TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

Dr. Hans Auer
Energy Economics Group (EEG)
Vienna University of Technology

Technical, Economic and Social Benefits of Smart System Integration

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PVPARITY

SmartBuild

Agenda

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   - 2.3 Social Benefits
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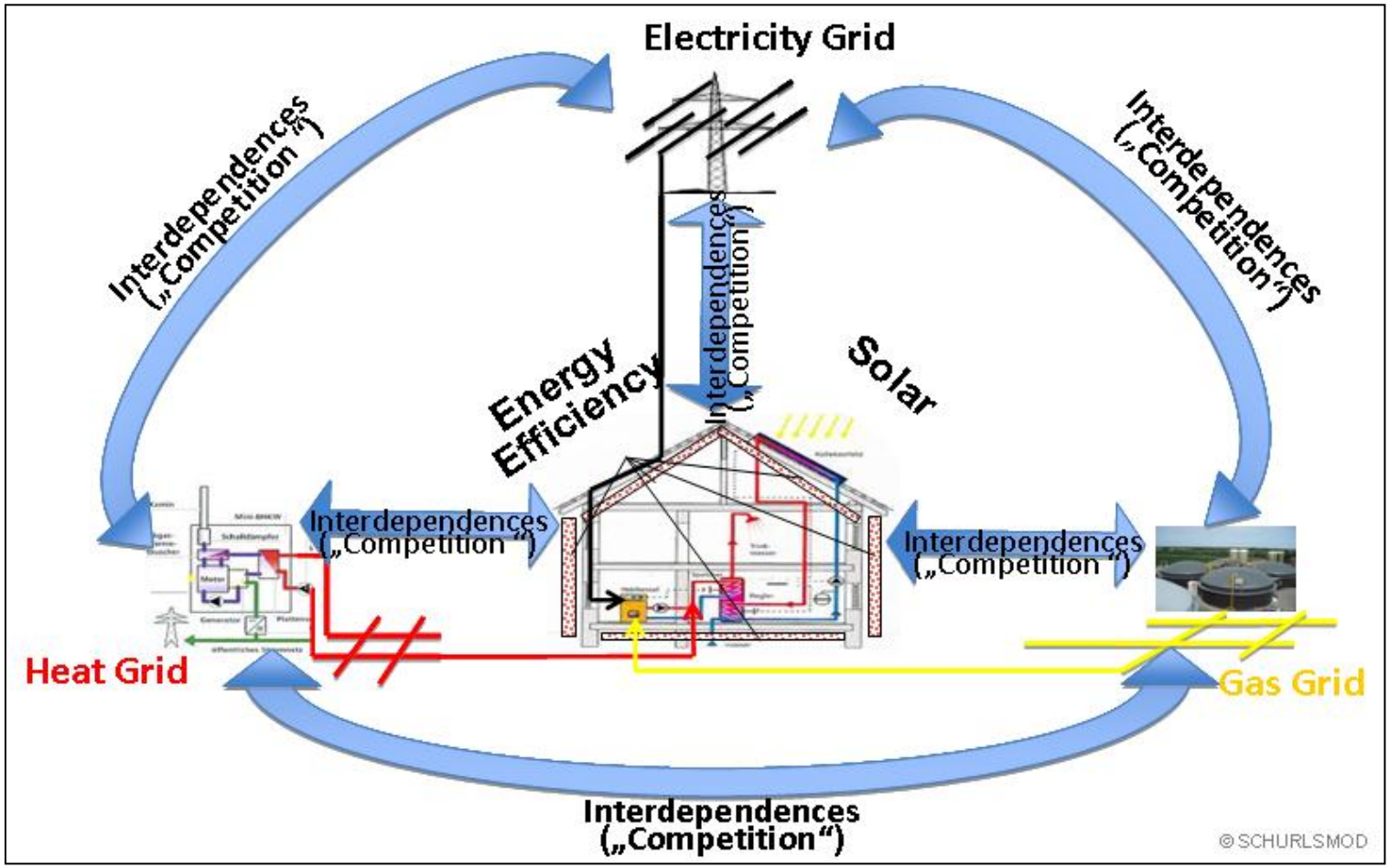
1. Introduction



Smart = Interdependences („Competition“) between the different distribution grids (electricity, gas, heat), energy efficiency and solar (thermal, PV)

2. Overview of Benefits

Different kinds of benefits of smart system integration:

- Technical benefits
- Economic benefits
- Social benefits

Analyses, case/field studies and large-scale implementation needs to be conducted and understood on different levels:

- Individual consumers point-of-view („bottom-up“)
- model areas/regions level („aggregates“),
- on energy system level („top-down“)

… in order to maximize welfare gains on several levels and scales in time, short- and long-term.

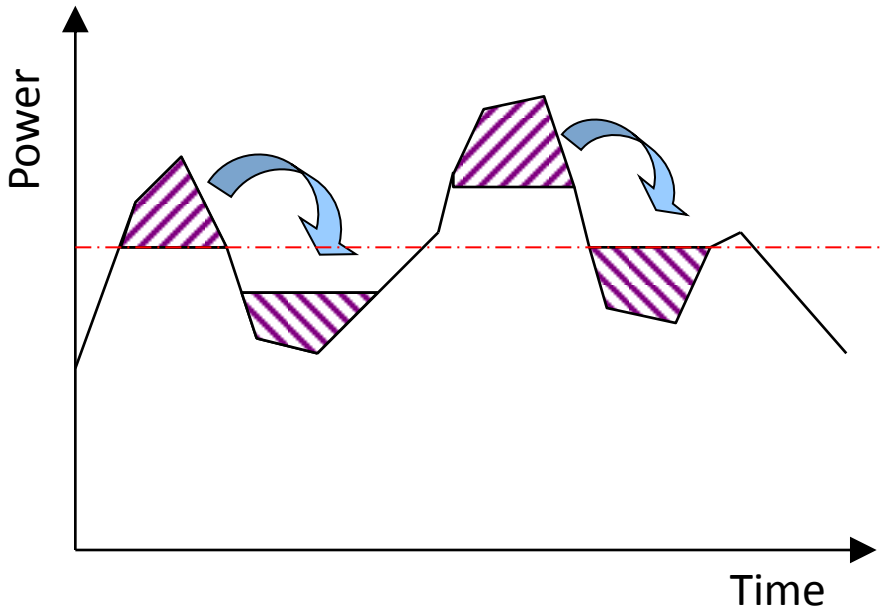
2.1 Technical Benefits

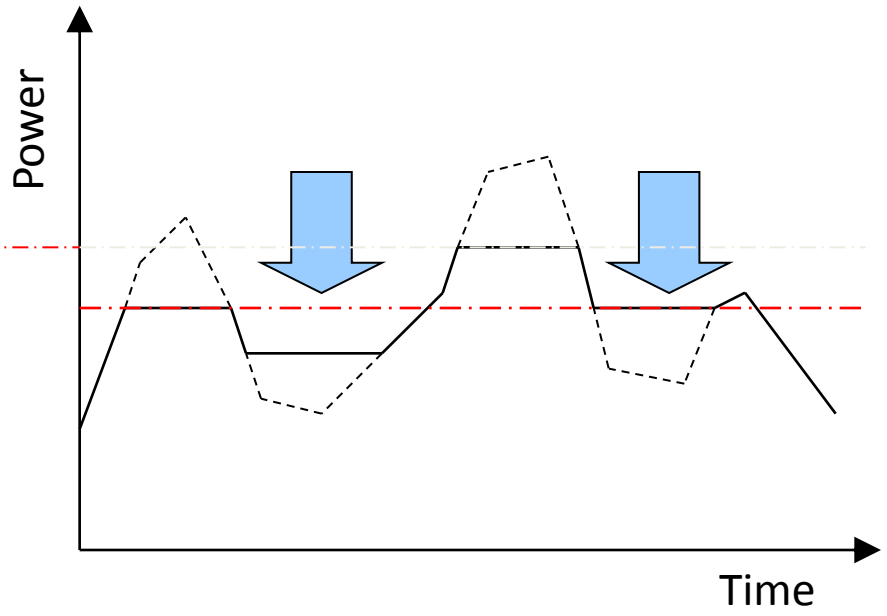
The implementation of integrated energy management systems and innovative new technologies (like PV, solar thermal, heat pumps, cooling systems, energy efficiency technologies, others) results in …

- Energy savings and
- Reduced peak demand (at critical hours for the energy system)

=> Reduced stress on the distribution grids, less energy and peak demand to be provided to the buildings by the distributor network operator and reduced investment needs on distribution grid level

2.1 Technical Benefits (cont'd)



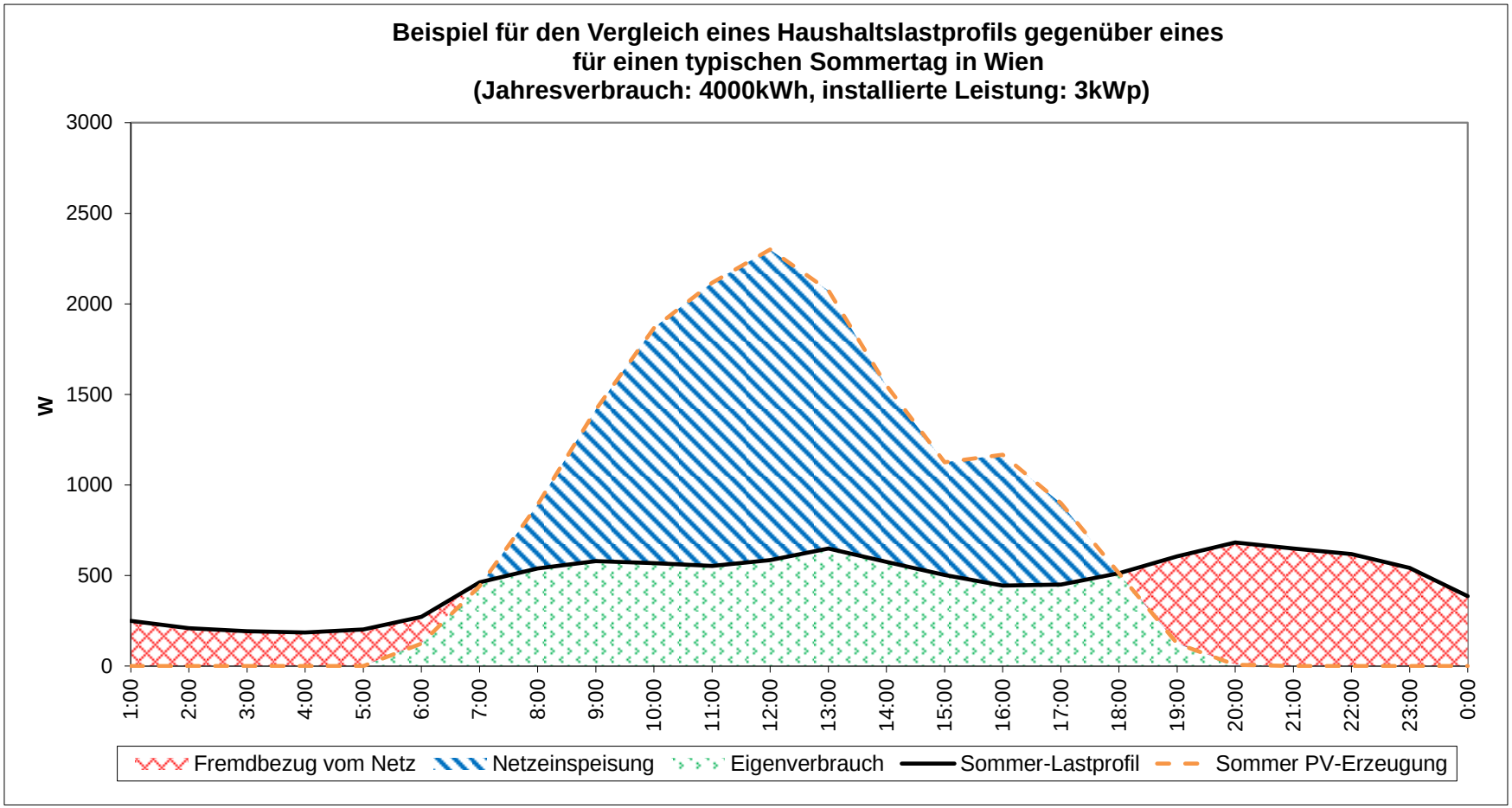


Peak Load Shaving

Efficiency Increase

….well known principles

2.1 Technical Benefits (cont'd)



….“revolution“ due to smart decentralized PV integration

2.2 Economic Benefits

Major objectives of household customer and building/energy managers is to find a positive trade-off between

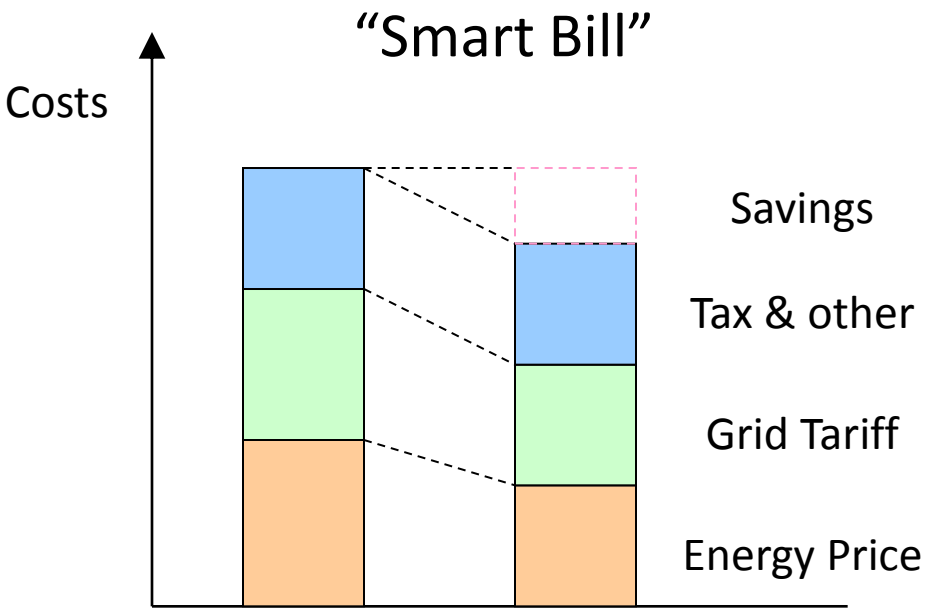
- short-term investment cost of new innovative technology necessary to exploit the full technical potentials, on the one hand, and
- medium- to long-term energy and peak demand savings and, thus, “direct” monetary benefits, on the other hand.

Further economic benefits besides “direct” monetary savings:

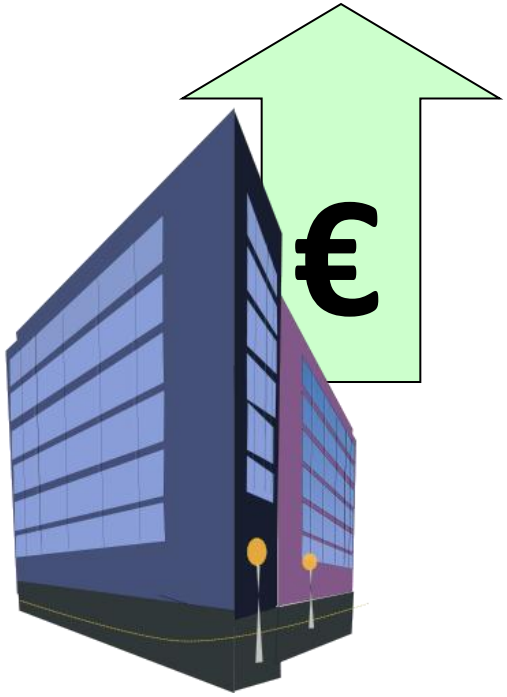
- General increase of the value of building
- Increase of expected useful life of buildings

On energy system level, new business models need to be developed for the different market participants (prosumers, consumers, grid operators, generators) and testing is necessary towards so-called “Pareto optima”.

2.2 Economic Benefits (cont'd)

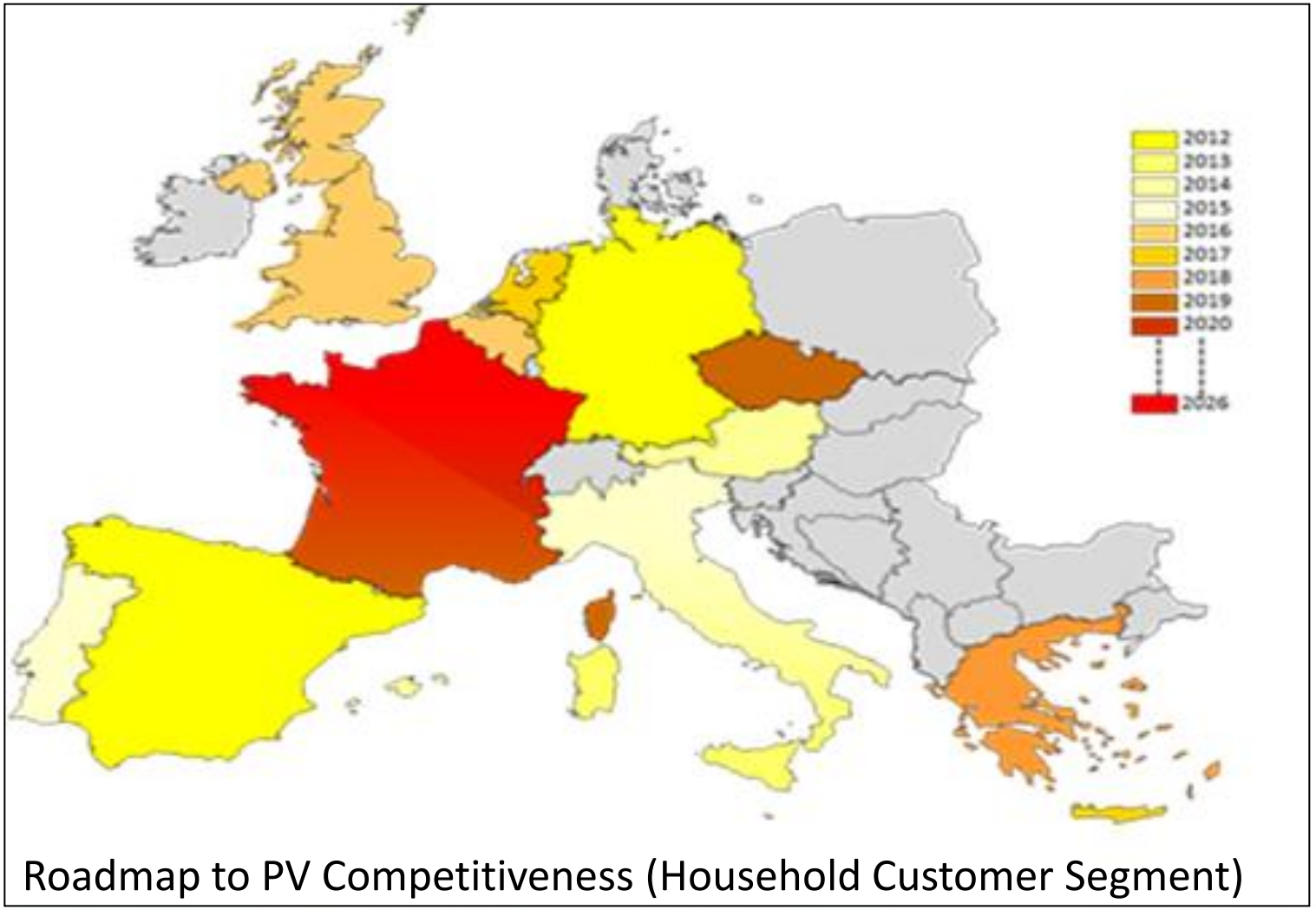


Decrease of electricity costs



General increase of the value of the building and an increase in the expected useful life of the building

2.2 Economic Benefits (cont'd)



Roadmap to PV Competitiveness (Household Customer Segment)

2.3 Social Benefits

Increased comfort for building users/occupants is also one of the major objectives when integrating new energy management systems and innovative new technologies into private, public, commercial buildings:

- without behavioural changes
- with behavioural changes

In case of behavioural changes necessary, it is important that the building users/occupants try to understand the basics of the "interplay" on the interface between consumer and corresponding energy flows in the building:

- Appraisal and interpretation of the social acceptance and social benefits (and, in case, also *discomfort*) of the implementation of integrated energy management systems and innovative new technologies
- Field studies necessary incl. tailor-made training courses, questionnaires
- Monitoring at different points in time (beginning, during, end).
- Diversity of field studies very important

2.3 Social Benefits (cont'd)

Diversity in terms of…

- Geographical location: buildings in different European countries covering different climate zones and also different life styles finally affecting consumer behavior
- Building types and uses: private, commercial, public (schools, hospitals, administrative offices, etc.)
- Building performance and status: with and without installed innovative technologies and energy management systems
- Kinds of building owners: households, small commercial sector, municipalities, public real-estate holdings, large municipalities, etc.
- Building management solutions: non (households, …), energy managers, general building manager
- Etc.

3. Synthesis, Conclusions

Example: Synthesis for Residential RES-Heating

Preferable Heating Strategies Depending on End-use Efficiency Ambition up to 2050			Expected End-use Efficiency Implementation 2030 - 2050	
			Low	High
Stand Alone	**Non grid connected RES-H** (e.g. stand alone biomass in less dense & rural areas,Solar thermal collectors)		o	+
Network Infrastructure	**Electricity Distribution Grid**	Direct electric heating (e.g. Norway)	o	-
		„Innovative“ electric heating (e.g. heat pumps)	-	+
	Heat Distribution Grid	CHP-based RES-H (e.g. Biomass / Biogas in dense areas / municipalities)	+	-/o
		District heating (e.g. various fuels in dense areas / municipalities)	+	-/o
	Gas Distribution Grid	RES-G fed into gas distribution grid	+	-
		Natural gas and LNG fed into gas distribution grid	+	-

+…Preferable Strategy O…Indifferent -…Non Preferable Strategy

Source: Auer (2010)

3. Synthesis, Conclusions (cont'd)

Bottom-up analyses/field studies in the different sectors (household, commercial, industry, tertiary) are essential in order to get comprehensive knowledge/experience on technical, economic and social benefits ….

…next decoupling from individual cases and/or model regions is possible…

… and patterns for replication/transferability on large scale can be found across Europe.

Simultanously, top-down analyses on energy system level is necessary. This is already more complex & exciting than ever before…