

# Sistemas que compõe as Smart Grids

**ABINEE TEC 2011**

**Davi Bisinotto Gomes**  
**Março de 2011**



## Energy supply in a changing world

### Demographic dynamics



- **Population growth:**  
7.5 bn in 2020 (+1.1 bn)
- **Megacities** (>10 million inhabitants): 27 megacities in 2025

Source: UNO

**Increasing power consumption**

### Resource scarcity



- **Geopolitics:**  
70% of world oil and gas supplies only in a few countries
- **Oil price fluctuations**

**Need for efficiency:  
Increasing electrification  
of society**

### Climate change



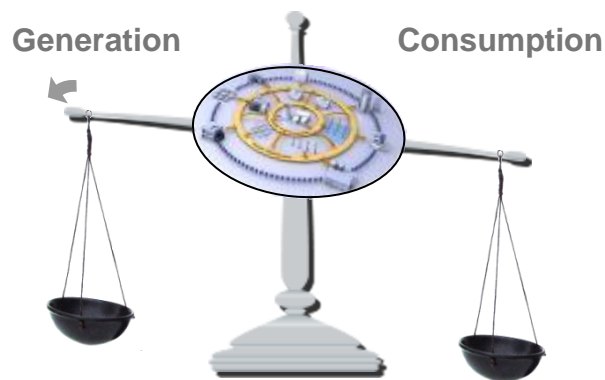
- **Climate targets:**  
Political programs for long-term reduction of CO<sub>2</sub> emissions

**Growing demand for  
“clean” power**

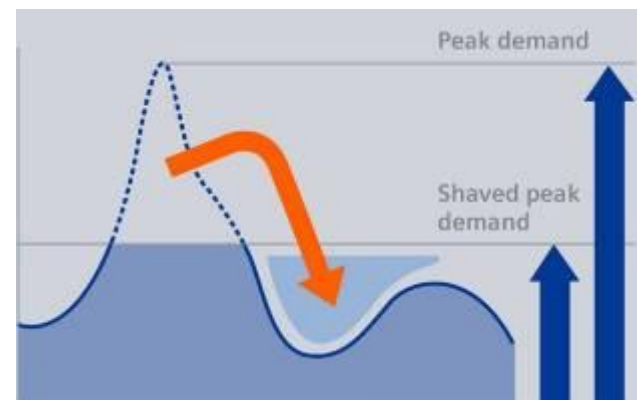
# Entering the New Electricity Age – Push-factors for Smart Grid

**SIEMENS**

## Imbalance between generation and consumption



## Load shift



## Electromobility



## Blackouts



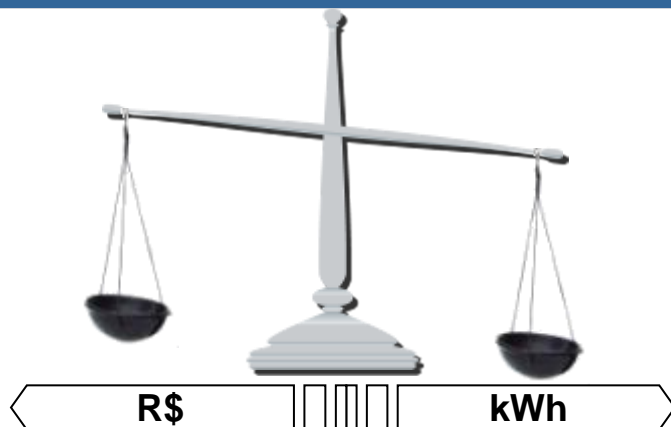
## Distributed generation



# Entering the New Electricity Age – Push-factors for Smart Grid - Brazil

**SIEMENS**

## New tariff structure



## Operational Efficiency



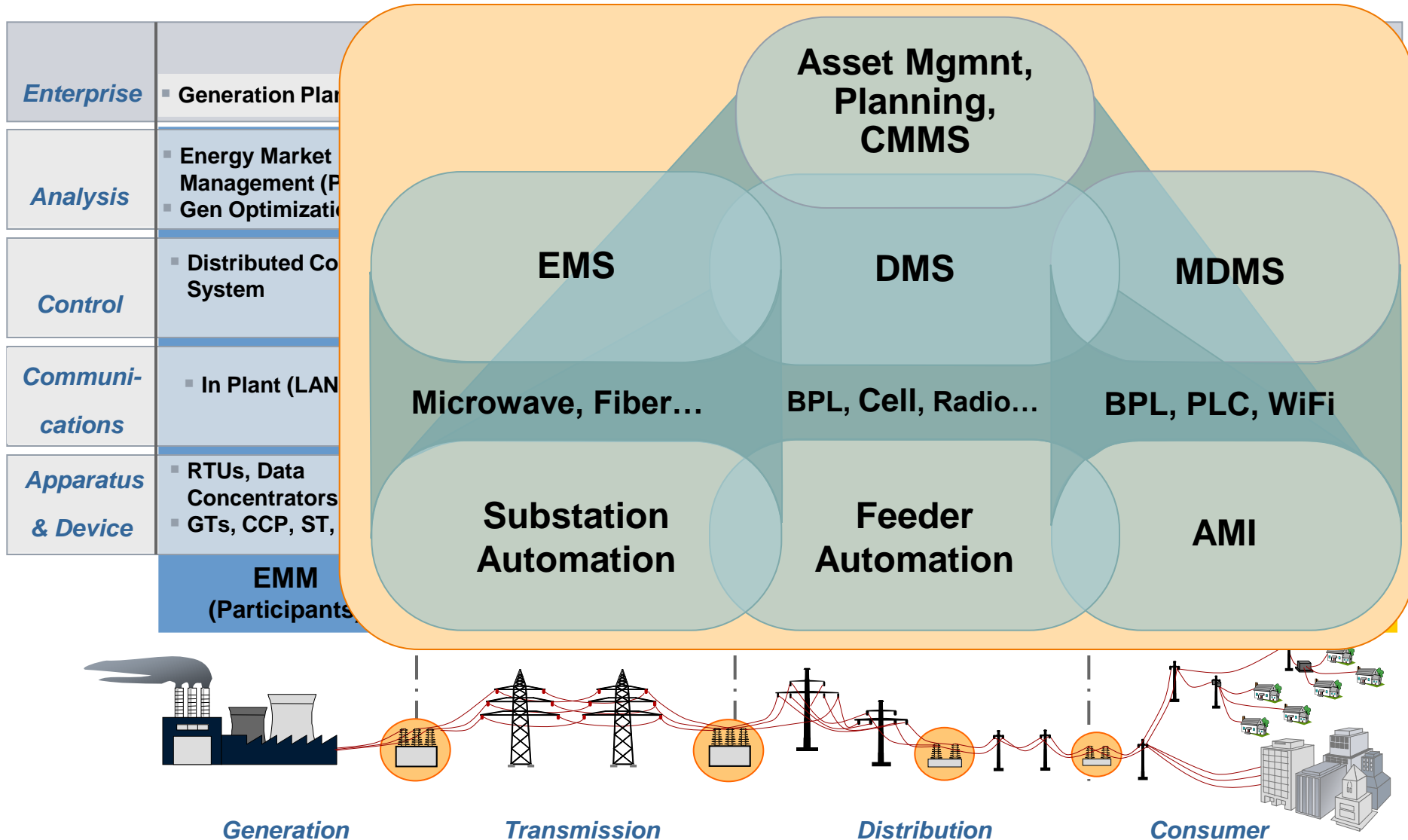
## Energy supply quality



## Intermittent and distributed energy



# The *New Electricity Age*



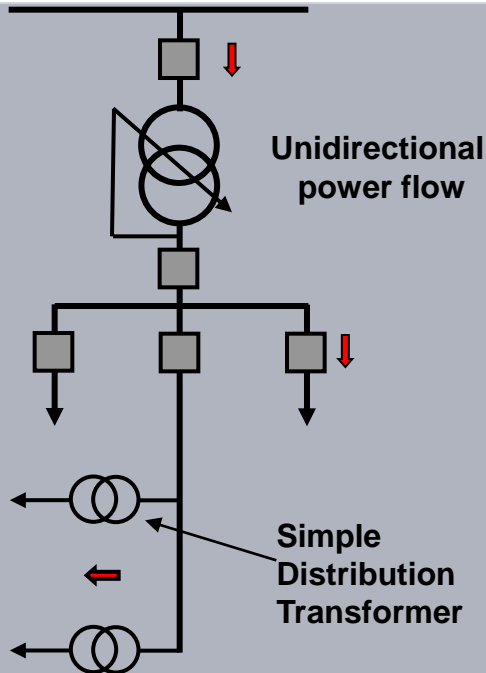


## Flexible and reliable distribution automation

Smarten up your distribution automation

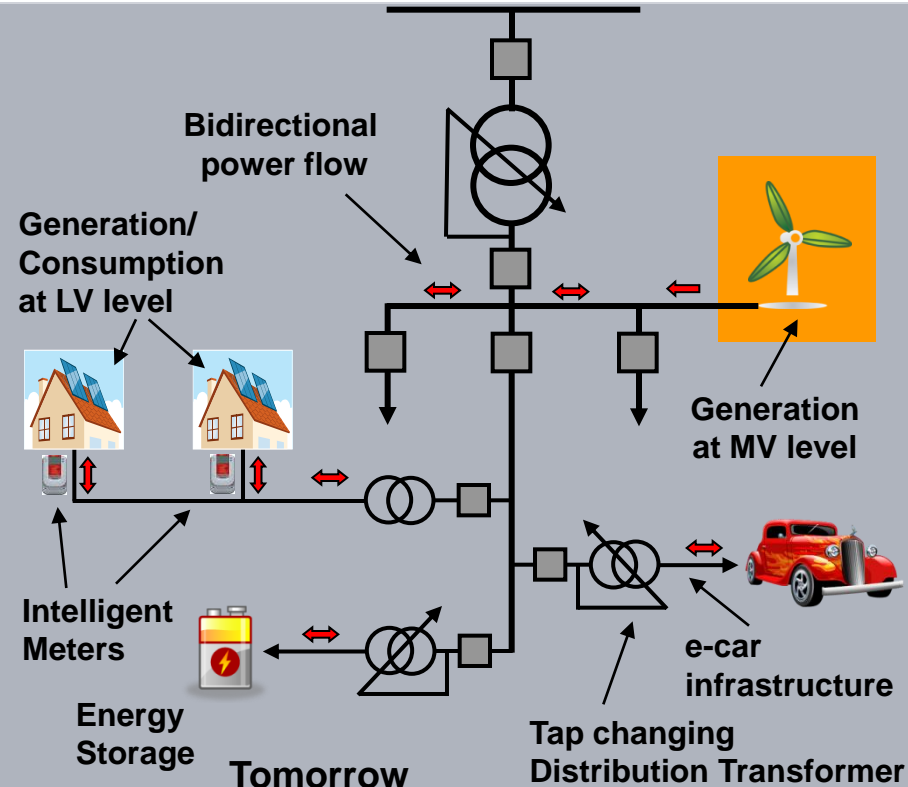


# Distribution Networks & Distributed Energy Resources



Today

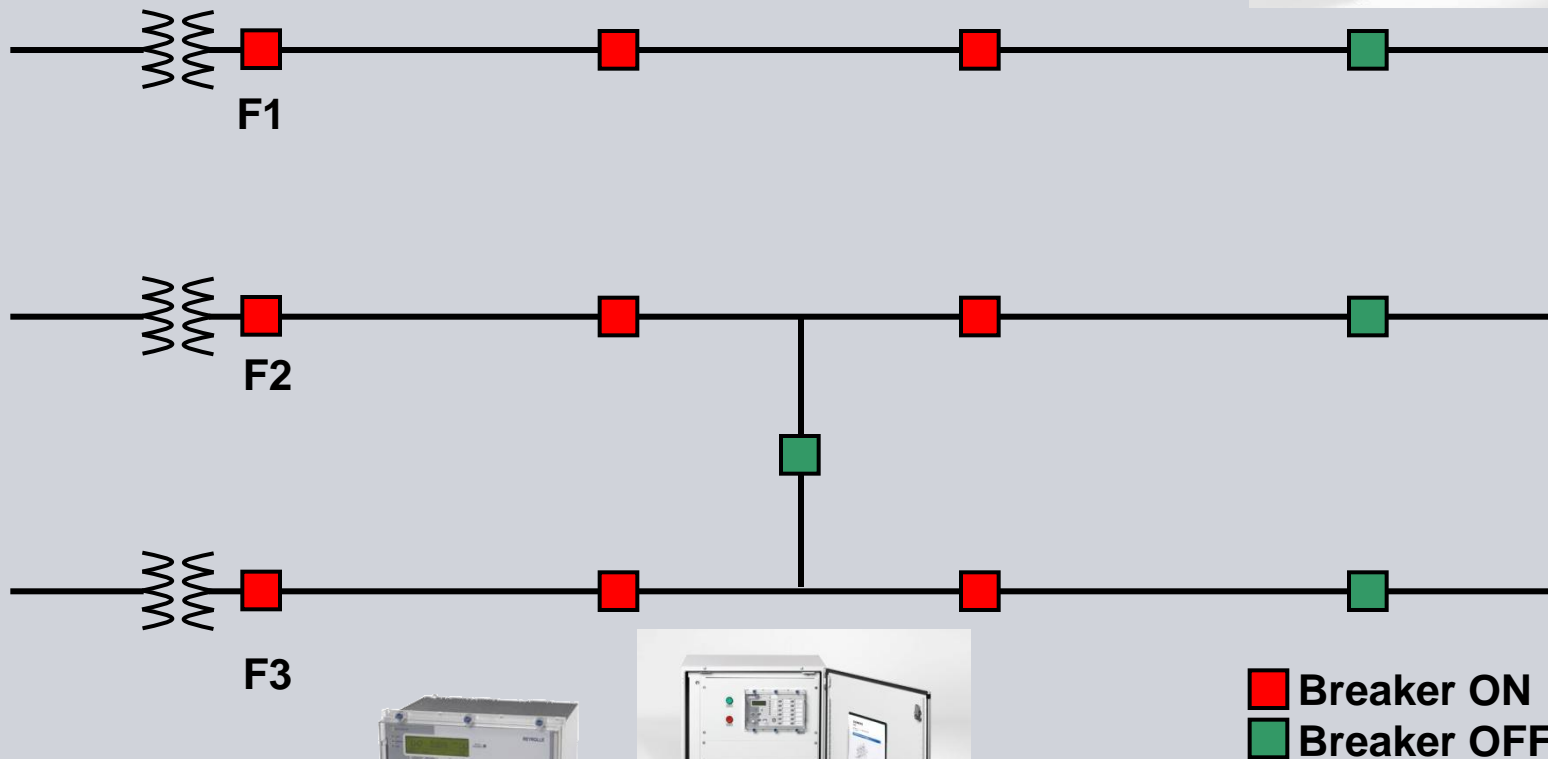
- ☐ Passive radial system & no generation
- ☐ Unidirectional static power flow
- ☐ Open loop operation
- ☐ Simple non directional Protection
- ☐ Simple or no automation
- ☐ Simple or no communication



Tomorrow

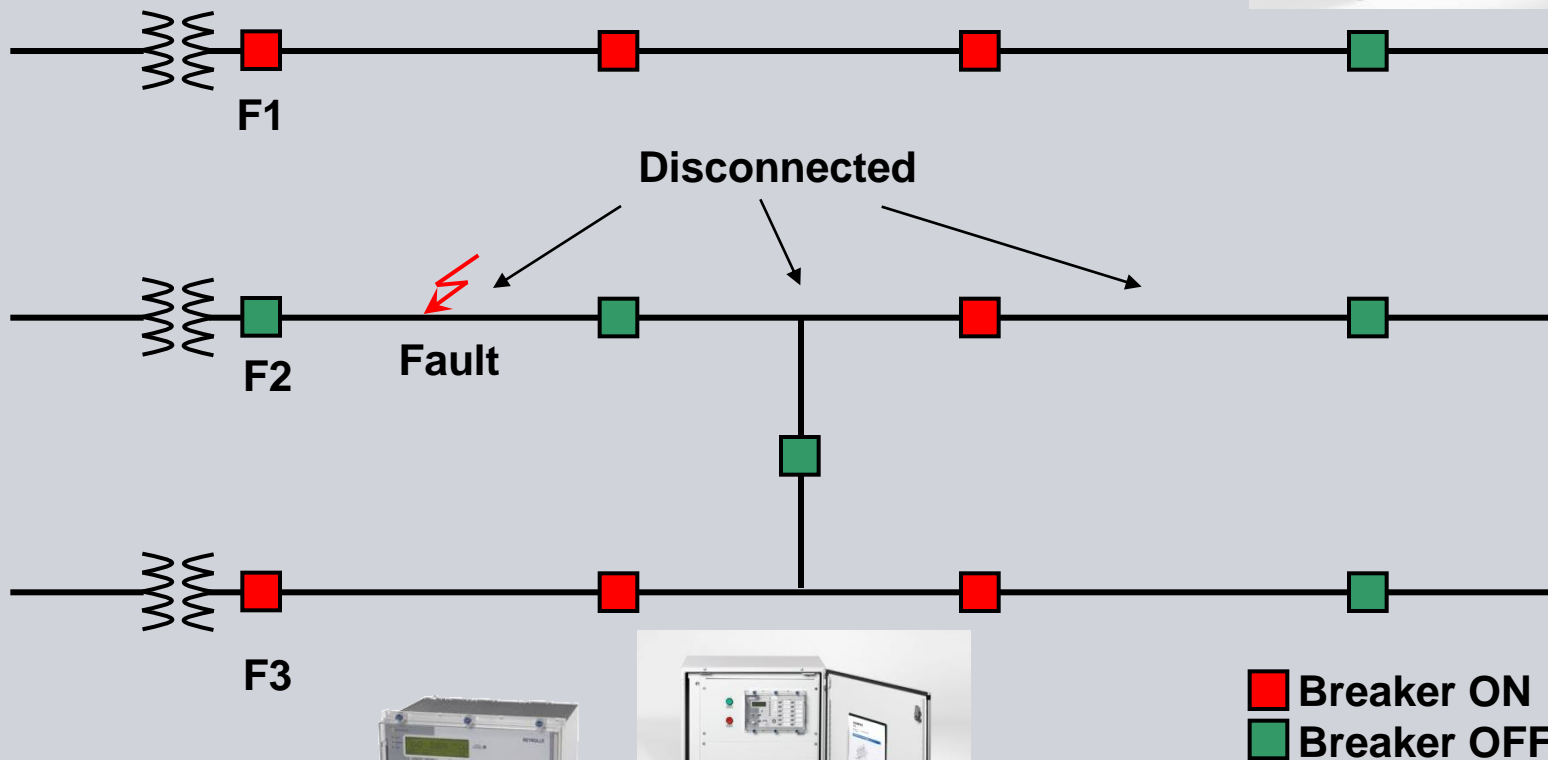
- ☐ Active system with integrated DERs
- ☐ Bidirectional dynamic power flow
- ☐ Closed loop operation
- ☐ Adaptive directional Protection
- ☐ High degree of automation
- ☐ Bidirectional communication

## Distribution Automation – Normal Operation



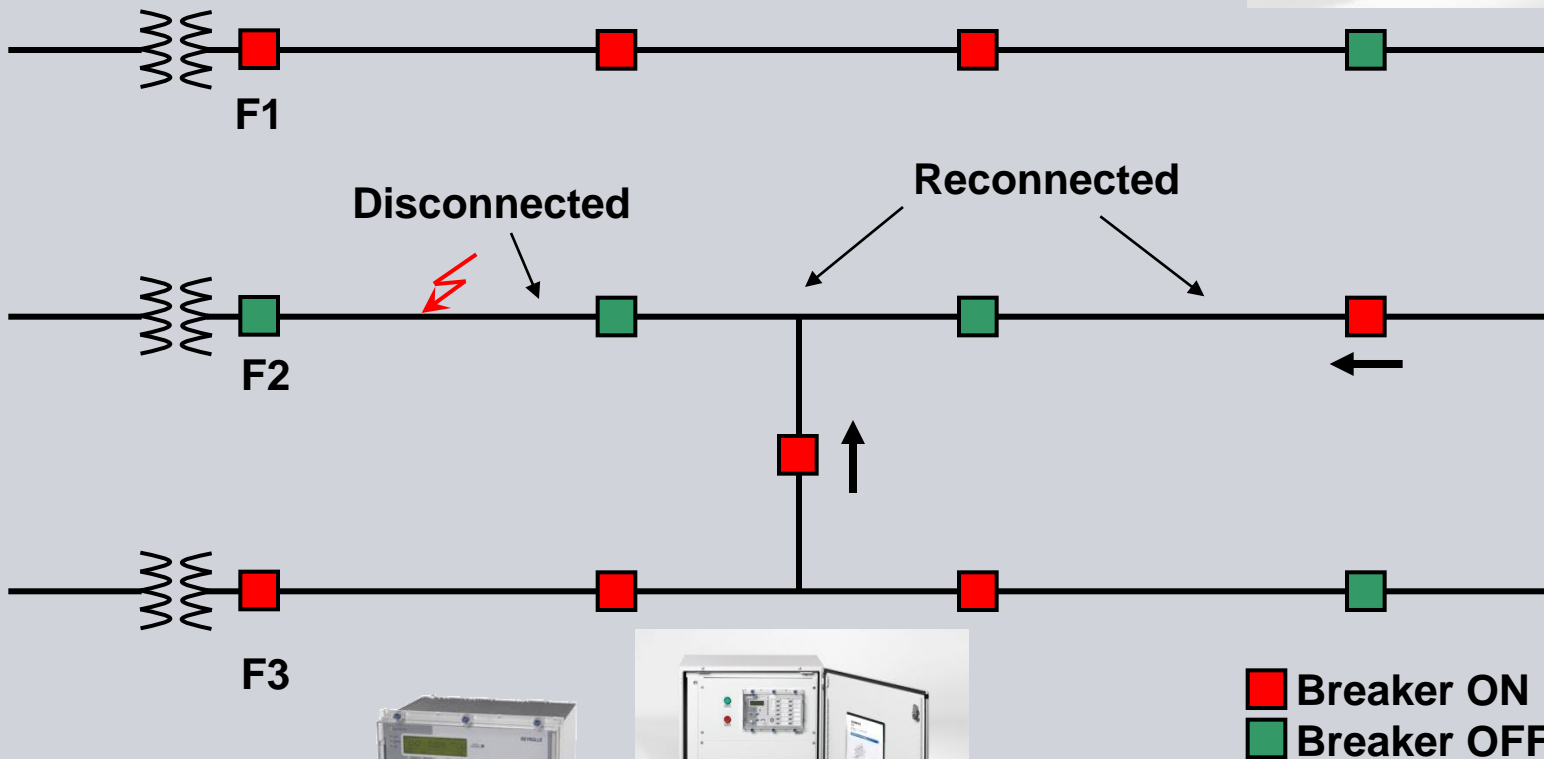


## Distribution Automation – Trip after a fault



# Distribution Automation System Restoration

SIEMENS



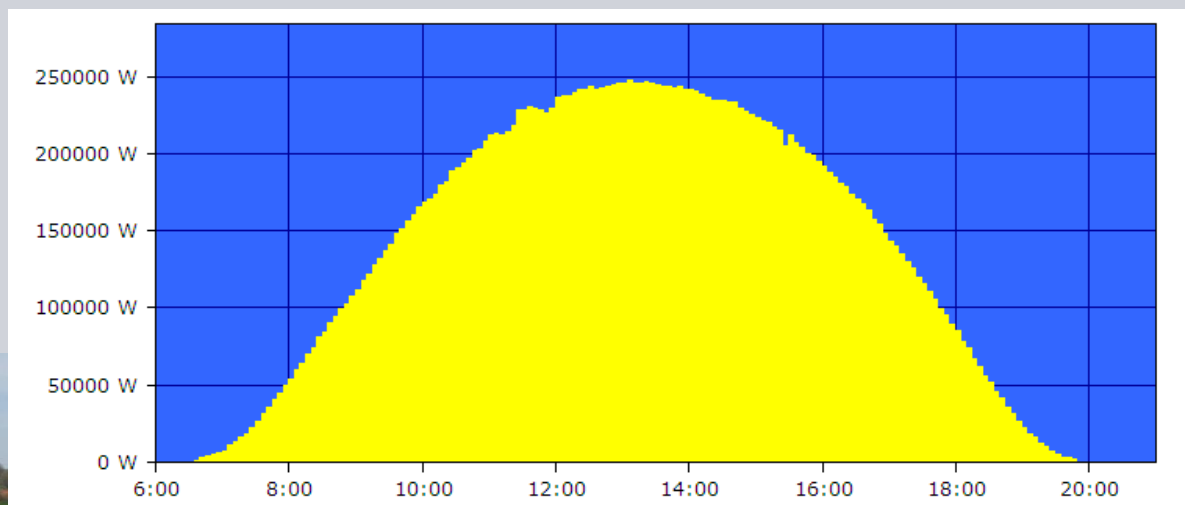
Any distribution feeder configuration changes, which must be pre-calculated and tested !

new feeder protection and Recloser controller

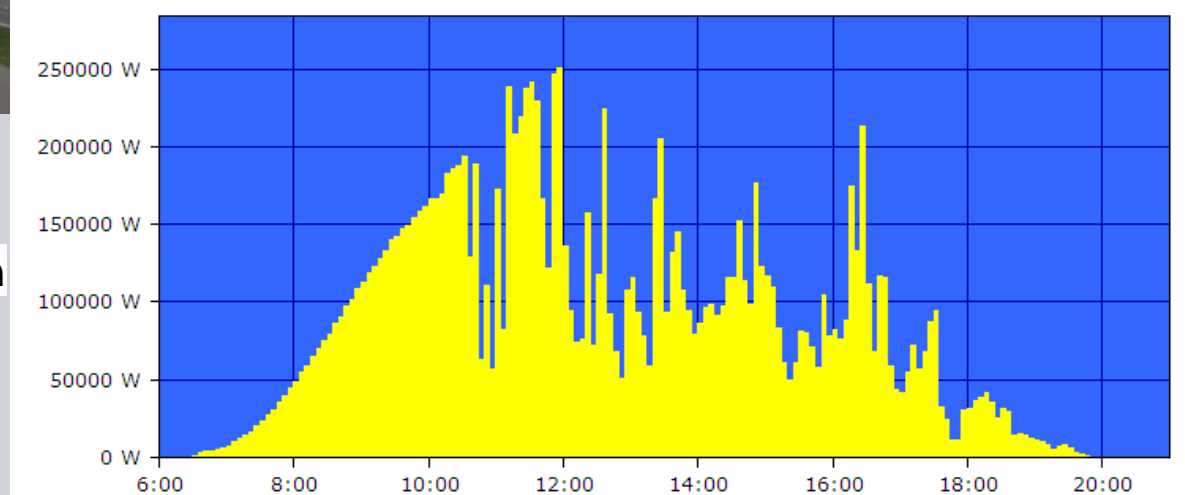
# Electricity production of a 314 kWp PV-installation near Erlangen, Germany

**SIEMENS**

**Sunny day in April: 1,9 MWh**



**Cloudy day in April: 1,2 MWh**





# The use of electrical energy will increase due to its high efficiency

## Example: E-car

In an E-car the electrical energy from batteries will be converted in kinetic energy with an efficiency of 95%.



## Example: All Electric Oil & Gas

### Traditional concepts:

Gas turbines with direct drive from compressors and pumps

**Efficiency:**  
**20-25%**

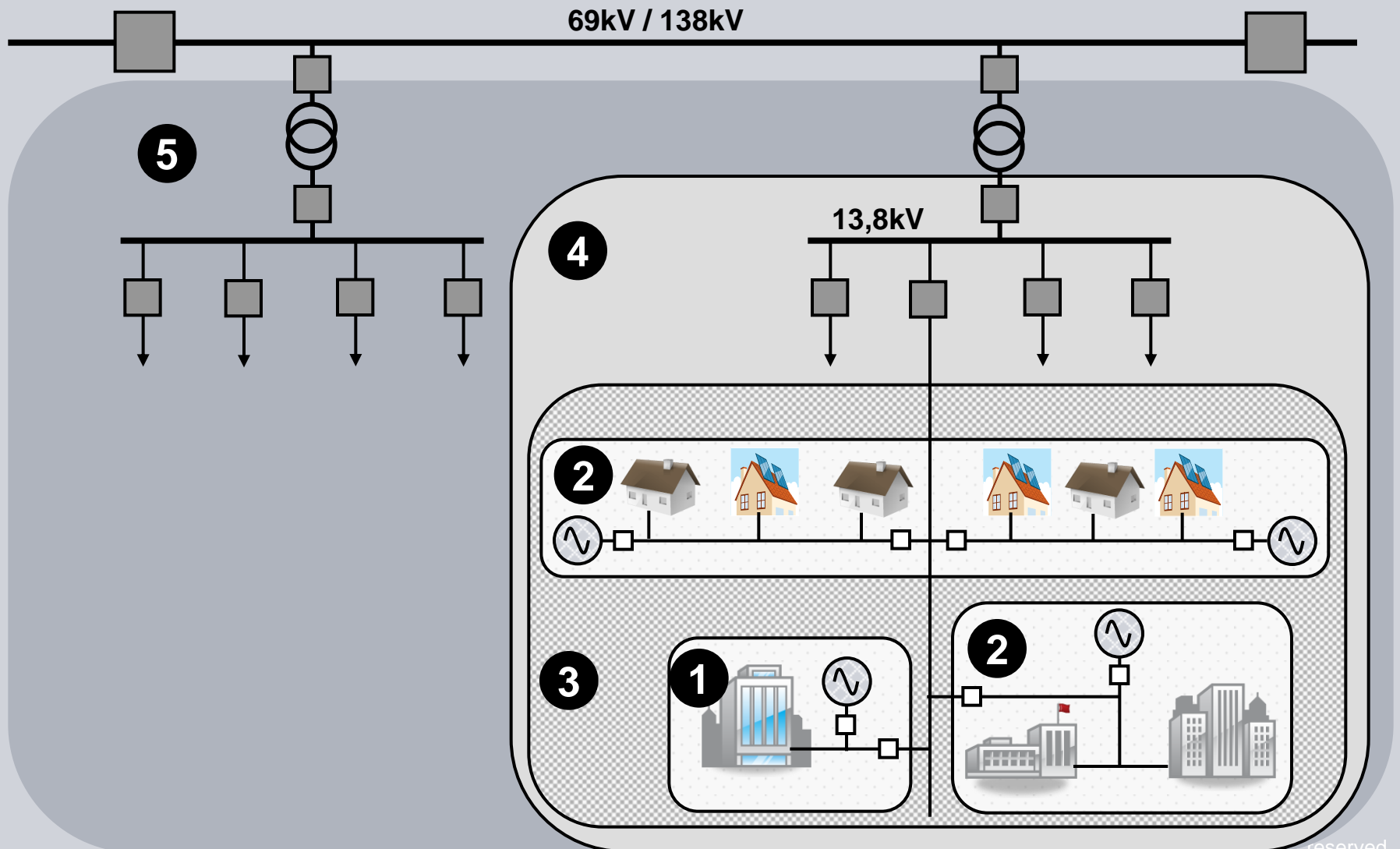
### All-Electric solutions:

Central power generation and all drives are electrical

**Efficiency:**  
**34-50%**



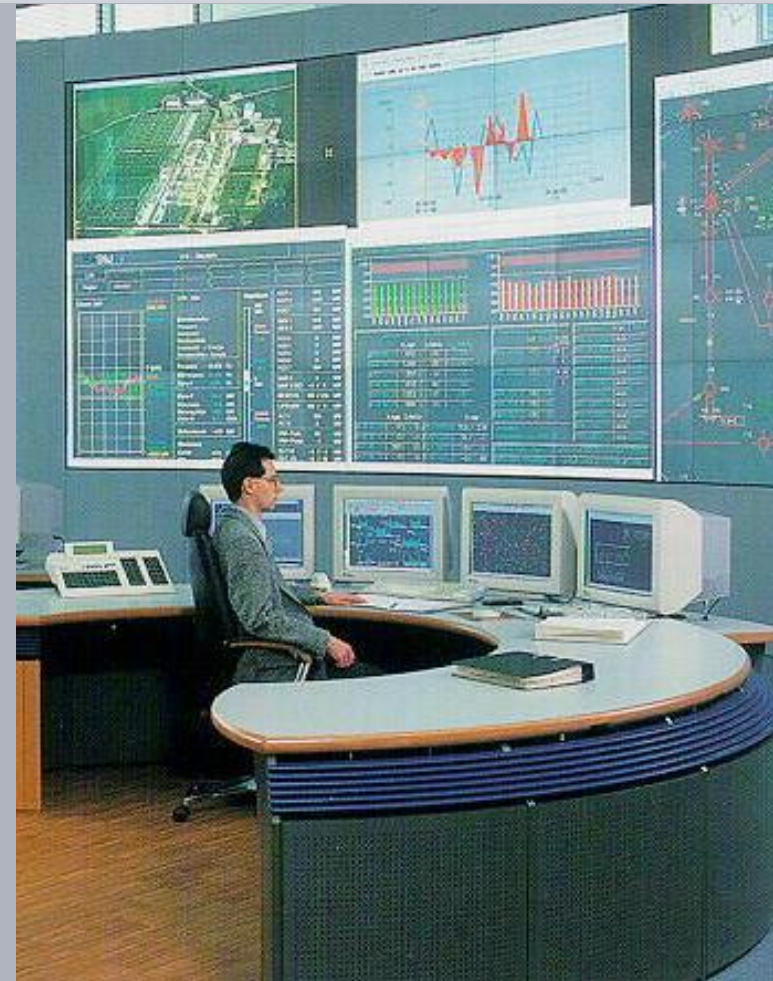
# Micro Grid Topologies



## Distribution Management System

### Efficient networks

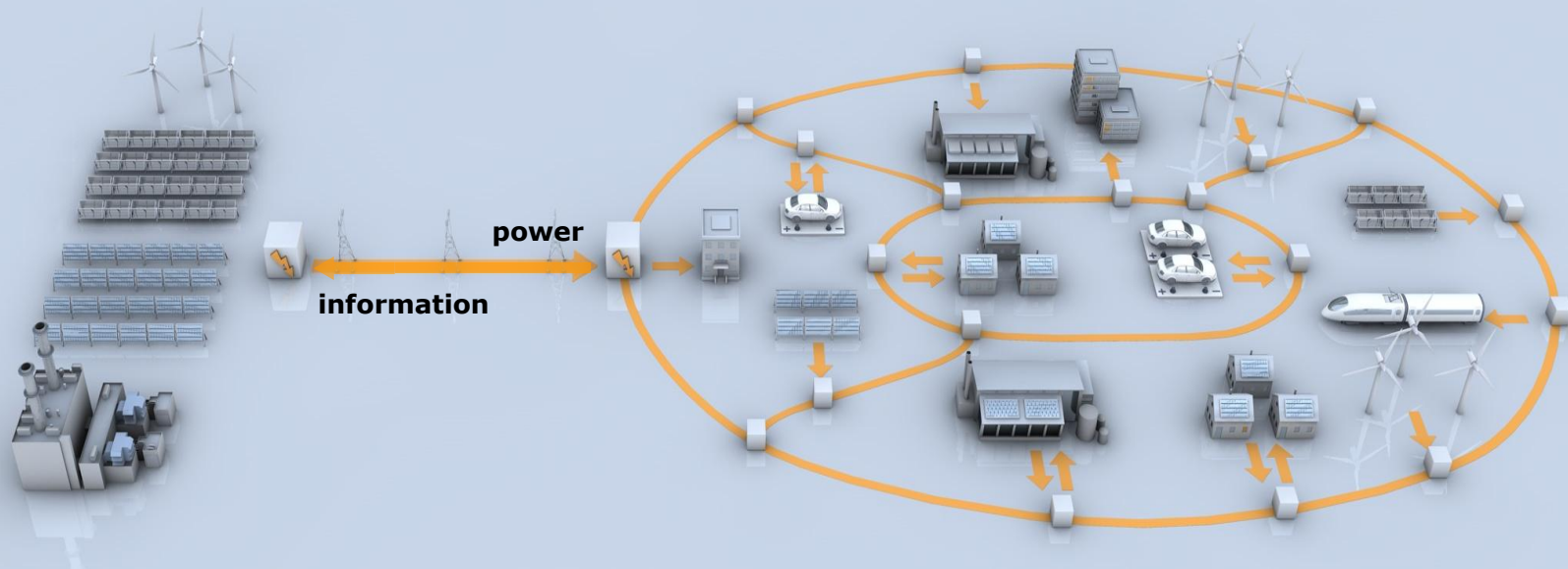
- Power electronics
- Smart substation automation and protection
- Communication solutions
- Asset monitoring





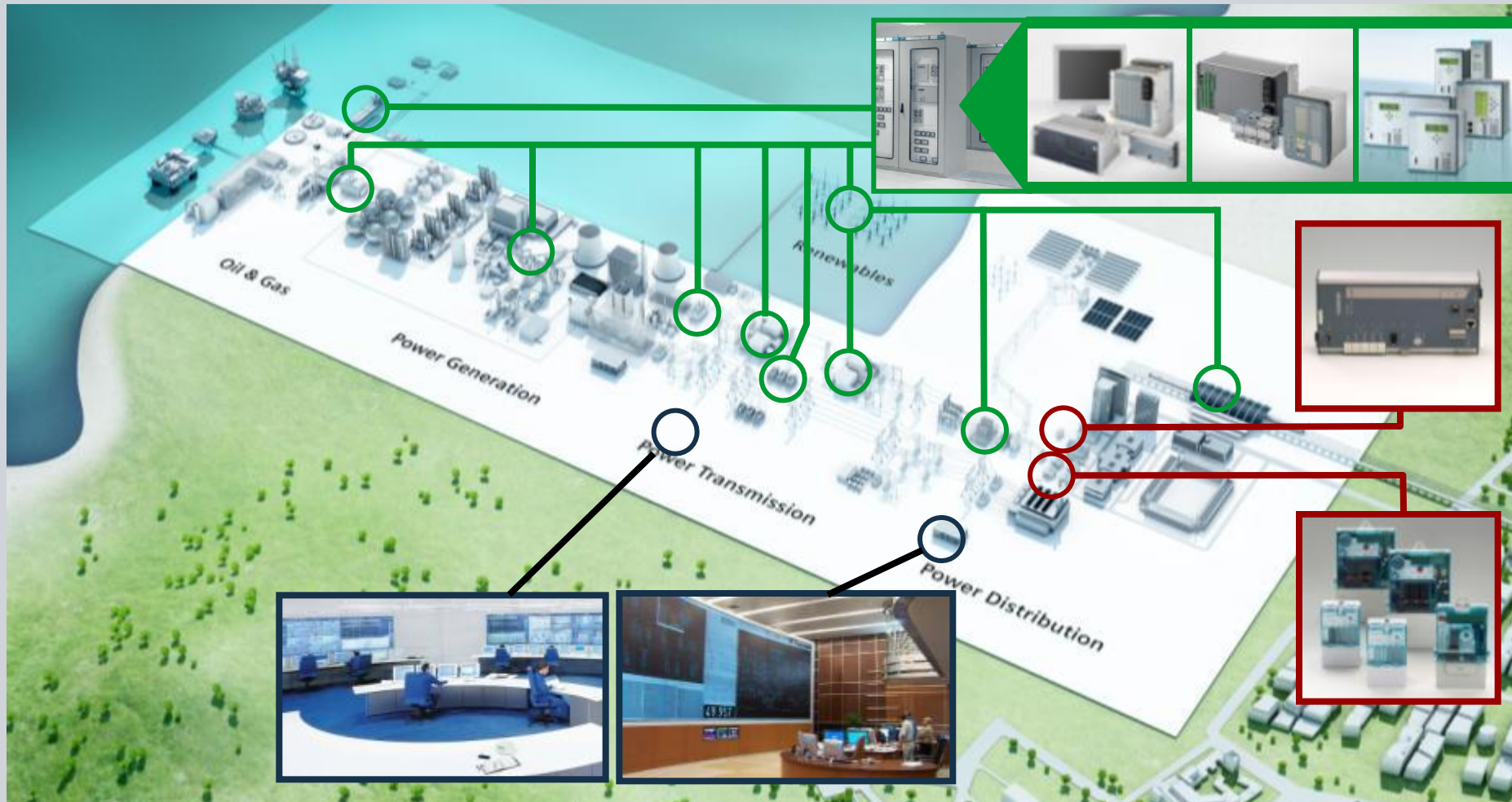
# The new world of Smart Grid: Decentralized and intelligent generation and consumption of Electricity!

**SIEMENS**



# Cadeia completa de valor da geração eficiente ao consumo inteligente de energia

**SIEMENS**





**How smart is your grid?**

**Thank you!**

Smart Grid Applications  
Davi Bisinotto Gomes  
[davi.bisinotto@siemens.com](mailto:davi.bisinotto@siemens.com)

[www.siemens.com/smartgrid](http://www.siemens.com/smartgrid)