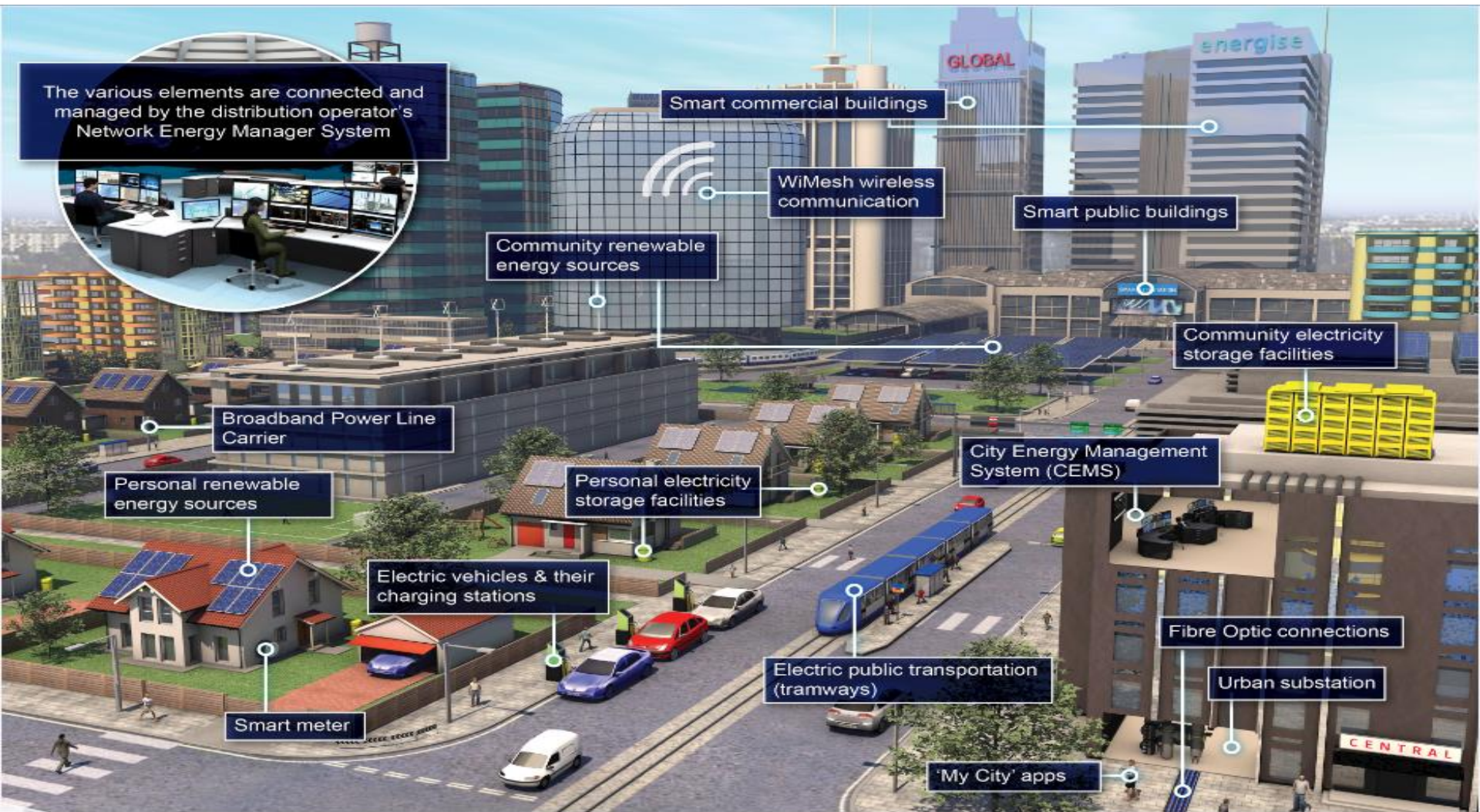


Lessons learned from DER Integration

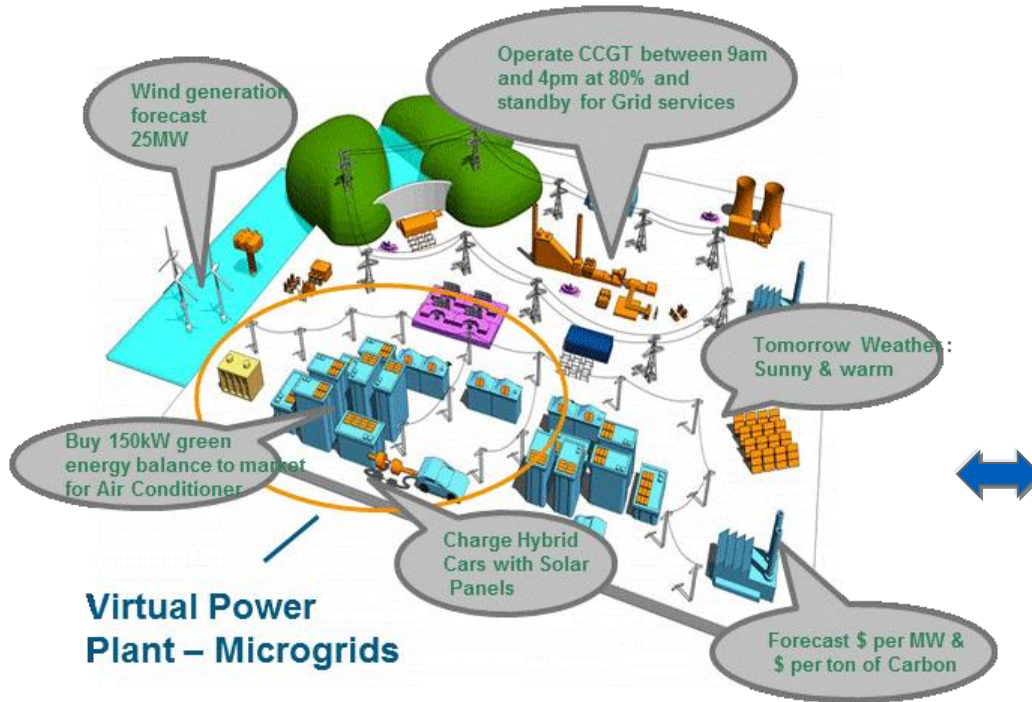


imagination at work

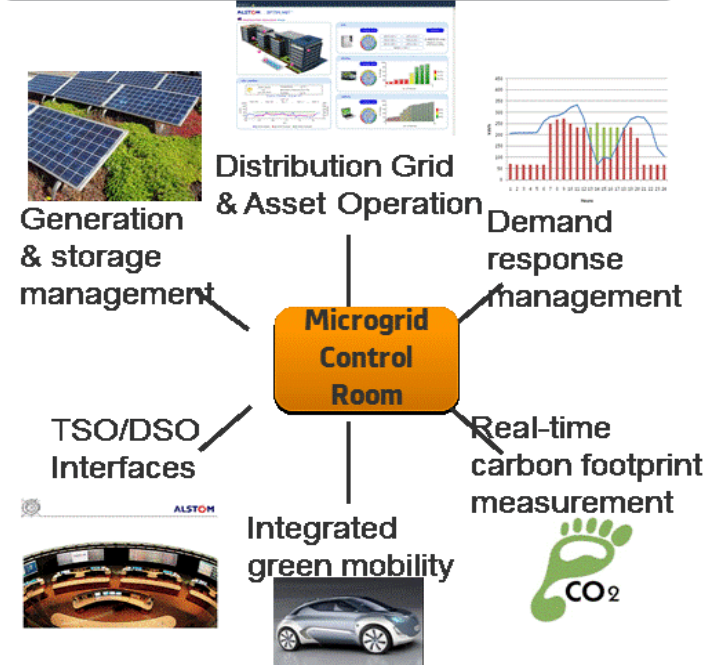
Eliot Assimakopoulos

Microgrid Sales Leader

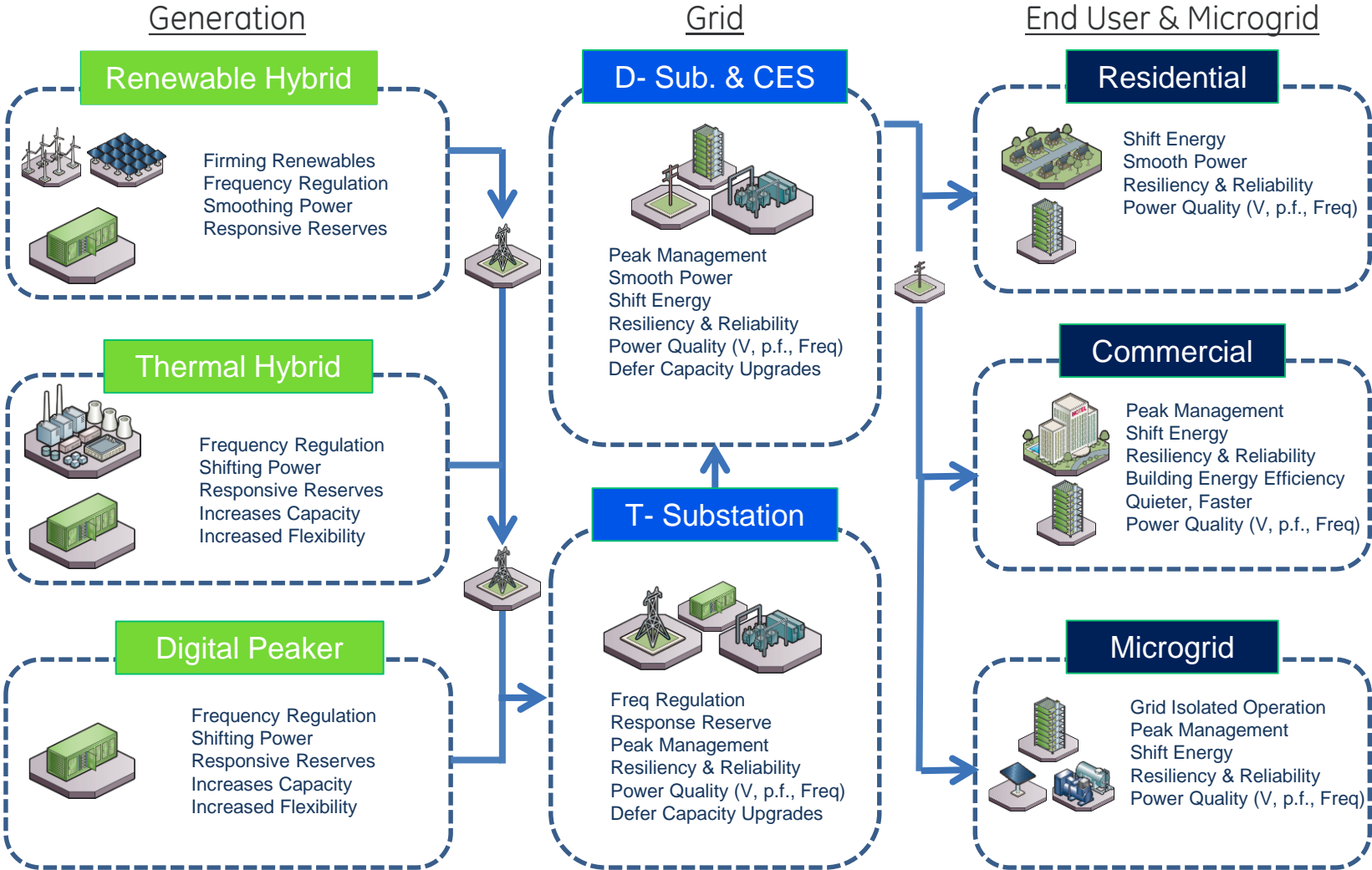
GE Microgrid Solution Concept - A Vehicle of DER Integration



- GE Offers complete DER – Microgrid Solution**
- ✓ Demand Response
 - ✓ Energy Storage
 - ✓ Distributed /Renewable Generation
 - ✓ Demand Response / Active Load Resource
 - ✓ Holistic System



Visibility, Control, and Optimization – Key to successful Grid Modernization



Community Microgrid – System Components

MICRO GRID TECHNICAL SOLUTION - APPLICATION COMPONENT ARCHITECTURE

Microgrid Operation Plan

- Forecasting
- Market Management

Microgrid Optimization

- Scheduling, Dispatch
- Settlements Management

Microgrid Automation

- Dispatch Signals
- Control Deployment

Microgrid Protection & Control

- Adaptive Protection
- Voltage – Frequency Control

Microgrid Resilience

- Islanding
- Synchronization

Operational Planning Communication

(minutes to Day Ahead)

Real-Time Operation Communication

(100s of m-seconds to 5 minutes)

Microgrid – DER Integration

Smart Metering, Communication & Automation Control Nodes

AMI / LMS
Head End
Software System,

AMI Network
Communication

Automation Control
Nodes

Power Electronics for
Grid Interconnection

Energy
Storage

Natural Gas
Generator

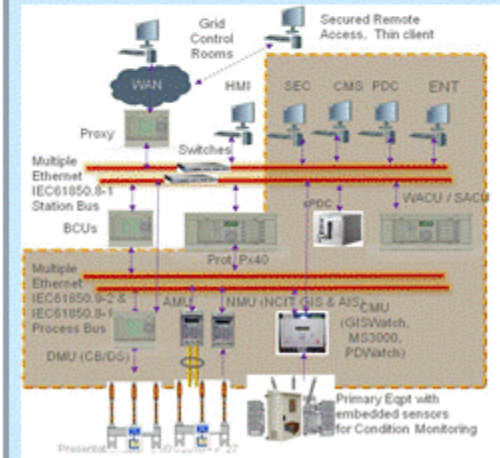
Smart
Meter

Solar
Power

Electric
Vehicle

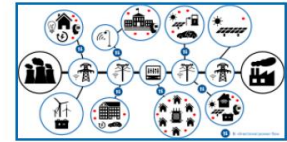
Smart
Meter

Micro Grid Substation Automation



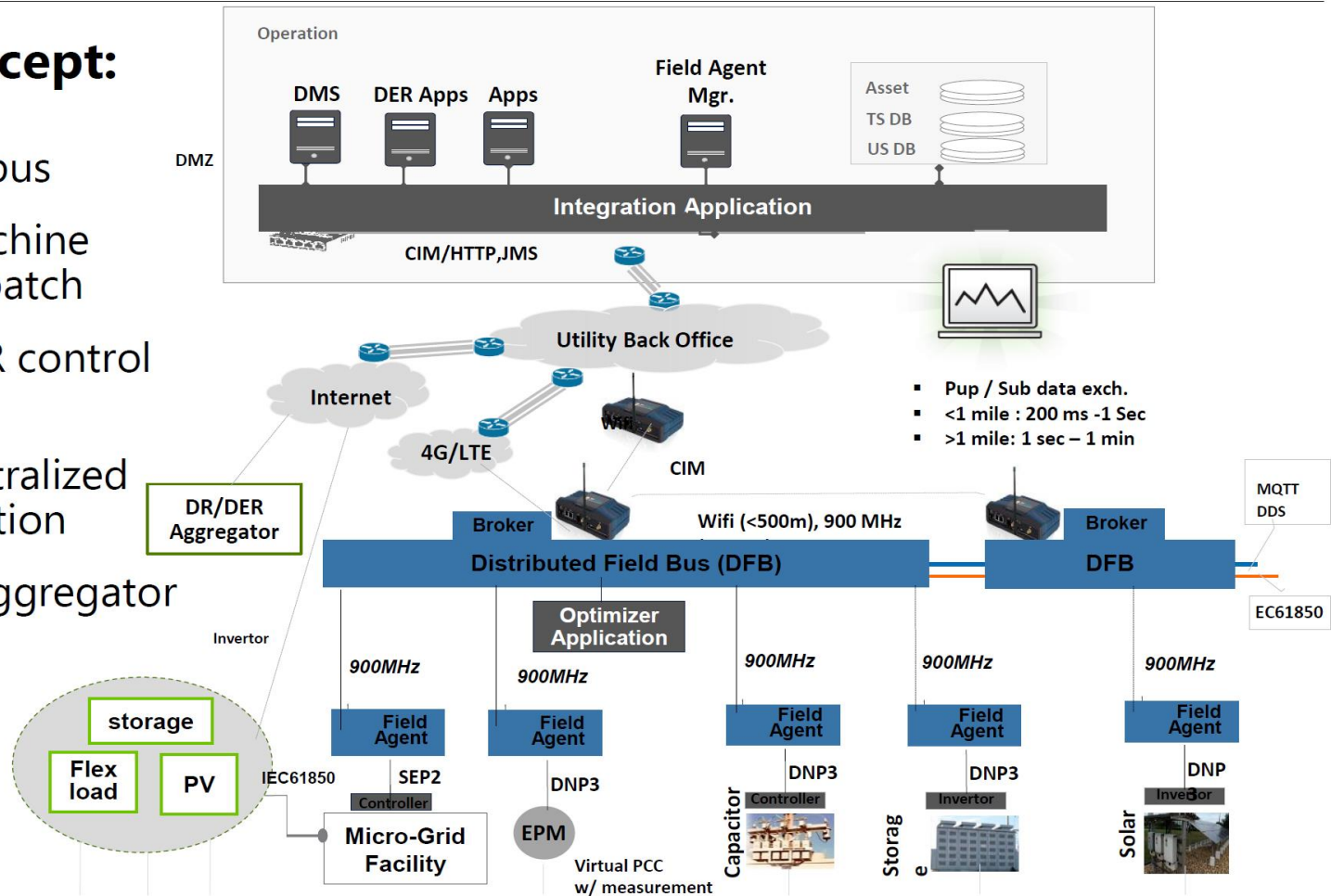
Example: SCE Proof of Concept

Distributing Controls to Support DER Future



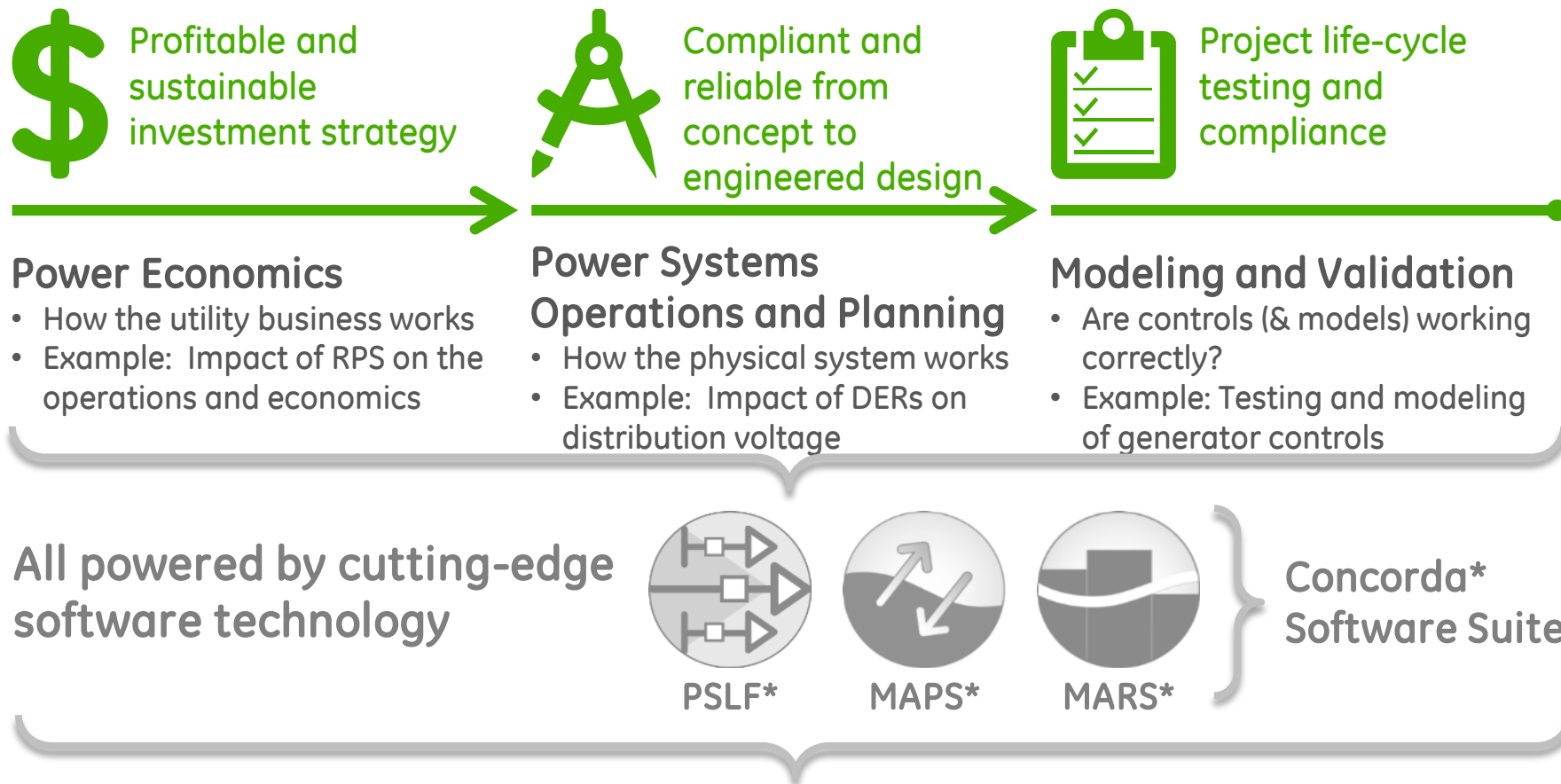
Proof of Concept:

- Field message bus
- Machine to machine automated dispatch
- Distributed DER control coordination
- End to end centralized model –integration
- 3rd party DER aggregator integration



Community Master Energy Planning

Aligns needs of the community with the energy system



 **Integrated into an Holistic Energy Master Plan** 



Example: NY State Reforming the Energy Vision – NY Prize

- Stakeholder outreach
- Master Energy Plan
- Explore P3 Structures
- Support Regulatory & Legislative Requirements
- Community outreach

STAGE 1: High Level Screening

- **“Qualitative” Characterization of the community grid**
 - **Description of Technical, Commercial and Financial Feasibility**
 - Conceptual Technical Design of Electrical and Communication Infrastructure
 - Preliminary commercial structure
 - Preliminary financial model
- duration: 5 months

STAGE 2 : Minimum Threshold/Quantitative Analysis

- **“Quantitative” Characterization of the community grid**
 - **Analysis of Technical, Commercial and Financial Feasibility**
 - High-Level Technical Design of Electrical and Communication Infrastructure
 - Commercial Feasibility Analysis, Benefit-cost Analysis
 - Financial feasibility analysis
- duration: 5 months

STAGE 3 : Audit Grade Design Phase ; Plan Execution Phase

Audit Grade Design Phase

- Technical, Commercial and Financial Audit Grade Study
- Complete Characterization of the community grid
- Detailed Technical Design of Electrical and Communication Infrastructure
- Letters of Support and Intent for commercial arrangements
- Cost estimates, Pro forma Financial Statements

Plan Execution Phase

- Financing
- Contractual Agreements
- Interconnection Agreement
- Zoning, Siting and Permitting
- Construction
- Monitoring and evaluation of outcomes

duration: 8-16 months



Some parting thoughts...

- Get to 100% Renewables ~20% at a time
- Once you have visibility focus on control
- Align community energy needs/plans with grid plan
 - Particularly DOD; Military installations on each island need to develop a holistic inter-base plan in the context of the utility energy plan
- Regulatory environment and framework that is conducive to grid services/P3 business models



Questions.....



Eliot Assimakopoulos

assimako@ge.com

