United Technologies Research Center

# The role of buildings in the digital grid

Murilo Bonilha, General Manager, UTRC Ireland

Tyndall Technology Days, October 25th 2017

# SMART GRID (AN OLD PARADIGM)

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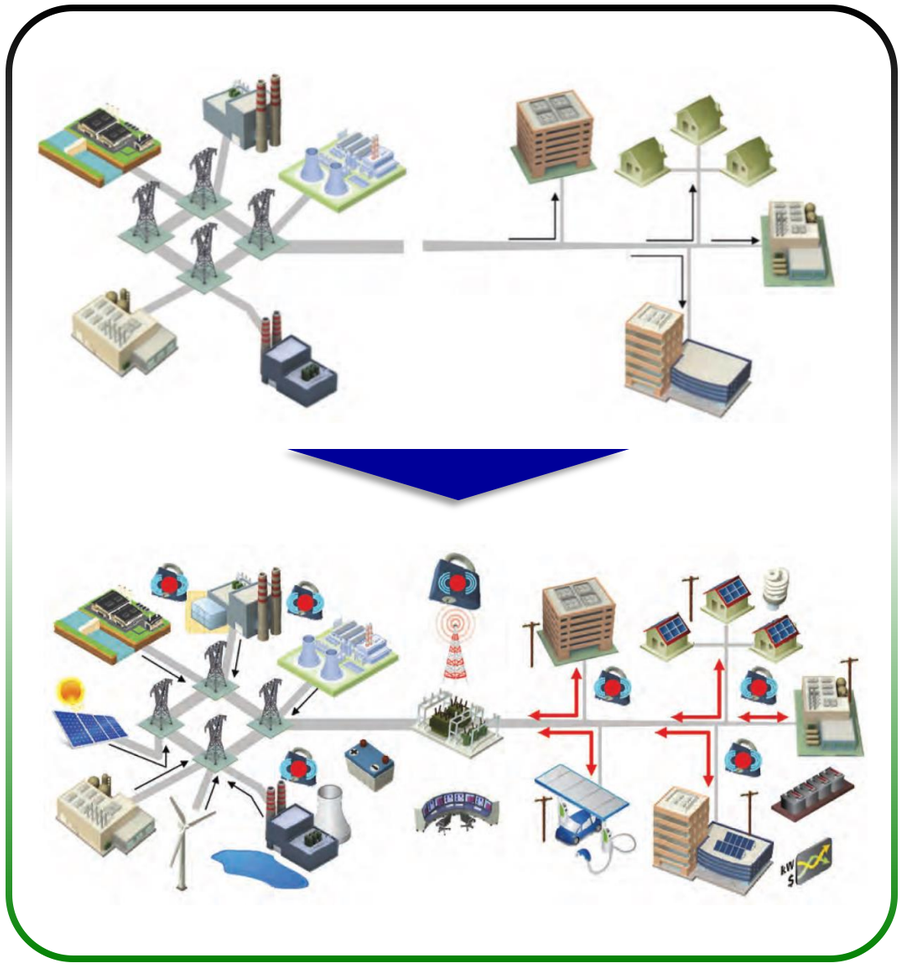
## Evolution of the grid: from passive to active



### Traditional Grid

- Consumers and buildings **passive** in the grid
- **No** distributed and intermittent generation sources
- **No** distributed and intermittent loads
- **No** distributed operations (monitoring and controls)

### Smart Grid

- Consumers and buildings **active** in the grid
- **Many** distributed and intermittent generation sources
- **Many** distributed and intermittent loads
- **Many** distributed operations (monitoring and controls)

# DIGITAL GRID IN THE DIGITAL ERA

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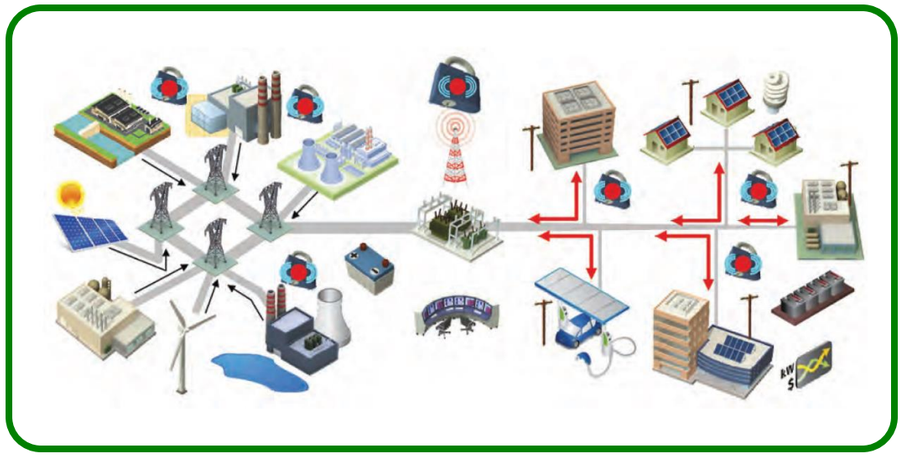
## Evolution of the grid: from active to digital



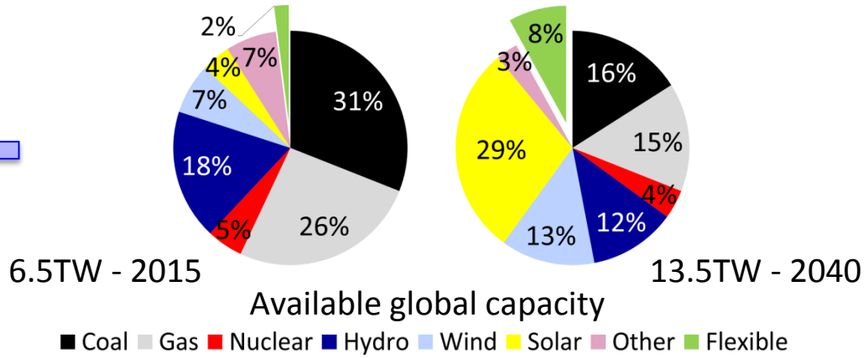
### Smart Grid

- Consumers and buildings **active** in the grid
- **Many** distributed and intermittent generation sources
- **Many** distributed and intermittent loads
- **Many** distributed operations (monitoring and controls)

### Internet of Things


### Big Data


### Flexibility




Credit: Bloomberg NEO 2016

# INTEGRATED BUILDINGS IN THE DIGITAL GRID

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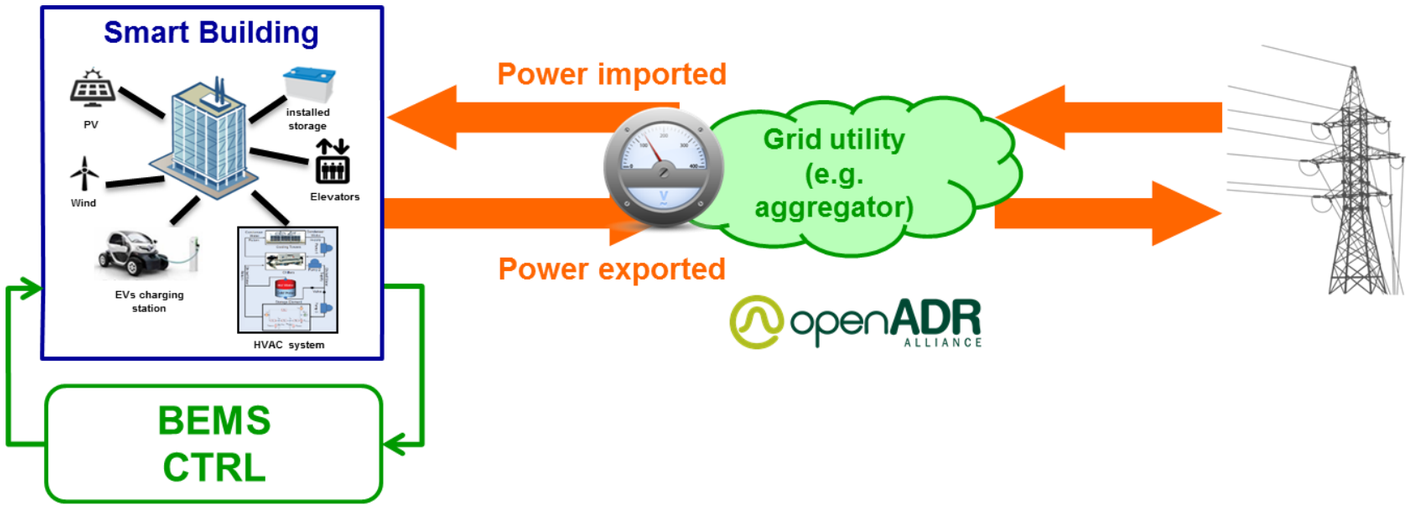
## A new role for buildings of the future



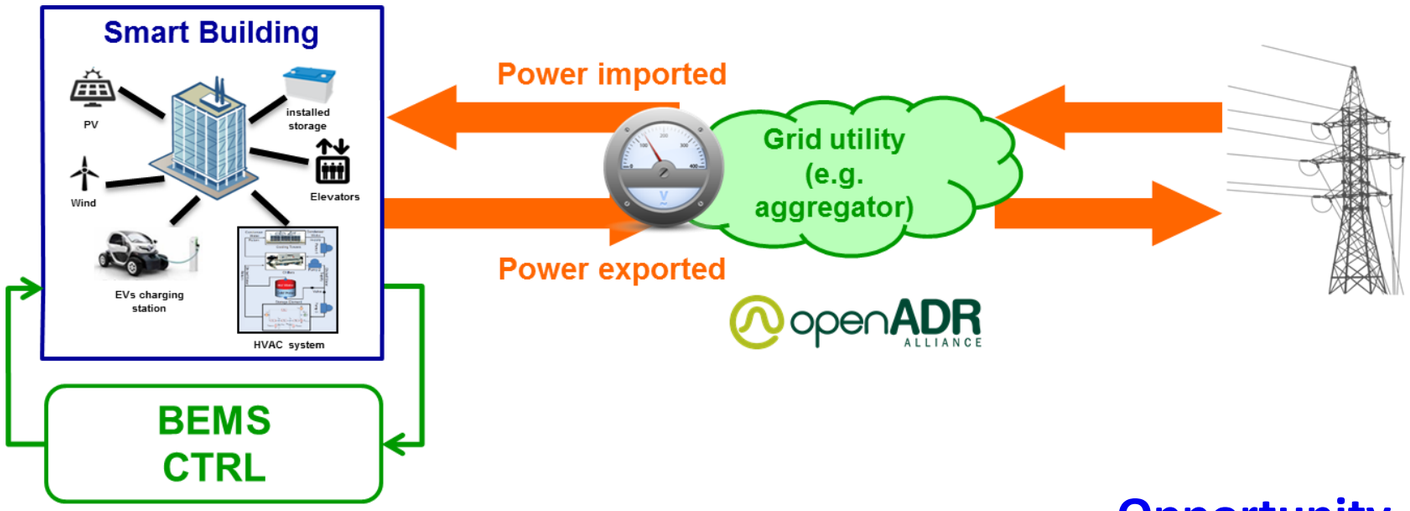

- Faster
- More flexible
- More interactive

Participation to Demand Response programs and Ancillary Services

# INTEGRATED BUILDINGS IN THE DIGITAL GRID

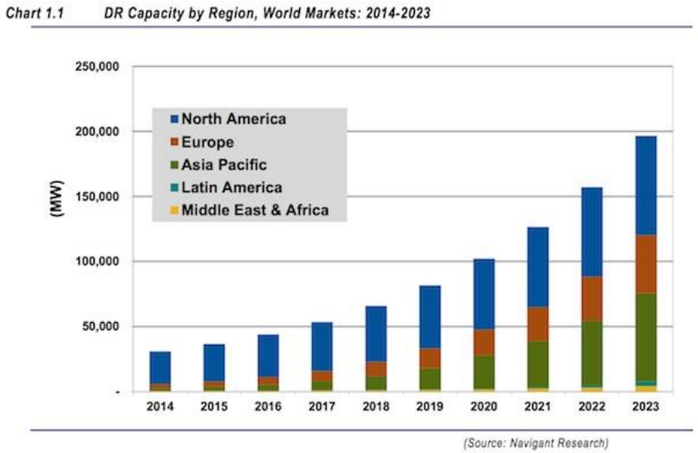
United Technologies Research Center

## A new role for buildings of the future




**Opportunity**

Demand Response capacity to reach 196.7 GW in 2023



# SUSTAINABLE AND REPLICABLE SOLUTIONS

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## H2020 ELSA – Energy Local Storage Advance system


- **Call:** H2020, LCE8: Local / small-scale storage
- **Budget:** Total: €13.5M
- **Duration:** Apr 2015 – Dec 2018
- **Web-site:** [www.elsa-h2020.eu](http://www.elsa-h2020.eu)

Develop & mature an Electricity Storage System (ESS) based on **2nd life Electric Vehicle** (EV) batteries coupled with an **Energy Management System** (EMS) to deliver smart grid services

# SUSTAINABLE AND REPLICABLE SOLUTIONS

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## 2nd life batteries in buildings


EV battery: Nissan Leaf 24kWh

2nd life EV battery ~16kWh

**SASMI building (UK)**

Storage system capacity:

1st life batteries : 72 kWh

2nd life batteries: 48 kWh

Energy services: peak shaving, energy arbitrage, demand response

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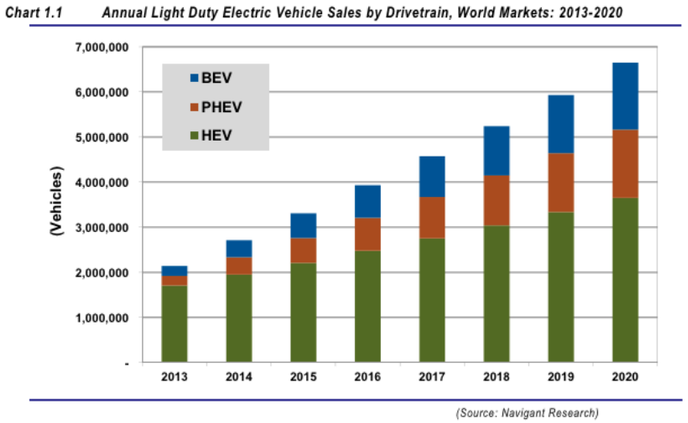
### Opportunity




### Barriers

- **Economic uncertainty** about 2nd life battery value
- Concerns about which entity is **responsible** for 2nd life batteries
- Remanufacturing costs
- **Lack of data** about battery performance in both 1st and 2nd life applications

# INTEGRATED BUILDINGS

## AMPERE E+, Paris, France

**Renewables**

RENAULT

**Storage**

**La Défense District**

**Loads**

OTIS United Technologies

ReGen

Carrier United Technologies

# INTEGRATED BUILDINGS

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## AMPERE E+, Paris, France

Renewables

What is missing?

RENAULT

Storage

La Défense District

Loads

OTIS United Technologies

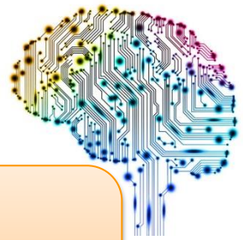
ReGen

Carrier United Technologies

# INTEGRATED BUILDINGS

## AMPERE E+, Paris, France

Renewables



RENAULT

Storage

BUILDING ENERGY MANAGEMENT SYSTEM

Loads

OTIS
United Technologies

ReGen™

Carrier
United Technologies

La Défense District

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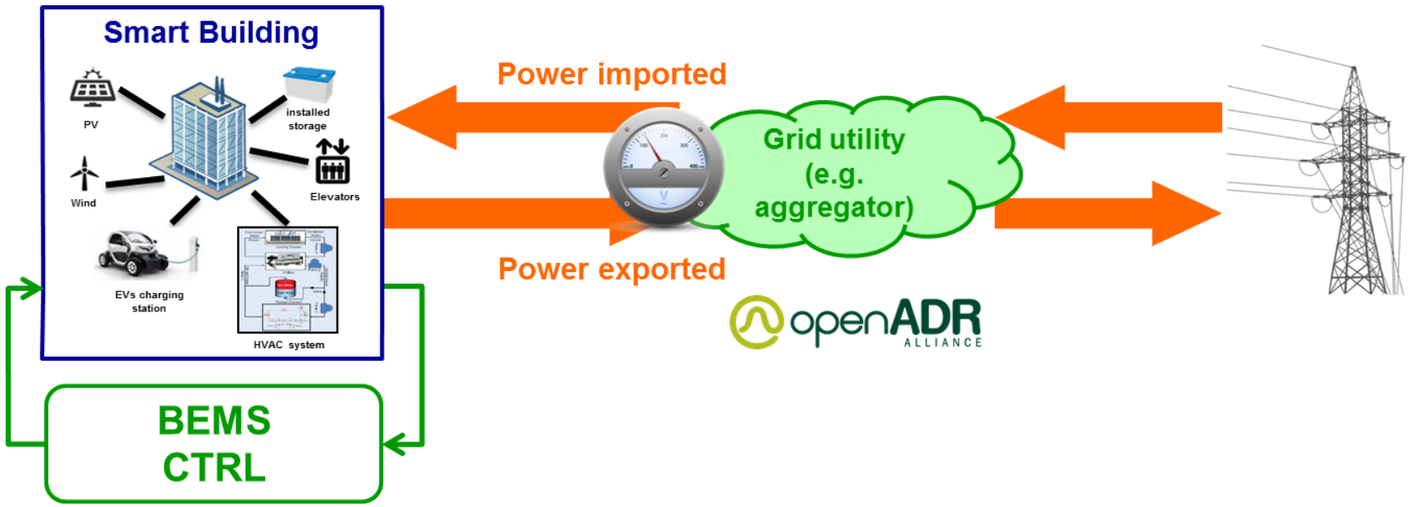


- Faster
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- More interactive

**How?**

- More digital
- More data
- More services

# THANKS

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