

# Energy Systems - Now & Beyond!

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# Content

- \* The Now & Challenges
- \* The Needs + How
- \* Conclusion



# The Now & Challenges (1)

- \* **Centralised Generation**
  - \* Waste often large (e.g. heat) -> **Poor overall Efficiency ? (e.g. CHP)**
  - \* **Slow (demand) response time: on/off**
  - \* **Large projects with long development times**
  - \* **Disconnected from actual users**
- \* **Hierarchical Distribution Network**
  - \* **Designed for feed in from "top"**
  - \* **Restricted flexibility**
  - \* **Challenging integration of localised generation**



# The Now & Challenges (2)

- \* Heat and Electrical generation & networks are most often disconnected
- \* Inefficient
- \* Energy storage:
  - \* Mainly large scale, which can be slow, inflexible and requires long development times
  - \* Sometimes poor (round-trip) efficiencies (e.g. Hydrogen)
  - \* Not always sustainable (e.g. batteries)



# The Now & Challenges (3)

- \* Energy providers:

- \* Large & inflexible

- \* Risk averse

- \* Profit driven

- \* Benefits towards sustainability ?

- \* Often avoid investment until the equipment fails miserably, and then let government pay for it.

- \* Long term planning ?



# The Needs + How (1)

- \* **Decentralised generation:**
  - \* **Where ? Local Communities**, but how local/large ?
  - \* **Communities should be self-sufficient but linked with neighbouring communities** for balancing.
  - \* **Benefits:**
    - \* **Community feeling & responsibility**
    - \* **Creates awareness of energy generation/ consumption**
  - \* **Devices need to be autonomous and interactive**, so one can build up a "network" that is also future proof.



# The Needs + How (2)

- \* Energy Storage:

- \* New technologies needed for efficient short & long term storage.
- \* How to integrate/combine storage and generation to match demand ?
- \* How to drive/adjust demand if and where possible ?  
Without further separating "rich" & "poor".



# The Needs + How (3)

- \* **Network** needs to be restructured:
  - \* **More local interconnect**, maybe still some hierarchical interconnect.
  - \* **Which equipment** can stay, what needs to change?



# The Needs + How (4)

- \* What becomes the **new role of the current "energy providers"** in this new model?
- \* How to create a **sustainable business**?
- \* **Independent advise**?
- \* **Backup generation/storage** for seasonal changes and/or averse weather conditions.
- \* How can **customers** be **put (more) central**?



# The Needs + How (5)

- \* Political / Societal and Economic needed changes:
  - \* Long term strategies / planning
  - \* Create local and global communities
  - \* Creating “virtual” money and developing for pure economic profit / “self” benefit are not long term sustainable ...
  - \* Politics will need to drive/promote cultural changes, set the scene & demo the example



# Conclusions

- \* The Energy Challenge is:
  - \* multi-disciplinary, and even expands beyond energy
  - \* if addressed as such, it can bring Europe closer together and eliminate borders of nations, through and within research.
- \* There is quite some change required, but it needs to be well "calculated" from all aspects.
- \* The aim should be to:
  - \* bring Europe closer together.
  - \* make Europe world leading, exemplar, self-sufficient & sustainable!



THANK YOU!



# Discussion

