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Building the Energy Internet

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a) Next step of smart grids
b) ICT-enabled power grid
c) The future safer, better, more efficient grid
d) All the above
e) None is correct

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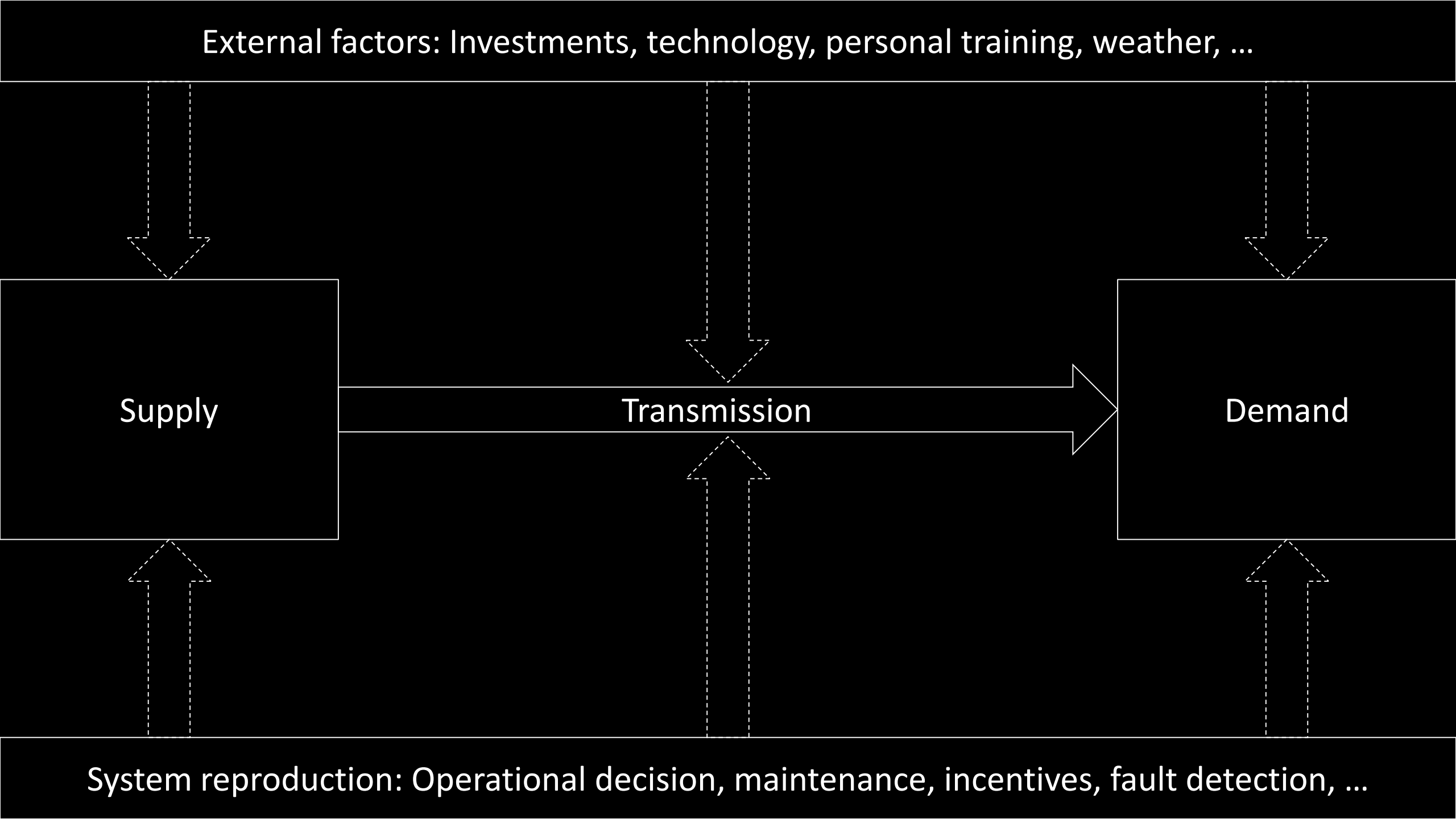
Energy System ⇔ Data Internet

How to define a specific system?

- **Operation:** Peculiar operation(s) and/or characteristic(s)
- **C1:** Conditions of production
- **C2:** Conditions of reproduction
- **C3:** External conditions

Electricity power grid as a system

- **Operation:** Interchange of electric power
- **C1:** Electric energy is produced and demanded
- **C2:** Maintenance, operational decisions to ensure power quality,…
- **C3:** Investments, qualified personal, raw material, technology,…


External factors: Investments, technology, personal training, weather, …
Supply
Transmission
Demand
System reproduction: Operational decision, maintenance, incentives, fault detection, …

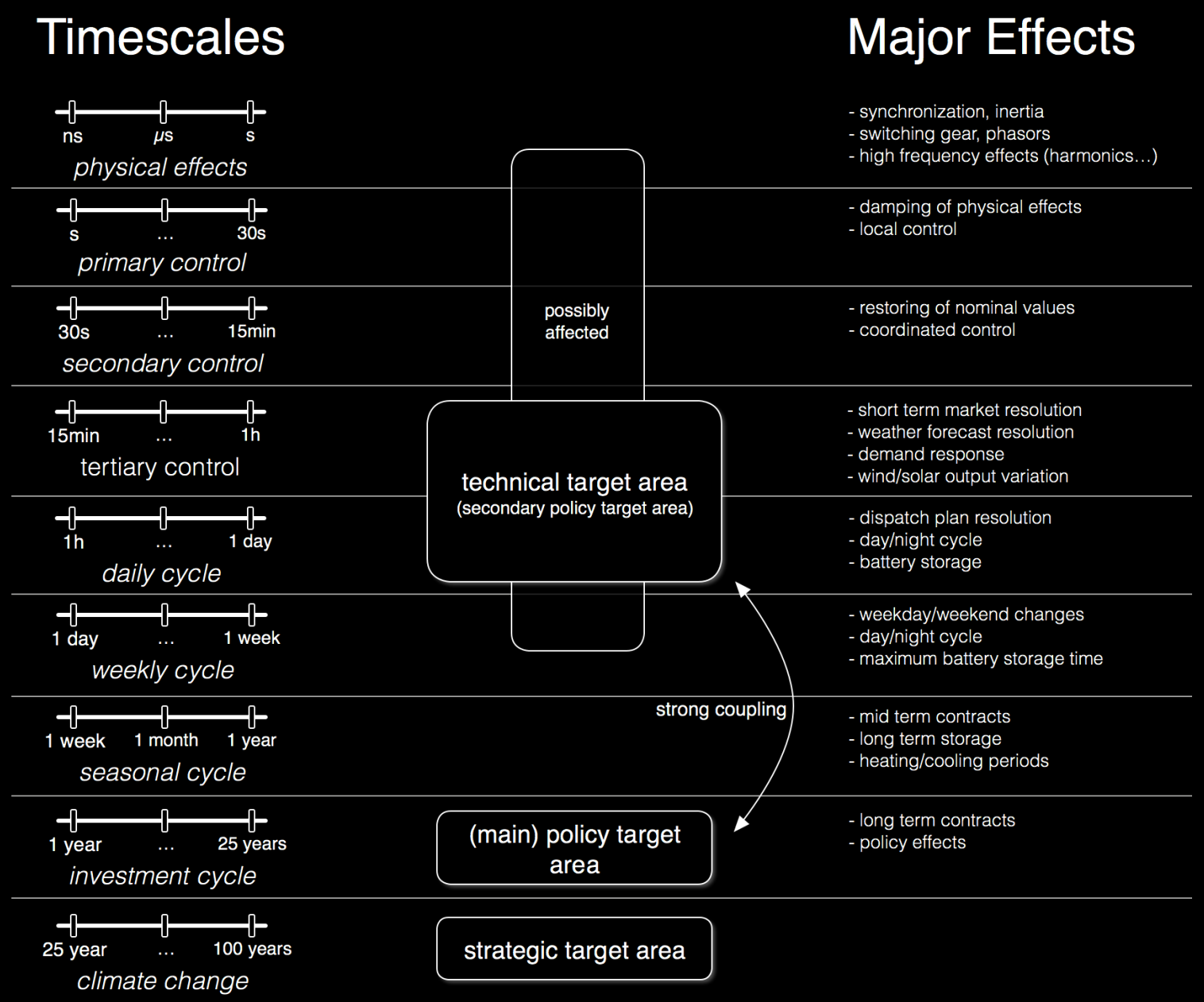


Figure by Florian Kühnlenz

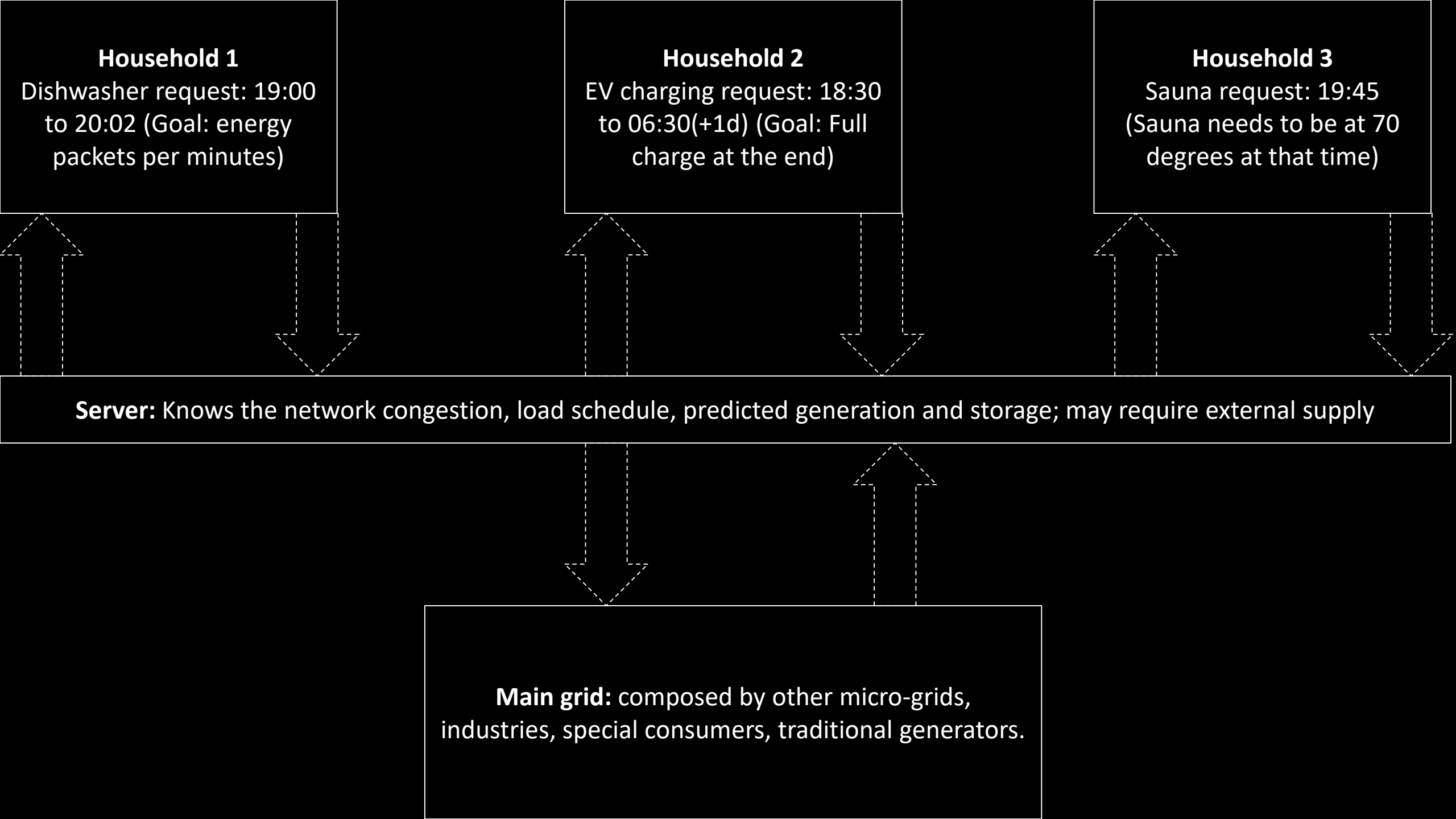
With small-scale generation and storage increase,
we need to **differentiate big users** and **households**

Big users' solution

Liberalized market as in Europe makes sense:
big suppliers and big users in day-ahead bids

Households' solution

Energy Internet defined as the management of energy systems based on **packetized energy**


Household 1
Dishwasher request: 19:00 to 20:02 (Goal: energy packets per minutes)
Household 2
EV charging request: 18:30 to 06:30(+1d) (Goal: Full charge at the end)
Household 3
Sauna request: 19:45 (Sauna needs to be at 70 degrees at that time)
Server: Knows the network congestion, load schedule, predicted generation and storage; may require external supply
Main grid: composed by other micro-grids, industries, special consumers, traditional generators.

How to scale up this solution?

We must politicize technology

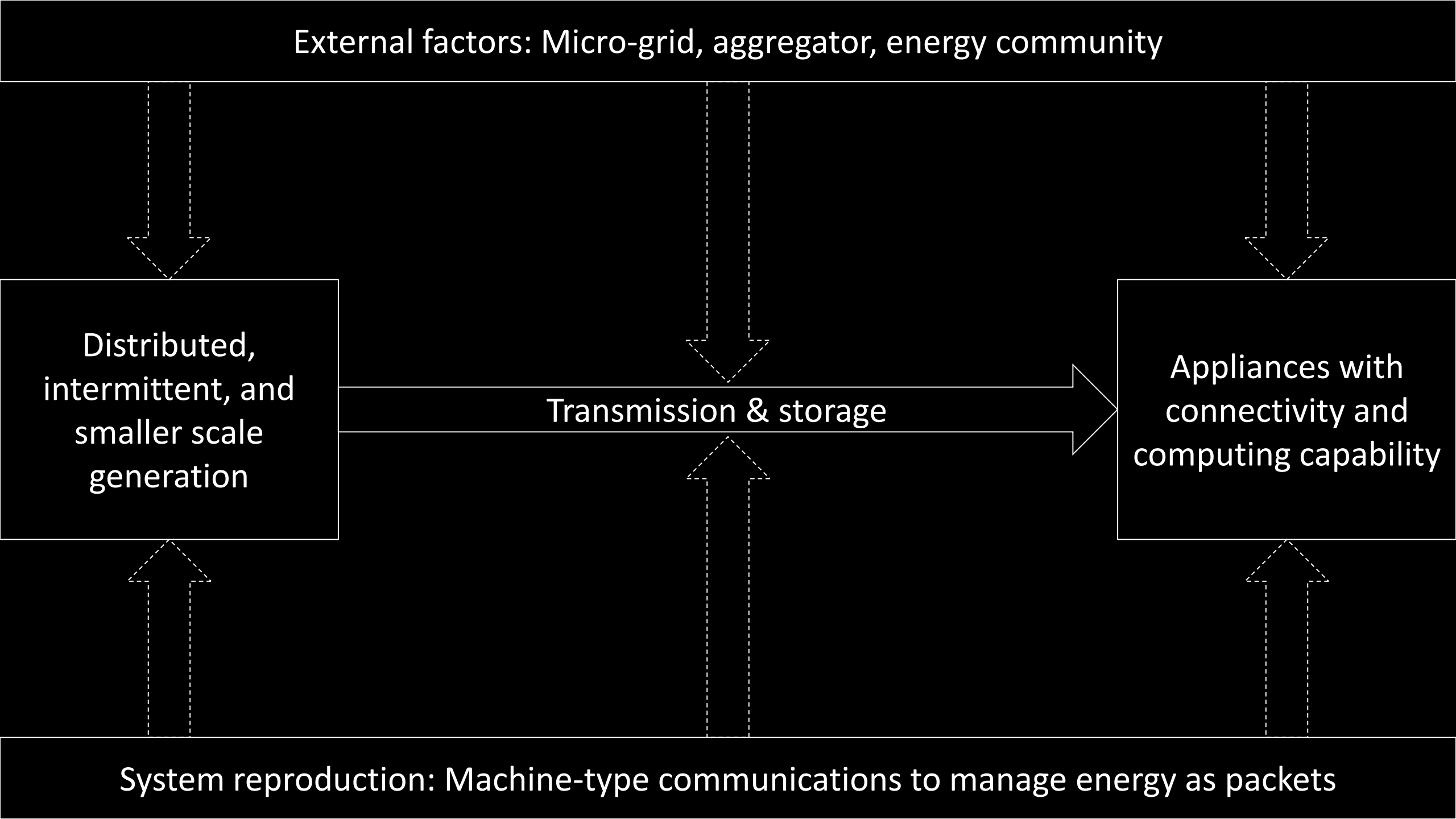
Electricity for households
neither **as a commodity** nor **as a service**

Electricity for households
but **AS A COMMONS**

But this can only work in a different society…

One that is **NOT** based on **exponential growth** structured by **scarcity**, **competition** and **exploitation**

But one structured by **cooperation** and **abundance**, but also capable of managing situations of scarcity


External factors: Micro-grid, aggregator, energy community
Distributed, intermittent, and smaller scale generation
Transmission & storage
Appliances with connectivity and computing capability
System reproduction: Machine-type communications to manage energy as packets

Final thought

Why blockchain and (local) markets are NOT the answer to Energy Internet?

Final thought

Energy Internet is **NOT** to **unlock** or **create value**

Final thought

Energy Internet is to **unlock use** and **create a commons**

Questions?

More details: https://arxiv.org/abs/1804.09363

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