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REGULATION

# Electricity Distribution Issues

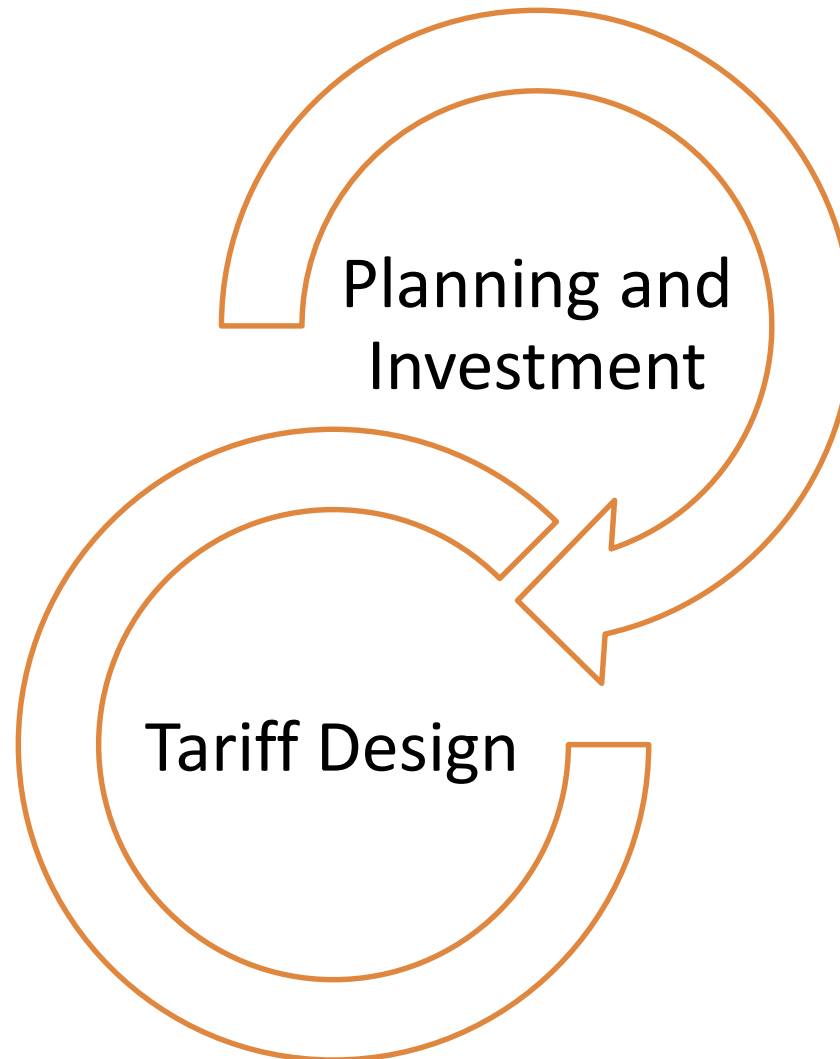
**Dr Pradyumna Bhagwat**

FSR Energy Regulation Training

ANRE, Rabat, Morocco

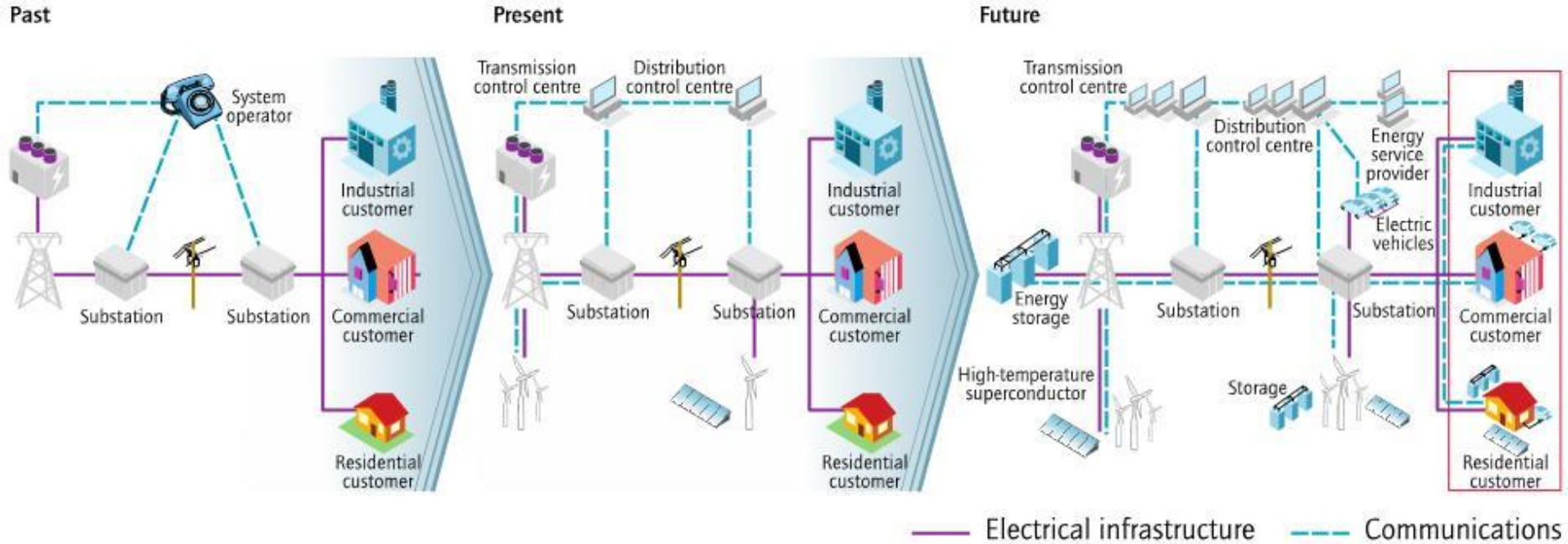
November 1<sup>st</sup>, 2017

# Presentation Overview





# Evolution of distribution networks



**“Passive” Consumer**  
Price inelastic, grid dependent



**“Active” Consumers**  
Prosumer → Prosumage

# Future challenges for distribution networks

- New uses of distribution networks
- Uncertainty about evolution of network
- Heightened CAPEX - OPEX trade-off
- Cybersecurity issues

## **Planning Perspective**

Shift from “fit and forget”  
to “active system  
management”

## **Investment Perspective**

Ensuring efficient  
investment signal in the  
future

# Changing the approach towards planning

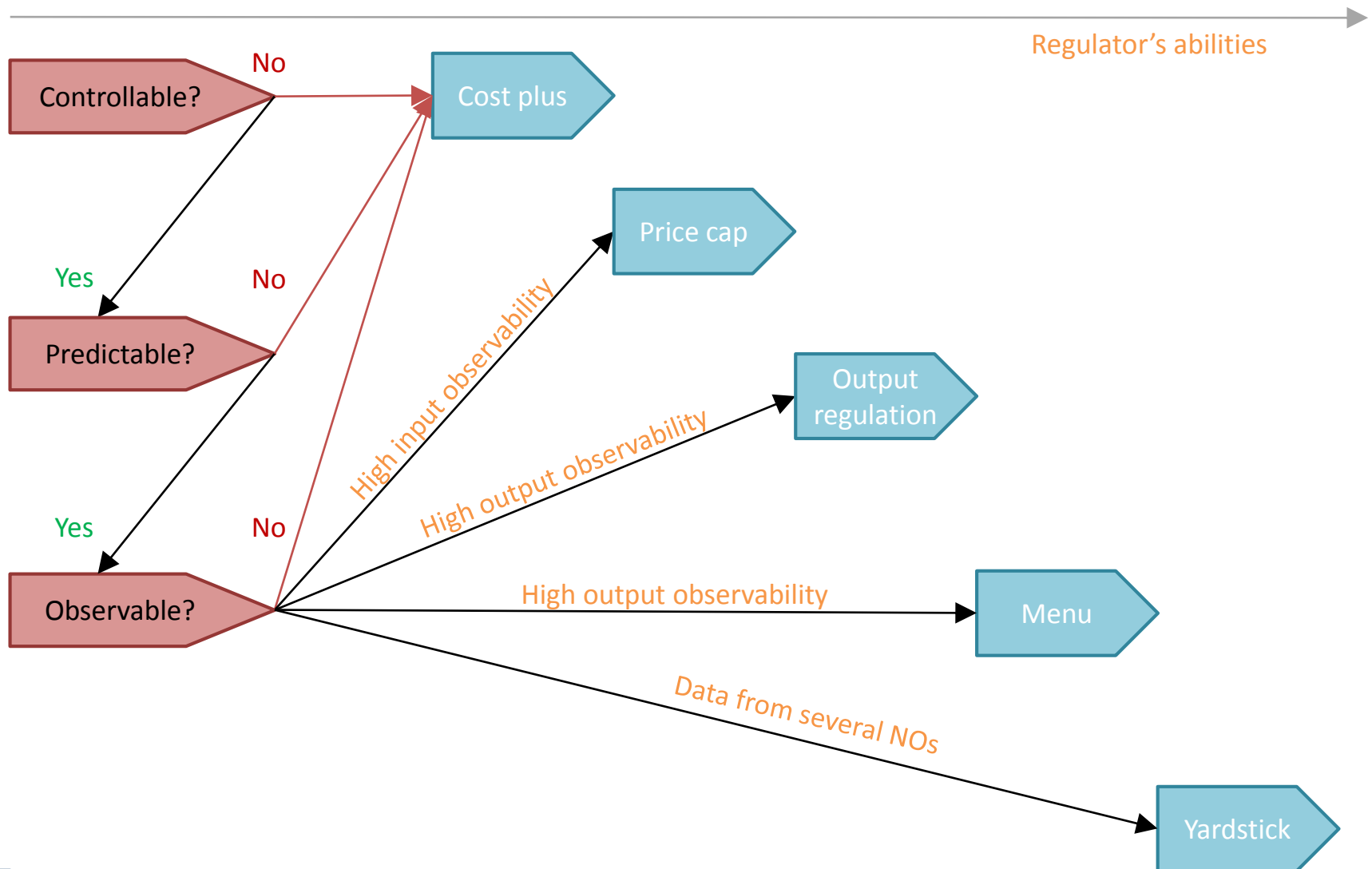
## Fit & Forget

- Ensuring no physical constraints were violated during real-time system operation.
- Forecasting regional and local peak demands over a planning horizon
- Reinforcing the grid accordingly.

## Active System Management

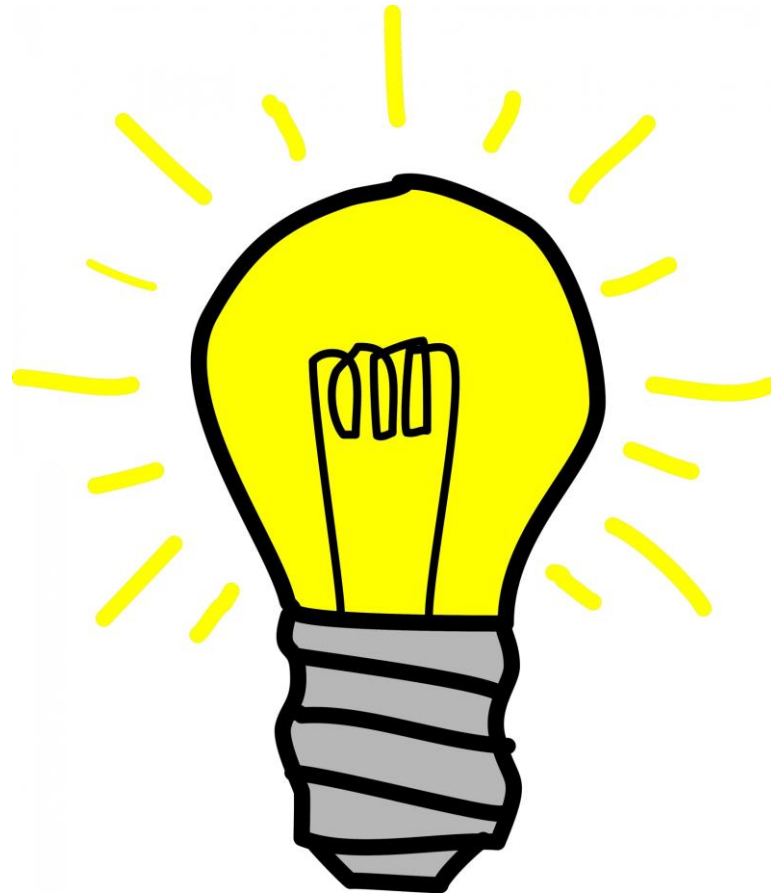
- Optimizing existing capacity
- Coupling network planning and operation
- DSO-TSO-DER Coordination in planning

# Selecting the right regulatory tools

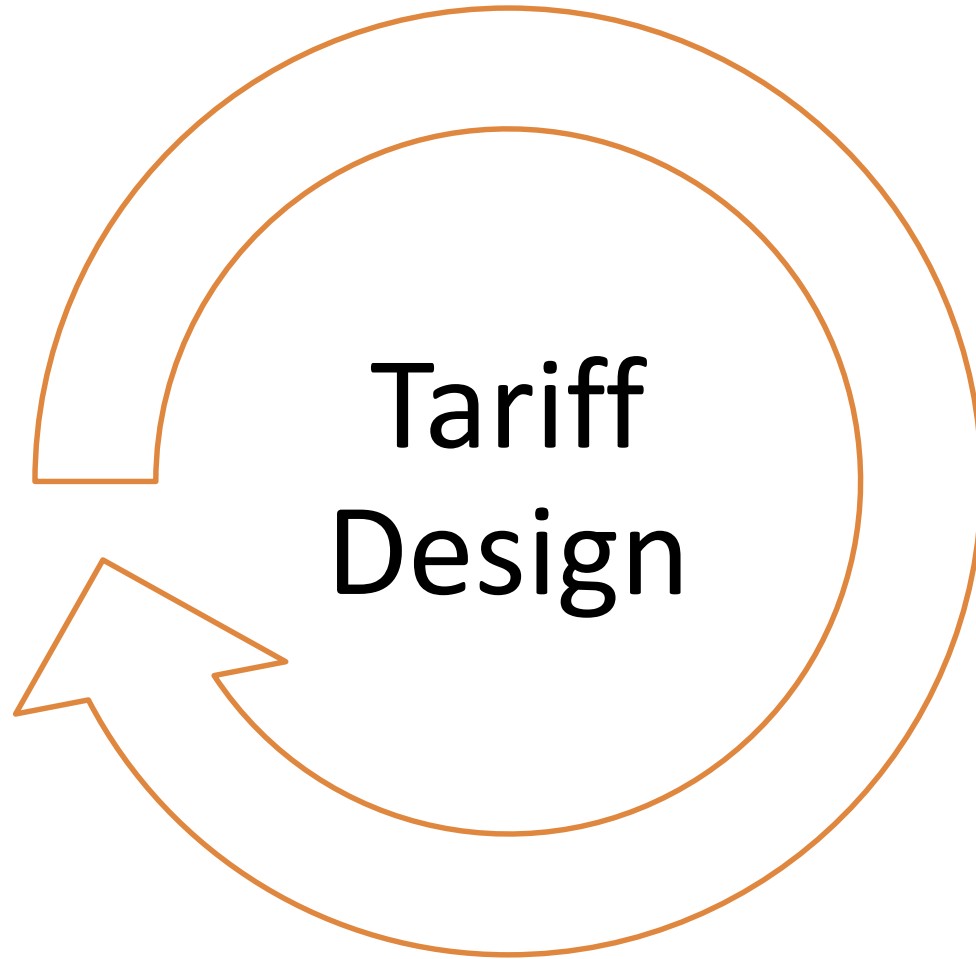


# Discussion – I

## Planning & Investment in Morocco



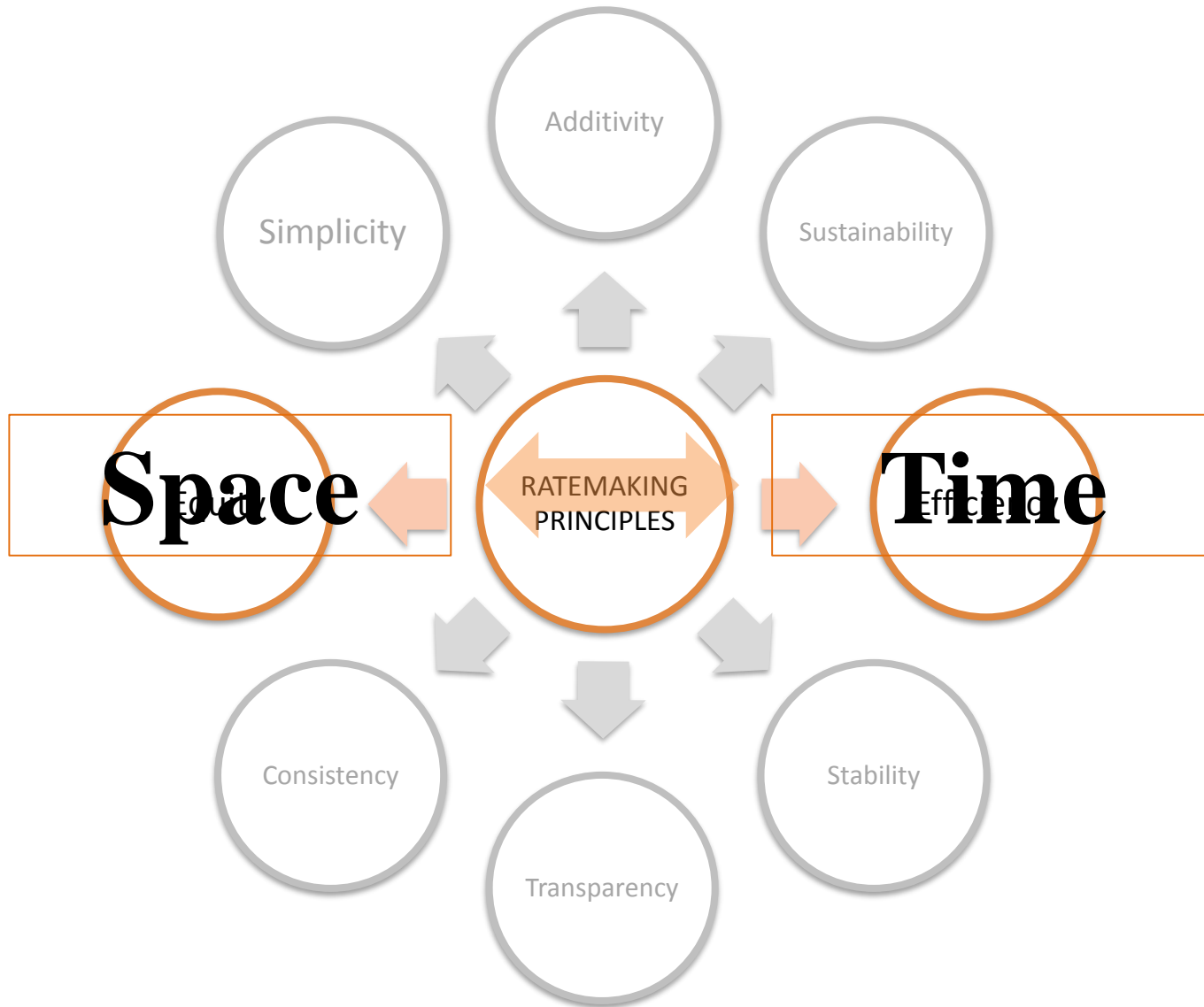




# Objectives of Tariffs

- **System costs recovery:** Raise money to remunerate the costs for regulated activities.
- **Desired consumer behavior:** Send the right economic signal to reach optimal socio-economic use of electricity.

# Regulatory Principles for tariff design



# Distribution Network Cost Recovery

One-time

Connection Charge

Periodic

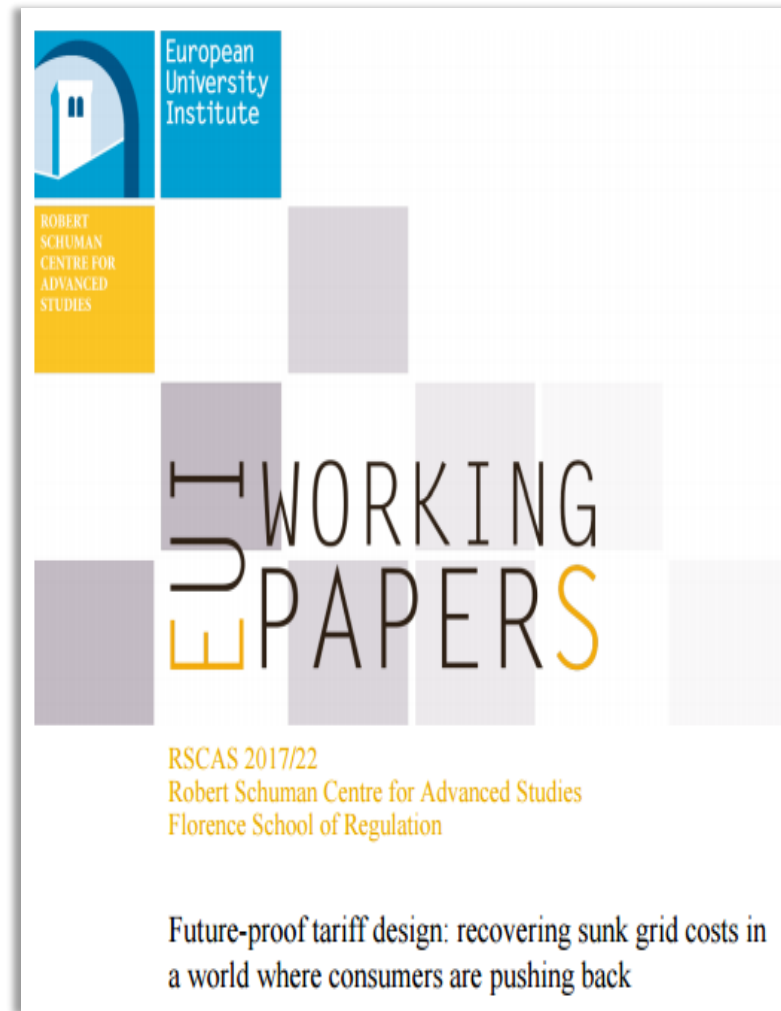
Use of System

Capacity Charge  
€/kW

Volumetric Charge  
€/kWh

Fixed Charge  
€/Customer

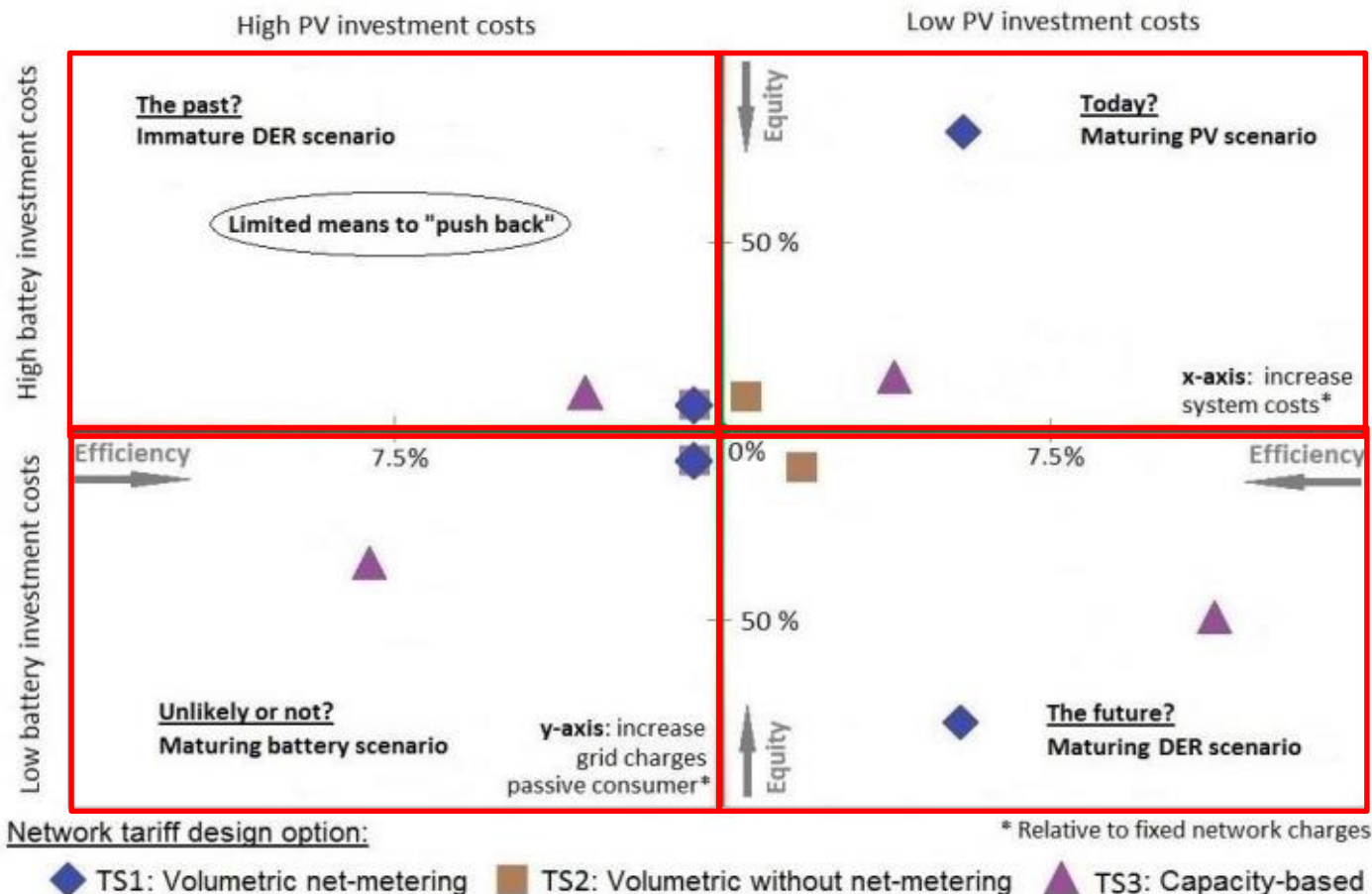
# Future-proof tariff design



Tim Schittekatte, Ilan Momber & Leonardo Meeus

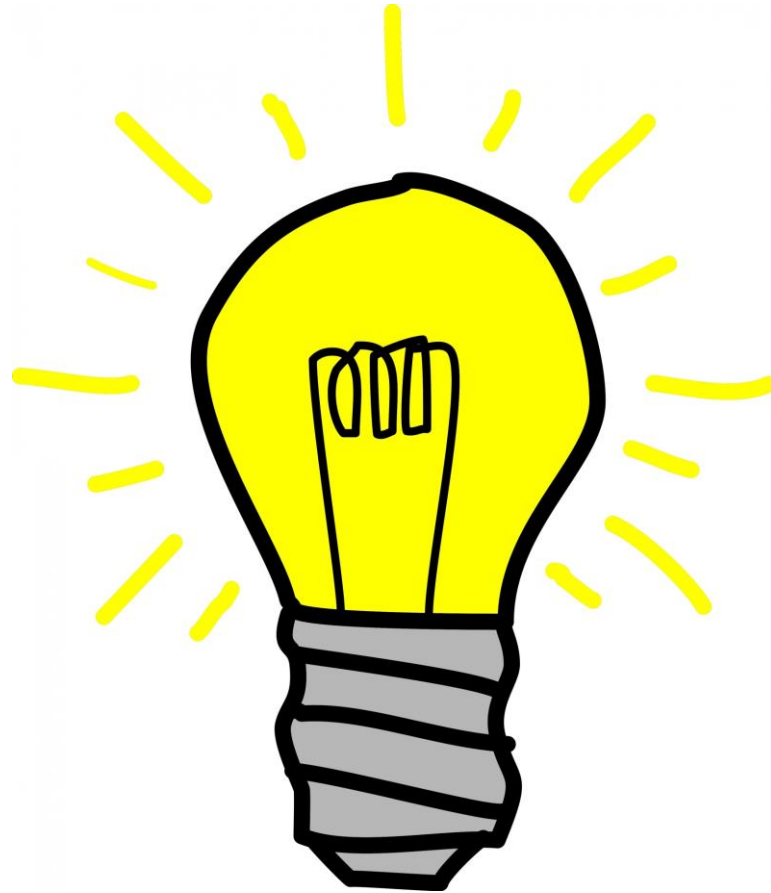
# Impact of technology states on tariff designs

**Figure 2: The results for the four states of the world with 50 % reactive consumers connected to the grid. Results for the efficiency (horizontal) and equity (vertical) proxy are shown.**



# Discussion - II

## Future of distribution tariffs in Morocco?





**Thank You!**



# Recommended Reading

- Schittekatte, Tim, Ilan Momber, and Leonardo Meeus. "Future-proof tariff design: recovering sunk grid costs in a world where consumers are pushing back." (2017).
- M. I. T. "Utility of the Future." (2016).
- Pérez-Arriaga, Ignacio J., ed. Regulation of the power sector. Springer Science & Business Media, (2014).
- Ruester, Sophia, et al. "From distribution networks to smart distribution systems: Rethinking the regulation of European electricity DSOs." *Utilities Policy* 31 (2014): 229-237.
- Glachant, Jean-Michel, et al. "Implementing incentive regulation and regulatory alignment with resource bounded regulators." *Competition and Regulation in Network Industries* 14.3 (2013): 265-290.

# Examples of new remuneration methods

## Incentivizing efficiency

- Multi-year revenue trajectory with profit sharing
- Incentive-compatible menu of contracts

## Equalizing CAPEX-OPEX incentives

- OFGEM –TOTEX Approach

## Managing uncertainty and information asymmetry

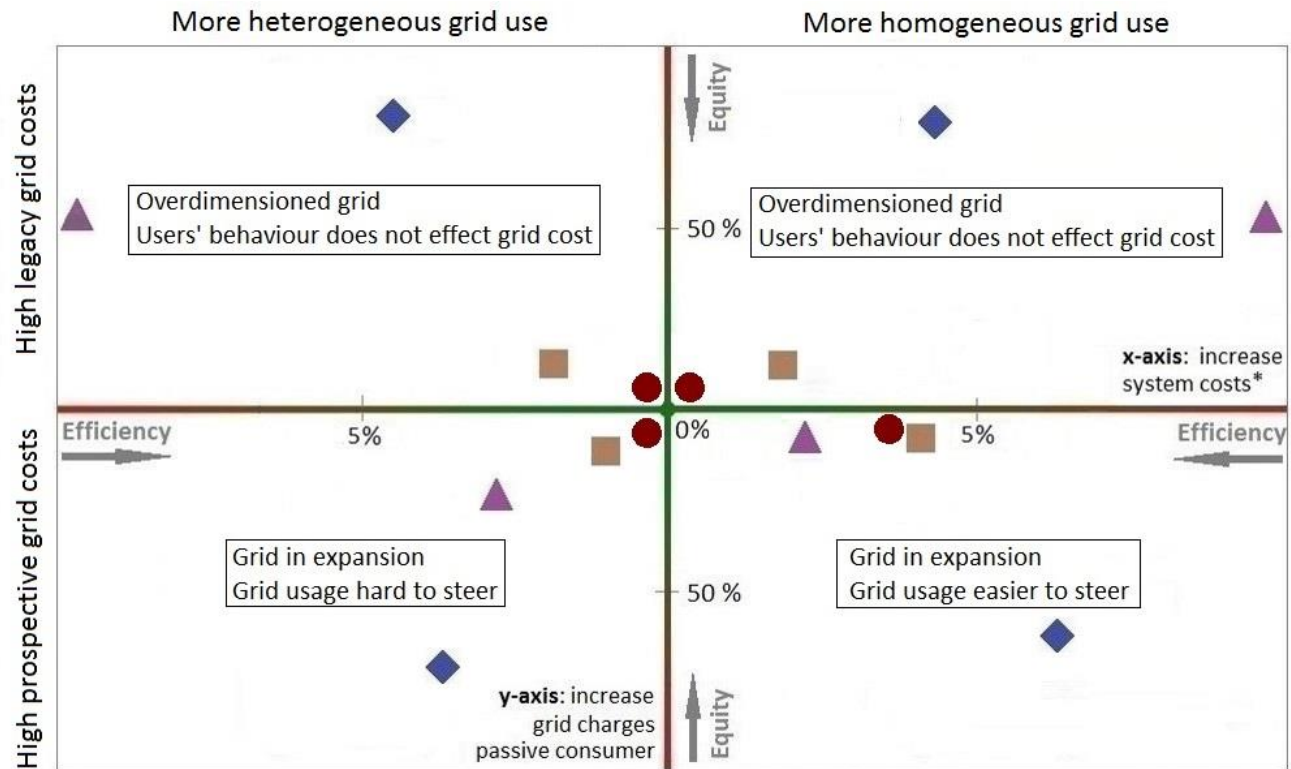
- Forward-looking benchmarks
- Distribute the risk of benchmark errors
- Automatic adjustment mechanisms to resolve forecast errors
- Progressive profit-sharing mechanisms

## Ensuring Quality of Service, Innovation, and Cybersecurity

- Outcome-based performance incentives
- Incentives for longer-term innovation



# Different tariff design perform differently in different contexts



Network tariff design option:

\*Benchmark: social optimal

●: Fixed charge    ◆: Volumetric net-metering    ■: Volumetric bi-directional    ▲: Capacity based

