Evolutions in energy conservation policies in the time of renewables

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Main discussion points:

The on-going transition to renewable energy sources may entail:

- a different relationship with time (stocks vs. funds of energy sources, energy vs. time)

- **a complexification of energy systems** (decentralization, connectivity, hierarchies, deeper unpredictability of energy systems evolution, rebound effects of EE)

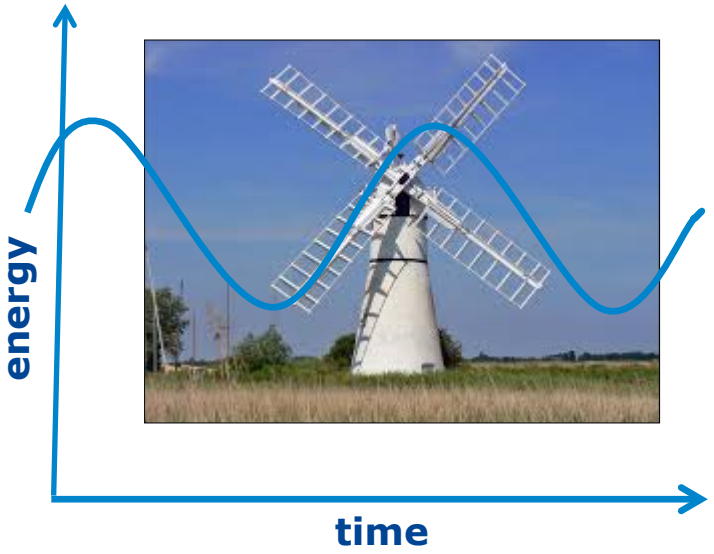
- **a need for more evolved approaches to energy conservation** (new social practices fostering lower total energy consumption and power demand, time management policies, energy co-operatives)

Renewable energies vs. time

STOCKS
Non - Renewable energy sources are like a candies box

We can decide to consume all candies NOW or some candies now and others tomorrow.

FUNDS
Renewable energy sources take us in the temporal dimension



We can only get LIMITED AND QUITE UNPREDICTABLE AMOUNTS of power capacity today, other limited amounts tomorrow and so on…

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Energy vs. time

Energy and **time** are closely implicated physical quantities.

Energy would not be of any practical use if it would not be assumed to obey a **conservation principle** holding within **isolated systems.**

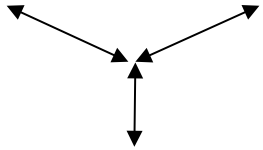
Energy conservation is a consequence of **time homogeneity**

Renewable energies determine an increase in **energy systems openness** and makes these systems more dependent on exogenous energy source supply rates.

Can it be assumed that **time is not necessarily homogenous** within **not isolated systems relying on renewable energy sources** and exchanging energy flows with the external environment?

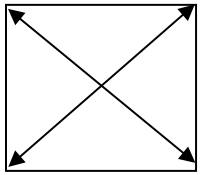
Renewable energies vs. space

Complexification due to decentralised renewable energy networks



Production and distribution structure of energy from non-renewable energy sources

Star like structure with energy flowing from few production centres



Production and distribution structure of energy from decentralised renewable energy sources

- **Small production centres highly dispersed over the territory (more outsourcing/delegation)**
- **higher connectivity/adaptability (prosumers)**
- **more parameters and hierarchical levels to control the overall production and distribution process**
- **energy systems control and management strategies affected by a deeper uncertainty**
- **autonomy loss by production/consumption centres**
- **self-reinforcing mechanism between power capacity growth and energy efficiency increase**

A large-scale transition to complex renewable energy systems requires that energy efficiency policies are increasingly accompanied by:

Policies for the time management of energy demand, due to the **fluctuations** in the energy supply and the energy that can be saved by managing the timing of social practices.

Policies limiting total consumption and power demand (most probably in complex renewable electricity networks), due to **the increasing final energy consumption** and the **amplification of rebound effects of energy efficiency improvements in complex systems (energy prosumers)**

Local, bottom-up and self-organised policy approaches to energy conservation, due to the **deeper uncertainties** affecting the evolution of complex energy systems.

These aspects of the on-going transition cannot be dealt with by relying exclusively on so called smart ICT based demand management approaches

Complementing mainstream ICT/technology based approaches with new social practices for energy conservation

Policies for time management

Regulations on opening hours of shops, schools, pubs, etc.
Conventions concerning holidays, travel commuting, urban planning, etc.

Policies limiting total energy consumption and power demand

Accompanying policies for the reduction of the energy **input** of practices with polices rearranging and reorganising the **output** of practices (e.g. sufficiency strategies)

Self organization policies

Integrating commons-based institutional settings (energy co-operatives) where energy sources and the technical equipment for energy generation are owned in common by people **into competitive market settings.**

Conclusions

Planned strategies relying only on ICT/technological solutions to ensure a sustainable transition to renewable electricity networks **are at fault twice because:**

- they do not consider that existing social practices might not be as adaptable as expected and might hence represent an insuperable obstacle to the technological transition envisaged.

- social practices can provide an innumerable amount of alternative and more sustainable solutions to realize a transition that can better adapt to constantly changing local conditions.

Thank you!

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