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Demand Modelling for Electric Vehicles

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May 2010

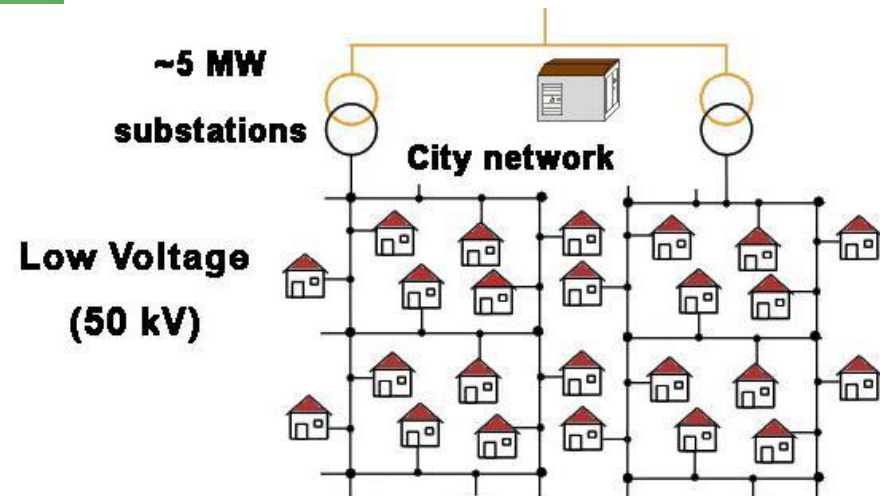
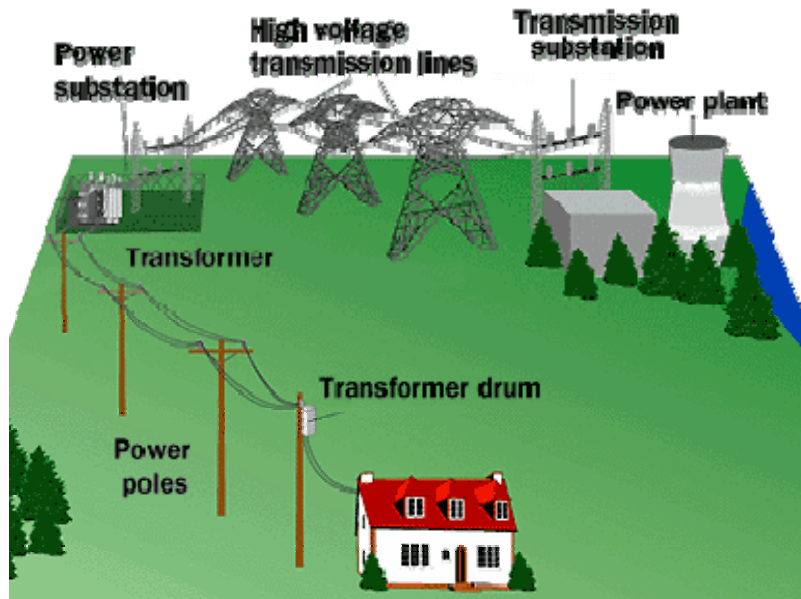
 *Institut für Verkehrsplanung und Transportsysteme*
Institute for Transport Planning and Systems

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

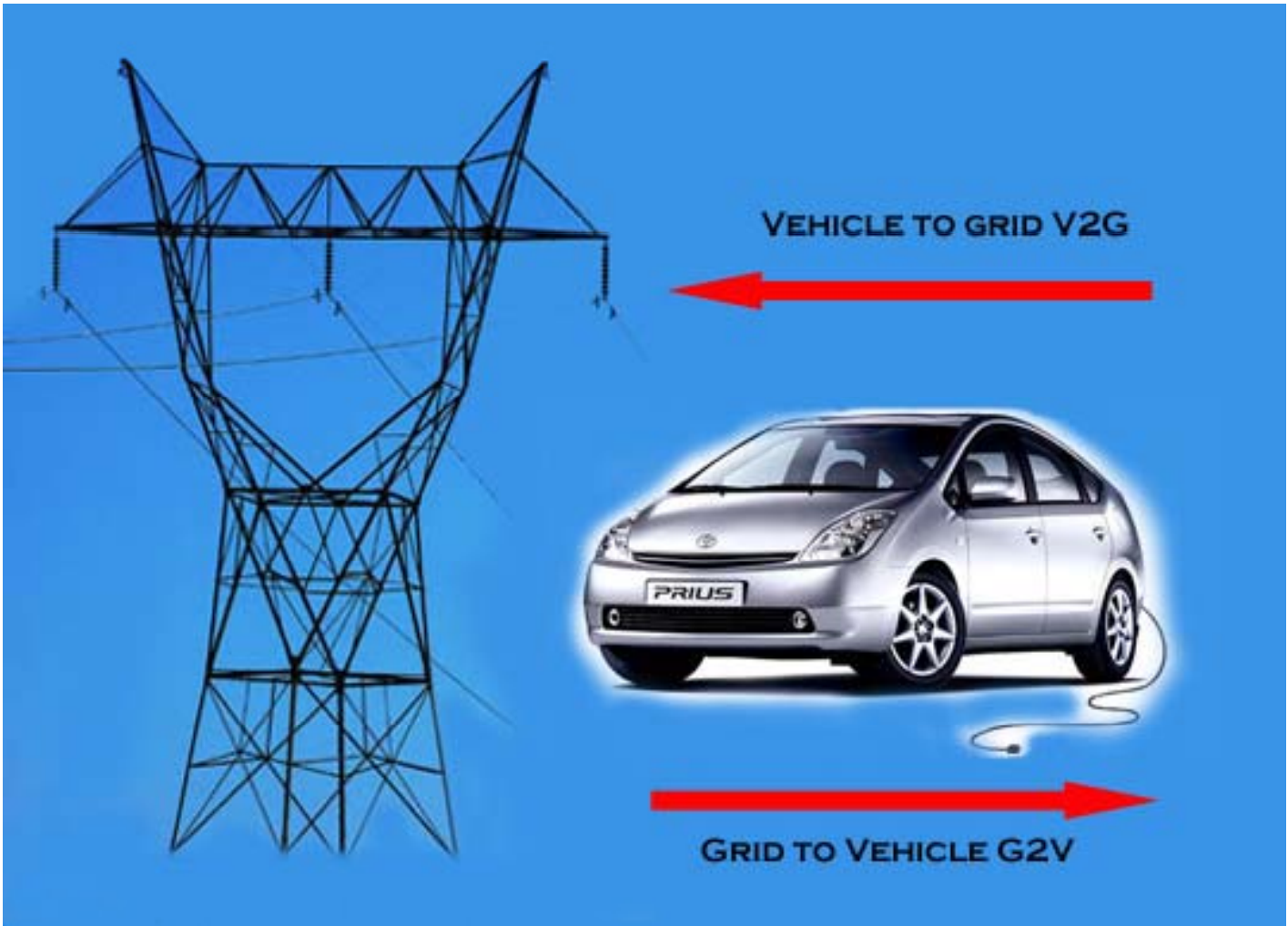
Bottlenecks in the Distribution Grid

Sources: www.science.smith.edu and wiki.uiowa.edu



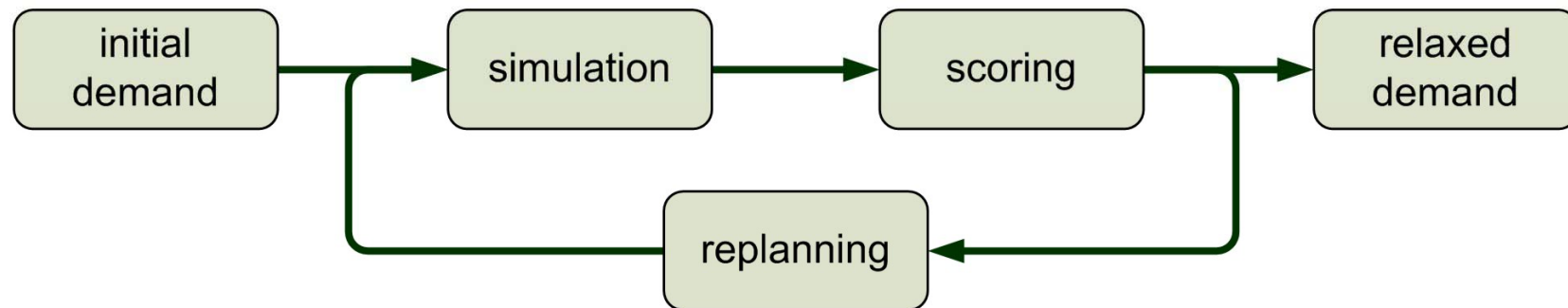
Smart Grid and Vehicle-to-Grid

Source: www.global-greenhouse-warming.com

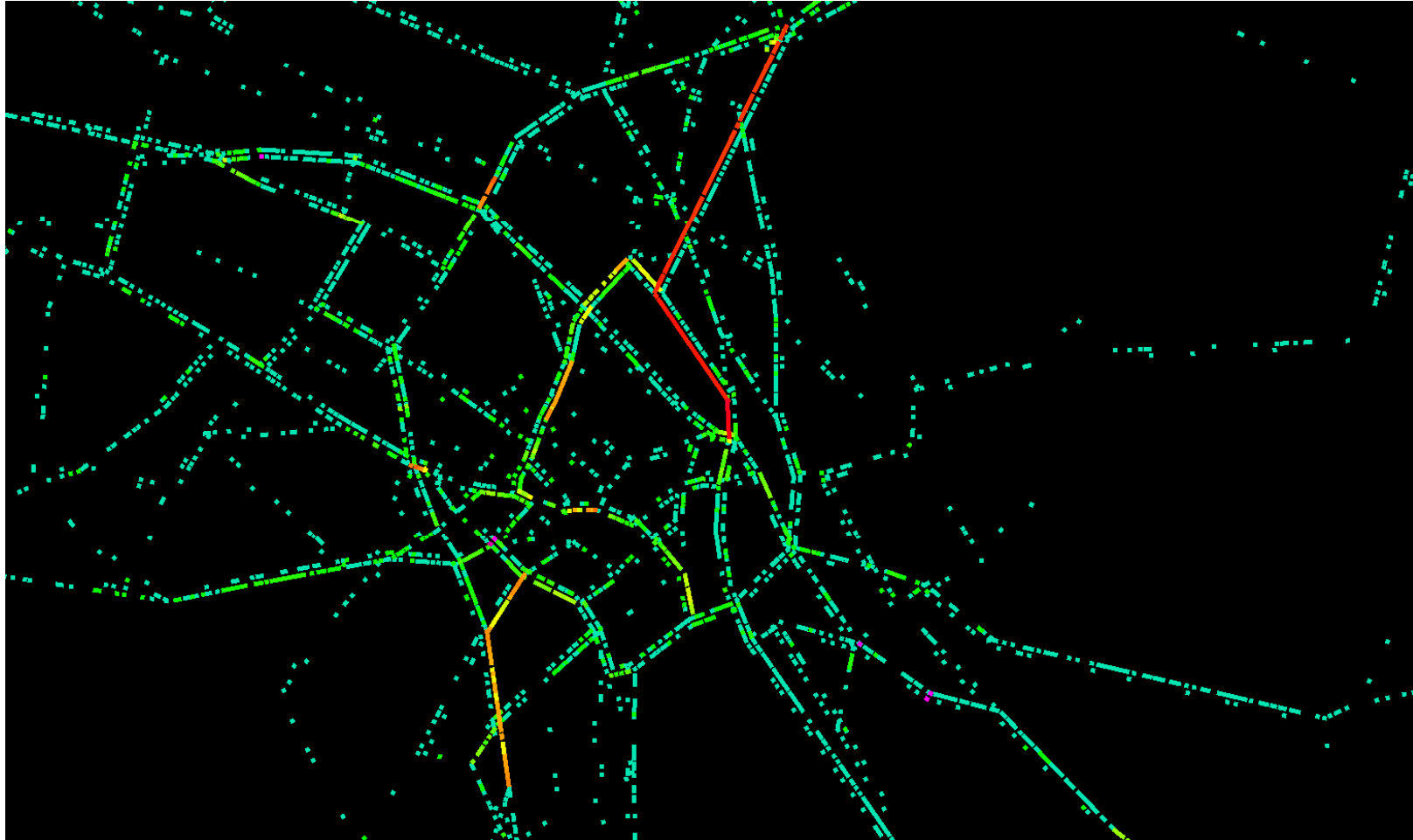


Framework based on MATSim

MATSim (Multi-Agent Transport Simulation)



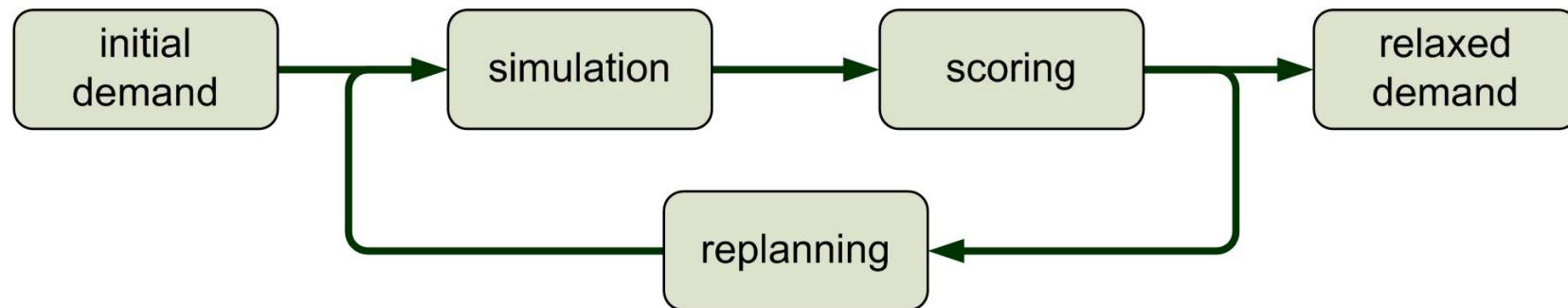
Traffic Simulation



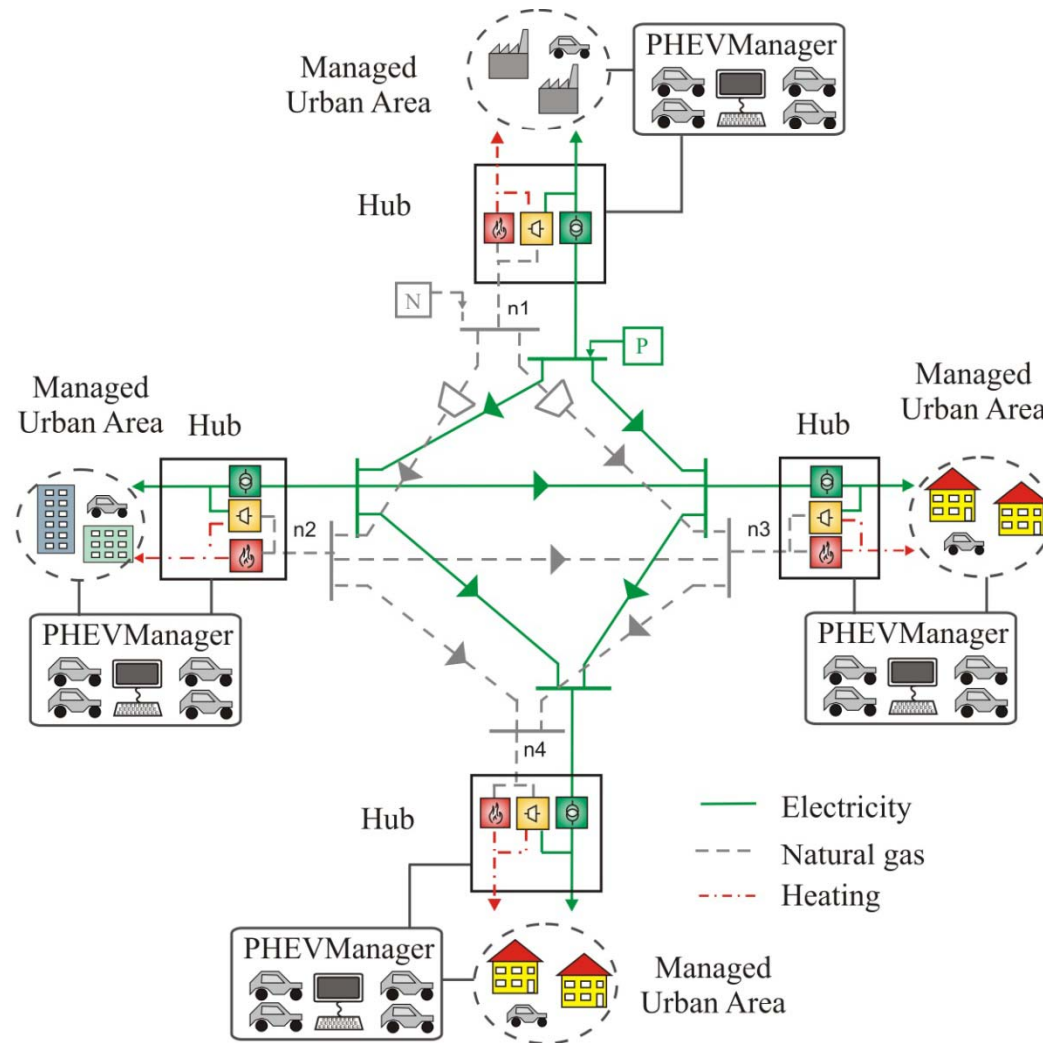
Source: www.matsim.org

Framework based on MATSim

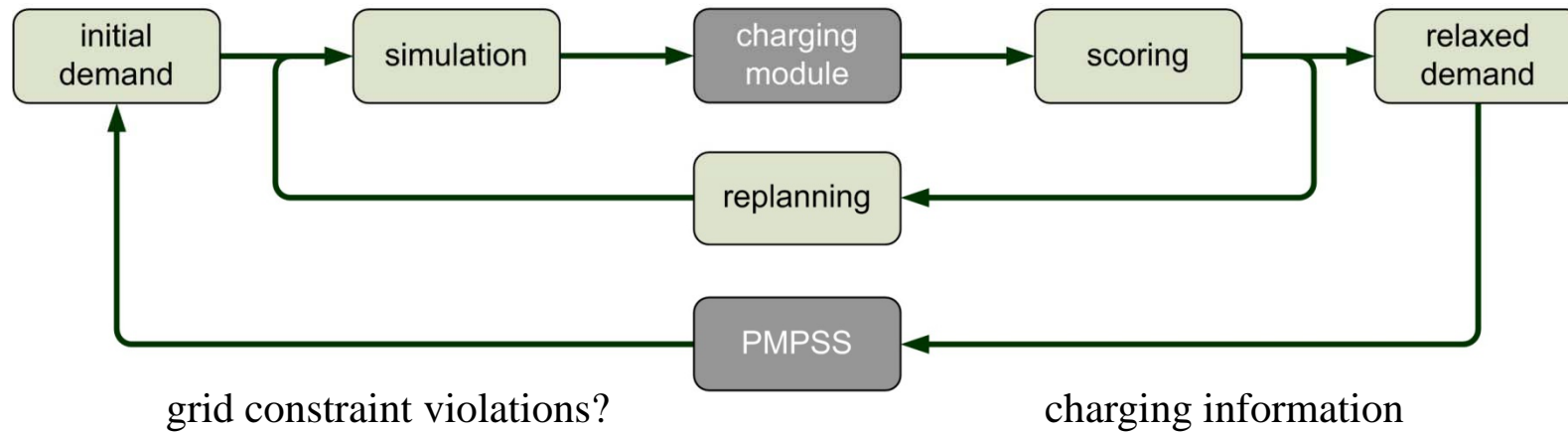
MATSim (Multi-Agent Transport Simulation)



PHEV Management and Power System Simulation (PMPSS)



Integrating MATSim and PMPSS

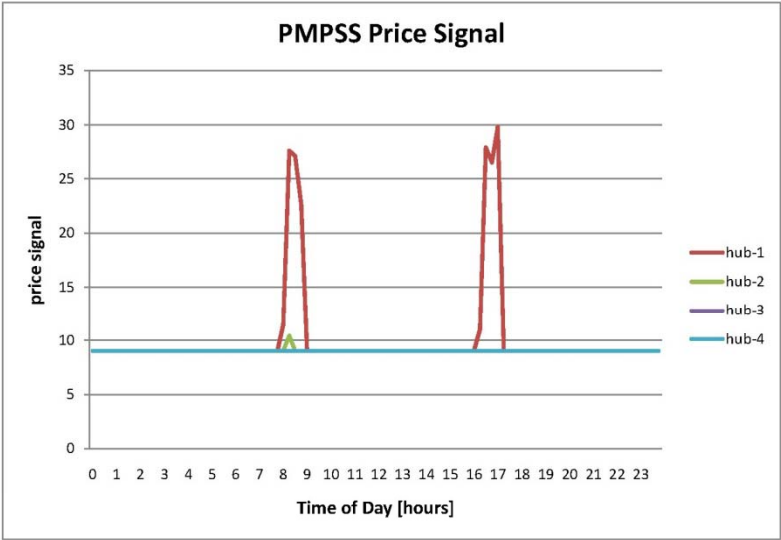
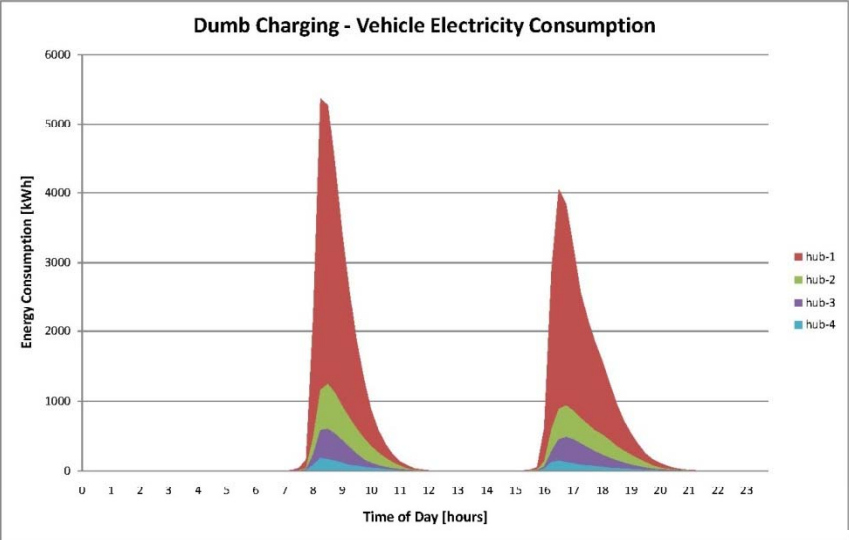


Methodology and Simulations

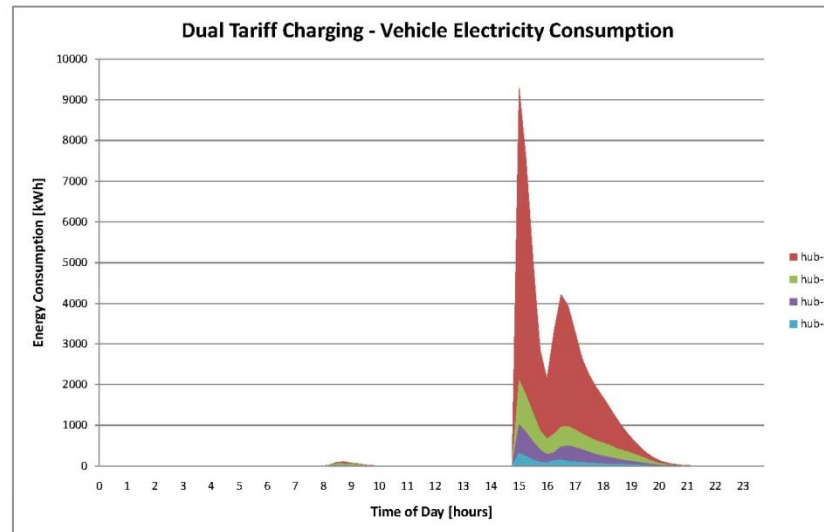
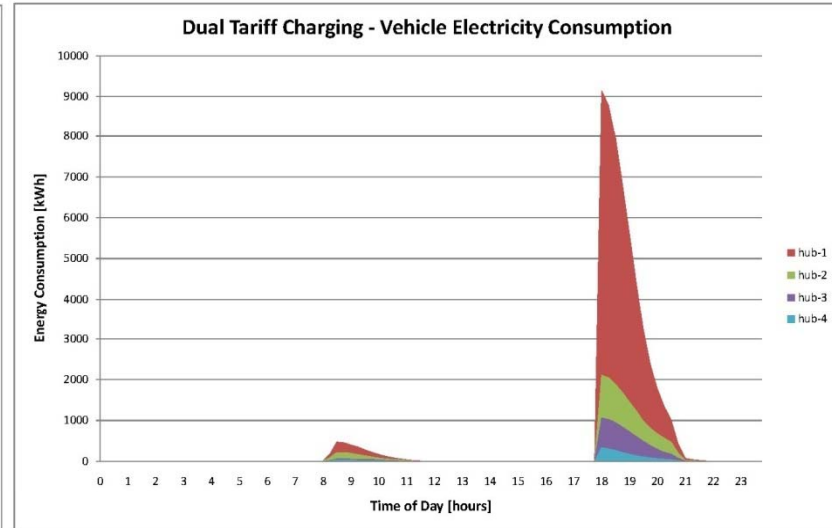
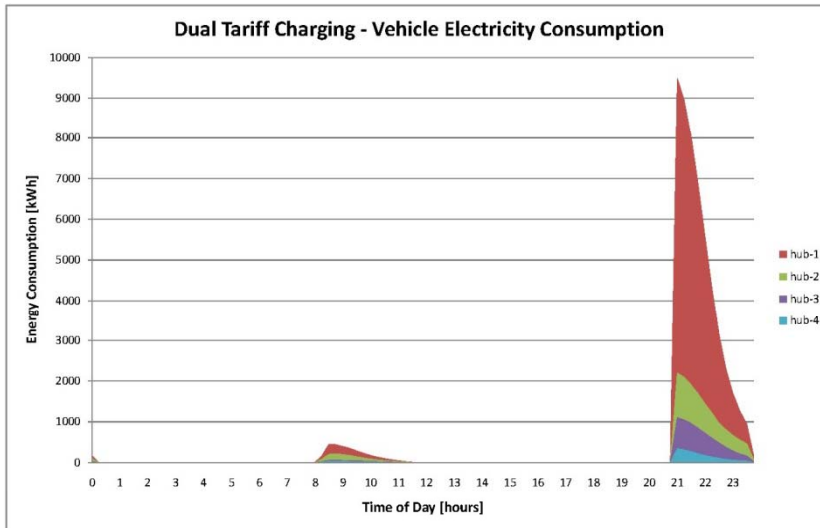
- Scenario
 - 16'000 agents
 - Berlin network
 - Home-work-home, home-education-home activity chains
 - 4 hubs, base load of a typical western city
 - Plugs available at all activity locations
 - Electricity price cheaper than gasoline

- Different charging schemes and policies tried simulated

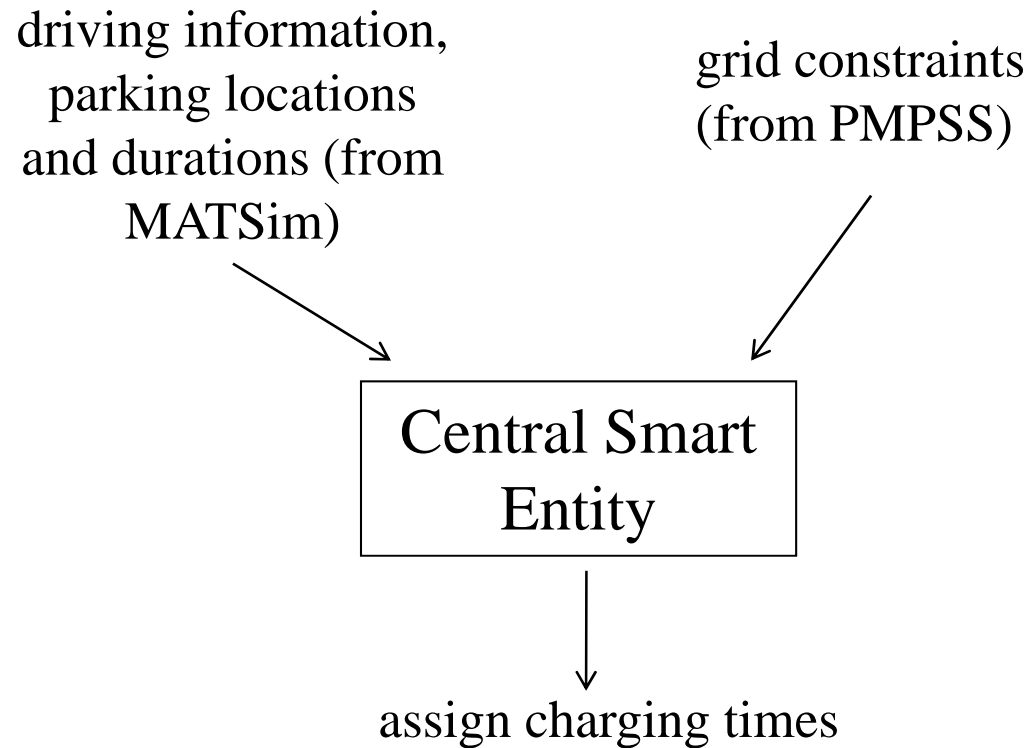
Charging upon Arrival



Dual Tariff Charging

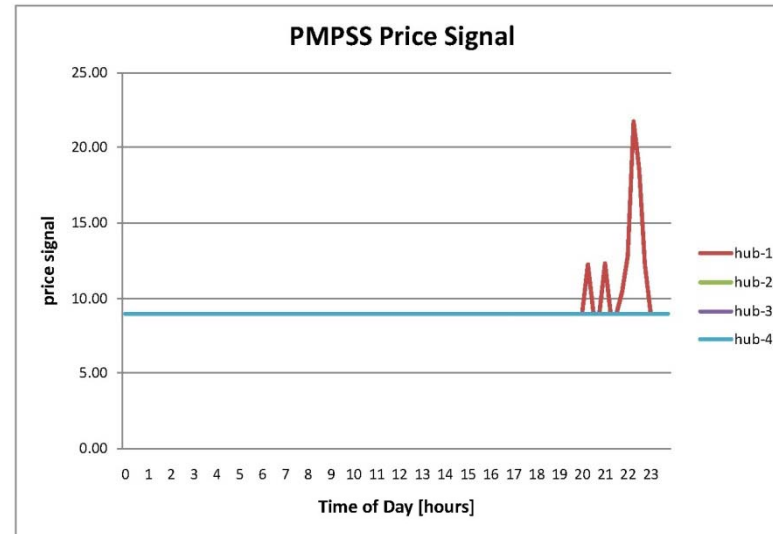
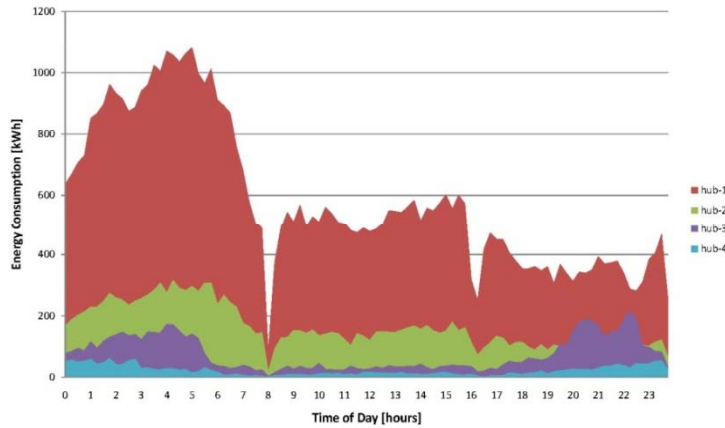


Centralized Smart Charging

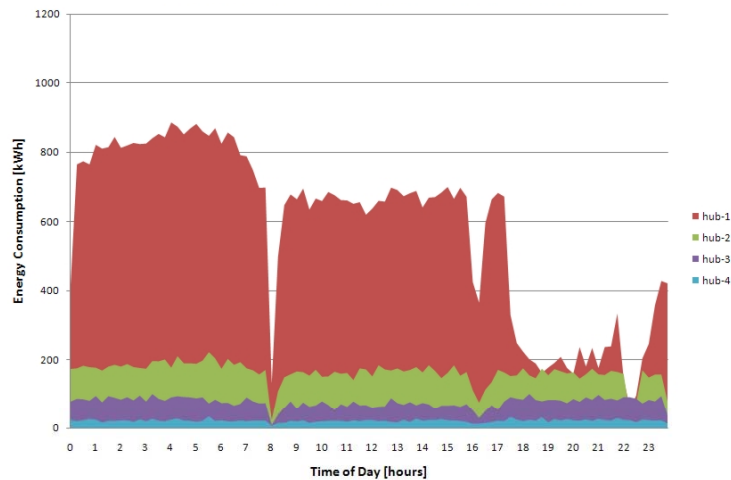


Centralized Smart Charging

1. Iteration – grid constraints violated



5. Iteration – all vehicles charged successfully



Conclusions and Future Work

- Framework for investigating PHEVs

In Future:

- Other smart charging schemes
- Privacy

Questions?
