

Realizing the smart grid:

Aligning consumer behaviour with technological opportunities

The energy behaviour of consumers is a major source of uncertainty in the development of smart energy systems (SES).

The envisioned benefits of SES will only be realized if consumers

(1) adopt smart energy technologies (SET), and

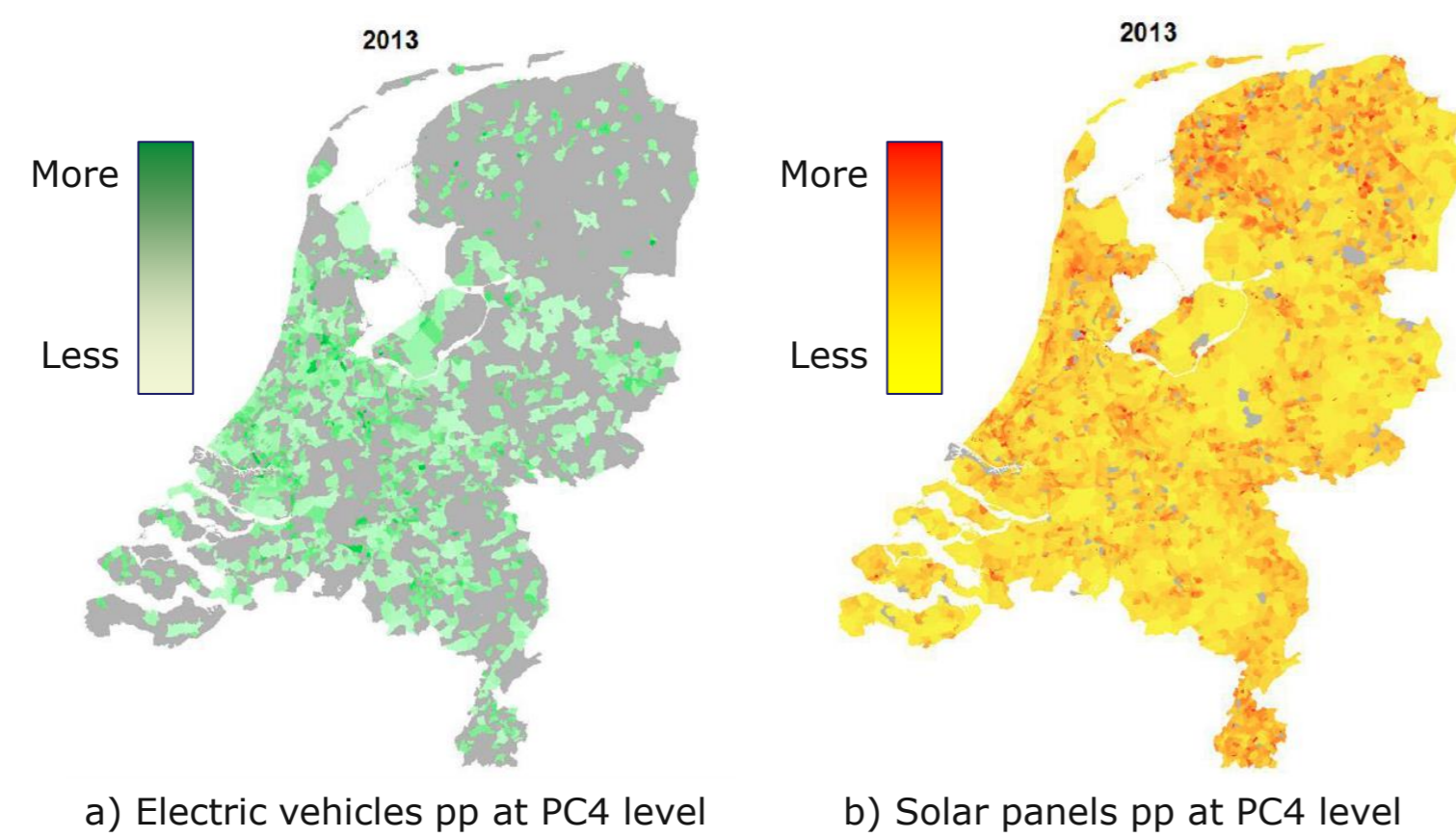
(2) use these technologies in a way that secures energy system reliability, efficiency, and sustainability.

Reliable scenarios for consumer adoption and use of SES at the neighbourhood level are essential to secure stability of the grid.

Research question:

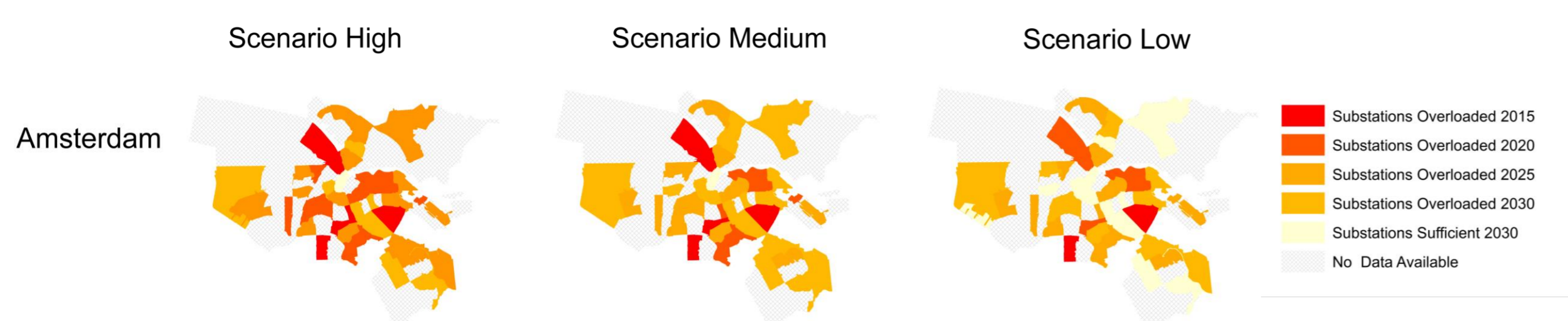
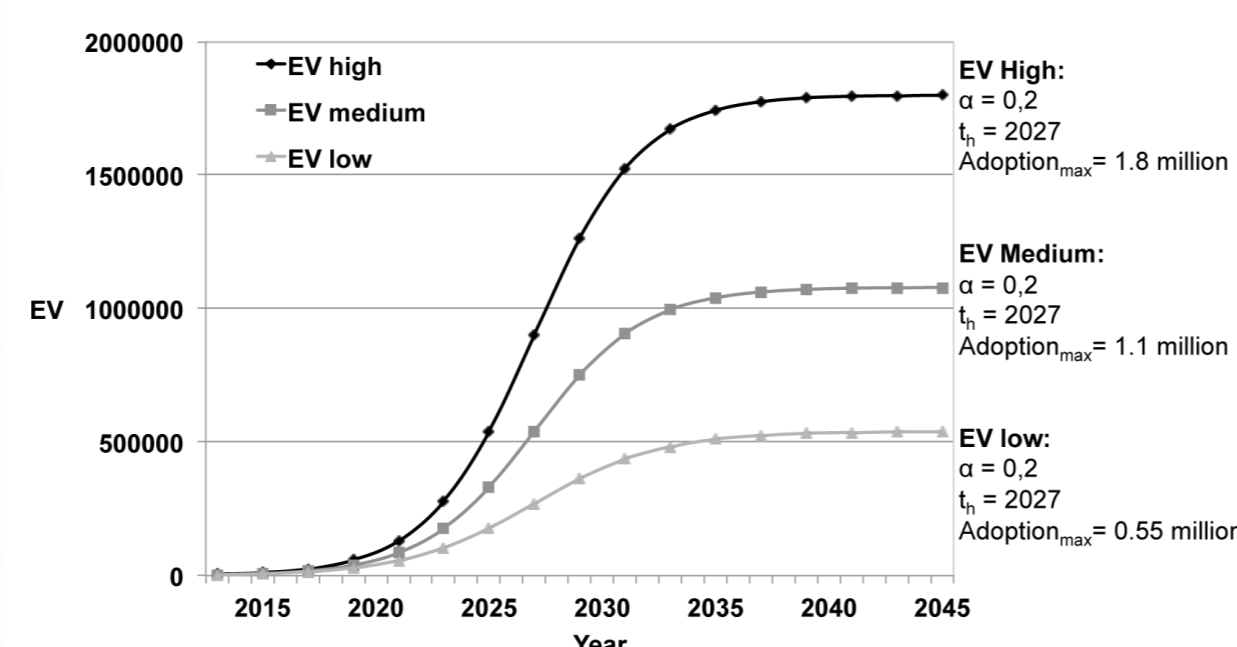
Which individual factors predict, explain, and influence consumer adoption and use of smart energy technologies that will result in a reduction of uncertainty in smart energy systems?

Who adopts smart energy technologies and why?



Adoption SET ≠ smart use

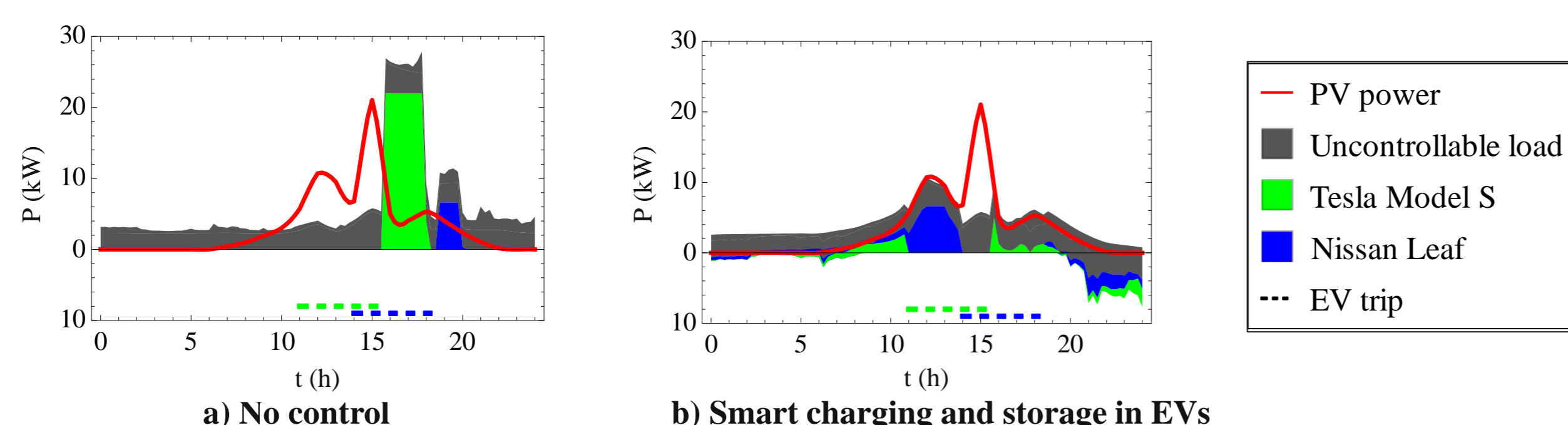
Early simulation results reveal that grid problems may already arise in Amsterdam in 2015, even if EV diffusion reaches only 50% of policy target.



Source: Eising, van Onna & Alkemade (2014)

Smart use = reduction of peak demand

An example of smart use of SETs is reducing peak demand by smart charging of EVs. EVs can also be used as storage for solar photovoltaic electricity.



Source: Van der Kam & van Sark (2015)

Environmental self-identity

Strong environmental self-identity, the extent to which you see yourself as a pro-environmental person (Van der Werff, Steg & Keizer, 2013), may promote durable and wide scale changes in smart energy behaviour.

How can the environmental self-identity be strengthened as to promote smart energy behaviours?

Method

- Multi-method approach: questionnaires, experiments, simulation modelling;
- Results of questionnaires and experiments serve as input for simulation studies;
- Results simulation studies serve as input for questionnaires and experiments.

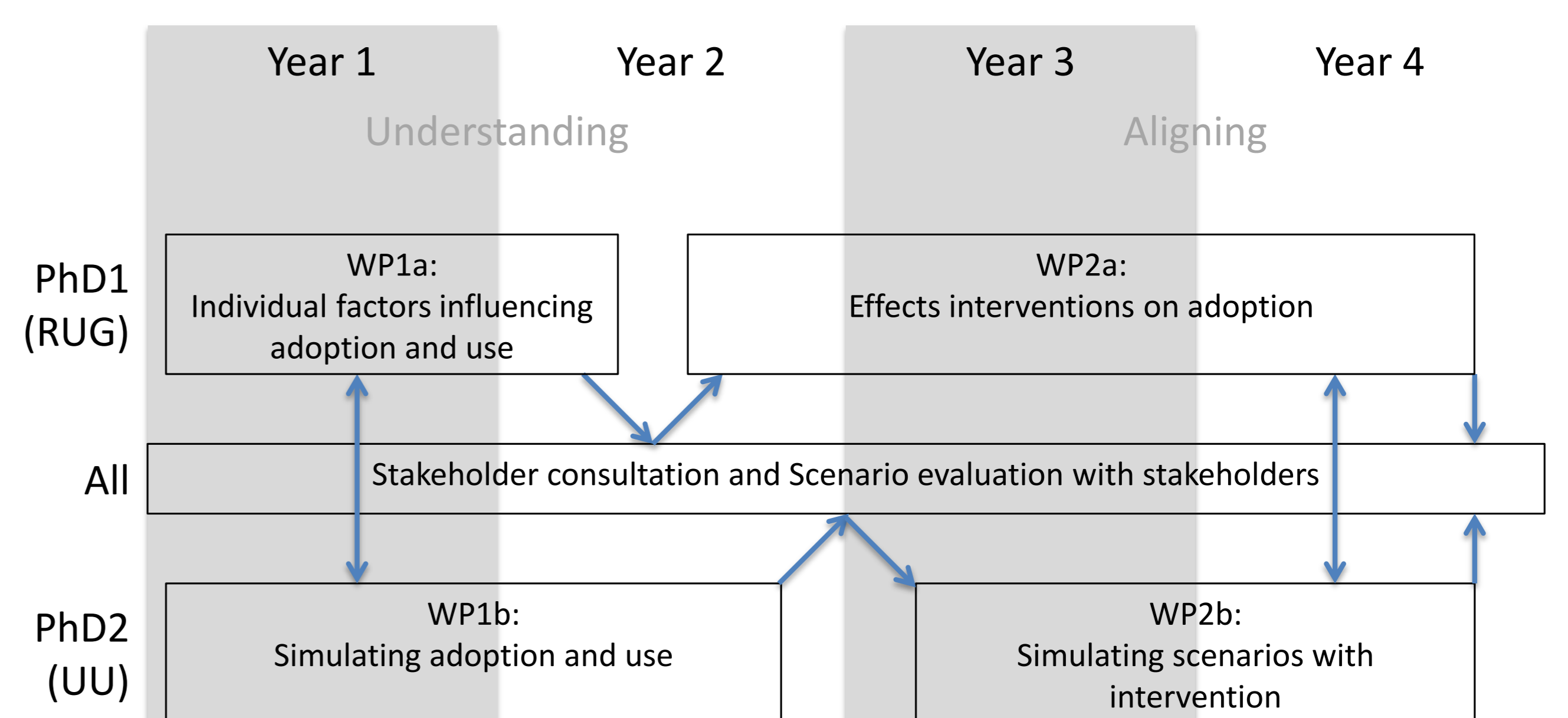
Current models	Our model includes...
...Macro & top-down	...Data about the grid
...Focus on technology & ICT	...Data about diffusion and use of several SETs
	...Behavioural factors influencing adoption & use

Expected results

Scenarios for SES that reveal where and when changes in energy infrastructure, investments and incentives are needed. Scenarios include:

- Accurate model of consumer behaviour;
- Capacity of the energy system;
- ...and are location-specific.

Planning



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