EV charging as the bottleneck for EV adoption: evaluating the current state of EV charging in Bangkok condominiums

21 July 2022

Knowledge Partner

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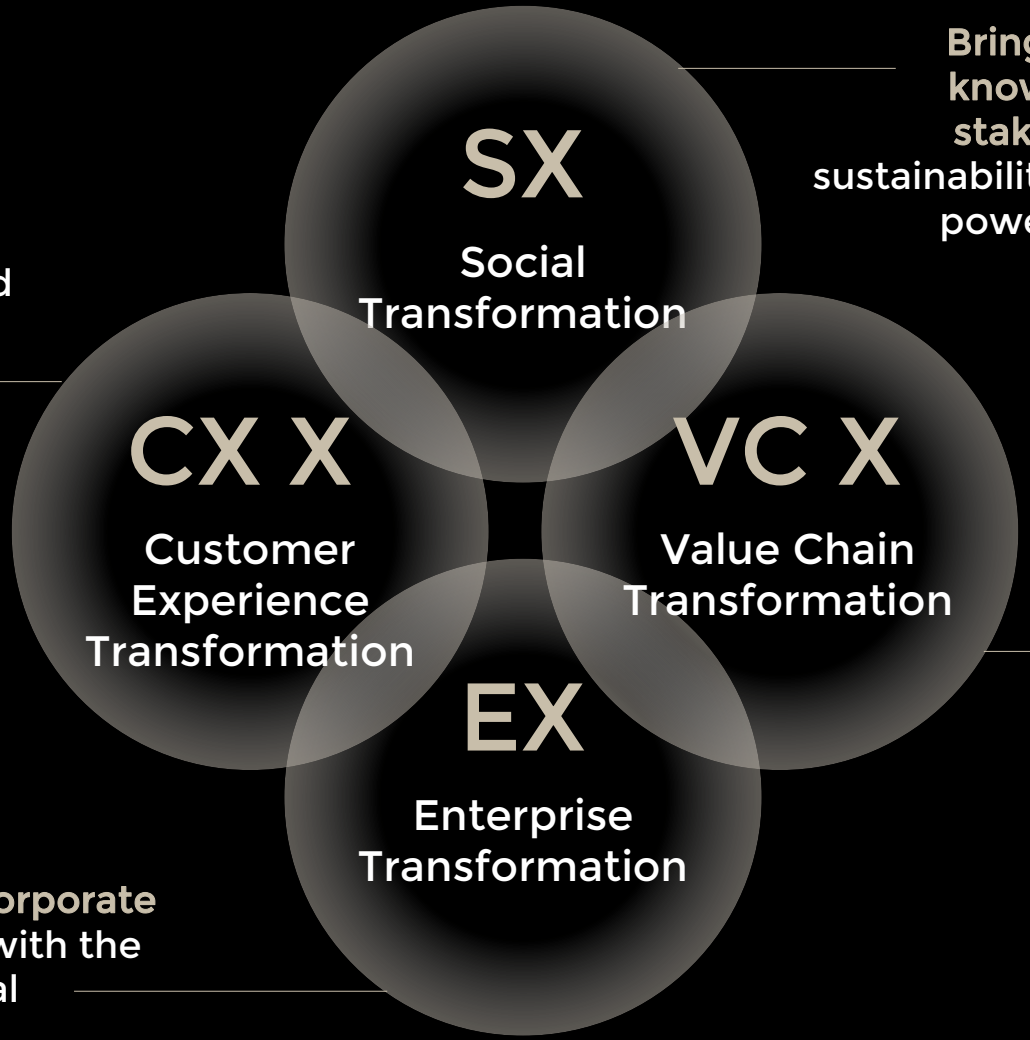
Build Beyond As One.

About ABeam Consulting



Bringing together the knowledge of various stakeholders to solve sustainability issues with the power of data-centric technologies

Providing new customer experiences and exceptional value created **with help of digital technology**

Using digital technology to create new business value by better understanding the business value chain and relationship across the industries, and accelerating co-creation amongst them

Expanding corporate capabilities with the help of digital technology

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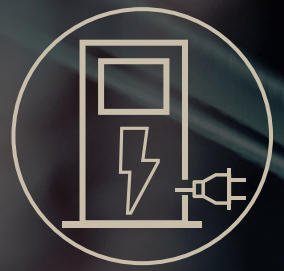
Agenda



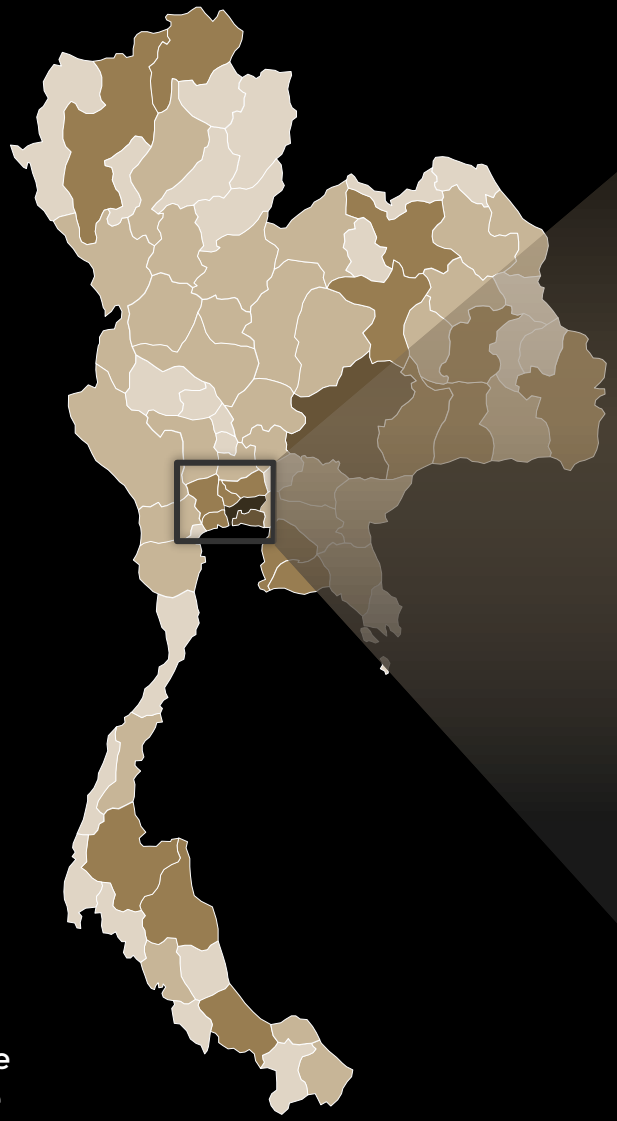
Why is convenient EV home charging experience at Bangkok condominiums crucial?

ABeam survey results:
What is the current state of EV charging infrastructure?

What next?
How do other countries drive the development of EV charging infrastructure?

1 Why is convenient EV home charging experience at Bangkok condominiums crucial?

Bangkok Metropolitan Region (BMR) is the economic center of Thailand

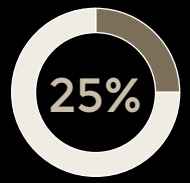


Province population

- > 3M people
- 2 – 3M people
- 1 – 2M people
- 0.5 – 1M people
- < 0.5 M people

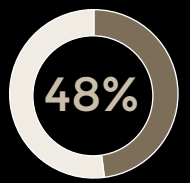
BANGKOK METROPOLITAN REGION

17.1M
Population (2020)



of Thailand

US$ 239Bn
GDP (2020)



of Thailand

US$ 14k
GDP per capita (2020)

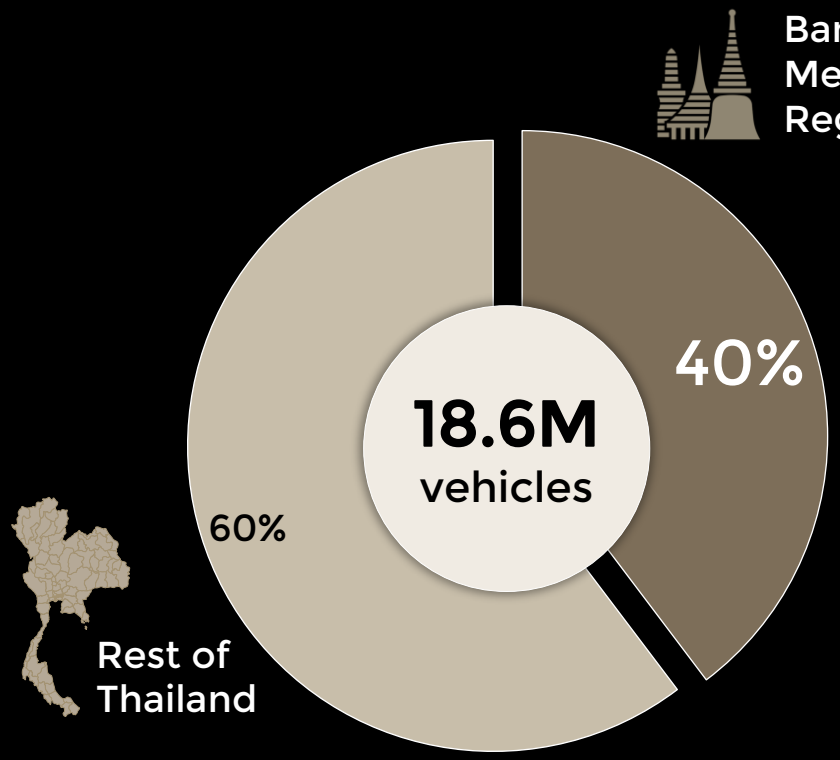
2.8 times

of the rest of Thailand (US$5k)

 Source: Office of the National Economic and Social Development Council (2020 Data)

Bangkok Metropolitan Region is also leading EV adoption in Thailand

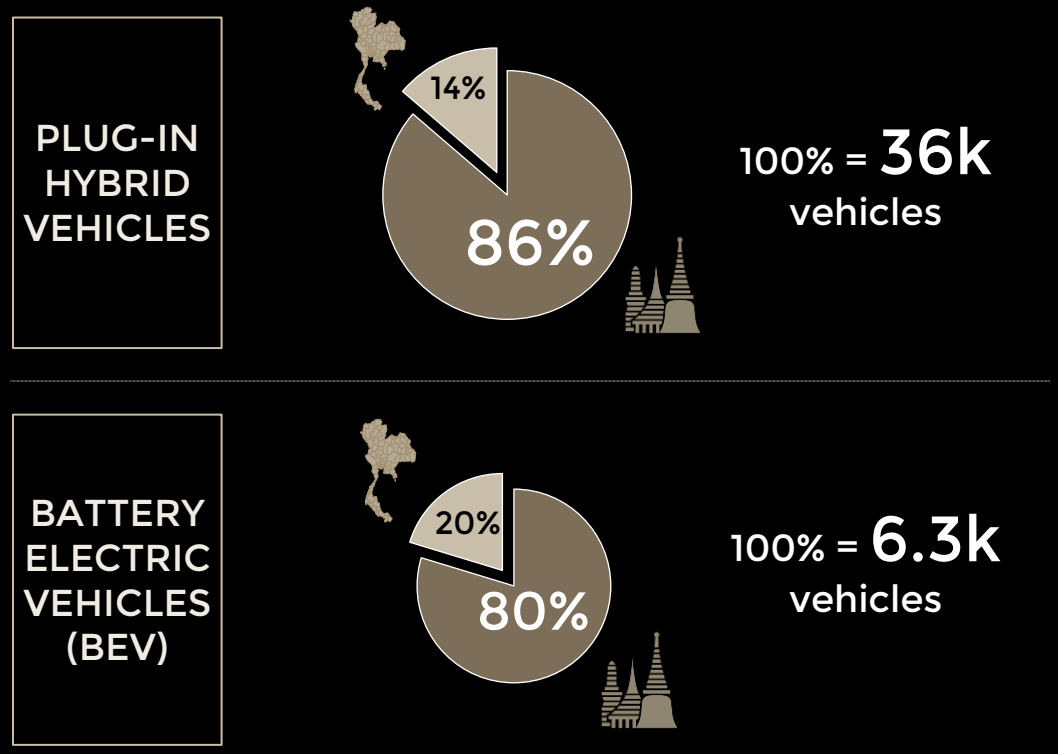
LIGHT VEHICLE REGISTRATIONS
May 2022



BMR accounts for 40% of all light vehicle registrations...

Bangkok Metropolitan Region[1] | Rest of Thailand

PLUG-IN EV REGISTRATIONS
May 2022



...but for >80% of plug-in EV registrations
(which altogether account for only 0.2% share in all registrations)

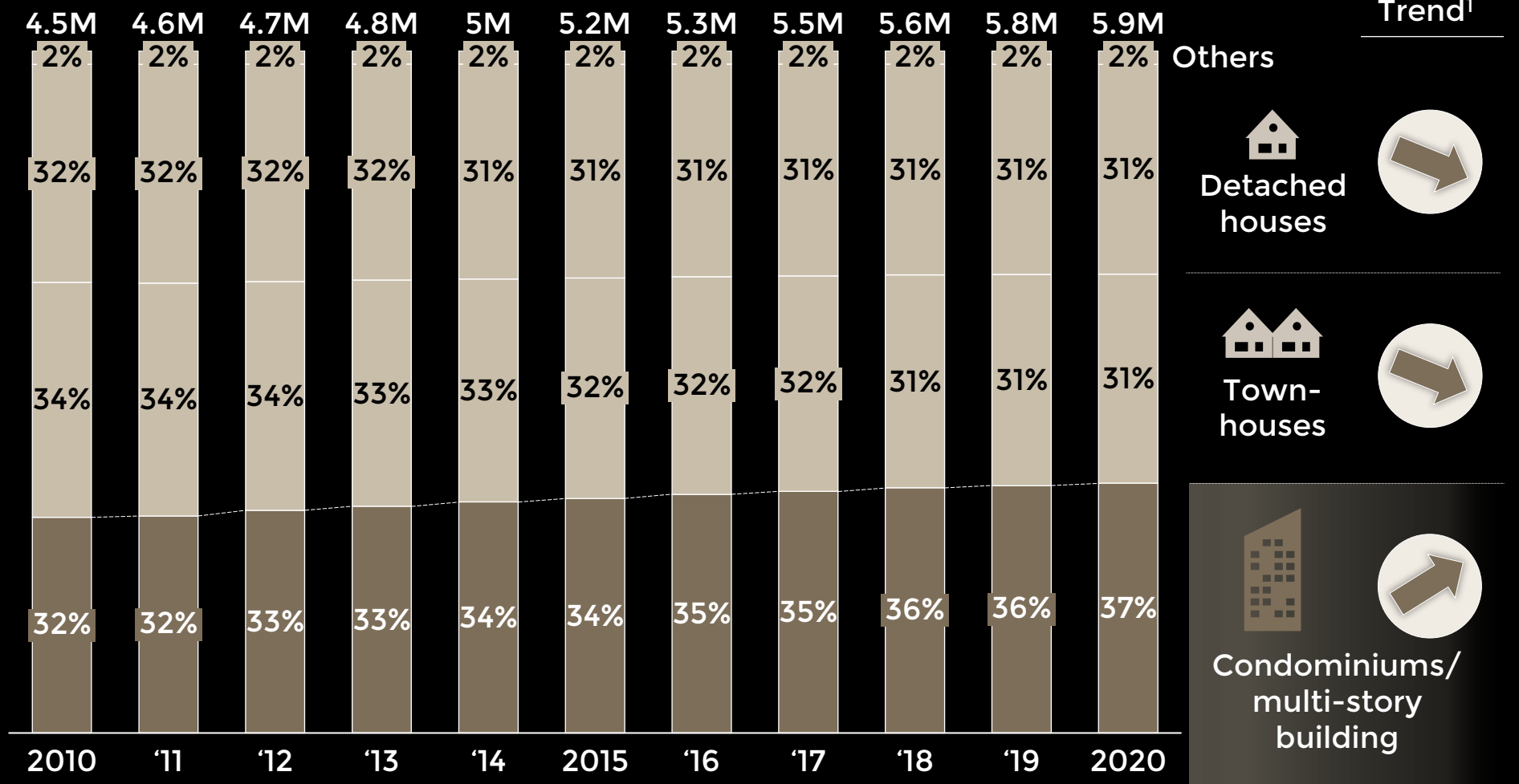
1 Bangkok Metropolitan Region is comprised of Bangkok metropolis, Nakhon Pathom, Pathum Thani, Nonthaburi, Samut Prakan and Samut Sakhon

 Source: Department of Land Transport

Condominiums account for more than a third of all housing units in BMR and their share is growing

Registered housing units in Bangkok Metropolitan Region by type

Percent of all housing units, Total in million units

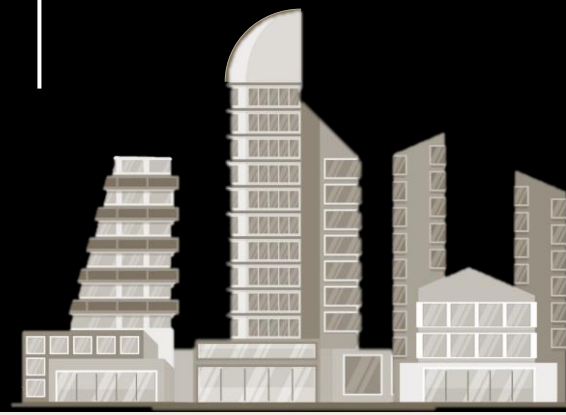


1 Trend in terms of the share in all housing units

Condominiums are the fastest growing housing type:

55%

of all newly registered units in BMR in 2015-2020 were condominium units



 Source: REIC, ABeam Consulting analysis

Concerns related to EV charging are a major roadblock in considering buying BEV

BEVs can charge overnight at home and rely on public infrastructure in special circumstances

In the USA and some European countries home charging accounts for

80%

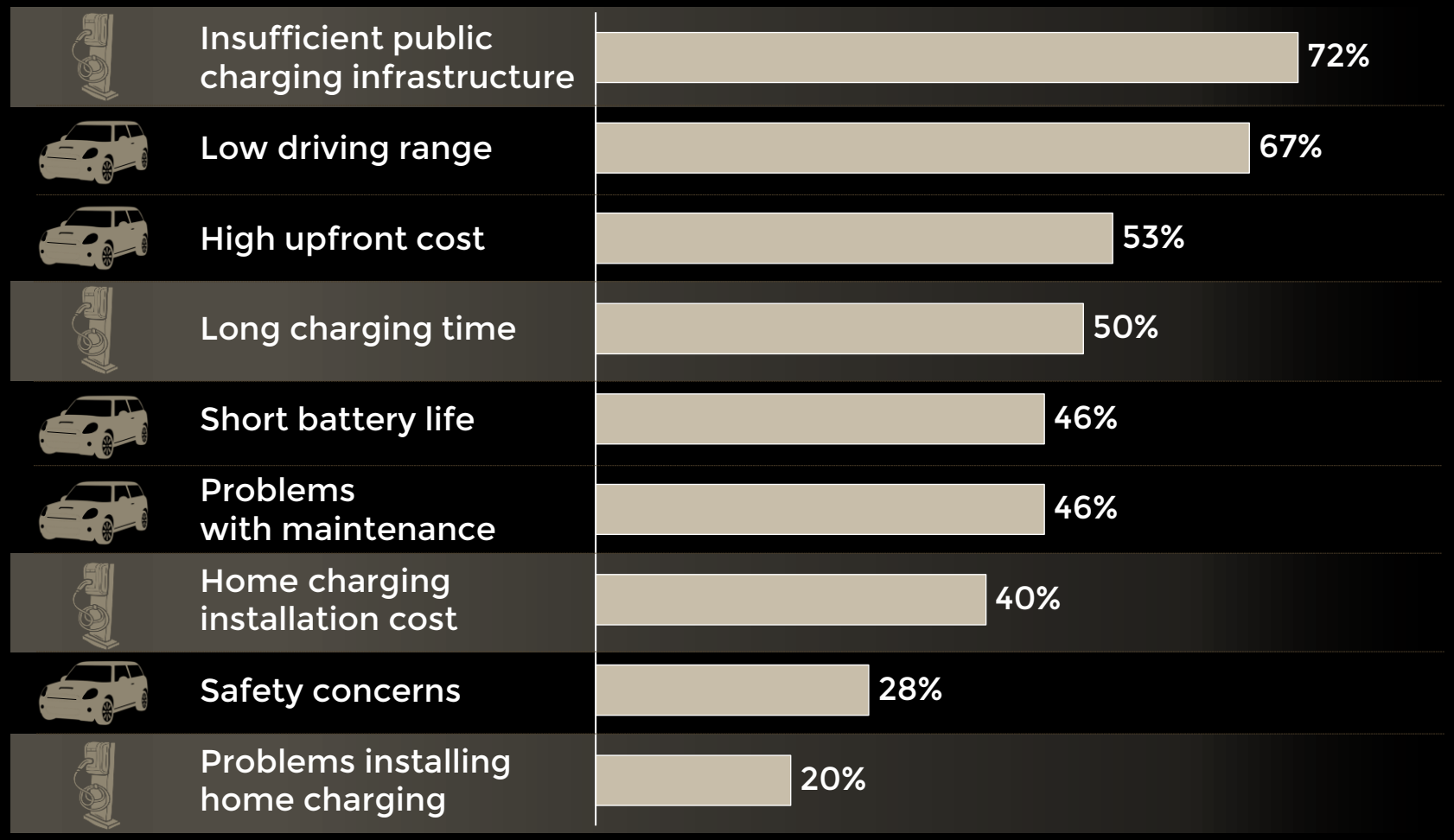
of all charging events of BEVs

RELATED TO BEV ATTRIBUTES

RELATED TO EV CHARGING

Key reasons against considering buying BEV in Thailand (August 2021)

Percent of all respondents, N = 400

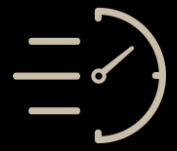


 Source: ABeam Consulting consumer survey from August 2021, ICCT

2 | ABeam survey results: What is the current state of EV charging infrastructure?

Context and key takeaways

Context



EV charging is constantly evolving and growing

Best-effort, bottom-up approach resulting in the most comprehensive study to date (publicly available)

Focus on completed condominium projects

Key takeaways

Inadequate EV charging infrastructure in Bangkok condominiums is a limiting factor in BEV adoption:

Only **~4%** of units have access to EV charging

In condominium projects with access to EV charging:

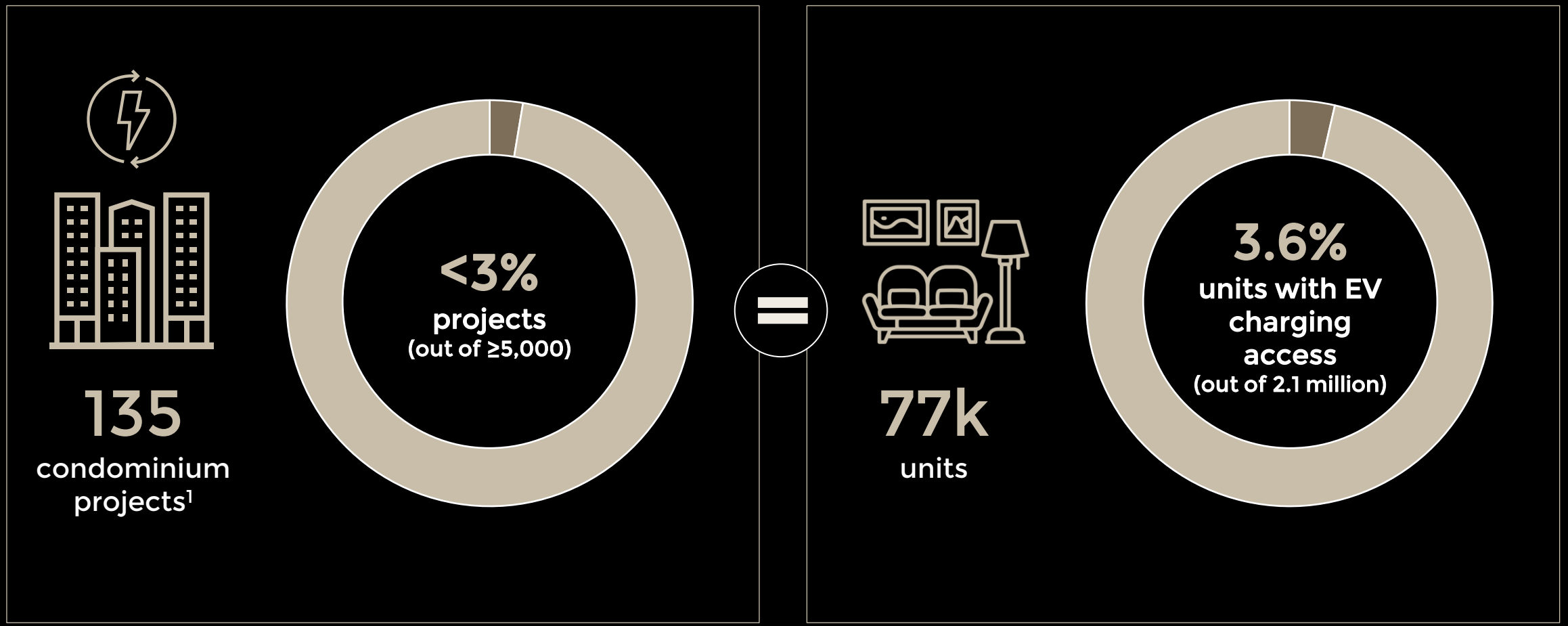
In **>80%** of projects, residents need to pay for charging at least 50% more than the electricity tariff

Currently, limited support for overnight charging

Source: ABeam Consulting research

Only a small share of condominium units have access to EV charging

Access to EV charging in multi-story residential buildings in Bangkok

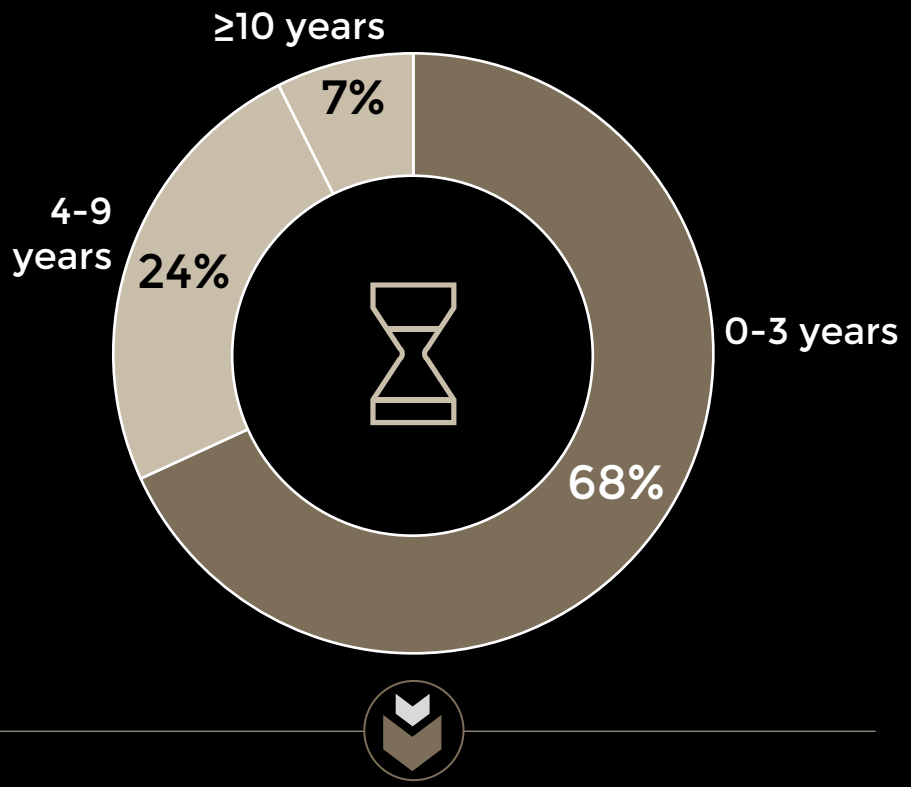


1 One project may include more than one building (tower)

 Source: ABeam Consulting research

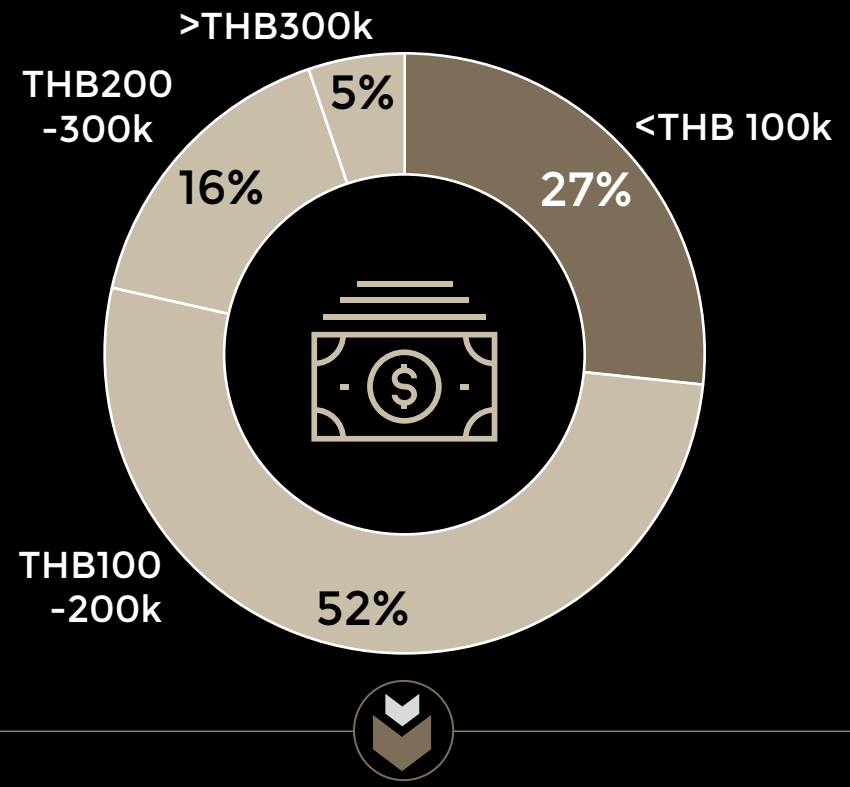
Most projects (buildings) with EV charging access were completed no more than 3 years ago; projects are quite diverse price-wise

Project age since end of construction
N = 135



Some older (≥10 years) buildings also have EV chargers

Avg. price per sqm when the project was new
N = 135



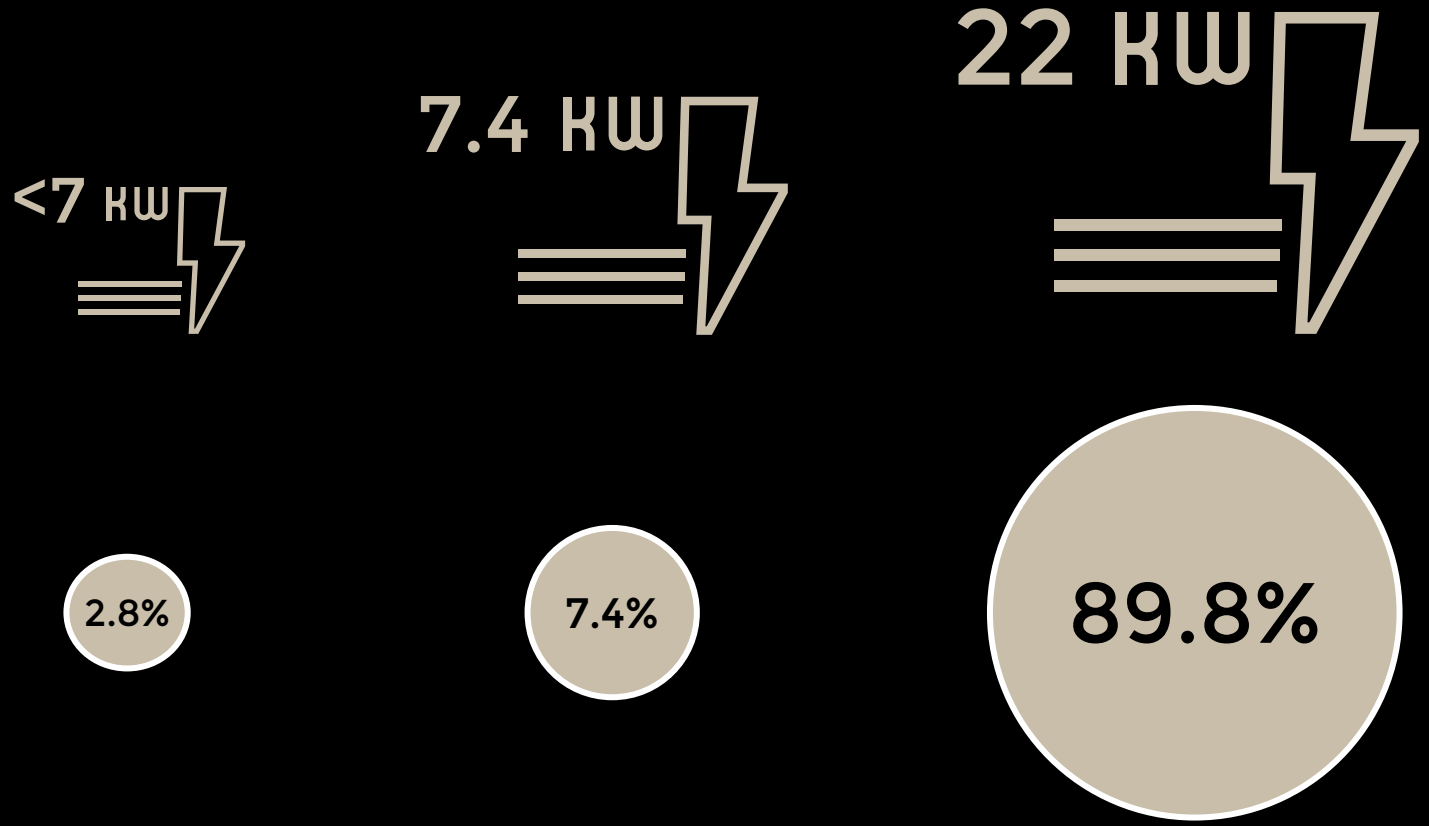
The residents of high-end condominiums are not the only ones with access to EV chargers; 27% of condominiums with an average square price below THB 100k have EV charging access

 Source: ABeam Consulting research

90% of condominiums are equipped with 22kW chargers whose potential is currently not fully realized due to BEV technology constraints

Distribution of EV chargers' speed (AC only)

N = 108



22 kW EV charger offers three times the power of 7.4 kW charger at 20% higher price

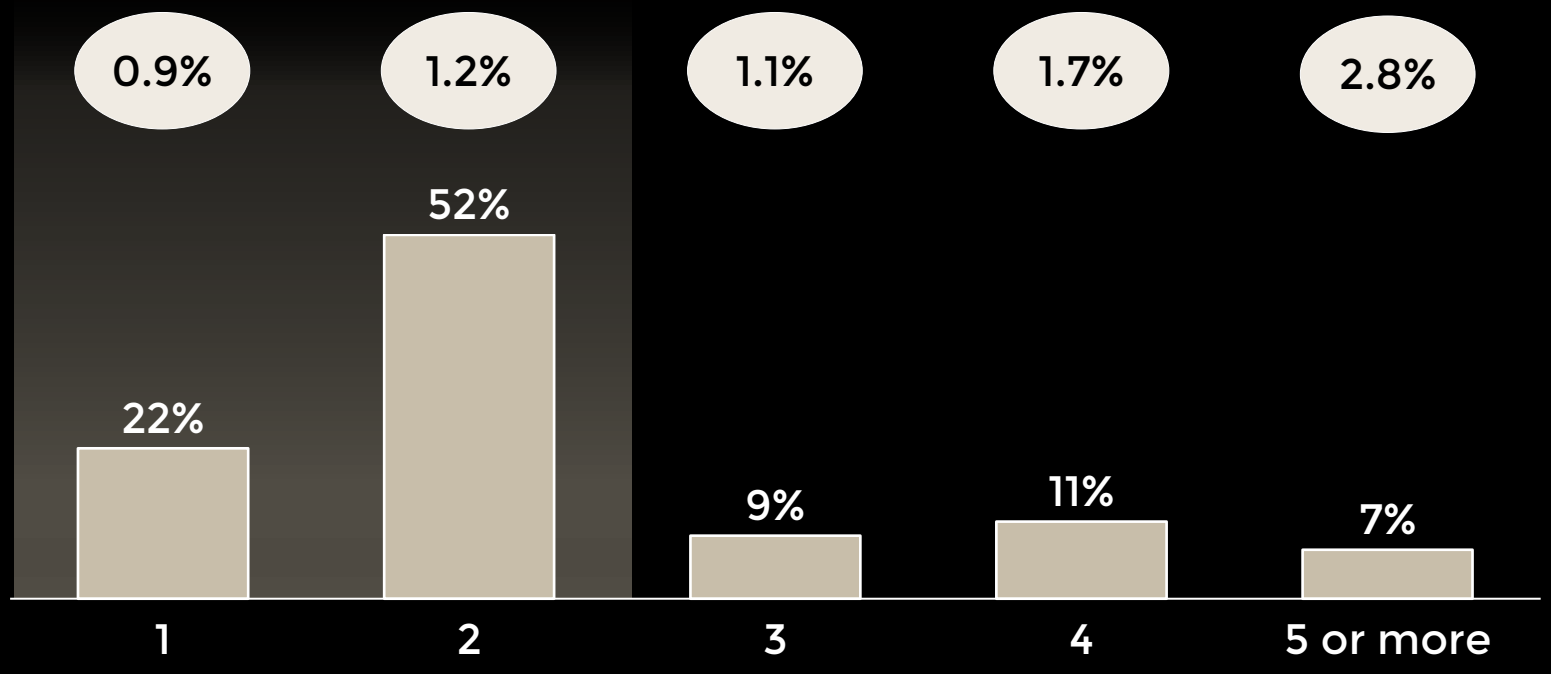
Yet, the majority of BEVs do not have onboard chargers supporting AC above 7kW

 Source: ABeam Consulting research

As many as 74% of condominiums can accommodate to charge only 1 or 2 plug-in electric vehicles at the same time

Distribution of the number of EV charging spaces (outlets)

N = 116



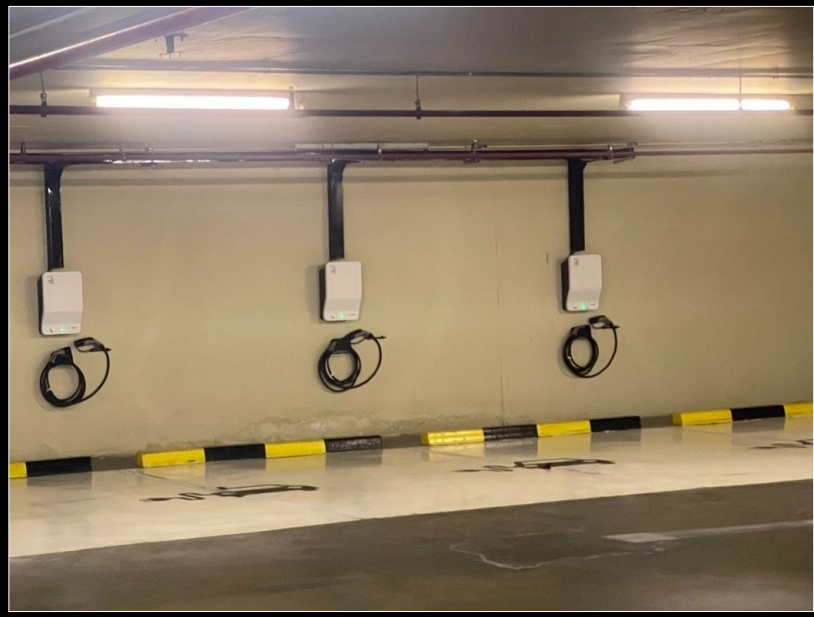
In total, there are ~400 spaces available to charge EVs[1]

In about 45% of condominiums, EV charging spaces account for less than 1% of available parking spaces

1 Considering all 135 condominium projects identified

x% AVG. PERCENT OF EV CHARGING SPACES IN TOTAL PARKING

Credit: PorbaanBaaCondo YT



 Source: ABeam Consulting research

Time-based pricing is the most common pricing model followed by paying for electricity consumed

Dominant pricing models in Bangkok condominiums

Unit: Percent, N = 121

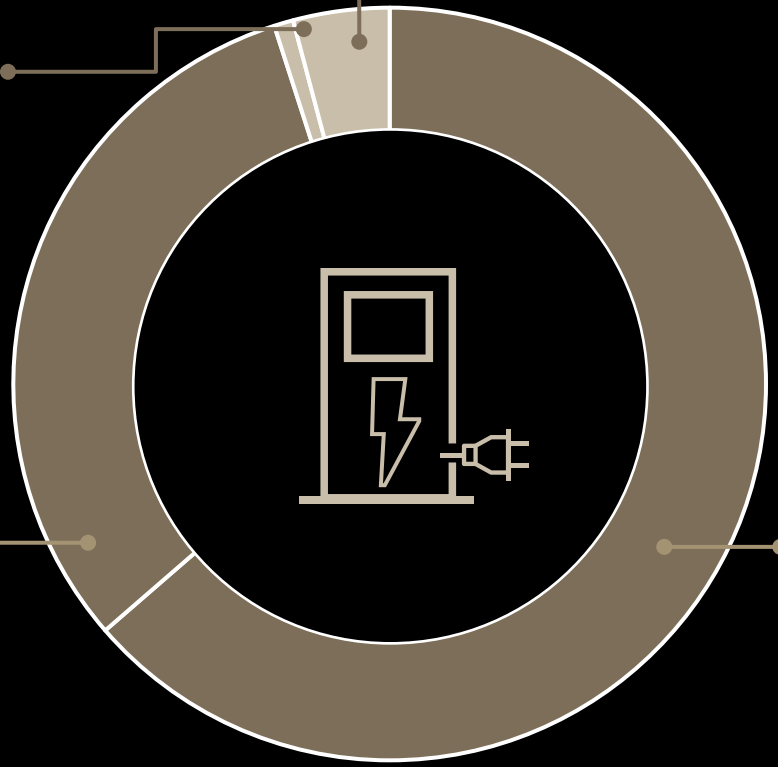
Detailed next

Per charging event: The price is fixed and is not dependent on time spent or electricity consumed

1%

4%

Free of charge



Per KWh: the price depends on how much electricity is consumed

31%

64%

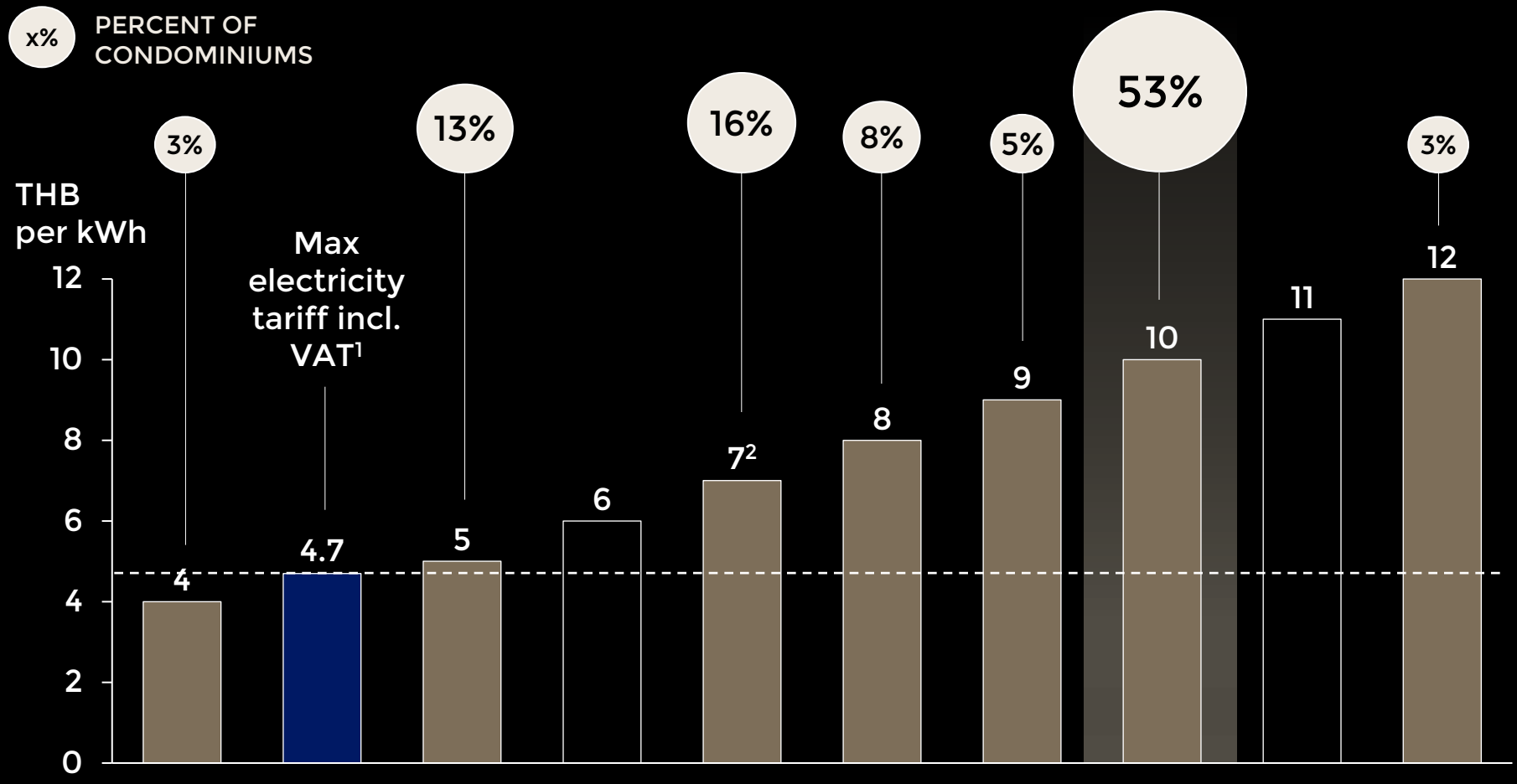
By hour: the price depends on how long a vehicle is charged

At many condominiums, there are penalties for keeping vehicles in the EV charging space without charging (no support for overnight charging)

Source: ABeam Consulting research

Price per kWh model: In over 50% of condominiums, residents need to pay more than twice the highest electricity tariff

Distribution of prices among Bangkok condominiums
N = 38



BEVs become no cheaper to charge at between THB 10/kWh (when compared with fuel-efficient ICE cars, esp. hybrids) and THB 15/kWh[3]

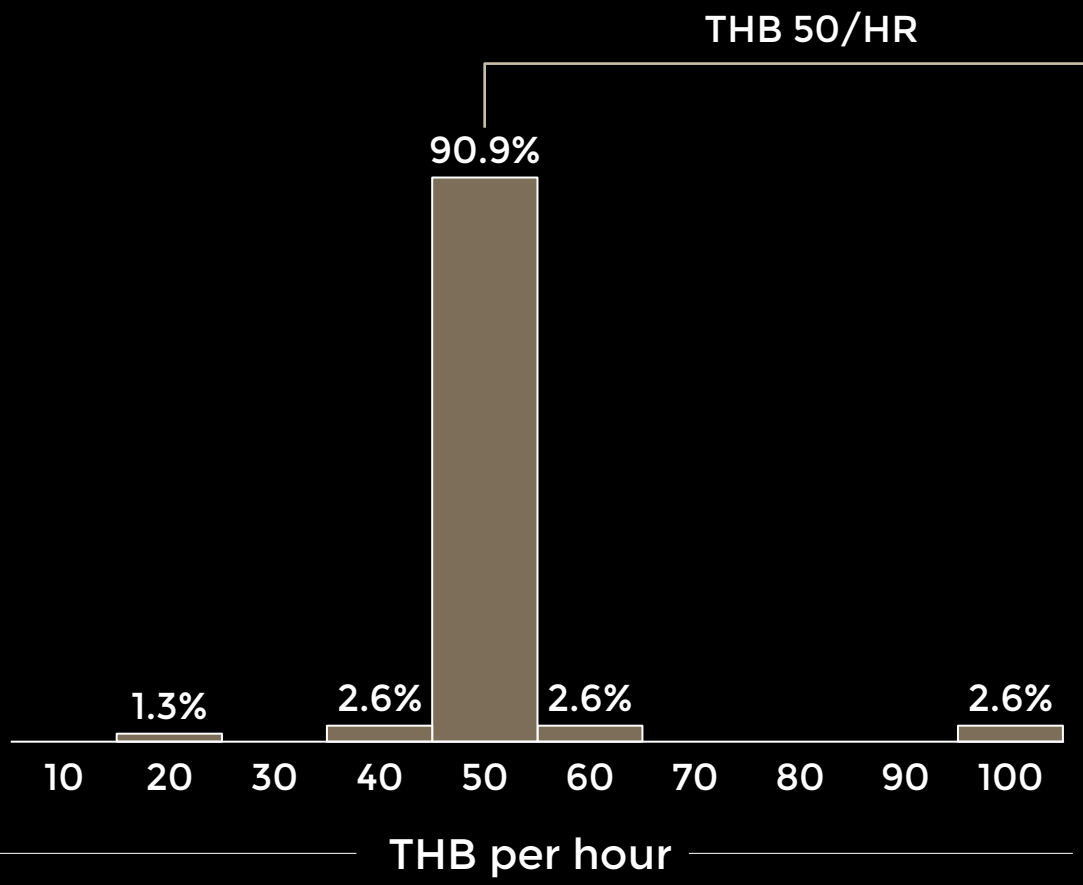
1 For residential customers, based on tariffs from the Metropolitan Electricity Authority
2 Incl. one condominium charging THB 7.5 per kWh
3 Assuming fuel price of THB 27 per litre (based on average E20 fuel retail price from Jan 2020 until July 2022)

Source: ABeam Consulting research, MEA, Bangchak

Price per hour model: In 91% condominiums, the charging price is THB 50 per hour which translates into ~THB 8 per kWh for the most common BEV

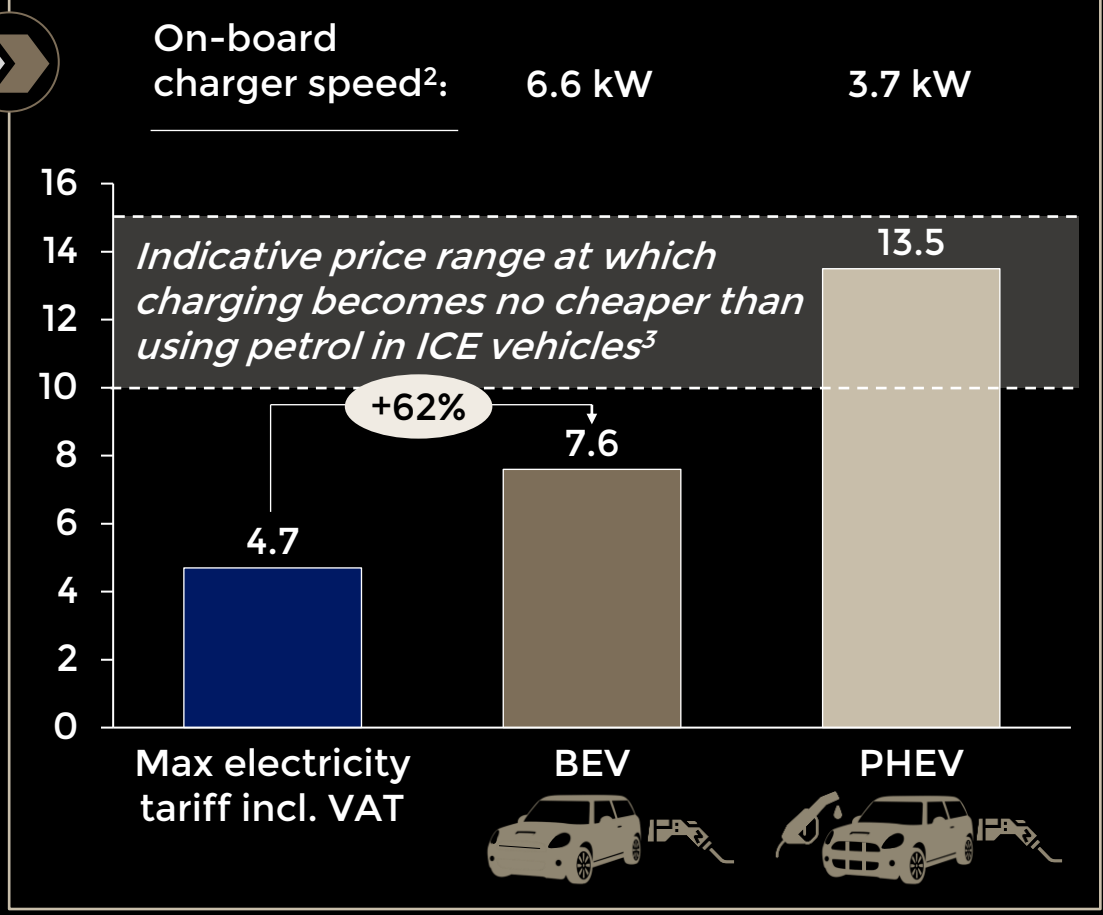
Price per hour distribution

N = 77, First hour of charging[1]



Indicative price per kWh by powertrain

THB, Based on THB 50 per hour rate (AC charging)

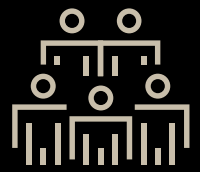


1 Some condominiums offer lower rates for subsequent hours
2 Considering the most popular BEV and PHEV models currently available for sale in Thailand
3 Assuming fuel price of THB 27 per litre (based on average E20 fuel retail price from Jan 2020 until July 2022)

Source: ABeam Consulting research

Key factors limiting EV charging infrastructure in condominiums

Process



The decision to install EV charger(s) requires approval from the Condominium Corporate Committee, the Juristic Person and more than 50% of unit owners

Key limiting factors

Cost considerations

In older buildings in particular, the cost of preparing enough electricity supply, installing meters, EV chargers, etc. can be high

'Chicken-and-egg problem'

Juristic offices in some buildings seem open to investing in EV charging infrastructure but only until there are residents with EVs

Limited parking

The current predominant mindset is that EVs should charge and then move to another parking space which in some buildings creates constraints on parking supply

 Source: ABeam Consulting research

3 What next? How do other countries drive the development of EV charging infrastructure?

Case example: Singapore is targeting to improve the infrastructure in both old and new buildings

Overview of selected EV charging regulations related to multi-story residential buildings

Singapore | China

Existing HDB[1] flats

Eight HBD towns (c. 20% of the country population) with 3-12 EV charging outlets per building by 2025 (expecting up to 12,000 EV charging outlets), and all HBD towns by 2030

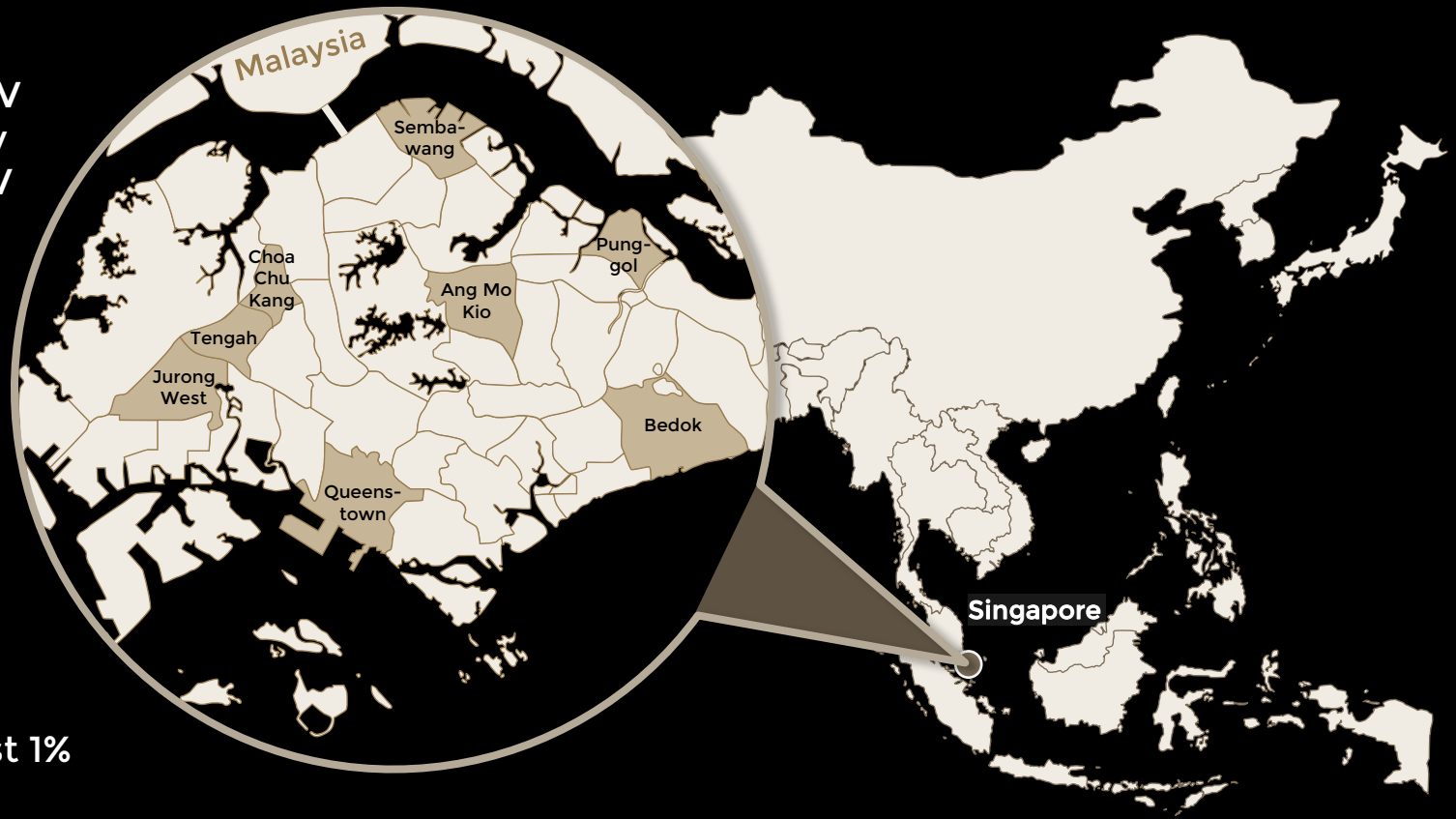
EV common charger grant

Up to 50% funding (up to S$4k) until 2023 for smart chargers

Proposed law

New residential buildings

Enough electrical capacity to support 15% of parking spaces with 7.4kW charging and at least 1% of parking places equipped with EV chargers



1 Housing and Development Board – Singapore's public housing authority

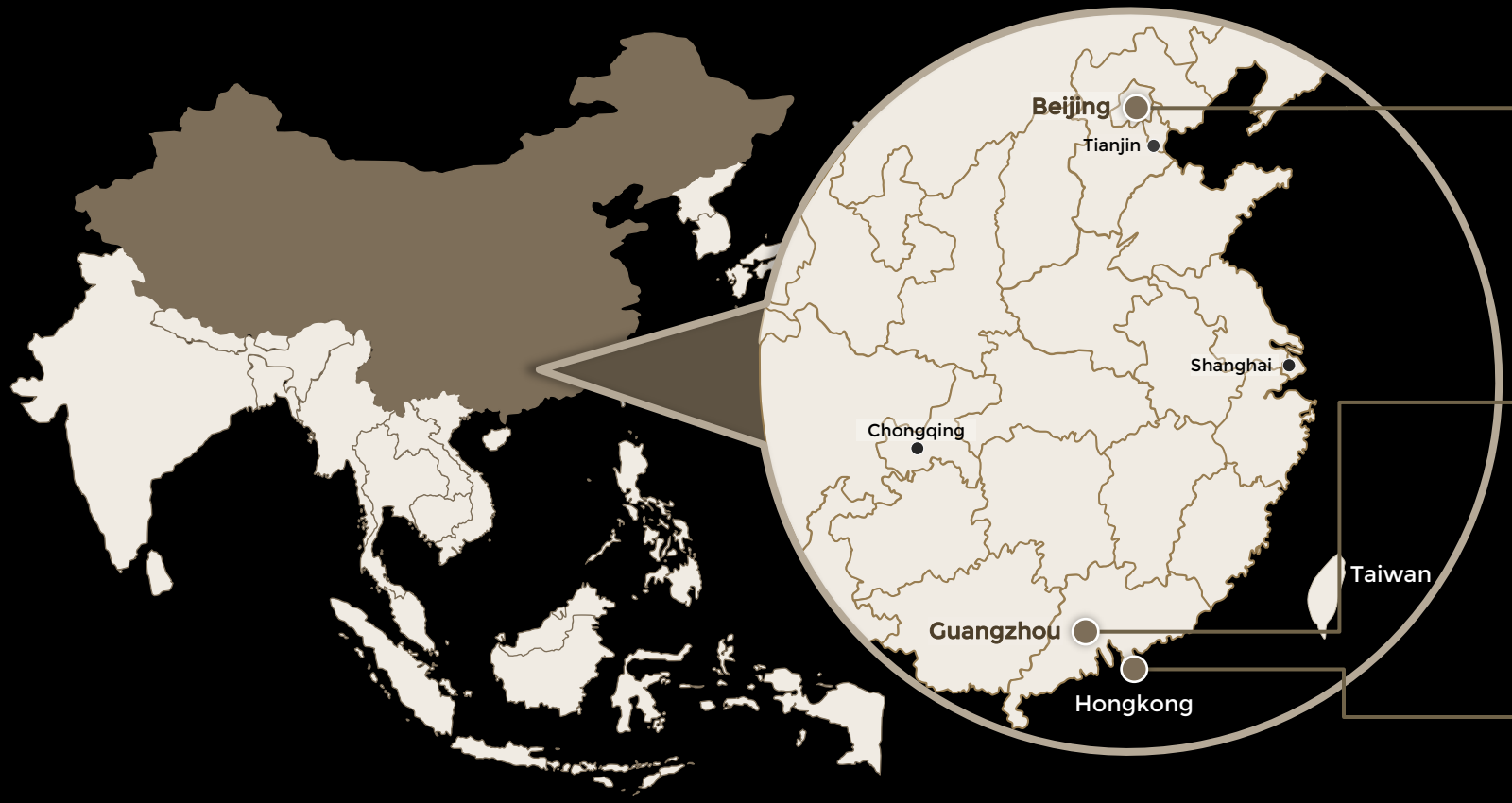
Source: Land Transportation Authority, Press

Case example: Some cities in mainland China introduced new building laws few years ago while HK is now supporting an extensive upgrade of existing buildings

Overview of selected EV charging regulations related to multi-story residential buildings

Singapore

China



Beijing
Since 2017, all new residential buildings must have all parking spaces enabled for the installation of EV chargers

Guangzhou
Since 2014, all new residential buildings must have 18% of parking spaces equipped with an EV charger or enabled for future installation

Hongkong
Up to US$4k per parking space to support the installation of EV charging-enabling infrastructure for 140,000 parking spaces by 2028 (total cost US$450M)

 Source: IEA, Press

Recommendations

Impact short-term

Existing buildings

More support in preparing appropriate electrical infrastructure in the city, buildings and in installing EV chargers

Public charging

More support from auto OEMs in the development of the public charging infrastructure in the city (with free or low-priced charging)

Impact long-term

New buildings

Regulations to require new buildings to install EV chargers and have appropriate electrical infrastructure with a 10 or 20-year horizon in mind

 Source: ABeam Consulting analysis

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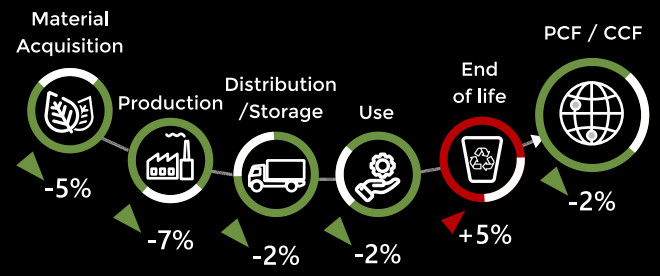

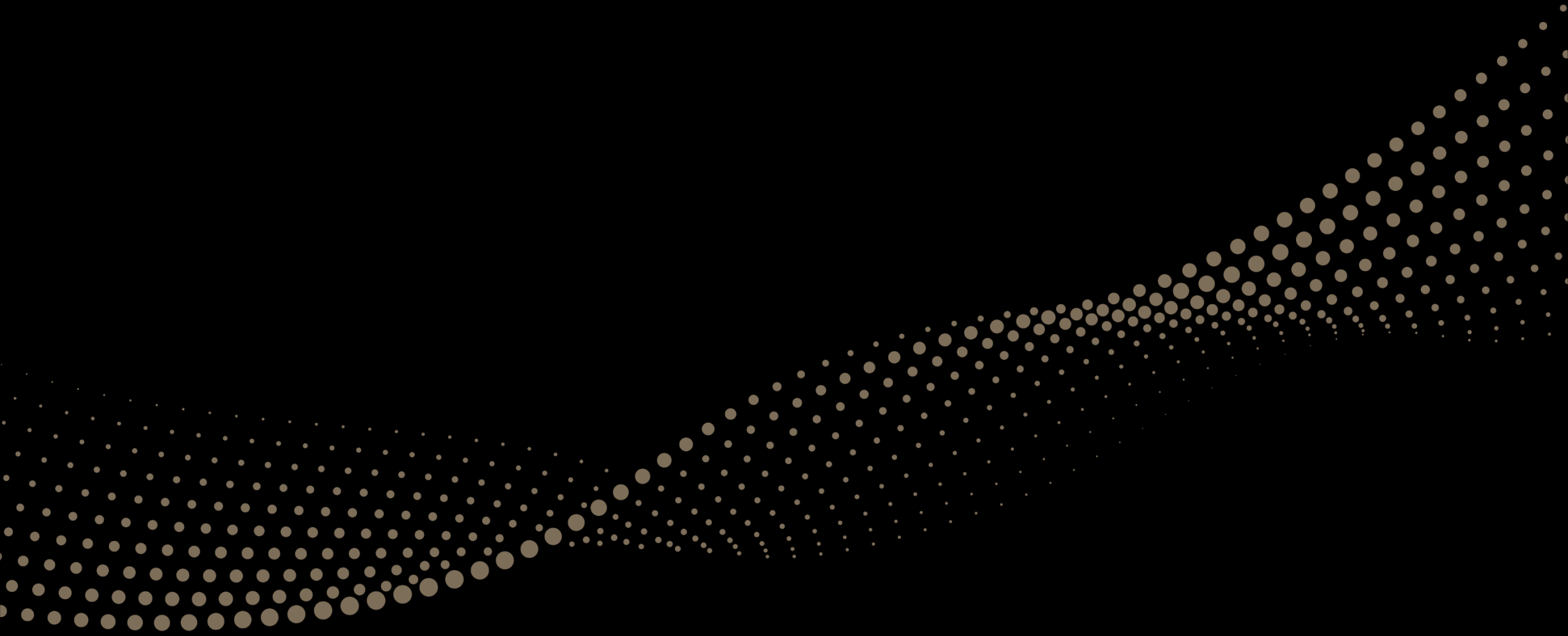

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