THE STRATEGY FOR INTRODUCTION OF ELECTRIC AND AUTONOMOUS VEHICLES

Presented at

TIME
TELEKOMUNIKACJA ■ INTERNET ■ MEDIA ■ ELEKTRONIKA
FORUM GOSPODARCZE

FROST & SULLIVAN

6th March2017

Who is Frost & Sullivan?

Leading Market Intelligence & Business Advisory Firm with 45 Offices in 30 Countries (including Poland)

43 Offices Around the World

55 years of Experience

10,000+ Clients Worldwide

Growth consulting, best practice training, market and technology research to help clients grow their businesses through exclusive proprietary methodologies.

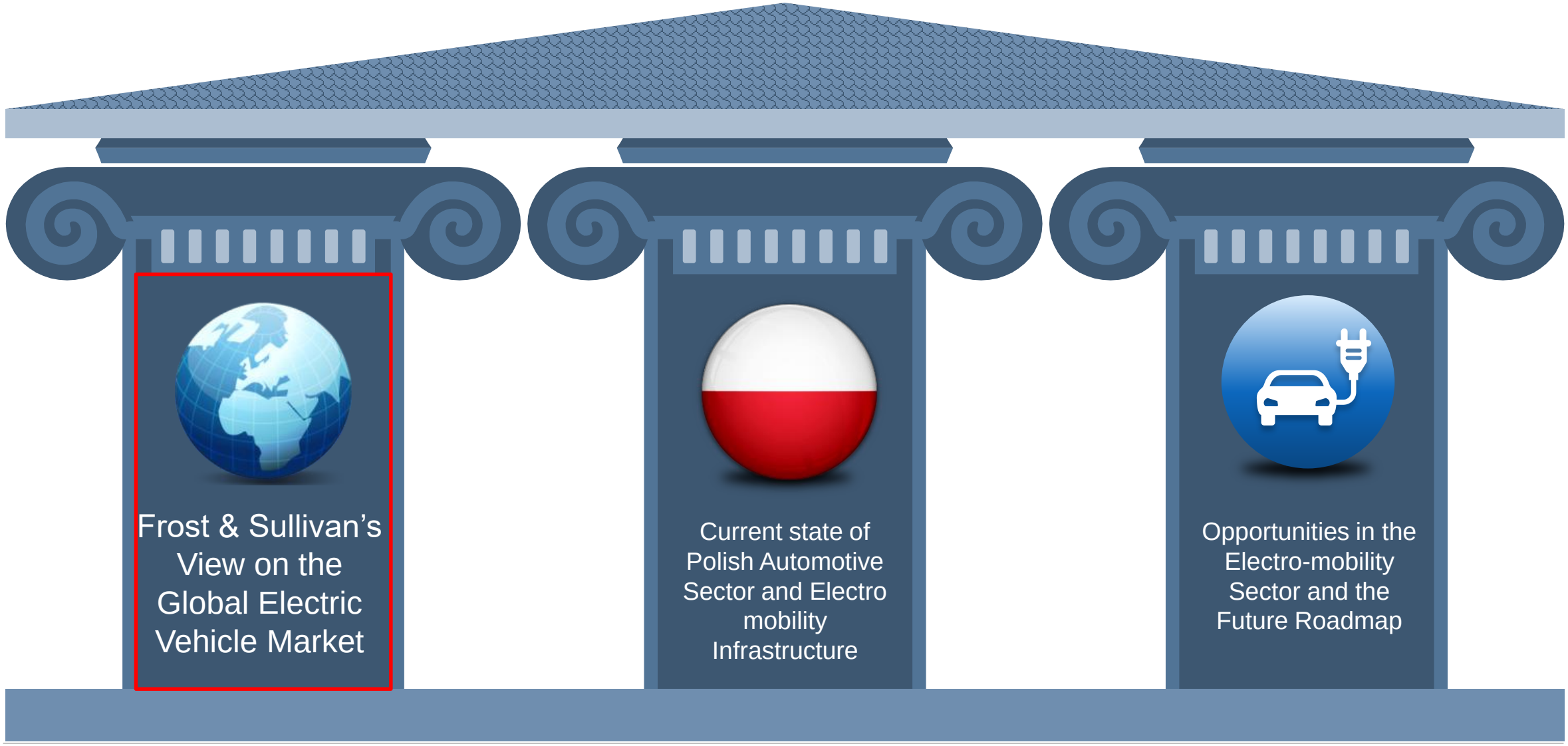
Market Intelligence/ Research

3-tiered Growth System

Business Advisory/ Consulting

Growth Implementation

3 Key Pillars of Today's Agenda



4Cs Impacting The Future of Mobility

Emergence of smart and connected nodes to optimize and better utilize commute time

Community

Smart Grid

Intelligent Infrastructure

Car

Car As A Service

Self Learning Car

Communication

Connected Driving

V2V & V2X

Commuter

New Mobility Solution

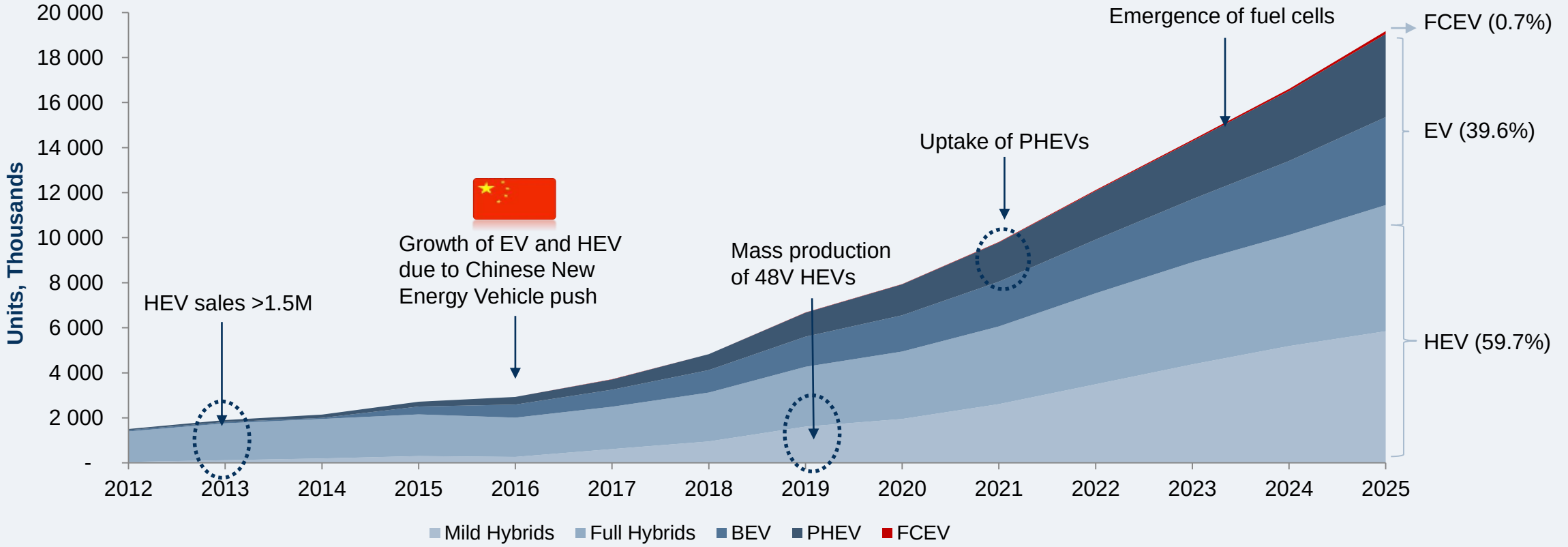
Smart Mobile Application

Source: Frost & Sullivan

Global Uptake of EV in PC Market

2.9 million [2016] to 19 million units [by 2025]; 14-16% of global LV sales. xEVs by 2030 has the potential to account for 30% of sales

SALES FORECASTS FOR HYBRID, ELECTRIC AND FUEL CELL VEHICLES – MIDLINE SCENARIO ESTIMATES, GLOBAL, 2012-2025



Source: Frost & Sullivan

Governments have been de-incentivizing PHEVs Benefits

Overall the incentives of BEVs is greater than PHEVs as governments support emission free mobility

Overview of EV Incentives, USA, Europe, China, Japan and S. Korea, 2016

Country	Est. purchase incentive (USD)*	Delta of incentives [BEV-PHEV]	EV sales in 2015
CHINA	10,000 / 6,500	-$3,500	BEV: 65% PHEV: 35%
USA	8,750 / 4,750	-$4,000	BEV: 62% PHEV: 38%
JAPAN	5,500 / 3,000	-$2,500	BEV: 50% PHEV: 50%
S.KOREA	16,550 / 7,200	-$9,350	BEV: 85% PHEV: 15%
NORWAY	20,000 / 11,750	-$8,250	BEV: 77% PHEV: 23%
FRANCE	7,100 / 1,250	-$5,850	BEV: 81% PHEV: 19%
HOLLAND	6,500 / 6,250	-$250	BEV: 10% PHEV: 90%
UK	6,200 / 3,750	-$2,450	BEV: 42% PHEV: 58%

BEV PHEV

*Reference taken from IEA Global EV Outlook 2016

Source: Frost & Sullivan

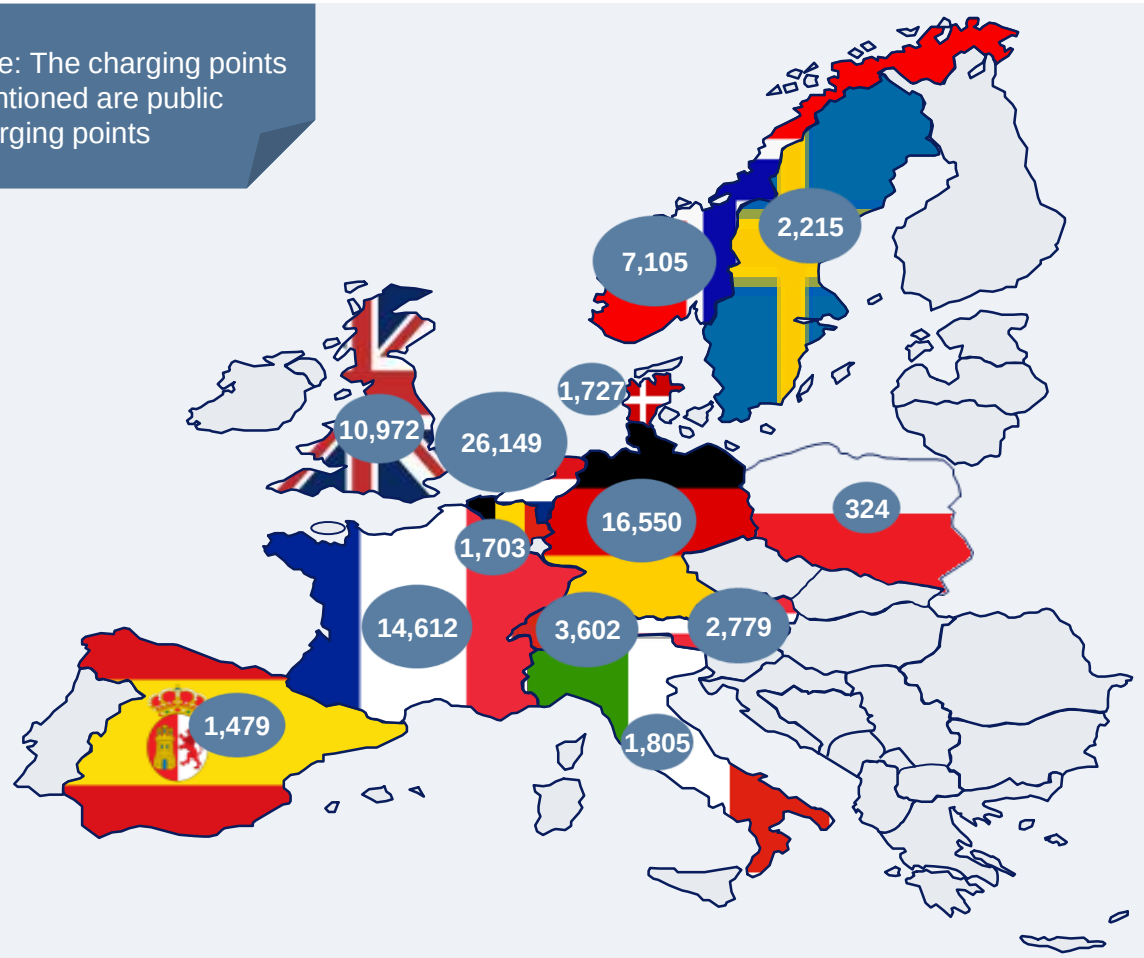
Existing Public Charging Points in 2016

The Netherlands has the highest number of AC charging points across Europe with more than 26,000 in operations, followed by Germany, France and the United Kingdom

COUNTRY	NORMAL <22 KW	FAST >22 KW
Austria	2,679	100
Belgium	1,335	368
Denmark	1,630	97
France	14,250	362
Germany	16,266	284
Italy	1,796	9
Netherlands	26,088	61
Norway	7,040	65
Poland	290	34
Spain	1,378	101
Sweden	1,654	561
Switzerland	3,399	203
United Kingdom	10,336	636
Europe	92,857	3,126

EXISTING AC CHARGING POINTS, EUROPE, 2016

Note: The charging points mentioned are public charging points

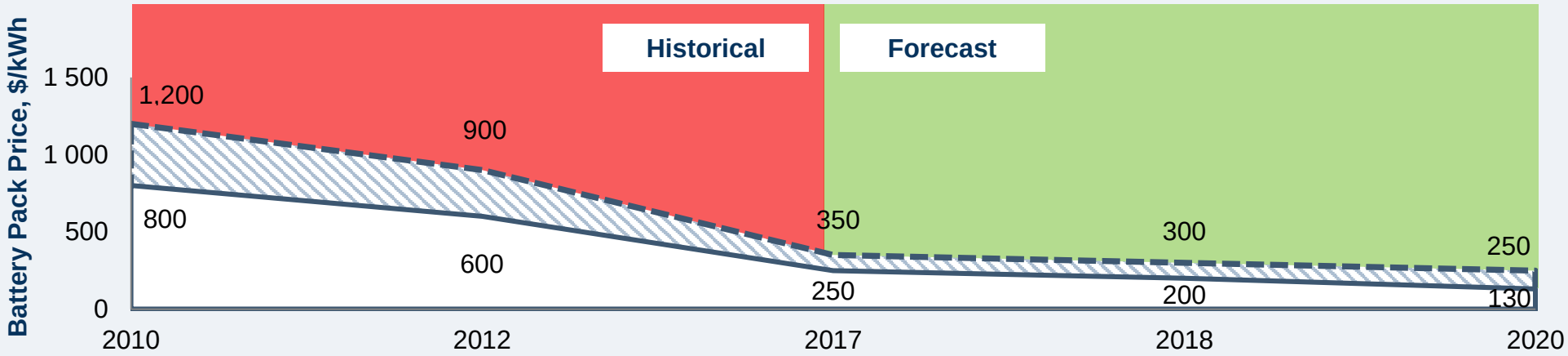


Source: European Alternative Fuel Observatory

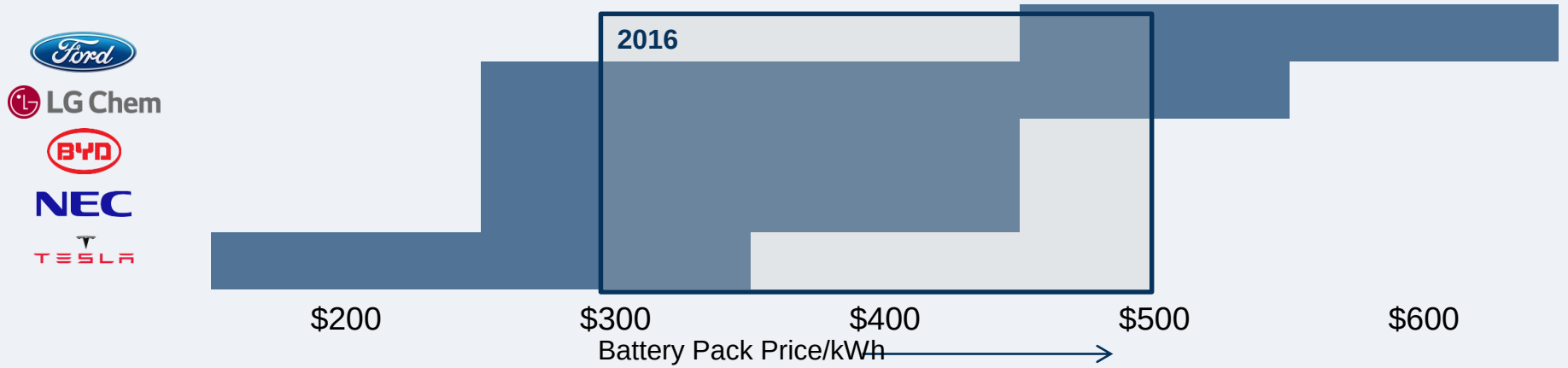
Decline in Battery Prices to make xEVs Affordable

The battery prices have decreased by ~50% since 2010 and is expected to further decrease by 50% in the next 4-6 years

TOTAL EV MARKET: LITHIUM-ION BATTERY PACK PRICING TREND & FORECAST, 2010-2020

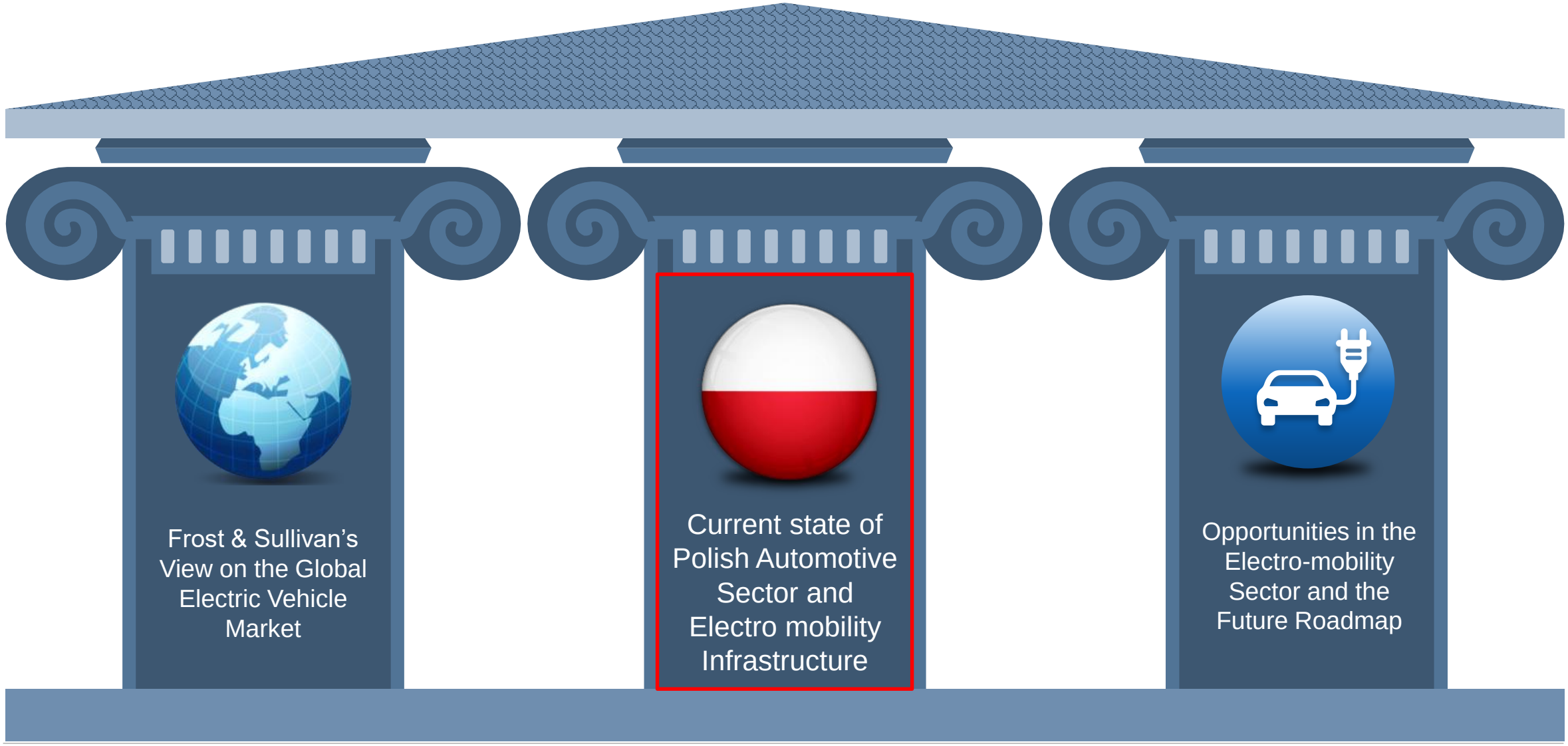


TOTAL EV MARKET: LITHIUM-ION BATTERY PACK COST RANGES BY INDUSTRY PLAYER, 2015-16



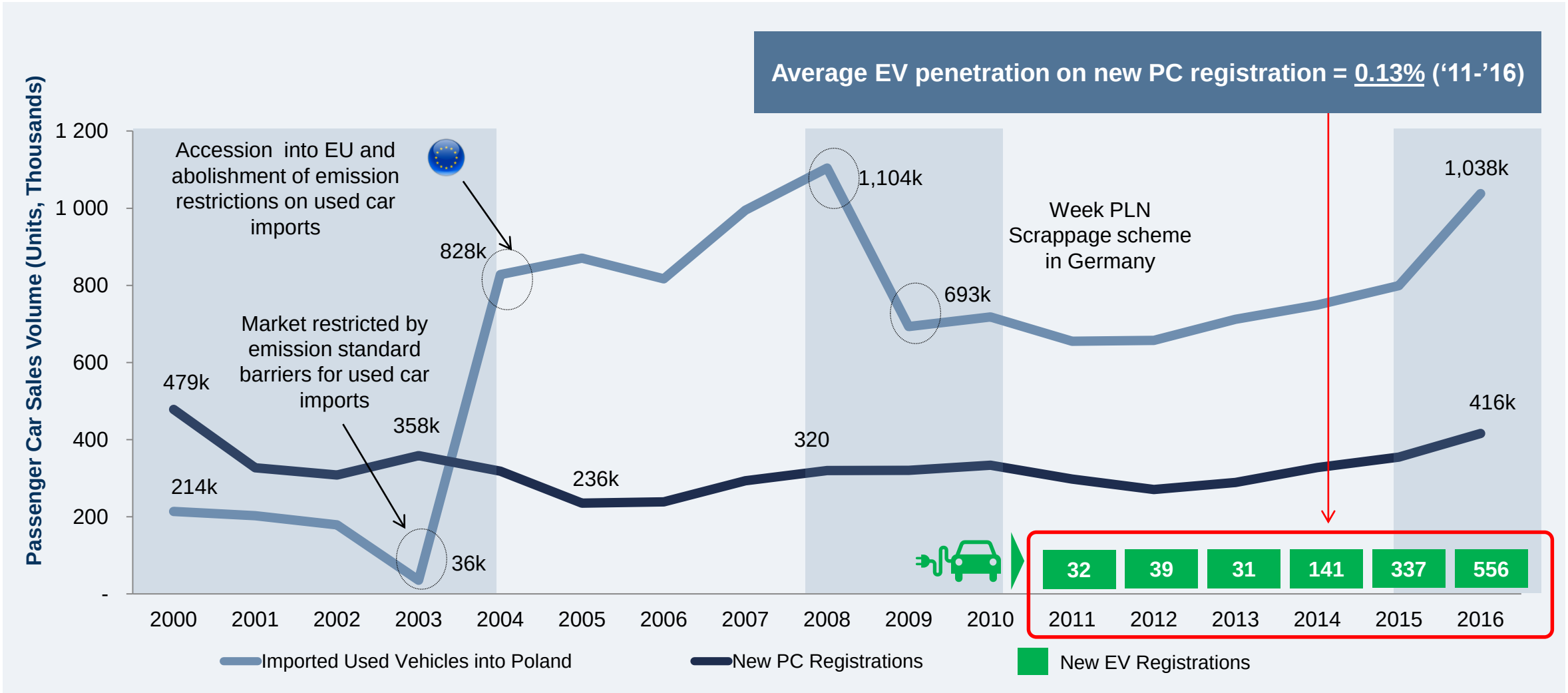
Source: Frost & Sullivan

3 Key Pillars of Today's Agenda



Polish Passenger Car Market (2000 to 2016)

Polish passenger market is characterized by extremely large volumes of imported used vehicles, which accounted for over 1 million cars in 2016



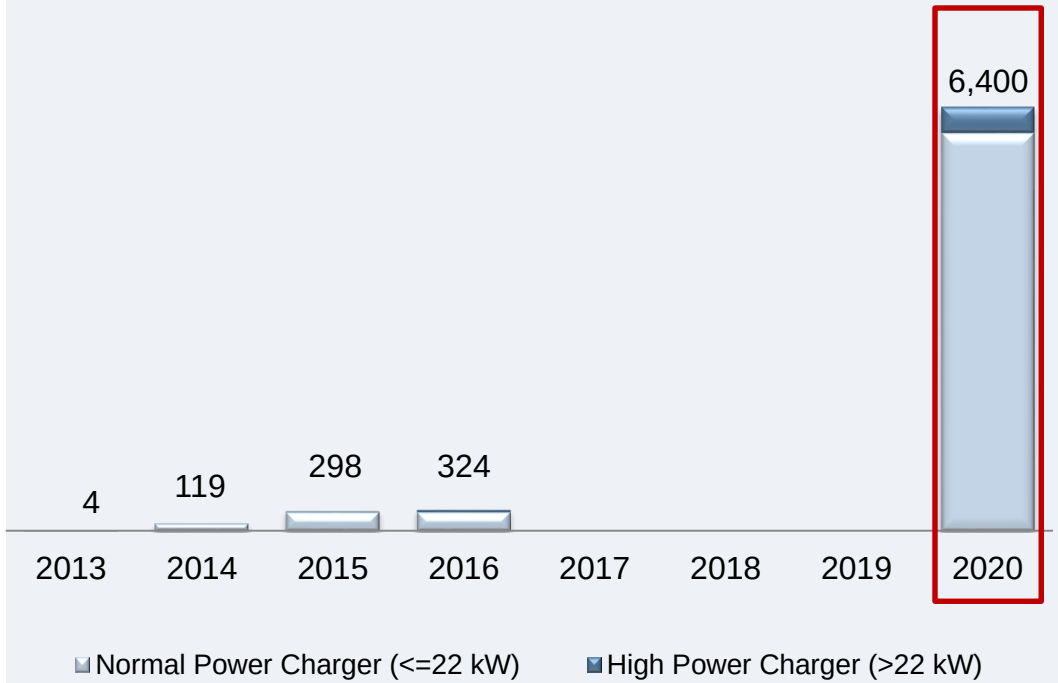
Note: EV = Battery Electric Vehicles (BEV) and Plug-In Hybrids (PHEV)

Source: PZPM, ACEA, EV-Volumes, Polish Ministry of Finance, EV Volumes, Frost & Sullivan

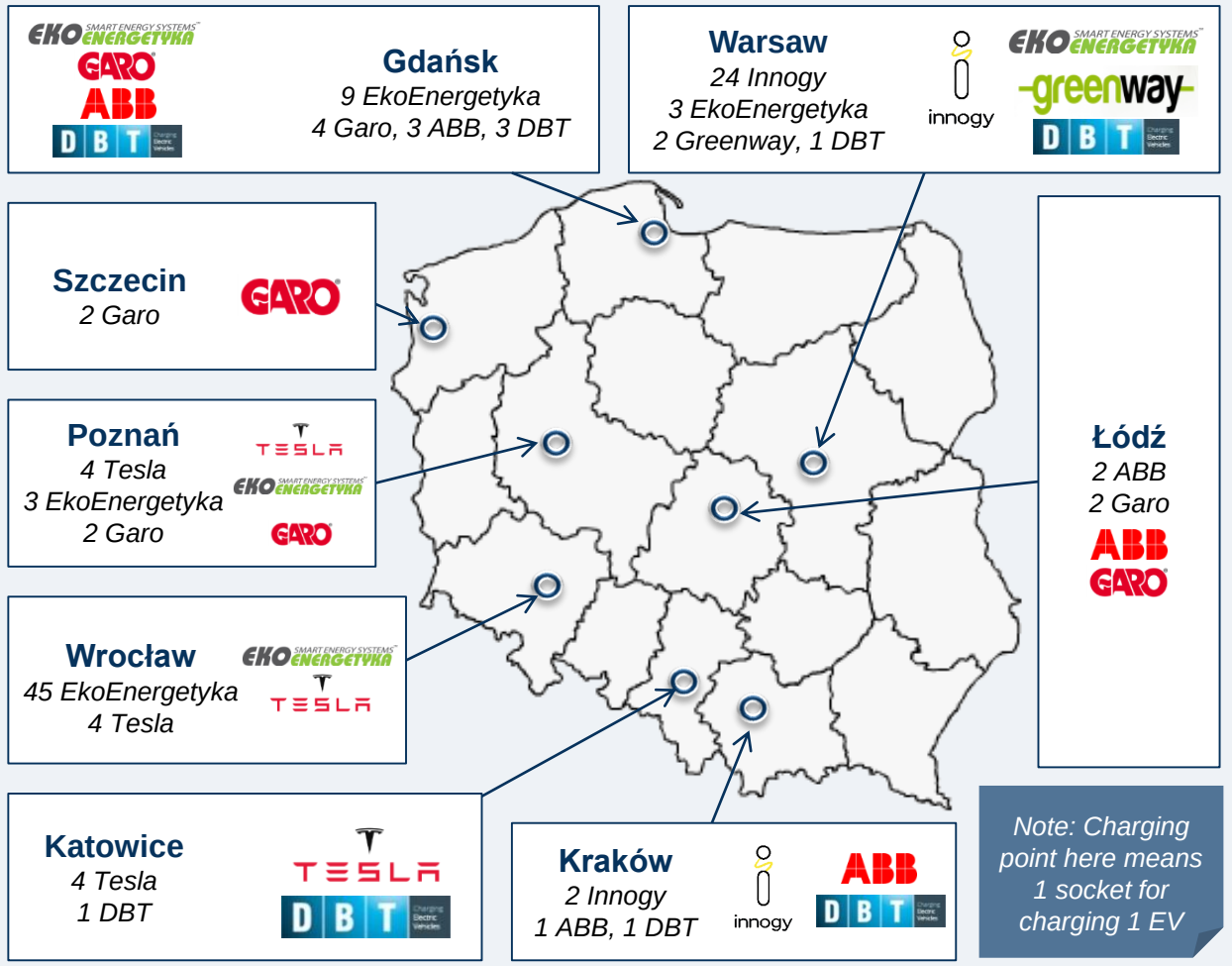
Charging Infrastructure In Poland

Currently, there are 324 public charging points present around the country and by 2020 the Government plans to have 6,400 of them conveniently distributed throughout Poland

CHARGING INFRASTRUCTURE, 2013-2025



CHARGING INFRASTRUCTURE IN KEY CITIES BY KEY PROVIDERS, 2016



**Previous studies suggest optimum number of 0.6-0.7 public charging points per 1 EV*

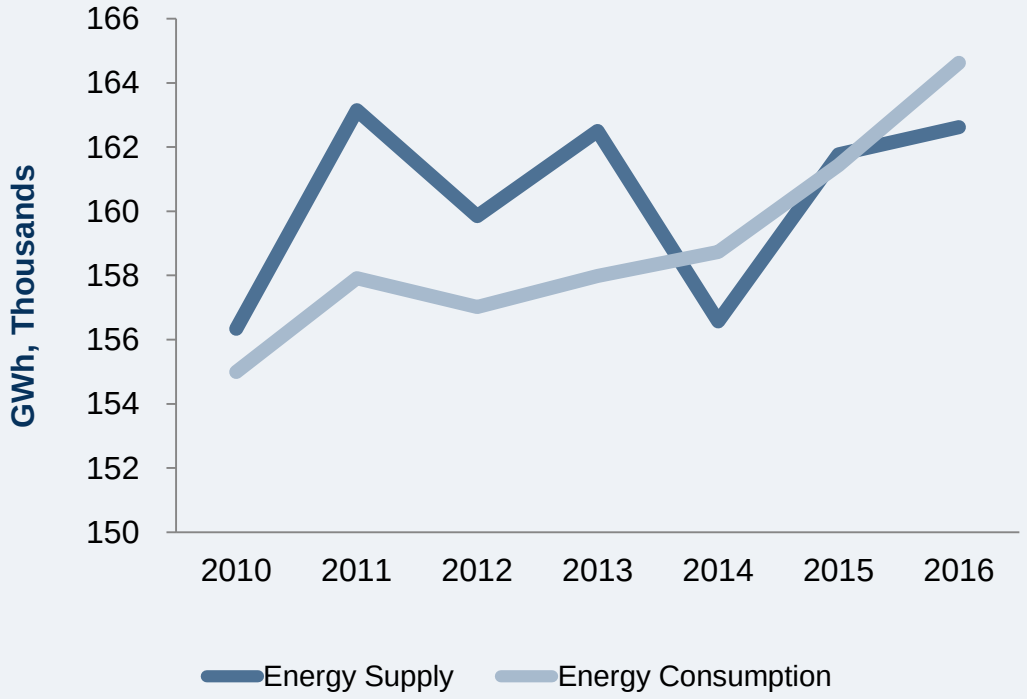
Source: Company Websites, European Alternative Fuel Observatory

Energy Supply and Consumption in Poland – Outlook

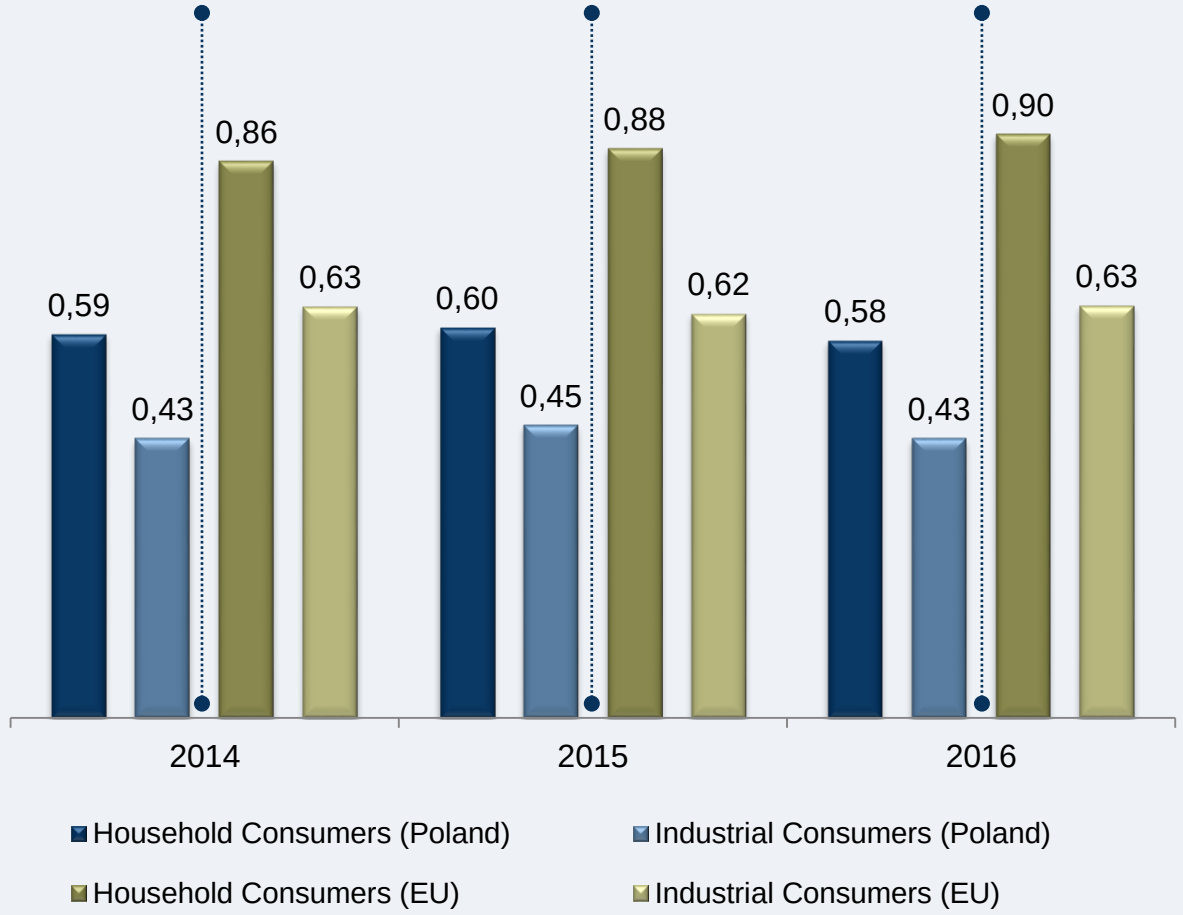
Energy supply and demand under current state is basically balanced, however an issue of insufficient amount of supply arises for projected development of EV ecosystem

ELECTRICITY SUPPLY & DEMAND, 2010-2016

By 2025 we need additional 1,427 GWh of annual energy supply to charge 1 million EVs.*
Nearly 1% increase in demand but the critical aspect with be the grid upgradation



ELECTRICITY PRICE, PLN/KWH, 2014-2016



**1 km in a C segment EV consumes 0.17kWh and 23 km is an average distance travelled per day in Poland*

Source: PSE, Eurostat, Frost & Sullivan

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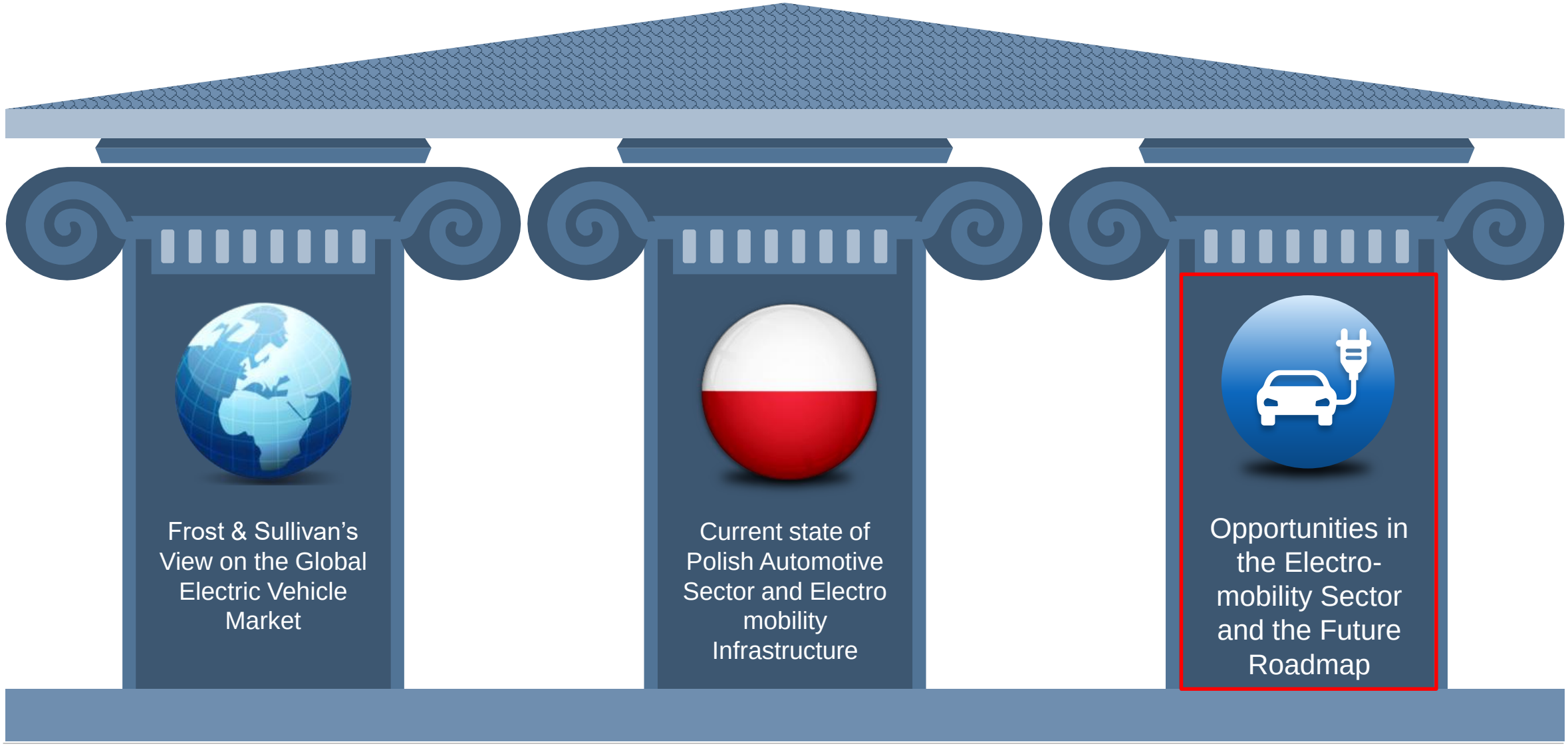
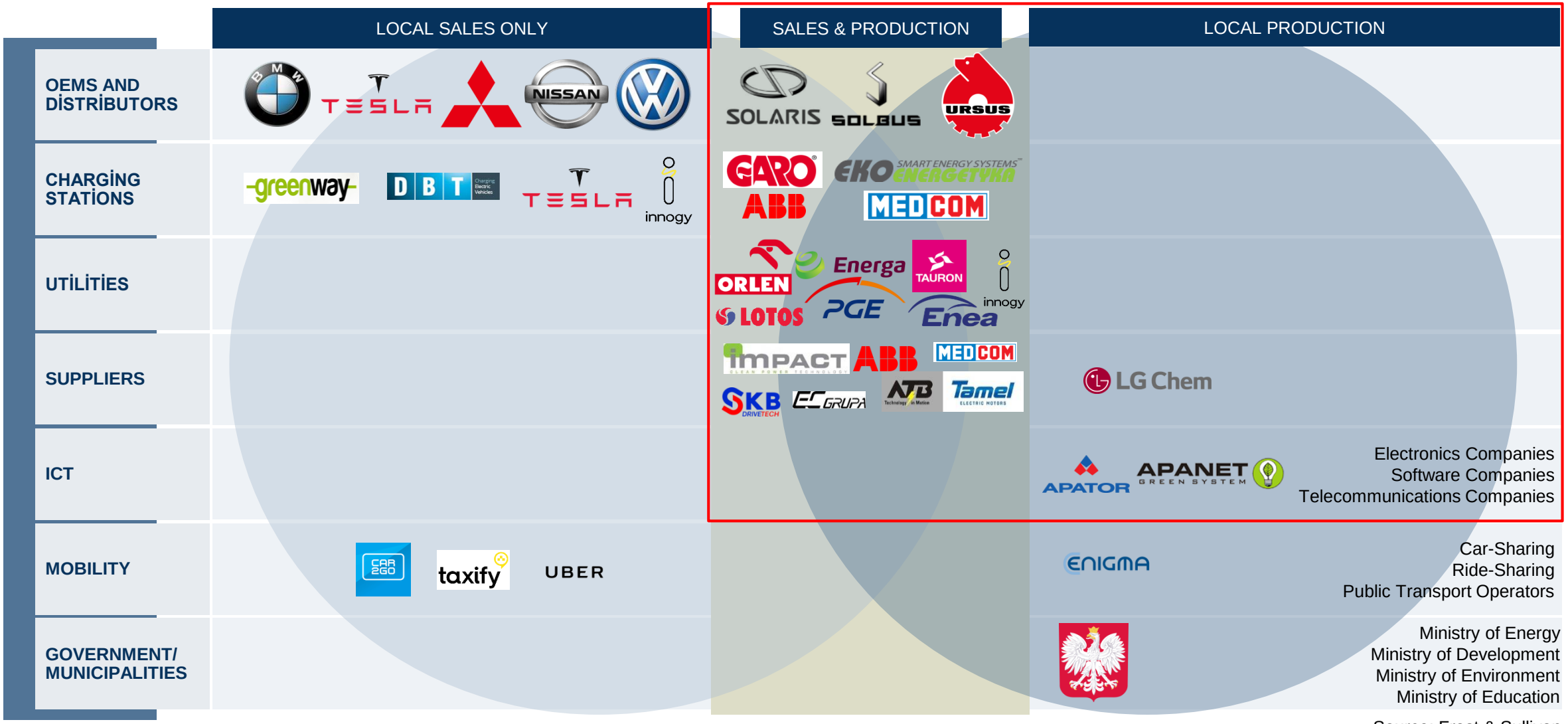


Key Players in the E-Mobility Segment in Poland

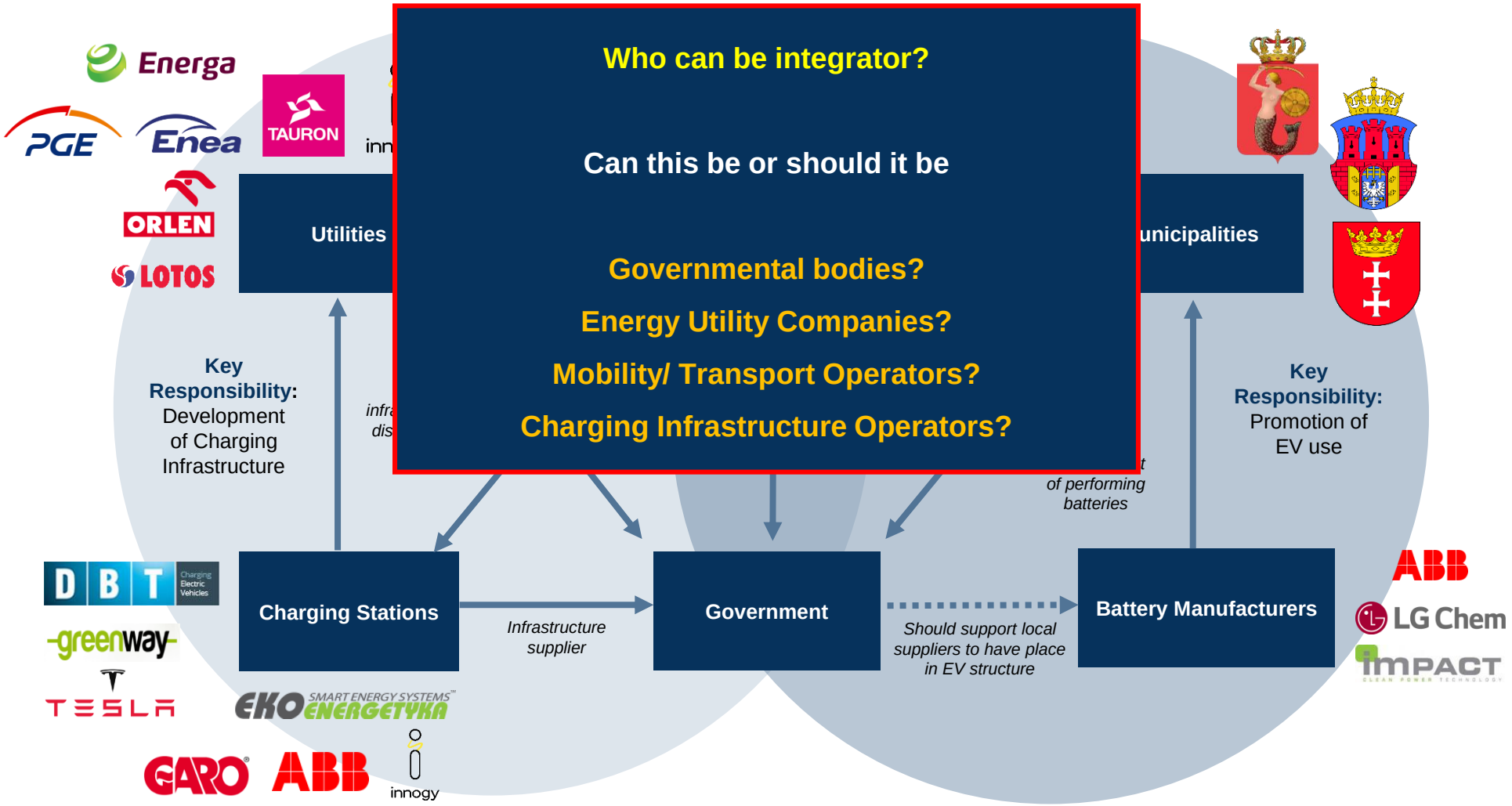
Poland has local technical base and production capability to develop electro-mobility solutions and meet ambitious goals



Source: Frost & Sullivan

Future EV Ecosystem

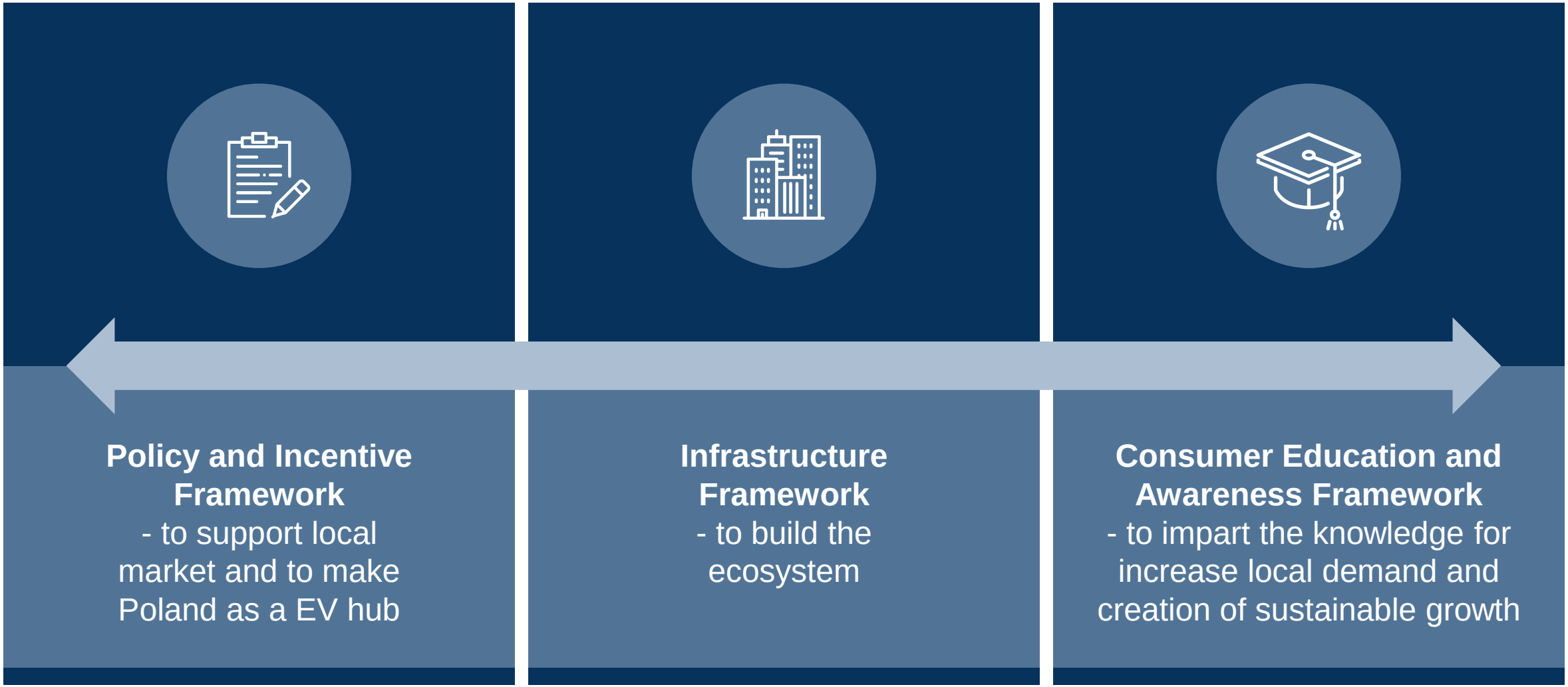
Integrators to create partnerships with all participants of the ecosystem to develop an electric vehicle infrastructure in Poland



Source: Frost & Sullivan

Electromobility Plan for Poland – Roadmap

All participants of the ecosystem have to cooperate closely on modernization of energy infrastructure and development of EV-friendly conditions to stimulate the ecosystem



Source: Frost & Sullivan

Future of Mobility

What if the car of the future was not a car?

Tesla Model S
Autonomous Electric Tank

450 km range
- 80,000 €

Re-Volt
Electric Three-wheeler

100 km range
- 15,000 €

Ehang 184
Autonomous Aerial Vehicle

50 km range
- 300,000 €

Source: Frost & Sullivan

Finally we are getting there!

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