IEA DSM Task 17

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About TNO

TNO connects people and knowledge to create innovations that boost the sustainable competitive strength of industry and well-being of society.

TNO was founded by law in 1932 to enable business and government to apply knowledge. As an organization regulated by public law, we are independent: not part of any government, university or company.

Expertise:

- BUILDINGS, INFRA STRUCTURE & MARITIME
- CIRCULAR ECONOMY & ENVIRONMENT
- DEFENCE, SAFETY & SECURITY
- ECN PART OF TNO
- HEALTHY LIVING
- INDUSTRY
- INFORMATION & COMMUNICATION TECHNOLOGY
- STRATEGIC ANALYSIS & POLICY
- TRAFFIC & TRANSPORT

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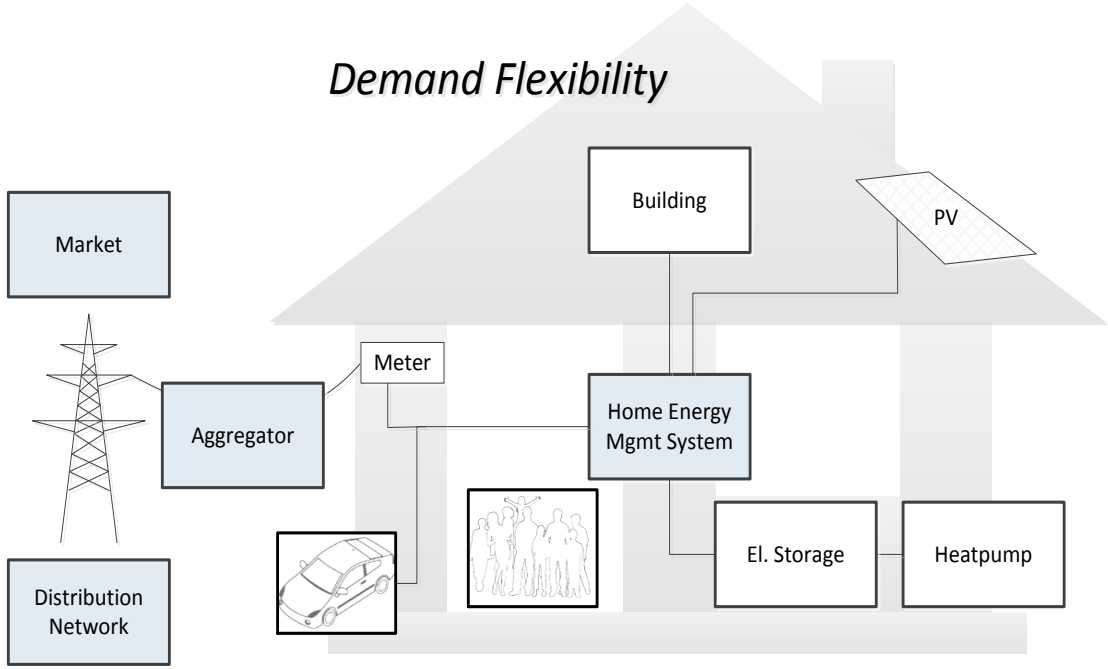
In total 2,600 professionals

Task 17: Integration of Demand Side Management, Energy Efficiency, Distributed Generation and Renewable Energy Sources

The main objective:

How to achieve the optimal integration of distributed generation, energy storages and flexible demand

- increase the value of distributed generation and demand response
- decrease the problems caused by intermittent distributed generation (mainly based on RES) in the physical electricity systems and at the electricity market.



Phase 1 (VTT: 2008-2010): Information collection on technologies and analysis
Phase 2 (VTT: 2011-2013): Projects inventory, qualitative analysis and maturity assessment
Phase 3 (AIT/TNO 2014-2016): Potentials, business models and quantitative analysis (US, Copper Alliance, S, CH, A, NL)

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Fair compensation

- Hourly energy cost tightly connected to the market day ahead prices

- Due to intermittent renewable productions prices vary more
- Extremely high prices usually occur due to inaccurate renewable predictions

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EYE market simulator is used to calculate day-ahead market price variability (€/MWh) for wind production increase (GW) in 2016

- While the electricity system market changes, prices cannot be guaranteed for demand response

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Demand response study for 2017 by TNO for a Dutch school building shows that a combination of a PV, heat storage and market participation via an aggregator can help decrease its yearly **gas consumption 25%** and the **energy cost by 12%**.

What will happen to the business case with the new prices?

How to create positive and realistic business cases for new demand response/electricity efficiency installations?

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Value of flexibility study for 30 MWh battery with charge/discharge speed 12 MW shows that the battery earnings increse with the average price spread

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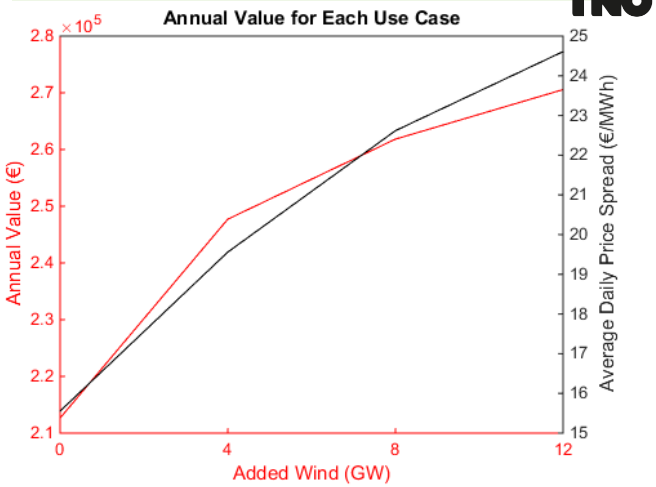


Responsiveness expectations

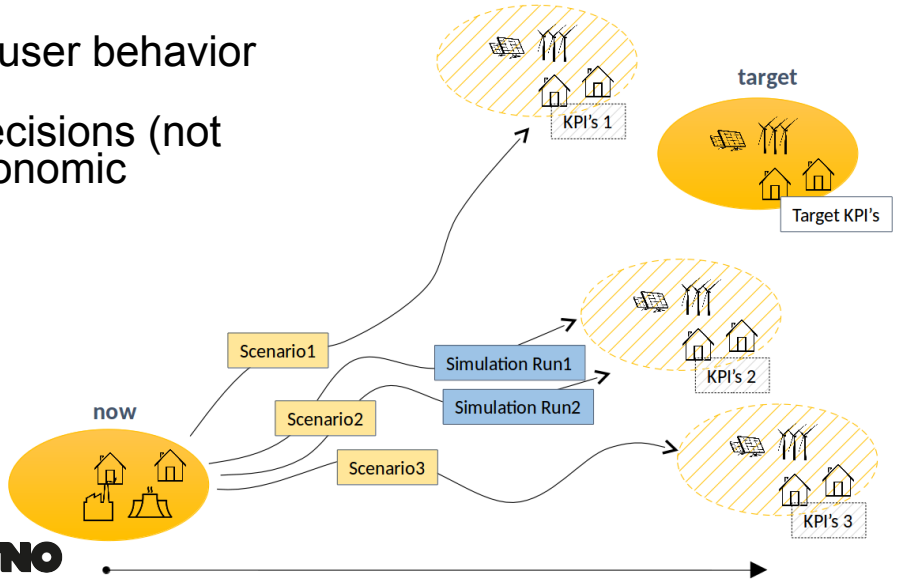
Experts expect the demand side management to be adopted if:

- The technology exists
- Positive business cases exist for users and aggregators
- DSM/EE can be used to reach national and regional energy transition goals
- Accepted by users

Extensive research with field trials evaluating how users behave in the context of demand response and energy efficiency

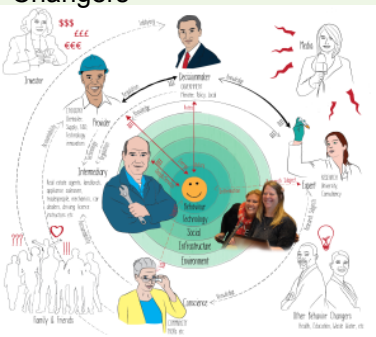
- Mostly technological possibilities are used to **evaluate business cases**, national policies and subsidies
- Simulators try to find an optimal user behavior to reach an economical goal.
  - Reality is that users make decisions (not always rational) and their economic situation is the result of that.

Updated user behavior models need to be used to calculate realistic business cases



DIDO tool: simulating energy-related investments strategies of a rational users

IEA DSM Task 24 Phase II: Behaviour Change in DSM – Helping the Behaviour Changers



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Task 17 Phase 4 Responsive Prosumer Networks

- Create and overview study on pilots with active prosumes to evaluate responsiveness highlighting:
  - how is the responsiveness characterized, measured, predicted and verified,
  - how is the responsiveness evaluated, incentivized and motivated.
- Lessons learnt from this study are used to extract knowledge on incentivizing the responsiveness with:
  - tariffs (commercial, distribution, tax),
  - subsidies,
  - innovative billing, including: access to information, instant feedback, micro-transactions and smart contracts.

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Questions?

TNO Netherlands organization for science and technology

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