# Fast Inductive Charging Needs
# &
# Energy Management System

FAST IN CHARGE

INNOVATIVE FAST INDUCTIVE CHARGING SOLUTIONS FOR ELECTRIC VEHICLES

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Bilbao

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FastInCharge is supported by European Union's Seventh Framework Programme {FP7/2007-2013} under grant agreement n° 314284

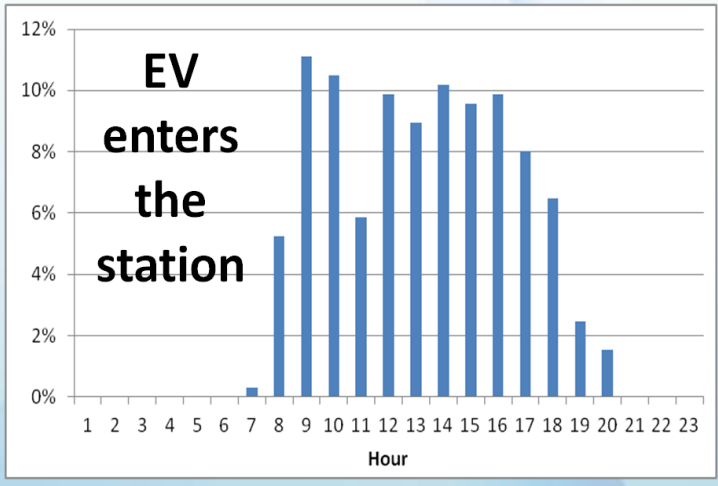
# Defining the Fast Inductive Charging Needs

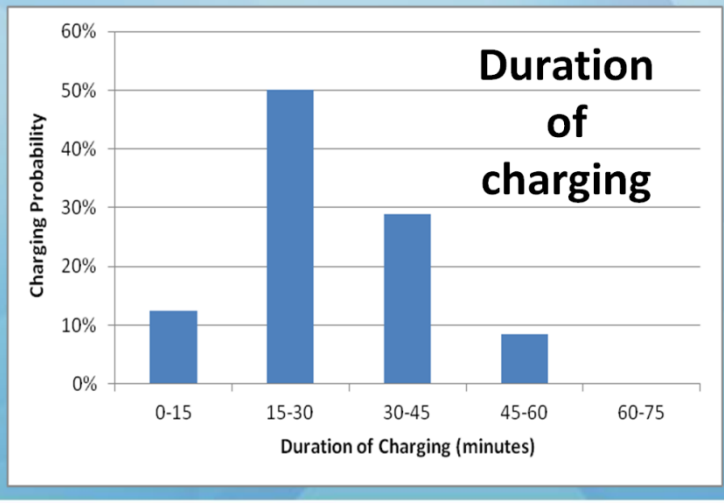
❖Inductive charging is a newly developed technology, therefore there is no operational experience concerning its demand profile.

❖However, the operational behavior of fast stationary inductive charging will resemble the respective one of fast conductive charging.

❖After processing real data on fast conductive charging stations the following parameters are defined:

1. The hour of the day a charging event is expected to occur
   - ➢ All of the charging events occur between 7am and 9pm, while a peak in the EV traffic can be observed in the morning and middle-day hours
2. The duration of each charging event.
   - ➢ Most of the charging events last for 15-30minutes, while none of them has a duration longer than an hour.

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# Defining the Fast Inductive Charging Needs

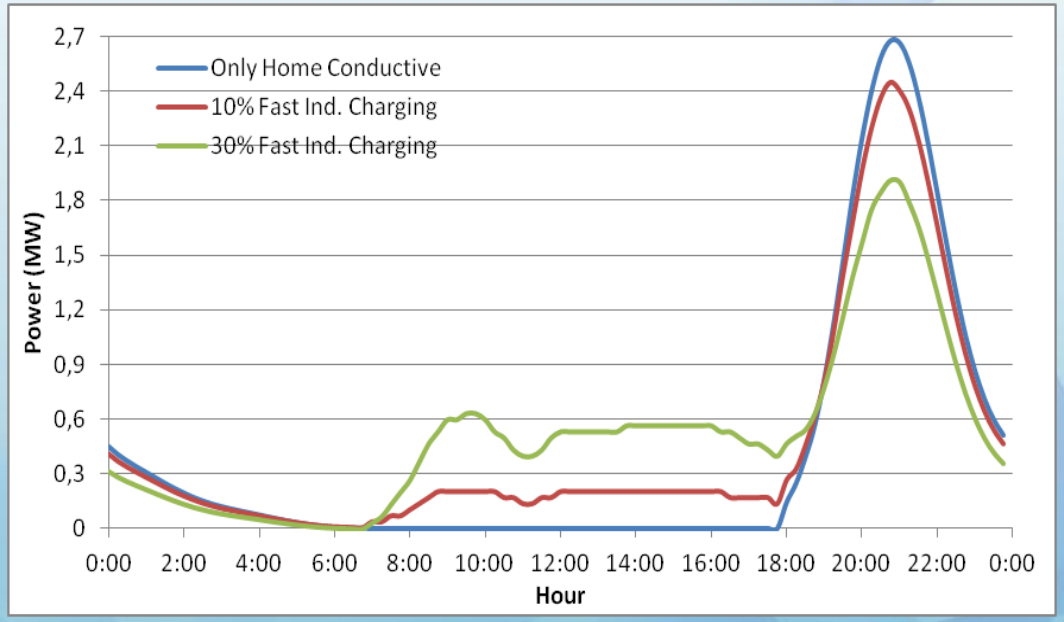
❖In case no inductive charging stations are installed in the grid, a significant peak can be observed in the EV demand

❖If the peak of the grid demand occurs at around the same time with the EV peak demand, conventional conductive charging could raise operational challenges to the system operators.

❖ Fast inductive charging implementation could shift the high EV demand from the evening towards the middle-day and morning hours.

❖In fact, in a scenario where a significant percentage of the drivers daily charge at fast inductive charging stations during the day, quite a considerable decrease can be observed in the evening EV demand.

❖However, the deployment capital of inductive charging infrastructure and the electricity cost are issues that should also be considered.

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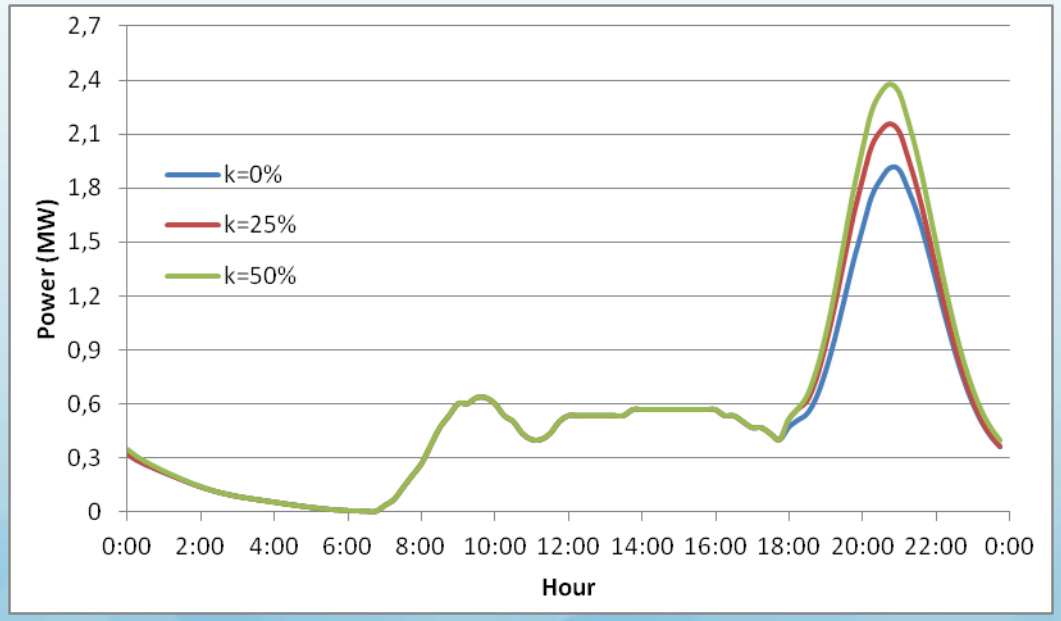


❖Drivers using fast inductive charging solutions during the day may also plug in their vehicle when they return home, receiving a **percentage k** of their daily energy needs from home conductive charging:

- ➢An increase in the evening demand shall be expected.

❖The amount of increase depends on the percentage of the daily energy demands received from home conductive charging.

- ➢A considerable increase is anticipated in case the relevant percentage is quite high.

❖However, even in this situation, fast inductive charging is able to shift a significant amount of the EV demand away from the evening, towards the middle-day and morning hours.

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# Energy Management System

❖Inductive charging should be considered as a service of *"charge as fast as possible"*:

- ➢Inductive charging technologies will offer EV owners the option of fast charging in an increased energy tariff compared to the conventional conductive chargers of Level 1 and 2.
- ➢EV owners will pay more only in case of emergency charging in order to be able to continue their travel.

❖Since there is no time flexibility in case of inductive charging, the availability of each inductive charging infrastructure should be defined a priory based on social and technical criteria in order to prevent network operation disturbances.

❖The scope of the **Smart Energy Management System** is to make EV owners aware of the availability of each inductive charging spot that can serve them without causing any disturbance in the grid operation:

- ➢A user interface will be developed so as to inform EV drivers for the location of the available inductive charging posts. The user interface will be an *applet* that can be installed in a tablet or a mobile phone.
- ➢Furthermore, the user interface will provide an estimation of the remaining time that the unavailable inductive charging posts will remain busy.
- ➢Based on this information and according to the EV driver's travel needs (i.e. direction and energy requirements), the driver will be able to choose one of the available inductive chargers.
- ➢The *EV drivers will also be able to book* a specific inductive charging post and determine the desired charging time.

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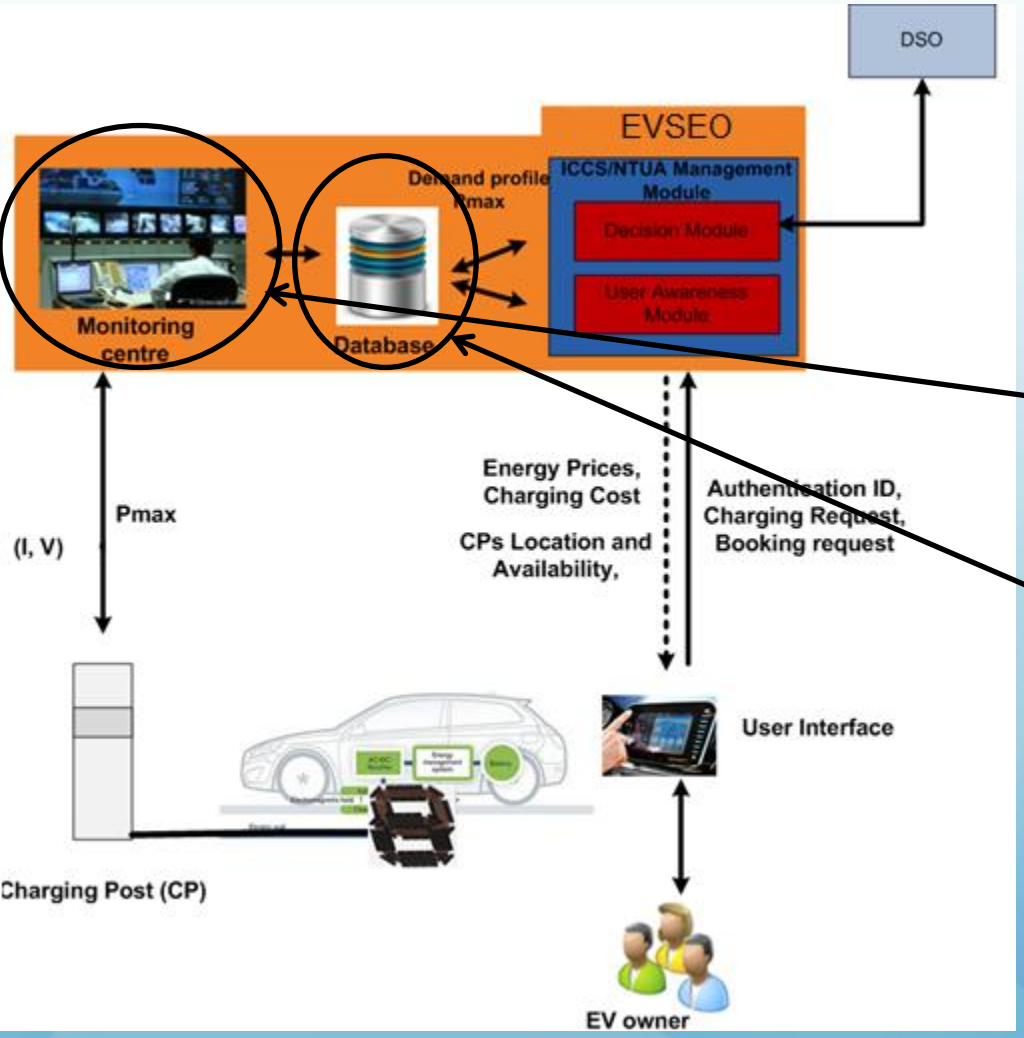


❖The overall outline of the energy management system is presented in the next figure.

❖When the EV is appropriately placed over the primary inductive plate and the EV owner requests for charging, the maximum charging rate is defined by the nominal apparent power of the charging infrastructure (S=30KVA).

❖The **Monitoring Centre**, which is responsible for monitoring the operation of the Charging Posts (CPs) and recording the respective consumption, can reduce the maximum allowable charging power exchange between the grid and the Charging Post at any desired level between 0-30KVA.

❖The current consumption of each Charging Post is stored in a **Central Database** placed at the EVSEO's system.

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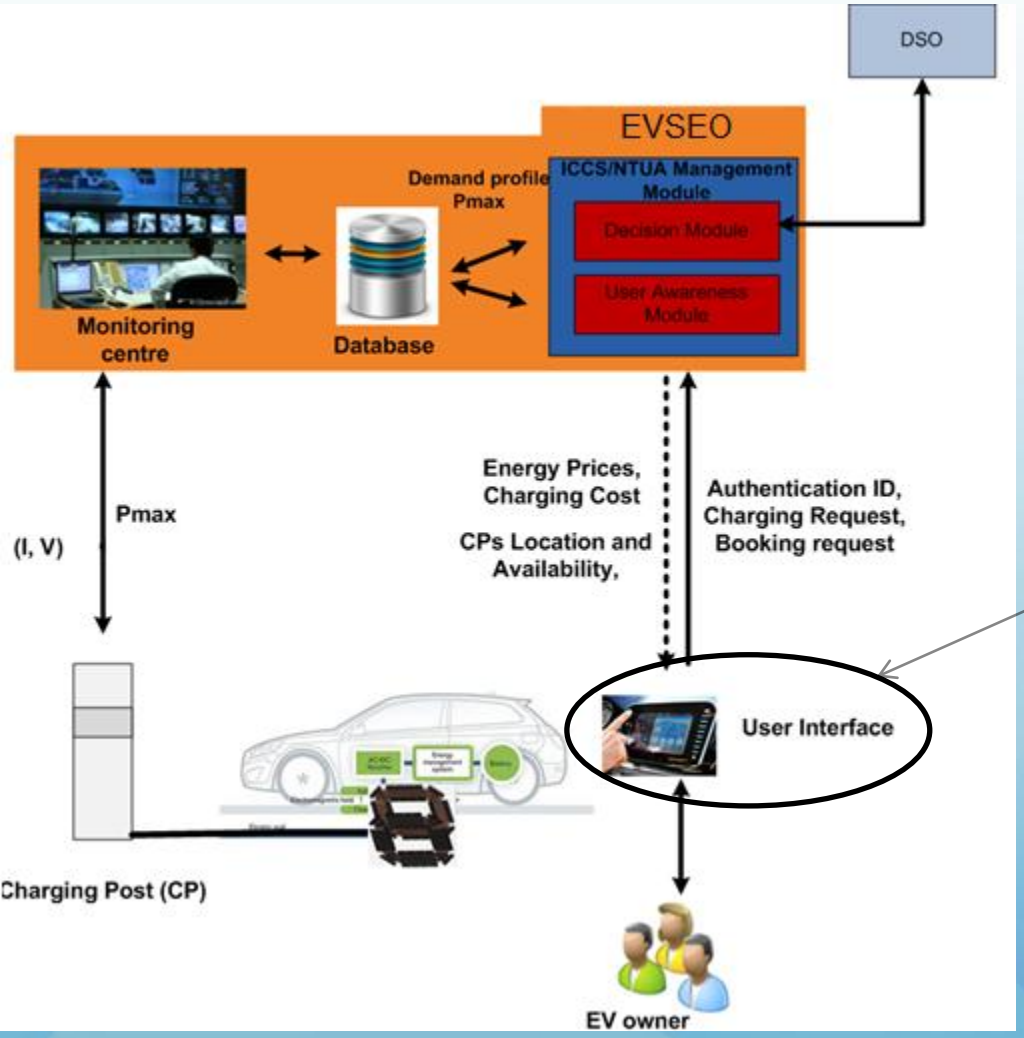


❖When an EV owner needs to charge their EV battery, he/she will drive to the nearest available charging post.

- However, the closest fast inductive charger might be busy and the EV owner will have to find the next closest charging point.
- For this reason, the **User Interface** module makes EV owners aware of the available Charging Posts as well as the estimated remaining time that busy Charging Posts will become available again.
- Therefore, based on their charging needs, their travel direction as well as the location of available charging stations, the drivers can reschedule their driving route to the desired destination in order to reach the most convenient and available charging station.

❖Furthermore, EV owners will be able to *book* specific timeslots in a Charging Post by defining the time of arrival and departure.

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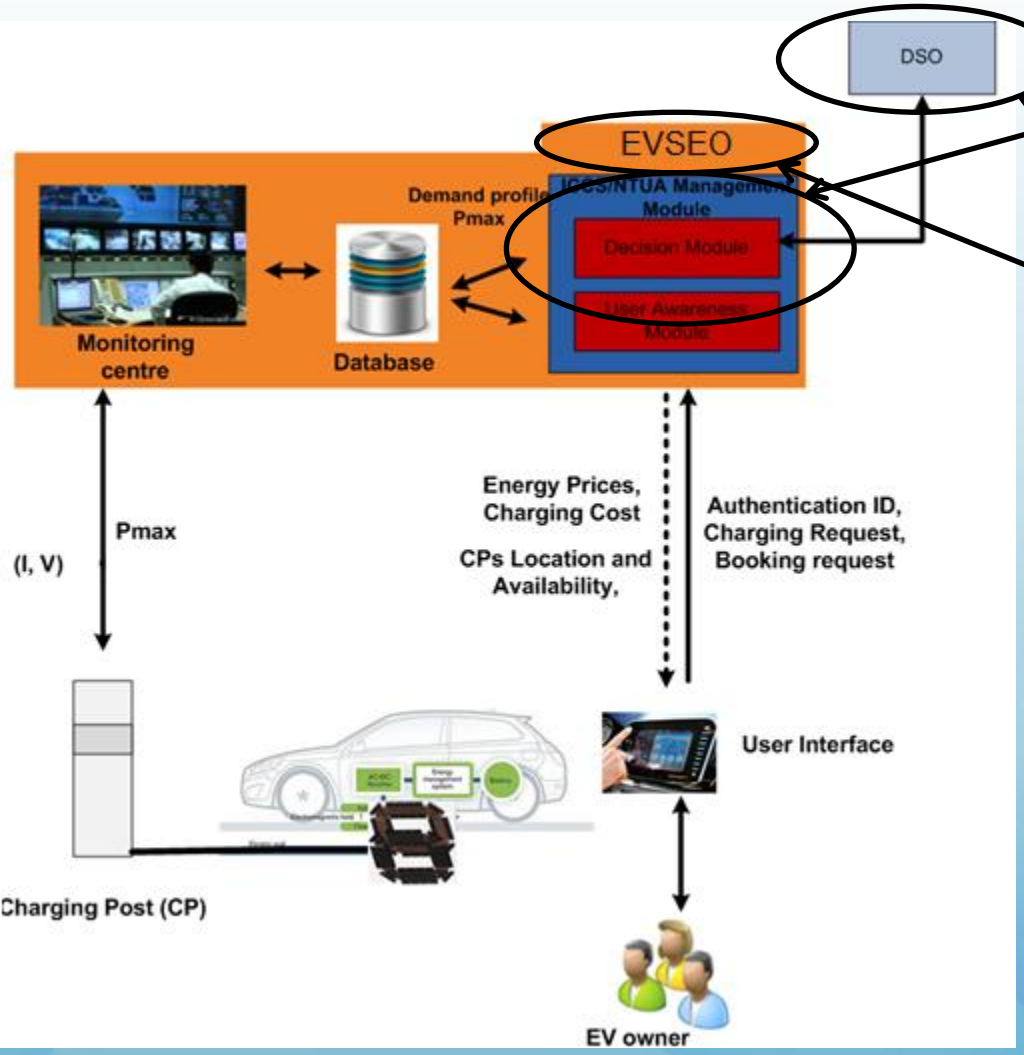


❖The **Decision Module** is responsible for purchasing energy from the wholesale market and supplying the charging demand of EV owners.

❖The **EVSEO** (EV-Supply Equipment Operator) should ensure the reliable supply of all Charging Posts under his responsibility.

❖The EVSEO is also linked with the **System Operator** in order to avoid grid operational constraints violations:

- ➢The System Operator can request from the EVSEO not to further increase its demand in case the grid is highly loaded or even reduce its requested demand in case of critical grid operational conditions.

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Thank you very much
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