

Science Europe Scientific Advisory Committee (SAC)
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*“Building a Scientific Narrative on Impact and
Societal Value of Science”*

**Early research on privacy made the
Internet of Things possible –**

The case of Smart Meters

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#SEimpact

Privacy Enhancing Technologies (PETs)

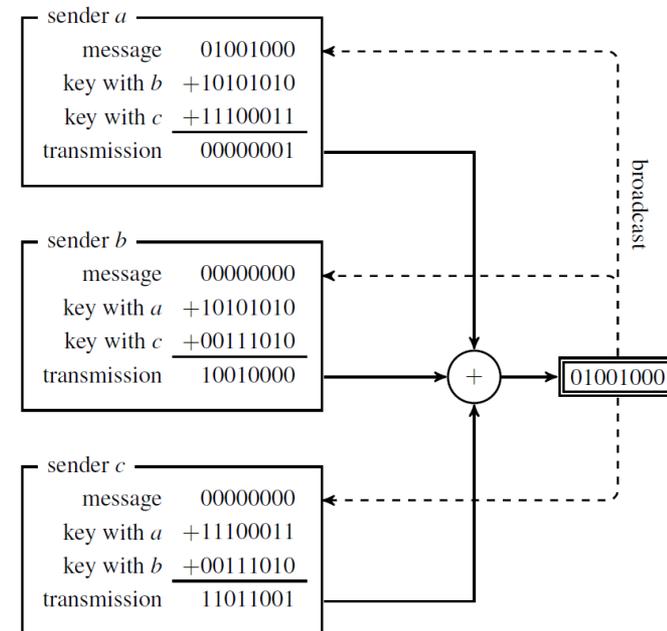
Design systems that use techniques to enforce privacy principles, e.g. :

▶ Data Minimisation

- ▶ Obtain useful information from data without access to the data or without knowledge of its origin.
- ▶ Collect and/or share a minimal amount of data by design.
- ▶ Be “able” to forget data upon request.

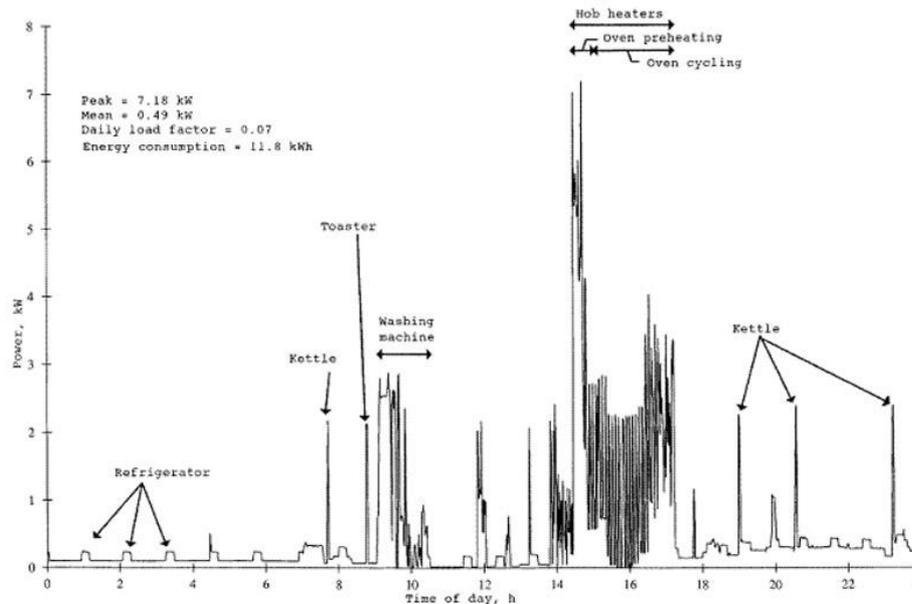
▶ Transparency & Intervenability:

- ▶ Provide usable policy information, obtain informed consent for data use (and audit it)
- ▶ Online functions for exercising data subject rights, et cetera



Smart meters save energy

- ▶ **Smart meters save energy:** “The EU aims to [introduce] smart meters by 2020 [to] reduce emissions in the EU by up to 9% [...]”
(<https://ec.europa.eu/energy/en/topics/markets-and-consumers/smart-grids-and-meters>)



Source: *Smart Metering & Privacy*, Elias Leake Quinn, 2009

- ▶ They optimise energy use in reaction to the household's energy use patterns (**lifestyle**)

Smart meters and privacy

- ▶ Connected smart meters “leak” information about individual household lifestyles to utilities



- ▶ 2009: Dutch government revokes plans for a mandatory smart meter deployment due to consumer pressure
- ▶ New smart meter projects balance privacy and energy saving by requiring **privacy enhancing technologies**

From curiosity-driven research on privacy to societal impact

1979: Shamir: Secret Sharing

1982-86: Yao, Goldreich, Chaum, et al.: Secure Multiparty Computation

1985-88: Chaum: “Dining Cryptographers”

Researchers developed the math of (perfect) anonymity 30 years before building on it to enhance privacy in smart meters

2010 onwards: Kursawe, Danezis, Bohli, Gómez Mármol, Erkin, ...; Privacy-enhanced smart metering

80s

Early application were small-scale and low impact

90s

1989: First commercial Internet provider

1993-1997: First wave of Internet of Things devices

00s

1997: Data minimisation by design in German law

2000-05: Enel Italy deploys smart meters to all customers

10s

2009: Netherlands back down from smart meter deployment

Influence of PET research on PbD and GDPR

- ▶ The Concept of "Privacy by Design" (PbD) has been influenced by PET research starting in the eighties;
- ▶ The new EU General Data Protection Regulation (GDPR) requires
 - "Data Protection by Design and Default" (Art. 25), particularly data minimisation technologies



KEY MESSAGE

- ▶ Fundamental PET research started more than 35 years ago, motivated by **social values**
- ▶ Long-term (**unpredictable**) **effects** or early PET research:
 - ▶ Classical PETs enable socially- acceptable, large-scale deployment of Smart Metering (and other potentially privacy-sensitive applications)
 - ▶ **Privacy by Design** as a **legal principle** in Europe