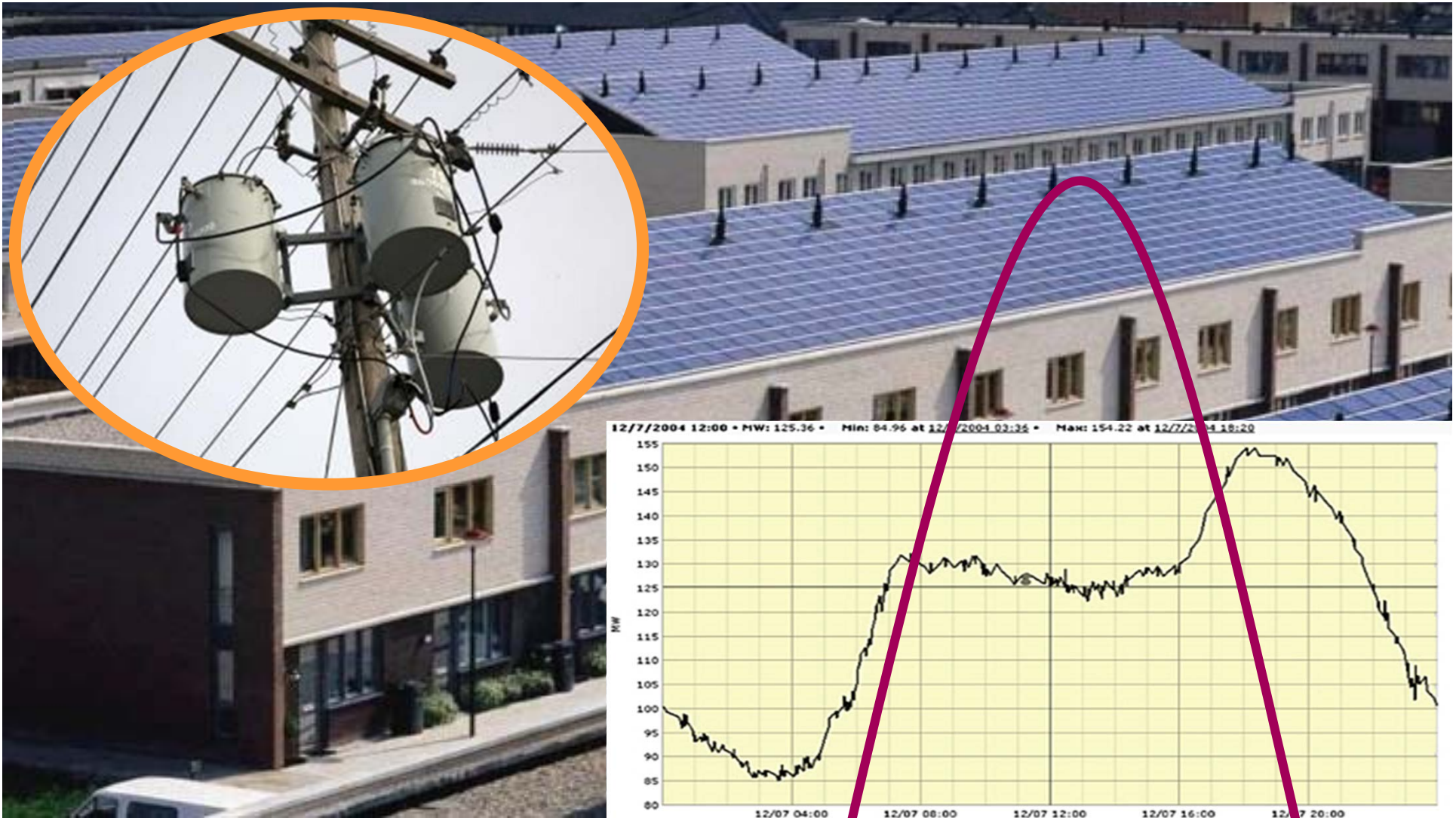


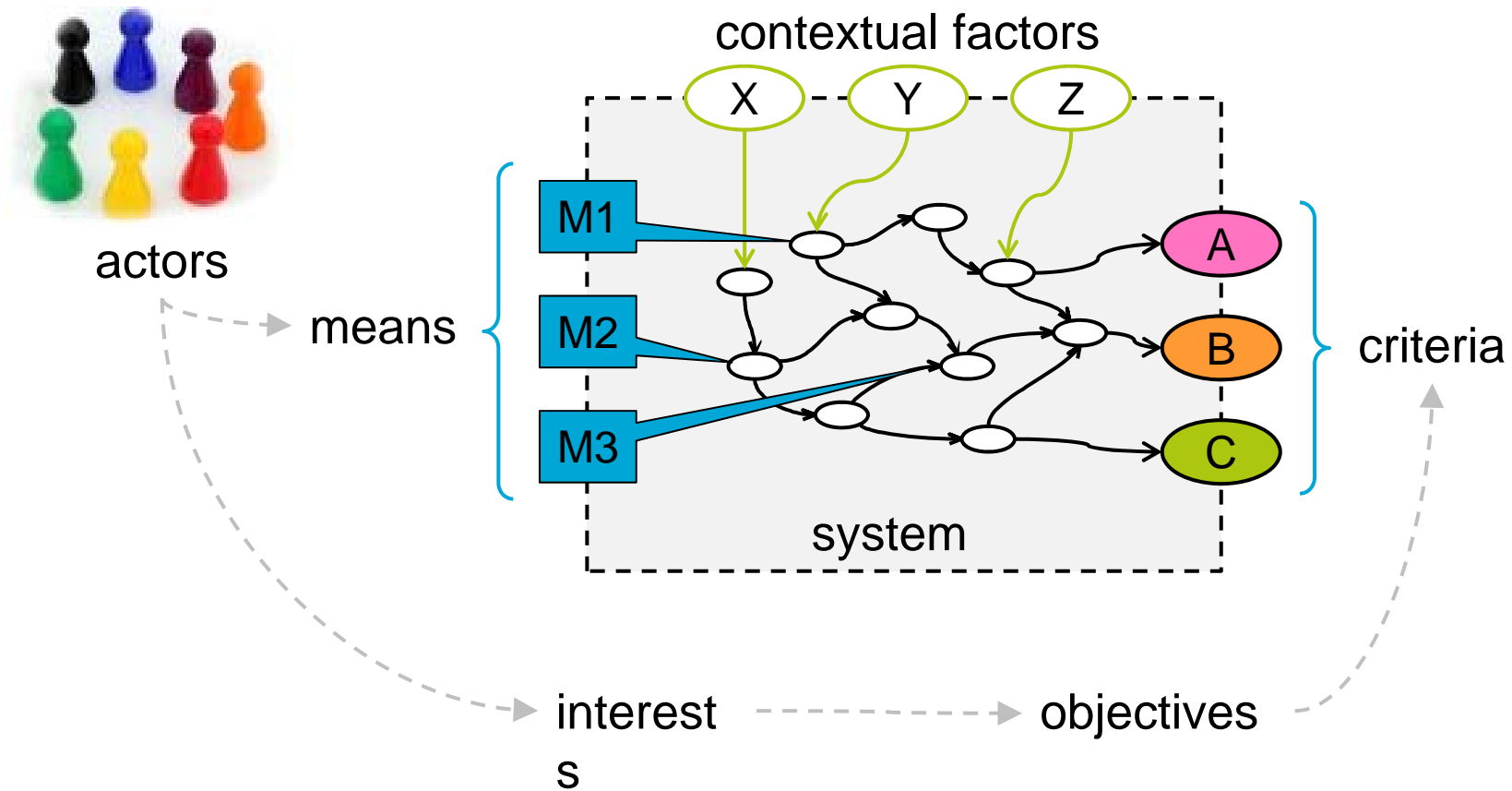


# From systems analysis to research proposal

- Client wants advice on policy issue
- Systems analysis reveals:
  - problem structure
  - knowledge gaps
- Research proposal:
  - knowledge gaps → **research questions**  
+ methods to find answers



# Problem analysis → system diagram



# Conditions for effective policymaking

1. **objectives** ( $\Rightarrow$  criteria)

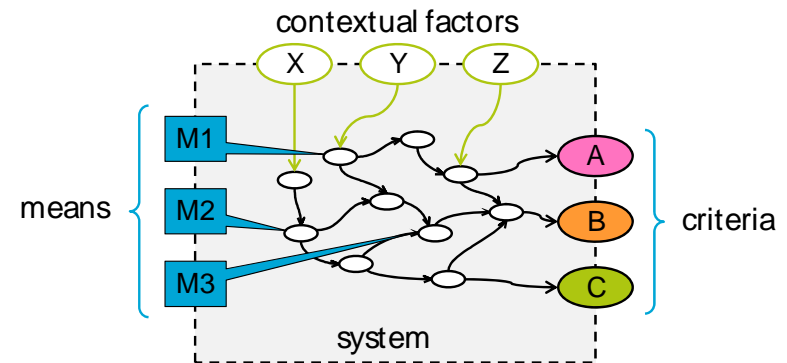
2. **model of the system**

3. sufficient **means**

4. **information** on state of system and context

5. sufficient **information processing capacity**

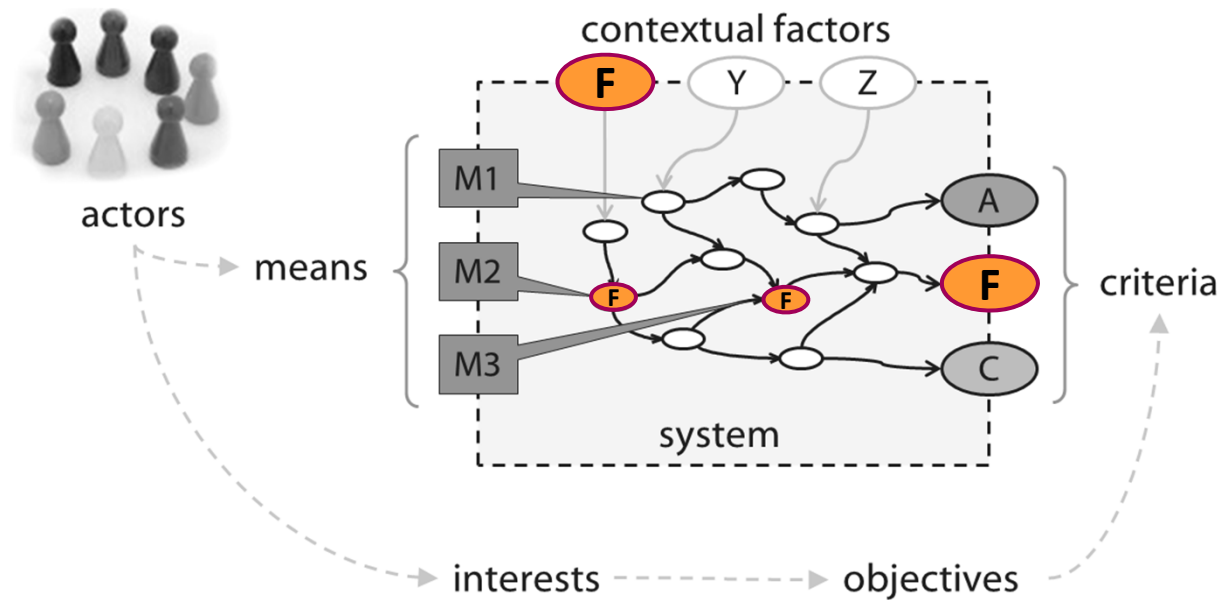
to assess **effects** of **means** and **contextual factors** on **criteria**



# Types of research question

## 1. State of system and context

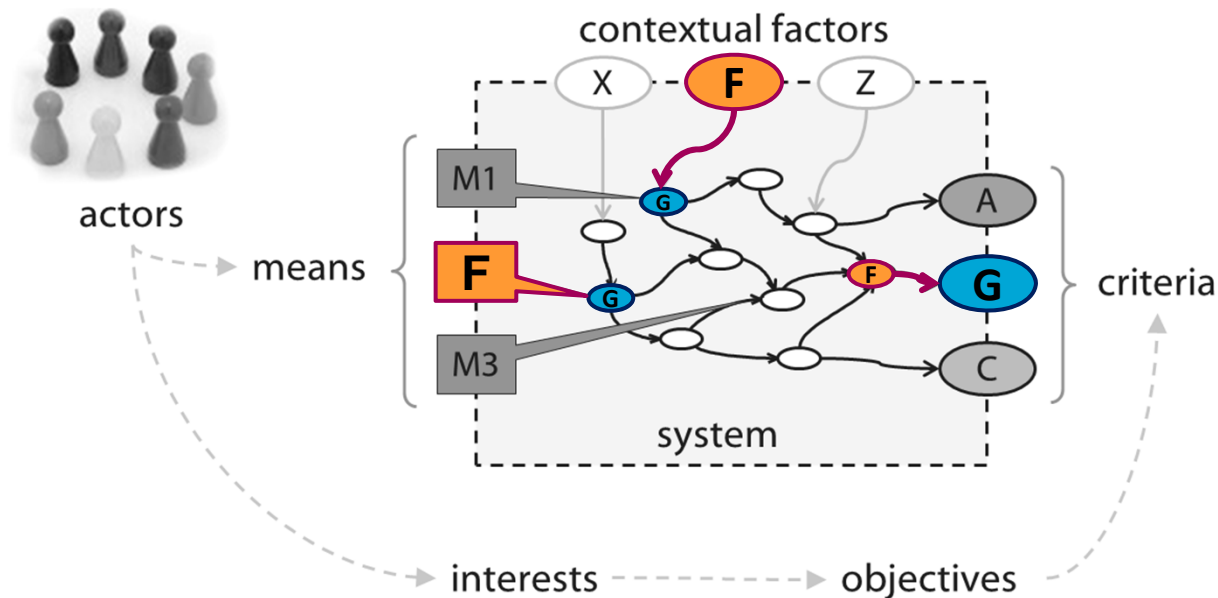
- What is the **value** of factor **F** (at time T) ?



# Types of research question

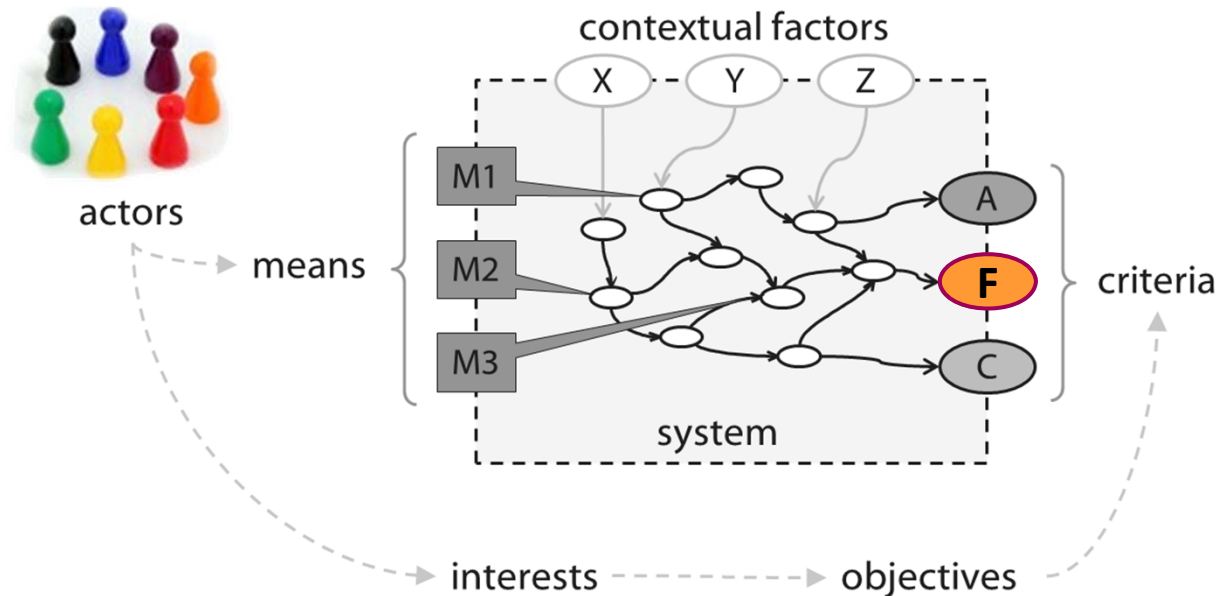
## 2. Causal relations between factors

- How does **G** change when **F** changes?



# Types of research question

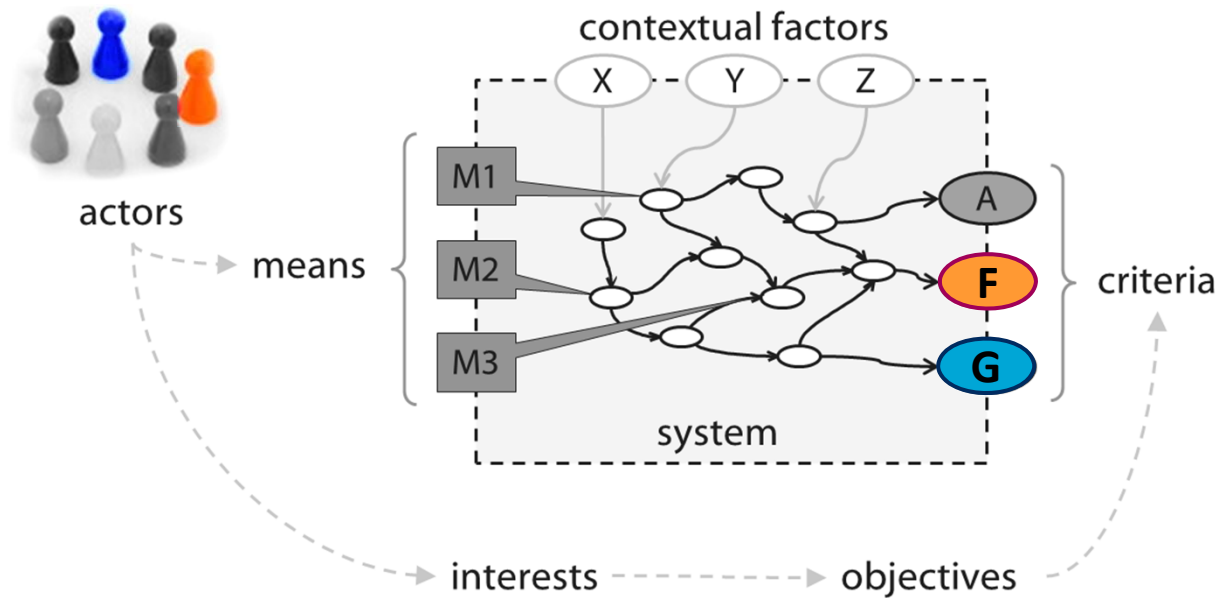
3. How people appraise change (“utility”)
- How much “utility” is gained when **F** increases?





# Types of research question

3. How people appraise change (“utility”)
  - How to “weigh” different objectives?



## Measuring properties of things

What is the weight of a solar panel?

What is the price of a solar panel?

How much power does a solar panel generate?

How much solar radiation is transformed into electrical power?



Source: unknown

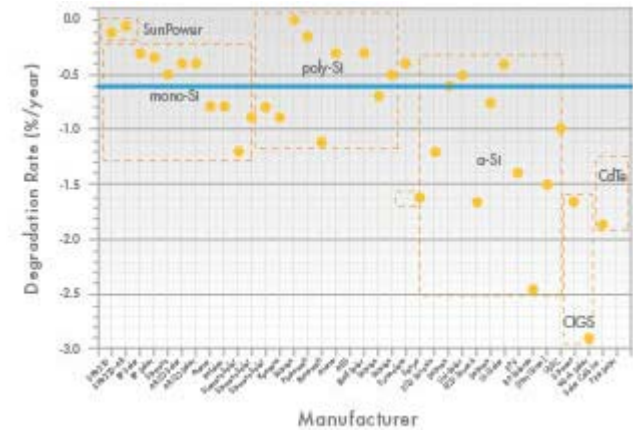
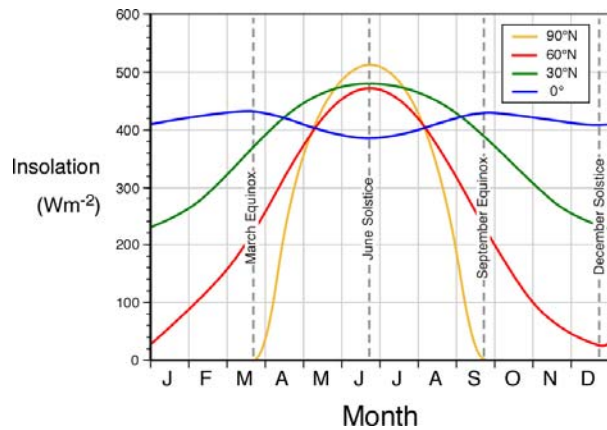
- Research: defining and measuring **variables**
  - **variable** = property of the system of interest
  - **variables** have a **value**, e.g., **weight = 15 kg**

- Two basic forms for research questions:

- What **is** the value of ... ?  $X = ?$
- What **determines** the value of ... ?  $X = f(Y, Z, \dots)$

What does this function ***f*** look like?

- How much power does a solar panel generate?



function ***f*** will be something like this:

insolation [ $\text{Wm}^{-2}$ ] \* panel surface [ $\text{m}^2$ ] \* conversion efficiency [1] \* (1-degradation rate)<sup>t</sup>

# Measuring properties of people

Who buys solar panels?

Why do people buy solar panels?

Up to what price will people buy solar panels?

Will people rather buy solar panels than wind turbines?



Source: unknown

- Why do people buy solar panels?



“save money”



“protect the environment”



“follow the crowd”



Also a function:

motivation = ***f*** (age, income, housing, education)

# Formulating research questions

Specify **precisely** what you want to know:

How much electricity is used by a household?

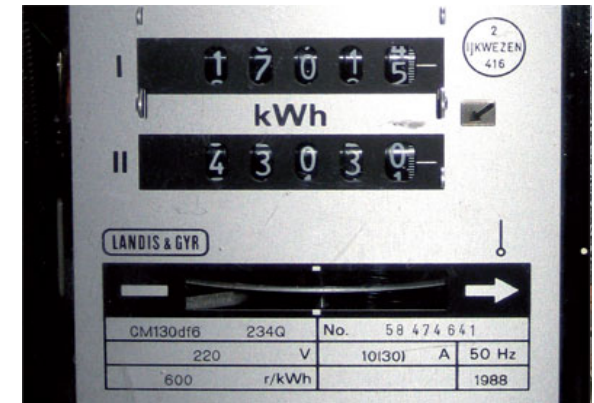
How many **kWh** does a household use?

How many kWh does the **average Dutch** household use?

How many kWh does the average Dutch household use **per day**?

How many **kWh day<sup>-1</sup>** does the average Dutch household use?

How many kWh day<sup>-1</sup> **is delivered to** the average Dutch house?



# Research questions

- “operationalize” knowledge gaps
- by specifying
  1. what variables and relations are relevant (and still unknown)
  2. measurement units for variables
  3. hypotheses about their relations



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  1. what variables and relations are relevant (and still unknown)
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