



Special Session on V2X Visions

EV4EU – V2X scenarios and vision

Hugo Morais

2023 / 06 / 08

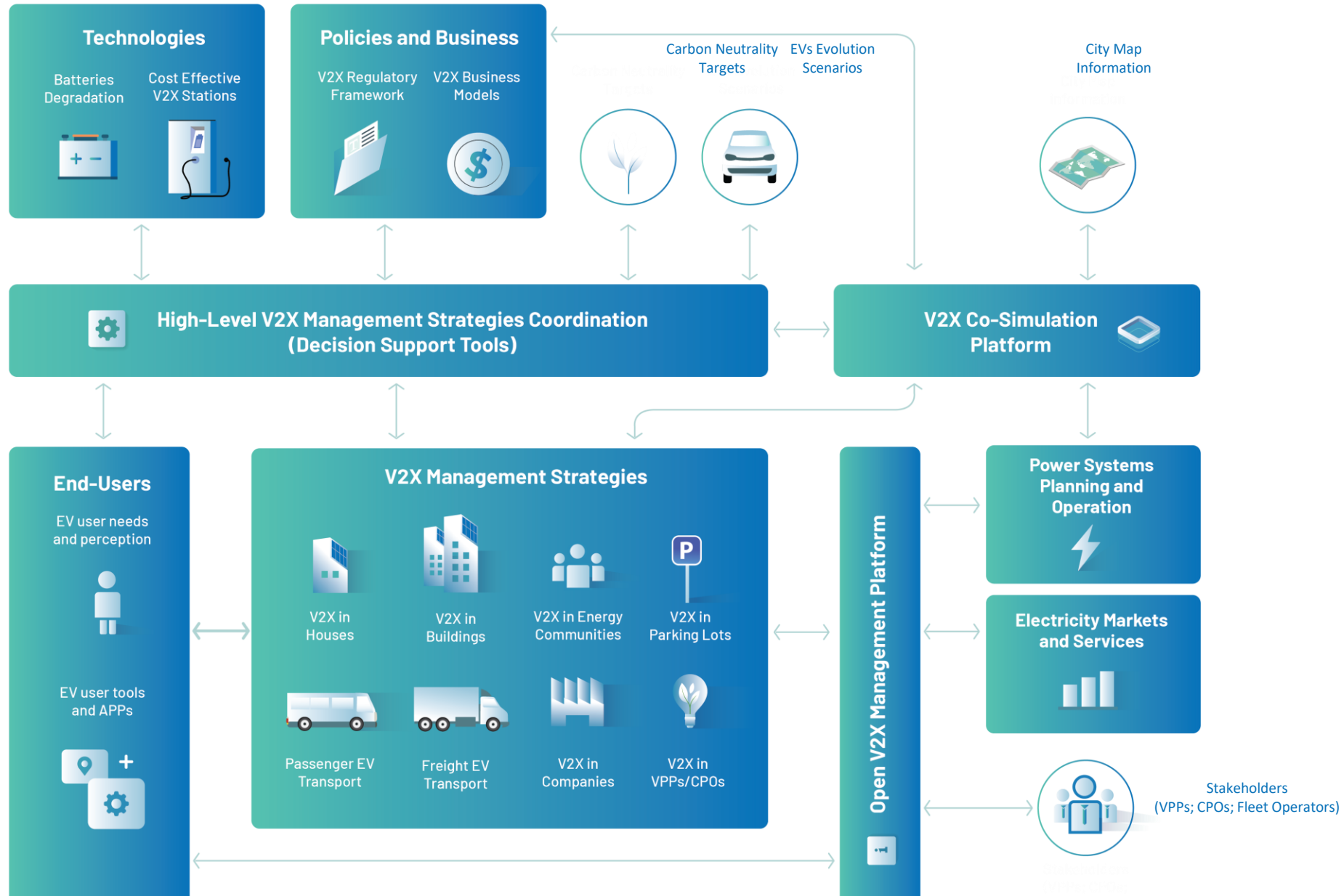
hugo.morais@tecnico.ulisboa.pt



EV4EU – Consortium

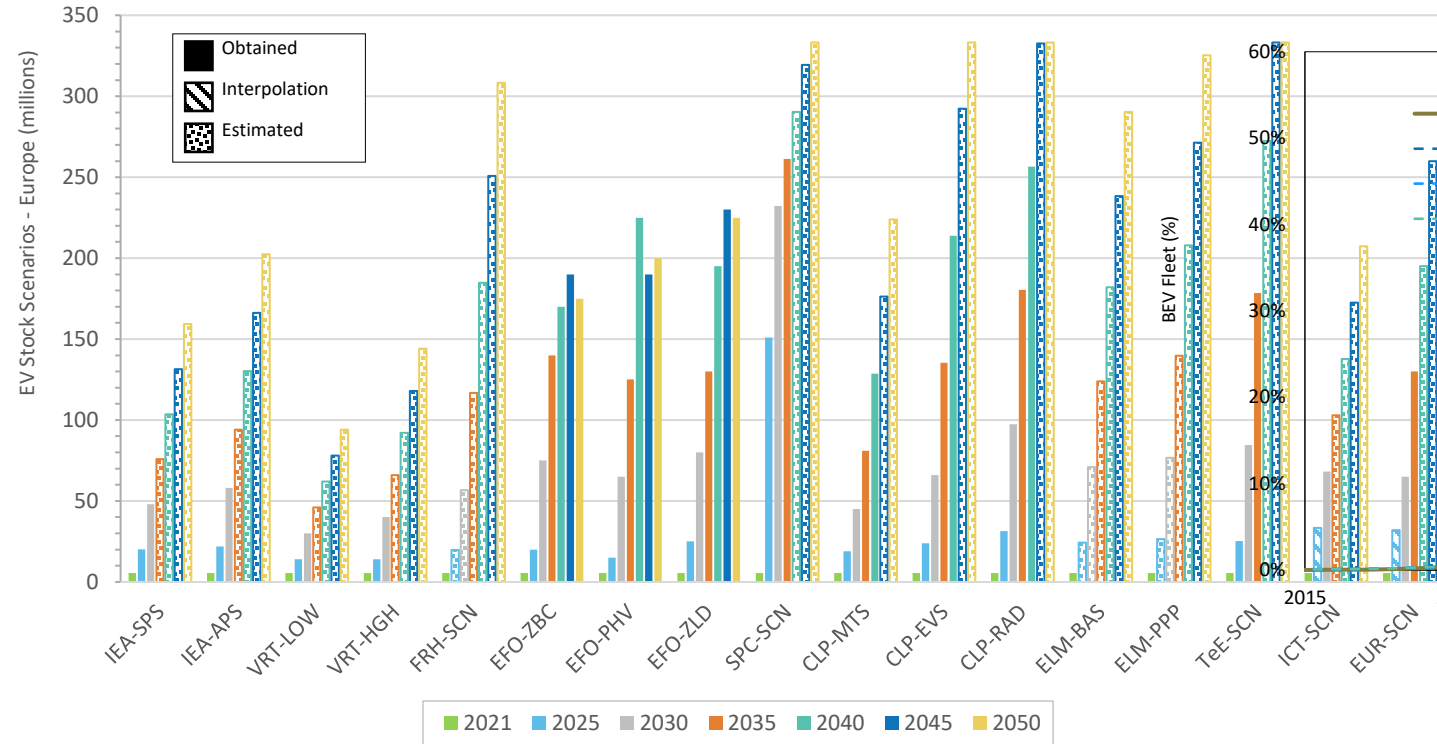


EV4EU – Concept

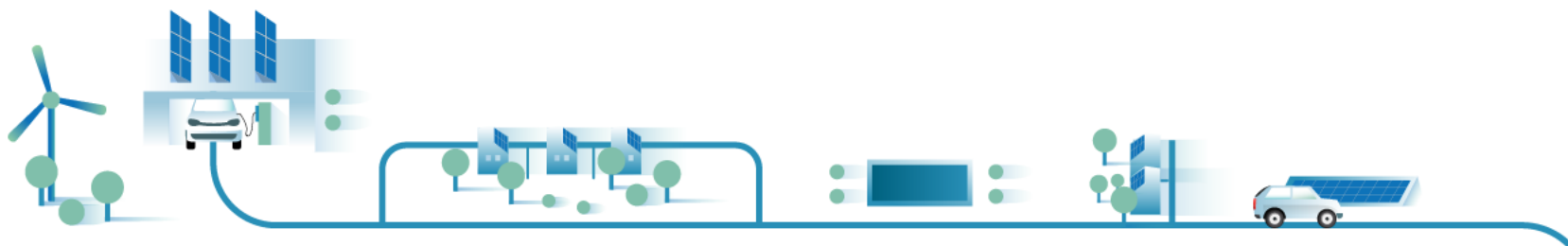
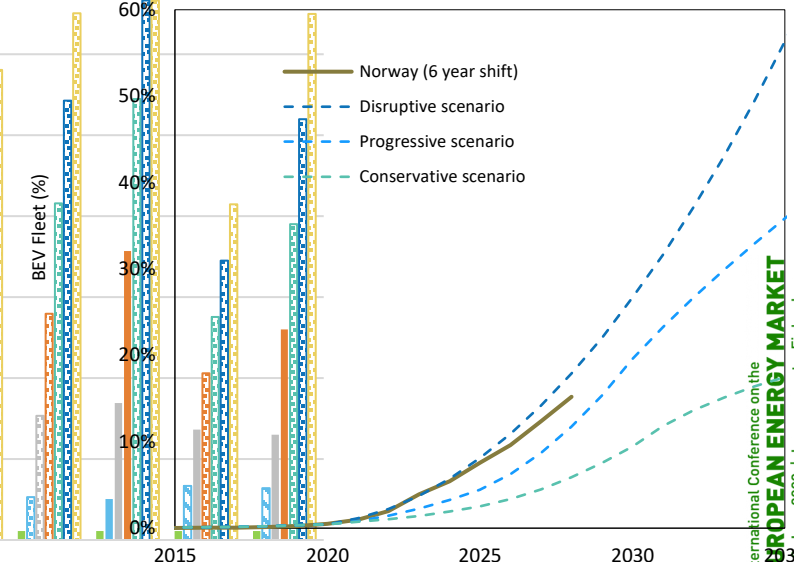


EV4EU – EVs Evolution Scenarios

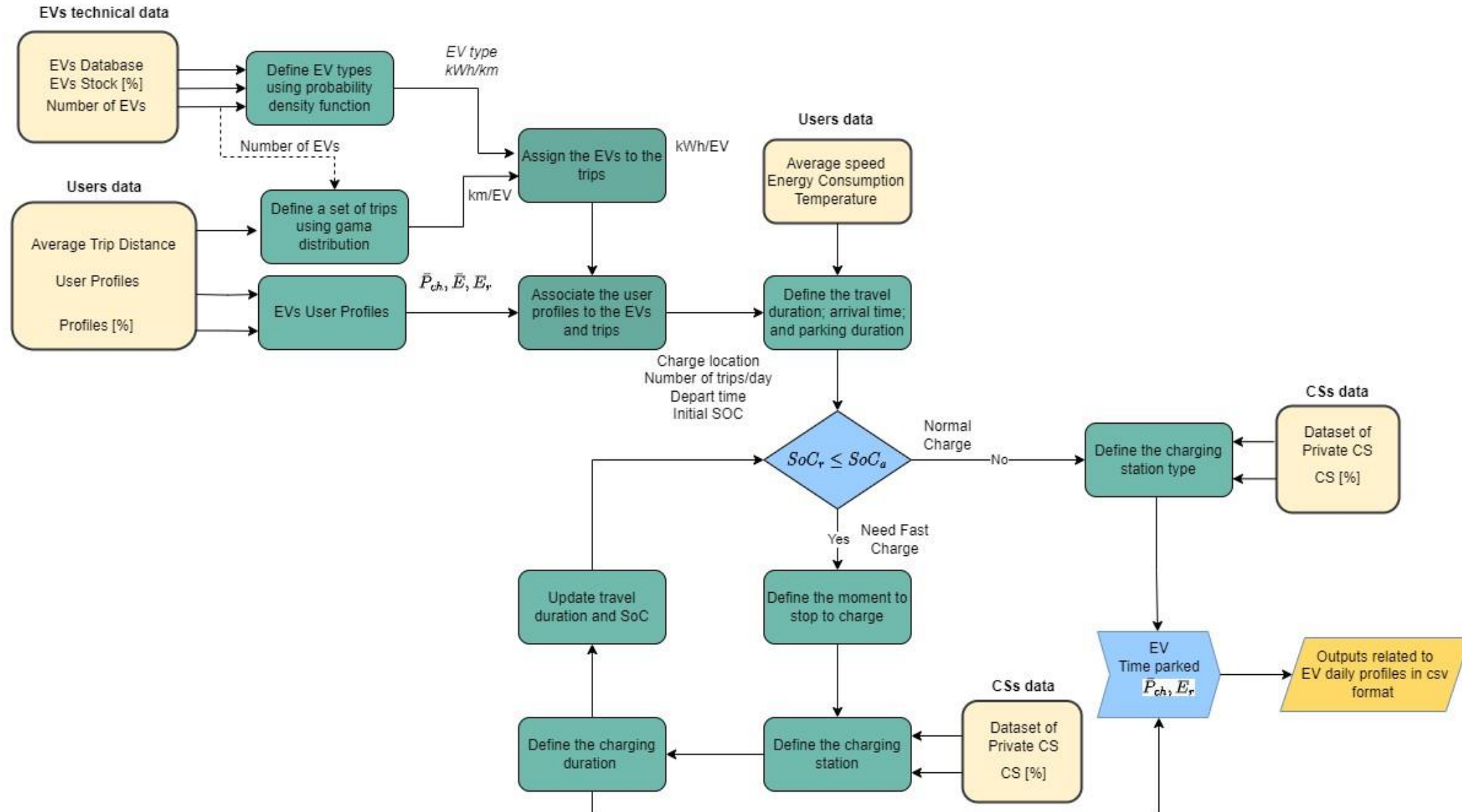
EV Scenarios in Europe



EV Scenarios in Portugal

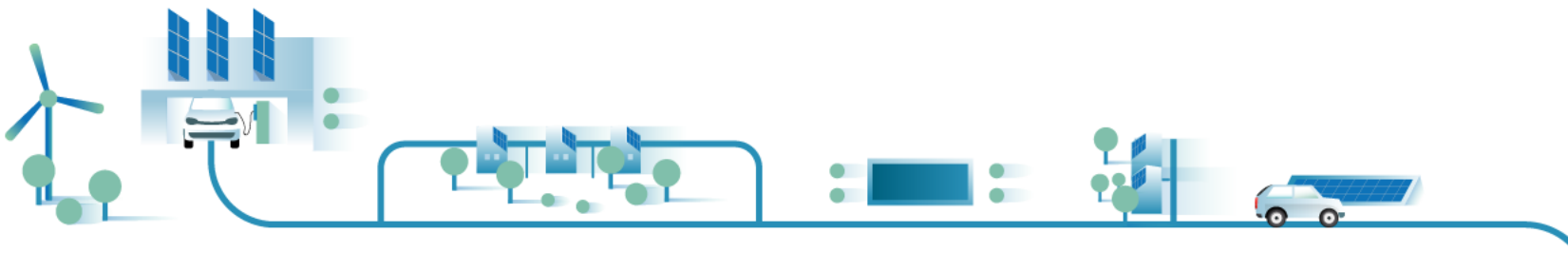
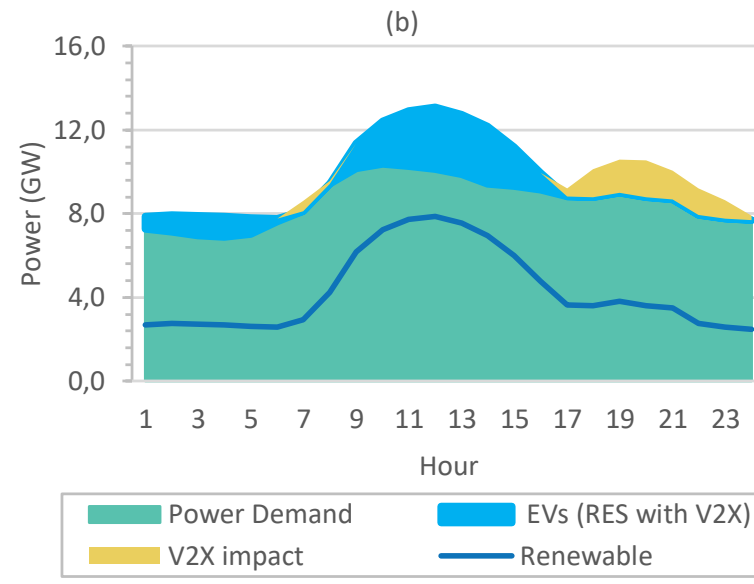
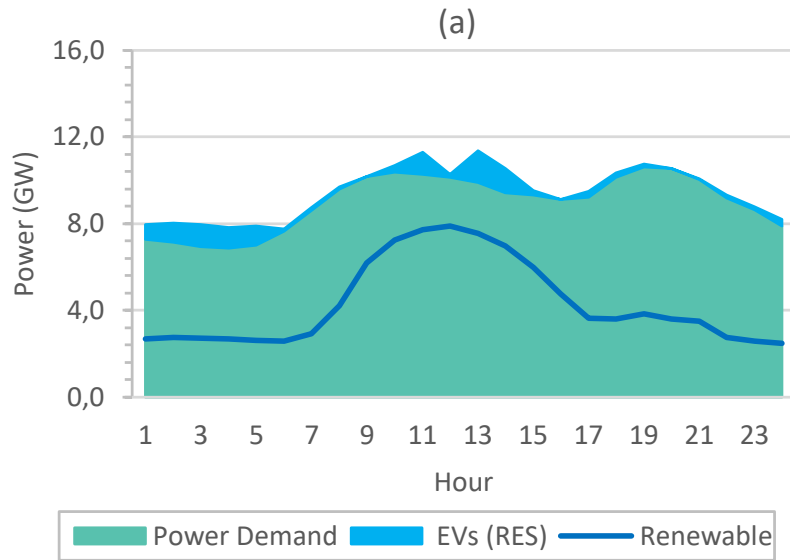


EV4EU – EVs Impact in Energy Systems



EV4EU – EVs Impact in Energy Systems

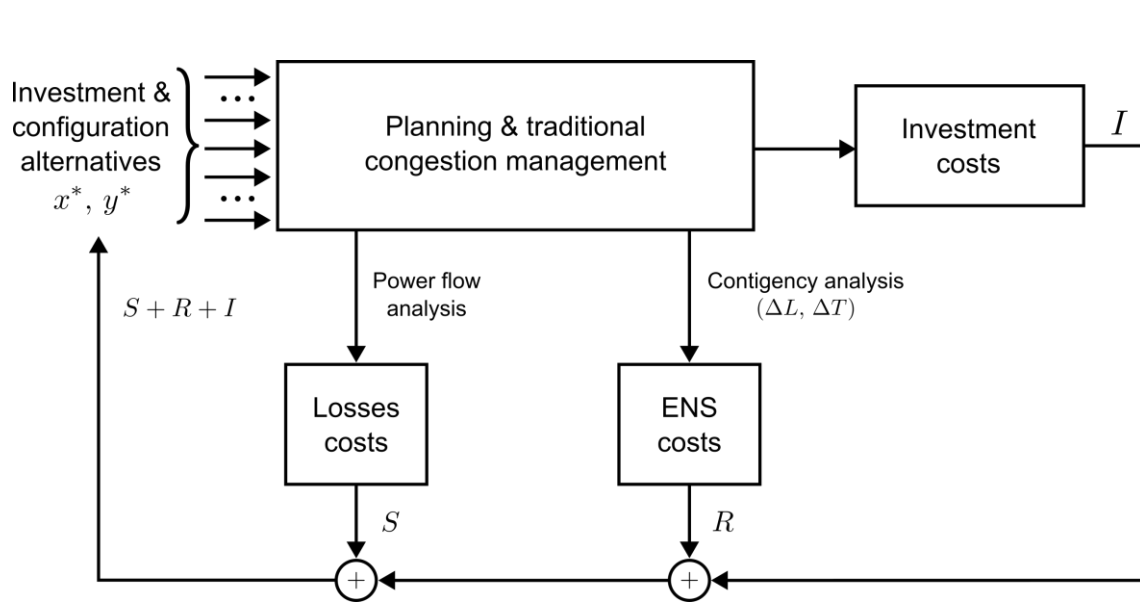
Impact of EV/RES coordination on Power System 2050



EV4EU – Modeling EVs flexibility in distribution system planning

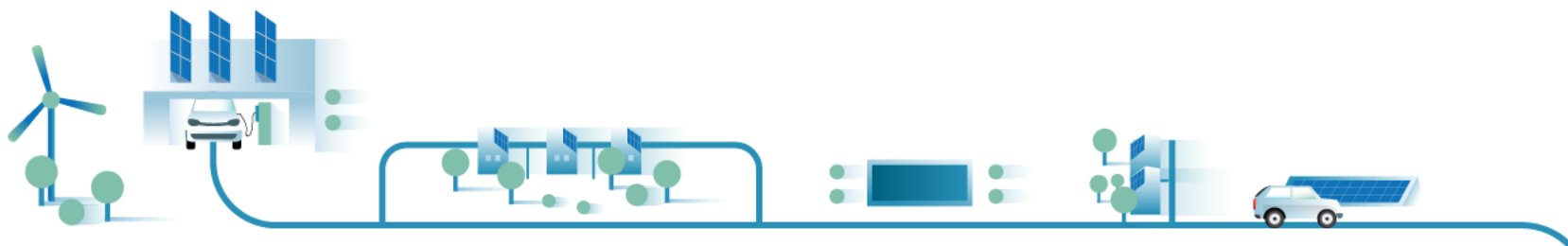
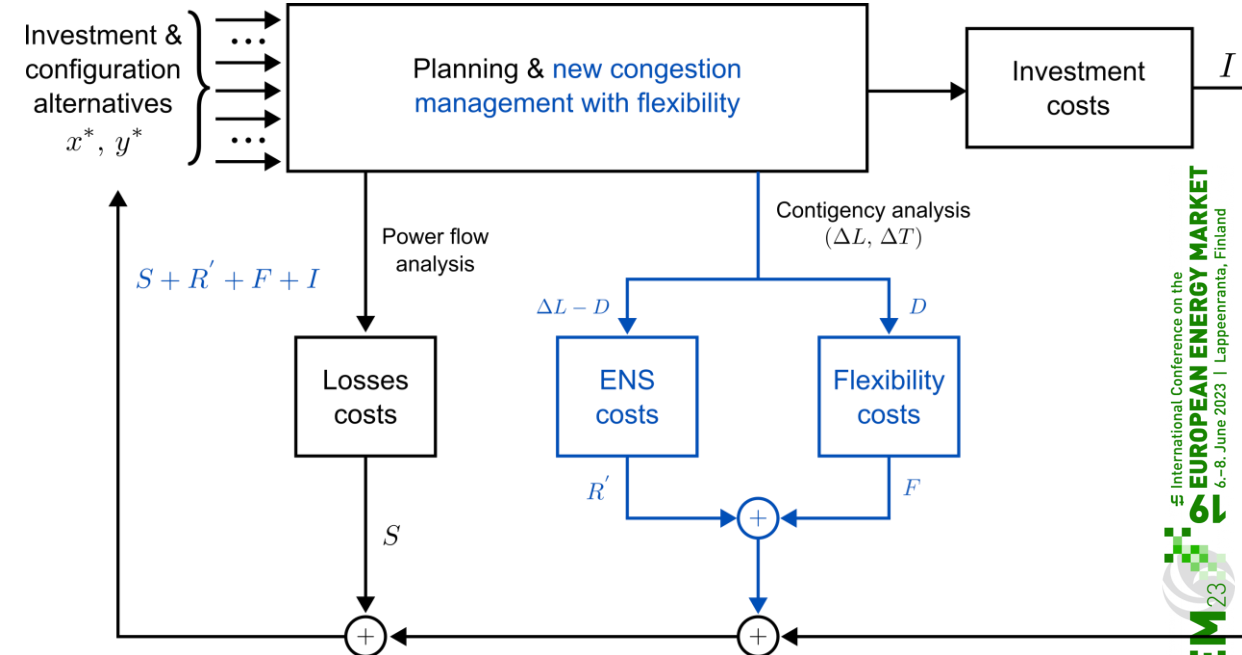
OPTION 1

Low Flexibility Availability

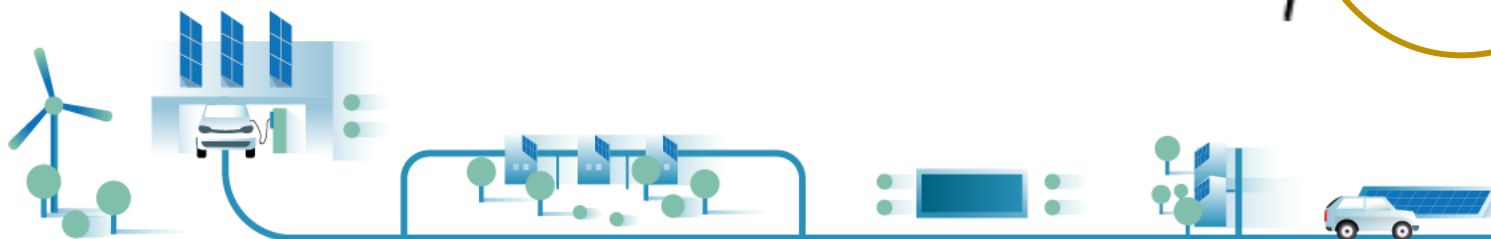
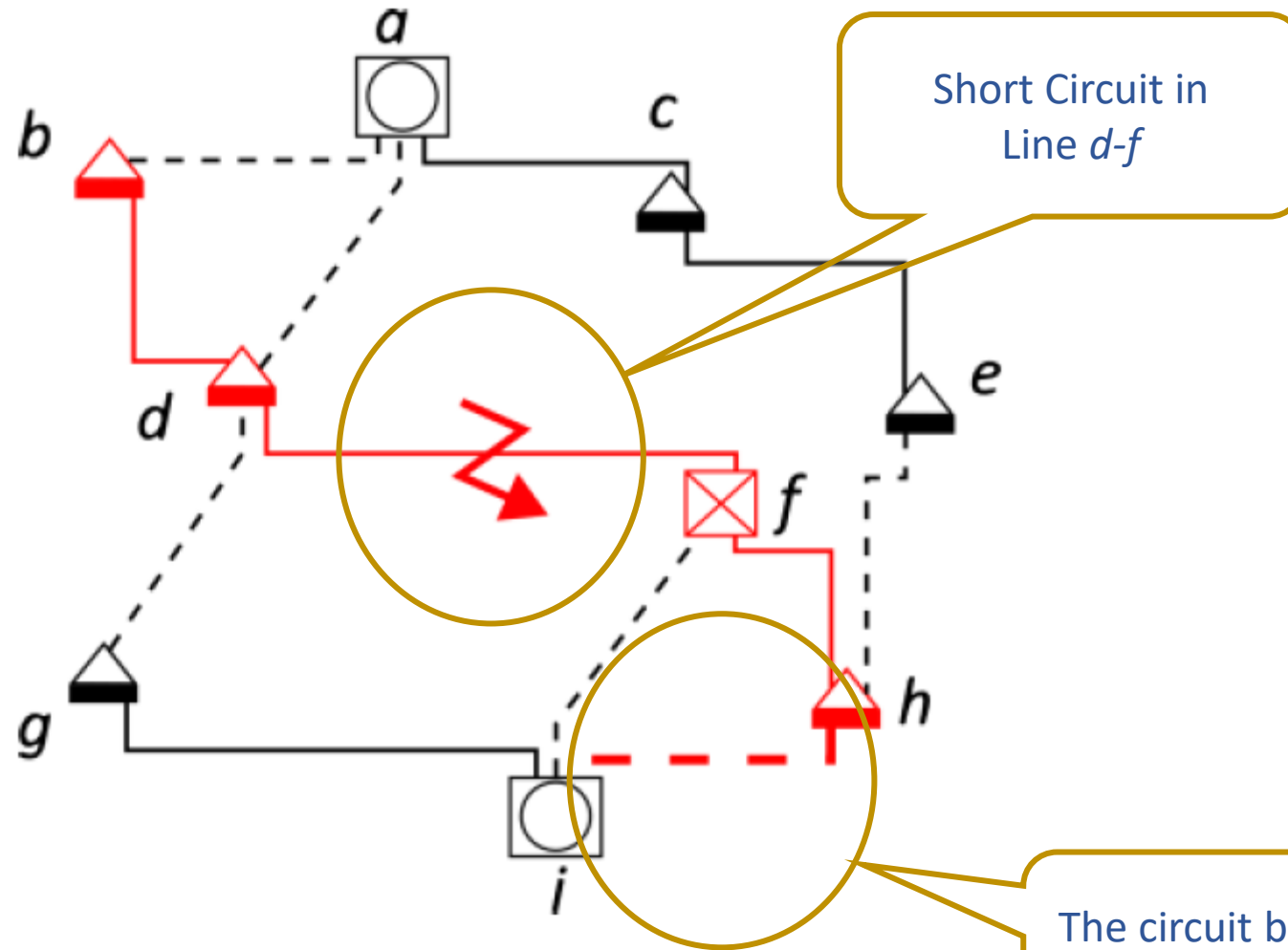


OPTION 2

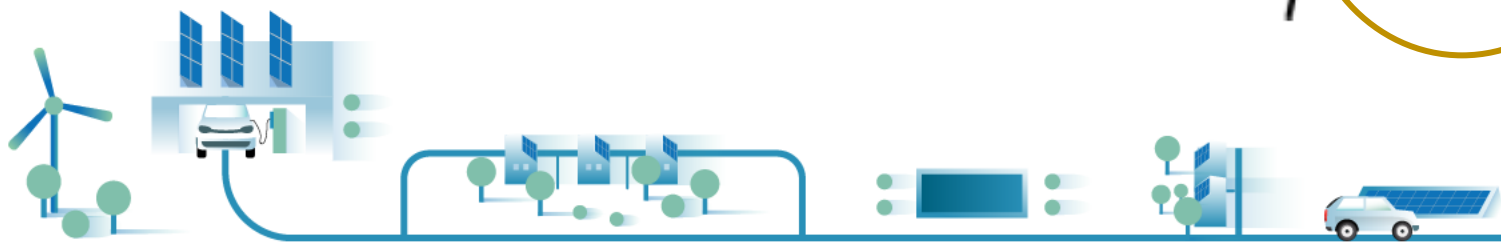
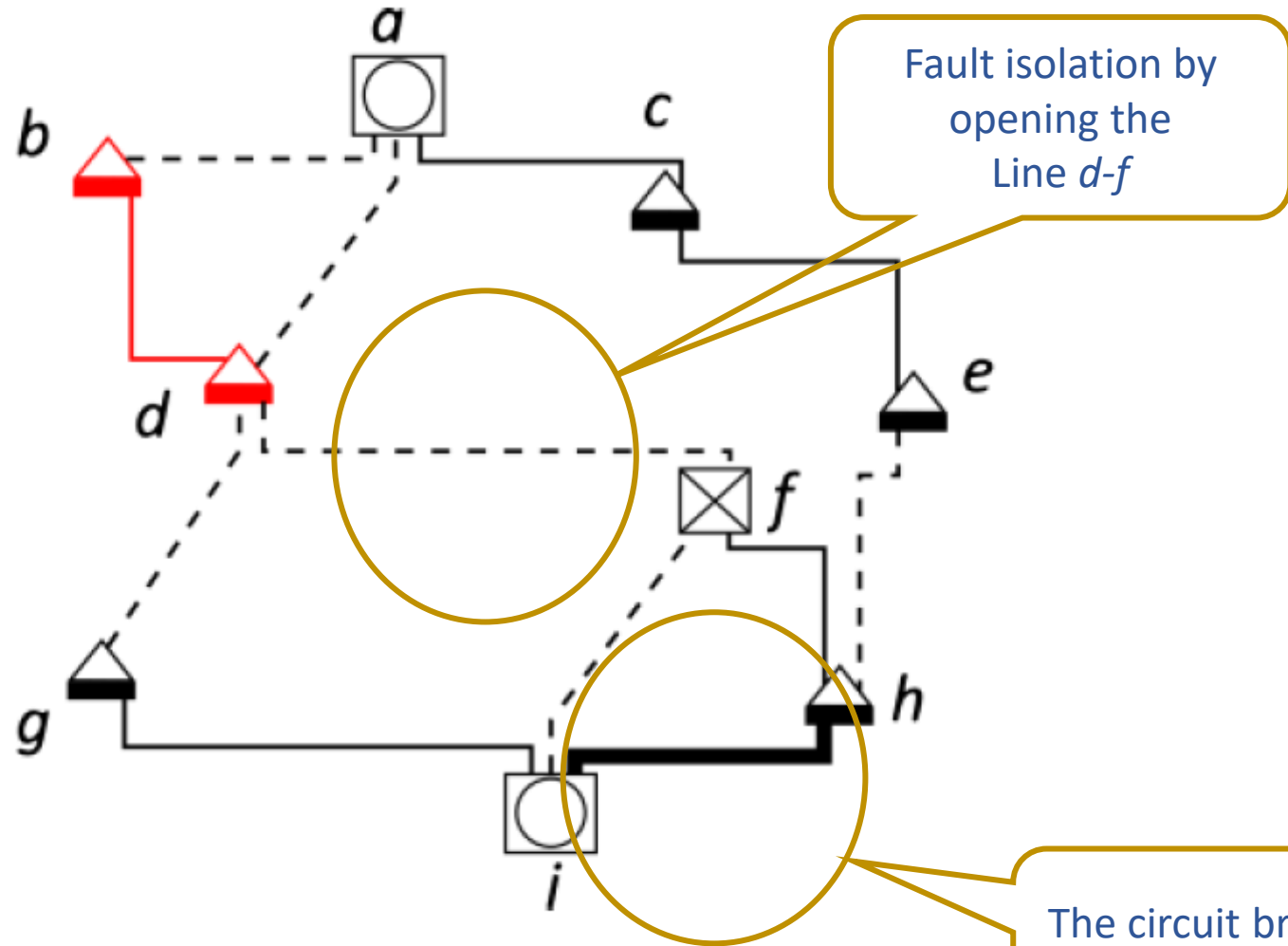
High Flexibility Availability



Distribution Systems Planning with EVs

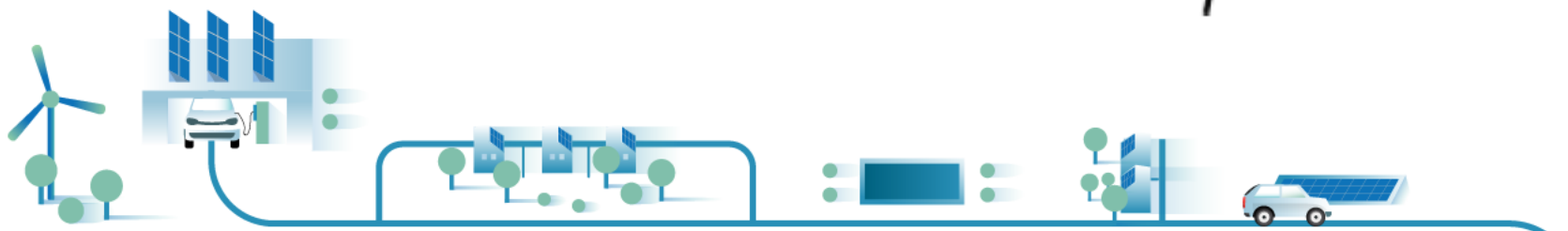
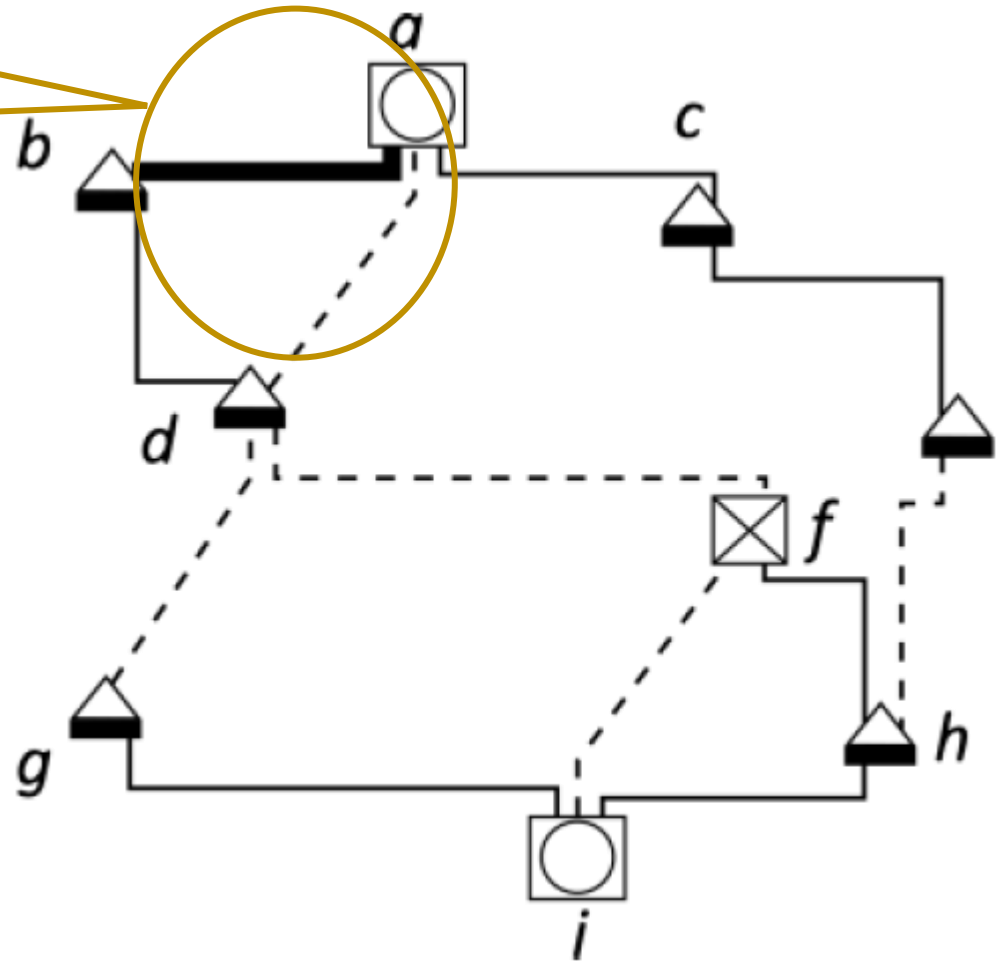


Distribution Systems Planning with EVs

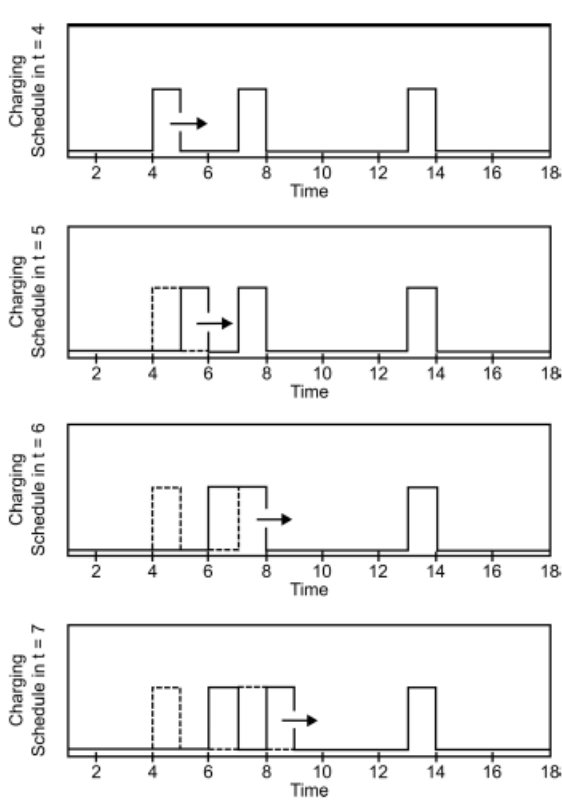


Distribution Systems Planning with EVs

Service Restoration
to PS *b* and *d*



Distribution Systems Planning with EVs



- Load shifting flexibility is represented in the lattice by the empty positions ahead of each occupied position

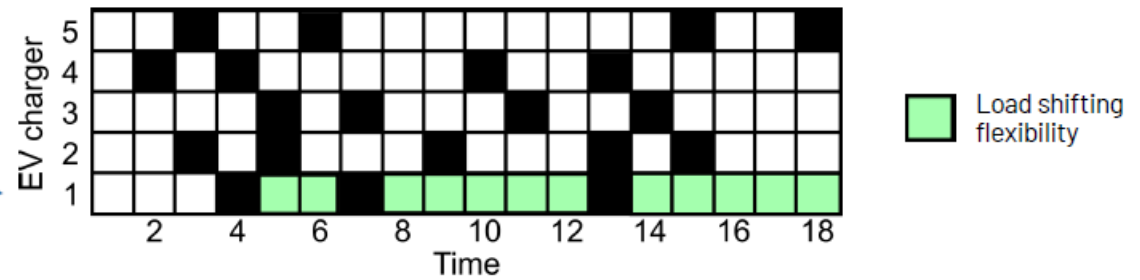


Figure 6 - Two-dimensional lattice of cells representing the original charging schedules of 5 EV chargers.

How to characterize flexibility?

- Load charging density, d (sole parameter)

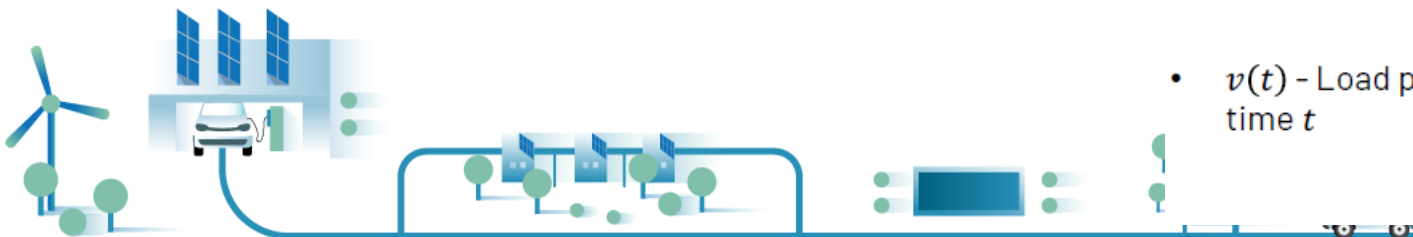
$$d = \frac{\text{\# occupied cells}}{\text{\# total cells}}$$

How to control the aggregate load in each time t ?

Shifting charging particles

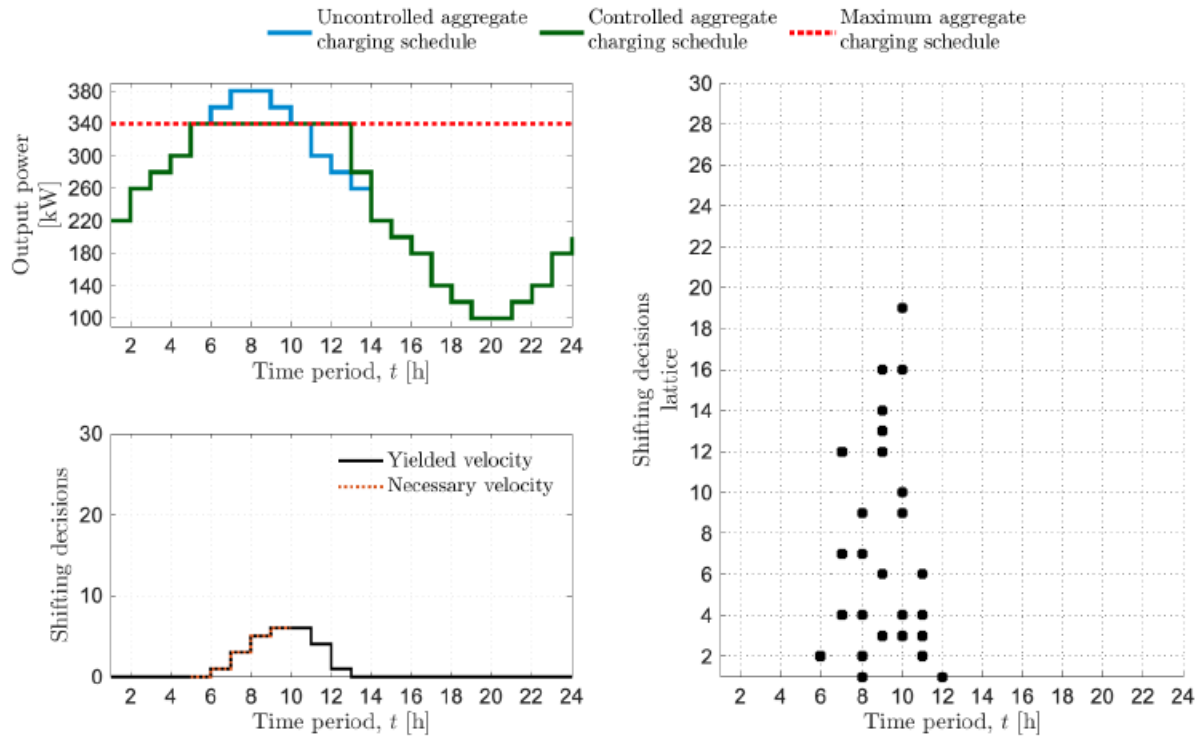
- $v(t)$ - Load particle shifting velocity (number of shift per time period) at time t

$$v(t) = \sum_{n=1}^N v_n(t), \quad v_n \in \{0,1\}, n = 1, \dots, N$$

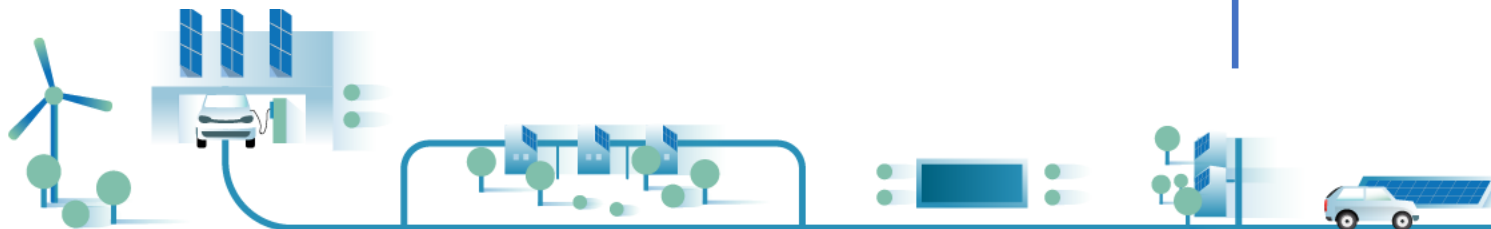
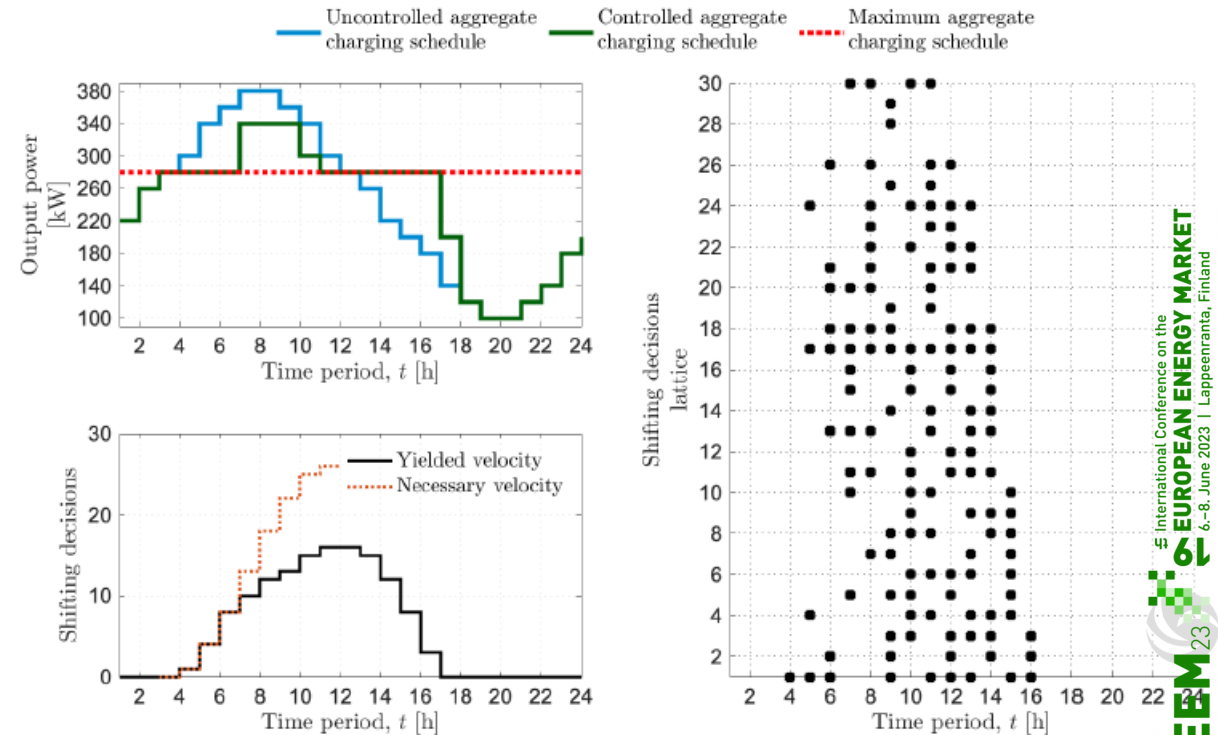


Distribution Systems Planning with EVs

Example 1: $\Delta T \Delta L < (\Delta T \Delta L)^{lim}$



Example 2: $\Delta T \Delta L > (\Delta T \Delta L)^{lim}$

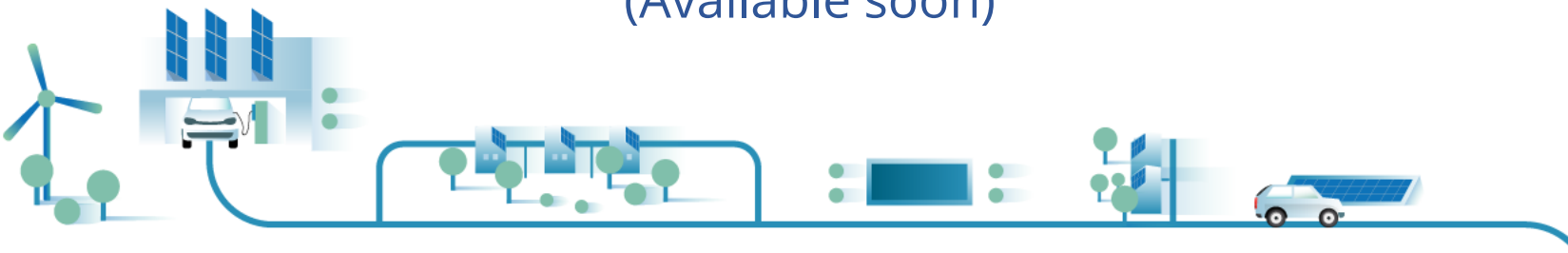


For more Information

<https://ev4eu.eu/>



- Deliverable 1.1 – Electric Road Mobility Evolution Scenarios. [DOWNLOAD PDF](#)
- Deliverable 1.2 – Impact of V2X in energy and power systems. [DOWNLOAD PDF](#)
- Deliverable 4.1 – Distribution Network Planning Strategies considering V2X Flexibilities. (Available soon)





@ev4eu_eu



@ev4eu



Hugo Morais
2023 / 06 / 08



Funded by
the European Union

Funded by European Union's Horizon Europe research and innovation programme under grant agreement no. 101056765. Views and opinions expressed in this document are however those of the authors only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.