Advanced Metering Infrastructure

Research Project 2

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Agenda

- Background
- Research motivation and questions
- Research methods
- Research findings
  - Stakeholders
  - Legislation
  - Smart meter
  - Technology
  - Communication
- Conclusion & recommendations

Background – The Market

- Liberalization
  - Trend of energy saving
  - Trend of emission reduction
- EU report see the trends hence the need of AMI, smart meter is there in 2005/2006
- In reaction to that Dutch Ministry of Economic Affairs commissioned NEN (Netherlands Normalization Institute) to draft a document describe the needs and requirements focusing on E and G.
- In April 2007, NTA 8130 was finalized
- In March 2011, Ministry of EL&I issued AmvB (Algemene Maatregel van Bestuur) on smart meter
- Both of them, give the task to GO to define specific requirements for Dutch smart meter – hence the birth of DSMR, the current version is 4.3
- Prosumers can sell back the energy which lead to crowd production

Research Motivation & Question

- Motivation
  - Understand the system
  - Take full advantage of the new system
  - ECO friendly
  - Energy saving

How to optimize the information flow between the stakeholders of the AMI in order to better facilitate the liberation of Dutch energy market?

Sub-questions

I. Who are the core stakeholders

II. Clear overview of AMI

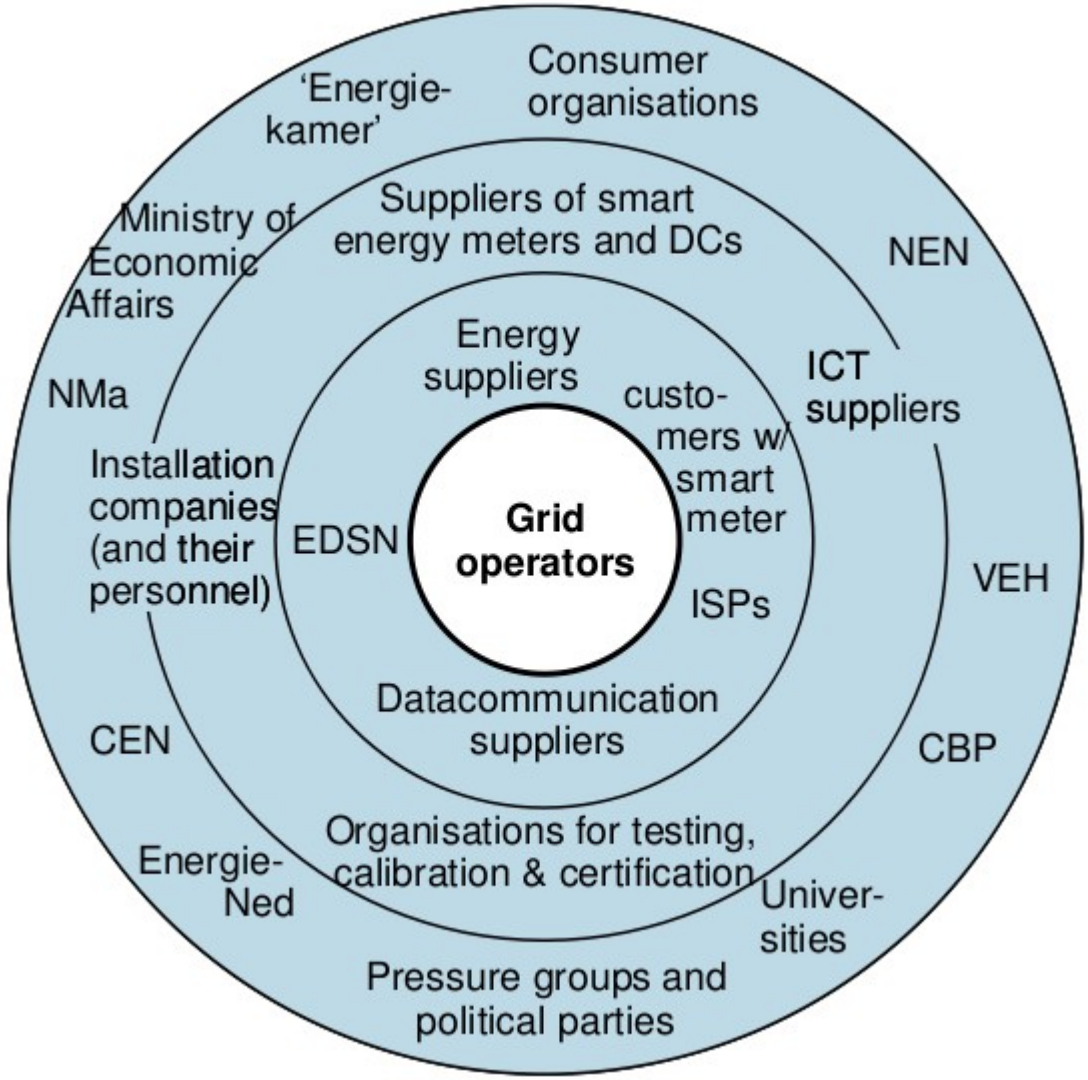
III. Division of task domains

IV. (Metering) Information flow

Research Methods

- Desk research
  - Open meter
  - DSMR
  - Relevant research papers
- Interviews
  - Prosumer
  - GO

Finding – Stakeholders

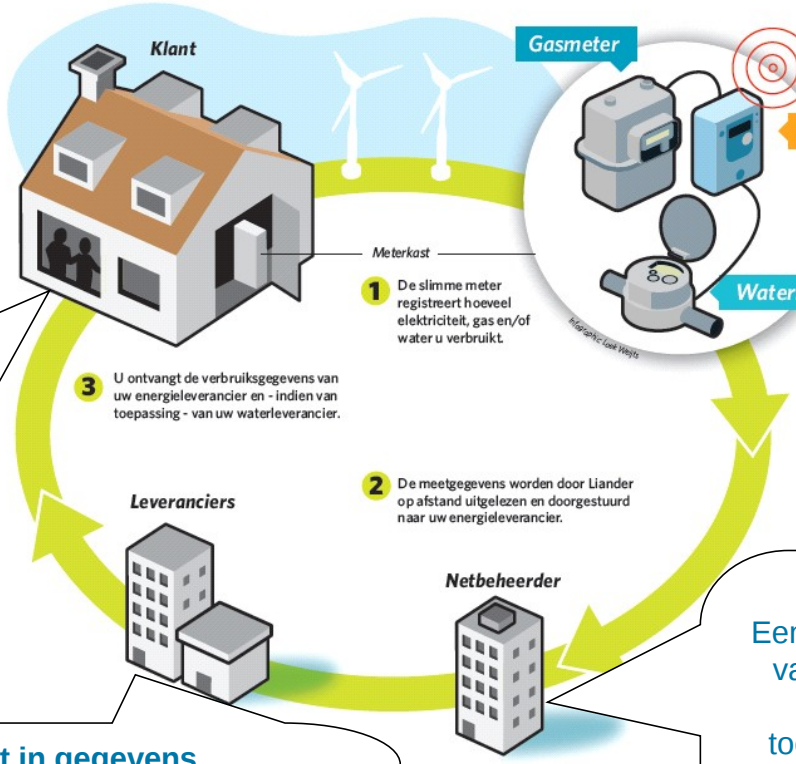


Finding - Legislation

- EU → NL → NTA/AMvB →DSMR
- The parliament will debate the policy (final) on 24th, June 2012 (news)
- GO is the owner of the whole infrastructure
- EDSN is the market facilitator
- NMA/Chamber of Energy carries the responsibility for checking if parties do follow the electricity and gas regulations
- Ownership of data depends on the type of information it contains
  - Privacy part
  - Technical part

Finding - Legislation

- SC / ISP metering data reading



Energietransitie
Door inzicht van de klant in zijn verbruiksgegevens kan deze bewustere keuzes maken

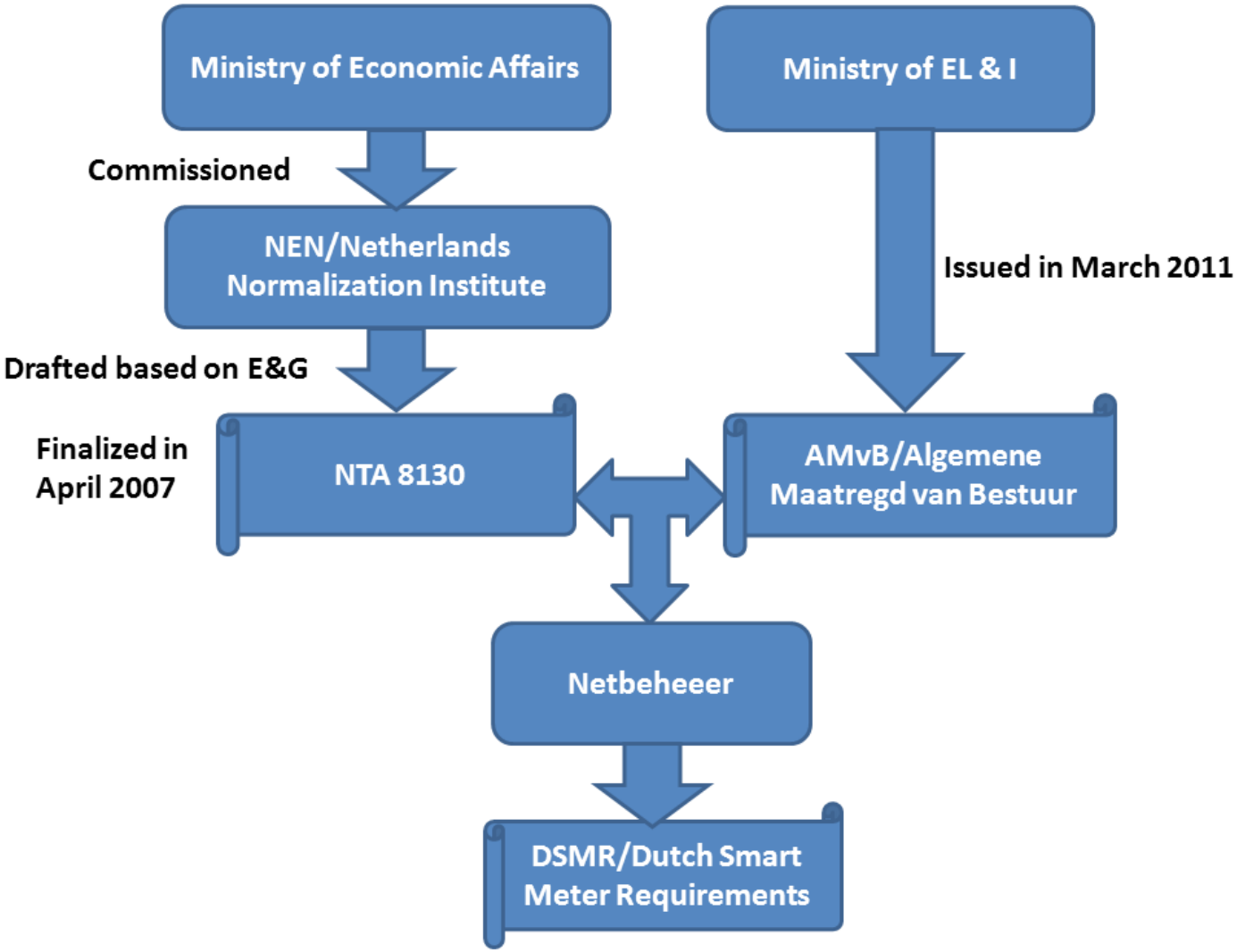
Uitlezen Slimme meter
- 6 x per jaar verplicht + bij switchen en verhuizen
- Dag- en intervalstanden op verzoek van de klant

Inzicht in gegevens
Leveranciers en derden kunnen – indien zij toestemming hebben van de klant – verbruiksgegevens ophalen en gebruiken voor jaarafrekeningen, verhuizingen, energiebesparing doeleinden, etc.

Slimme netten
Een slimme meter is onderdeel van een 'slim net' (smart grid), welke de grootschalige toepassing mogelijk maakt van duurzame technologieën. Ook zorgen slimme netten ervoor dat de netbeheerders de netten op afstand beter kunnen monitoren, beveiligen en besturen.

Smart Meter

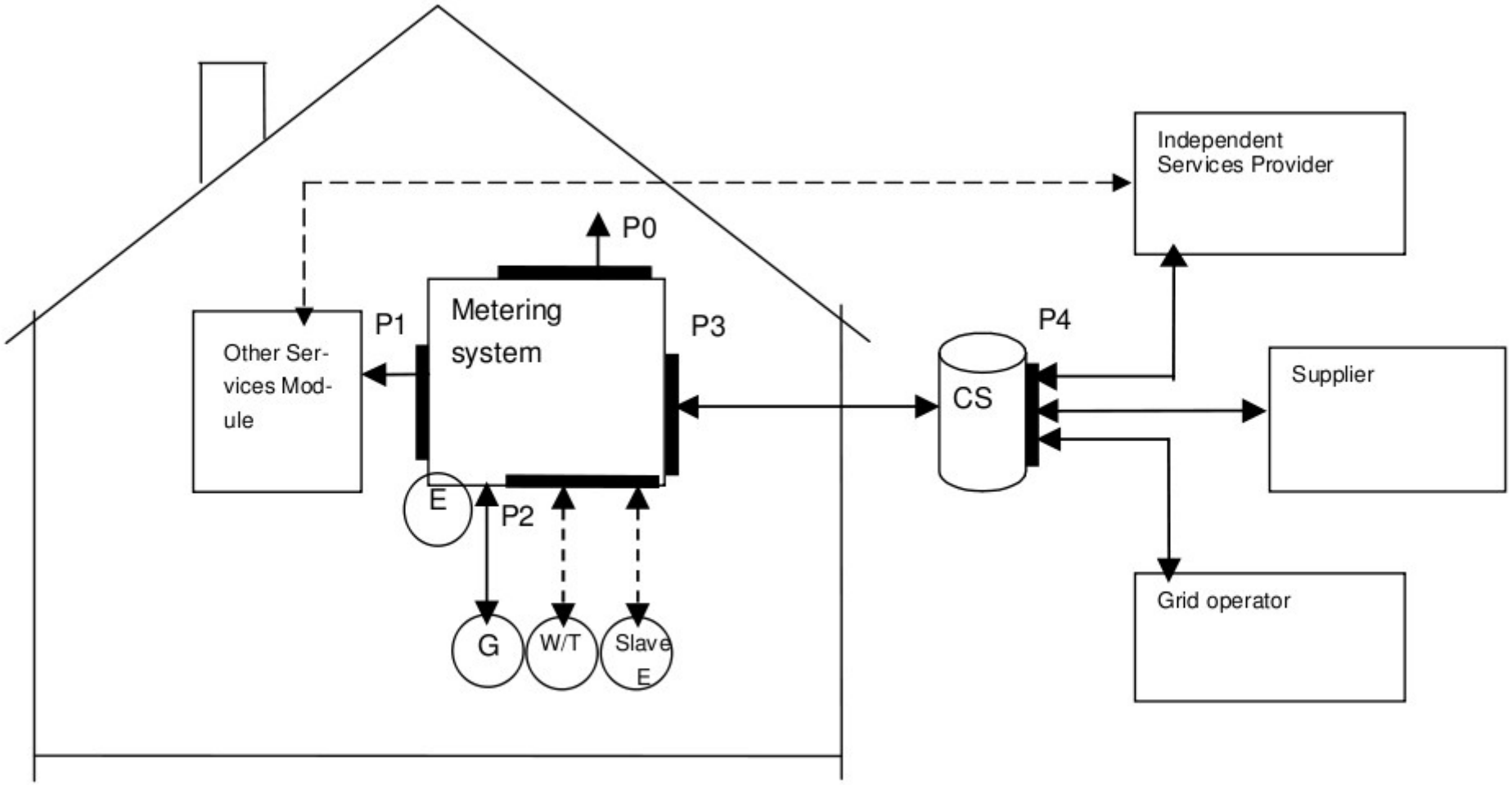
- DSMR



Smart Meter

- GOs are purchasing and rolling out smart meters according to DSMR 2.2+ by now
- By 2013, they will use DSMR 4
- Two types of smart meters: PLC and GPRS
- By 2015, DSMR 5 (possibly EU standard)
- Kill switch available now, will be used starting from 2013

Smart meter


Independent
Services Provider
P0
Other Ser-
vices Mod-
ule
P1
Metering
system
P3
P4
CS
Supplier
E
P2
G
W/T
Slave
E
Grid operator

Smart Meter


ACE3000
Itron
3-fase kWh-meter
3x230/400V 50Hz Class A
0,5-10(100)A
kWh
2011
0122
to 70 °C
T10039
1000 imp/kWh
kWh

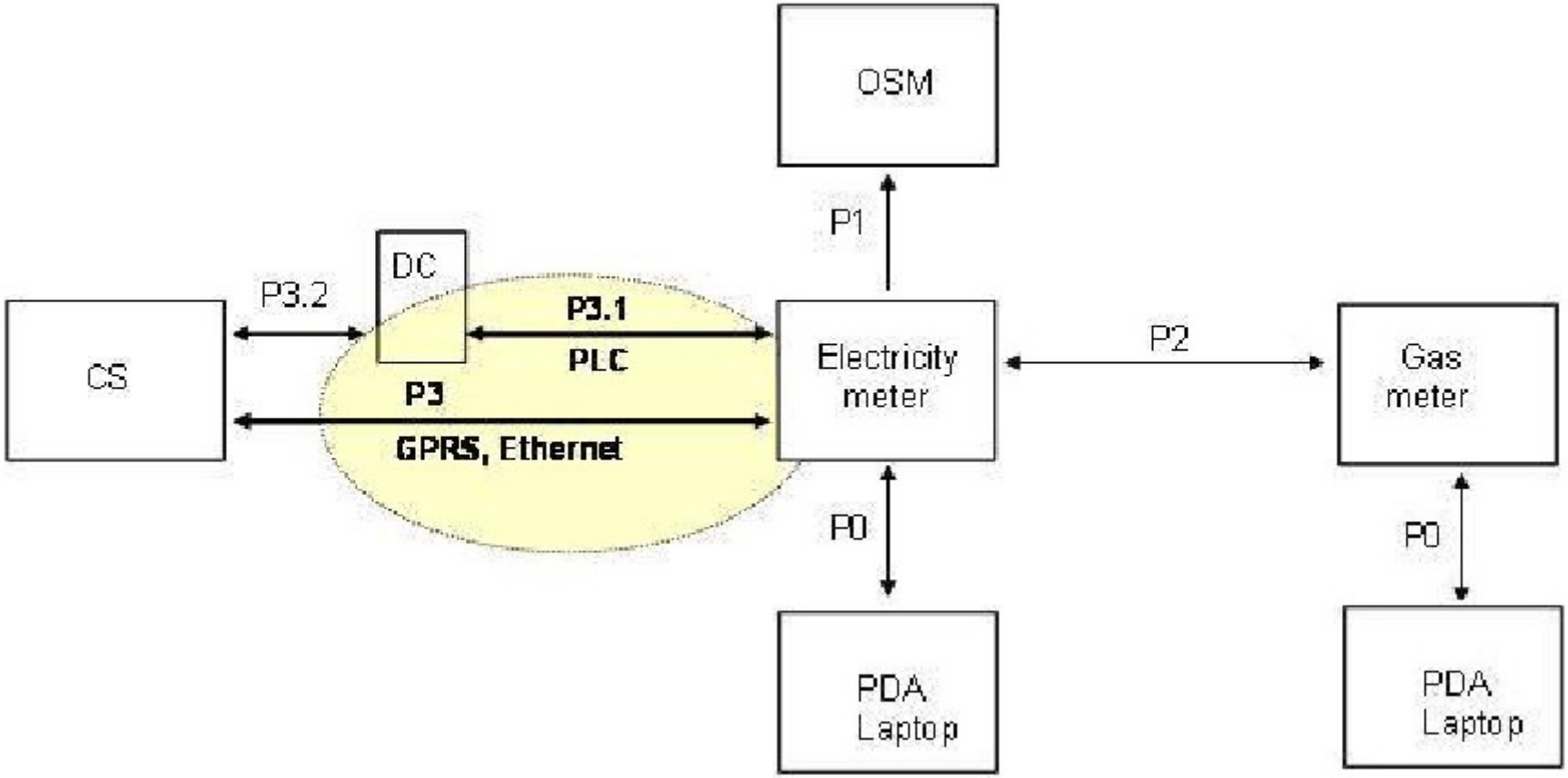

E350
E35C
Ethernet Module
AD-FEX1GX50 No. 99 999 001
MAC: 88-88-88-88-88-88
dlms


METERUS

Technology

- PLC (Power Line Carrier) use existing infrastructure
  - Prime / G3 PLC (both uses DLSM/Cosem)
  - DC (Data concentrator) at transformer station
- GPRS use mobile network
  - Need Teleco provider
  - GO choose Teleco for its own network
  - Direct connect to C-AR through local AR

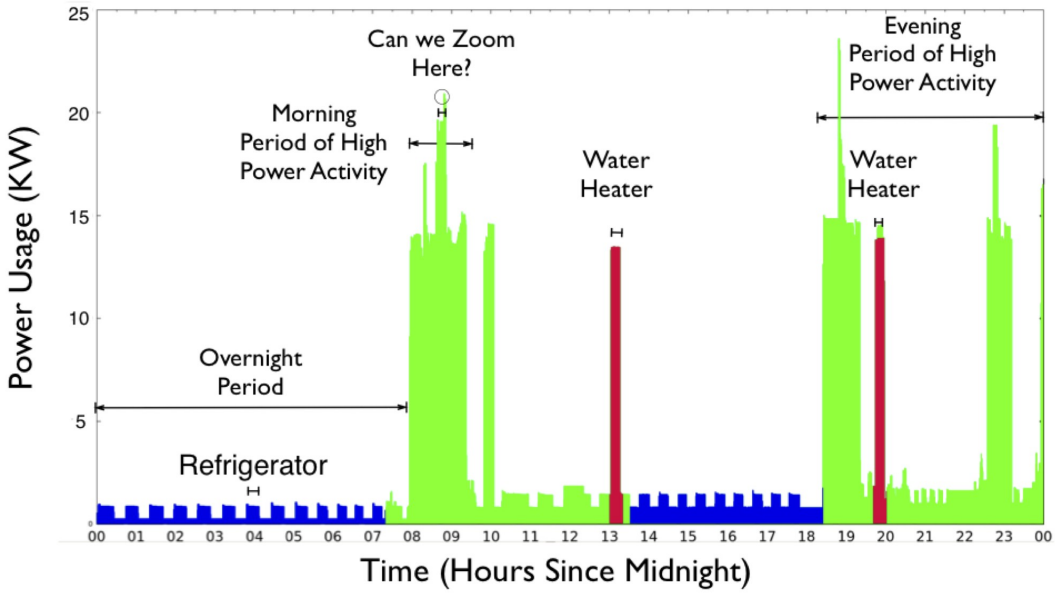
Technology - PLC



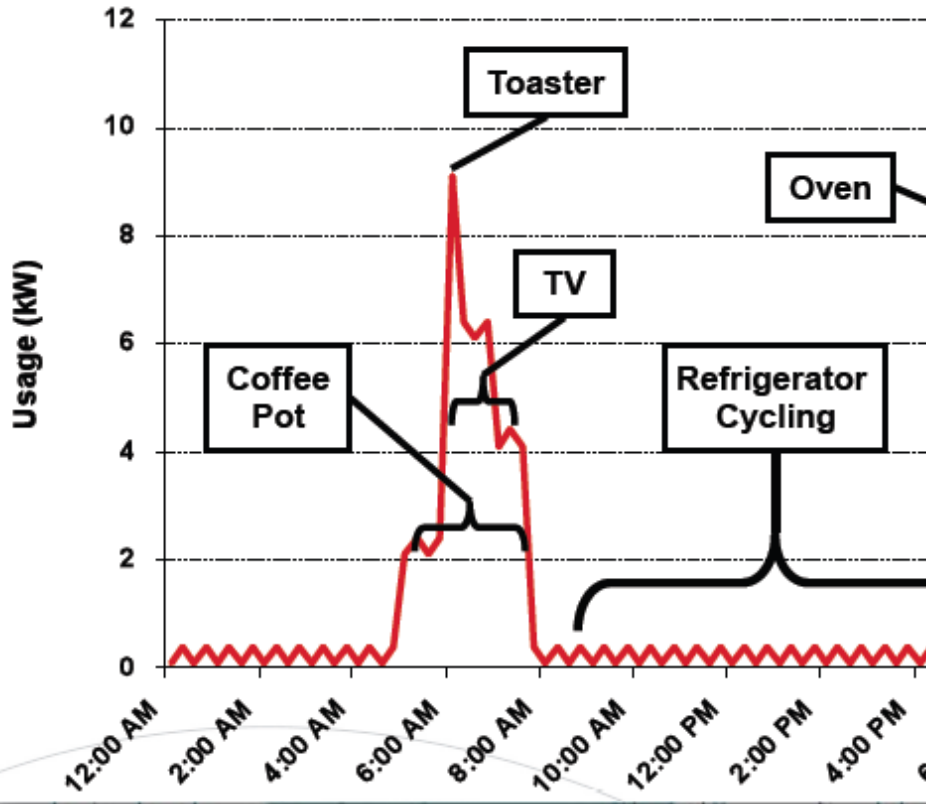
Communication

- EDSN – C-AR / ODA
  - Virtual port: P4
  - EDSN is the communication hub
  - C-AR for SC (supplier company)
  - ODA for ISP (independent service provider)
- GO, SC and ISP have to be certified
- Annual audit report has to be sent to GO from both SC and ISP to prove legal operation
- 6 times metering data reading by law
- 15 minutes interval for E and 60 minutes for G, data is read daily

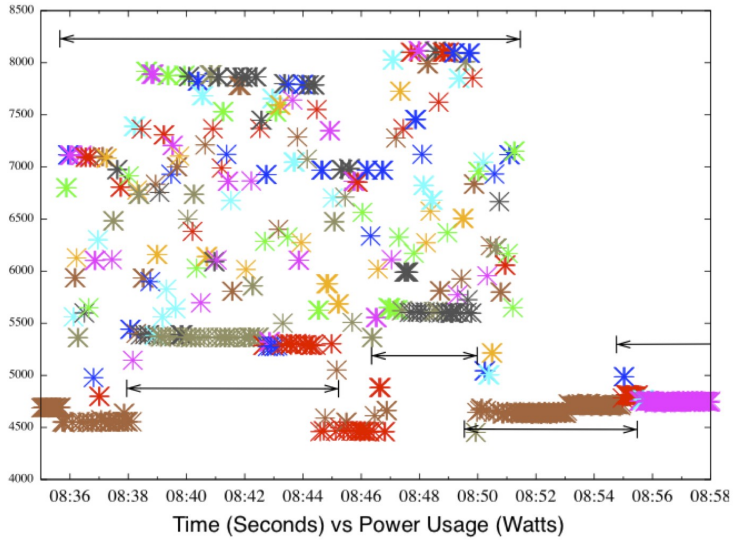
- Privacy is a big concern



Basic patterns can be inferred with minimal analysis, even with power measurements every 30 seconds.



Morning Trace



There is a high correlation between power segments and consumer interaction with appliances.

Conclusion

- Core stakeholders from different interests groups and task domains
  - GO (owner of the infrastructure)
  - Prosumer (usage produce data)
  - EDSN (market facilitator)
  - Teleco providers (GPRS)
  - ISP (provide value-added services)
- The overall picture of the whole system
  - Metering networks (PLC & GPRS)
  - Local AR and C-AR
  - EDSN as communication hub
  - GO is the center part
  - EDSN will be the future center

Recommendations

- Possible improvements
  - Security & Privacy
    - Check both base contract and extra contract
  - System & Network
    - Avoid potential bottleneck “EDSN”
  - Usability
    - User should be able to adjust the permission directly (DigID?)

That's IT!
Thanks for your attention!

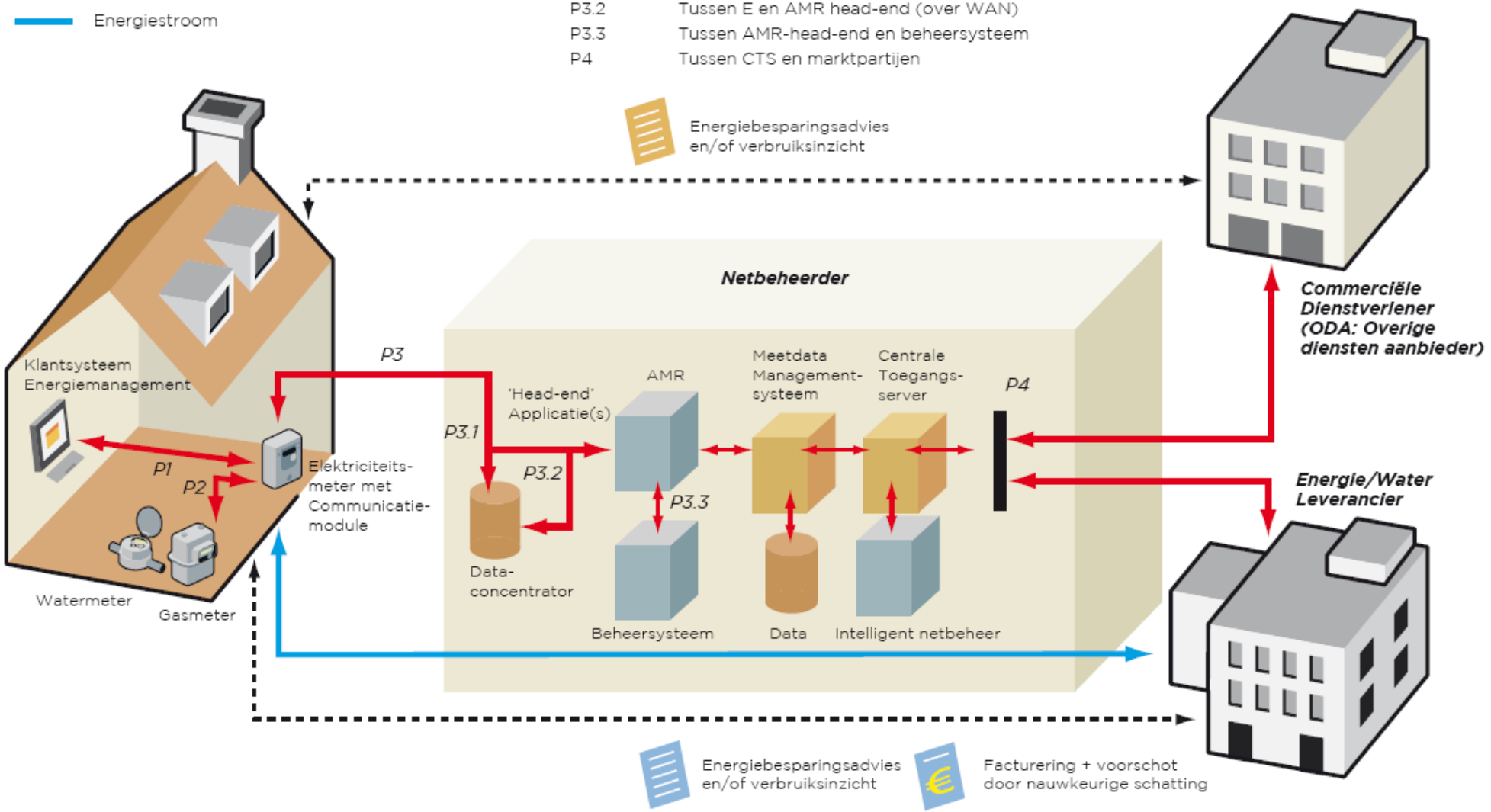
Facts

- Smart meter is more for consumption shifting, no direct saving
- Regulation and specification not final
  - EU regulation and standard maybe there
- Process not fully automated
- Bright future, but long way to go
  - Appliances mostly not ready/not available
  - Inter-section/inter-industry cooperate needed
  - Current situation is only a small part of the future big picture

Communication

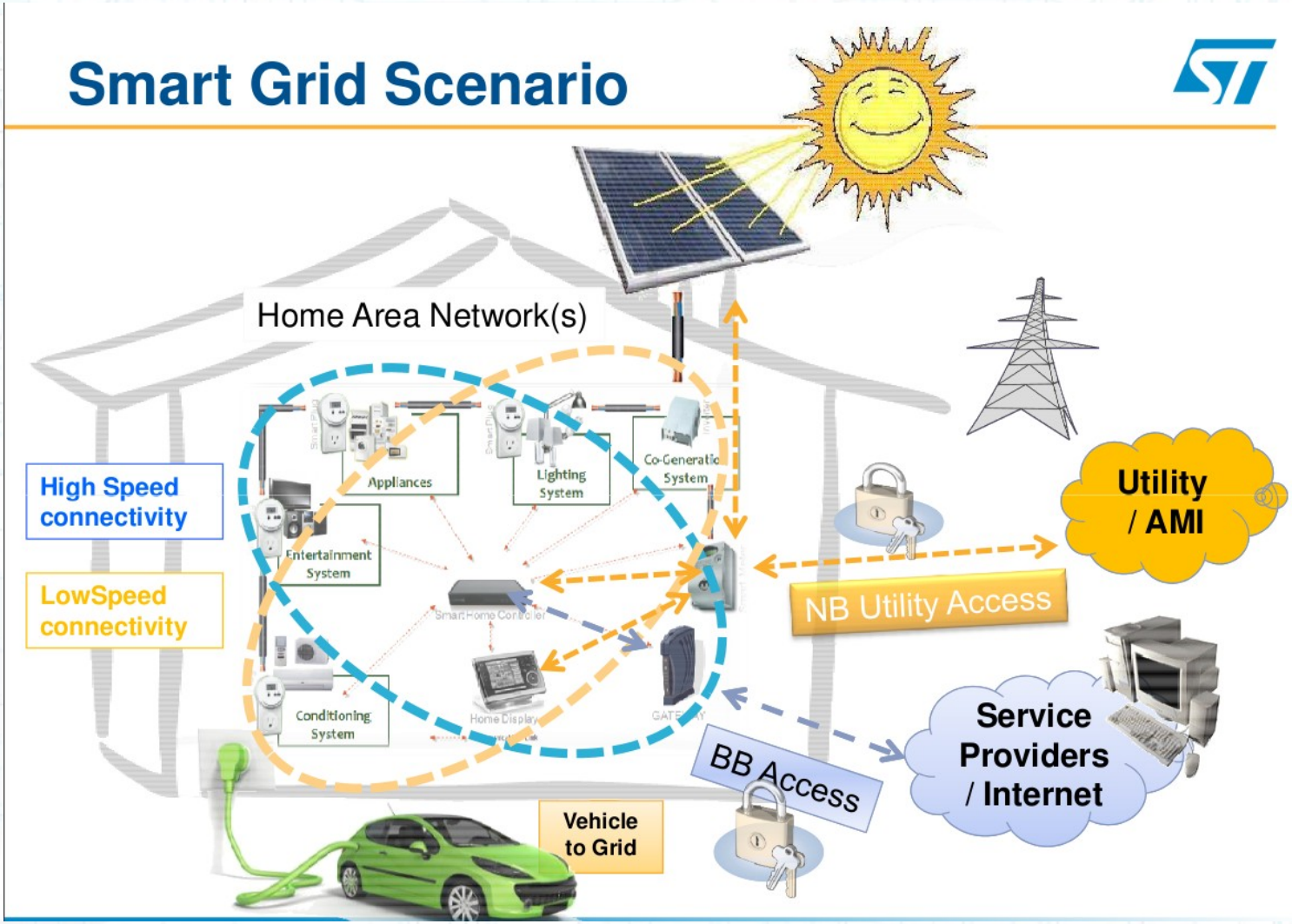
Het systeem bestaat uit componenten 'in het veld' en uit applicaties 'bij de utility'.

Poort	Communicatie
P1	Vanuit E met de klant
P2	Tussen E en andere utility meters
P3	Tussen E en AMR (over GPRS)
P3.1	Tussen E en DC (over PLC)
P3.2	Tussen E en AMR head-end (over WAN)
P3.3	Tussen AMR-head-end en beheersysteem
P4	Tussen CTS en marktpartijen



Use case

- HAN (Home Area Network)



Use case

- Prosumer