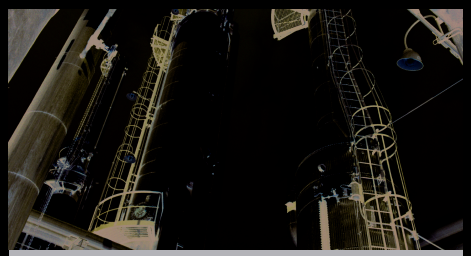
Intelligent Sensing Anywhere

As TIC nas Smart Grids

José Basílio Simões

10.º Encontro Nacional do Colégio de Engenharia Electrotécnica

06 de Outubro de 2010 I OE Região Centro



Oil & Gas

Energy

Environment

Healthcare

ISA in Numbers

20 Years of experience in the telemetry technology domain

110 Highly qualified employees

40% Employees dedicated to R&D

10x Turnover from 2003

Still growing fast…

42% CAGR (Compound Annual Growth Rate) in the past 6 years

70% Percentage of turnover coming from the international market

50,000 Number of equipments deployed worldwide…

Markets and Solutions

Environment

- Measurement of carbon footprint
- Meteorology and Seismology
- Hydropower Potential

Oil & Gas

- Monitoring of LPG and piped gas networks
- Supply logistics (tanks and cylinders)
- Remote management of fuel stations
- Refineries monitoring

Energy

- Remote monitoring
- Energy efficiency
- Smart grids
- Renewable energies
- Aggregator Solutions

Healthcare

- Ambient Assisted Living
- Tracing people and assets
- Remote medicine

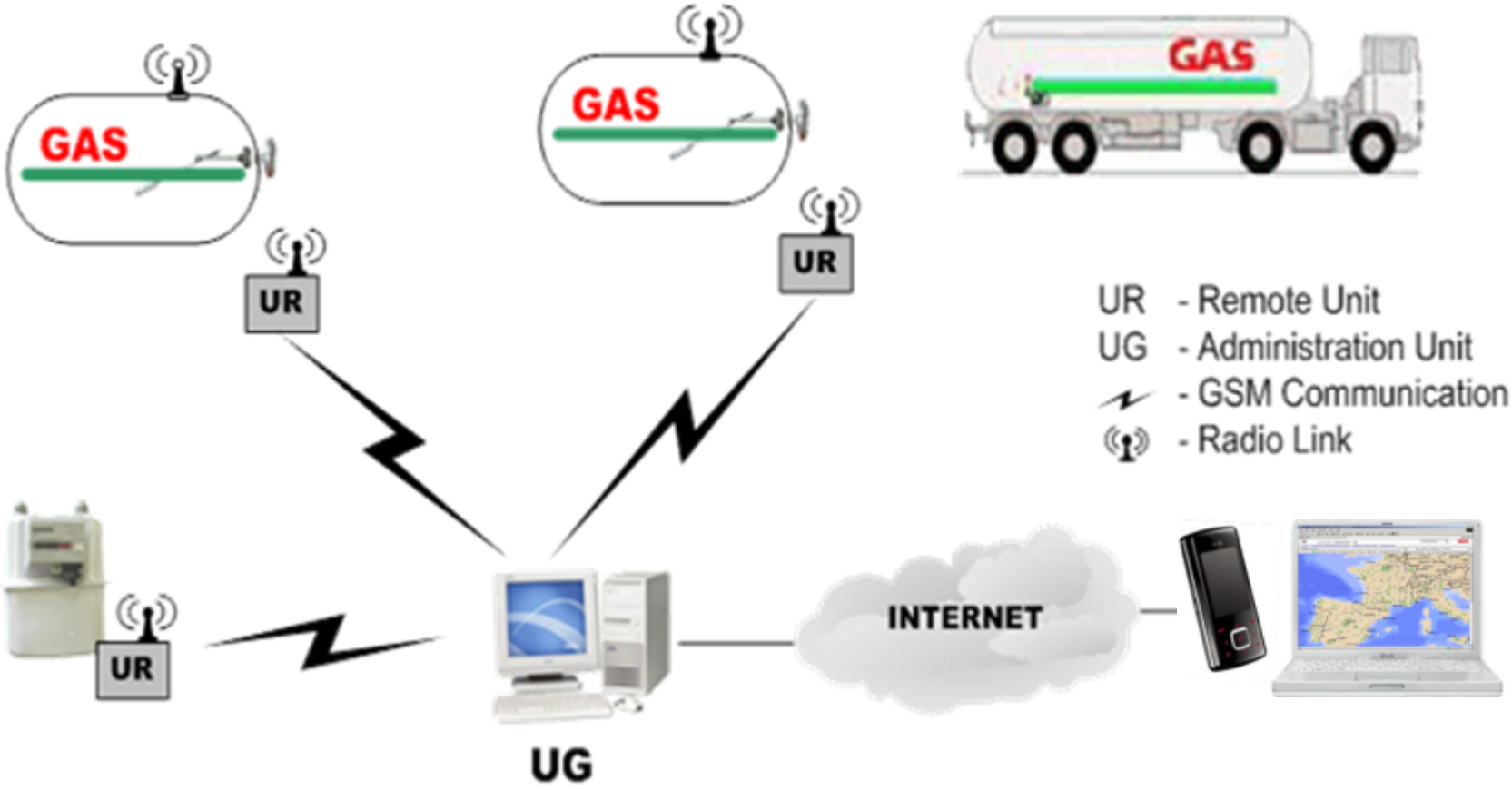
World leaders in LP Gas smart metering

Over 50,000 telemetry high quality systems installed the world around

World leaders in LPG telemetry

Pioneers in LP Gas Smart Metering

1996-1997



O smart metering do GPL permitiu aos clientes da ISA reduzir 63,2 mil toneladas de emissões de CO_2 nos últimos 3 anos

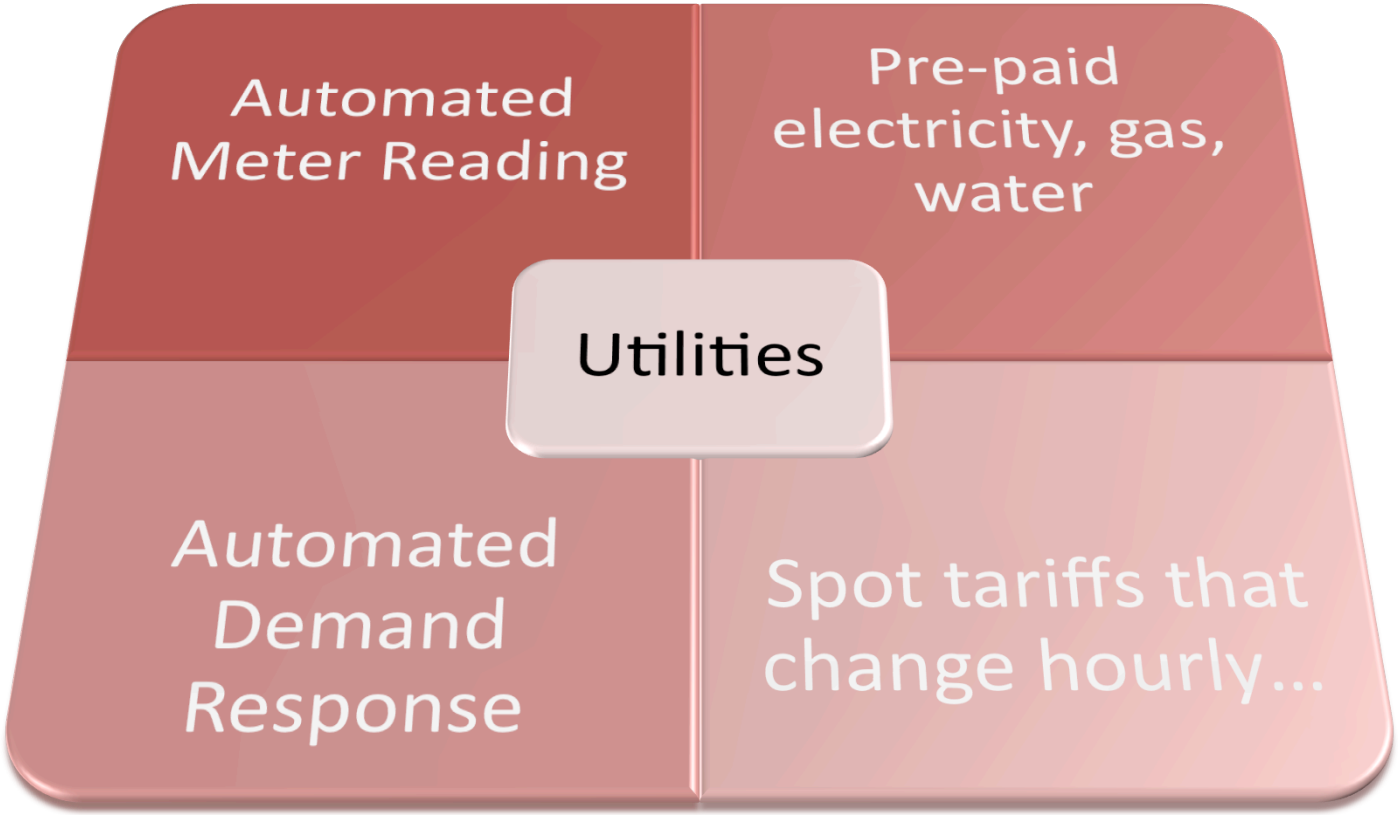
Como aumentar este impacto?

A penetração do smart metering no GPL é ainda apenas de 2% na Europa!

Há 10 milhões de clientes servidos com GPL, mas pelo menos 30 vezes mais servidos por outras formas de energia…

20-20-20 European policies demand smart grids!

Smart Grids enable…



- Grids are not smart…

…until they use Information and Communication Technologies!

The *power* of Internet

A internet e as comunicações móveis distribuíram, na última década, conhecimento e poder por biliões de Pessoas.

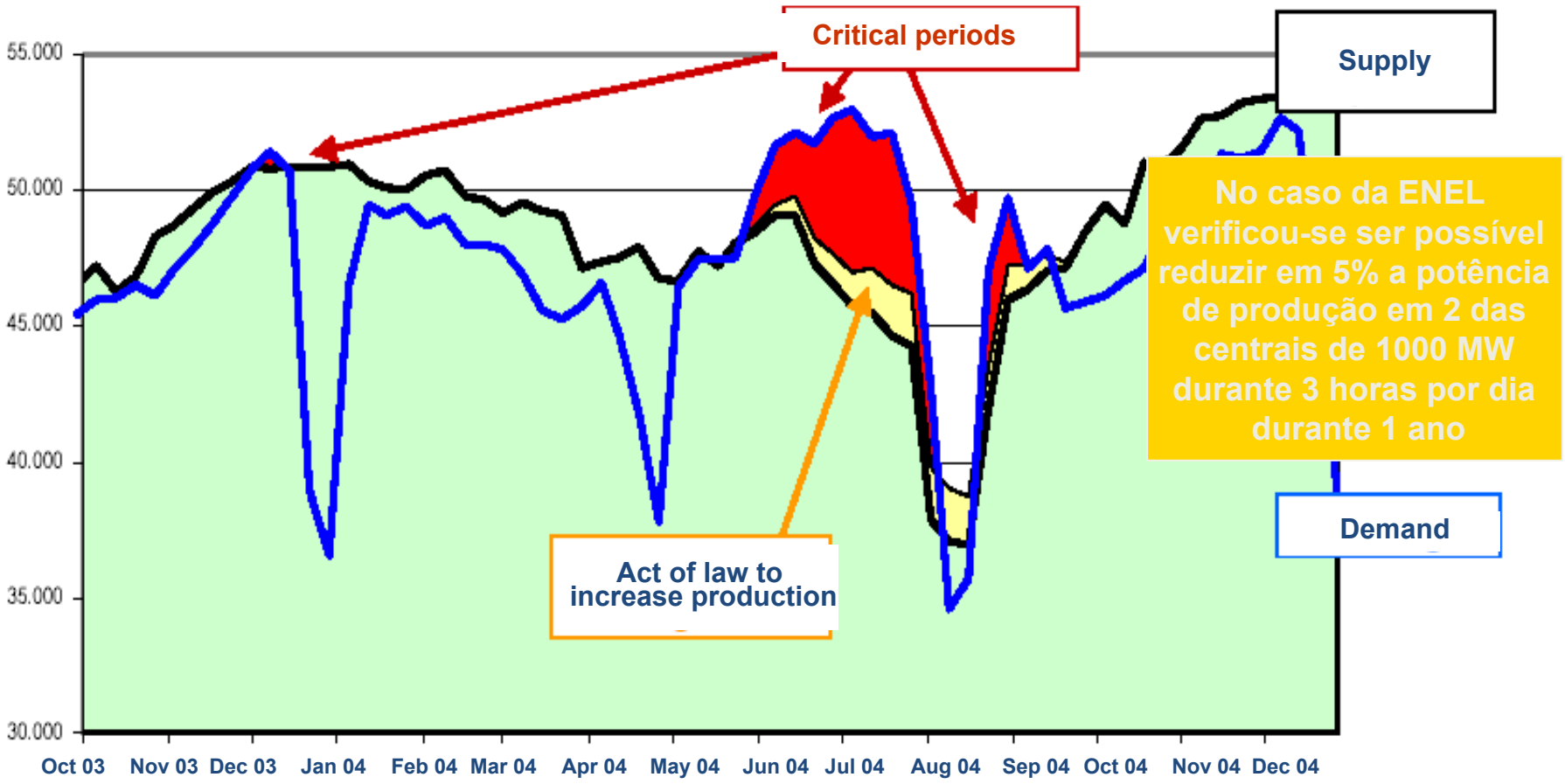
E irão continuar a fazê-lo, exponencialmente, conquistando mais capacidade de influência do que todos os sistemas políticos até hoje conseguiram na história da Humanidade.

The Internet to save the *power*

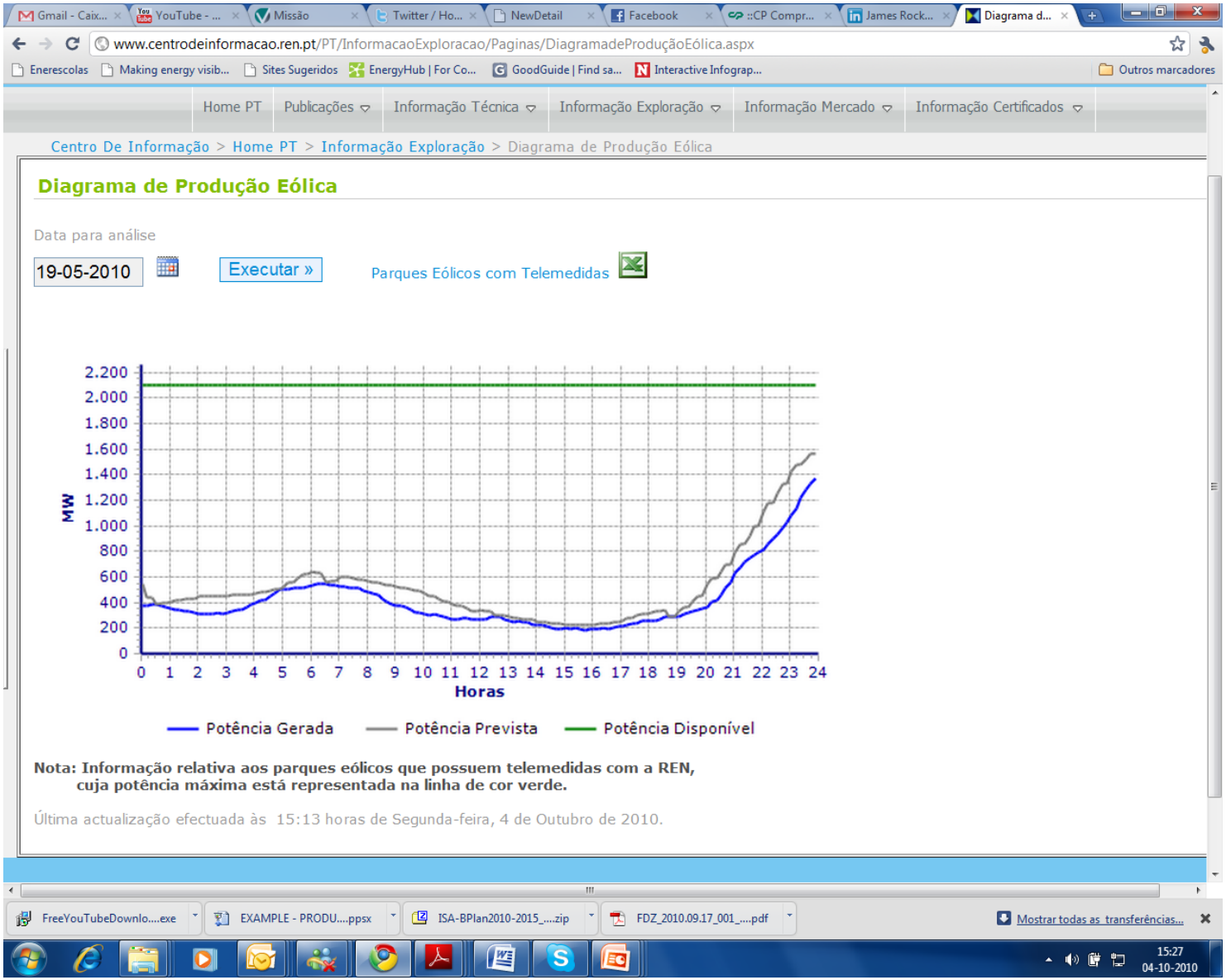
O «poder» que a Internet confere a todos os cidadãos não é afinal diferente do «poder» de conhecermos a nossa energia (“power” nos dois sentidos em inglês) que, desta forma, poderá ser distribuída, gerida, poupada e utilizada durante mais tempo, garantindo que os nossos descendentes continuarão a ter reservas de energia e qualidade ambiental na Terra.

Informação e Comunicação são fundamentais para a Eficiência Energética!

- Prever e monitorizar a procura para optimizar a geração…



Mas também, com as Renováveis, prever e monitorizar a geração para optimizar a procura!



Que fazer? – Gestão pela Procura

Uma nova política energética baseada na ***gestão da procura,*** com um claro envolvimento dos consumidores, assente na **eficiência energética** e na utilização das **energias renováveis**, numa lógica de produção descentralizada da energia, mais adequada ao consumo que os utilizadores necessitarem,

o que pressupõe uma enorme sensibilização dos consumidores…

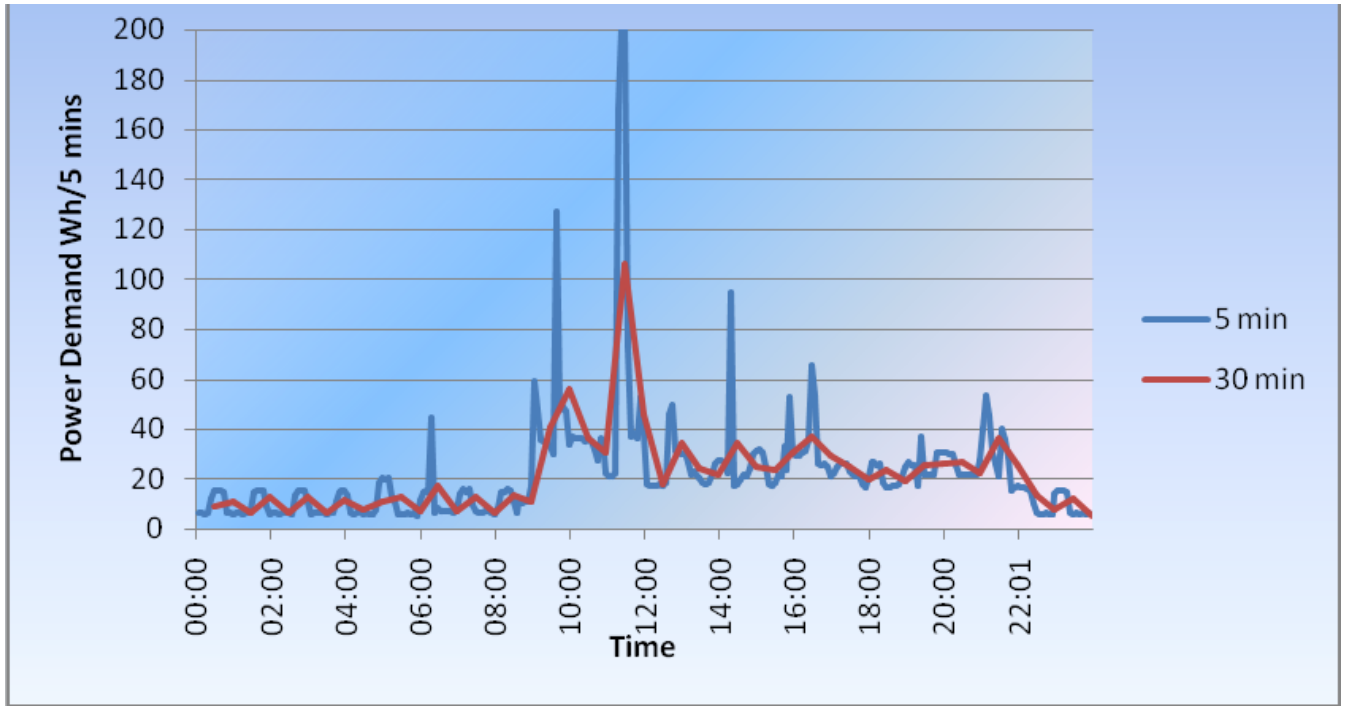
Mais dados, mais informação…
…necessidade de maior capacidade de gestão!

Com efeito, só uma rede energética inteligente, dispondo em tempo real da informação sobre os recursos energéticos disponíveis, por um lado, e sobre os recursos requisitados, por outro, será capaz de gerir as necessidades de produção e de condicionar os consumos de forma a aumentar a eficiência de toda a rede e de promover uma utilização racional dos recursos.

Com milhares de micro-produtores e mais do que um grande fornecedor disponíveis e com condições tarifárias que podem mudar de hora a hora, cada interveniente terá de tomar decisões sobre como e quando produzir ou consumir, em que regime horário e com que intensidade laborar ou mesmo quando cessar momentaneamente a actividade.

…Sistemas de decisão em tempo real!

Para tal torna-se indispensável a introdução de sistemas de telecontagem, a monitorização de consumos parciais com o correspondente aumento da eficiência energética, e a construção de sistemas de decisão em tempo real, capazes de efectuar escolhas inteligentes de estratégias de consumo e produção, tendo em conta as tarifas, as necessidades de consumo, o potencial de produção e a possibilidade de diferimento temporal.



Daily Electricity Profile of a Final Customer

ICT Areas

- ICT for smart energy consumption processes
- ICT for smart small and medium user behavior
- ICT for smart large user behavior management
- ICT for generation and grid infrastructure readiness
- ICT for breakthrough industry transformation

ICT Recommendations for investments to achieve energy savings of 20% in 2020

I. ICT studies, business cases, surveys, project best practices, go to market required

- European funded project: Build a European Standard business case for smart metering comprising best practices from existing projects
- Library of case studies across diversity of business customers (schools, grocery stores, private sector office buildings, warehouses, etc,…) to bring more visibility to utilities about demand response (EU project)
- Assistance in developing energy management capabilities for end users
- Create ICT enable energy efficiency standard indicators
- Comprehensive survey of European demand response pilots (EU survey)

ICT Recommendations for investments to achieve energy savings of 20% in 2020

II. Costumer communications (smart metering)

- **European regulation:**
  - **Time-of-use metering and billing (real consumption) mandatory inEurope**
  - **Large scale penetration of smart metering to reach 100% penetration in 2015**
  - **Incentives for investments**
- **Standardization:**
  - **European harmonization and standardization group to be setup: Interoperability and open standards between metering suppliers and end-to-end from customers to utilities**
- **Telecom and utilities:**
  - **Setup joint cooperation between utilities and telecommunications**
  - **Setup a publicly available infrastructure for smart metering (vs PLC and GPRS) (European project)**

ICT Recommendations for investments to achieve energy savings of 20% in 2020

III. Demand side and demand response management and real time pricing

- Standardization: Automated demand response communication standards for C&I buildings
- Incentives: Develop innovative incentives and business models to share benefits on demand response across various stakeholders
- R%D: Technical feasibility of distributed, autonomous load control

IV. Home energy controlling box (internet box like)

- Collecting real time consumption of household appliances and connected to smart meters (European project)

ICT Recommendations for investments to achieve energy savings of 20% in 2020

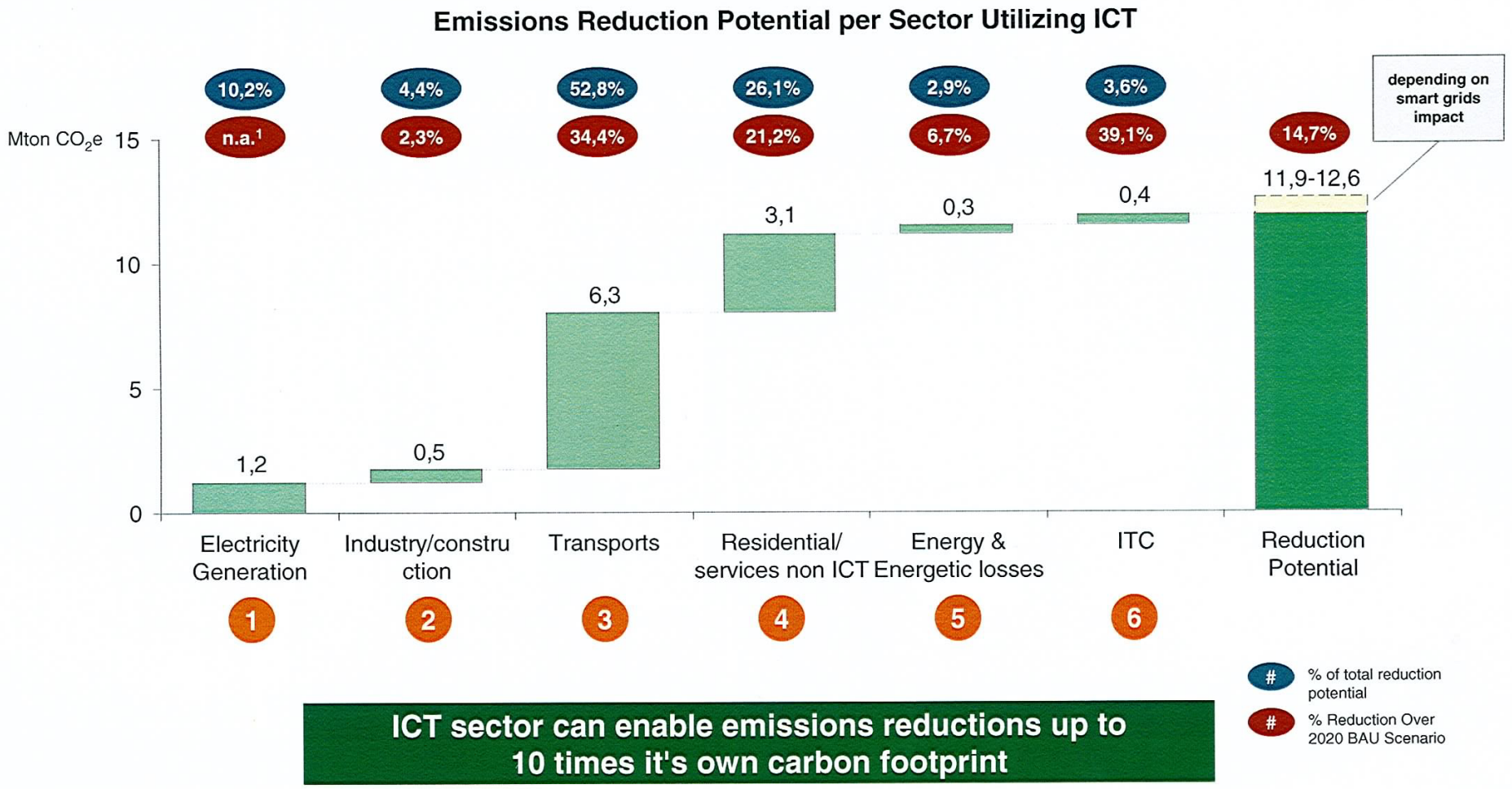
V. "Losses free" and readiness of infrastructure network to connect large scale DG and RES

- Research innovative technologies for minimizing network losses and improving network stability (KPIs: FACTS, WAMS, etc.) (European Project)
- Large scale connection of DG and RES to the grid by 2020 (considering 20 to 50% renewable capacity connected to the grid) (European project)

VI. ICT readiness for "mobile electricity consumers" (eg. PHEVSs)

- Promote the advancement of commercial PHEVs
- Promote renewable energy programs around cars
- Push the creation of TOU rate plans as an incentive for PHEVs
- Change the regulatory framework to allow pan-European ubiquitous micro-payments and engage telecoms and banking

11,9 – 12,6 Mton CO2e reduction potential due to ICT



1. Electricity generation not considered an independent emission sector. Emission reduction considered is due to lower unitary emission costs
Source: BCG Analysis

List of major emission reduction strategies per sector with ICT involvement

Sector	Strategies	Description	ICT Involvement	Potential (Mton CO_2e)
1 Electricity Generation	Increase renewable capabilities	Introduction of load management capabilities to allow higher renewable penetration	• Network monitoring • Generation Control	1,2
2 Industry/ construction	Automation and Motor systems	Introduction of process automation and variable motor systems control	• Control systems • Process optimization • Consumption monitoring	0,5
3 Transports	Demand, logistics and mobility	Pass emission costs onto drivers while actively managing private and public mobility emissions	• Emissions monitoring • Driver accountability • Transports optimization	6,3
4 Residential/ services non ICT	Energy efficiency and monitoring	Increased energy efficiency in appliances and customer energy use monitoring and accountability	• Consumption monitoring (meters) • Building/equipment efficiency	3,1
5 Energy & Energy Losses	Microgeneration penetration and grid control	Increased grid capabilities to handle microgeneration and penetration of smart grids	• Smart grids – Grid load monitoring – Grid management	0,3
6 ICT	Reduction of unnecessary energy waste	Increased energy efficiency in ICT equipment and reduction of energy waste (e.g. standby)	• Reduction of standby consumptions • Server cooling & virtualization	0,4

Source: BCG analysis

SMART 2020 framework applied to industry sector highlights areas with enablement potential

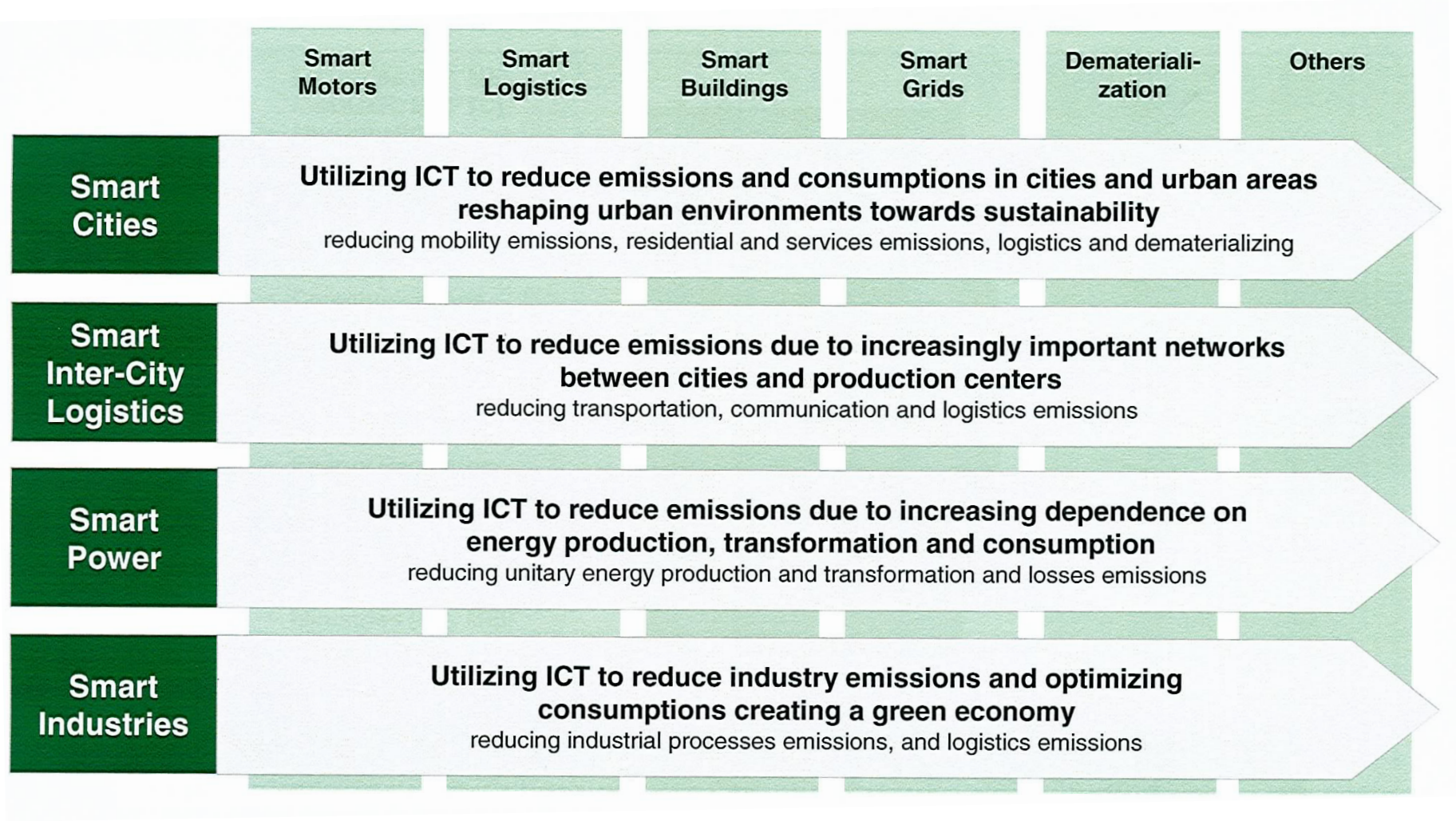
Standardize	Standardizing monitoring tools and processes to increase industry efficiency
Monitor	Monitoring of engines consumptions to track real working conditions
Account	Fine-tune engines and other machineries to optimize efficiency and output
Rethink	Using simulation applications to permanently reengineer the process
Transform	Developing new approaches in terms of primary energy use

Initiative details for reducing residential/services emissions

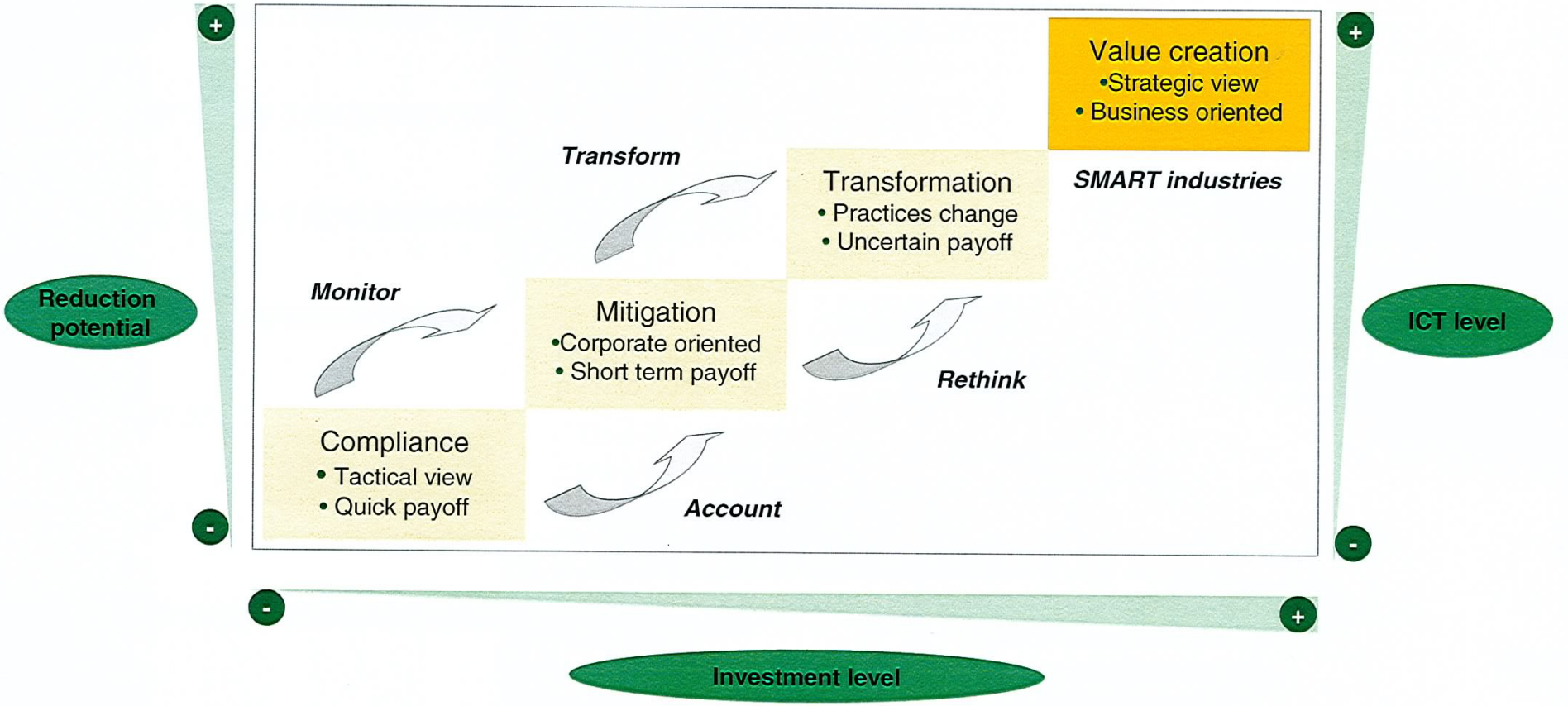
Initiative	Description	Assumptions	Sources
Increased energy efficiency	**Utilization of ICT to increase demand side management of energy** • Efficient devices and efficient installation – Low consumption devices, insulation, public lighting... • Optimized usage of installation and devices – Turn off devices when not needed, regulate motors or heating at the optimized level…	**Increase from 10% to 25% energy efficiency in buildings** • Average 20%-30% achieved in buildings where efficiency is fully introduced	• **Expert interviews** • **EU REMODECE** • **Intelligent energy Europe**
Increased consumption visibility	**Usage of ICT enabled monitoring and communication equipment to transmit consumption profile to users** • Dynamic energy pricing • Permanent monitoring and improvement program • Rigorous maintenance program, measure and reaction in case of deviation	**0,5% consumption reduction per year due** • only considering increased visibility to consumers • excluding peak shaving already excluded in power generation	• **UK OFGEM** • **UK Energy White Paper**
e-paper transactions	**E-government implementation and roll-out** • Introduction of all non-essential processes utilizing internet and intranet **Elimination of processes within and among enterprises and private users** • Increasingly important as internet and pc's penetrate businesses and homes	**25% avoided paper consumption** • 1 kg CO2e avoided per tonne not consumed	• **Smart 2020** • **Celpa**
Online purchases and media	**Usage of ICT equipment (pc's and cpe's) by users to acquire media online** • Increasing speeds and new business models evolve as online purchases is cheaper, faster and easier from the comfort of home • Non-Direct to home purchases become marginal	**Elimination of all CD and DVD purchases** • 1 kg CO2e avoided per cd/dvd	• **Smart 2020** • **GFK** • **AFP – Associação fonográfica Poertuguesa**

Source: Industry expert interview; BCG analysis

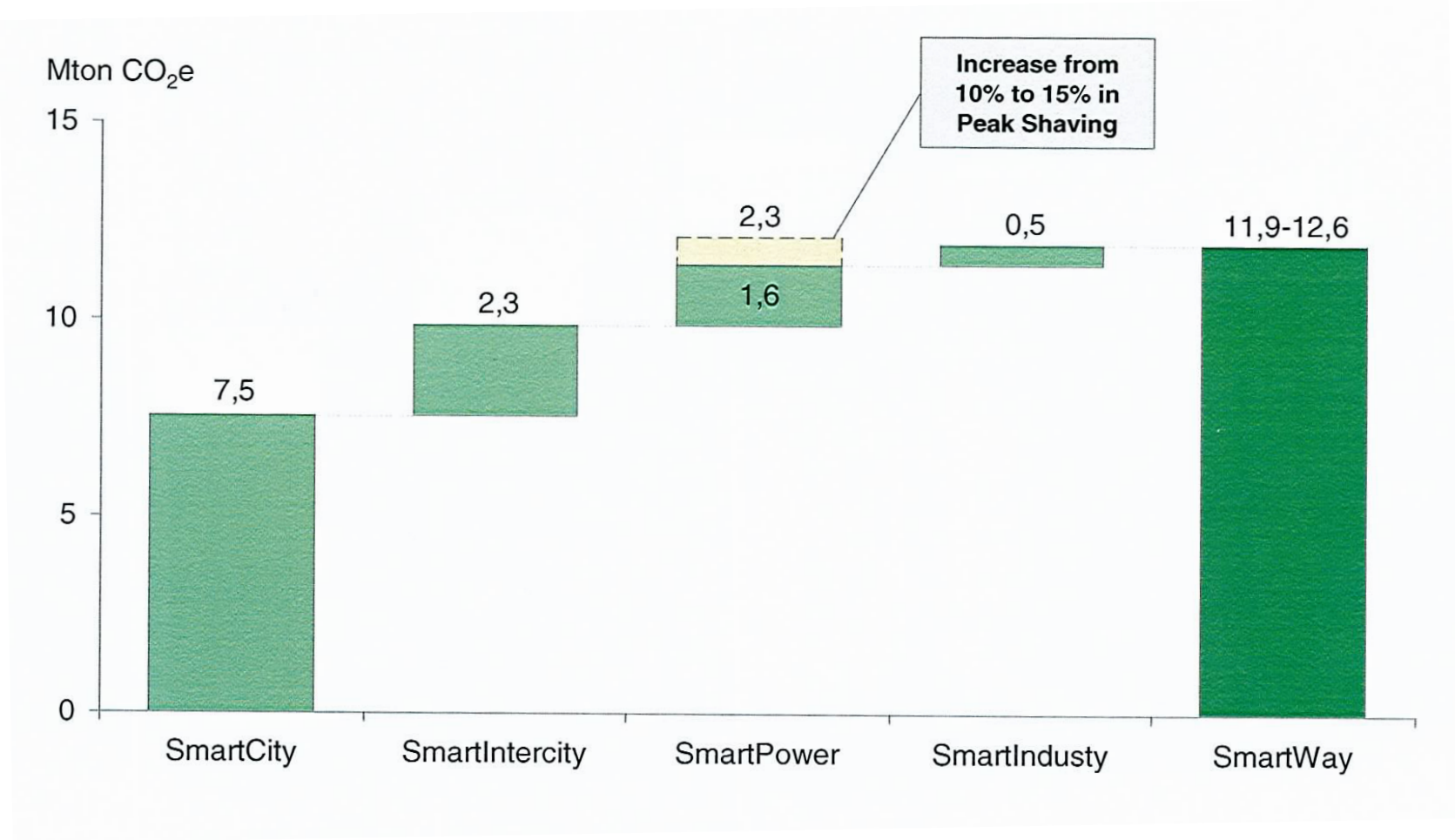
The SmartWay for emission reduction



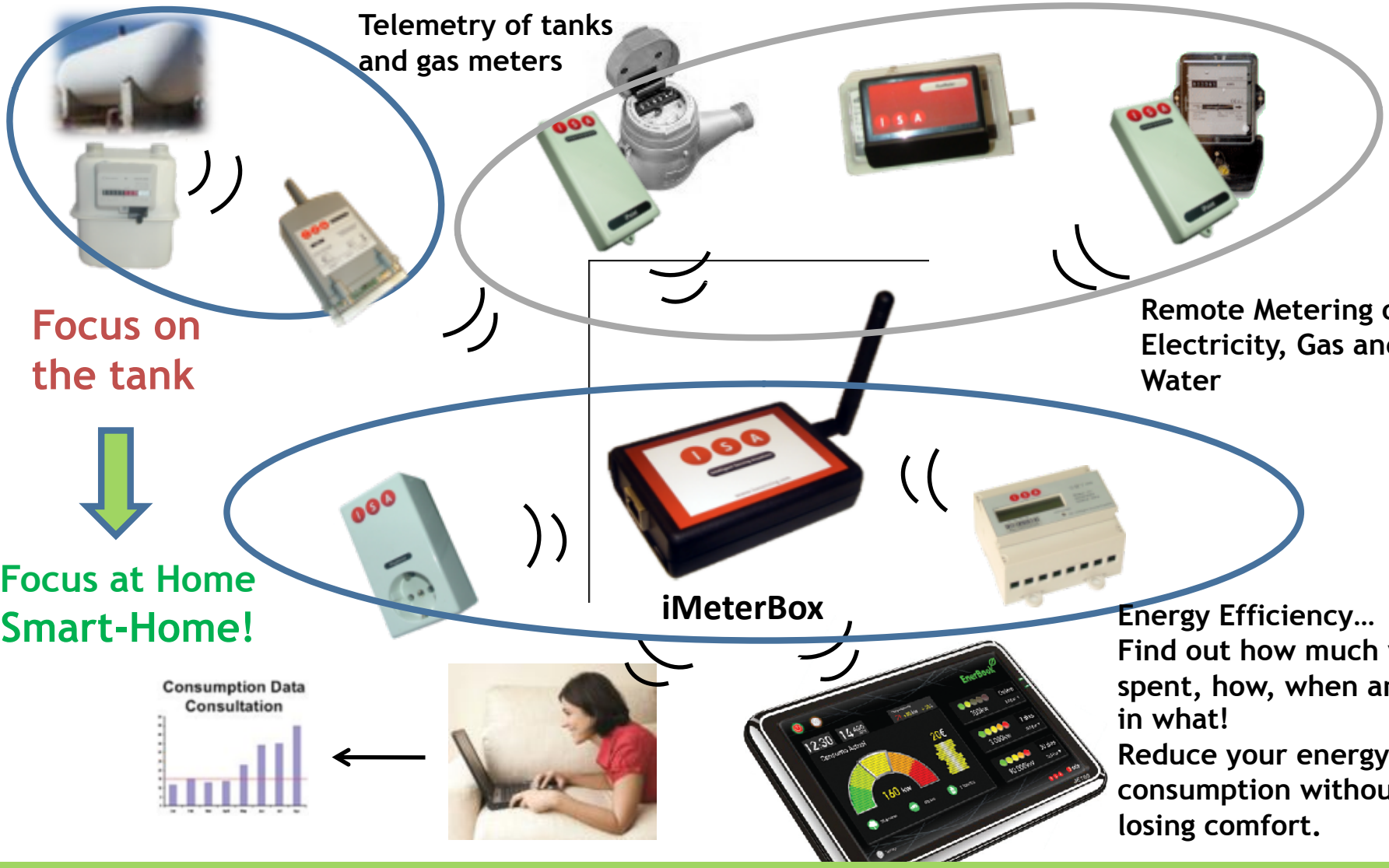
Reducing carbon emissions through green logistics should be faced as a value creation opportunity



11,9 – 12,6 Mton CO2e reduction potential due to ICT



Voltando à ISA… New paradigm!

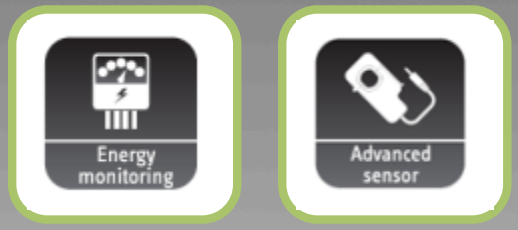


More services available…

Logistic savings have to pay for only a small part of the investment!

Smart Homes

Simultaneous collection of data:



iMeter Kit

New value-added services

Energy Management Console (EMC)

- Endless number of services provided
- **Bridge between the Internet and any number of sensors spread throughout the home**
- Those sensors can provide services such as security, comfort, personal safety and well being

Smart Home

New value-added services

EnerBook

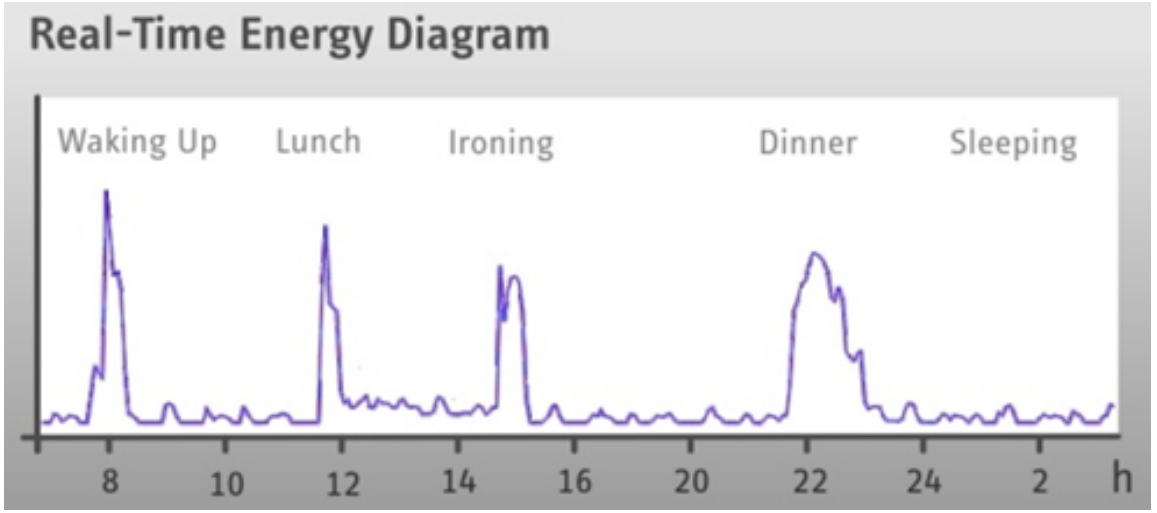
Sends information about energy usage of your appliances to the web portal - EnerBook - allowing consumers to be aware of their consumption

Measure your Carbon Footprint

EnerBook

- ✓allows users to view real-time historical and current data on their consumption of water, gas and electricity;
- ✓makes it possible for consumers to manage their consumption independently and to monitor the development of their carbon footprint.

New value-added services



Watching over elderly customers → Follow their periodic daily pattern → Take notice of any abnormal activity

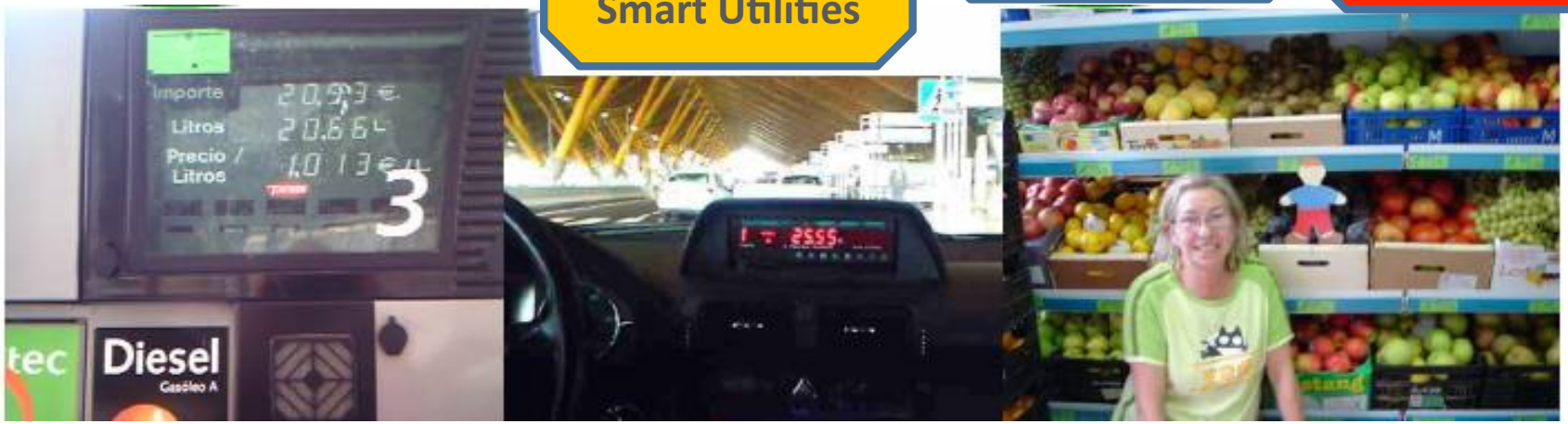
The power of Information

Smart Meters

Smart Utilities

Smart Consumers

Smart Billing

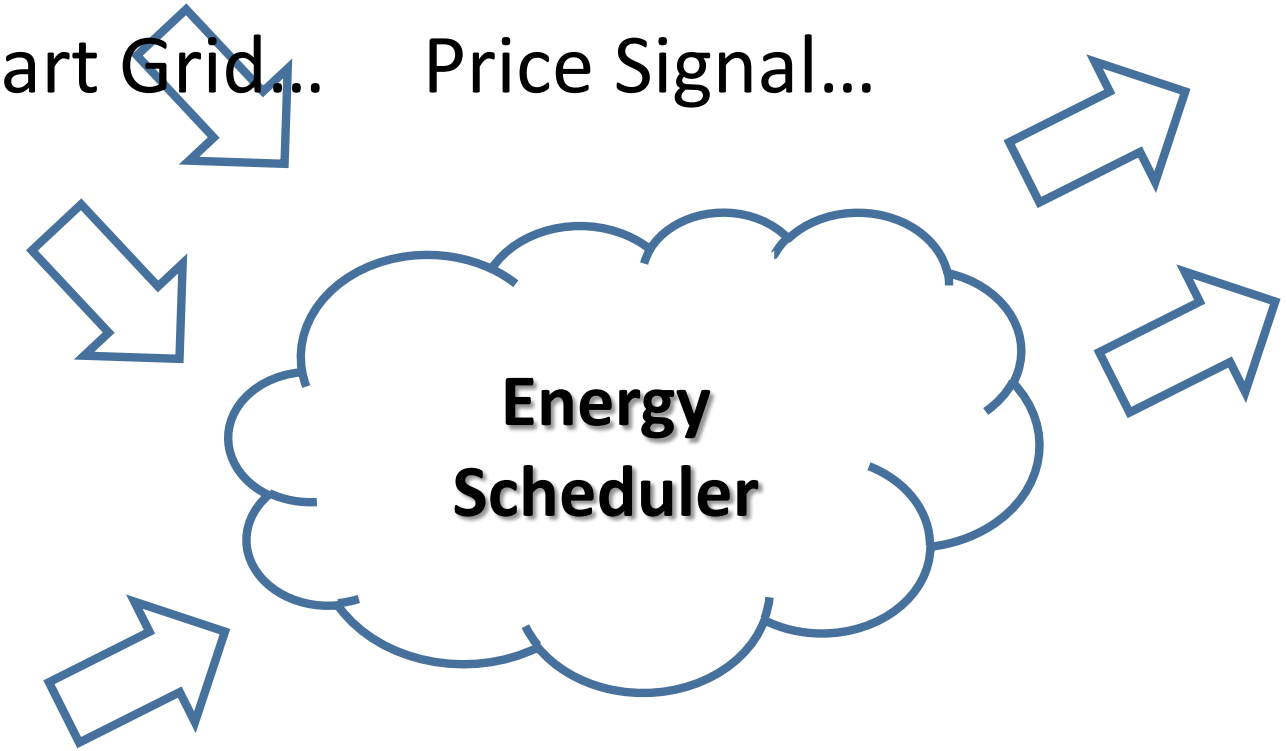


New meters are needed to take price signals to customers…

But new ToU tariffs are also needed for the end-user to benefit

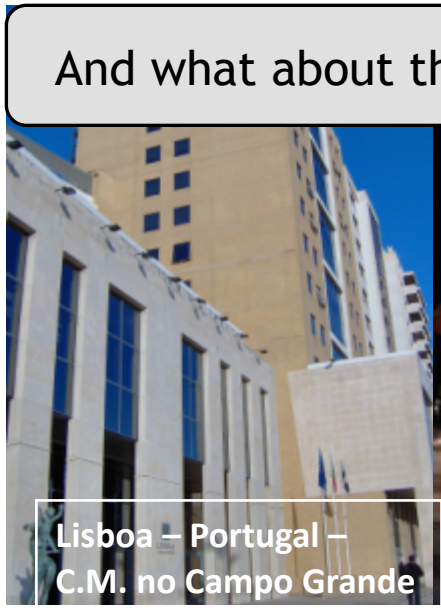
The Energy Scheduler

- Smart Grid… Price Signal…



Scheduler is running at the gateway

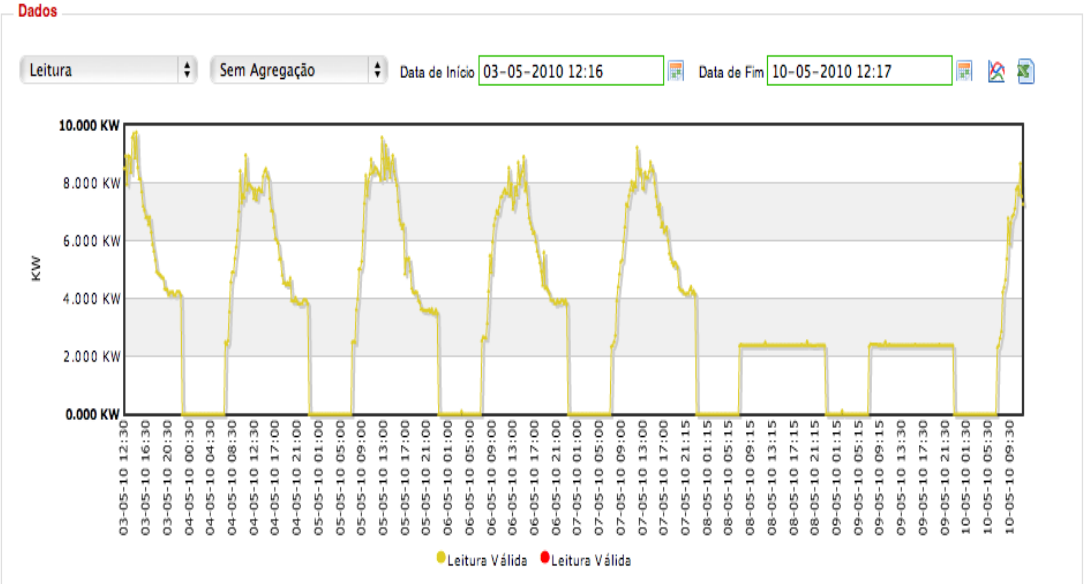
And what about the Buildings…?



Lisboa – Portugal – C.M. no Campo Grande

Lulea – Suécia - Casa da Cultura

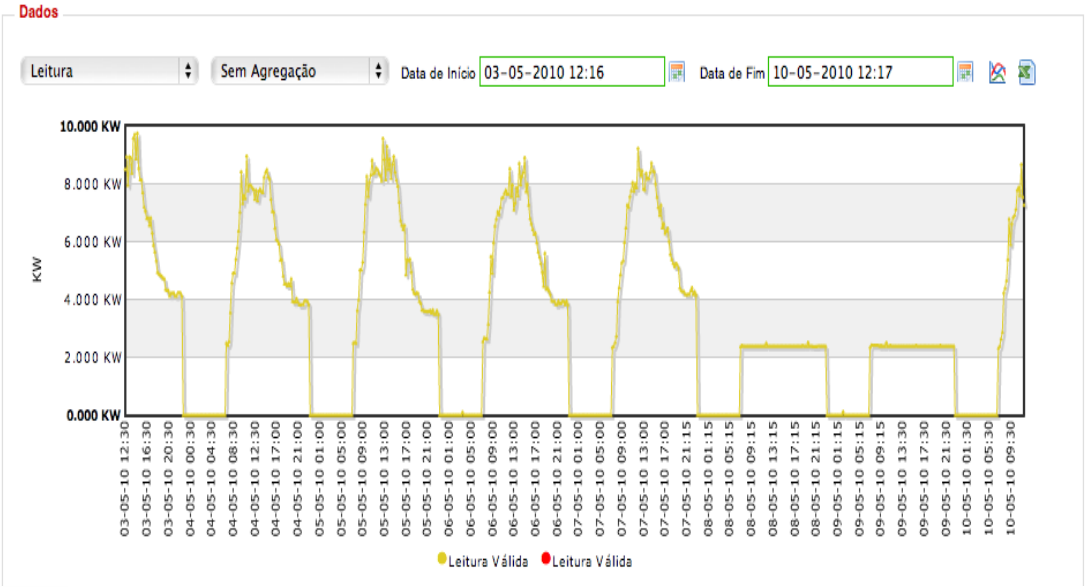
Manchester – Reino Unido – Câmara Municipal



Helsinki – Finlândia – Escolas

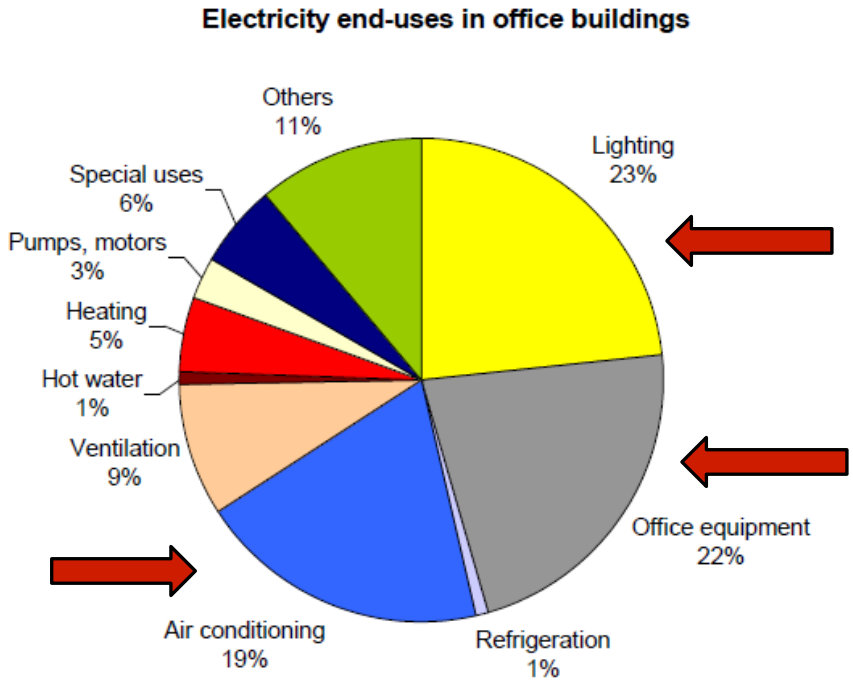
Less than 2 weeks after starting real time continuous monitoring savings of more than 13% were achieved!

- Não basta auditar!



Desafios na gestão energética de edifícios

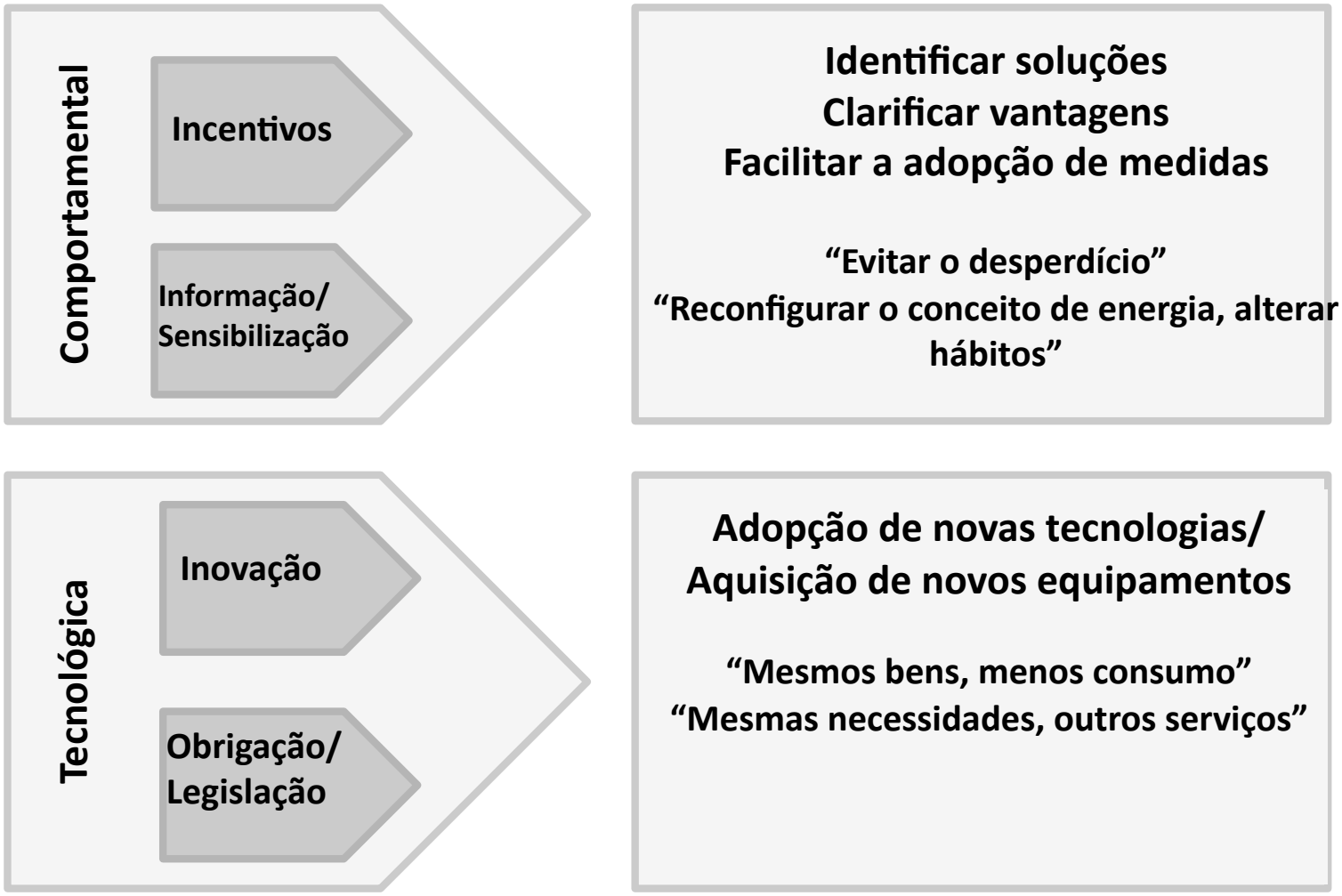
- O que melhorar?
  - Iluminação
  - Redimensionar equipamentos
  - Isolamento
  - Equipamento Eficiente
  - Utilização Racional
    - **Alteração comportamental**
    - Sistemas de gestão/ controlo de energia



Pessoas -> Factor chave de sucesso

Alteração Comportamental → ROI + Baixo

Abordagem Estratégica à Eficiência Energética



Abordagem Estratégica à Eficiência Energética
O Que Fazer Para Racionar o Consumo de Energia?

Medir para perceber

Perceber para controlar

Controlar para optimizar

Implementar um sistema de monitorização de eficiência energética para:

Reduzir a factura de energia sem perder o conforto

Promover a racionalização de recursos

Abordagem Estratégica à Eficiência Energética
Ter a Informação em Tempo Real = Saber onde Optimizar

Que energia estou a gastar neste momento? Onde?

Quanto me está a custar?

É muito ou pouco?

Devo tomar medidas? O que fazer? → Começar por mudar comportamentos

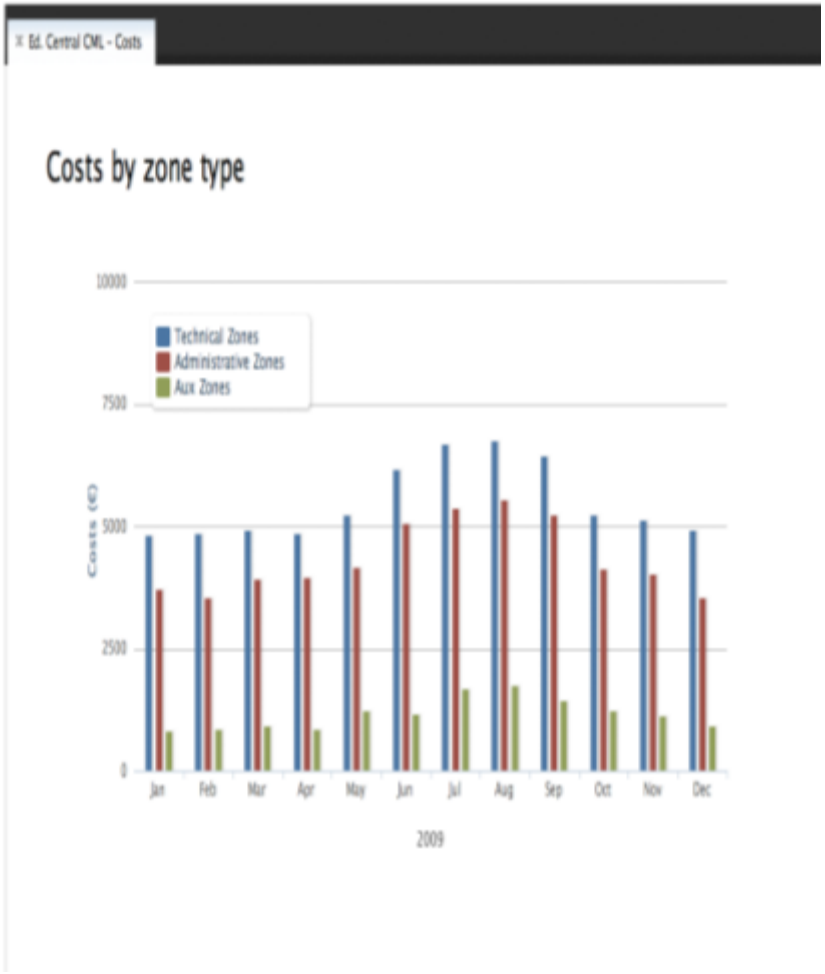
Acção Contínua - Acompanhamento e Consultadoria
Disseminação da Informação a Utilizadores e Técnicos

- **Gestão Técnica e Económica da Energia**:
  - Acesso a perfis de consumo, indicadores chave, configurações, relatórios de eficiência
  - Indicadores de consumos específicos
  - Relatórios de gestão

- **Utilizadores:**
  - Indicadores chave gráficos
  - Acesso a relatórios simplificados
  - Web 2.0 - Comunidade da Energia

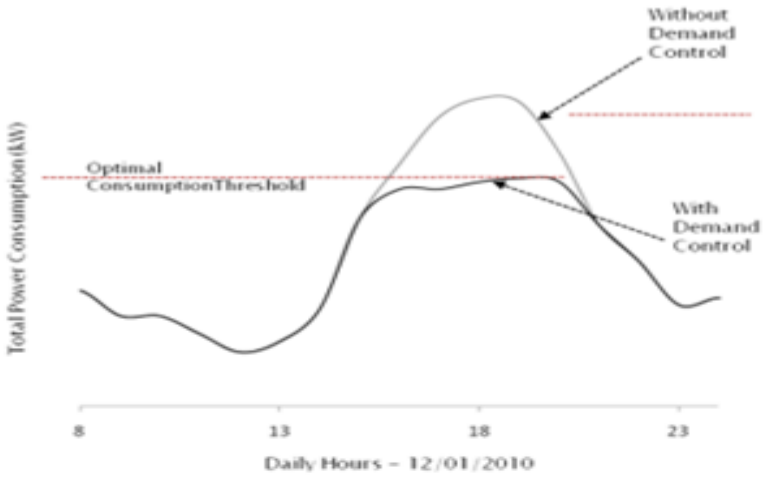
Acção Contínua - Acompanhamento e Consultadoria
Disseminação da Informação a Utilizadores e Técnicos

- **Benchmarking**:
  - Comparação de consumos de energia entre instalações semelhantes
  - Indicadores (consumos por m2, por utilizador, centro de custo, ...)
  - Desde grandes edifícios a redes de pequenas lojas

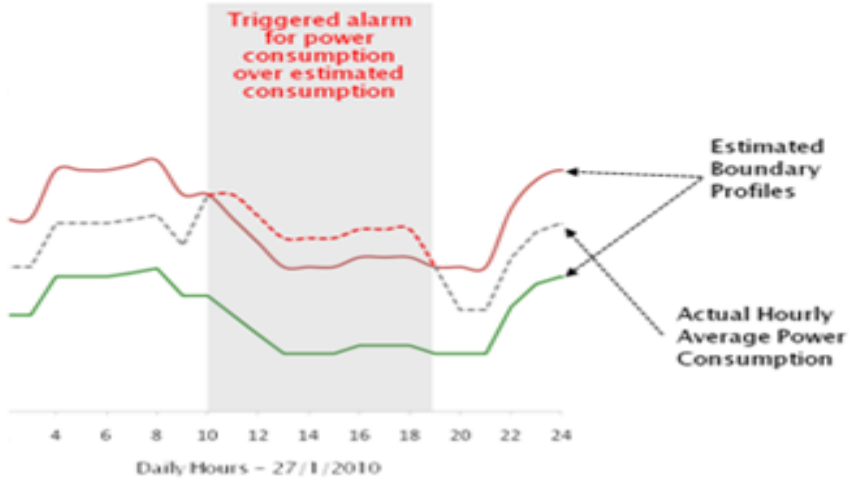


Acção Contínua - Acompanhamento e Consultadoria
Disseminação da Informação a Utilizadores e Técnicos

- **Analisar**:
  - Análise de cenários
  - Gestão da procura
  - Tarifas
  - Alarmística



- **Implementar e Gerir**:
  - Proposta, Gestão da Implementação de projectos de melhoria

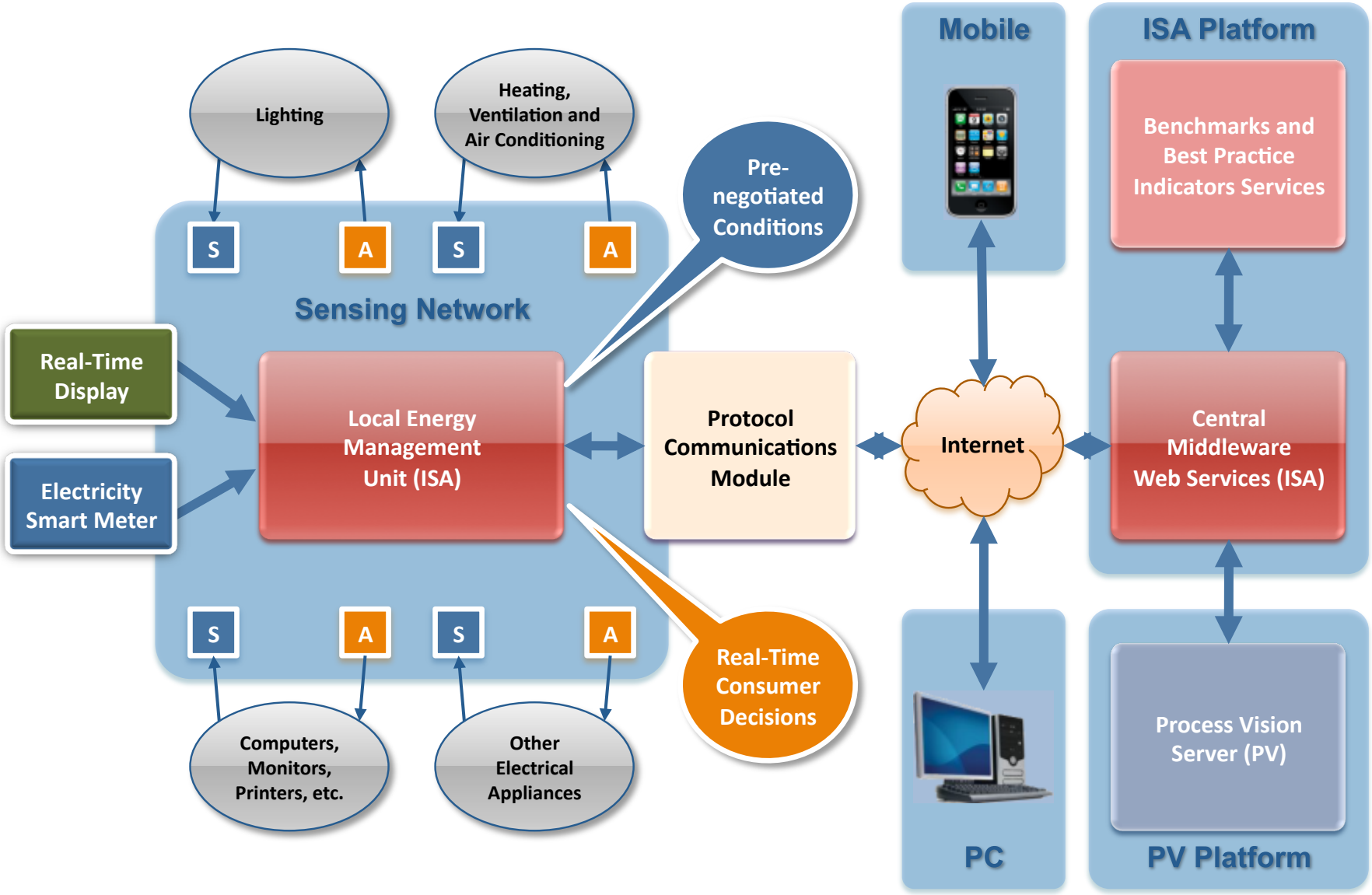


Acção Contínua - Acompanhamento e Consultadoria
Disseminação da Informação a Utilizadores e Técnicos

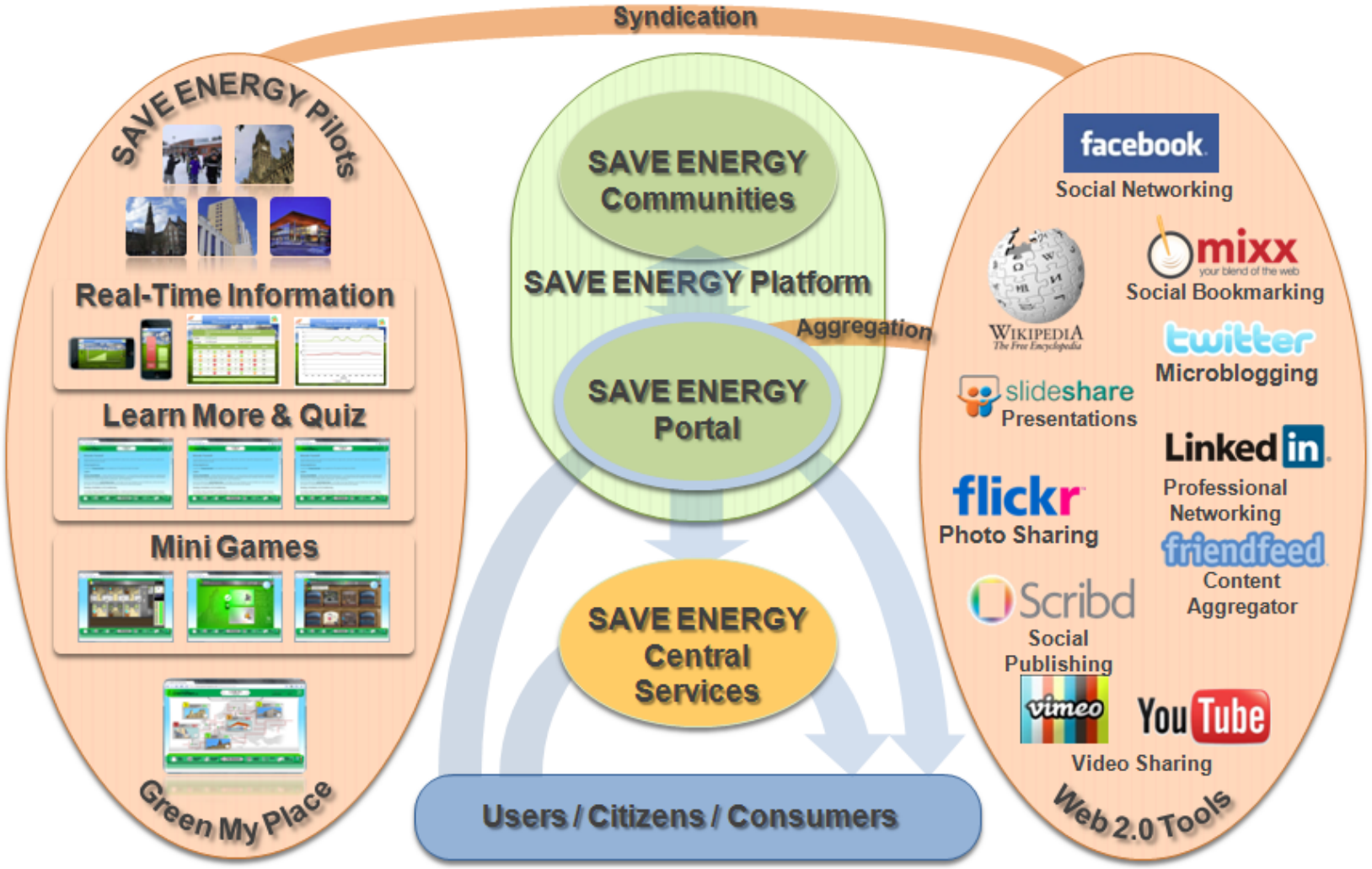
- **Relatórios (Reporting Services – KPI's)**:
  - Desenvolvidos e personalizados á medida do cliente
  - Agregação e cruzamento da informação relevante para o cliente

- **Canais de Comunicação com os Utilizadores**
- Displays
- TV Corporativa
- Intranets, via Web

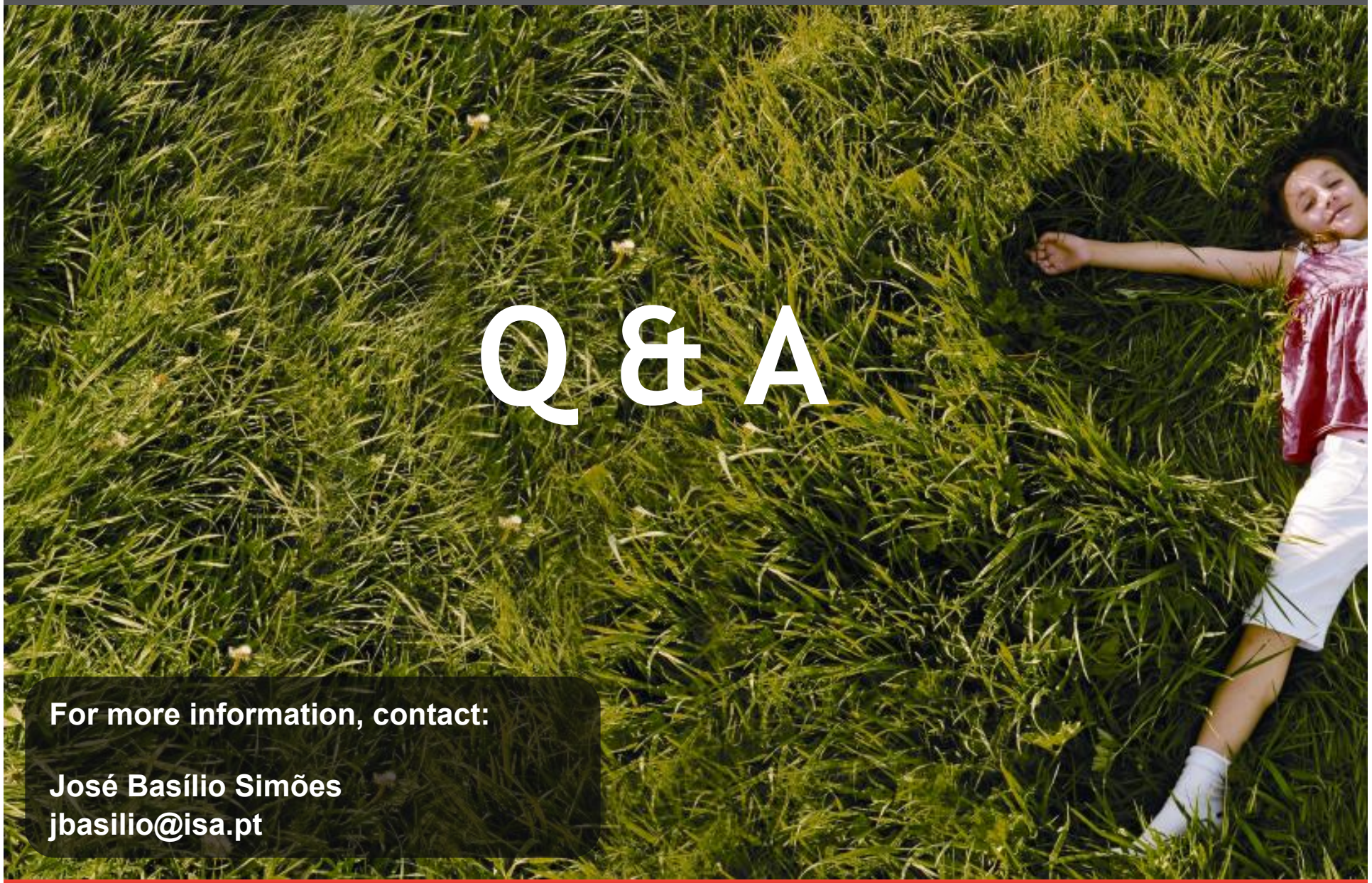
System Architecture



Portal SAVE ENERGY. Ferramentas e Serviços.
Web 2.0, Redes Sociais



Innovating for you!



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