

# Energy sharing in citizens communities

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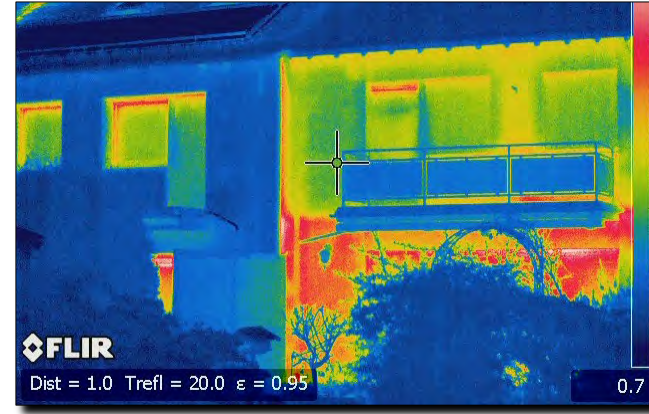
18. April 2024



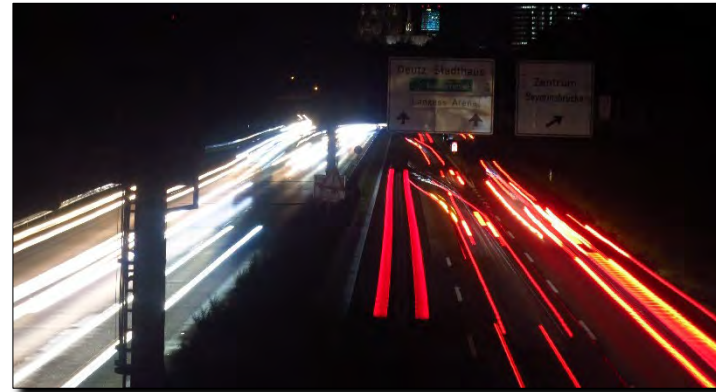
# Aspects of Energy Change



Energy generation:  
Wind and solar energy



Energy use: Heating



Energy use: Traffic

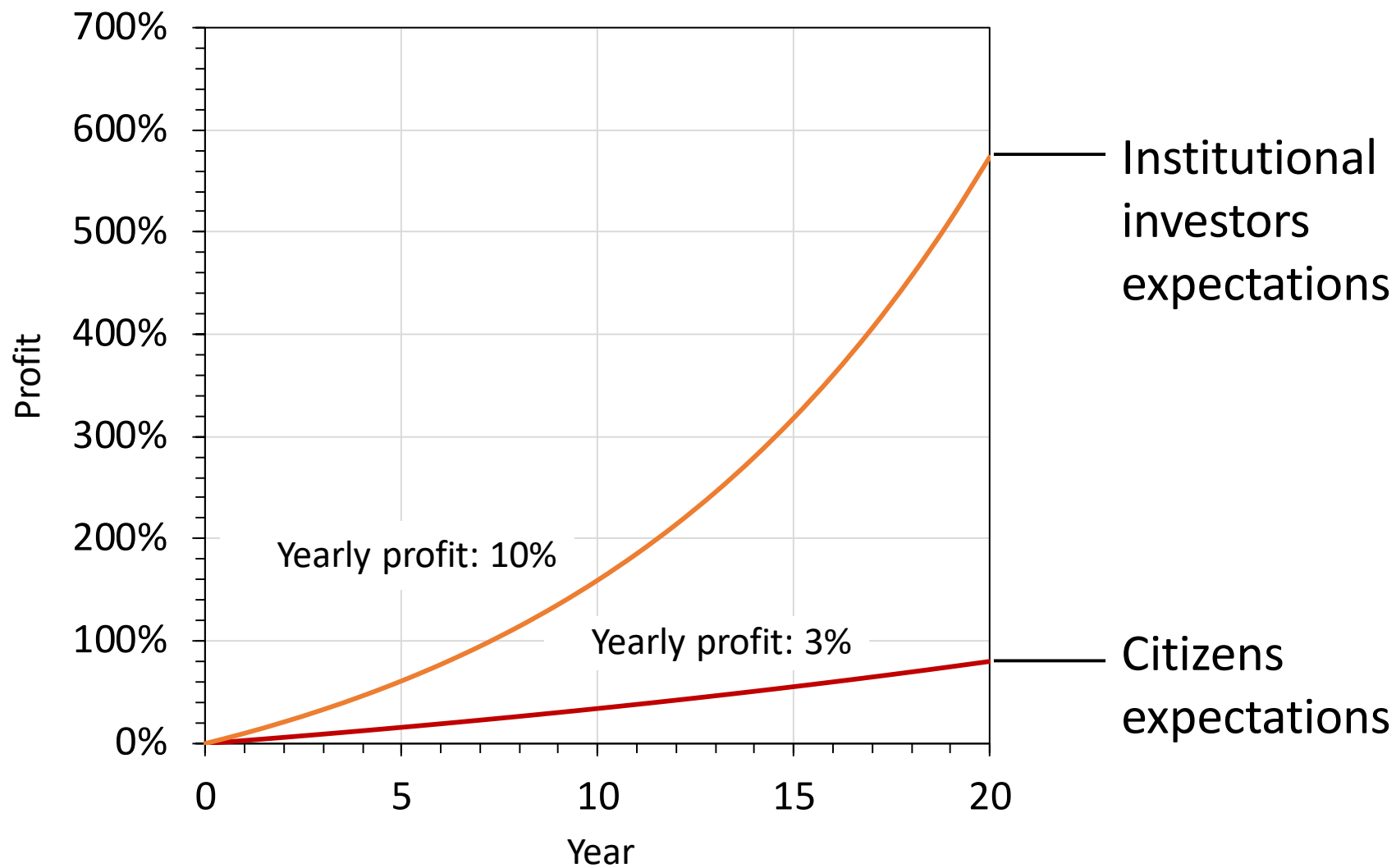
## Everybody is involved!

# Involvements of citizens

The majority of the energy transition is financed by citizens in Germany!



# Citizens involvement is cheaper



Spending money on

■ Investments:  
Needed anyhow

■ Profit:  
relates to cost

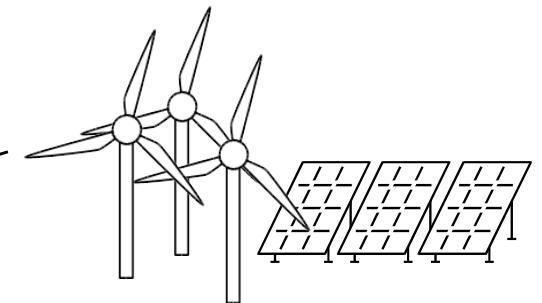
# Profit by Renewable Energy

Example: German region Rhein-Hunsrück-Kreis

~~Previously:~~

~~Yearly expense for energy imports~~

~~Approx. 290 000 000 €~~



Now:

Yearly regional profit in 2017 <sup>[1]</sup>

**44.175.000 €**

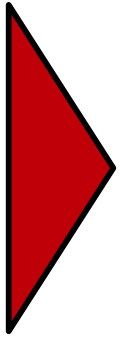
# How to empower people?



Make it easy

- To use renewables
- To share energy
- To use mutually

# Easy use of Solar Energy: Plug-in solar

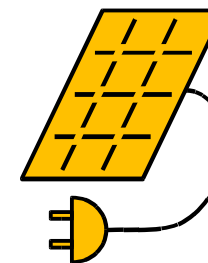


# Plug-In Solar

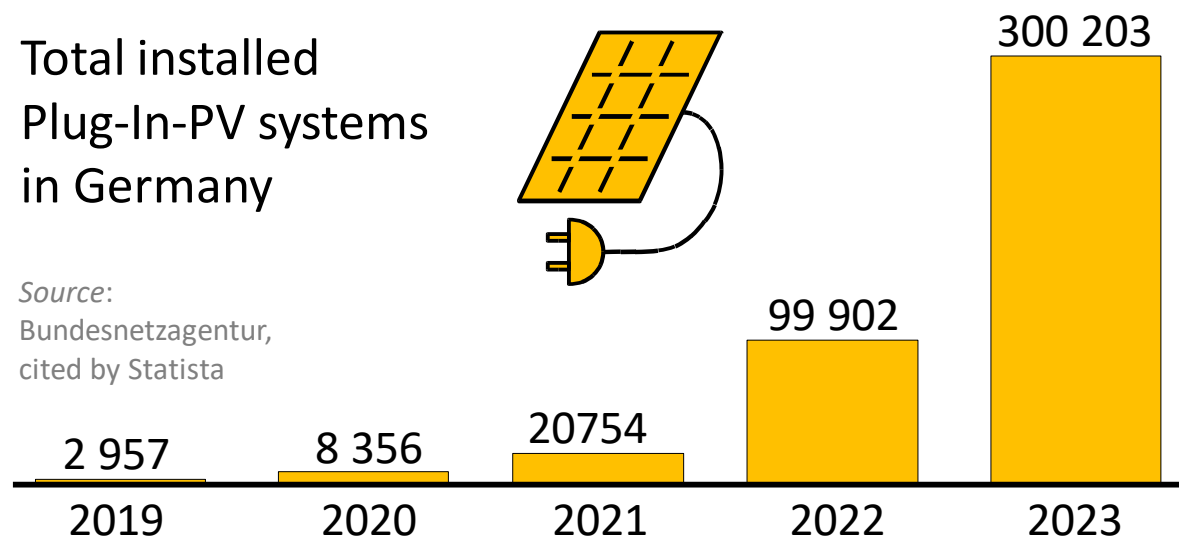


- Plug your PV into wall socket
- Up to 600 Wpk (800 Wpk)
- Saves grid power
- No re-fund

Total installed  
Plug-In-PV systems  
in Germany



Source:  
Bundesnetzagentur,  
cited by Statista





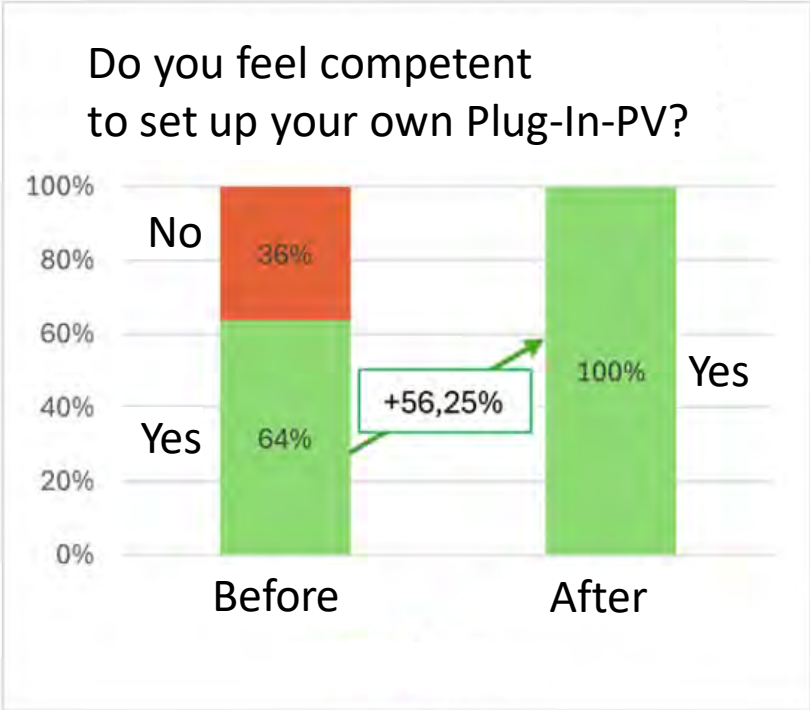
# Plug-in PV Workshops



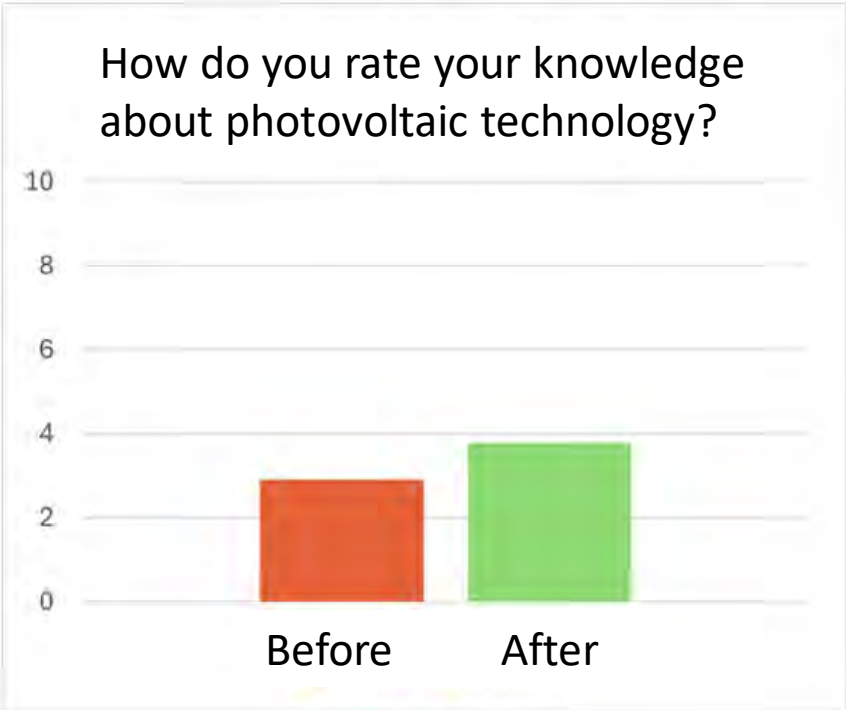
- At TH-Köln
- For general public
- Students as teachers
- Scientific investigations including surveys

# Survey Results

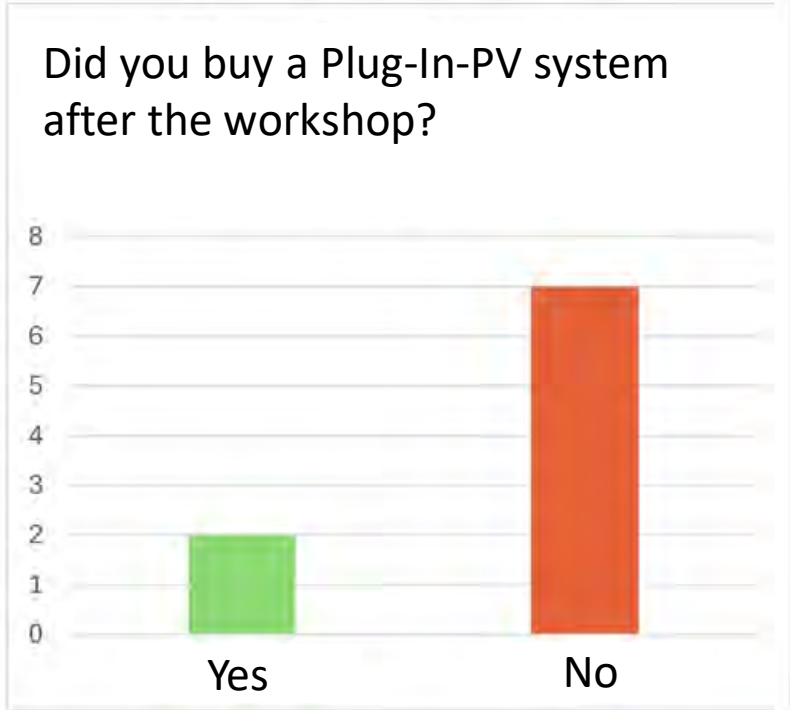
## Confidence



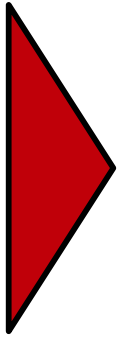
## Knowledge



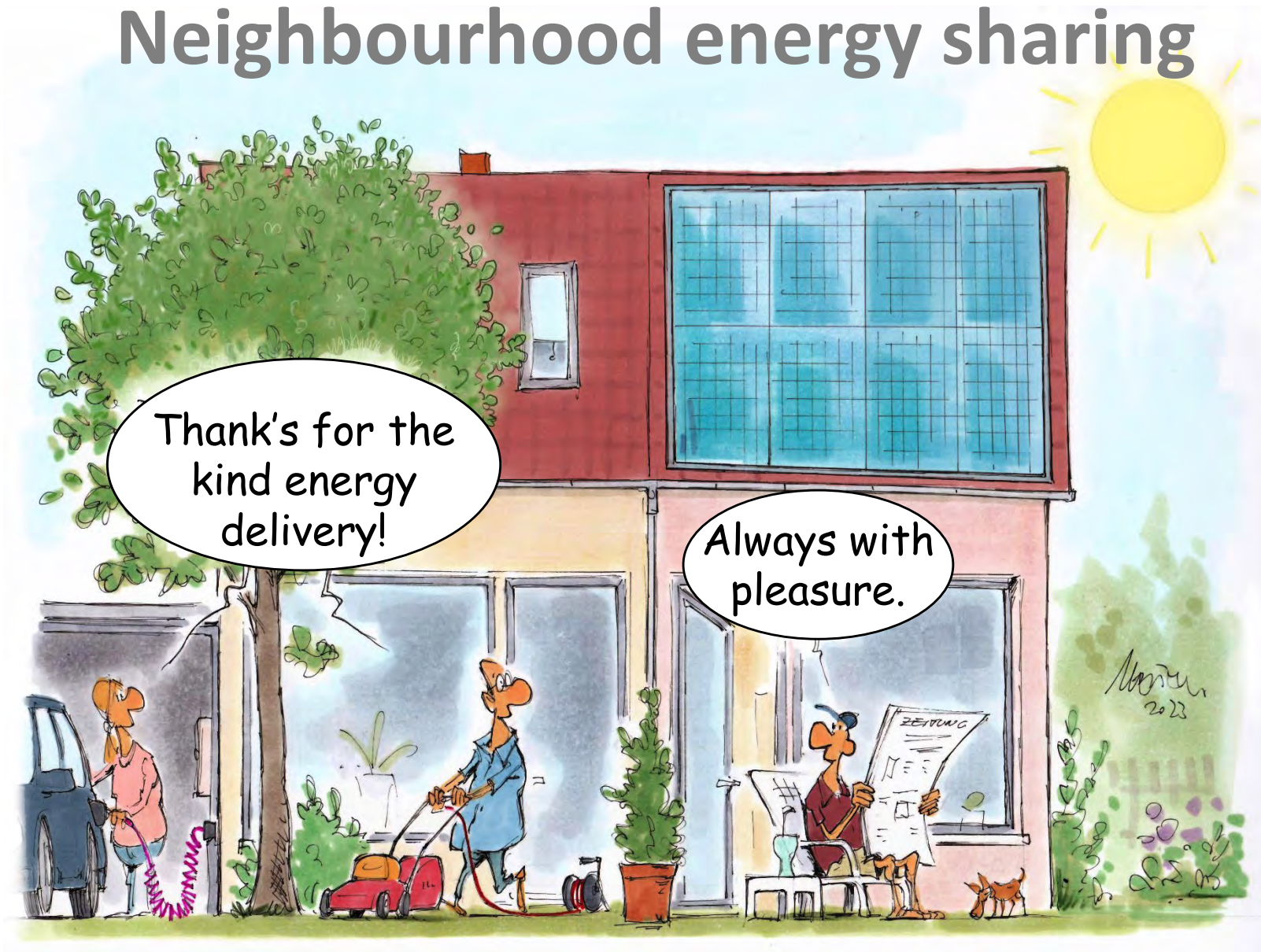
## Action



# Sharing Energy

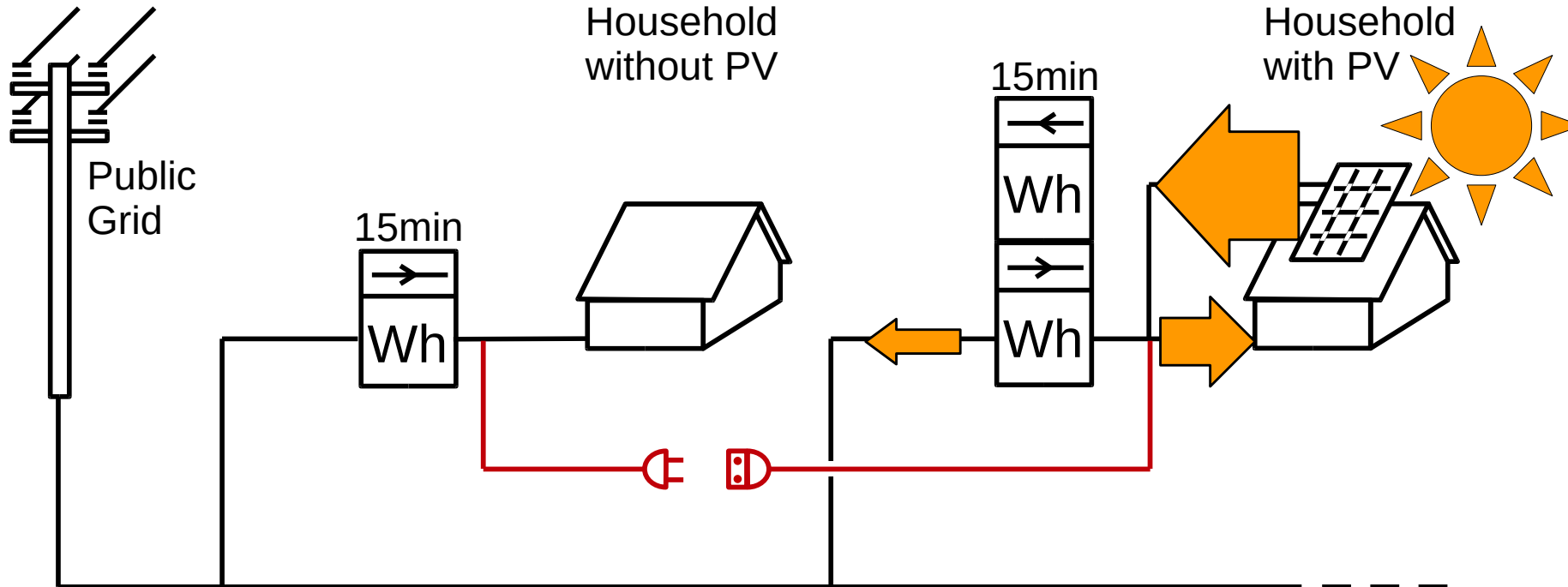


# Neighbourhood energy sharing



# Neighbourhood energy sharing

## Physical connection

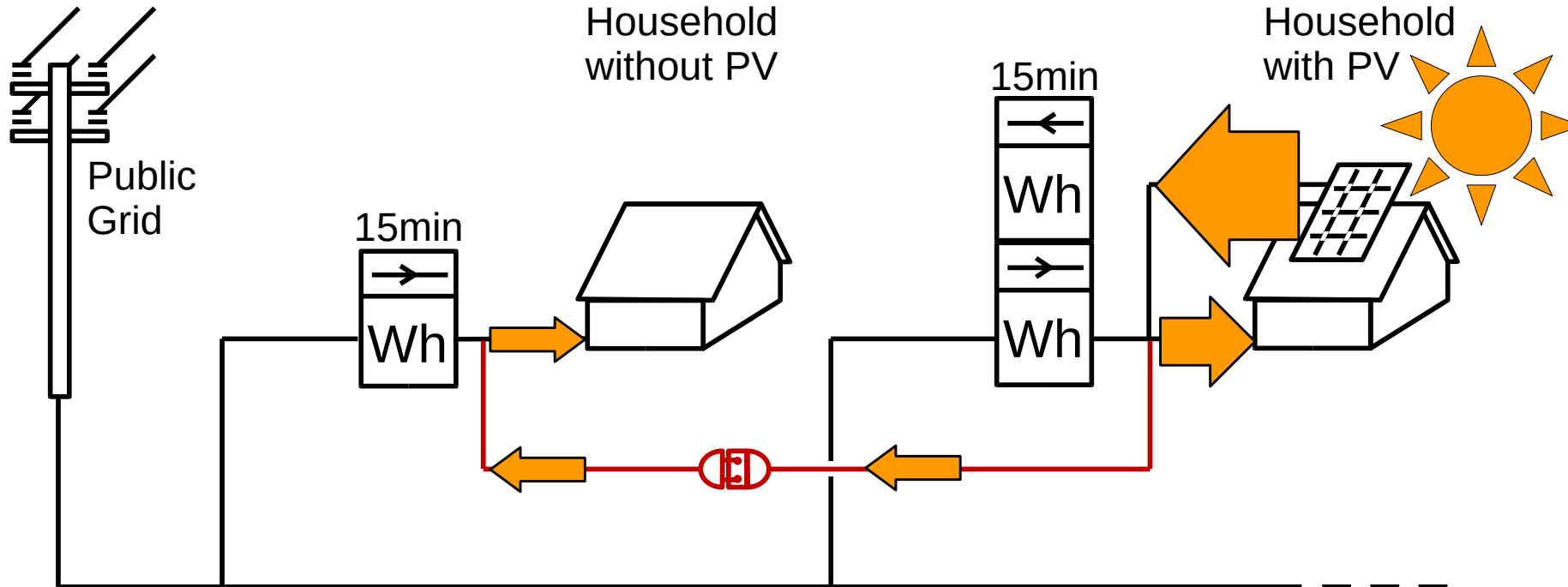


### Idea

- Share PV energy with neighbour
- using a power cord

# Neighbourhood energy sharing

## Physical connection

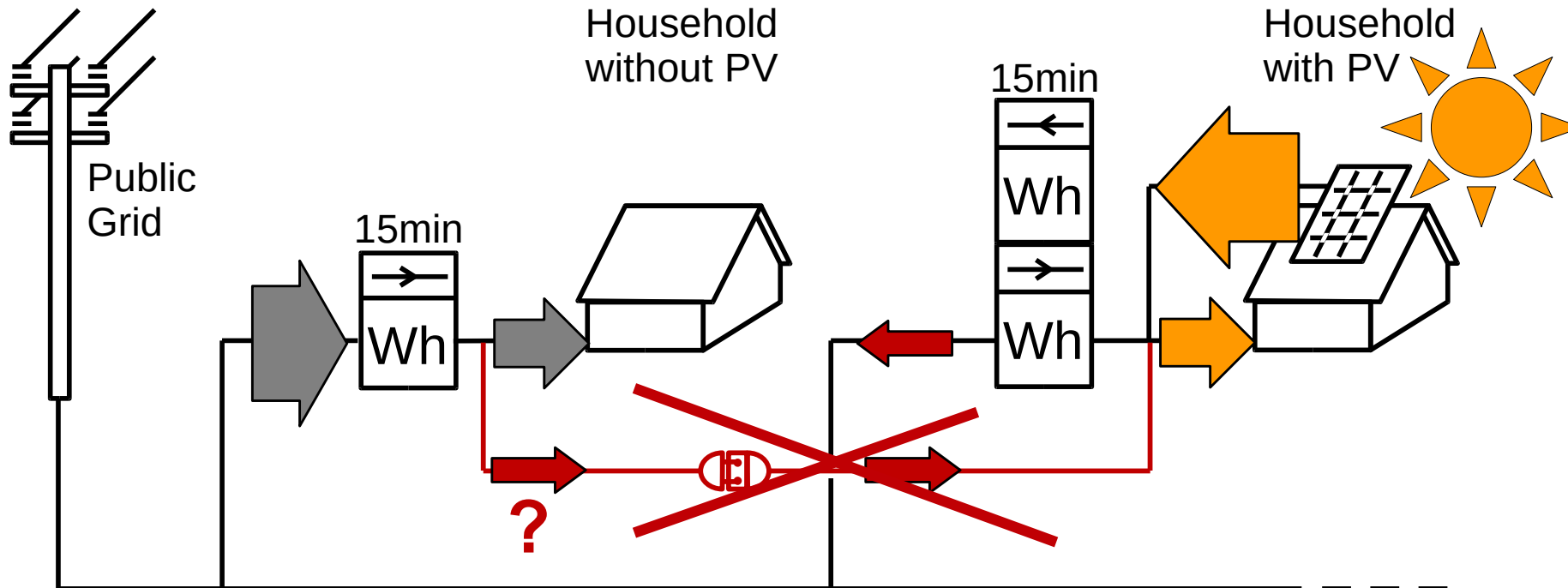


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# Neighbourhood energy sharing

## Physical connection



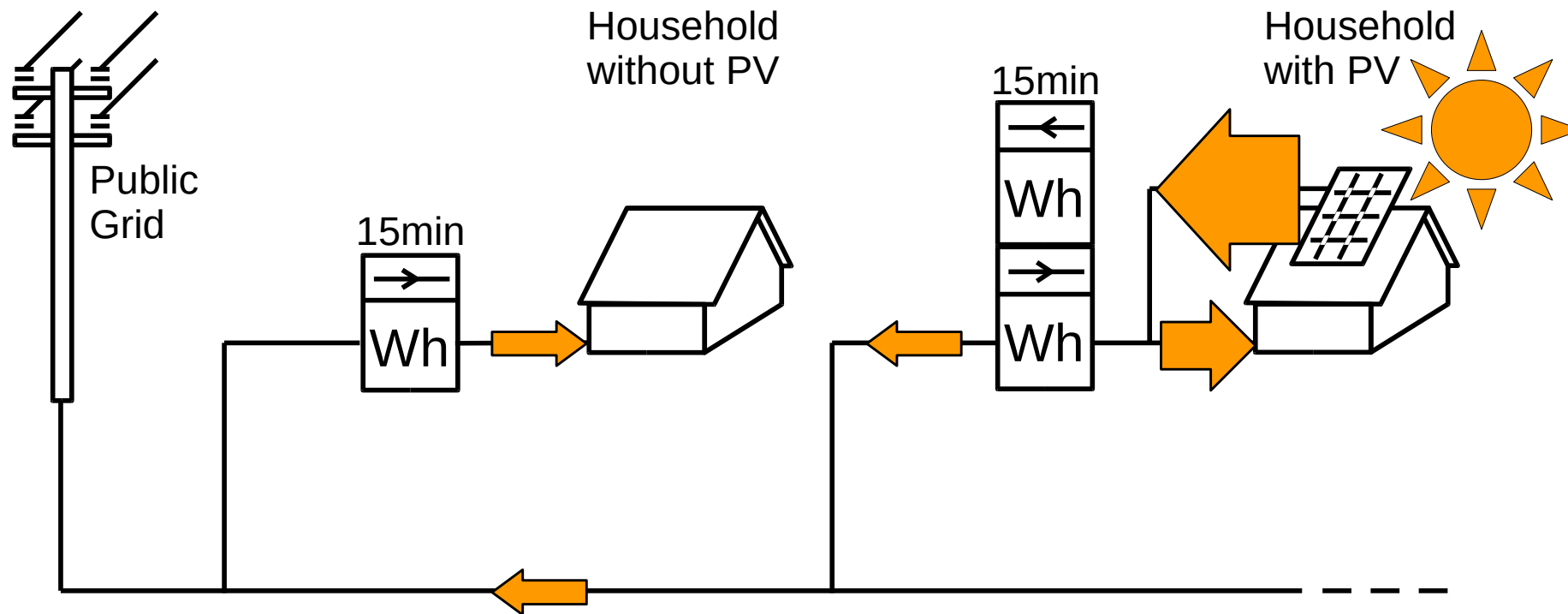
### Reality

- Uncontrolled power flow:
- No proper energy counting
- Even worse: Circulating currents causing damage

**Energy sharing only over power grid**

# Neighbourhood energy sharing

## Virtual connection



### Challenge

- Suitable energy counting
- Legal aspects

**Energy sharing only over power grid**



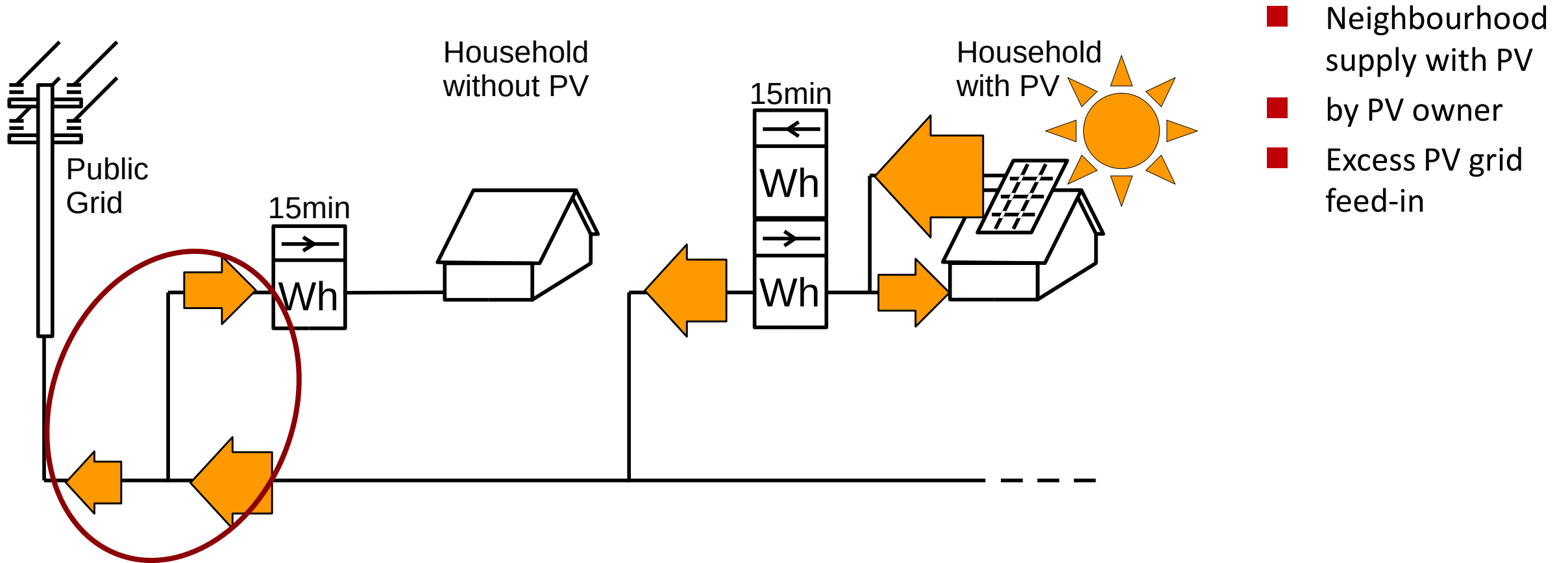
# Neighbourhood energy sharing

- It's only commercial
- Really?
- Triggers additional PV installations
- Improves acceptance
  
- Requires organization and legislation



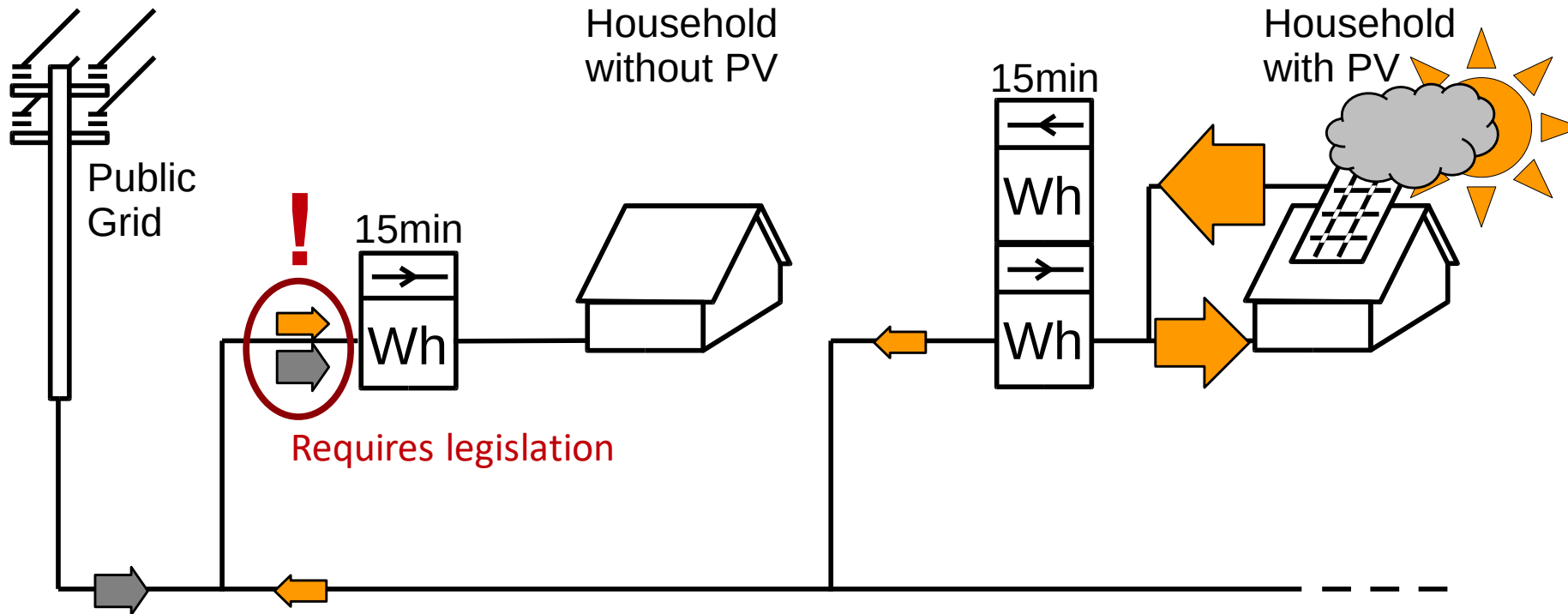
# Neighbourhood energy sharing

## Sunny



# Neighbourhood solar sharing

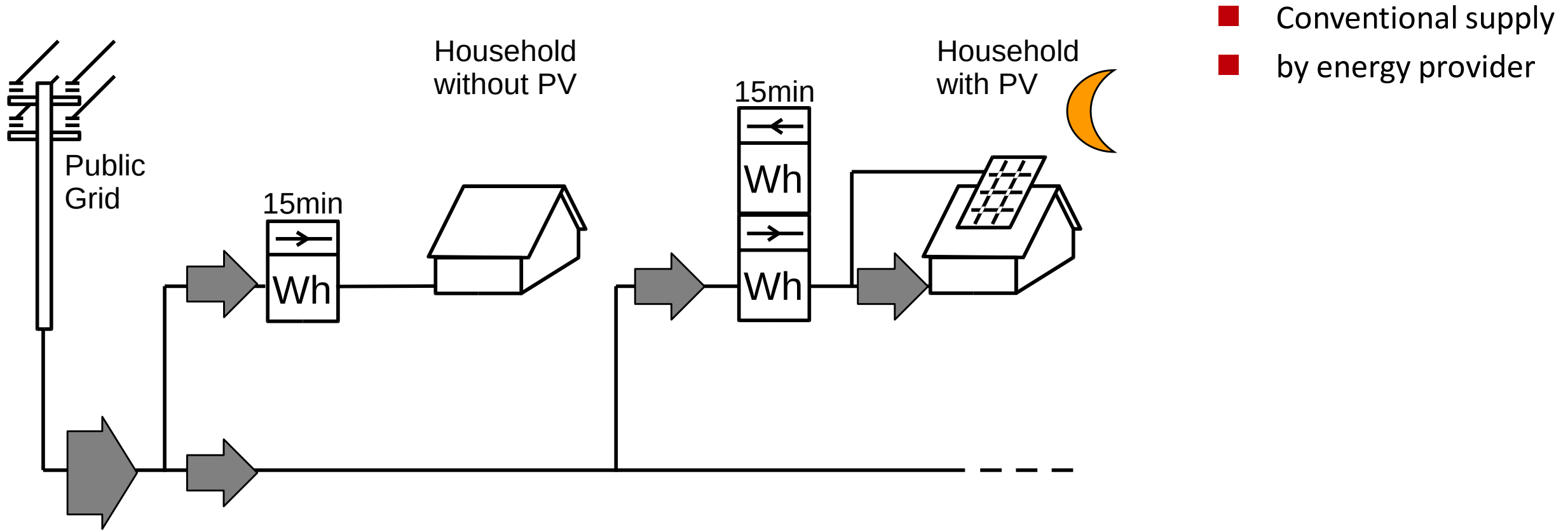
## Cloudy



- Supply with
  - Neighbourhood PV and
  - Grid power
- Requires:
  - 15 min energy counting
  - Real-time balance provided by energy supplier

# Neighbourhood solar sharing

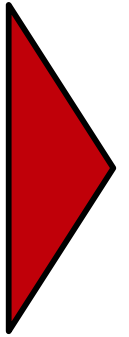
## Night



# Proposal by SFV

- Allow multiple suppliers
- Obligate energy provider to billing
  - With multiple suppliers
  - Excess PV energy
  - Individual profiles
  - 15 min
- Limit to neighbourhood

# Mutual use of energy: Community storage



# Individual vs. Community Storage



# Community Battery

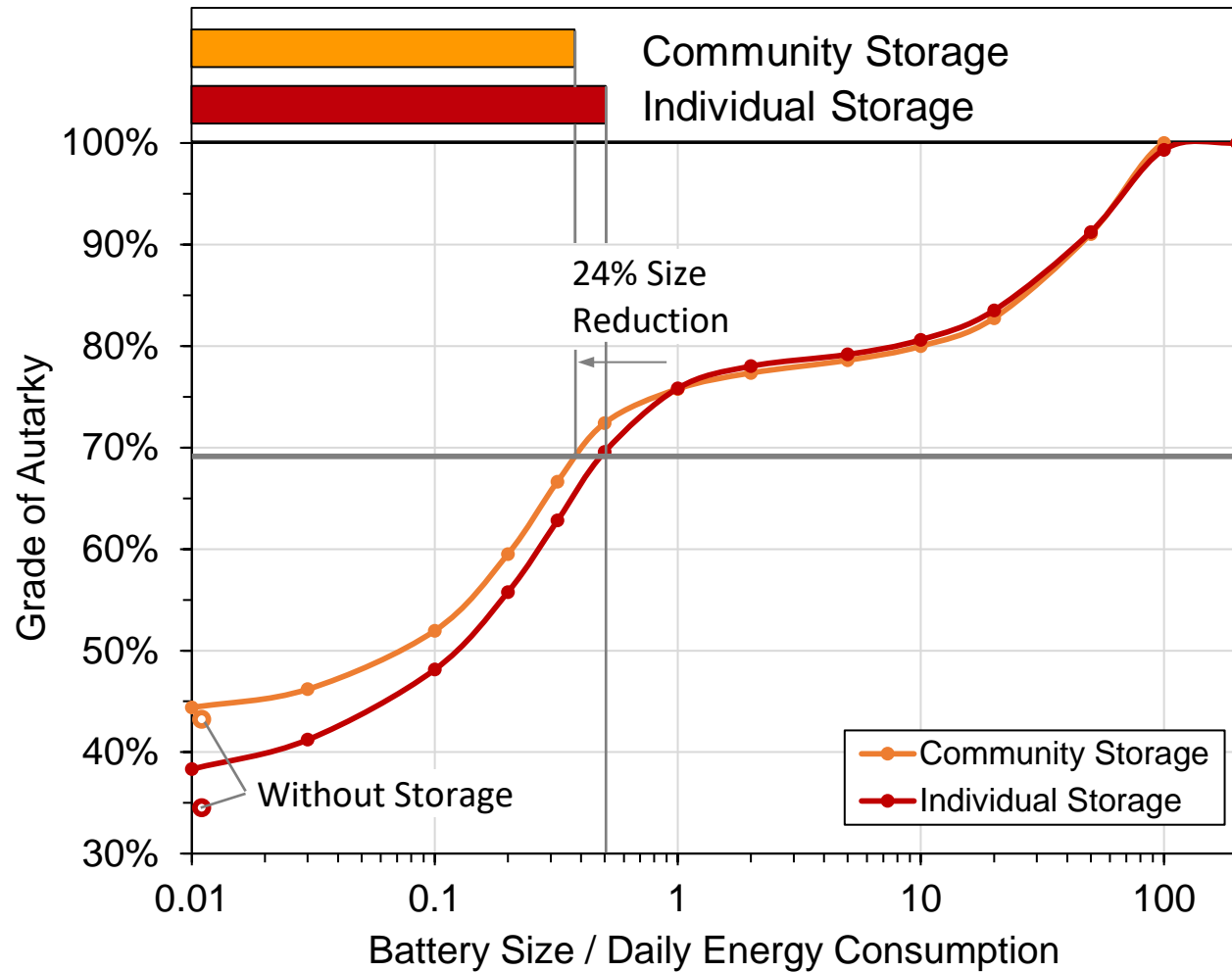


- Use case:
  - Storage in combination with photovoltaics (PV)
  - Store excess PV energy
  - Provide energy in case of darkness
- Aims:
  - Increase grade of autarky (use green energy)
  - Reduce need for grid power (grey energy)





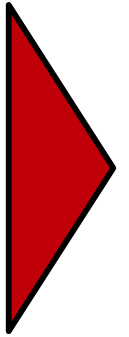
# Battery Size



## ■ Optimal size:

- Halve day storage
- 24% size reduction with same grade of autarky

Fairness

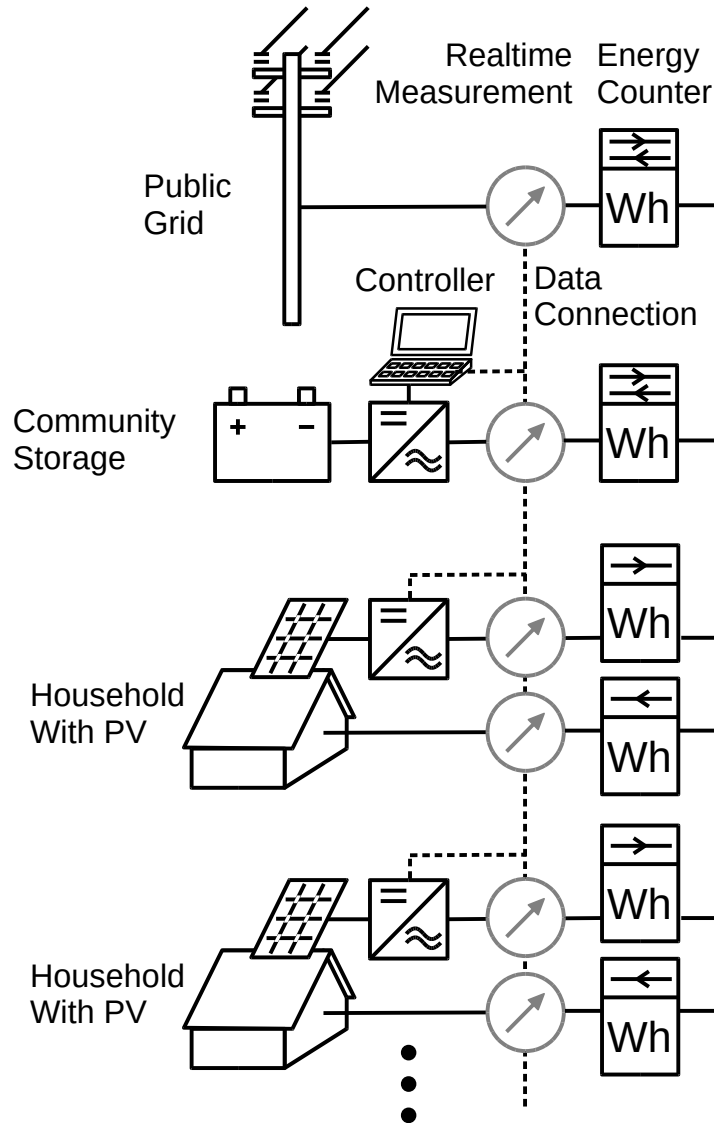


# Commercial Fairness



- Buy for what you get –  
Get what you pay for
- Individual Property
- Example: Market hall

# Individual Property



## Measuring devices for

### ■ Operation

- Real-Time
- Reliability
- No public data network

### ■ Billing

- Each 15 min or yearly
- Public data network
- Data security

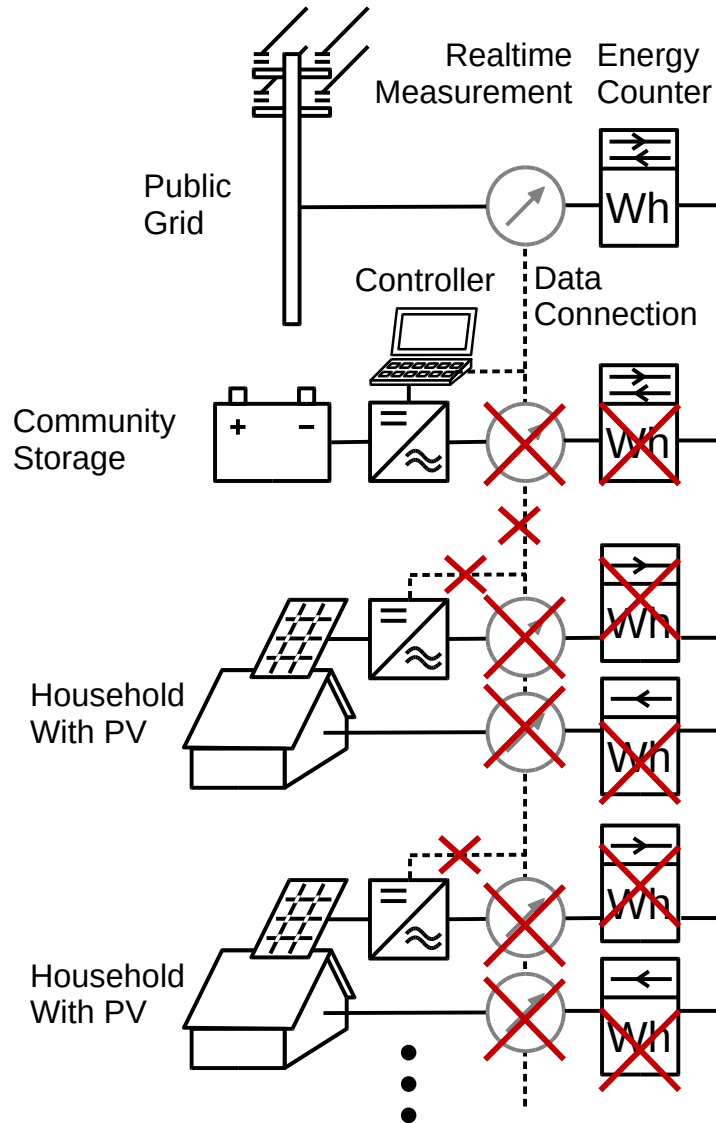
### ■ High effort

# Social fairness



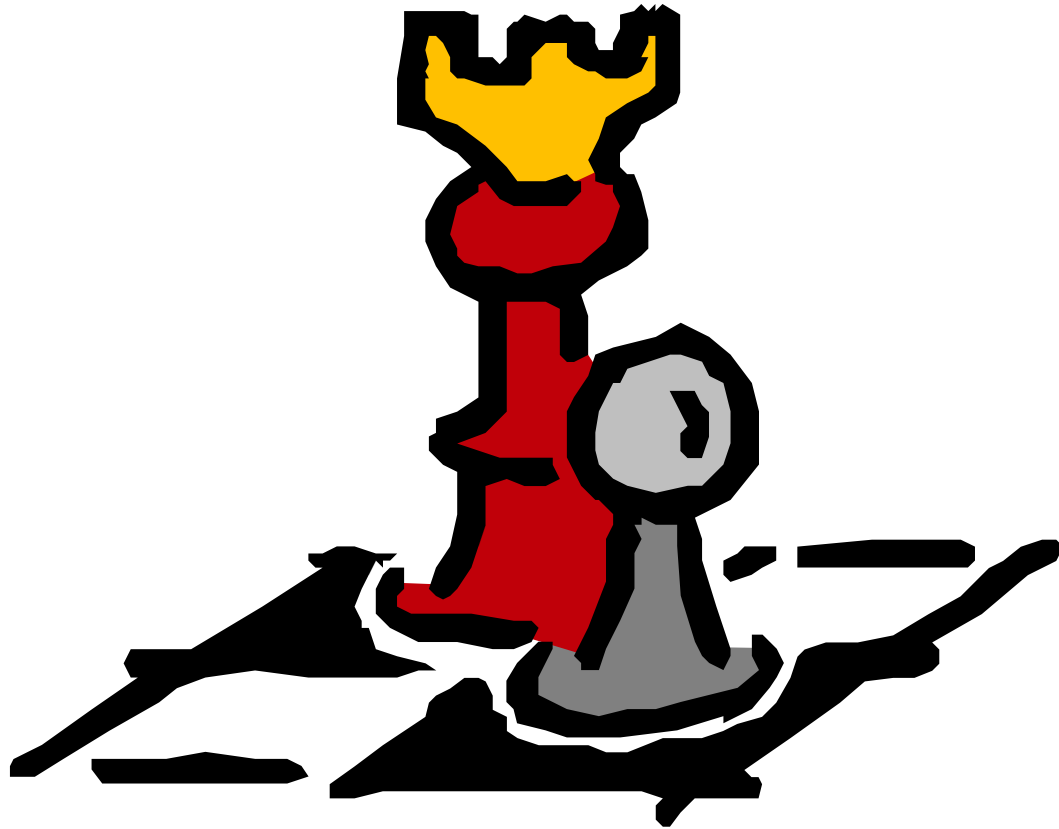
- Each person gets what needed
- Mutual property
- *Examples:*
  - Family
  - Friends

# Mutual Property



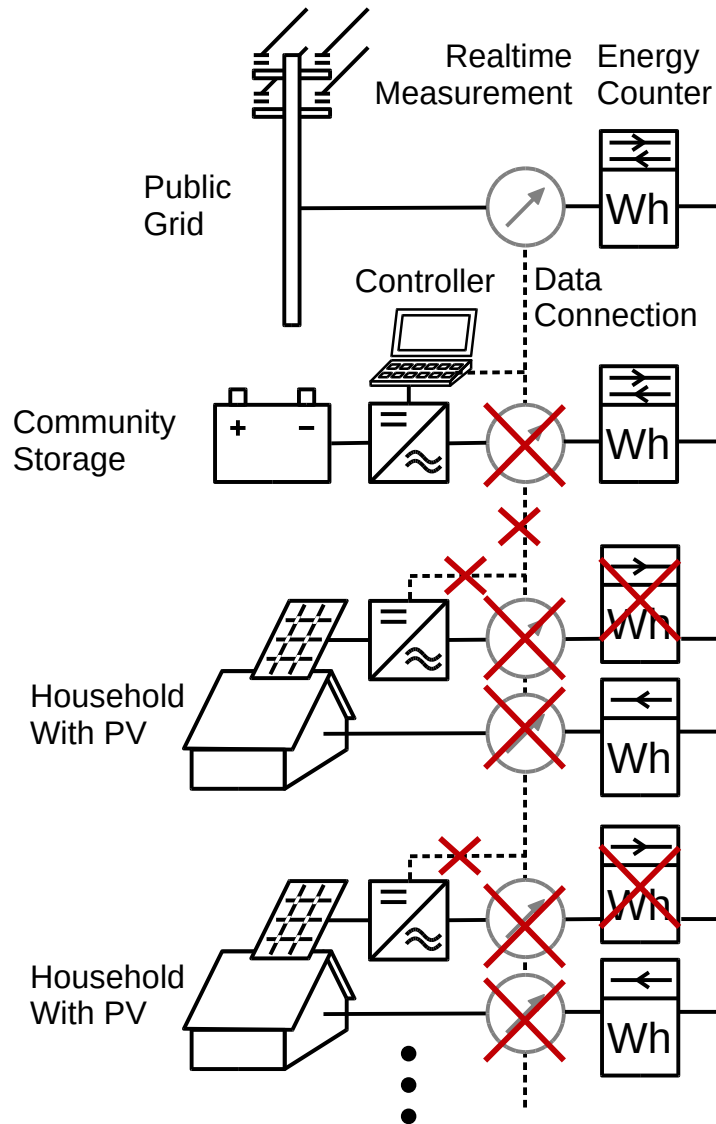
- No internal measuring equipment necessary
- *Requirement:*  
Trust

# Trusted Authority



- Supervised use of energy
- Simple measuring equipment
- *Drawback:*  
Additional cost to pay authority

# Trusted Authority



- *Use case: Contractor*
- Organisational Aspects

- Contractor owns
  - Community storage
  - PV-systems
  - Local grid
- Fixed, average electricity cost for households

- Technical Aspects

- Realtime measurement only at mains grid connection
- Yearly recording for billing
- Simple data processing

**Our Proposal**



# Empowering People for Renewables...

- Speeds up energy transition
- Reduces cost
- Enhances acceptance
- Must be *fair*



# Contact and further Information

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*Further Info:*

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