

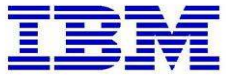
# JOUW ENERGIE MOMENT



Technolution



Technische Universiteit  
Eindhoven  
University of Technology



## Structure



- ▶ Introduction
- ▶ Challenges and developments
- ▶ The quest for flexibility in the energy system
- ▶ Jouw Energie Moment Pilots Breda & Zwolle
- ▶ Indesit's smart washing machine



# Enexis

- ▶ Distribution network company  
(former business unit of energy company Essent/RWe)
- ▶ Fully; i.e. ownership unbundled DSO  
(1-7-2006 national law on independent networks)
- ▶ Shareholders provinces and municipalities
- ▶ 4100 employees\*
  - ▶ revenue: 1204 million euros
  - ▶ profit: 194 million euros
  - ▶ total assets: 5911 million euros
- ▶ Independent network operator



## Gas

- 1.892.000 clients
- 41.000 km mains and service lines
- 24.000 gas stations
- < 1 min yearly failure duration



## Electricity

- 2.596.000 clients
- 130.000 km MV and LV cables
- 51.000 transformer stations
- 25 min. loss of loads (SAIDI)

\*) Taken from: Enexis (2010) Full financial statements [http://www.enexis.nl/site/over\\_enexis/publicaties\\_en\\_jaarverslagen](http://www.enexis.nl/site/over_enexis/publicaties_en_jaarverslagen)

# Developments

- ▶ Network operator is responsible for delivery of right amount of energy at the right time at the right place
- ▶ Energy savings
- ▶ Increase in (sustainable) distributed energy production
- ▶ Electricification of energy usage



# Consequences Energy Transition Network

- ▶ Existing Infrastructure designed to facilitate one-directional energy flows





# Consequences Energy Transition Network



- ▶ Incorporating **bi-directional flows** (distributed production) and increasing **flexibility** (intermittent sources) necessary

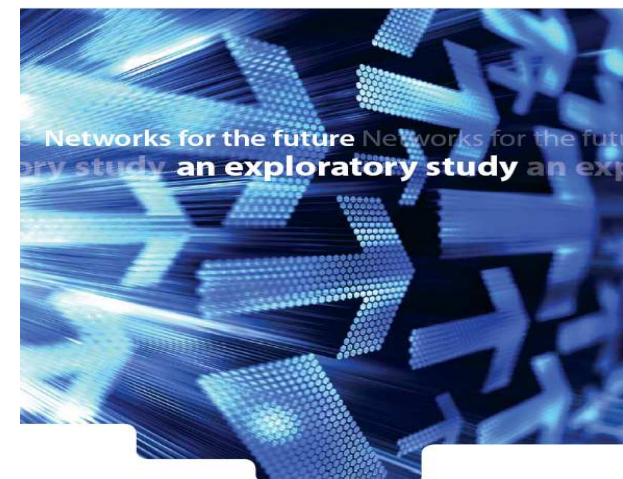
# Developments

- ▶ Flexibility and integration of distributed production
- ▶ Two directions for solutions:
  - ▶ Classical grid reinforcements

**Table 6**  
Summary of the extra investment (billions of euros) in energy infrastructure related to facilitation of energy transition in the period up to 2050

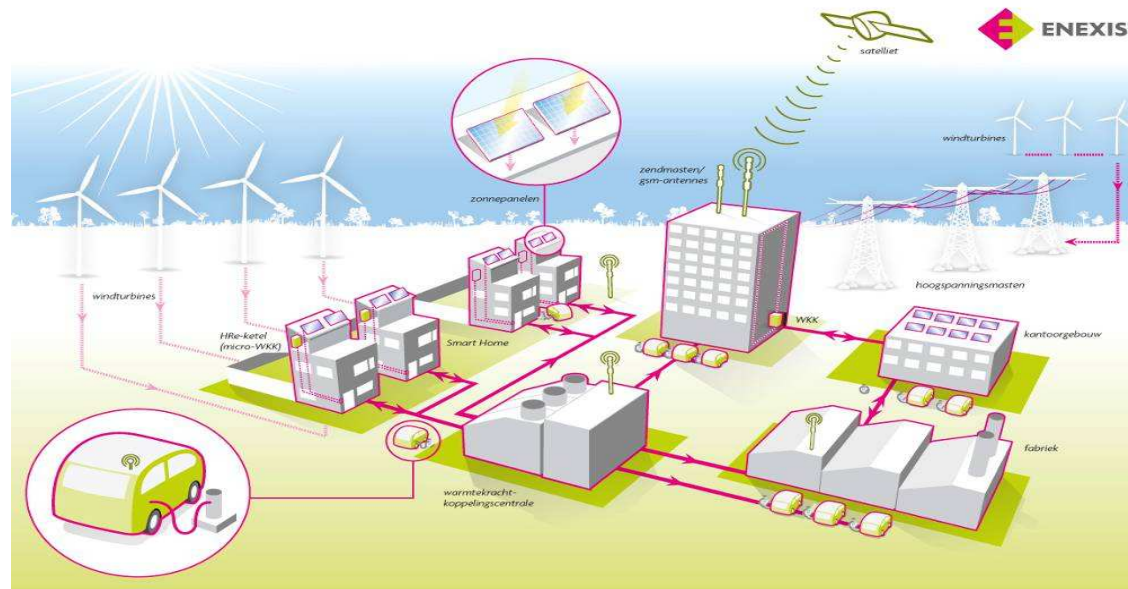
	Scenario A	Scenario B	Scenario C
Feeding in offshore wind power	9 - 15	3 - 5	3 - 5
Feeding in onshore wind power	2	1	0
Increasing capacity of HV network and HV/LV transformers	11 - 12	6 - 12	12
Increasing capacity of MV network and MV/LV transformers	5 - 19	5 - 8	5 - 14
Increasing capacity of LV cables	0 - 15	0 - 5	0 - 8
Increasing capacity of LV connector cables	0 - 3	0 - 1	0 - 1
Increasing capacity of gas transmission network	ca. 4	ca. 4	ca. 4
Construction raw gas infrastructure, green gas intake	ca. 1	ca. 1	ca. 1
Investments in experimental projects	p.m.	p.m.	p.m.
Investments in heat infrastructure, CO <sub>2</sub> infrastructure, and storage	p.m.	p.m.	p.m.
<b>Total</b>	<b>32 - 71</b>	<b>20 - 37</b>	<b>25 - 45</b>

ca. = approx.  
p.m. = amount to be determined



# Developments

- ▶ Flexibility and integration of distributed production
- ▶ Two directions for solutions:
  - ▶ 'Smart'





## Smart Grids: High Expectations

- ▶ “In their 2004 Memorandum of Understanding, the GridWise Alliance and the U.S. Department of Energy agreed to work together to realize the vision of a transformed national electricity grid.” (Grid Wise Alliance)



# Smart Grids: High Expectations

- ▶ “SmartGrids will help achieve sustainable development.” (Technology Platform for the Electricity Networks of the Future)



# Smart Grids: High Expectations

- ▶ “Smart Grids are a key enabler for the implementation of government energy and environmental policies.” (KEMA)



# Smart Grids: High Expectations

- ▶ “It’s the Dutch government’s ambition to hold a frontrunner position in smart grid technology and applications.” (Energierapport 2008)



Ministerie van  
Economische Zaken



ENEXIS

# Smart Grids: High Expectations

- ▶ “We will see the current passive network, where in times of emergencies blunt interventions are needed, changing into an active network in which autonomous software agents will take decisions to optimise system stability and network quality.” (prof.ir. W.L. Kling, TU/e)



## Smart Grids: Why haven't they arrived yet?

- ▶ (Decentral) storage of energy (stationary and / or in electric vehicles) is (still) too costly
- ▶ Law and regulation (“copper plate” paradigm; unbounded facilitation of market through network)
- ▶ Costs, reliability and lifetime expectancy of needed ICT
- ▶ Split incentives; costs and benefits are not evenly distributed amongst stakeholders

## Smart Grids: Why haven't they arrived yet?

- ▶ (Decentral) storage of energy (stationary and vehicles) is (still) too costly
- ▶ Law and regulation ("congestion management"; unbounded facilitation of market entry)
- ▶ Costs vs. lifetime expectancy of needed ICT
- ▶ Incentives; costs and benefits are not evenly distributed amongst stakeholders

**Indistinctness about actual "form" of smart grids in real life**



ENEXIS

# Enexis

- ▶ Enexis will make the best effort in order to earn the trust of our clients, employees, shareholders and society **to play a leading role in facilitating a sustainable energy supply system.**
- ▶ Department of Innovation initiates pilots on the field of “smart grids” to increase insights in the workings of the technologies, effects and functions of the concept.
- ▶ Focus is on “increasing flexibility of the energy system”



# The Quest for flexibility in the energy supply system

- ▶ Adding flexibility by directing non-time critical demand
  - ▶ E.g. directed charging of electric cars, heat pumps switches



# The Quest for flexibility in the energy supply system

- ▶ Technical solutions
  - ▶ Remote switching, routing flows of energy,  
local storage of decentralised production of electricity





# The Quest for flexibility in the energy supply system



Involving the consumer in issue of flexibility

- ▶ Demand Side Management

# Smart Grid pilot Breda



60 "energy neutral" households  
Between Oosterhoutseweg and Cadettenkamp

Heat pump  
Solar panels



250 "CO2 neutral" households Ettensebaan

Combined Heat and Power  
Collective Solar panel system



# Smart Grid pilot Zwolle



Muziekwijk

- ▶ 266 houses
- ▶ Solar panels



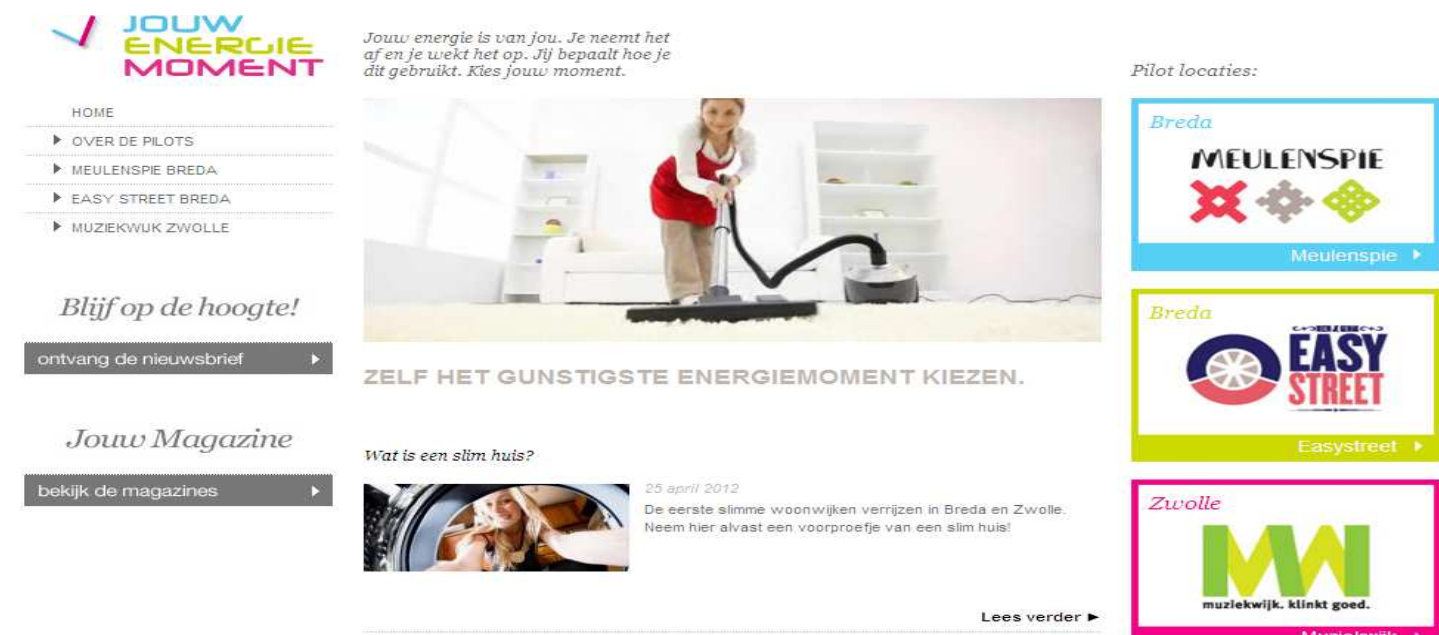
# Method

Aim of project smart grid with consumer:

- ▶ Realising flexible use of electricity by consumer
  
- ▶ Necessary:
  - ▶ Communication
  - ▶ Interaction
  - ▶ Financial and emotional stimuli
  - ▶ Technology

# Communication

► [www.jouwenergiemoment.nl](http://www.jouwenergiemoment.nl)



The screenshot shows the homepage of 'Jouw Energie Moment'. At the top left is the logo with a checkmark icon. Below it is a navigation menu with links for HOME, OVER DE PILOTS, MEULENSPIE BREDA, EASY STREET BREDA, and MUZIEKWIK ZWOLLE. A central banner features a woman vacuuming with the headline 'ZELF HET GUNSTIGSTE ENERGIEMOMENT KIEZEN.' and a sub-headline 'Wat is een slim huis?'. To the right, under 'Pilot locaties:', there are three location-specific logos: Meulenspie (Breda), Easystreet (Breda), and Muziekwijk (Zwolle). At the bottom right of the page content, there is a 'Lees verder' link.

**JOUW ENERGIEMOMENT**

HOME  
► OVER DE PILOTS  
► MEULENSPIE BREDA  
► EASY STREET BREDA  
► MUZIEKWIK ZWOLLE

*Blijf op de hoogte!*  
ontvang de nieuwsbrief ►

*Jouw Magazine*  
bekijk de magazines ►

*Jouw energie is van jou. Je neemt het af en je wekt het op. Jij bepaalt hoe je dit gebruikt. Kies jouw moment.*

**ZELF HET GUNSTIGSTE ENERGIEMOMENT KIEZEN.**

*Wat is een slim huis?*

25 april 2012  
De eerste slimme woonwijken verruizen in Breda en Zwolle. Neem hier alvast een voorproefje van een slim huis!

Lees verder ►

*Pilot locaties:*

**Breda**  
**MEULENSPIE**  
Meulenspie ►

**Breda**  
**EASY STREET**  
Easystreet ►

**Zwolle**  
**MW**  
muziekwijk. klinkt goed.  
Muziekwijk ►



# Communication

## ► Newsletters

 [► Nieuwsbrief online bekijken](#)

*Jouw energie is van jou. Je neemt het af en je wekt het op. Jij bepaalt hoe je dit gebruikt. Kies jouw moment.*

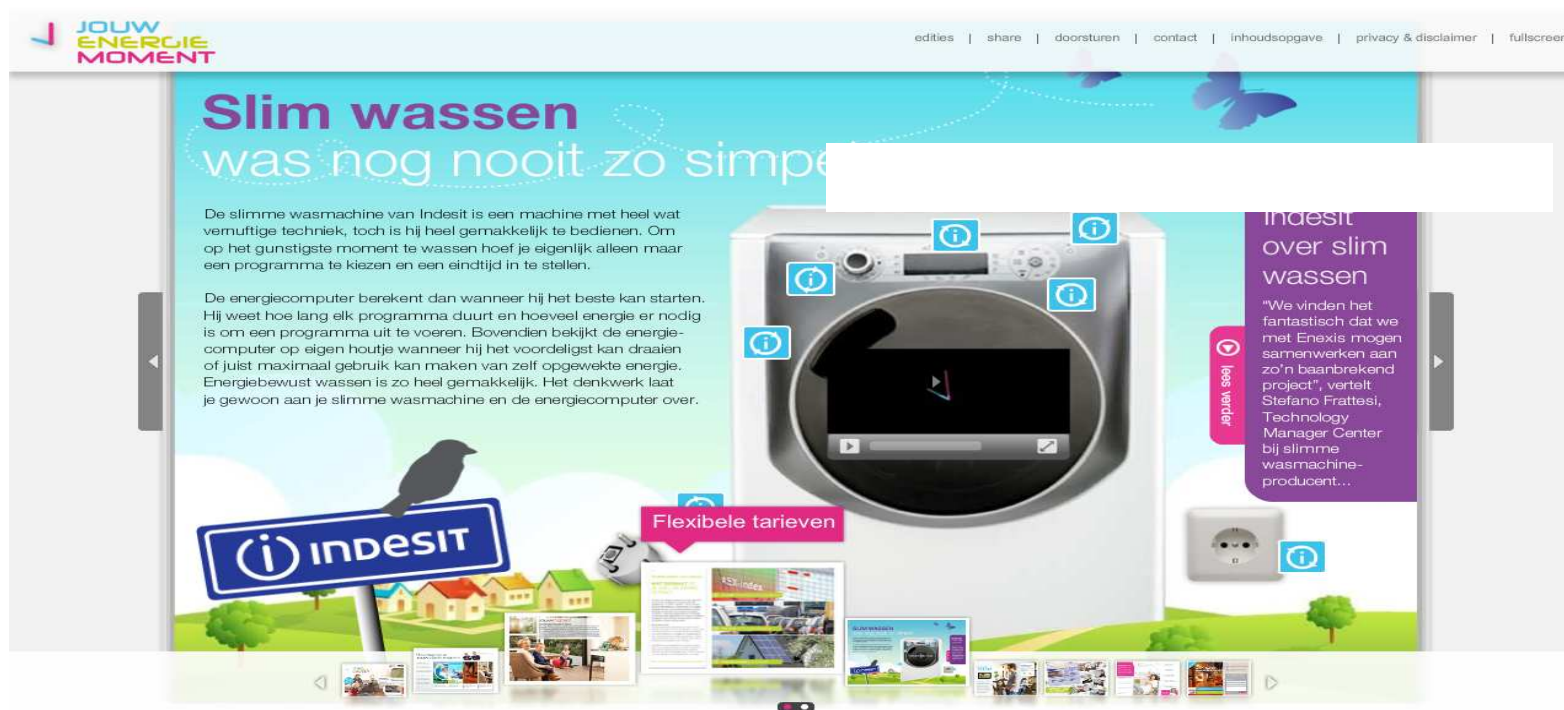


**Nieuwsspecial Bewonersavond Easystreet** 

Tijdens en ook na de bewonersavond op 22 maart jl. zijn er veel vragen gesteld door jou. In deze nieuwsbriefspecial vind je de antwoorden op jouw vragen terug. Mocht je hierna nog twijfels, vragen of opmerkingen hebben, mail ze dan naar [info@jouwenergiemoment.nl](mailto:info@jouwenergiemoment.nl). Wij helpen je graag! Je kunt je nog tot 1 mei a.s. opgeven voor deelname. We kijken uit naar jouw deelname!

[Bekijk hier het filmpje](#) voor een impressie van de bewonersavond.

# Communication



- ▶ Magazine (on-line) & social media (twitter, facebook, youtube)

# Communication



- ▶ “town hall” meetings

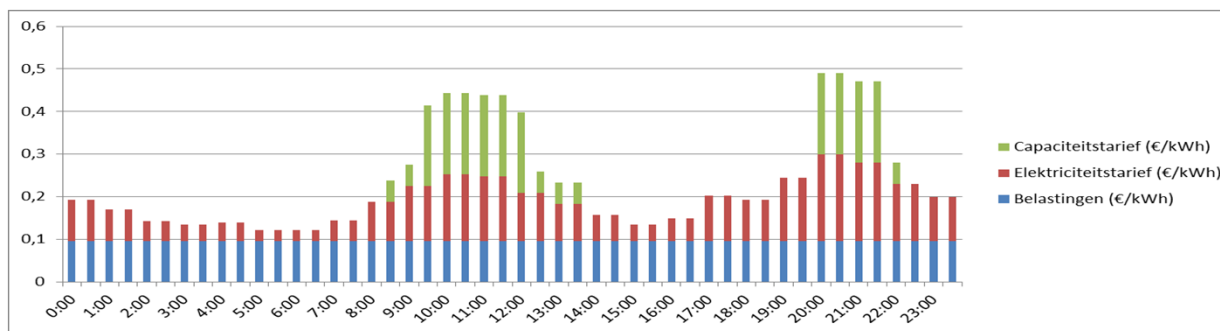
# Stimuli / Incentives

User can shift the use of appliance during agreed timeframe: most optimal moment to use is determined by operator of demand side management

Optimal time slots are communicated to user 24hrs in advance

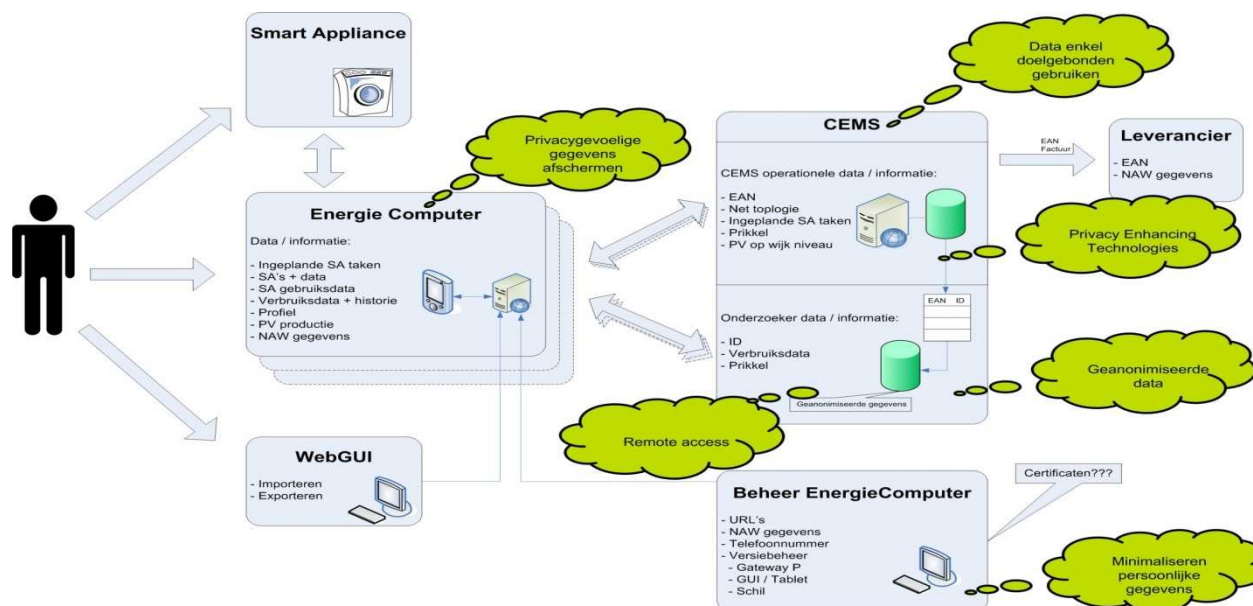
User makes choices based on:

- ▶ Costs preferences
- ▶ Efficient use of locally produced electricity



# Technologies

- ▶ ICT – developed by Technolution, Flexicontrol, IBM and Logica



# Technologies

- ▶ ICT – developed by Technolution, Flexicontrol, IBM and Logica



## Indesit Company in the Jouw Energie Moment

- We met Enexis at



- We immediately realized that our Smart Washing Machine fit the field trial use cases and we left it to Joris!
- In 3 months, **we integrated it to the system!**
- **How?**
  - Sharing specs and documentation
  - Using a lot of Skype
  - Working hard, with **passion** and **motivation**
- **Why?**
  - We loved since the first moment the idea of the project
  - We would like to offer to our customer new services to be greener and to save money.





## Indesit 1.0 Energy Saving Approach

MDAs are responsible for 43% of residential consumption



### TRADITIONAL TECHNOLOGIES FOR ENERGY EFFICIENCY



Reducing the quantity of water



Designing low energy cycles



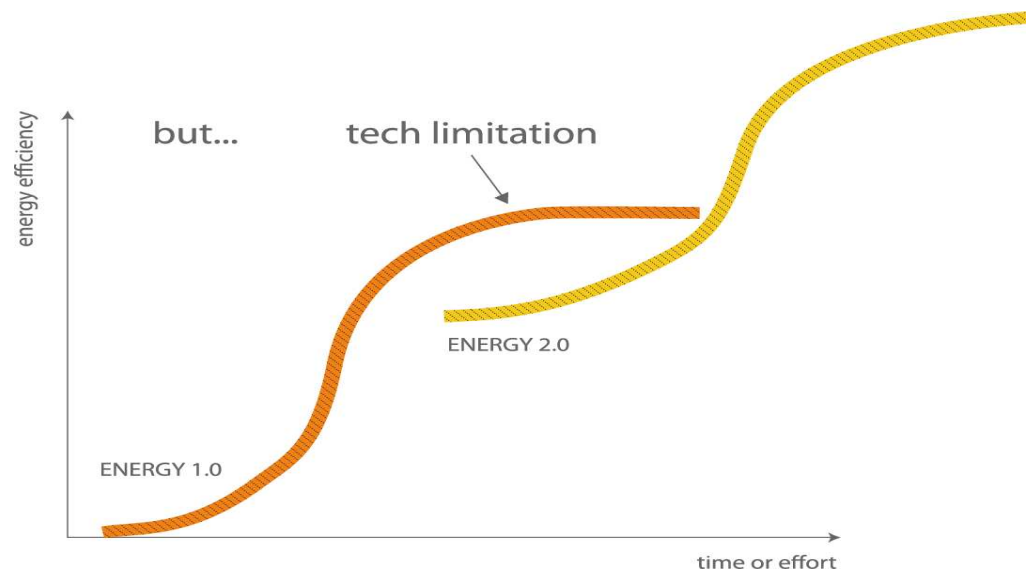
Using higher efficiency actuators and motors



Bettering the thermodynamics

## From Energy 1.0 to Energy 2.0

We reached outstanding results but....



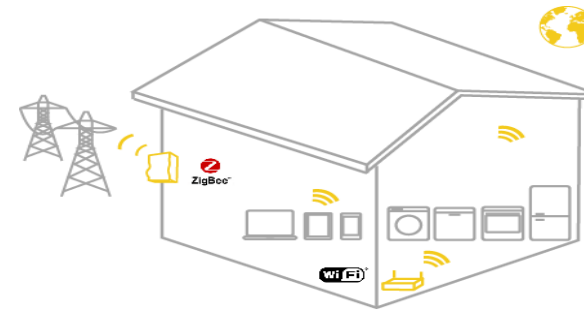
LIFECYCLE OF INNOVATION CURVE

# Indesit Energy 2.0: Smart Appliances in the Smart Grid



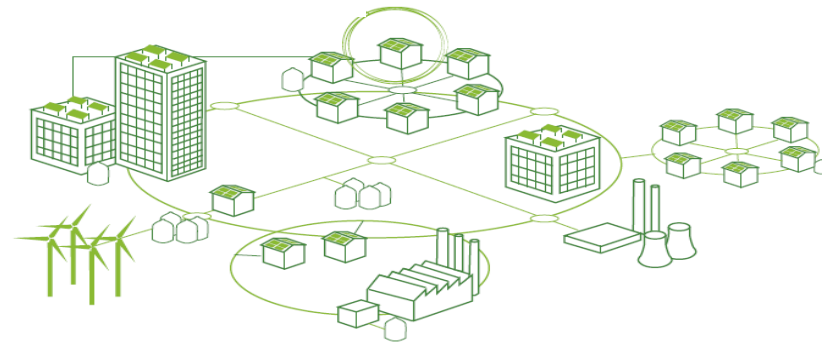
## SMART HOUSE

The Smart Appliance, endowed with additional intelligence and communication capability, becomes an energy actor in the Home Area Network ecosystem



## SMART GRID.

Smart Houses are connected to the new Smart Grid



## The active role of Indesit Smart appliances



### AWARENESS

Energy  
Cost  
CO<sub>2</sub> footprint



### COORDINATED ENERGY MANAGEMENT

Active planning and coordination



### DEMAND SIDE MANAGEMENT

Flexibility in the energy usage to contribute to the grid  
balancing

## Smart washing machine

**Smart Aqualtis** is the first Indesit WM designed to be integrated in “Smart” ecosystems, covering a wide range of use cases.



Calculation, visualization and dispatch to the HAN of the energy and power consumption before and during the cycle execution

Forecast and visualization of the estimated cost for the selected cycle based on time based tariff

Visualization of the total power consumption of the house

Coordination with the others connected appliances and to micro-generation to optimize the power consumption in the house

Scheduling of the starting time to ensure the cheapest or the greenest cycle, always respecting the users constraints

## the Smart Aqualis speaks E@h

Protocol extensions for Smart Appliances:

### **Power Profile**

sequence of **Power phases**, the basic “uninterruptable” elements

The cycles are **NO MORE MONOLITHIC**



### **Status**

Current Cycle and Phase  
Time To End  
Start and Finish Time



### **Statistics**

To export a whole set of behavioral data

### **Control**

Start, Stop, Pause  
Remote scheduling

### **Events & Alerts**

Cycle related events  
Faults

## E@h achievements



- Technical specifications of the Home Area Network protocol currently under standardization within the Zigbee Alliance
- An interoperable fully-integrated system comprising smart gateway, smart meter, smart plugs and smart domestic appliances
- Interoperability test events (including some ZigBee events hosted by Energy@home)
- An Italian field trial involving 50 users
- The “Jouw Energie Moment” field trial
- Foundation of the Energy@home Association



## Energy@home Association

- On 4th Jul 2012 the Partners founded a not-for-profit Association open to all interested partners.
- The Association will be the way to:
  - ▶ Continue the activities with a larger number of Partners; Edison has already joined it.
  - ▶ Enlarge range of industries
  - ▶ Influence regulation, consumer & manufacturer associations, and standards

## Indesit Company in the Jouw Energie Moment project

### What we learned?

Public protocols, open specifications and a lively ecosystem of many different industries are the key success factors for interoperability

### Next challenges:

Analyze the huge amount of data flowing from the premises!

And crossing the fingers for the customers reaction.....

Thank you!

