

# Transactive Energy

GridWise® Architecture Council  
Foundational Session

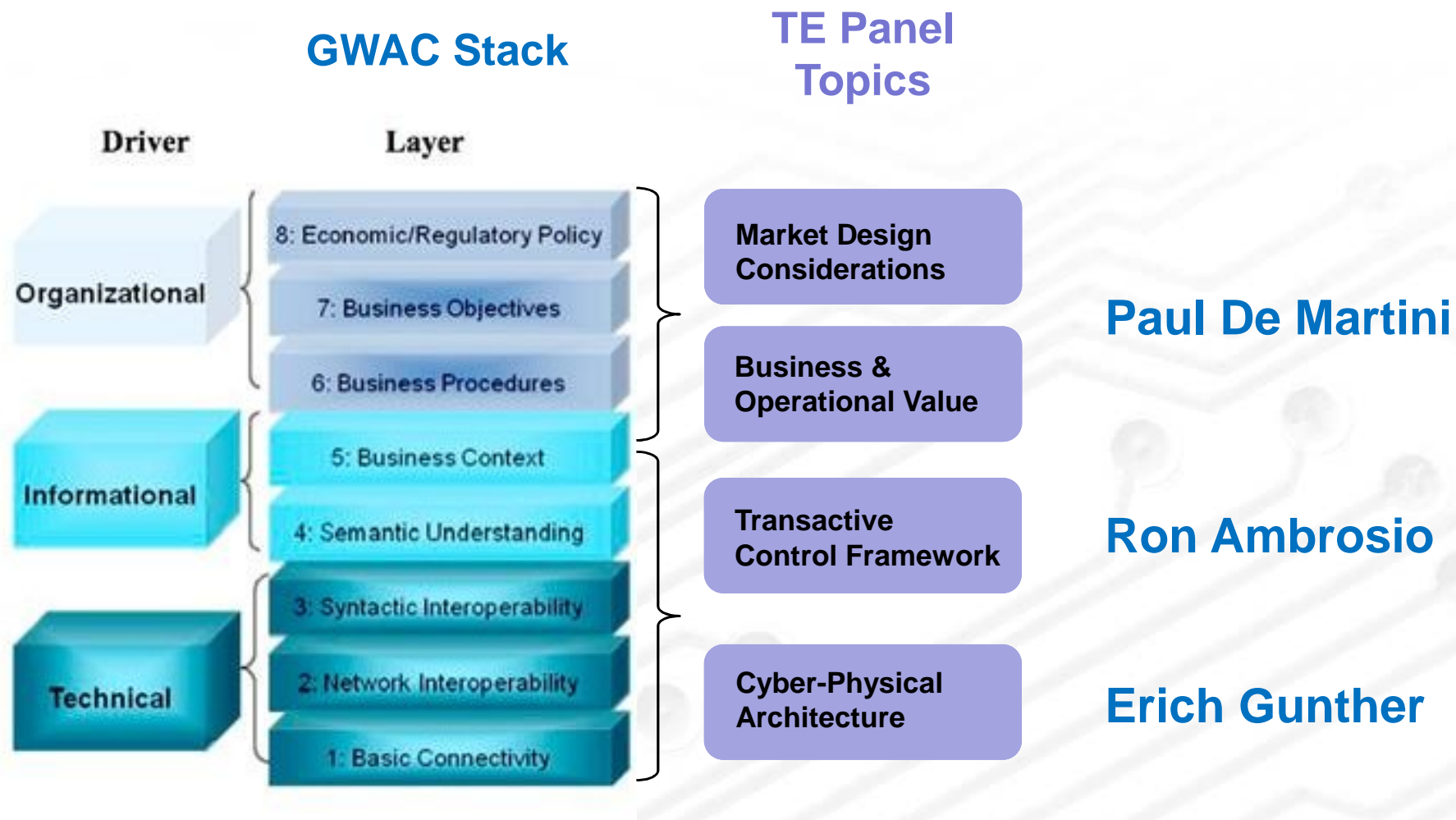
## ○ Transactive Energy (TE)

Refers to techniques for managing the generation, consumption or flow of electric power within an electric power system through the use of economic or market based constructs while considering grid reliability constraints.

The term “transactive” comes from considering that decisions are made based on a value. These decisions may be analogous to or literally economic transactions.

Transactive Energy Workshop Proceedings 2012, prepared by the GridWise® Architecture Council, March 2012, PNNL-SA-90082 (<http://www.gridwiseac.org/historical/tew2012/tew2012.aspx>)

# TE in Architectural Context



# GridWise® Architecture Council

## *2013 Meetings & Workshops*

### **GWAC Web Meeting**

January 23, 2013

10:00 AM to 12:00 PM PST

### **GWAC Meeting and Transactive Energy Workshop**

February 5-6, 2013

General Electric's Grid IQ Experience Ctr  
Atlanta, Georgia

### **GWAC Web Meeting**

March 20, 2013

10:00 AM to 12:00 PM PST

### **GWAC Web Meeting**

April 24, 2013

10:00 AM to 12:00 PM PST

### **GWAC Meeting and Transactive Energy Workshop**

May 21-22, 2013

World Trade Center  
Portland, OR

### **Transactive Energy Conference**

May 23-24, 2013

World Trade Center  
Portland, OR

### **GWAC Web Meeting**

June 26, 2013

10:00 AM to 12:00 PM PST

# Transactive Energy Value Creation

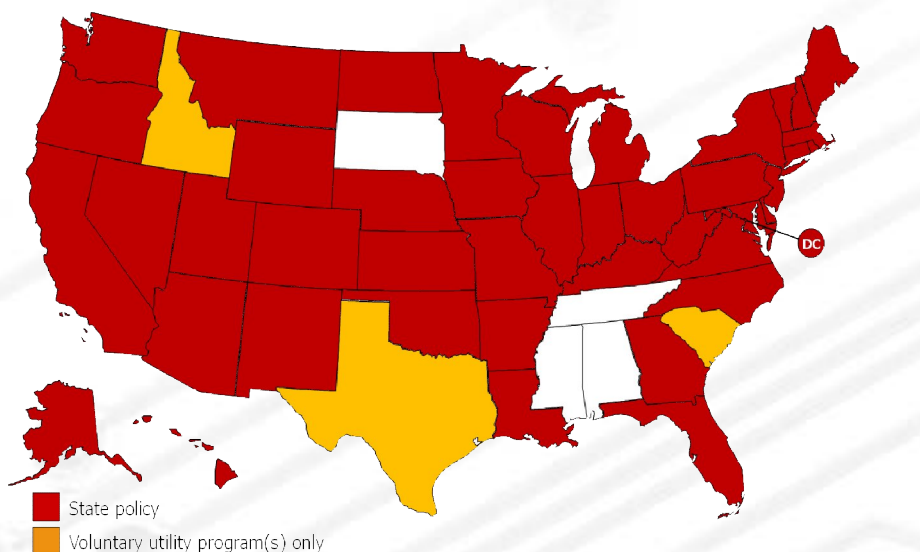
Paul De Martini

# Policy is Spurring DER Adoption

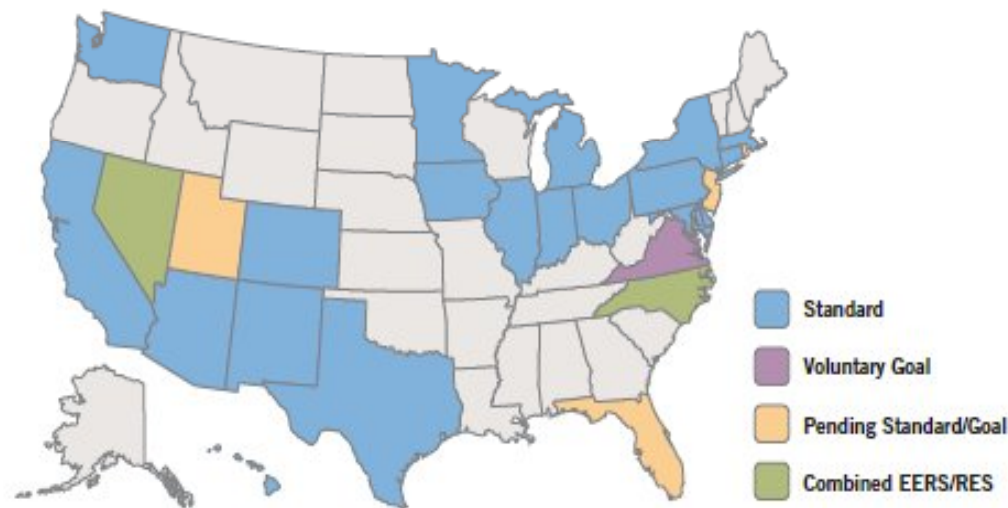
43 states with net metering tariffs + 17 states with distributed generation mandates + WH goal of 122 GWs of CHP by 2020

2012 US State Net Metering Policy

2010 US State EE Policy



Source: DoE EERE

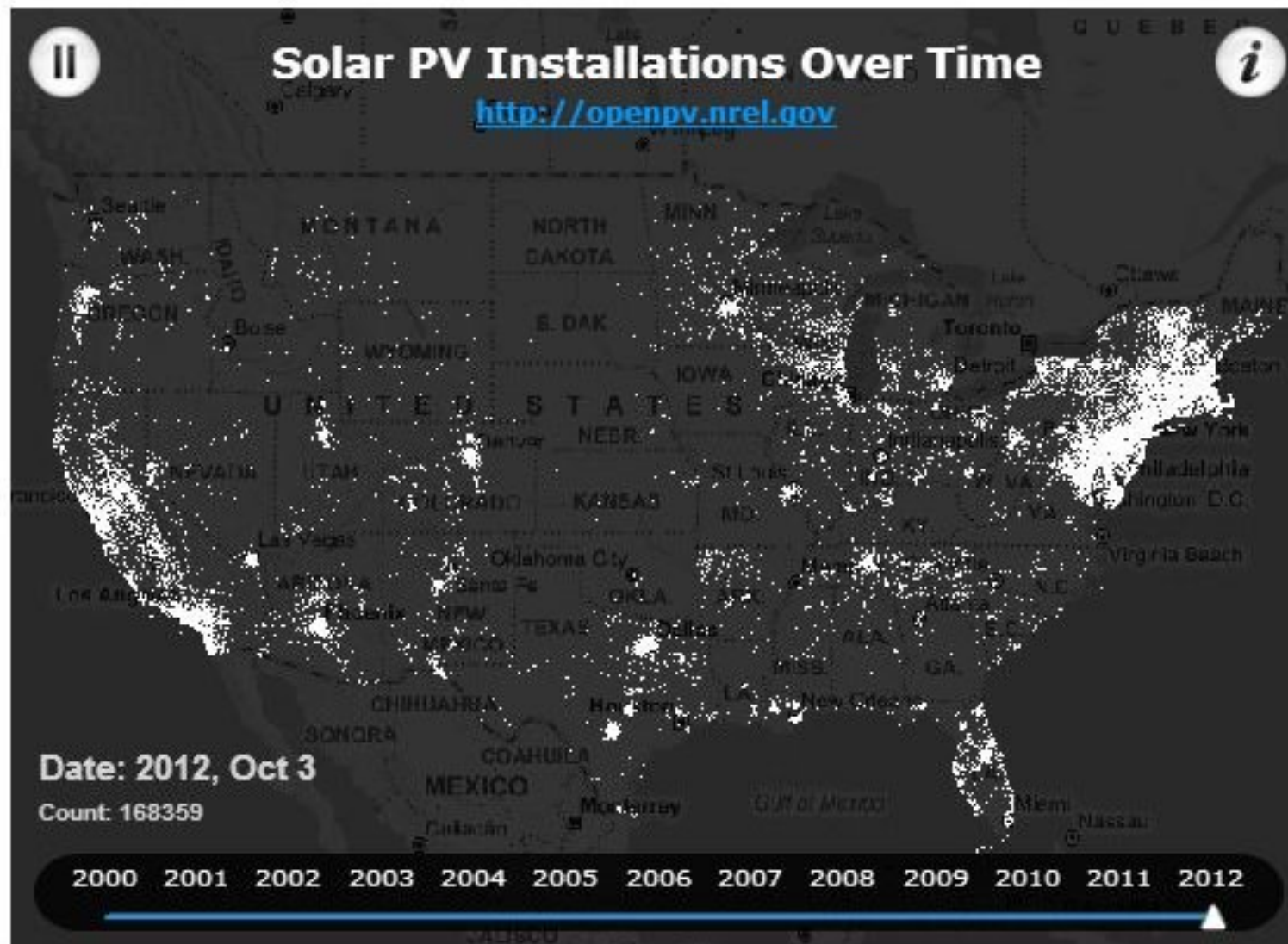


Source: ACEEE

80% of US population under the equivalent of EU's 20/20/20 Plan

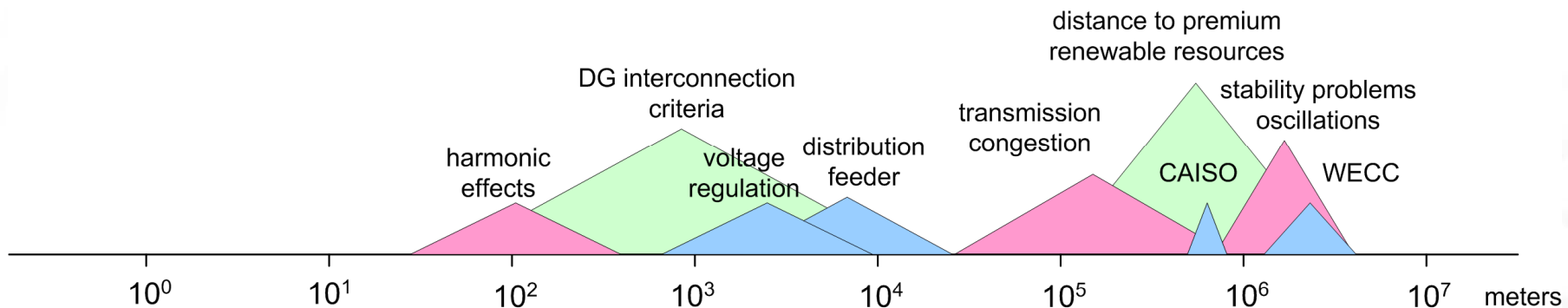
# Solar PV & CHP may reach 322GWs in 2020

Reaching an average of 3MWs per circuit in concentrated areas

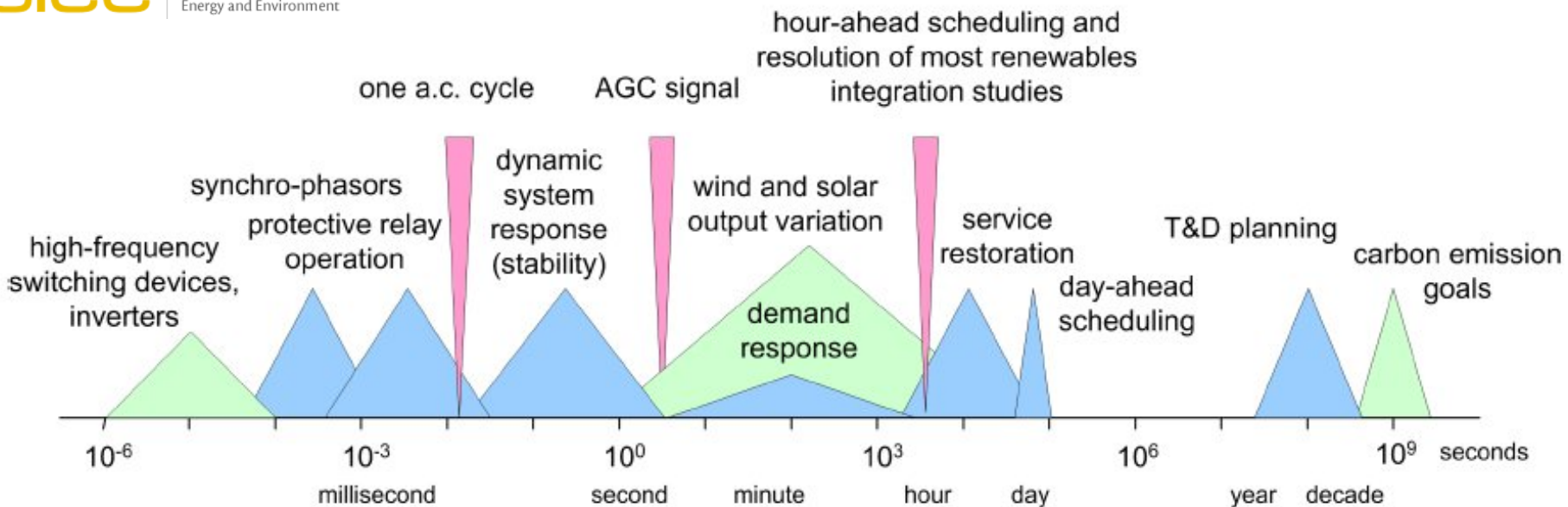


# Spatial & Temporal Changes

Operational systems are challenged by increased span of control and decreasing timing of information and decision and control responses



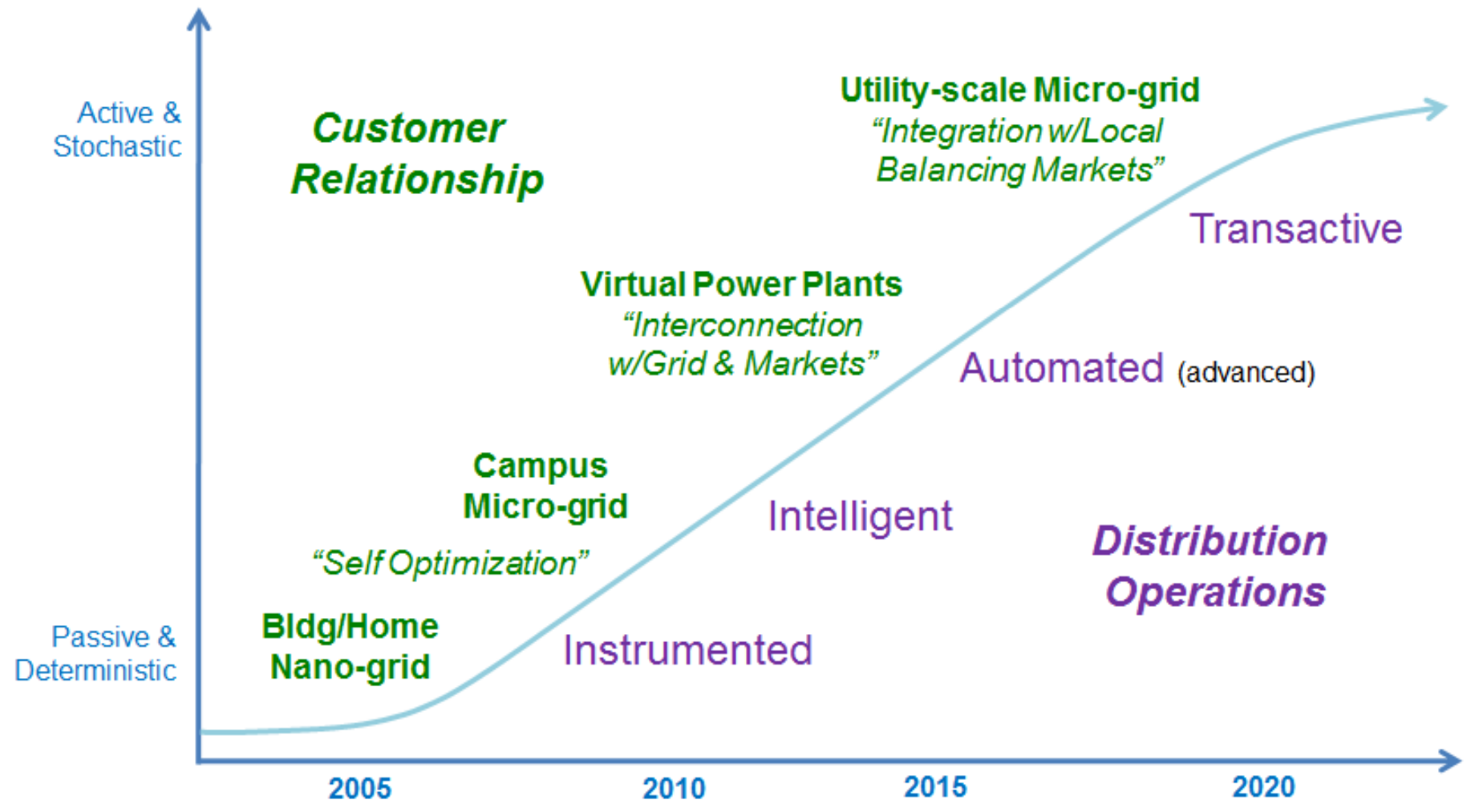
**ciee** California Institute for Energy and Environment





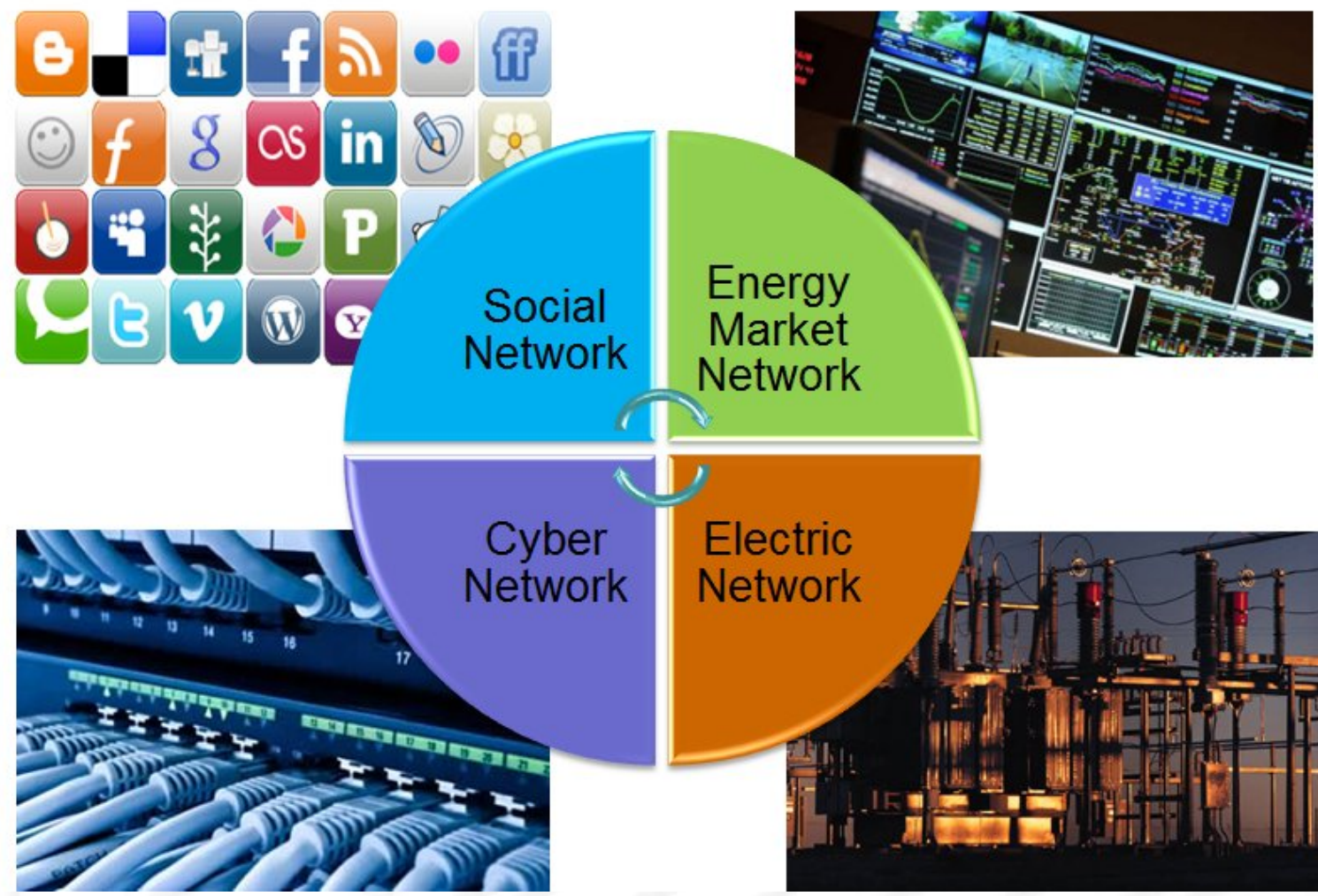
# Customer-Grid Evolution

Customer DER driven by resilience, economics & environmental objectives



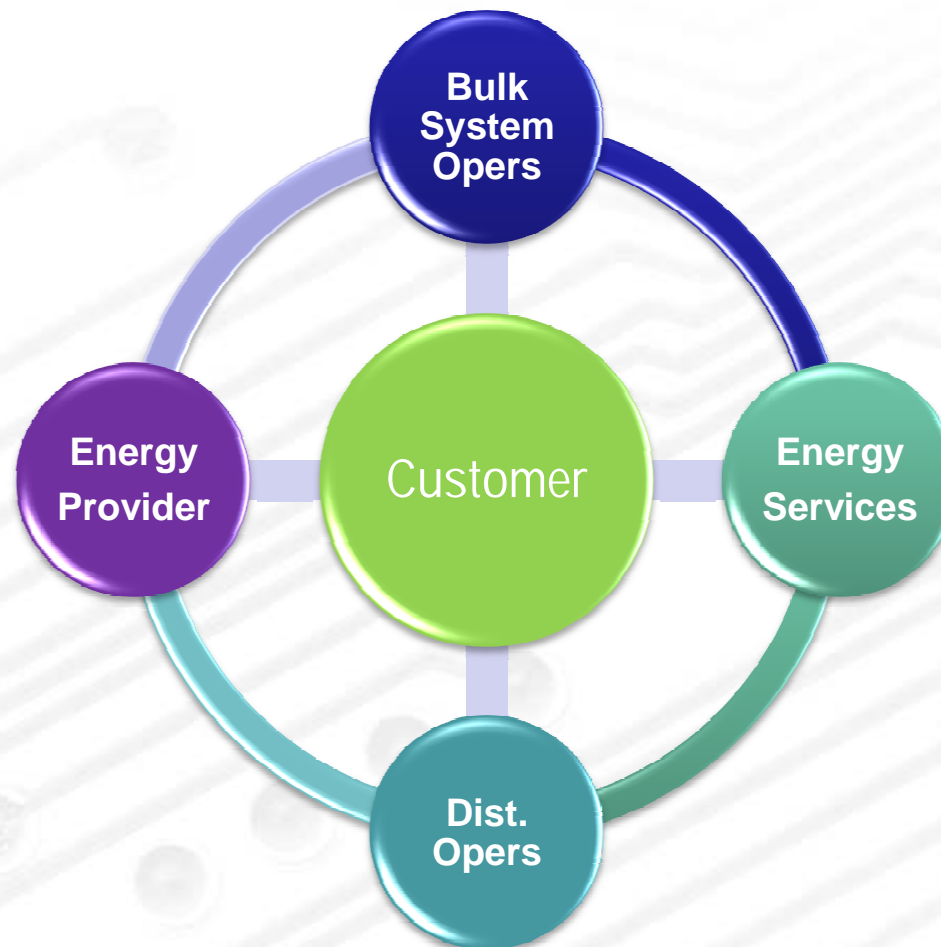
# Transactive Energy Ecosystem

*Convergence of Four Key Networks*



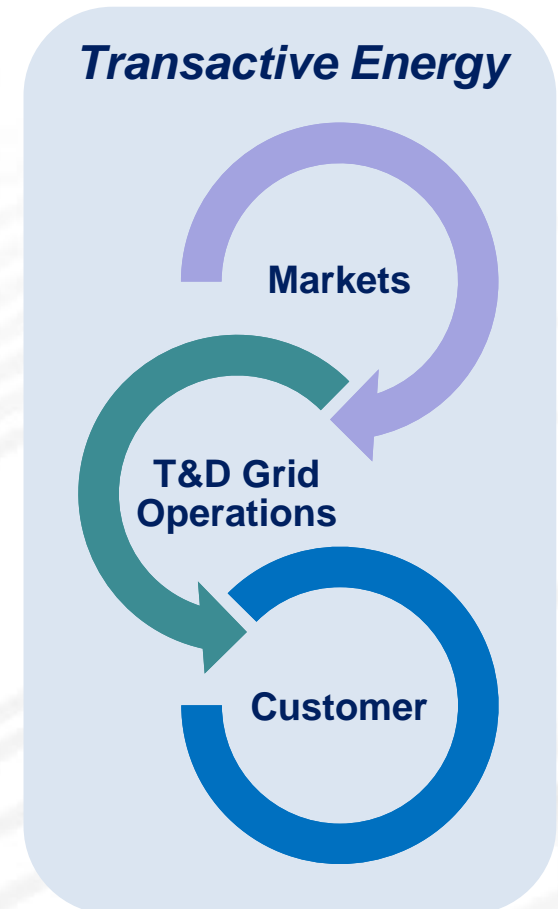
## Multiple DER Constituents

*Transactive schemes must be able to reconcile multi-party objectives & constraints related to the same distributed resource*



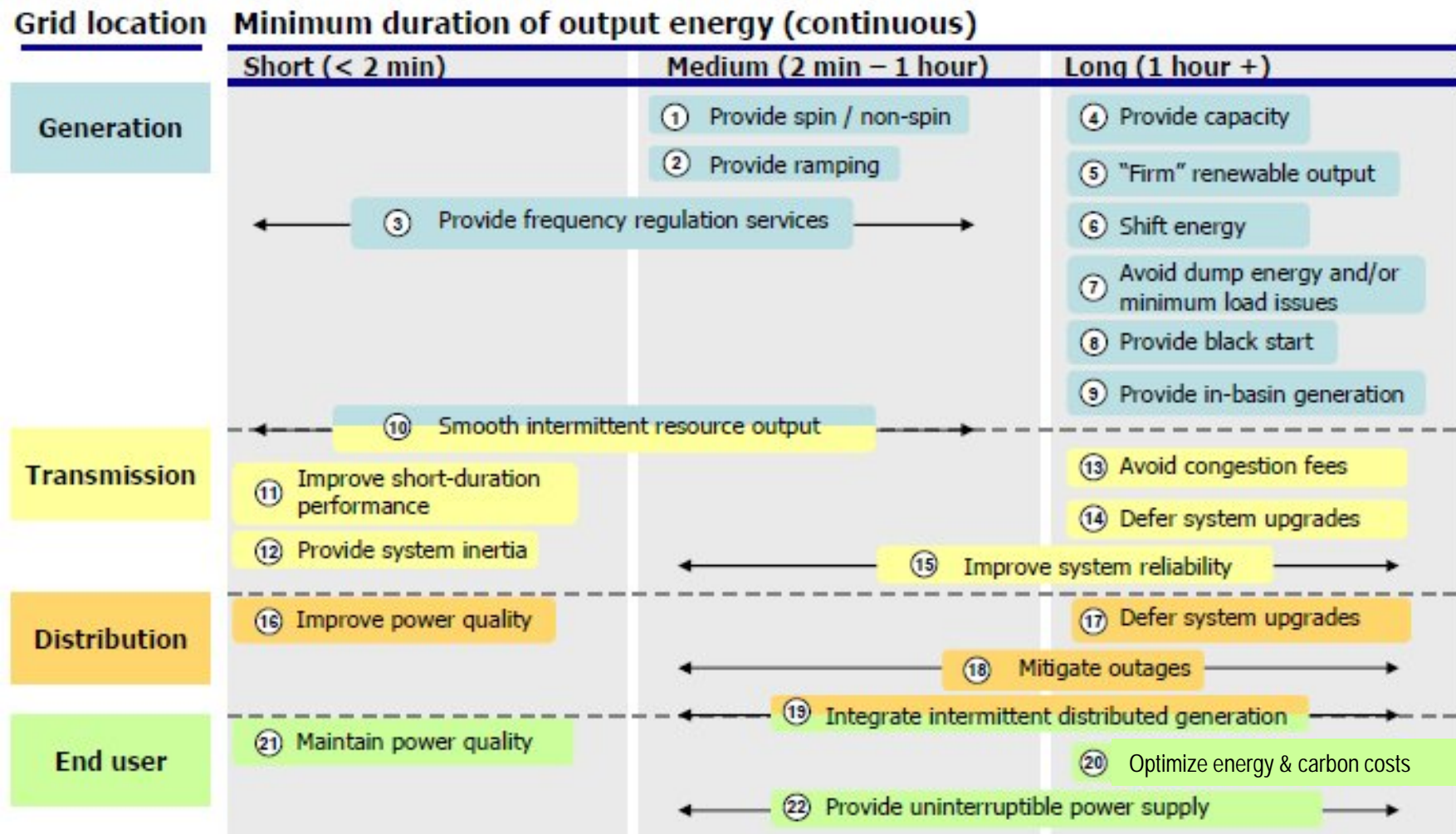
# Engineering-Economic Based Grid Controls

- Transactive Energy framework is focused on the convergence of multi-party business and operational objectives and constraints
- Not just markets, but also a broader integrated cyber-physical control system to ensure reliable electric services
- Not simply “*Prices to Devices*”, but coordinated and federated engineering-economic signals aligned to differentiated services across a broad time range



# Value Creation thru Differentiated Services

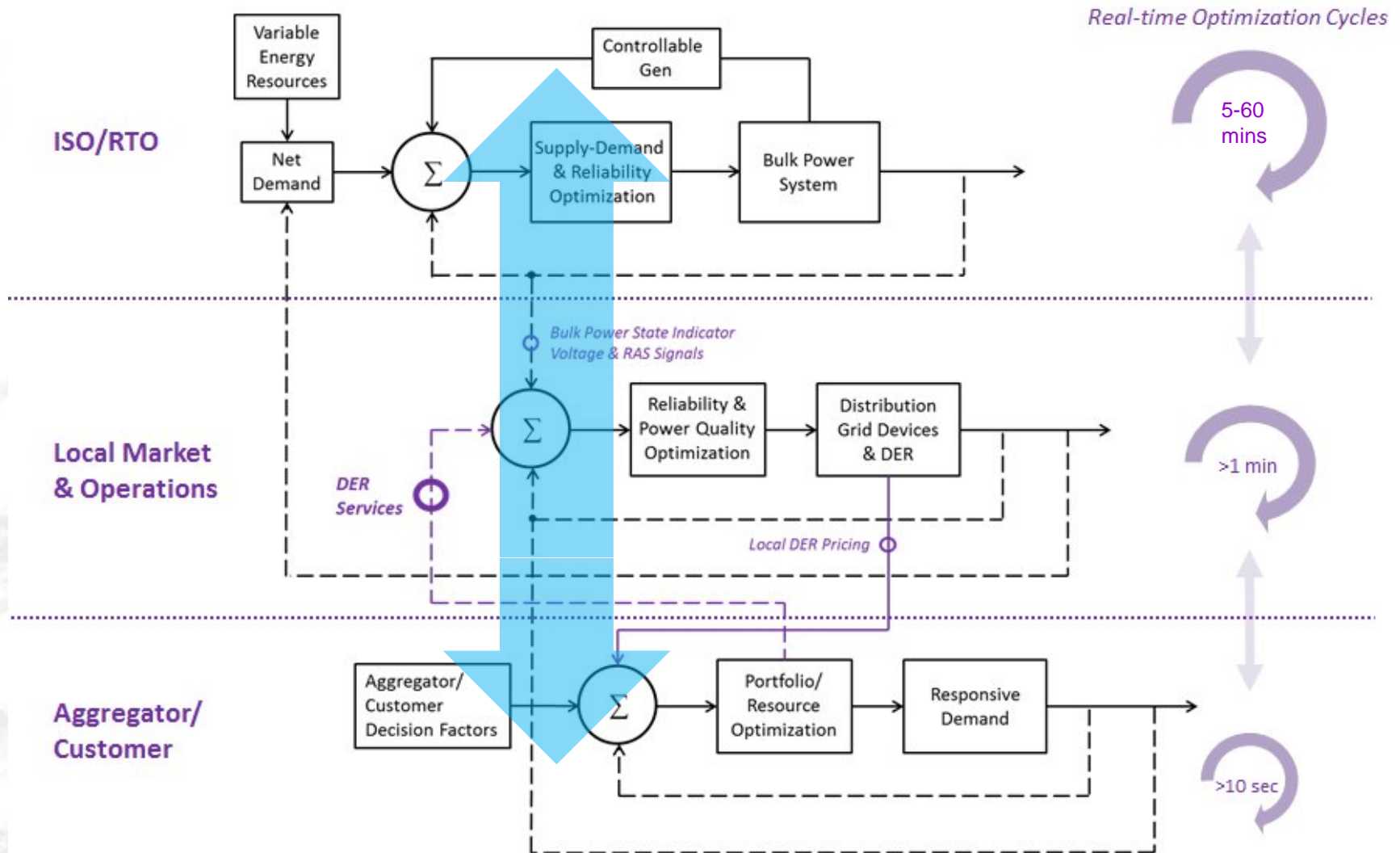
*22 Services that DER can provide with proper structuring and pricing*



Source: SCE

# Federated Markets & Distributed Controls

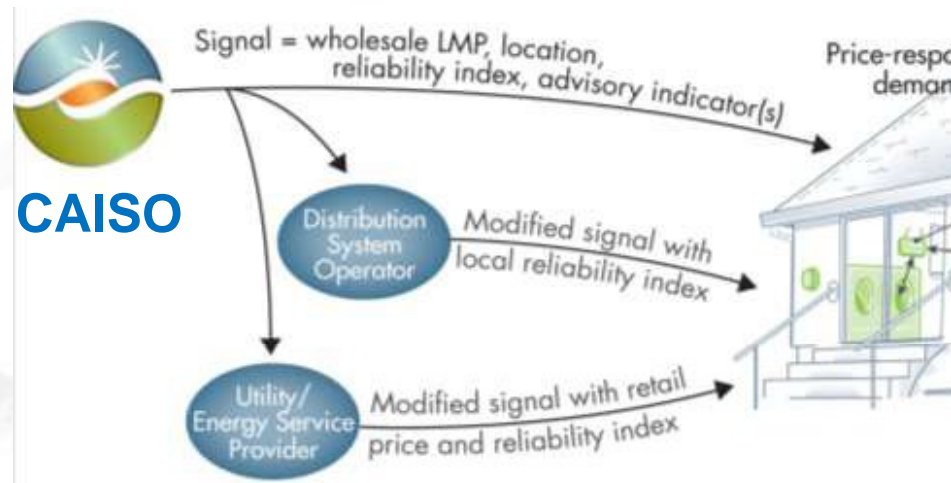
## Integration of DER with Markets & Grid Changing Control Paradigm



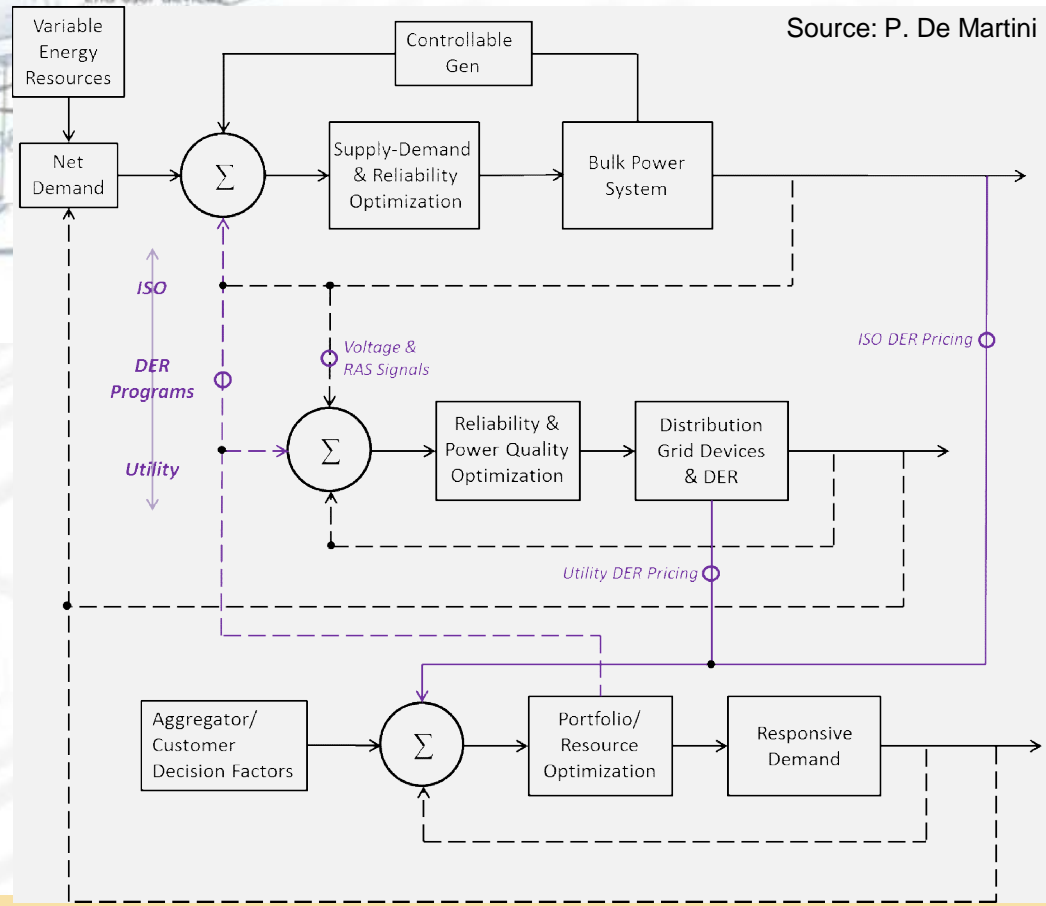


# Current DR Pricing Schemes Don't Scale

Multiple prices to distributed resources create multiple uncoordinated feedback loops – plus opportunity to game pricing options



Source: CAISO



# TE Architectural Framework

