

Smart city: visione ST e implementazione di soluzioni avanzate. Caso A2A

**X GIORNATA DELLA
RICERCA ANIE**

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Megatrends Shape Our Future



Demographic dynamics

- **Population growth**
 - > 8 billion in 2030 (+1.2 billion vs. today)
- **Urbanization**
 - 280 million people live in megacities, today (>60% of the world's population will live in cities in 2030)
- **Population aging**
 - The 65+ generation will nearly double worldwide by 2030 (from 7% to 12%)

Rising energy consumption



Scarce resources

- **Geopolitics**
 - 70% of global oil and gas reserves are located in just a few countries
- **Oil price fluctuations**
- **Finite oil and gas reserves**

Demand for energy efficiency and renewable energy



Climate change

- **Climate goals**
 - Political programs aimed at long-term reduction in CO₂ emissions

Demand for "clean" energy

Three Pillars to Sustainable Energy Demand



... Electricity consumption rising, even in a slowly growing global economy
(from 20,300 TWh in 2008 to 33,000 TWh in 2030)

Sustainable Energy Demand

Optimization of energy sources mix



Efficiency increase



Smart Grid



Increasing Energy Efficiency



- Electronics is the key for reducing global power consumption, with the ability to save an estimated 27% of energy savings from now to 2030.

Application Examples	WW Electricity Consumption	Today's Saving Potential
Power supply: ■ Stand-by & active mode	Power Supply 24%	Up to 90%
Electronic Ballast LED, HID, Dimming ...	Lighting 21%	Up to 80%
Factory automation Process engineering Heavy industry Light industry Transportation: ■ Train, car, bus, ... Home appliances: ■ Fridge, white goods Air conditioning	Motor Control 55%	Up to 40%

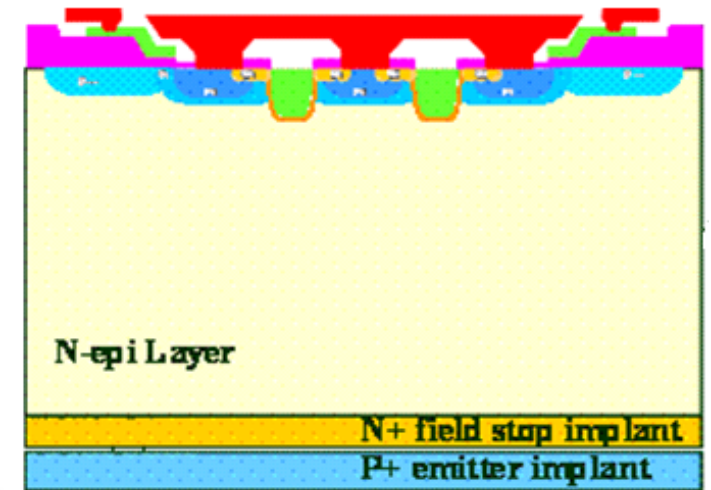


Energy Efficiency Optimization



Advanced Semiconductor Technologies

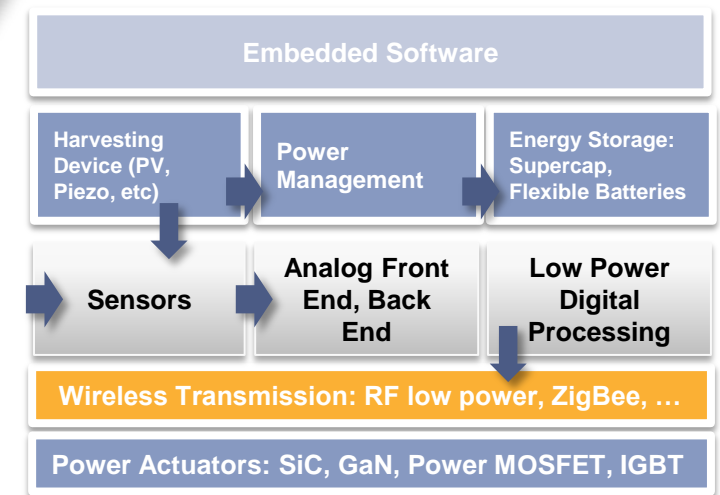
Increasing power density, switching frequency and efficiency



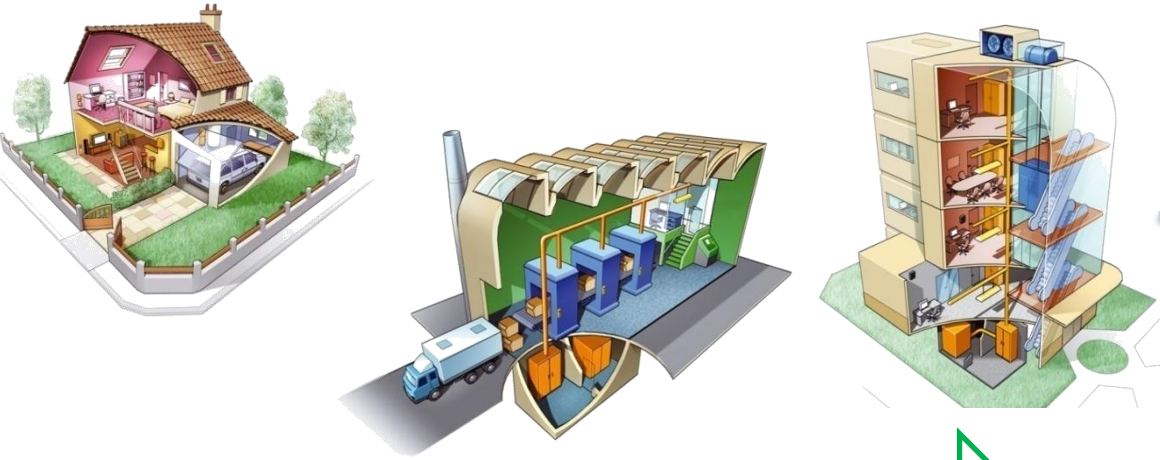
Two main paths ... one converging result: **Energy Efficiency**

Smart Systems

Combining advanced sensing, digital real-time-monitoring, efficient power actuation, hybrid technologies and packaging

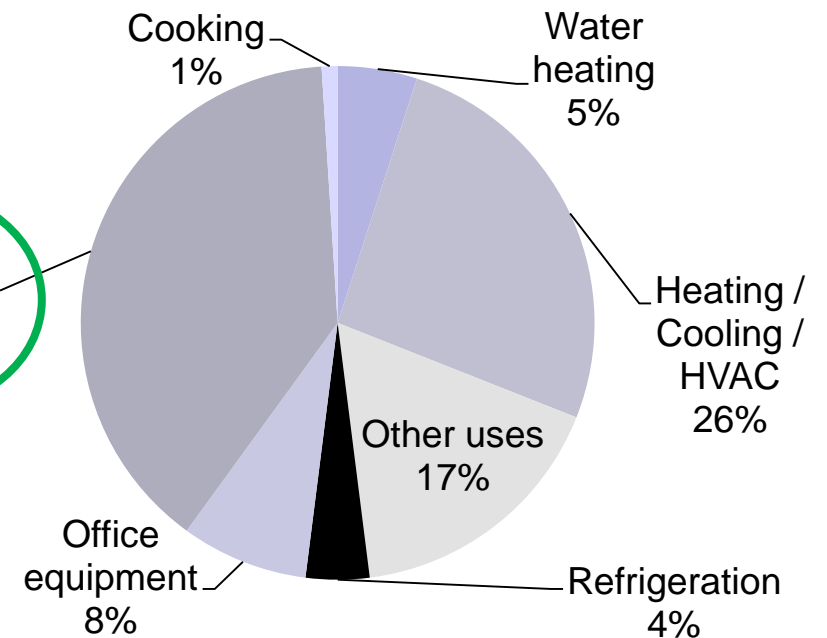


Global Switch to Energy-Efficient Lighting



Buildings consume over **40% of total energy** and **produce 21% of CO₂** in the EU and US

→ Typical **office energy consumption**



Lighting is a major target of energy efficiency improvement in buildings

Lighting energy consumption can be cut by 60-80% through upgrades to efficient lighting systems

The replacement of incandescent bulbs offers a huge energy-saving opportunity

- **Reduced CO₂** emissions by approximately 15 million tons per year
- Energy-saving bulbs can **reduce a household's total electricity consumption by 10-15%**, saving the EU some 40 billion kWh a year (**roughly equal to the annual consumption of Romania**)

Innovation → More Light / Less Power



Luminous efficiency

HID >120 lm/W



LED >100 lm/W



TL 70 lm/W



CFL 50 lm/W

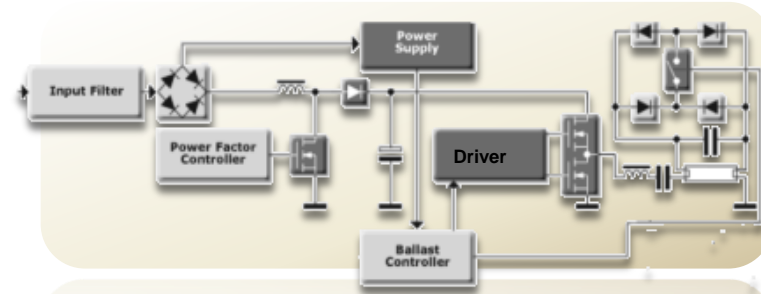


Filament 15 lm/W



ICs for energy-efficient lighting systems:

- Power Transistors
- Lighting Controllers ICs
- Microcontrollers
- LED Drivers



Switching bulbs to CFL lamps in EU could save 11.5 TWh (2025)

Solutions for signage, backlighting, building, street lights:

- Electronic Ballast for Tube Lamp
80% power savings



- LED Street Light Driver with Solar Energy Charger

250W HPS Lamps



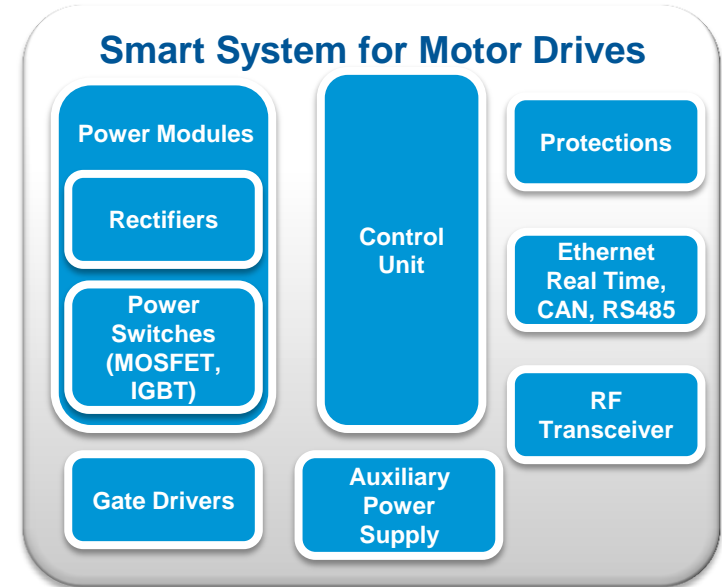
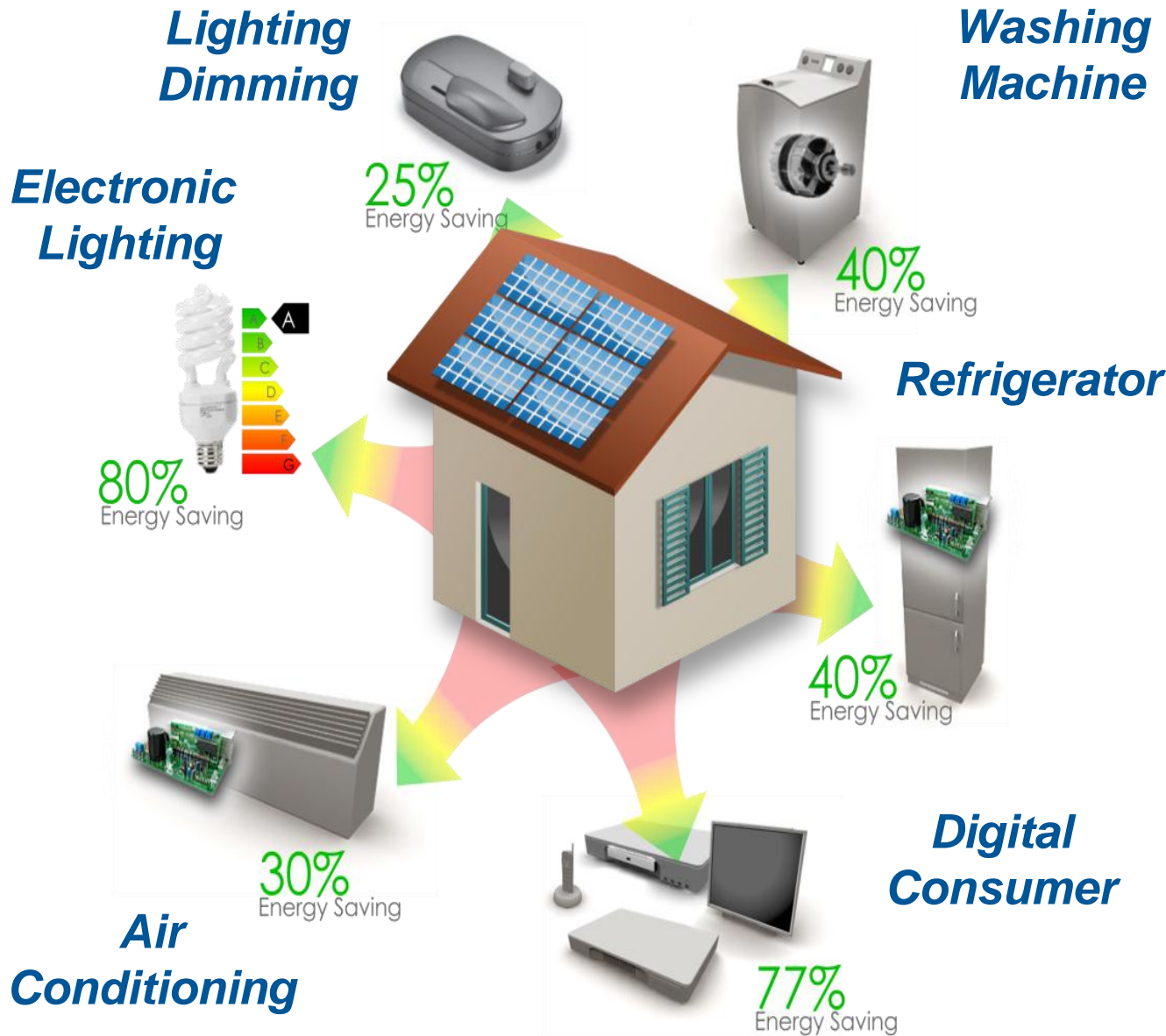
108W LED Lamps



- Signage Panels
Switch-off non active LED
80% power savings



Home Energy Savings via Smart Systems



The Italian Scenario

- Single home consumption would be reduced by 1 MWh/y
- Total residential sector saving by 27 TWh/y

...equivalent to 4 x 1 GW Nuclear Power Plants

EU new Energy Class for white goods will allow 51 TWh savings by 2020*

*yearly electricity consumption of Portugal + Latvia

Keeping Stand-by < 1 W can reduce EU power consumption of 35 TWh/y* by 2020

* today 's Denmark yearly electricity consumption

Smart Grid: Step Forward in Efficiency



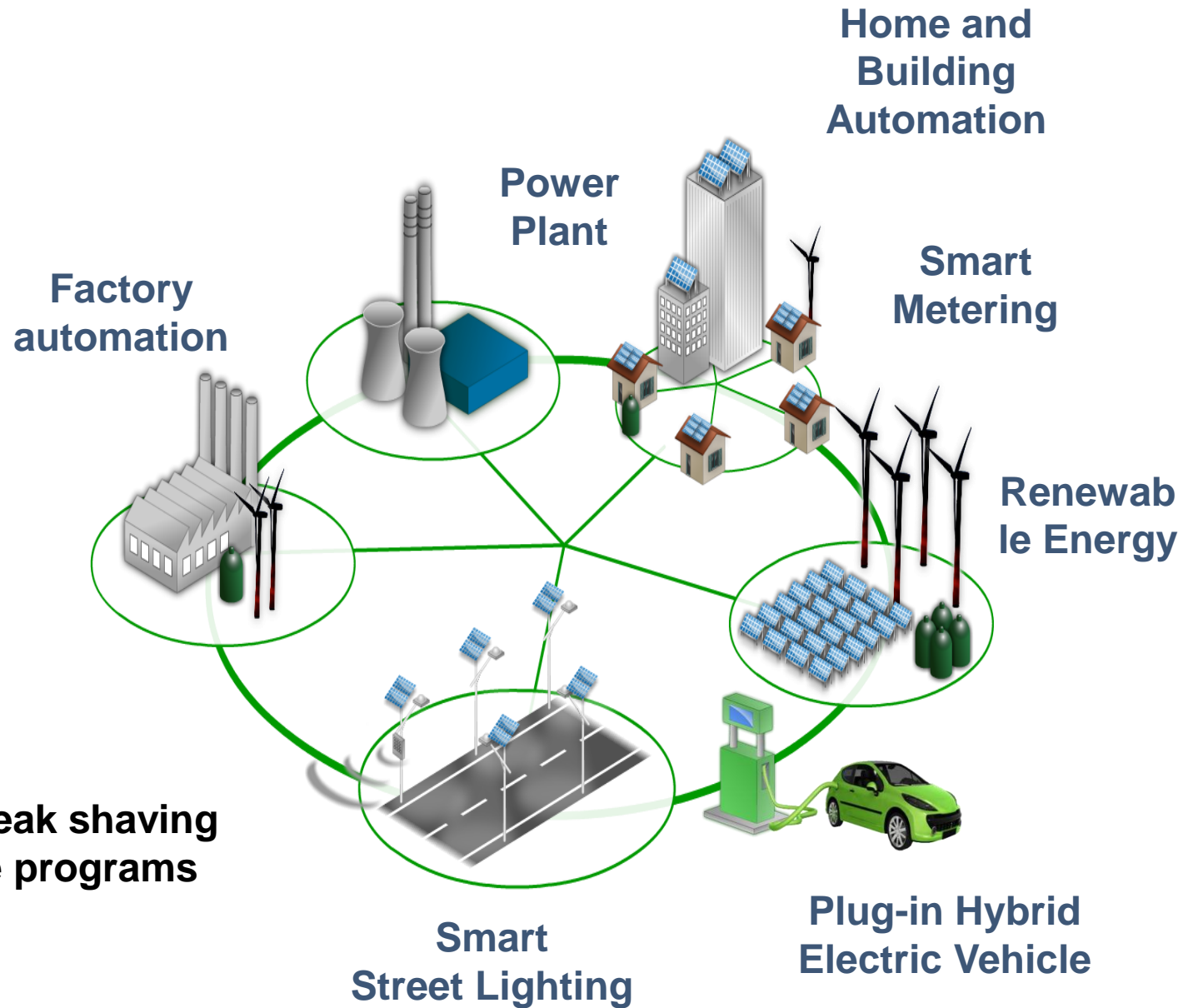
Integrating distributed renewable energy sources



Enhancing customer awareness of Energy Usage



Reducing grid losses through peak shaving by enabling Demand Response programs



... Efficient Energy Generation and Distribution combined with Advanced Monitoring and Control

What is a Smart Grid?



... It's more than just smart meters!

Power Generation



Traditional power plants



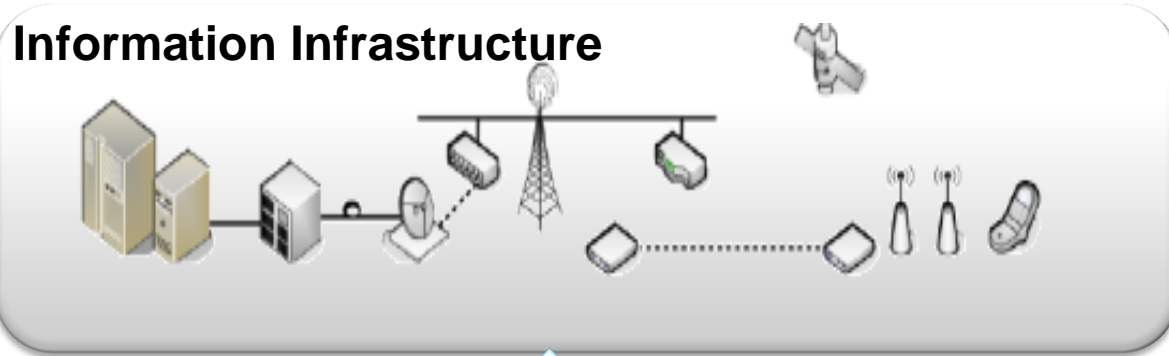
Solar generation



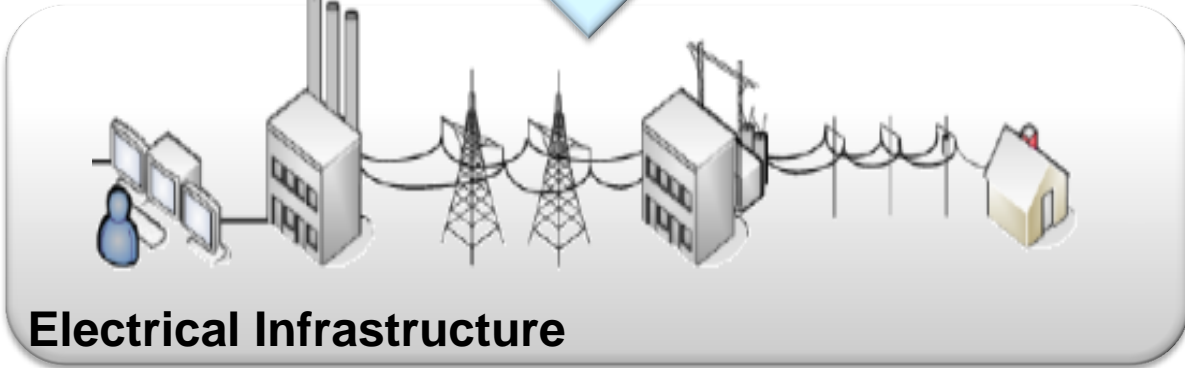
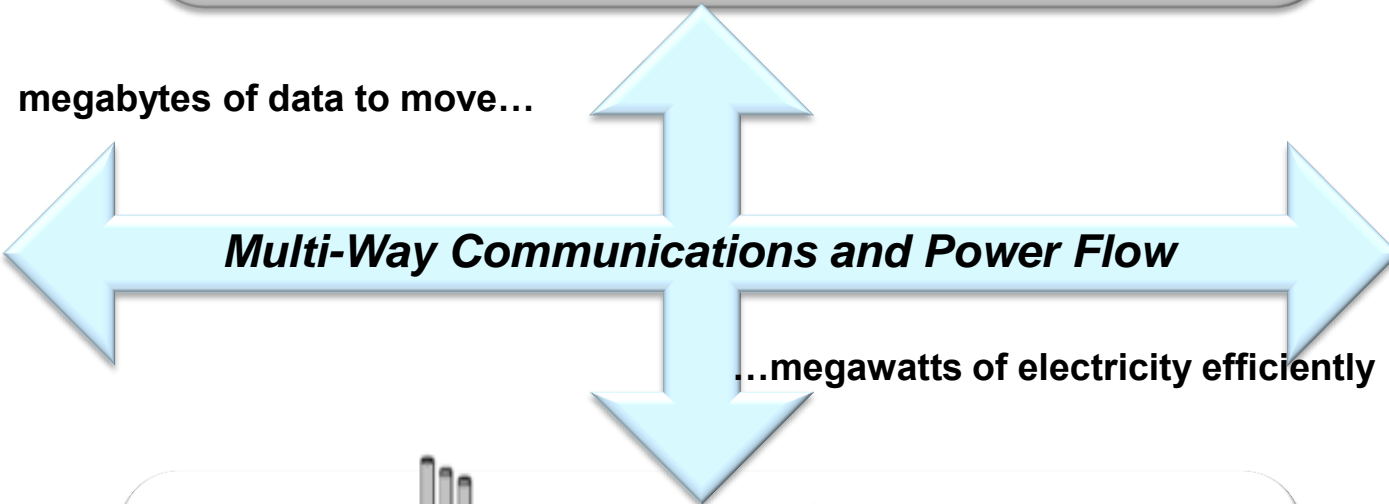
Wind farms



In-House Generation



Information Infrastructure



Electrical Infrastructure

Consumer



Smart meters



Smart house



Plug-in vehicles



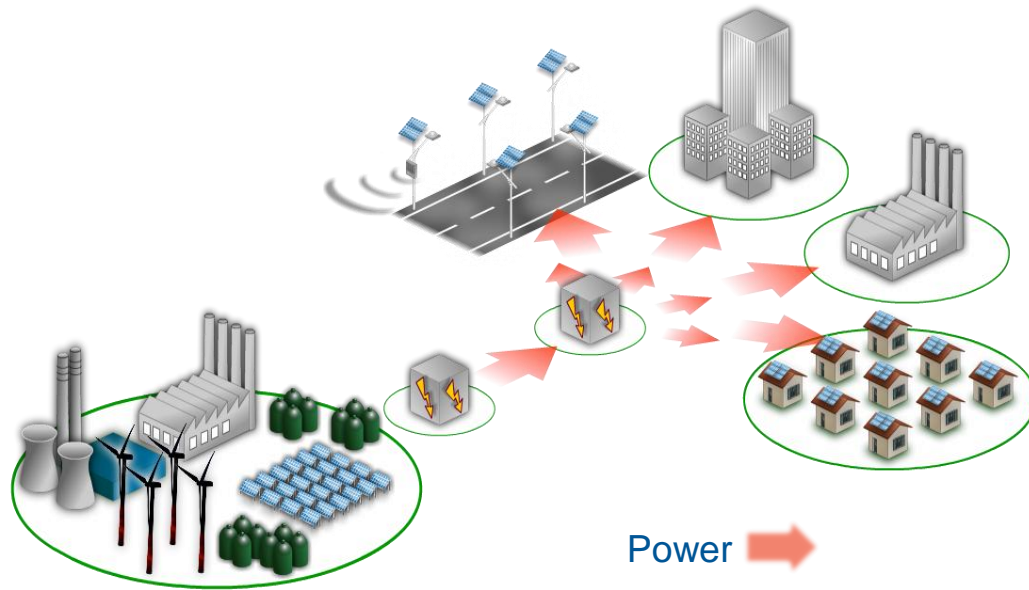
Industry

... Internet of energy

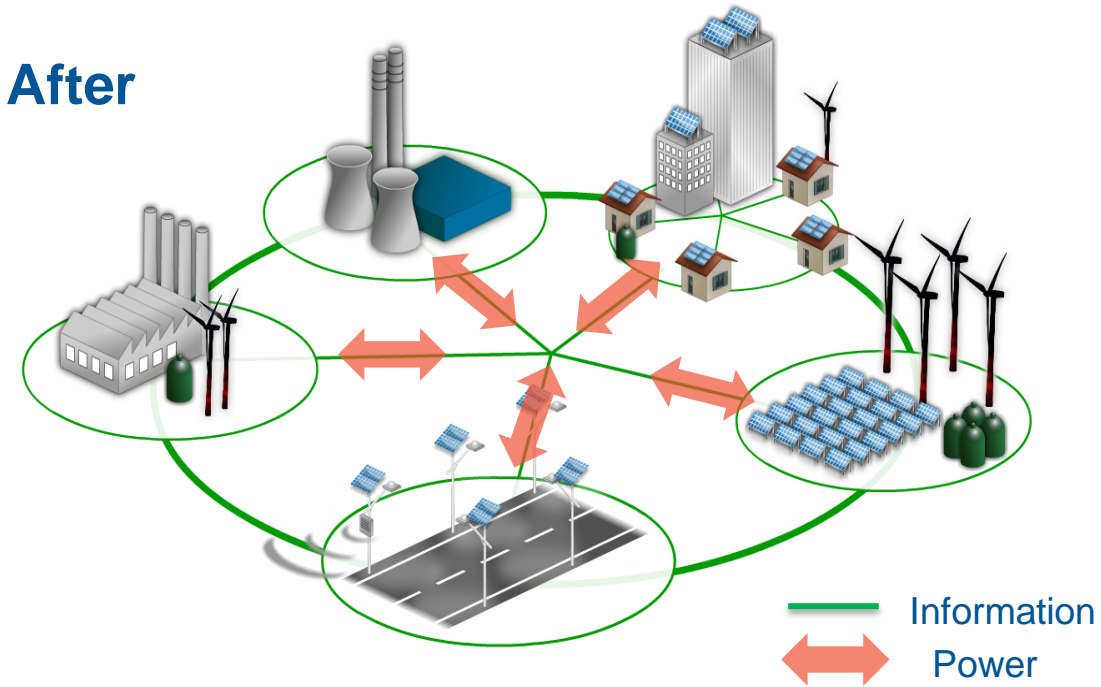
Growth Engine: Smart Grid Technology



Before



After



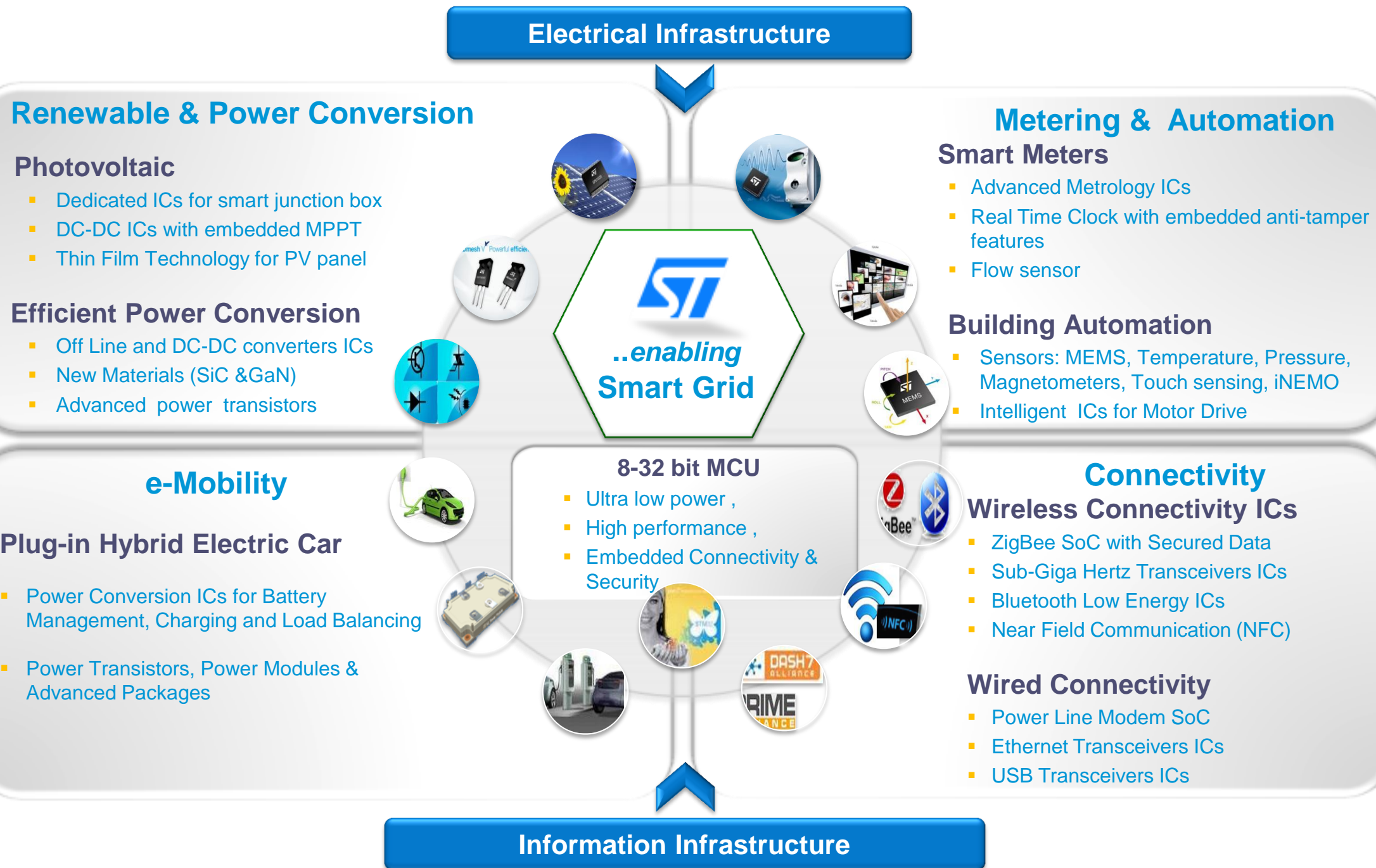
... the intelligent power network of the future

- Improving US grid efficiency by 5% would be equivalent to cut fuel use and carbon emissions of 53 Mu cars (Research sponsored by the U.S. Government)

What Makes Up the Smart Grid?



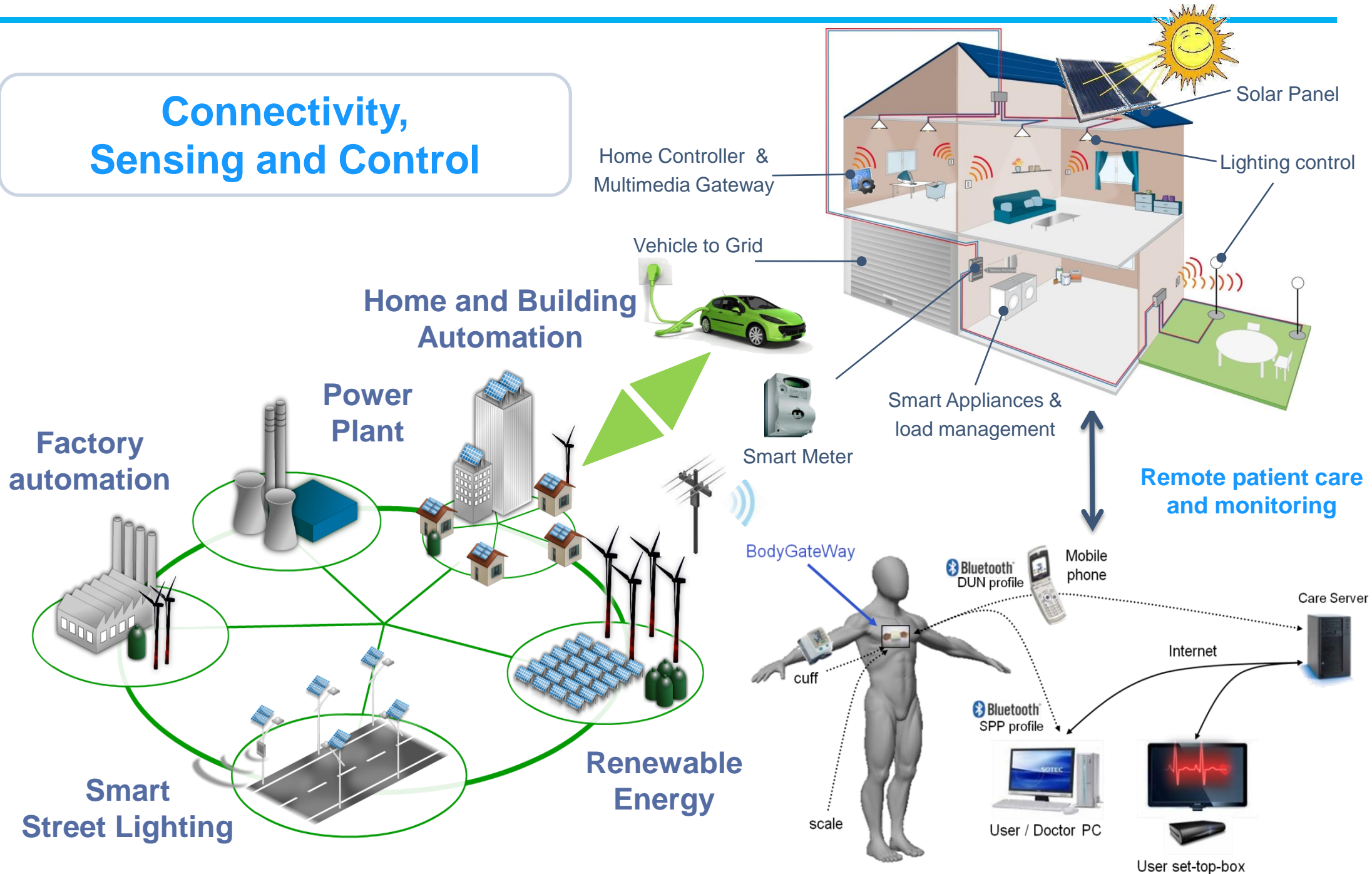
- Sensors and controls
- Two-way communications
- Applications and information technology
- Consumer and end-user electronic devices



Smart-Grid Technology Convergence



Connectivity,
Sensing and Control

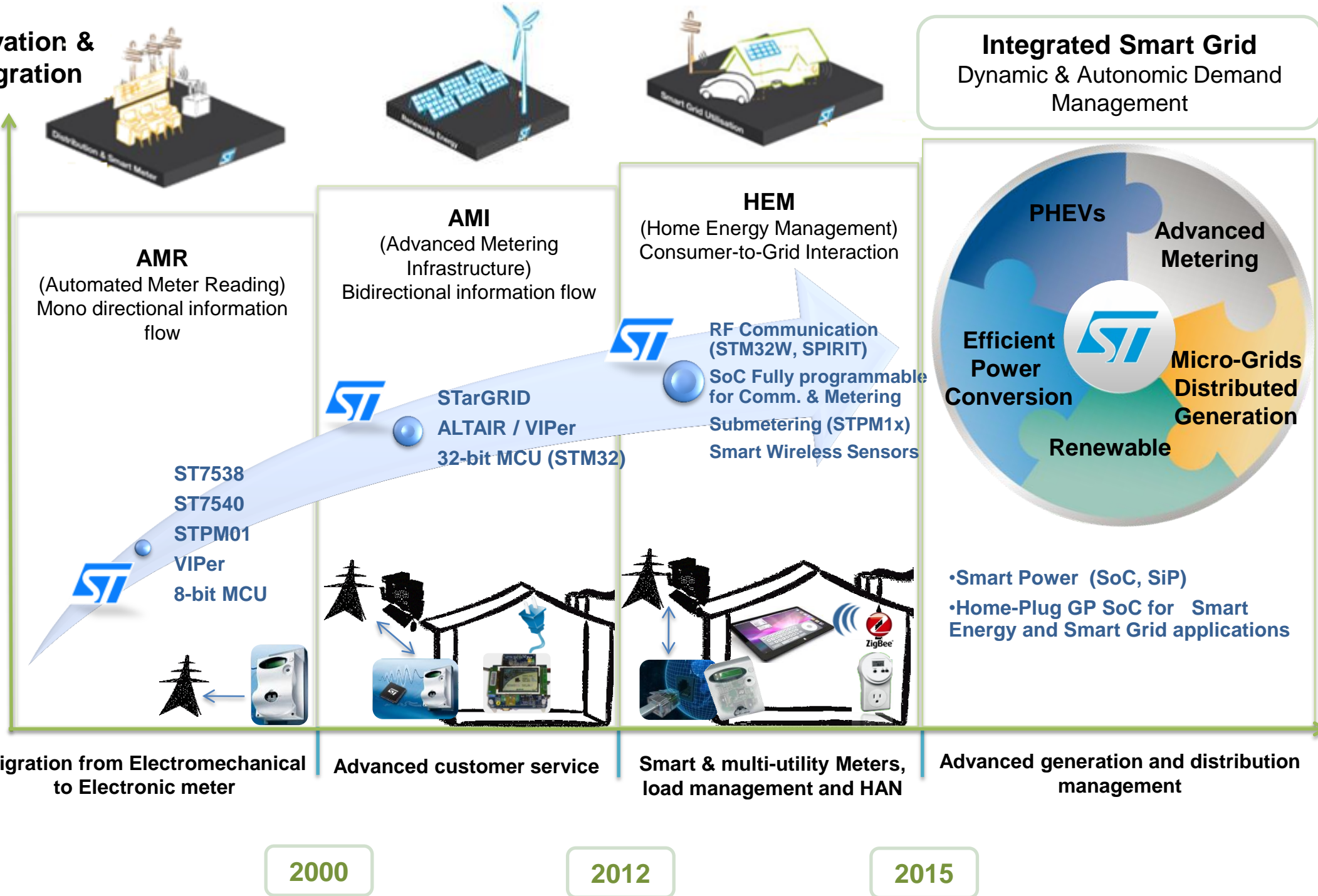


... Enabling reduced environmental impact and improve a *day-by-day life* through secure and reliable communications

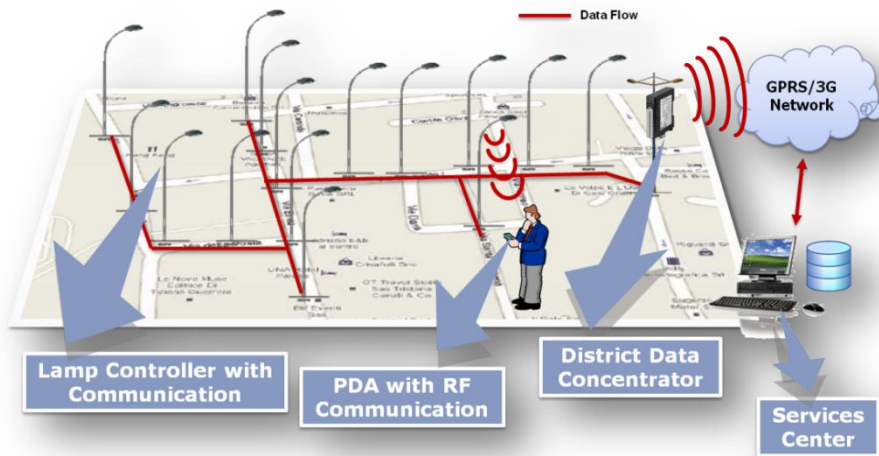
Smart Grid Evolution vs. ST's Milestones



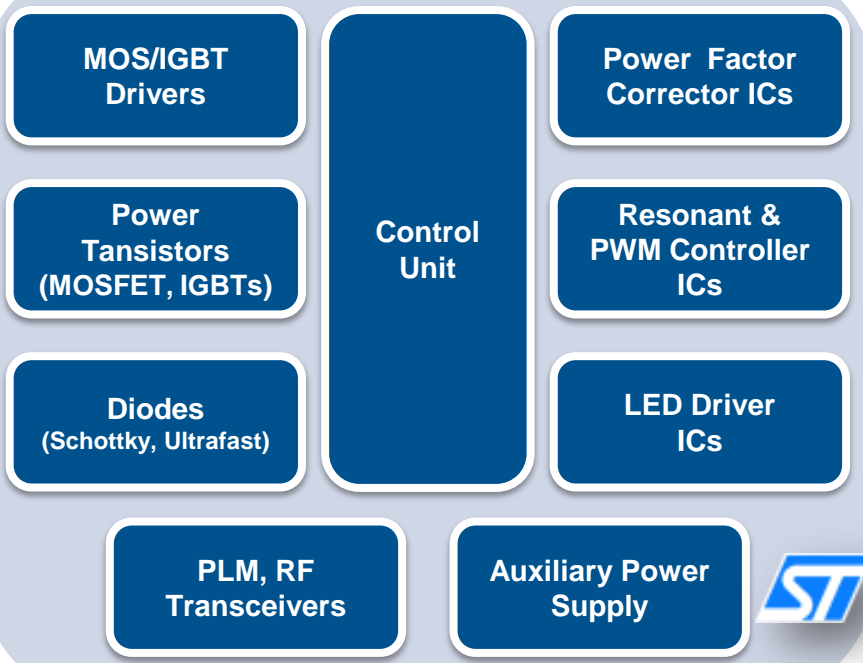
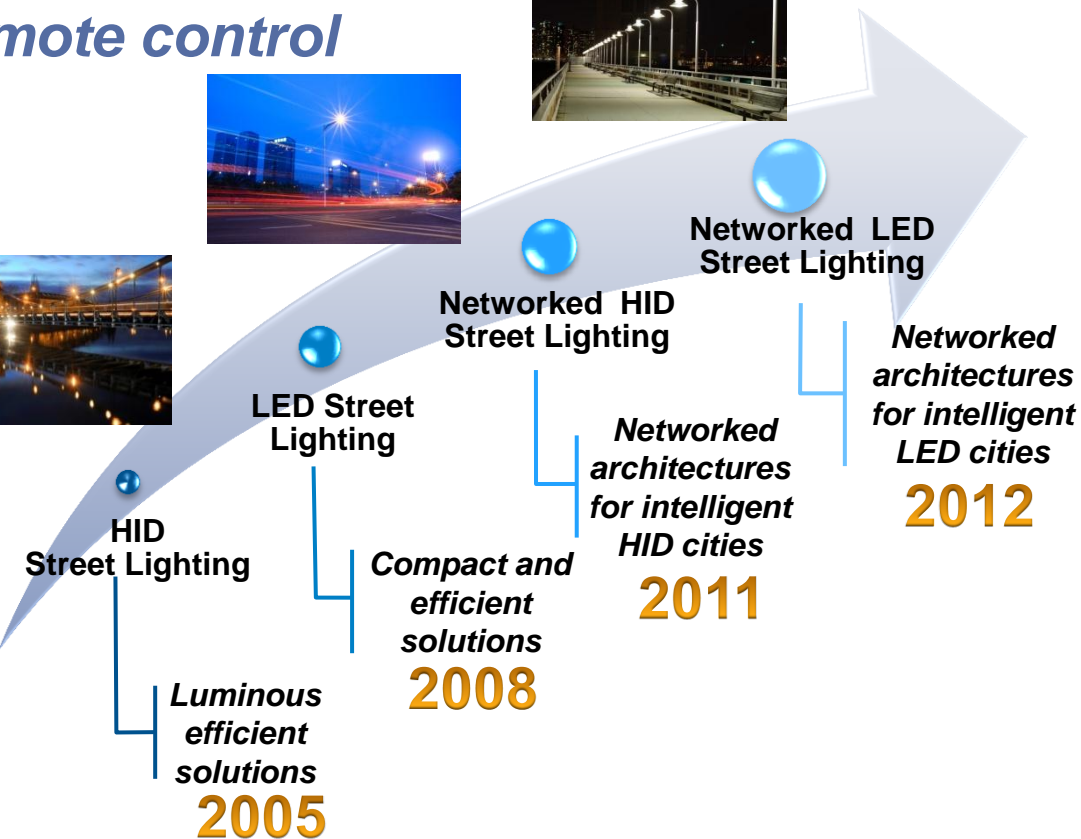
Innovation & Integration



Intelligent City: Smart Street Lighting

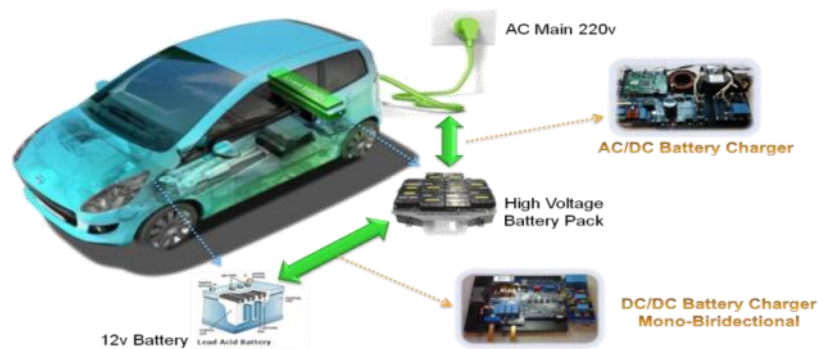


High efficiency lamp driving combined with advanced monitoring and remote control

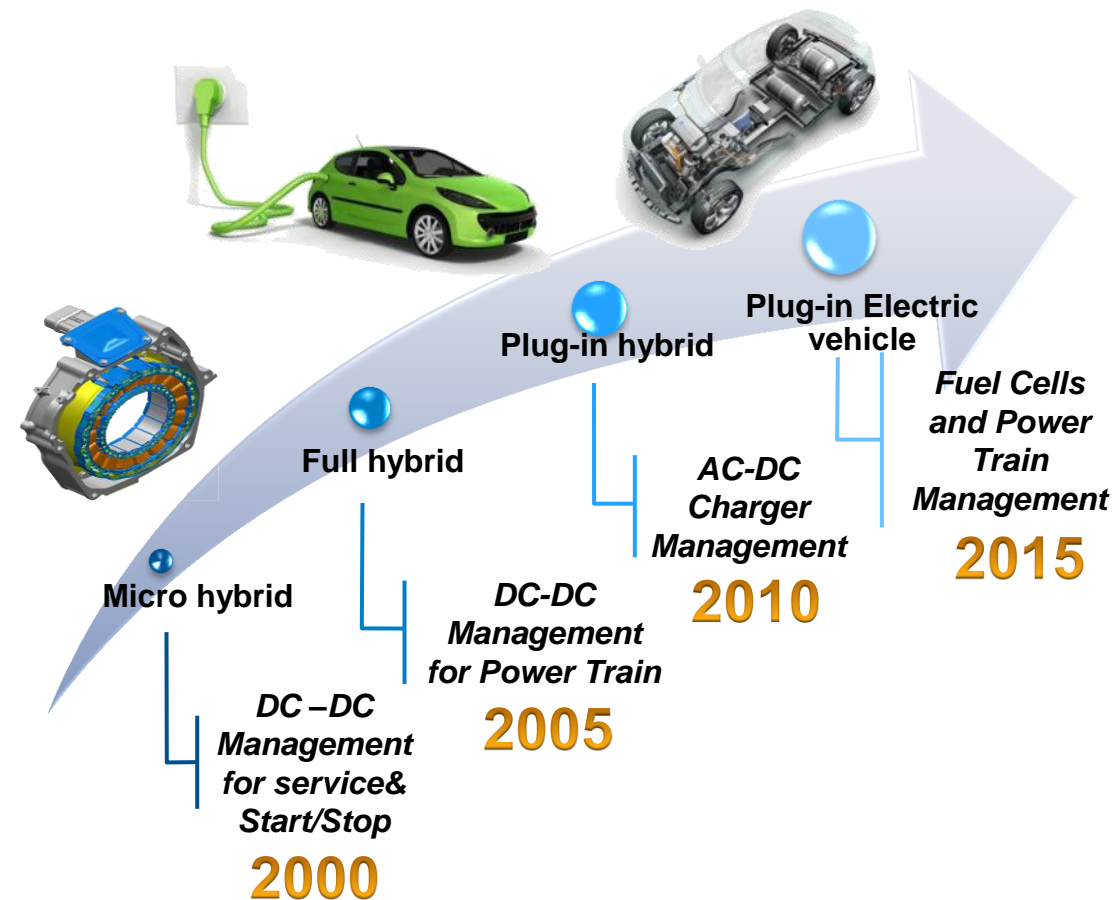
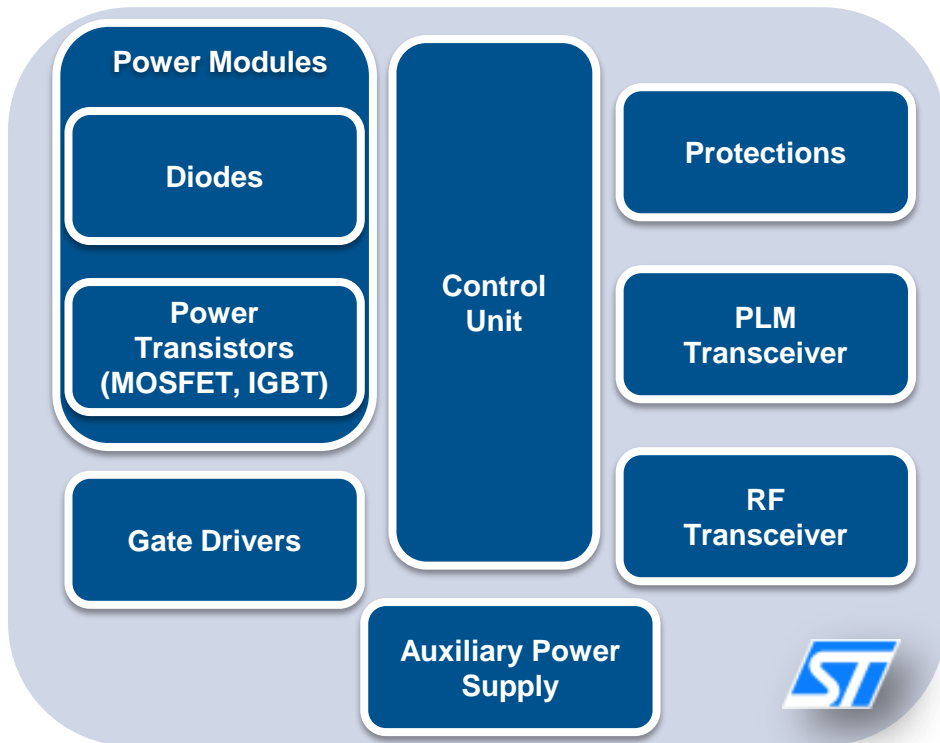


**LED Driver ICs in Street Lighting
CAGR 2011-2015: 55%**

- CO₂ reduction: Power Modules in Smart Systems for a high reduction emission



Typical Block Diagram & Product Families



**HEV / EV 2015 Semiconductor
TAM: \$2.3B
CAGR 2011-2015: 27%**



Smart IP

Milano, 19 dicembre 2011



Obiettivi

Valutazione sistema SMART IP per una città come Milano

Con l'obiettivo di:

- Riduzione costi esercizio IP

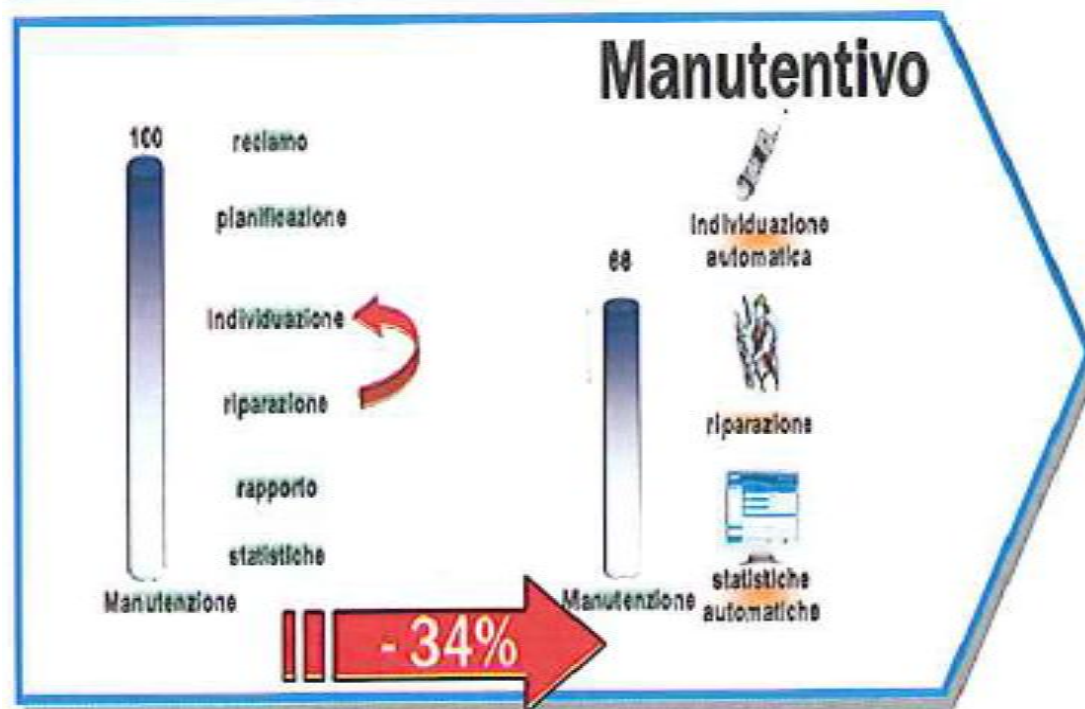
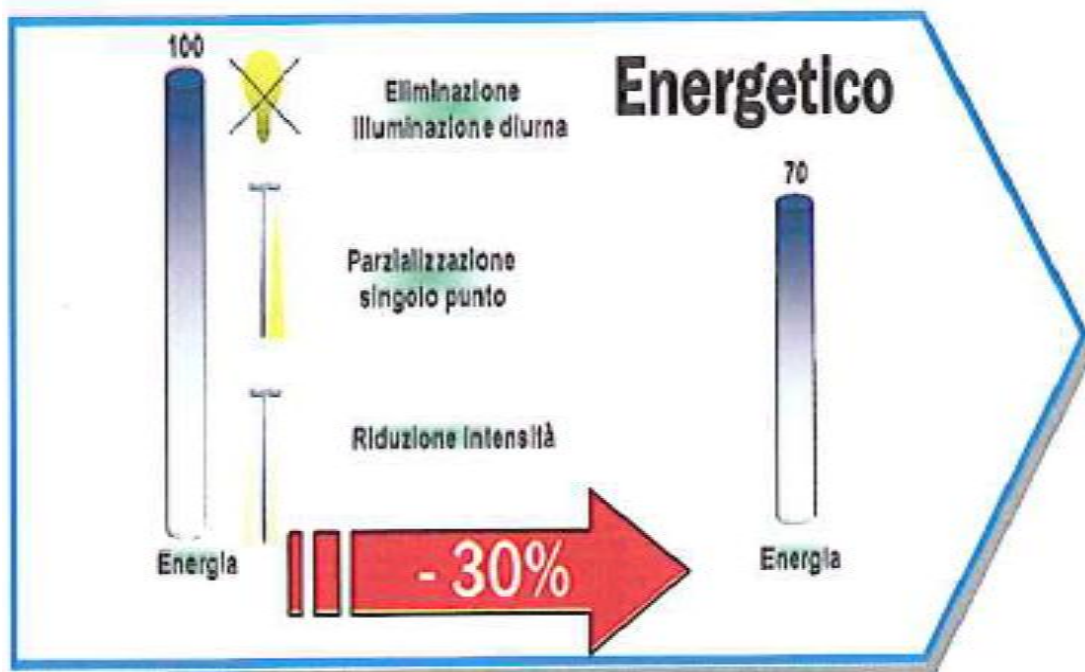
e l'opportunità di:

- Servizi a valore aggiunto

Vantaggi Smart IP

- RISPARMIO ENERGETICO
- dimming lampade a scarica nelle ore notturne si può ridurre la luminosità con un risparmio energetico fino al 25%
- GESTIONE REMOTA del punto luce Acceso/Spento
- DIAGNOSTICA segnalazione lampade guaste e/o problemi circuito
- SERVIZI AGGIUNTIVI: avere il palo alimentato permette avere tensione fino alla lampada e utilizzare la strutture x altri servizi - wi-fi, telecamere, ecc....
- L'UTILIZZO di concentratori basati sul PLC ST permette la gestione dall'esistente Centro di controllo Metering Ele.

Vantaggi Smart IP



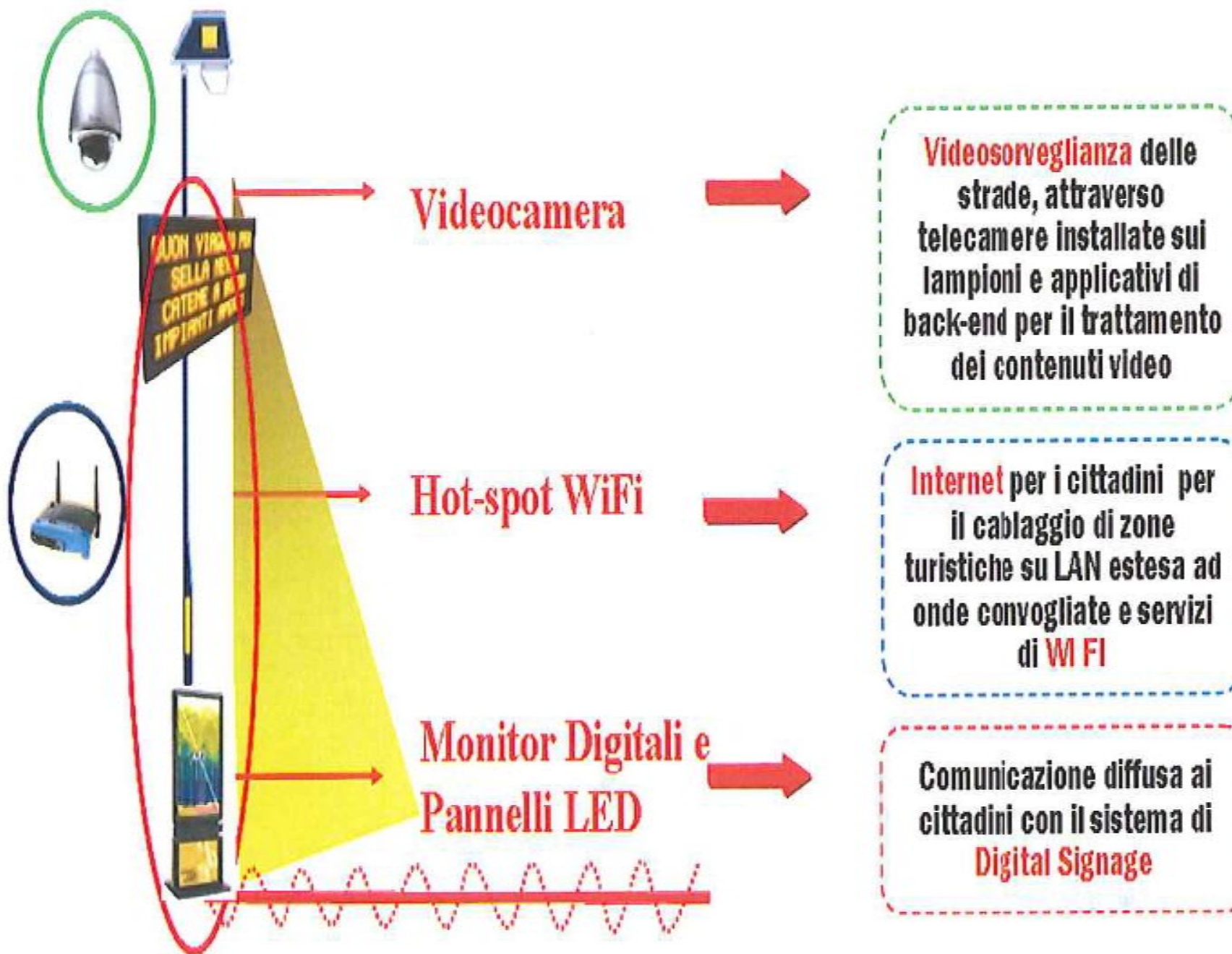
Ottimizzazione consumi

- ▶ **razionalizzazione** dell'uso delle lampade mediante parzializzazioni
- ▶ **ottimizzazione** dei cicli di funzionamento
- ▶ **programmazione** personalizzabile dell'orologio astronomico per l'accensione/spegnimento puntuale degli impianti
- ▶ **riduzione** delle accensioni diurne per ricerca guasti
- ▶ **riduzione** delle dispersioni di linea per basso fattore di potenza (lampade non correttamente rifasate)

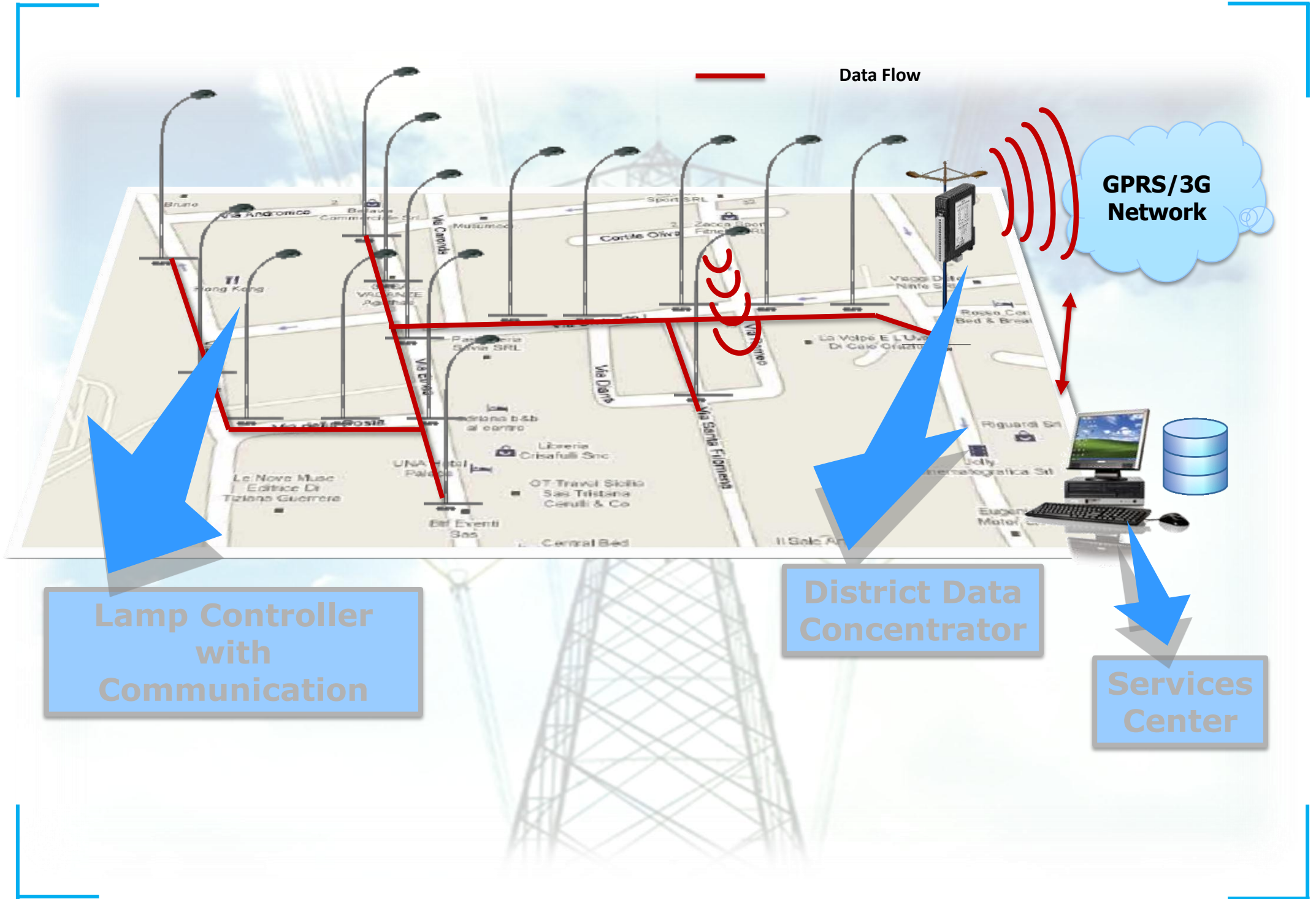
Ottimizzazione processo di manutenzione

- ▶ **risparmiare** sui costi del personale, grazie all'ottimizzazione dei tempi d'intervento
- ▶ **risparmiare** sui materiali, grazie al controllo mirato degli elementi effettivamente guasti
- ▶ **ottimizzare** la gestione del magazzino e degli automezzi
- ▶ **eliminare** i costi dovuti alla ricerca dei guasti
- ▶ **risparmiare** i costi sull'organizzazione del servizio

Servizi a Valore aggiunto



SMART IP - architettura



Lamp Controller with Communication

District Data Concentrator

Services Center

Thanks for your attention

