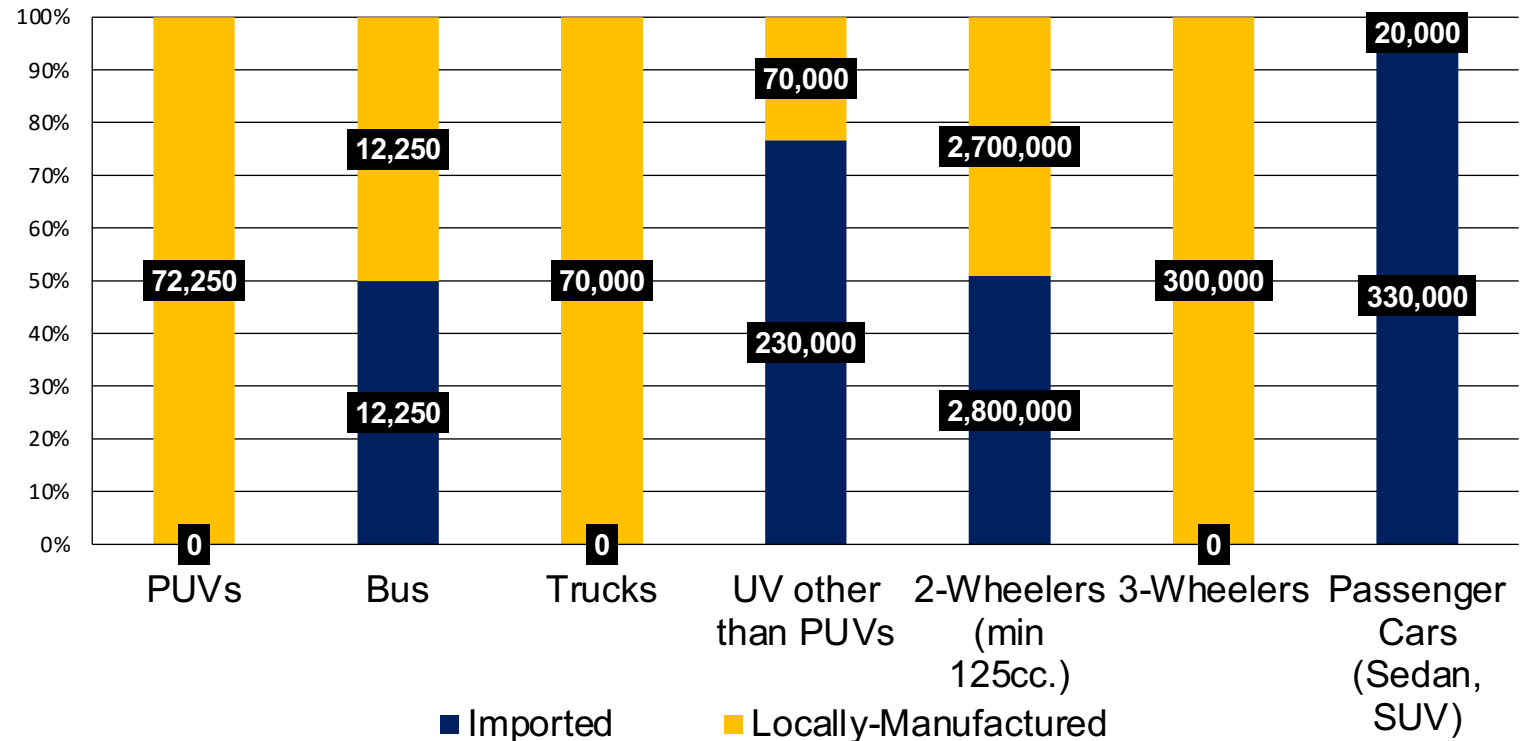
Reduction in battery prices including planned incentives are expected to drive EV adoption

Projected EV Stock by 2030

Vehicle Segment	Projected EV Stock	Share (%)
Public Utility Jeepneys	72,250	1.09%
Bus	24,500	0.37%
Trucks	70,000	1.06%
Other Utility Vehicles	300,000	4.53%
2-Wheelers	5,500,000	83.12%
3-Wheelers	300,000	4.53%
Passenger Cars	350,000	5.29%
Total	6,616,750	

Source: DTI-BOI Calculations & Projections; Assumptions Applied

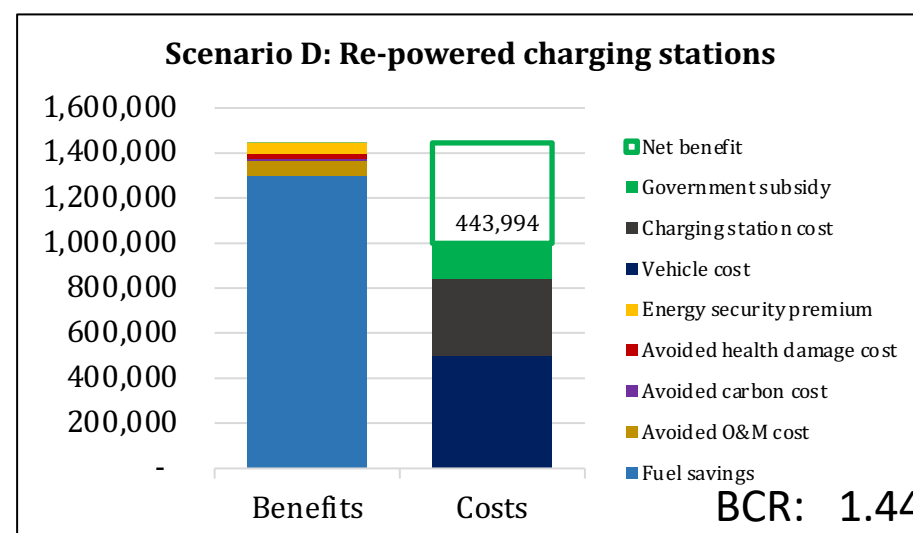
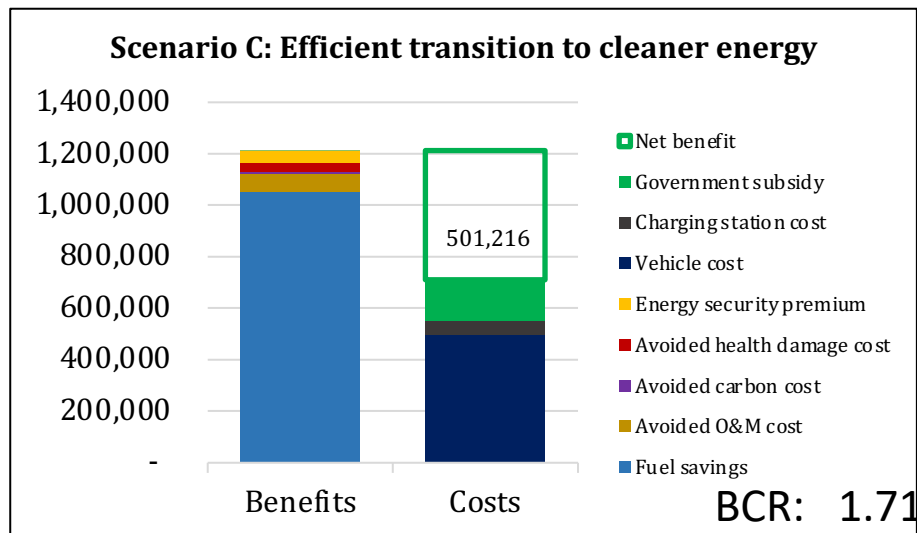
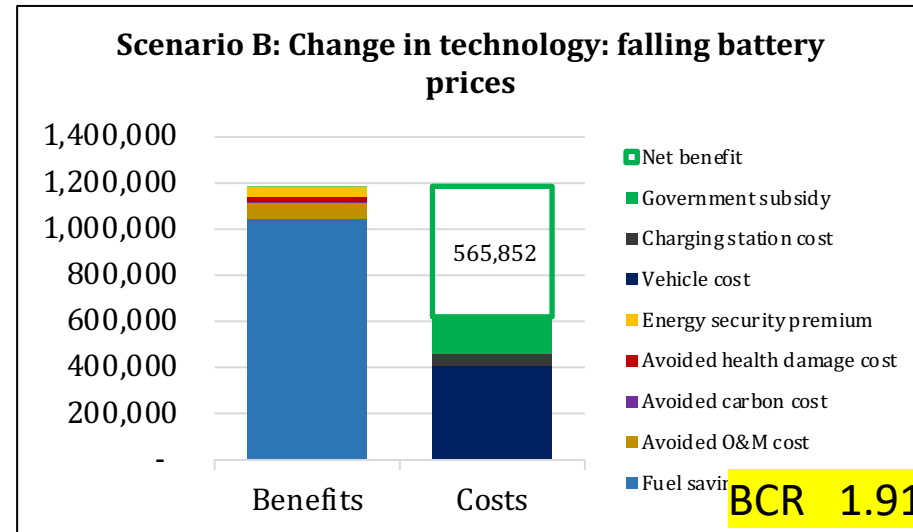
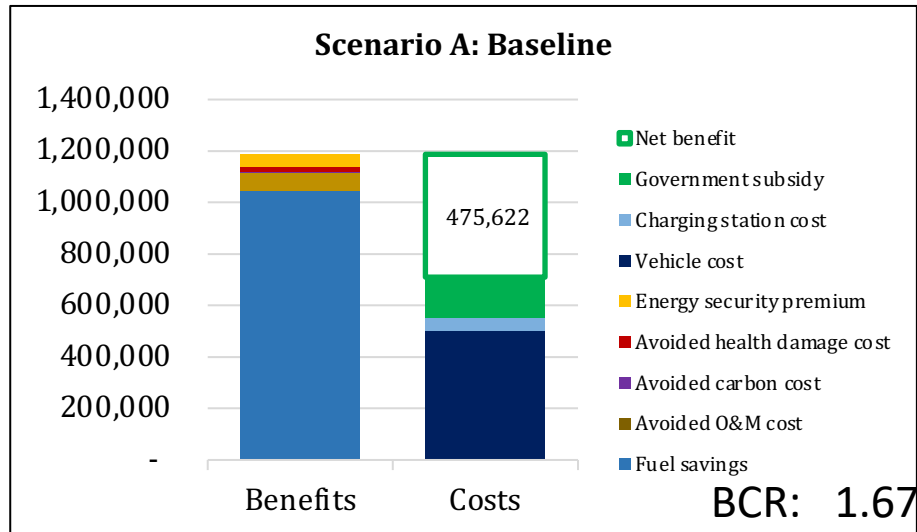
Local Manufacturing Targets in the EV adoption target



- 6.6M EVs in the next ten years until 2030; 2-wheelers - 83.12% of target
- Of which, **3.3 million electric vehicles** are targeted to be locally manufactured.

10-year cost-benefit analysis of E-jeepney ownership

Scenarios based on 10% SDR



in all scenarios, socio-economic net benefits of e-jeepney > 0 and BCR > 1

importance of facilitating reduction in investment costs by supporting development & manufacture of e-jeepneys & EVs in general

PH Electronics companies are entering the electronic segments of global automotive industries



Denso Global

Meter cluster, air-con, compressor, smart key, sonar sensor



Integrated Microelectronics Inc.

Complex safety & control systems (auto camera modules) for Advanced Driver Assistance System (ADAS) applications



Ionics EMS

Electronic car dashboard assembly; manufacture of tracking devices; assembly of car charging systems



Temic Automotive Philippines

Manufacture of Automotive Stability Management System (ASMS), Anti-Skid Brake System (ABS); Anti-Lock Brake System - Electronic Control Unit; Electronic Car Door/ Body Control Modules; Electronic Brake System

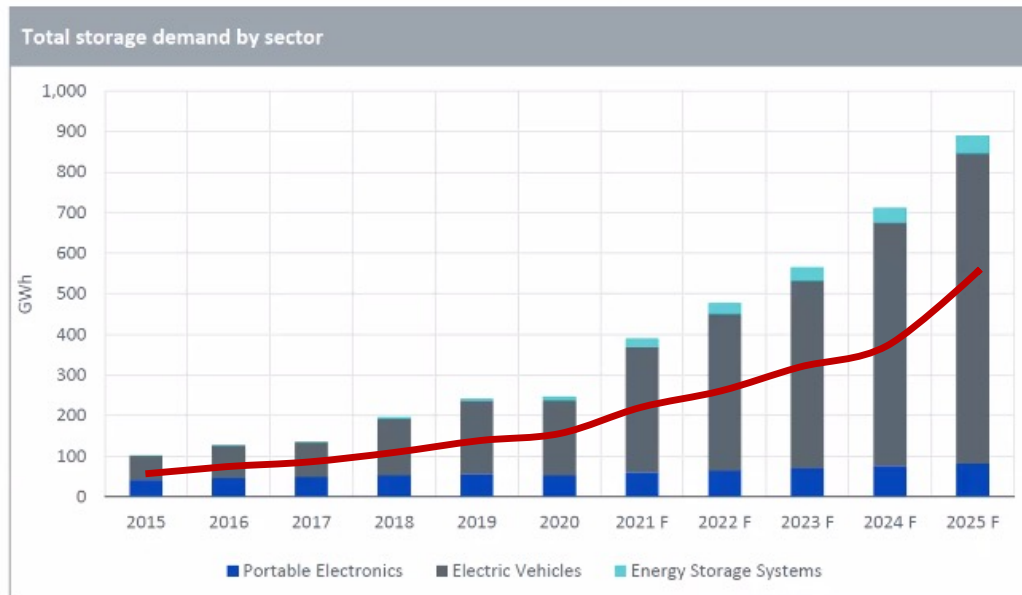
The PH Electronics Industry

- Electronic products comprise **60%** of the Philippines' exports. **10%** Global share in Semiconductor Manufacturing
- More than **500** electronics companies creating **3.2** million direct and indirect employment
- Globally competitive strengths in SMS, EMS, esp. in complex PCB assembly, box build and systems assembly with growing capabilities in Design and Development and Original Design Manufacturing (ODM).

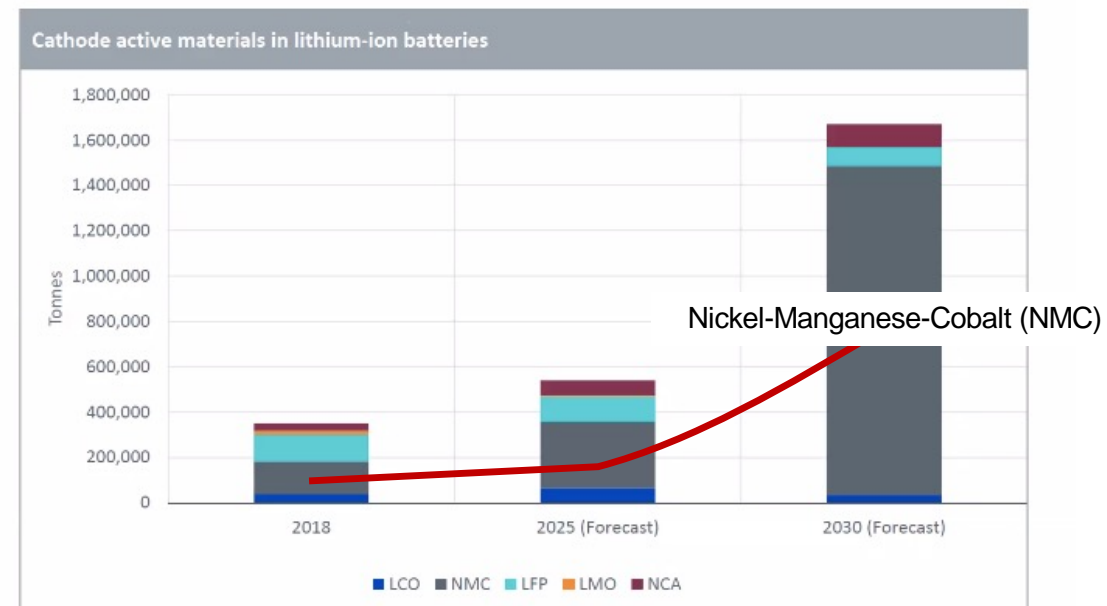


The Philippines is positioning itself as a global manufacturing hub for Lithium-ion batteries utilizing Nickel and Cobalt as cathode materials which are very abundant in the country

Advancements in technology expand the potential for battery applications in consumer electronics (cellular phones, laptops), automotive (EV, PhEV, E-bike), and next energy storage systems (solar panels).



Source: WisdomTree, International Nickel Study Group



Source: WisdomTree, International Nickel Study Group

- By 2025, total storage demand of electric vehicle, portable electronics, and energy storage systems is projected to be almost 900GWh, this will be dominated by growth in EV demand.
- Among battery chemistries, there will be more demand for lithium ion batteries than any other battery chemistries until 2030 due to their battery characteristics.

The Philippines hosts export-oriented battery and battery parts manufacturers serving global electrical, electronics, and automotive industries

Philippines manufactures Lead-Acid, Lithium-ion batteries, battery parts such as sensors, cartridges, protectors, including battery-related services such as charging, repair, and recycling.

LITTELFUSE PHILS., INC.	Manufacture of Li Ion Battery Protector	Lima Technology Center - SEZ
Battery Philippines, Inc.	Manufacture of Lead Acid Batteries	Bulacan
Imarflex Battery Manufacturing Corporation	Manufacturing of Lead Acid batteries	Pasig
Lead Core Technology System, Inc.	Assembly and/or distribution of customized battery packs utilizing VRLA, VTLA nickel cadmium and lithium ion batteries	Valenzuela City, Quezon City, Subic, Pampanga
People's International Enterprises	Assembly and/or distribution of off-the-shelf and/or customized battery packs utilizing VRLA, VTLA nickel cadmium and lithium ion batteries	Valenzuela
Standard Manufacturing Company Inc.	Manufacture of Lead-Acid Batteries	Valenzuela
ACBEL POLYTECH PHILIPPINES, INC.	Assembly and test of Lithium-ion battery pack	Carmelray Industrial Park II - SEZ
CSB ENERGY TECHNOLOGY CO., LTD. [formerly: HITACHI CHEMICAL ENERGY TECHNOLOGY CO., LTD.];	Manufacture of VRLA (Value Regulated Lead Acid) Battery	Cavite Economic Zone
DANAM PHILIPPINES, INC.	Assembly of battery charger for cellular phones	Cavite Economic Zone
DANAM PHILIPPINES, INC.	Assembly of battery charger for cellular phones	Cavite Economic Zone
DONG HO ELECTRONICS (PHILIPPINES), INC.	Manufacture of battery packs and antenna	Cavite Economic Zone
INTL. PRECISION ASSEMBLIES, INC.	Manufacture of various Surge Arresters and Replacement Battery Cartridges	Cavite Economic Zone
LITTELFUSE PHILS., INC.	Manufacture of Li Ion Battery Protector	Lima Technology Center - SEZ
NEP LOGISTICS, INC.	Charging of "Lead Acid Battery Charging" for battery units	Cavite Economic Zone
YUTAKA MANUFACTURING (PHILIPPINES), INC.	Manufacture of battery base component	Laguna Technopark - SEZ
ECO GREEN RISING PHILS. CORP.	To engage in collecting, buying and sorting of used battery and other precious and non-ferrous metal scraps for export	Suntrust Ecotown Tanza
Ionics EMS	Repair of Power Controller of NiMH batteries	Light Industry & Science Park I - SEZ
FURUKAWA ELECTRIC AUTOPARTS PHILIPPINES, INC.	Manufacture of Battery Statement Sensor (BSS)	Laguna Technopark - SEZ

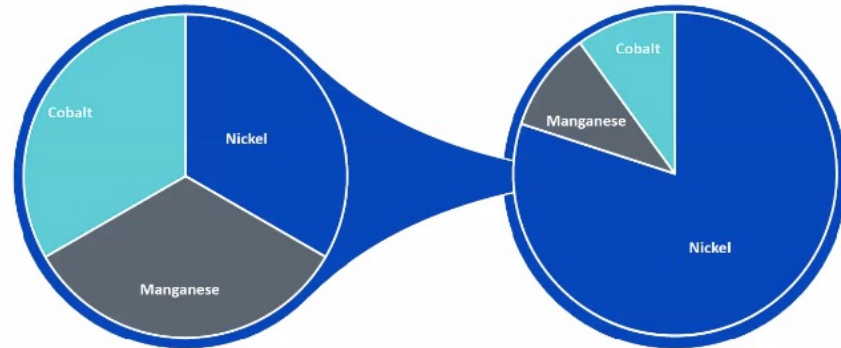
Source: PEZA and other sources

Within the Lithium-ion batteries, Nickel as a cathode material will comprise a larger share in the future...

PH is #6 in Nickel Reserves; #2 in Nickel Production

Pre-2017 NMC cathodes were equal weight

Technological solutions allow for a 8:1:1 ratio



Source: WisdomTree, International Nickel Study Group

Top Countries	Reserves	Share
Indonesia	21,000,000	22%
Australia	20,000,000	21%
Brazil	16,000,000	17%
Russia	6,900,000	7%
Cuba	5,500,000	6%
Philippines	4,800,000	5%
Others	19,800,000	21%
Total	94,000,000	100%

Source: NSEnergyBusiness

Countries	Production (MT)
Indonesia	853,000
Philippines	323,000
Russia	279,000
Caledonia, France	208,000
Canada	181,000
Australia	159,000
China	120,000
Brazil	60,600

Source: Statista Nickel Production

- In 2017, Nickel, Cobalt, and Manganese components of cathode materials were at equal weight. However, technological solutions will allow Nickel for an 8:1:1 ratio increasing the Nickel composition in cathode materials.
- In 2019, there is an estimated 94M tonnes of global nickel reserves. The Philippines hosts 5% of these reserves making it the 6th largest host of Nickel reserves in the world; and 2nd to Indonesia in ASEAN. In terms of production, the Philippines ranks 2nd which produced 323,000MT in 2019 and 333,962MT in 2020
- In cobalt Production, the Philippines produced 4,600 tonnes of cobalt in 2019, accounting for around 3.3% of the global share. Democratic Republic of Congo comprised 70% of total global cobalt production in 2019.

PH as a manufacturing base for battery and battery parts production offers companies greater market access to major EV markets such as Japan, Australia-New Zealand, India, China, and Europe

	MFN Rate	Availability*	PH-JP	ASEAN	ASEAN China	ASEAN Korea	ASEAN JP	ASEAN ANZ	ASEAN India	EFTA
Nickel metal hydride battery	5	LPNISQ	0	0	0	0	0	0	0	0
Lead-acid batteries	15	LP	0	0	0	HSL E	0	0	6	10
Nickel-cadmium batteries	3	NLP	0	0	0	0	0	0	0	0
Lithium-ion batteries	1	LPNISQ	0	0	0	0	0	0	0	0
Wiring Harnesses	30 /d	LP	0	0	5	HSL E	30	0	EL	30
Battery clamps	20 /f	LP	0	0	5	HSL E	20	0	8	20
Battery cables	20 /d	LP	0b	0	5	HSL E	0	0	16.43	20
Insulators	1	LP	0	0	0	0	0	0	0	0

PH can leverage on its leadership in the global IT-BPM sector to expand to R&D, technical and IT shared services in the automotive industry

The Philippines remains a top-tier destination for IT-BPM services and remains as one of the leaders in the global IT-BPM industry.



DENSO

Denso

Software development for auto products like instrument clusters



F.tech
R & D PHILIPPINES INC.

F-tech Philippines

Engaged in Research and Development of Automotive Products



YAZAKI

Philippine EDS Techno-Service, Inc.

Yazaki

Provides technical services for Yazaki Corporation's automotive Electrical Distribution Systems (EDS) development centers around the world



LEAR
CORPORATION

Lear Automotive Services

Engaged in Shared Services (BPO) for its automotive manufacturing plants

1st in voice services, 2nd in non-voice services, accounting for 13% of global market share.

Software development is one of the more established sub-sectors of the Philippine IT-BPM industry with 400 software companies in the Philippines and 200,000 IT and Software personnel.

National Center for AI Research (N-CAIR)

A hub where multinational companies can explore various R&D projects with the Philippine government, its researchers, and its linkages with universities and research institutes for manufacturing and other industries

STRENGTHS

- FTAs with key EV markets such as ASEAN+1, PH-Japan, PH-EFTA, RCEP
- Participation in Electronics GVC and potential areas for upgrading with the emergence of EVs and AVs
- Global brand of the Philippines in IT and software development with the increasing integration of software in vehicle technology
- Regionally competitive tax & incentive regime through CREATE
- Government support to the automotive industry thru CARS Program

OPPORTUNITIES

- Build on CARS in crafting an EV program
- Strong potential for local manufacturing of global automakers Toyota and Mitsubishi
- DTI National AI Roadmap for AI R&D focus on Autonomous Vehicles
- DOST Additive Manufacturing Center for low-cost manufacturing R&D of automotive & electronics components

WEAKNESSES

- Lack of a unified and national target in adopting electric vehicles
- Lack of clear regulations among government agencies in the utilization EVs
- Lack of testing facilities that can test the soundness of EVs

THREATS

- Growing market demand will skew towards greater imports in the absence of domestic production

Rapidly changing mobility landscape: autonomous, electric, connected, shared

- Autonomous vehicles and smart cities introducing hyperconnectivity among vehicles, smart buildings, and electronic devices
- E-commerce and the future of delivery vehicles (whether manned or unmanned)
- Online mobility platforms or ride-hailing applications and the growing need for optimized and shared mobility
- Growing backlash on traffic congestion and car-centric mobility warranting the shift from privately-owned vehicles to safer, smarter, technology-enabled, and more convenient public transportation
- Growing popularity of micro mobility such as electric scooters and electric bicycles for intra-zonal or intra-city mobility