

# ***Energy Monitoring Systems - Promises and opportunities***

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# Table of contents

1

About Infineon

2

Sustainability @ Infineon

3

Smart X / Energy Monitoring Systems / Sensors

4

Security

5

Conclusion

# Table of contents

1

**About Infineon**

2

Sustainability @ Infineon

3

Smart X / Energy Monitoring Systems / Sensors

4

Security

5

Conclusion

# Infineon at a glance

## Portfolio

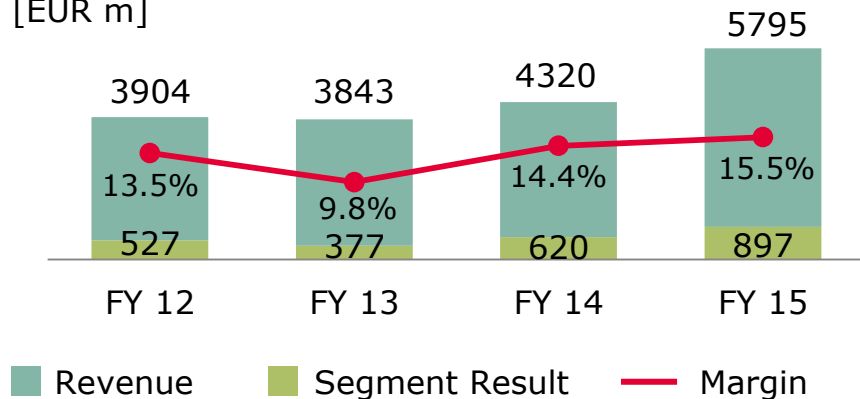
Semiconductors for

- > Automotive
- > Industrial Power Control
- > Power Management & Multimarket
- > Chip Card & Security

Strong technology portfolio with more than 25,000 patents and patent applications (as of Sep. 2015)

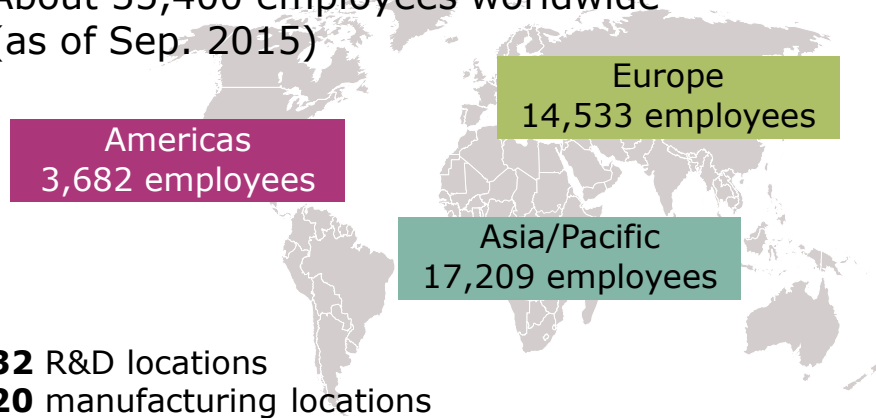
## Financials

[EUR m]



## Employees

About 35,400 employees worldwide (as of Sep. 2015)



## Market Position\*

\*Details see page 8

| Market Segment | Rank | Source                        |
|----------------|------|-------------------------------|
| Automotive     | # 2  | Strategy Analytics April 2015 |
| Power          | # 1  | IHS Inc. September 2015       |
| Smart card ICs | # 2  | IHS Inc. July 2015            |

Infineon enables efficient generation,  
transmission and conversion of electrical energy



## Applications

Energy transmission and conversion, renewable energy generation, home appliances, power supplies, LED lighting systems, mobile devices, power supplies, industrial drives, industrial vehicles



# Infineon enables security in the connected world



## Applications

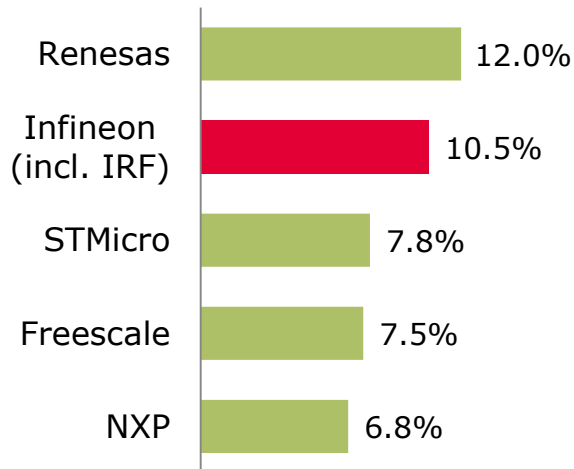
Internet of Things (incl. Industry 4.0), mobile security, embedded security, trusted computing, machine to machine, (mobile) payment, SIM applications, transport ticketing, government identification

# Top positions in all major product categories



## Automotive semiconductors

total market in 2014:  
\$27.5bn

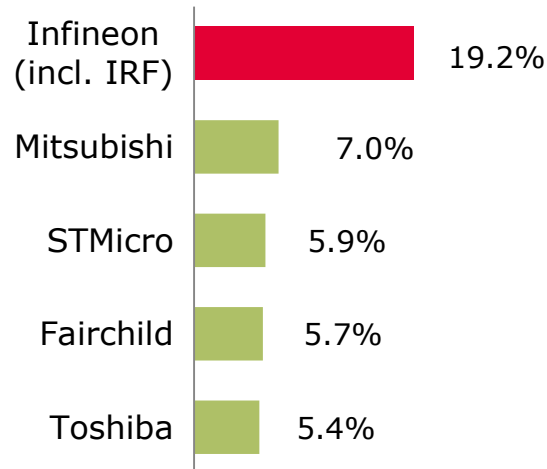


Automotive semiconductors incl. semiconductor sensors

Source: Strategy Analytics, April 2015

## Power semiconductors

total market in 2014:  
\$16.2bn

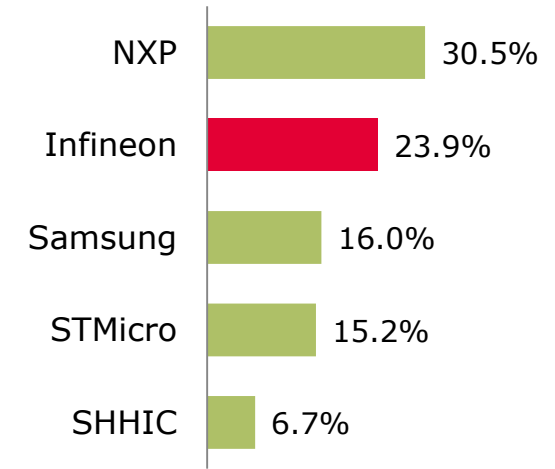


Discrete power semiconductors and power modules

Source: IHS Inc., September 2015

## Smart card Ics

total market in 2014:  
\$2.63bn



Microcontroller-based smart card ICs

Source: IHS Inc., July 2015

# Table of contents

1

About Infineon

2

**Sustainability @ Infineon**

3

Smart X / Energy Monitoring Systems / Sensors

4

Security

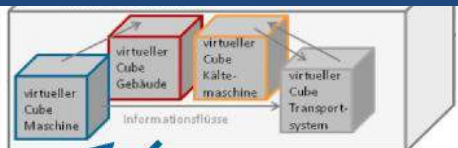
5

Conclusion



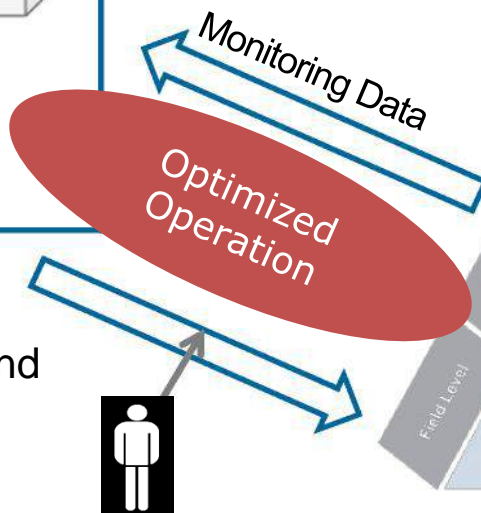
# Method **B**alanced **M**anufacturing

## Modellierung & Simulation (Virtuell)



Optimierungs-  
algorithmus

BaMa  
Tool Chain



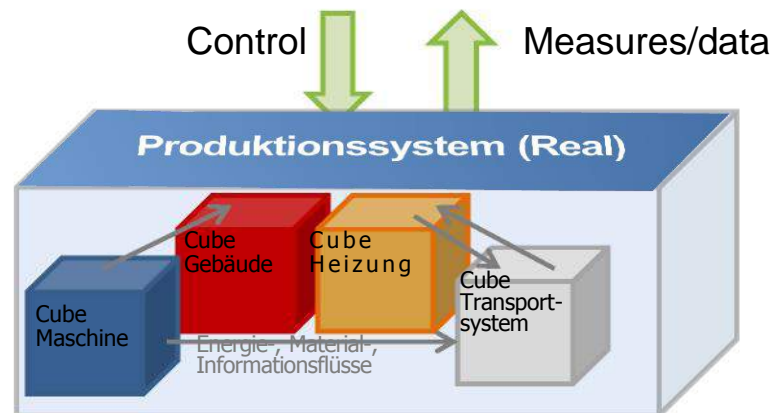
|                           |                          |                     |                    |
|---------------------------|--------------------------|---------------------|--------------------|
| Wissenschaftliche Partner |                          | Entwicklungspartner |                    |
| TU WIEN                   | IFT                      | automation          | SIEMENS            |
| IET                       | IPK                      | die Dübenerhandlung | DAUBNER Consulting |
| ITWW                      | libbpm                   | ATP sustain         | INTECH             |
| researchTÜB               | AUTOMATION SYSTEMS GROUP |                     |                    |
| Industrielle Anwender     |                          |                     |                    |
| MPRES                     | Infineon                 | berndorf BAND       | MKE                |
|                           | AAE                      | St. Pölten          |                    |
| Gefördert durch           |                          |                     |                    |
|                           | FFG                      |                     |                    |

### Vision:

Continuous comparison of real and virtual systems to get recommendations to improve operation

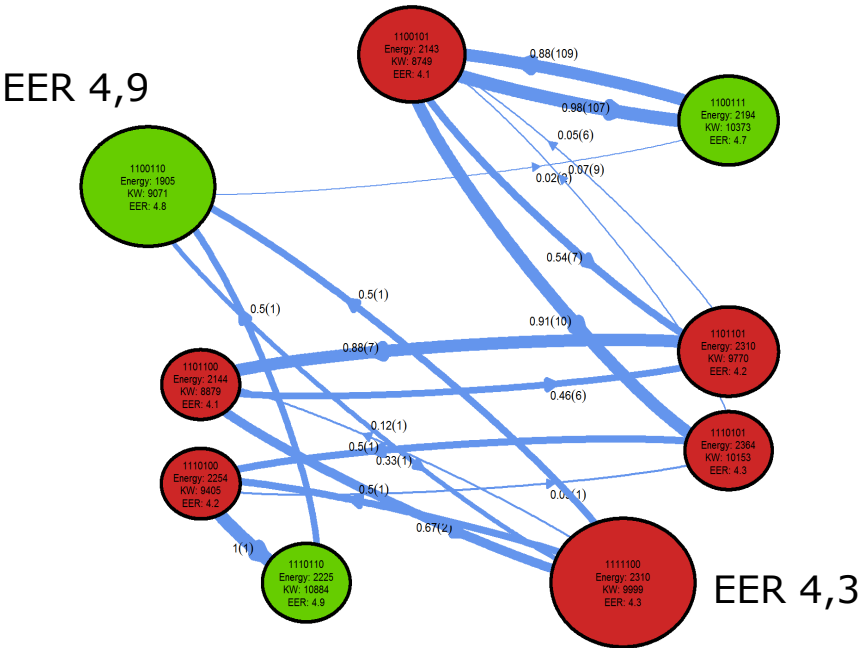
### Reference to real data:

- BPS Data
- Planning Data
- Specifications from OEM
- Self learnings



# Initial results INFRA Operation (BaMa Project) Chiller Pilot

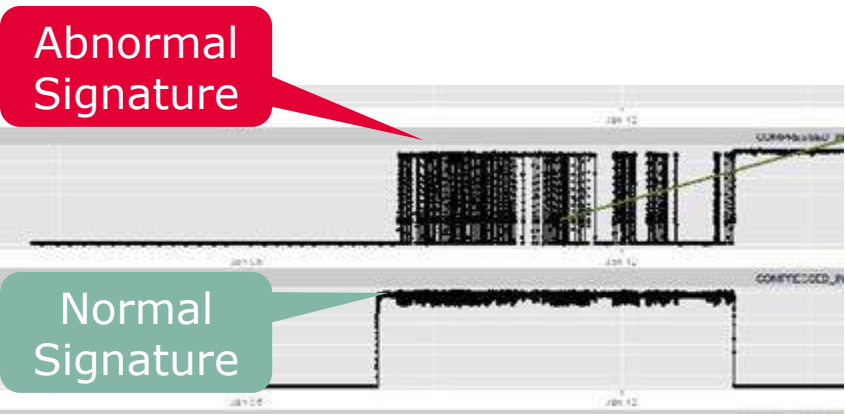
## Energy Efficiency Ratio



## Outputs Efficiency

- > EER shows up to 13% losses in efficiency
- > Efficiency of Chiller configuration
- > Motivator and enabler for better system understanding (interdisciplinary know how)

## Stability



## Outputs Stability

- > Capability of signature detection
- > Early deviation detection
- > Fast troubleshooting and learning

# Corporate Social Responsibility

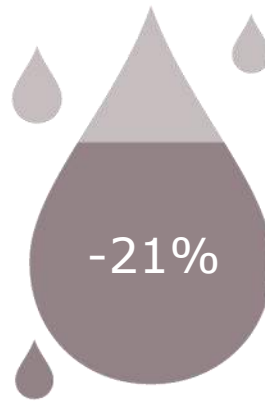
## We are excellent in Resources Efficiency



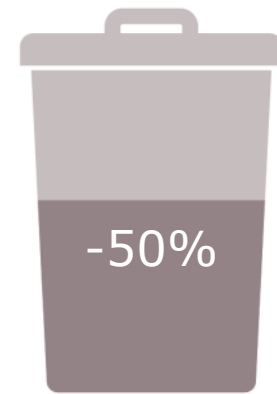
### At Infineon, less is more



About **40% less** electricity consumed per square centimeter produced wafer than the global average



About **21% less** water consumed per square centimeter produced wafer than the global average



About **50% less** waste generated per square centimeter produced wafer than the global average

We use resources much more efficient in our production processes than the global average of the semiconductor industry.

Basis for the calculations are the square centimeters processed wafer area in the front-end production and consumptions according to WSC definition.

The information and data given in this document apply to the Infineon Technologies group, except for International Rectifier companies.

### Emission Reduction enabled by our products and solutions

around  
1.6  
million  
tons

CO<sub>2</sub> burden<sup>1)</sup>



Ratio around 1:23

around  
36.5  
million tons

CO<sub>2</sub> savings<sup>2)</sup>

Net ecological benefit:  
**CO<sub>2</sub> emission reduction around 35 million tons**

1) This figure considers manufacturing, transportation, function cars, flights, materials, chemicals, water/wastewater, direct emissions, energy consumption, waste, etc. and is based on internally collected data and externally available conversion factors. All data relates to the 2015 fiscal year.

2) This figure is based on internally established criteria, which are explained in the explanatory notes. The figure relates to the calendar year 2014 and considers the following fields of application: automotive, LED, PC power supply, renewable energy (wind, photovoltaic), drives as well as induction cookers. CO<sub>2</sub> savings are calculated on the basis of Infineon market share, semiconductor content and lifetime of technologies concerned, based on internal and external experts' estimations. Despite CO<sub>2</sub> footprint calculations are subject to imprecision due to the complex issues involved, the results are nevertheless clear.

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# Table of contents

1

About Infineon

2

Sustainability @ Infineon

3

**Smart X / Energy Monitoring Systems / Sensors**

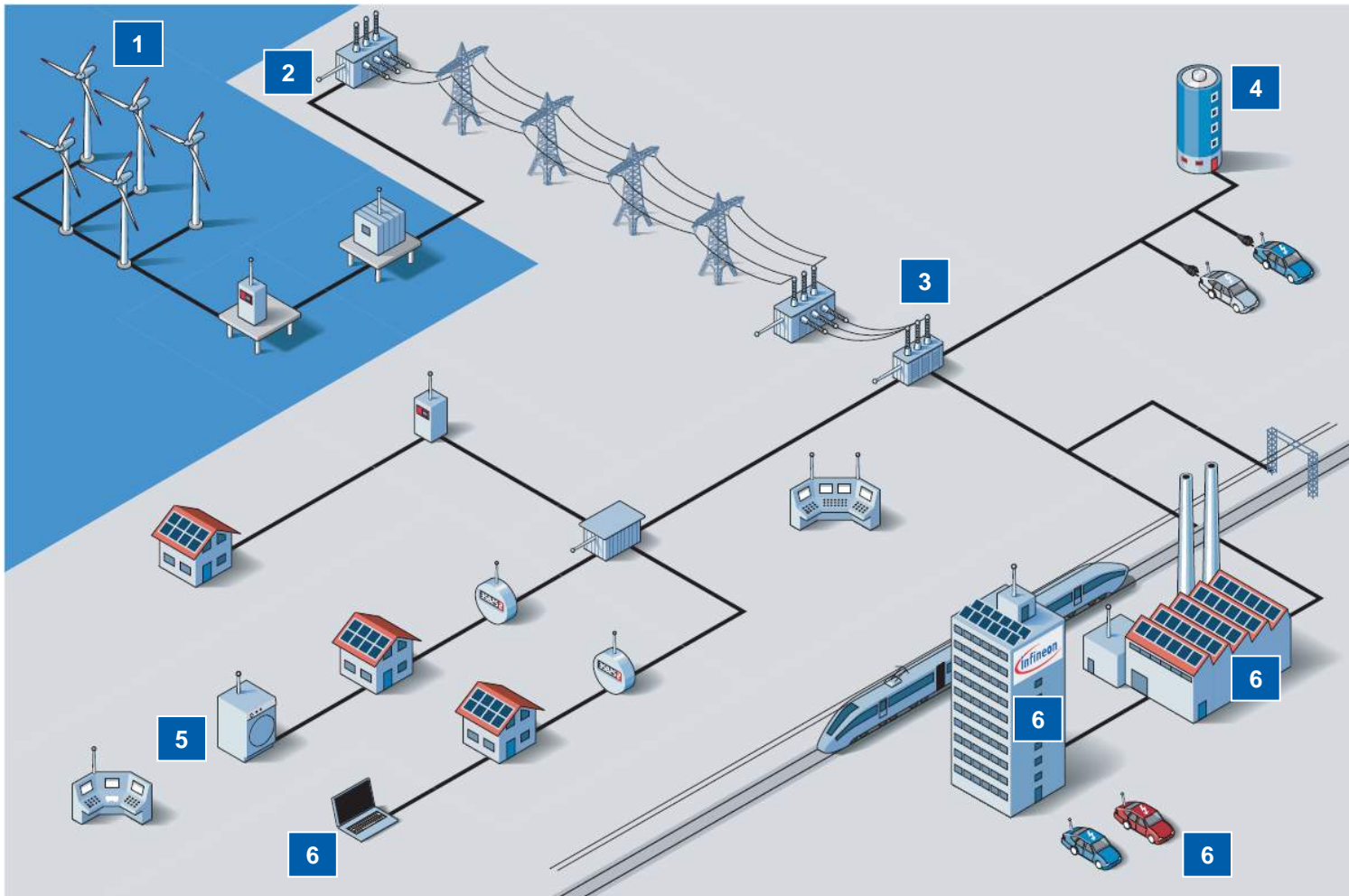
4

Security

5

Conclusion

# Smart Grid



- 1** Integration of renewable energy
- 2** Advanced transmission
- 3** Grid monitoring and control
- 4** Energy storage and EV-charging
- 5** Smart metering and appliances
- 6** Efficient consumption



## Electromobility



## Public transportation



# Smart City

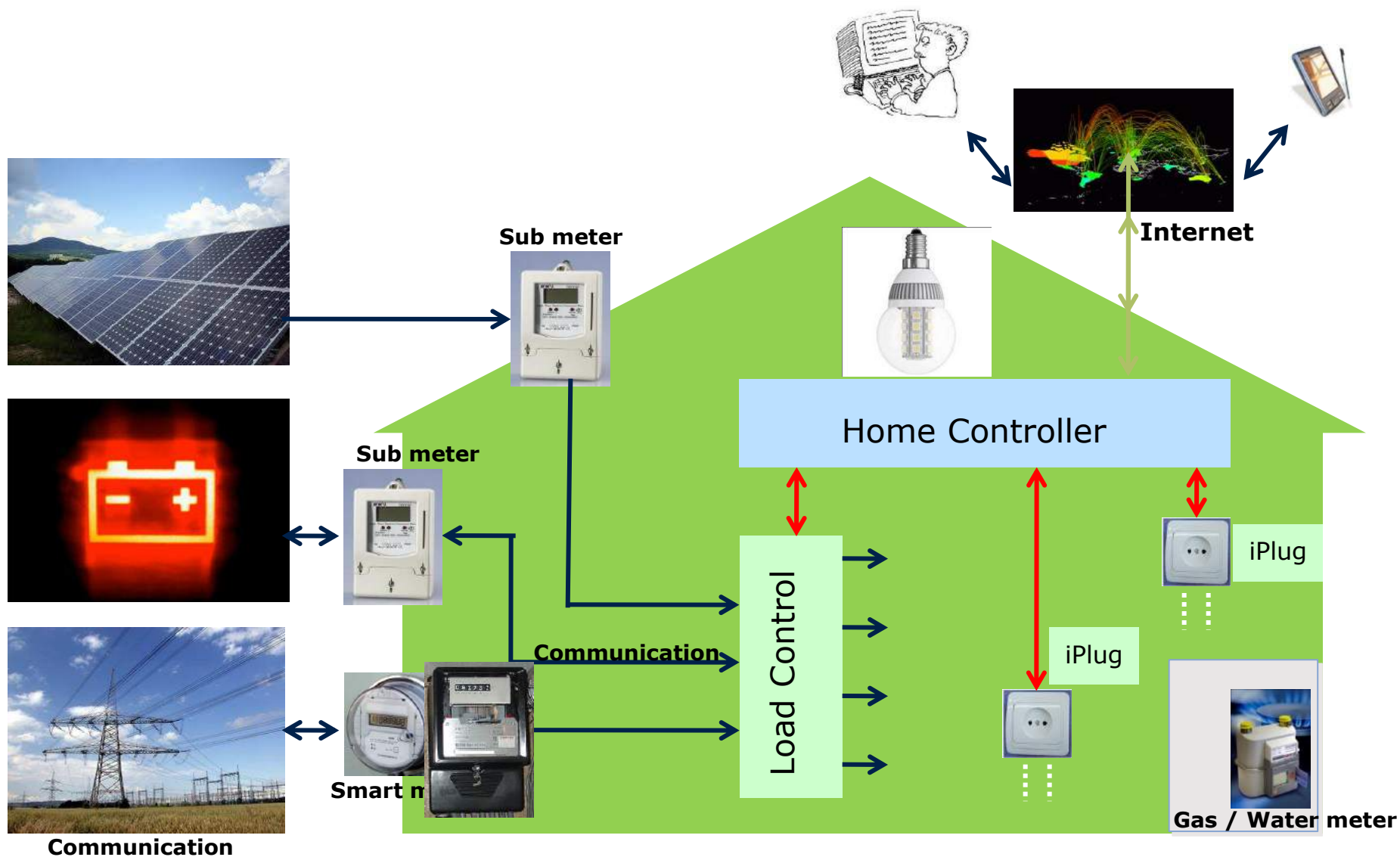


## Public lighting Renewables



## Security

# Smart Home



# Many plug-in EMS products already available (randomly chosen example)



## Intelligenteres Zuhause

Sie erhalten ein Smart Home, und zwar zum Preis eines Smartphones. Mit den neuen Komfort-Steckern™ haben Sie Ihr Zuhause mit Smappee ganz einfach mit einem Fingerstreich auf dem Smartphone unter Kontrolle. Mithilfe der Trigger in der App können Sie die Geräte zudem miteinander kommunizieren lassen. Über IFTTT können Sie Smappee sogar mit anderen Geräten im Internet der Dinge verbinden. Was spricht also dagegen, wenn alles in Ihren heimischen vier Wänden eingeschaltet wird, sobald Sie nur noch wenige Meter davon trennen ...

# Table of contents

1

About Infineon

2

Sustainability @ Infineon

3

Smart X / Energy Monitoring Systems / Sensors

4

**Security**

5

Conclusion

# Security of actual products

## SO UNSICHER SIND SMART-HOME-KITS – DER AV-TEST 2014

| PRODUKT                             | GIGASET ELEMENTS  | RWE SMART HOME   | QIVICON   | ICOMFORT   | TAPHOME  | ICONNECT   | XAVAX MAX!   |
|-------------------------------------|---|--|---|--|--|--|--|
| Anbieter                            | Gigaset   | RWE  | Telekom   | REV Ritter   | EUROiSTYLE   | eSaver   | Hama   |
| enthaltene Komponenten und Software | Gateway, Türsensor, Bewegungssensor, Smartphone-App <i>Gigaset Elements</i> | Gateway, Steckdosen-schalter, Wandschalter, Heizkörperthermostat, Online-Portal (auch mobil), lokales Portal, Smartphone-App | Gateway, Steckdosen-schalter (Ein/Aus), Heizkörperthermostat, Rauchmelder, Smartphone-App <i>Smart Home</i> | Gateway, 2 Steckdosen-schalter (Ein/Aus), Smartphone-App <i>REV iComfort</i> | Gateway, Steckdosen-schalter (Ein/Aus), dimmbare Steckdose, Smartphone-App <i>tapHOME Haus-automatisierung</i> | Gateway, 2 Steckdosen-schalter (Ein/Aus), Smartphone-App <i>eSaver Cloud</i> | Gateway, 2 Heizkörperthermostate, Eco-Wandschalter (Wechsel Eco/Auto), Fensterkontakt, MAX Desktop Software, Webportal |
| ENTHALTENE SCHUTZFUNKTIONEN         |   |  |   |  |  |  |  |
| verschlüsselte Kommunikation        | +   | +  | +   | -  | -  | +  | teilweise  |
| aktive Authentifizierung            | +   | +  | +   | -  | +  | nur bei Webzugriff   | nur bei Webzugriff   |
| Manipulation durch Externe          | keine Möglichkeit   | keine Möglichkeit  | keine Möglichkeit   | keine Möglichkeit  | keine Möglichkeit  | anfällig für Manipulationen  | anfällig für Manipulationen  |
| gesicherte Fernsteuerung            | wirksamer Schutz  | wirksamer Schutz   | wirksamer Schutz  | kein Fernzugriff möglich   | kein Fernzugriff möglich   | anfällig für Manipulationen  | anfällig für Manipulationen  |
| Testergebnis                        | guter Schutz  | guter Schutz   | guter Schutz  | anfälliger Schutz  | anfälliger Schutz  | zu schwacher Schutz  | zu schwacher Schutz  |

Die Experten von AV-Test haben 2014 sieben Smart-Home-Kits unter die Lupe genommen und herausgefunden, dass nur drei Systeme ausreichend gesichert sind (grün). Bei REV Ritter und EuroiSTYLE werden Daten unverschlüsselt übermittelt (gelb), und als unsicher gelten iConnect und XAVAX MAX! (rot).

# Important Features of Security systems

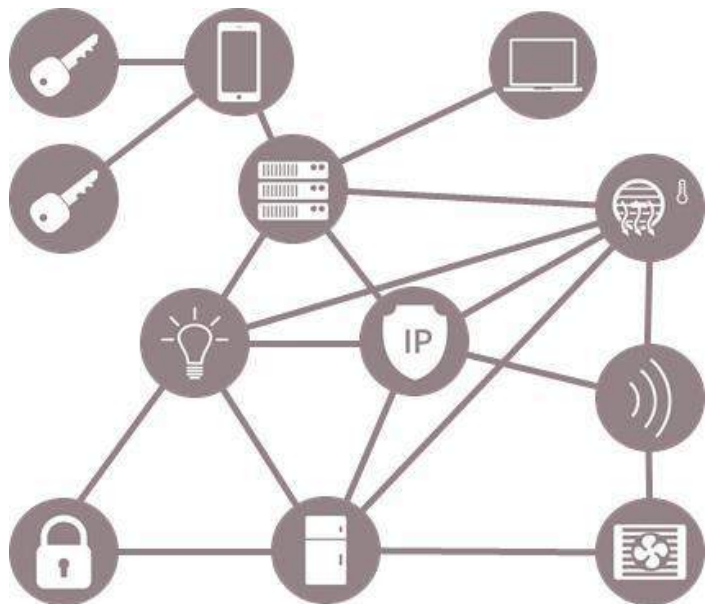


> [A Typical Family Home Could Contain More Than 500 Smart Devices by 2022](#)

> Important features are based on networks and stored data

- Real-time remote monitoring/control
- Detect and alarm smoke/water/CO, smart-lock /door/window/status
- Send email/text alerts
- Manage modes (home/vacation)

> Home security system protects health/life and home property





# Benefits of Hardware Security

|                                    | <br><b>Software Only</b><br>All security on main MCU/SoC | <br><b>Hardware Security</b><br>Use dedicated security chip |
|------------------------------------|--|---|
| Crypto Functionality               | ✓  | ✓   |
| Strong Isolation                   | STOP   | ✓   |
| Tamper Resistant                   | STOP   | ✓   |
| Security Certified Platform        | STOP   | ✓   |
| Security Certified Manufacturing   | STOP   | ✓   |
| Security Certified Personalization | STOP   | ✓   |

# Table of contents

1

About Infineon

2

Sustainability @ Infineon

3

Smart X / Energy Monitoring Systems / Sensors

4

Security

5

**Conclusion**

# Conclusion

1

Many proprietary solutions: Standards now or waiting for survivals

2

Own consumption of EMS is crucial

3

EMS has to provide an holistic overview

4

The more IoT, the higher the needed Security

5

Differentiate between analysis and permanent EMS needs



Part of your life. Part of tomorrow.

