

# Smart grid, a strategic structure for the electrical Vehicle

Sylvain Paineau  
Strategy & Innovation

EURIPIDES FORUM  
September 30<sup>th</sup> – October 1<sup>st</sup>, 2010



**Schneider**  
Electric

# A unique positioning

Global specialist in  
Energy Management

Energy production  
& transmission

Making energy:

- Safe
- Reliable
- Efficient
- Productive
- Green

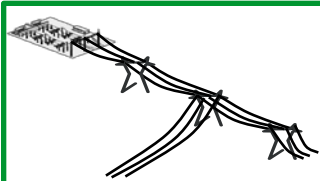
Covering  
**72%**  
World Energy  
consumption

up to  
**30%**  
energy saving

Energy usage



# Content



Electric charging infrastructure:  
do we need to change the grid ?

- Agenda :



Electrical vehicle  
Needs & Solutions



Major stakes for  
infrastructure



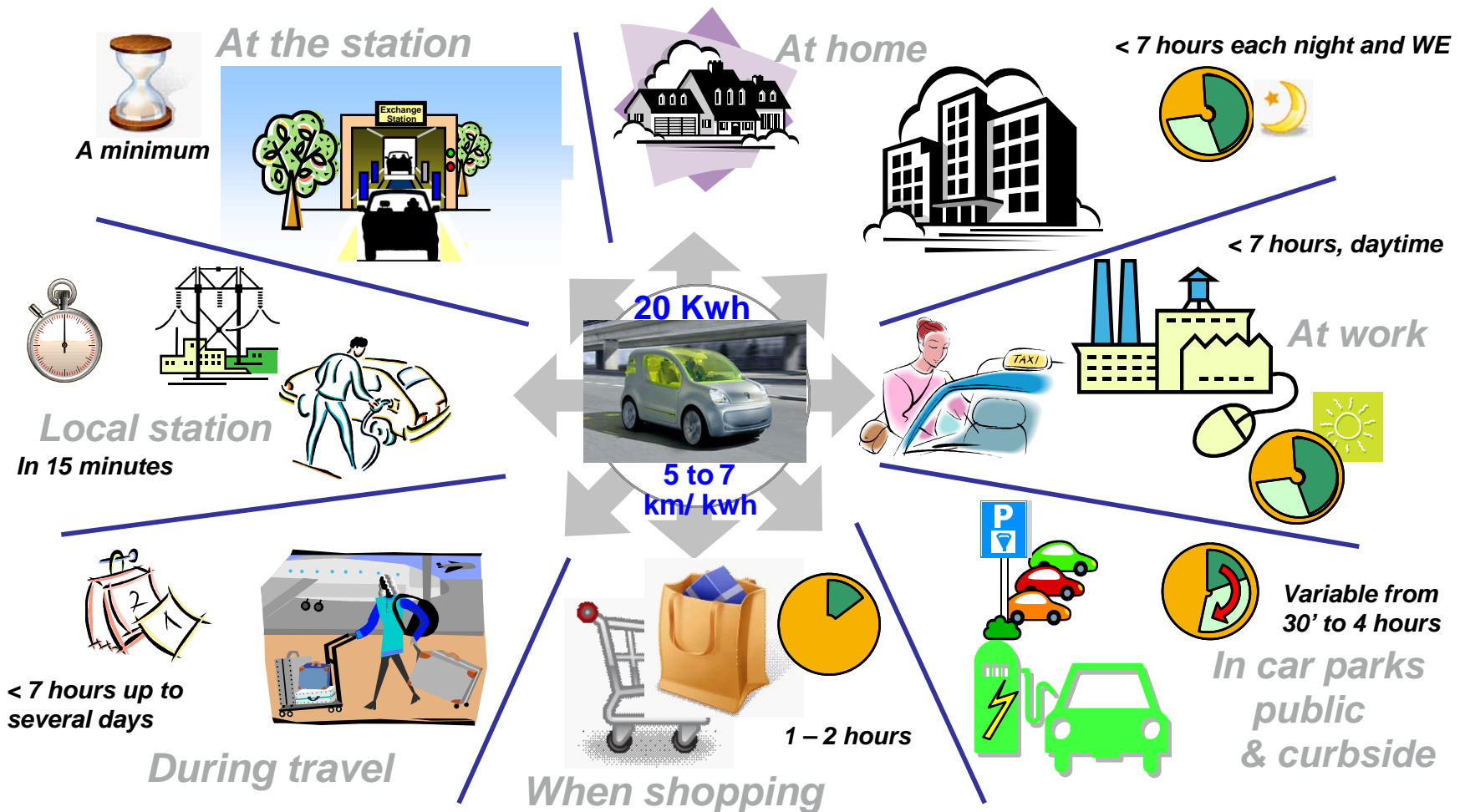
Grid evolutions



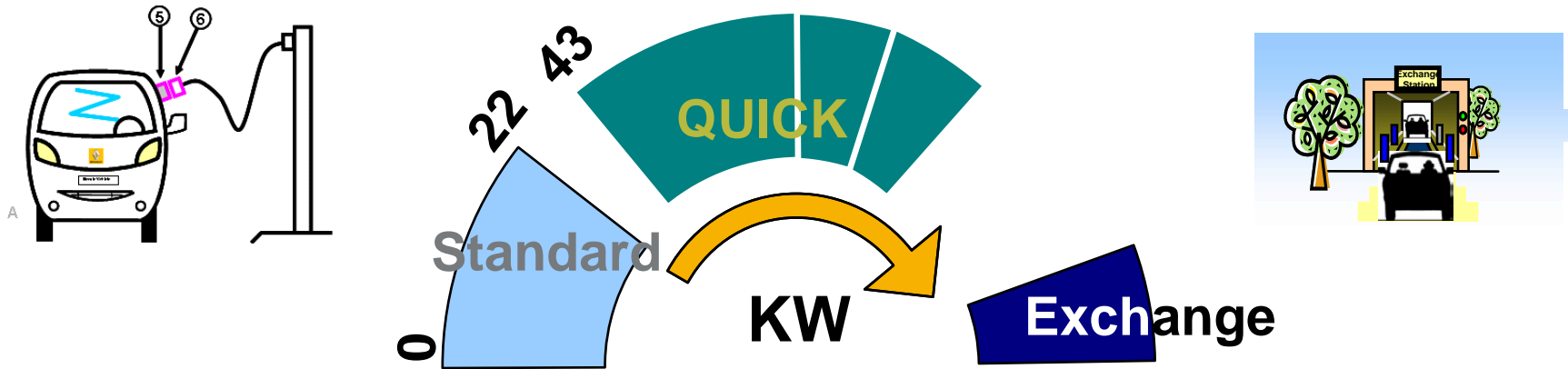
Conclusion

# Vehicle charge: a customer usage issue

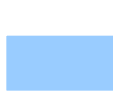





- When, where, for how long do I stop my car ?
- Can I charge here ?



# Different solutions to serve these needs



For a full charge...

	<b>Standard charge</b> ➔	<i>AC Single Phase : 230V – 16/32A AC Tri-Phases : 400V – 16/32A</i>		<i>8h to 1h</i>
	<b>Quick charge</b> ➔	<i>From 43kW up to 150kW (?) DC or AC – depending on car architecture</i>		<i>30min to 10min</i>
	<b>Battery exchange</b> ➔	<i>In a few minutes</i>		<i>3min</i>

# Key values

- Highest safety level

- Plugs with shutters on wall side: no risk of direct contact with powered parts.
- Mode 3 charging

- Simplicity and Ease of use

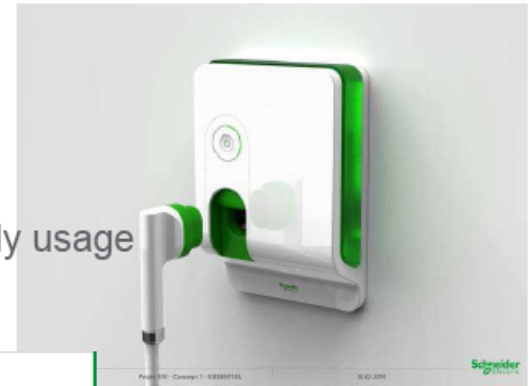
- Ergonomics of connection system, from installation to daily usage
- Simplicity, for lower cost

- Energy management

- Normal charge to allow for effective load management
- Avoid peak time (cost, CO2)
- Adapt to installation capacity

- Compliance with international standards

- IEC compliance
- Creation of EVPlug Alliance to promote rapid adoption of a standard connection system.



# 5 questions for infrastructure deployment

- Normal or fast charge ?

- *Do I stop to charge* or *do I charge as I stop* ?
- How many fast charge spots to deploy ?
- Fast charge only as **reassurance** or a **basic** option ?

- Public spots or private, AC or DC ?

- At home / Office or on the curb side ?
- Use the existing AC network or dedicated DC chargers on the infrastructure ?

- Grid capacity ?

- 1 M EV = 2 TWh / year (for ex, < 0.5% of total electricity in France)
- ... but could generate an extra 2% power need at peak time.

- Who pays ?

- Home / building owner ? Mobility operator ? Tax payer ? Gasoline cars ?

- Business models

- A full charge value in electricity will cost between 1 and 2 €
- Does it pay for the charge infrastructure ?

# Some References



Strasbourg - Toyota Prius 3



HMI (Japan)



Israel



Home garage installation (Fr)

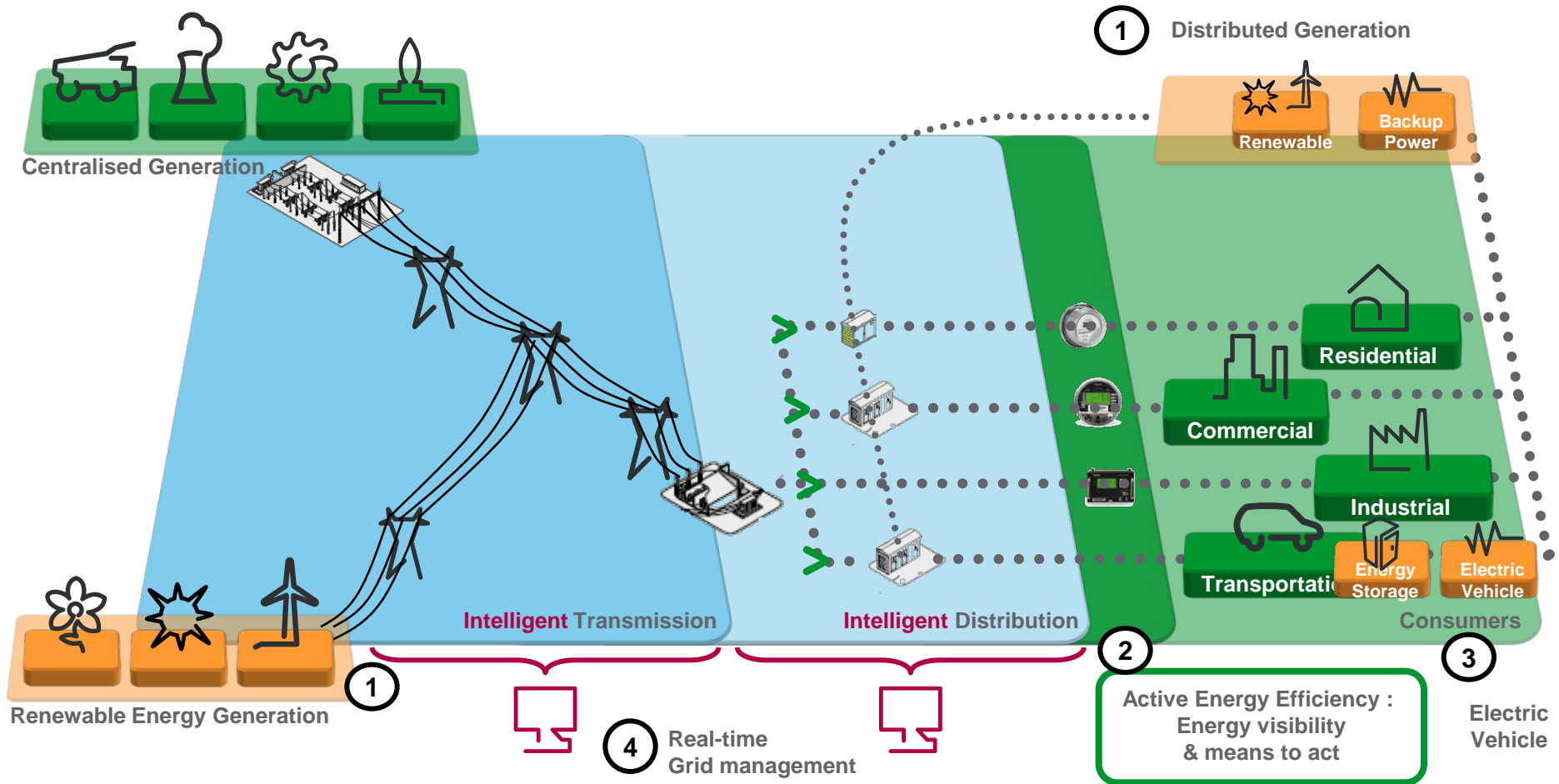


MoveAbout DK



US prototype for home spot

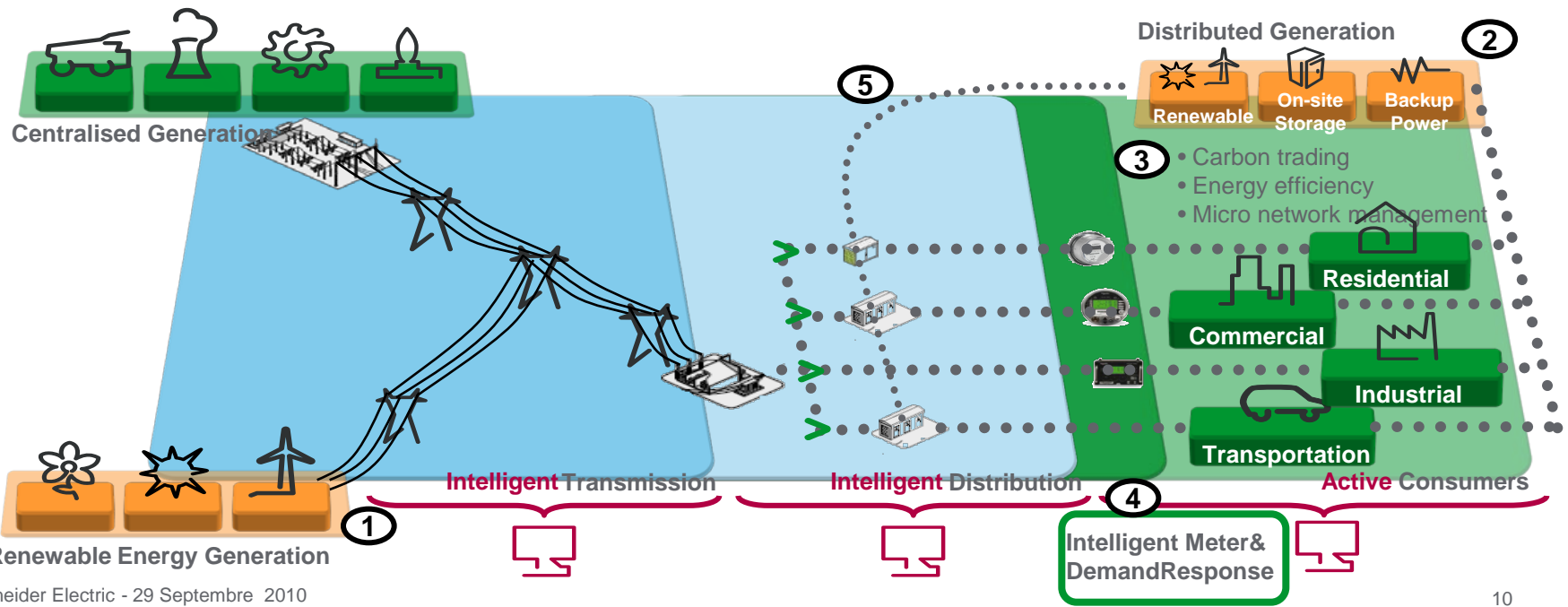
# Supply/demand of Energy started its transformation journey



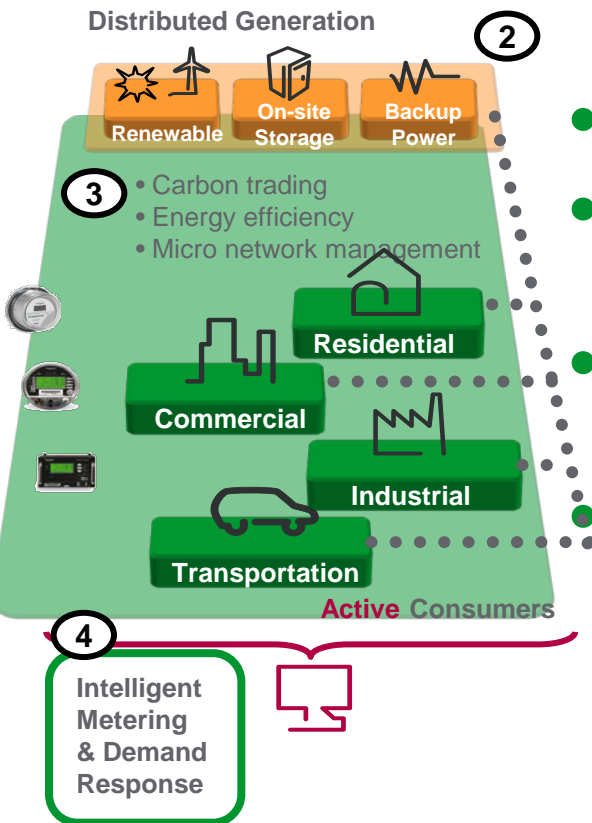
# Meanwhile, Grid becomes a Smart Grid

Communication, Intelligence, Automation to...

- Optimize energy use and availability
  - Manage demand ③ and production ①: reduce peaks, energy efficiency by better information ④ on energy use.
- Allow massive introduction of renewable energies ① ②
  - Automation ⑤ for grid stability, bidirectional power flows, Storage ② to compensate renewable variability.
- Self healing grid with automation ⑤



# Smart Grid and Electric Vehicles will mutually benefit

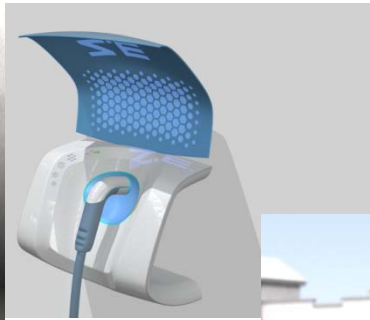


- Charge management : avoid peaks, contribute to Demand / Response
- Smart metering and charge price management
- Fleets and infrastructure management through smart grid
- Use batteries to store and feed electricity back to the grid (Vehicle To Grid, V2G)
- Association of EV and renewable energies to increase use of carbon free generation.



# Schneider Electric develops full solutions for infrastructure.

- From plugs to spots to stations
- Energy management systems (metering, load shedding, demand / response...)
- Schneider Electric participates to experiments (Strasbourg, Ile de France, ...)
- Actively involved in international standardisation.



# As a conclusion

- The **present** grid will support the arrival of EV and PHEV for several years.
- Major attention to be put on **safety** and charge **management** to avoid adding to peaks.
- Cost of infrastructure will highly depend on chosen **scenario** for charge.
- As number of EV grows, smart grid capabilities will be increasingly needed and Grid will progressively use the storage capacities of cars.
- The EV will be considered as a load among others in the Building energy efficiency Management System.