

Residential electricity disaggregation – Tailored consumption feedback in smart grids

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Increasing number of appliances drives residential energy consumption

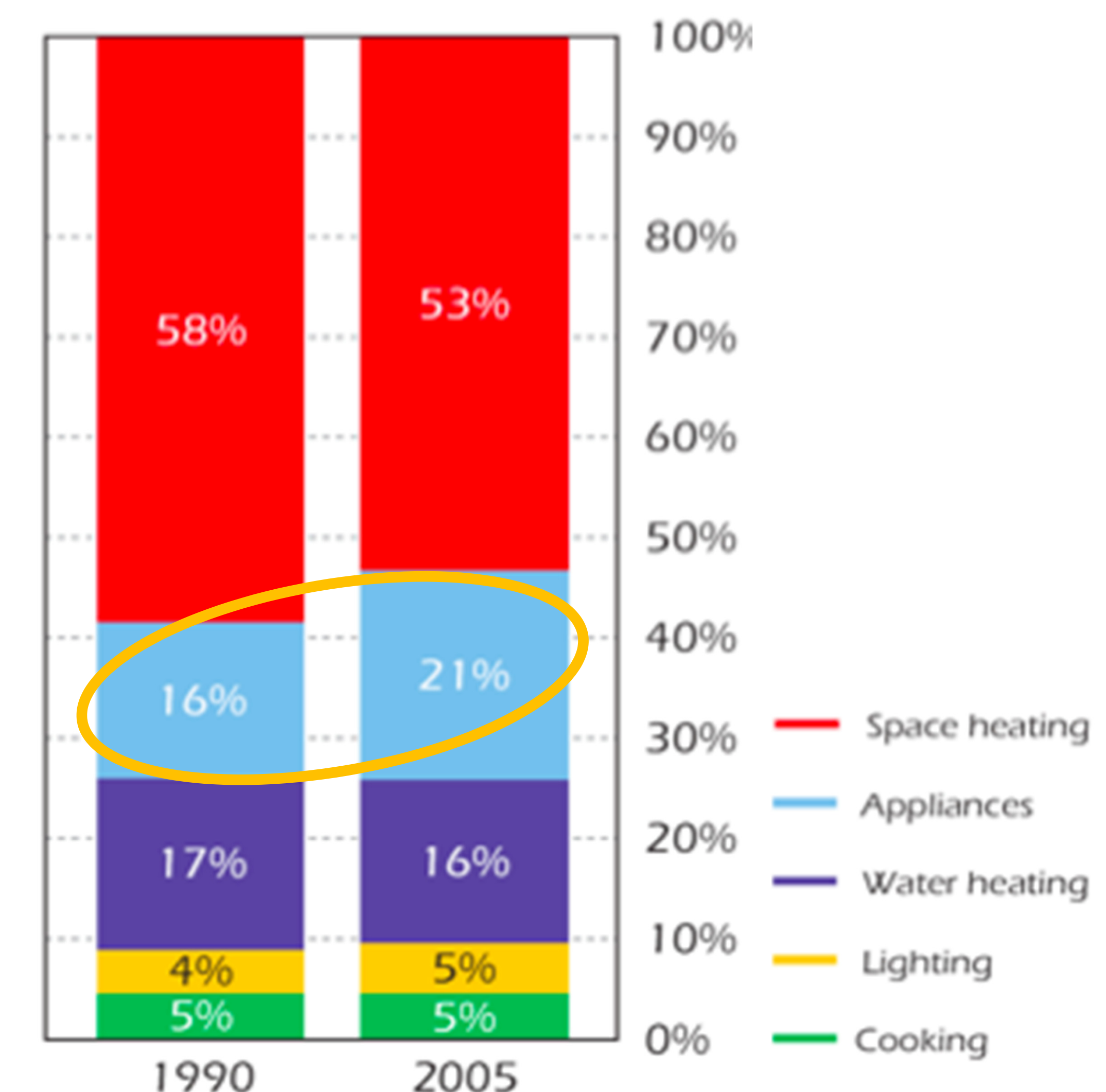
Managing energy use in existing buildings is crucial for overall improvements in energy intensity. About 40% of the total energy used in the US is consumed by the building sector¹.

Heating and cooling are the major end uses of energy in buildings. However, appliances increasingly contribute to the growth in energy consumption in residential buildings.

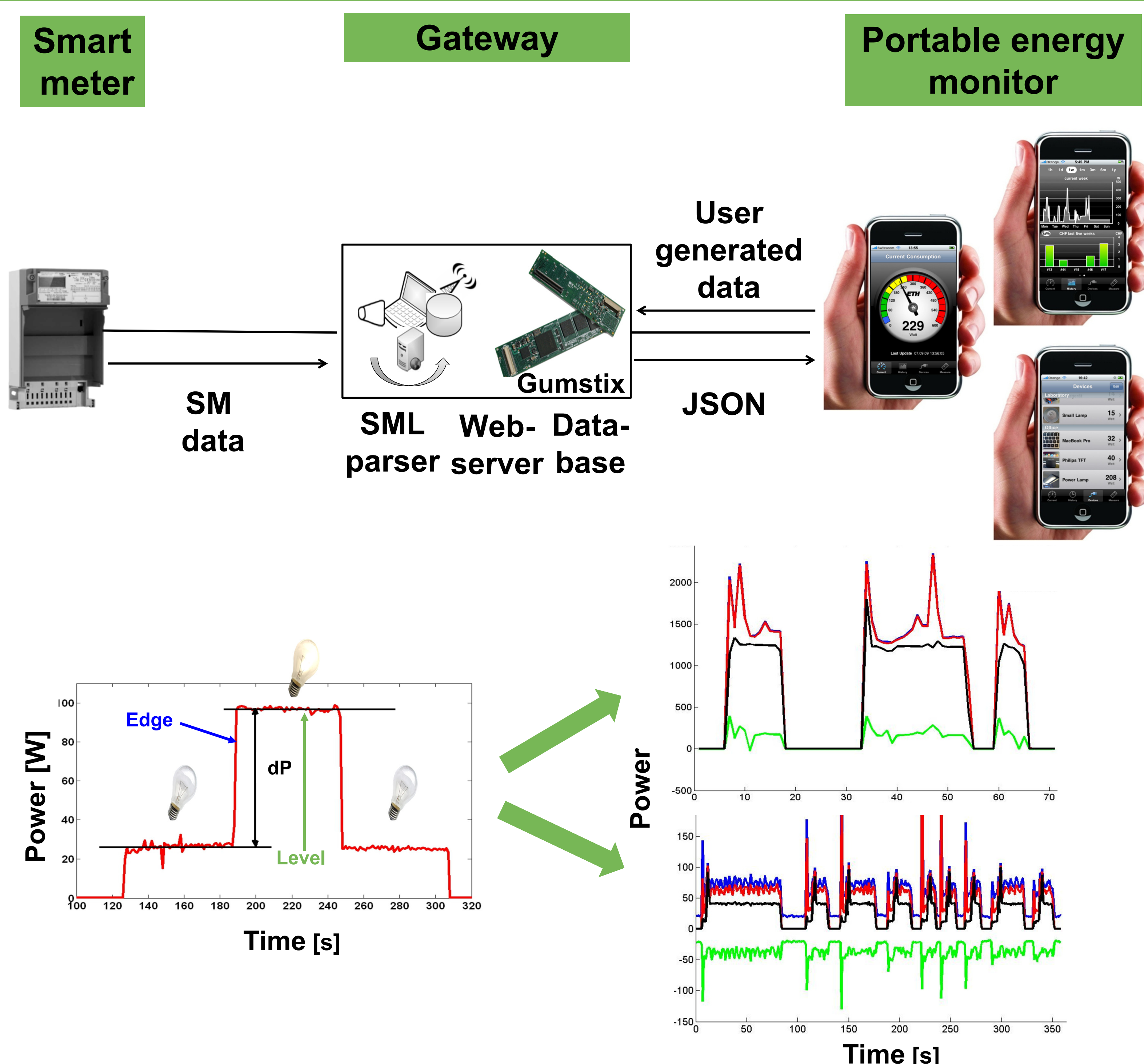
Data analytics of metering data allows us to auto-identify the consumption of an individual appliance:

- tailored energy feedback at no extra cost
- improved energy efficiency in combination with actuation
- new business opportunities in the smart grid

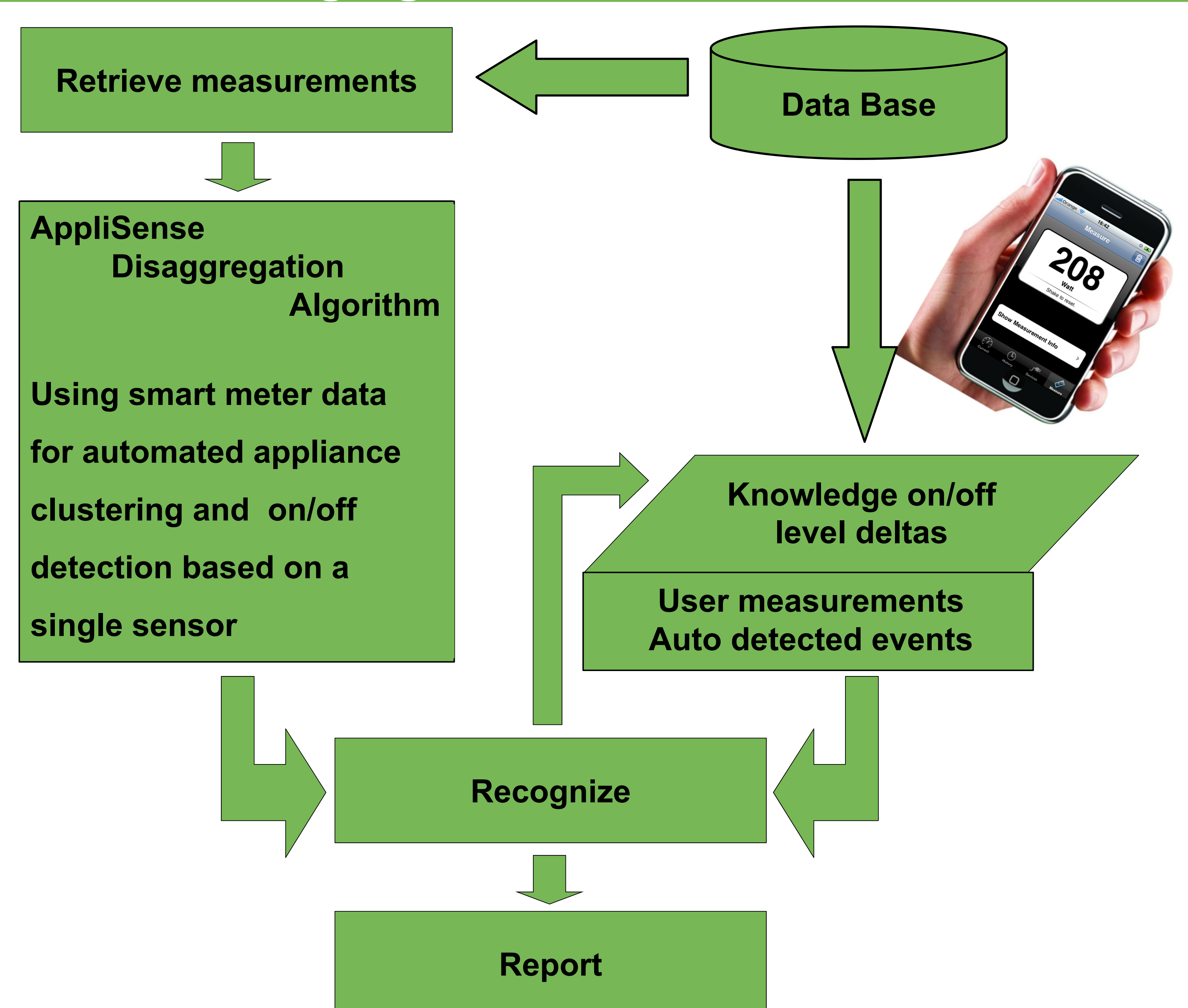
Household Energy Use by End-Use (IEA19)²



Infrastructure³ & Appliance Signatures⁴



Leveraging Smart Meter Information



Results & Future Work

- Loosely coupled three component architecture.
- 91% recognition rate in lab study.
- Real-world deployment for over 6 months (9 million measurements for analysis).
- Algorithm refinements based on real-world data.
- Combine with smart power outlets.
- Input for automated heating control.
- Use data on a higher aggregation level (e.g., streets, regions, etc.).

References:

- Annual Energy Review 2009, Energy Information Administration, 2010.
- International Energy Agency (IEA) 2008. Worldwide Trends in Energy Use and Efficiency - Key Insights IEA 2008.
- Weiss, M., Graml, T., Staake, T., Mattern, F., Fleisch, E., Handy feedback: Connecting smart meters with mobile phones. Proc. MUM 2009, Cambridge, UK, 2009.
- Weiss, M., Staake, T., Mattern, F., Fleisch, E., PowerPedia - A smartphone application for community-based electricity consumption feedback. Proc. Smartphone 2010, Gwangju, South Korea, 2010.