

# Security analysis of Dutch smart metering systems

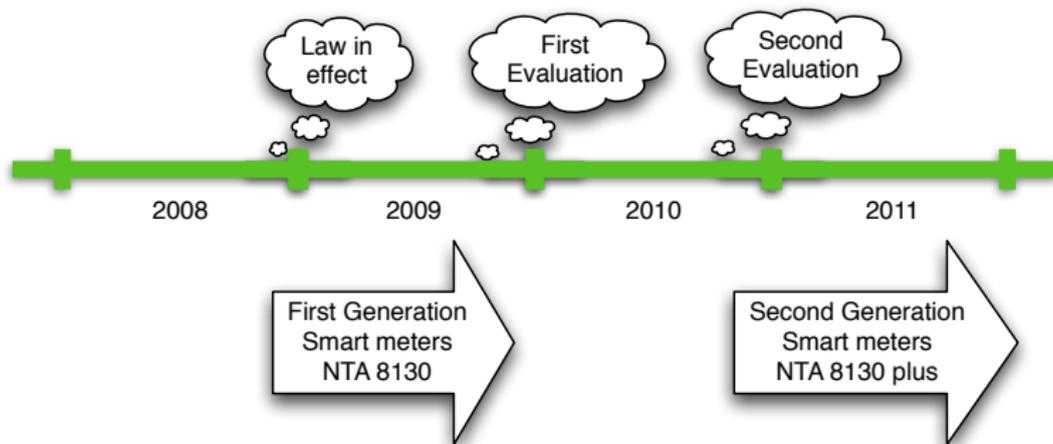
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July 2, 2008

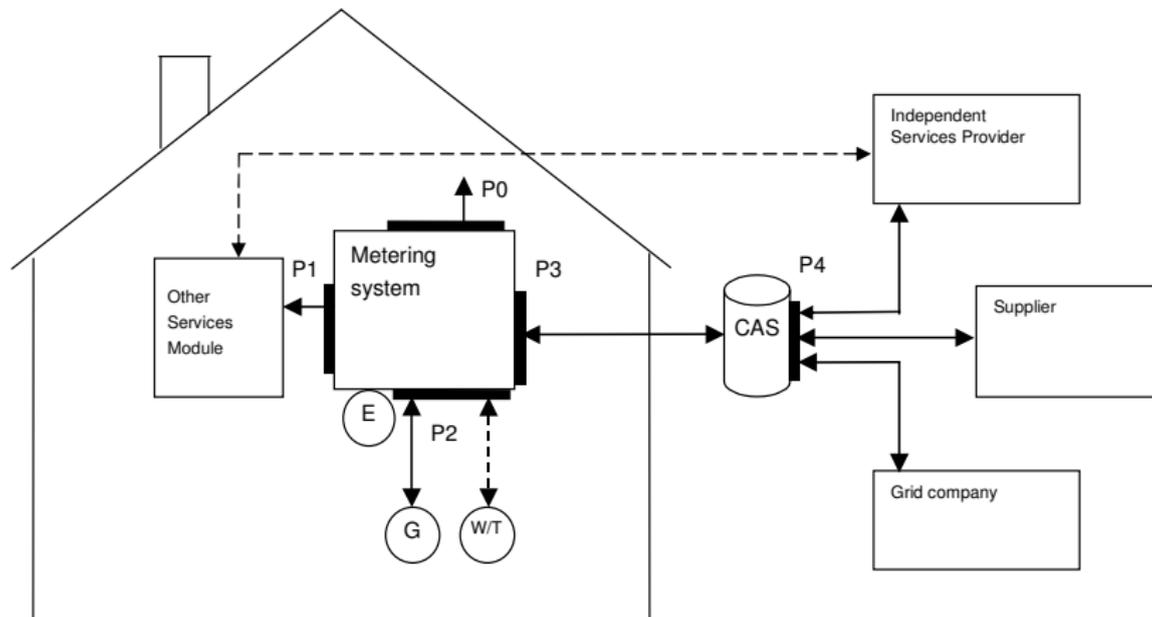
- 1 Smart metering introduction
- 2 Theoretical research
- 3 Practical research
- 4 Recommendations
- 5 Conclusion

# Smart Metering goals

- Accurate billing
- Insight in energy usage
- NTA Dutch Technical Agreement

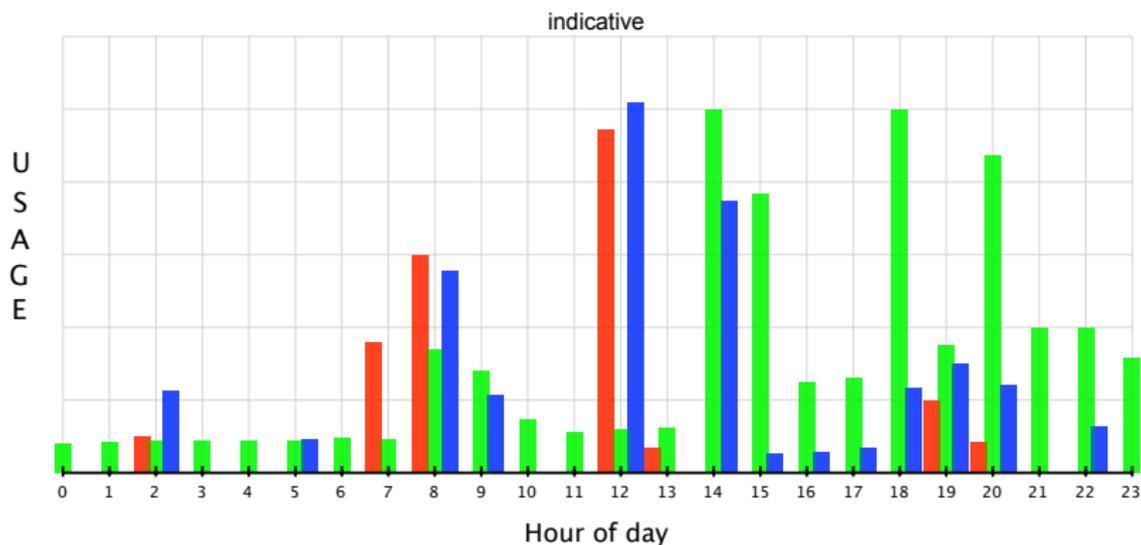


## NTA



# Your energy usage

- What do you see in this image?



Electricity Water Gas

## Research objective

*“Analyze the possible impact of the use of smart metering systems on the security of electricity metering using the CIA-triad and minimum requirements as stated in the NTA-8130 regulation. Compare the NTA and a preferred situation with the smart metering systems that are currently implemented.”*

# Theoretical research

- Defined the need for security using the CIA-triad
- Analyzed the NTA security requirements:

P0	Not defined
P1	Read-only
P2	Encryption allowed if interoperable
P3	Grid operator should take 'appropriate measures'
P4	Grid operator should take 'appropriate measures'
P5	Out of scope

- Defined possible attack vectors based on CIA-triad

# Port 0 security

- Optical interface (all meters)
- Programming buttons (some meters)
- Security measures
  - Switch behind security seal
  - Tamper detection





## Port 2 security

- Wired
  - M-Bus without encryption
  - M-Bus interfaces widely available
  - Simulate gas or water meter (slave)
  - Simulate electricity meter (master)



- Wireless
  - Proprietary protocols
  - Wireless M-Bus not being used

## Port 3 security

- Communication methods:
  - PowerLine Communication (PLC)
  - GPRS
  - Ethernet
  - Radio Frequency mesh (RF)
- Risks
  - Sniffing (Serial GPRS modem and Ethernet)
  - Disrupting communications
  - Denial of Service attacks

# Port 3 security

WebRTU z1

http:// / Inquisitor

Apple Yahoo! Google Maps YouTube Wikipedia Nieuws (971) Populair Serialtest Se...cket Sniffer

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Date	Time	Code	Status	1	Gas (l)	Cold Water (l)	Heat (MJ)
2008/06/20	15:15:00	00	0000	0000000005	0001299080	0000007851	0000032896
2008/06/20	15:00:00	00	0000	0000000006	0001299080	0000007851	0000032896
2008/06/20	14:45:00	00	0000	0000000006	0001299080	0000007851	0000032896
2008/06/20	14:30:00	00	0000	0000000005	0001299080	0000007851	0000032896
2008/06/20	14:15:00	00	0000	0000000006	0001299080	0000007851	0000032896
2008/06/20	14:00:00	00	0000	0000000005	0001299080	0000007851	0000032896
2008/06/20	13:45:00	00	0000	0000000006	0001299080	0000007851	0000032896
2008/06/20	13:30:00	00	0000	0000000005	0001299080	0000007851	0000032896
2008/06/20	13:15:00	00	0000	0000000006	0001299080	0000007851	0000032896
2008/06/20	13:00:00	00	0000	0000000006	0001299080	0000007851	0000032896
2008/06/20	12:45:00	00	0000	0000000005	0001299080	0000007851	0000032896
2008/06/20	12:30:00	00	0000	0000000006	0001299080	0000007851	0000032896
2008/06/20	12:15:00	00	0000	0000000005	0001299080	0000007851	0000032896
2008/06/20	12:00:00	00	0000	0000000006	0001299080	0000007851	0000032896
2008/06/20	11:45:00	00	0000	0000000005	0001299080	0000007851	0000032896

# Port 5 security

- Risks
  - Sniffing
  - Man-in-the-Middle attack
  - Shoulder surfing for credentials
  - The usual risks
- Basic security measures
  - SSL (HTTPS)
  - Strong authentication

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### Inloggen

Klantnummer:  Postcode: Huisnummer:  zonder toevoeging**Inloggen** Meer informatie op [Oxxio.nl](https://www.oxxio.nl)

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Mijn aansluitingen

Voortgang installatie

Verbruiksgegevens



Bekijk hier uw  
verbruiksgegevens!

## Verbruiksgegevens stroom

## Kies periode

Periode: Maand

Jaar: 2008

Maand: juni



## Mijn verbruik

Piek: 98.47 kWh

Dat: 92.05 kWh

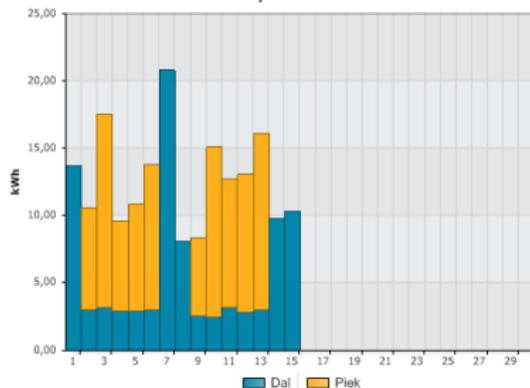
Totaal verbruik: 190.52 kWh

Percentage piek: 51,68%

## Mijn meterstanden

Piek

Geen gegevens

Energieprofiel  
juni 2008

Voor meer details klik op de betreffende dag in de grafiek

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U bent ingelogd als:

DemoKlant

Storkstraat 17c

3833 LB LEUSDEN

Klantnummer: 9999998

Uitloggen

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# Recommendations

## NTA:

- Aggregate data per day, week or month
- More specific security requirements in NTA
- Port 0 should be part of NTA
  - Including minimal security requirements

# Recommendations

Supplier and grid operators:

- Do not trust security seals
- Data availability can not be guaranteed
- Use open encryption on all links
- Do not underestimate privacy aspects
- Use SSL and strong passwords on website
- Perform data checks to verify correctness of data

# Conclusion

- Privacy underestimated
- NTA not specific enough about security
- Security of meter management functions not sufficient
- No secure channel between electricity and gas or water meter
- Supplier websites should improve their security

# Thanks

Thanks for your attention  
Any questions before enjoying your lunches?