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SGEM workshop on migration scenarios:

*Expectations of customers on smart grids*

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Satu Viljainen, LUT Energy



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Content of the presentation:

- Customer's needs
- Expectations on smart grids
- Benefits of smart grids



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What do I mean by smart grid?

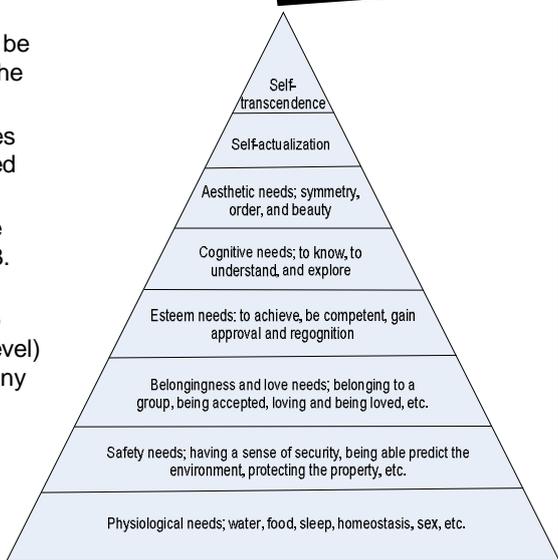
- From a customer's point of view, the question is essentially about having either *passive* or *active* network connection
  - In this presentation, the term smart grid refers to active network connection
- The next question is why should a customer want an active network connection
  - The benefits for the electricity system and for the society as a whole are obvious but what is the gain for individual customer?

## Maslow's hierarchy of needs



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- The lower level needs have to be fulfilled first before moving to the next higher level
- Active network connection does not directly fulfill any basic need → difficult to sell
- For comparison: mobile phone fulfills the need of belonging (3. level need)
- Electrification as such helps to fulfill physiological needs (1. level) and plays a role in fulfilling many other needs as well



The diagram is a pyramid divided into eight horizontal layers, representing Maslow's hierarchy of needs from top to bottom:

- Self-transcendence
- Self-actualization
- Aesthetic needs; symmetry, order, and beauty
- Cognitive needs; to know, to understand, and explore
- Esteem needs; to achieve, be competent, gain approval and recognition
- Belongingness and love needs; belonging to a group, being accepted, loving and being loved, etc.
- Safety needs; having a sense of security, being able predict the environment, protecting the property, etc.
- Physiological needs; water, food, sleep, homeostasis, sex, etc.

## Needs and expectations of customers' on smart grids



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- Customers need electricity
- Customers need to be able make choices that support sustainable development
- Customers need to have means to control their electricity and energy bills

Solutions provided by smart grid:

- Technical solutions (power electronics, network techniques, electricity storing) guarantee uninterrupted power supply
- Customer can easily utilize electricity storages, micro production, alternative heating and cooling solutions, etc.
- Customer's electricity usage is controllable and can be adjusted e.g. according to price
- In a few years, all of the above are 'must', not value added services

## Responding to the expectations



- There are different ways to direct the development of smart grids to fulfill the customers' expectations
  - Voluntary development – this would require that investing in the active network connection fulfills some basic need or brings clear benefits to customers
  - Economic regulation – network companies are rewarded in regulatory price or profit calculations for installing active network connections (and/or punished for installing passive network connections)
  - Norms (standards) – active network connection is made a norm, and the access conditions to the customer interface are standardized

## Voluntary development



- Nobody's basic need is to control electricity loads
  - For many, the potential monetary savings seem minor and bigger savings can be reached e.g. by changing the heating methods
  - Controlling the loads may even seem inconvenient rather than beneficial, and compromising the usability of the product is not an option
  - Arguing for the benefits of smart grids to customers is difficult
- Voluntary development would probably be a slow process leading to non-harmonized technical solutions

## Economic regulation



- Economic regulation can be used to promote the replacement of passive network connections with active ones
  - Active network connections are rewarded in profit or price calculations
- Economic regulation as such does not guarantee that the active network connections have open interfaces
- Economic regulation alone would probably result in rather slow emergence of active network connections and lead to non-harmonized technical solutions
  - Willingness to develop services that utilize active connections would suffer from the poor technical availability

## Norms (standards)



- Directing by norms is the fastest way to guarantee the diffusion of certain technique
- Uninterrupted electricity supply, easy access to the customer interface, and the controllability of loads will be the standard level of operation, not value-added services that can be charged separately
  - Norms work well in guaranteeing these to all customers

Norms are needed because customers can easily live without active network connections but the electricity market cannot live without flexible demand

## Benefits of smart grids



- Active network connection is a requisite for flexible demand
- From the electricity market's point of view having a flexible demand makes all the difference because it is the key to workable competition
  - Customers benefit from the increased competition
- From the society's point of view flexible demand enables the efficient use of resources
  - Efficient use of capital
  - Sustainable development

## Conclusions



- From the customer's point of view, the most significant benefits of smart grids are indirect
  - Increased competition in electricity market
  - Sustainable development
- Once in place, the electricity saving, demand response, and other services that make use of the active network connections can be developed
  - Differentiated according to the customer type
- To achieve the benefits of demand flexibility, active network connections should be made a norm and the customer interface should be standardized
  - Technology should support the development of demand response services