New AncIllary Services (NAIS) for the Smart Grid

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Program

- Part I – 40-45min
  - Talks
    - Iván S. Razo-Zapata: On social and economic value co-creation for the Smart Grid
    - Mihail Mihaylov: NRGcoin: Decentralized currency for renewable energy
    - Bryan Mulder: Value Exchange - Energy or Currency?
    - Roxana Rădulescu: Multi-agent Learning for Smart Grid Management and Control
- Part II – 50-70min
  - Brainstorming
- Part III – 40-45min
  - Wrap up
  - 10 min presentation

On Social and Economic Value Co-Creation for Smart Grids

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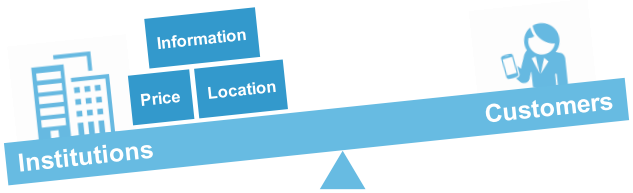
Context

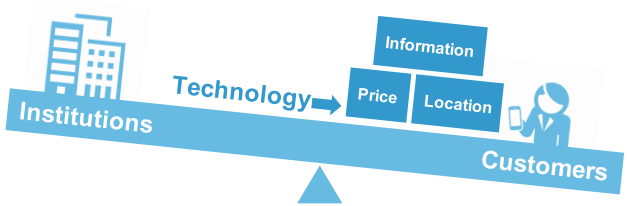
- Economic growth has been linked to energy consumption (mostly non-environmentally friendly)
- Decarbonizing our economy
  - Promote economic growth using environmentally friendly sources of energy
- New services can support the creation of economic and social value
- Operators and customers should both benefit from these new services by co-creating value

Lessons learned
Smart Cities

- Transformation due to digital technology
- Collaboration
- Cooperation
- Coordination

	City Government	People
City 4.0	Collaborator	Co-Creators
City 3.0	Facilitator	Participants
City 2.0	Service Provider	Consumers
City 1.0	Administrator	Residents





Lessons learned
Smart Grid

- Same transformation, i.e. customers gaining some “power” through technology
- Operators and customers collaborating to co-create **value**
- Operators [1]
  - Profits, flexibility (improved services), stability, low energy losses
- Customers [1]
  - Lower prices for energy, revenues for collaborating in ancillary services, greater power quality

[1] Niesten, E. and Alkemade, F. (2016). How is value created and captured in smart grids? a review of the literature and an analysis of pilot projects. Renewable and Sustainable Energy Re- views, 53:629–638.

Research agenda

Value? A.k.a. beyond energy efficiency and costs

- System Value [2]
  - **net benefit** arising from the addition of a wind or solar power plant
  - determined by the **interplay of positive and negative effects** arising from the addition
    - **Positive**: reduced fuel costs, reduced CO2, reduced need for grid usage and associated losses
    - **Negative**: higher costs cycling conventional power plants, additional grid infrastructure
  - Power generation: **when**, **where** and **how**

[2] Next Generation Wind and Solar Power - From cost to value. Technical report, International Energy Agency (IEA), 08/2016 2016.

Research agenda

Value? A.k.a. beyond energy efficiency and costs

- Social value
  - Societal goals
  - Preservation of the environment
  - Quality of life – well-being
  - Perception of the benefits provided by smart grid solutions

Research agenda

Value? A.k.a. beyond energy efficiency and costs

- Exploit **ICT** [3]
  - Real-time operation
  - Sensing, analyzing, reacting
- New **business models** [4]
  - Value co-creation
  - P2P collaboration
  - Revenue models that incentive prosumers and consumers

[3] Appelrath, Hans-Jürgen; Terzidis, Orestis; and Weinhardt, Christof (2012) "Internet of Energy - ICT as a Key Technology for the Energy System of the Future," Business & Information Systems Engineering: Vol. 4: Iss. 1, 1-2.
[4] Satchwell, Andrew, and Peter Cappers. "A Framework for Organizing Electric Utility Regulatory and Business Models." The Electricity Journal (2015).

Addressing new challenges

- How to engage customers in new services?
- Initial stages (design) – final stages (operation)
- Co-create value
  - New ways of collaboration
  - Exploit ICT and business models (revenue management)
- Value: Economic and social aspects
  - Costs, flexibility, quality of power, well-being

Thank you!

Questions?

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