



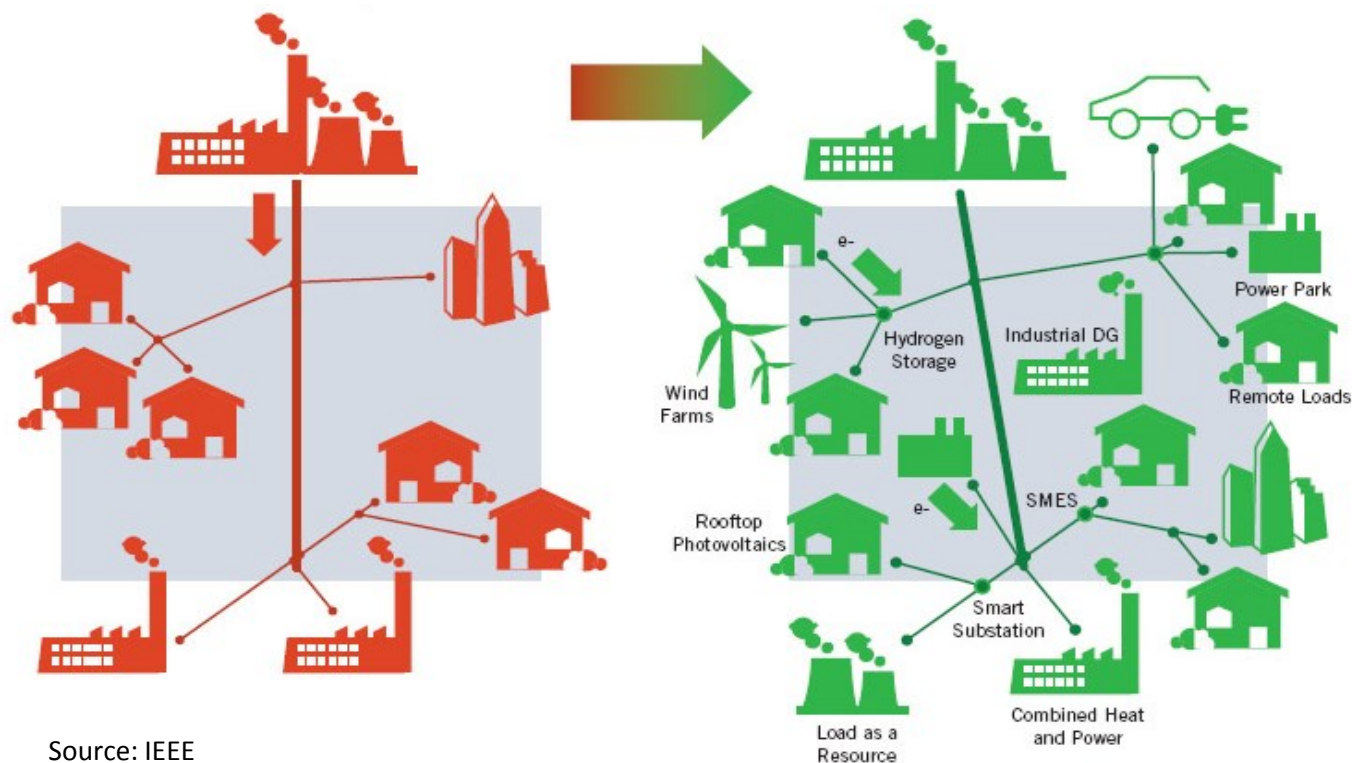
Making the Distribution Grid More Open, Efficient and Resilient

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March 26, 2015

Grid Evolution: One-way Road to Grid of Things

Grid increasingly becoming a multi-directional network potentially interconnecting millions of intelligent consuming devices and flexible DER and back-up generation



Operating such a system requires greater situational visibility and collaboration with customers and their services providers

How Will We Develop & Operate an Integrated Grid?

Focus on Customer Value & New User Needs

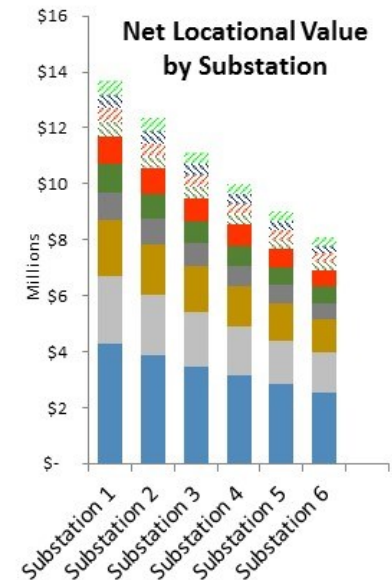
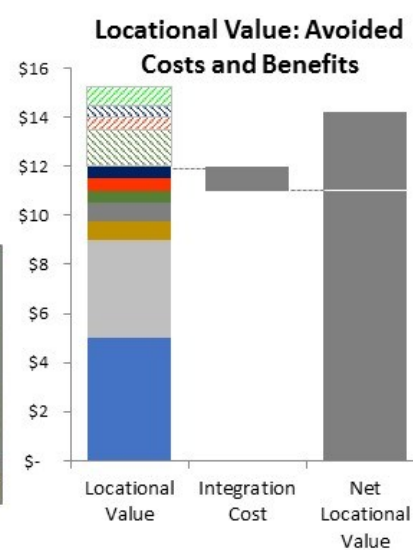
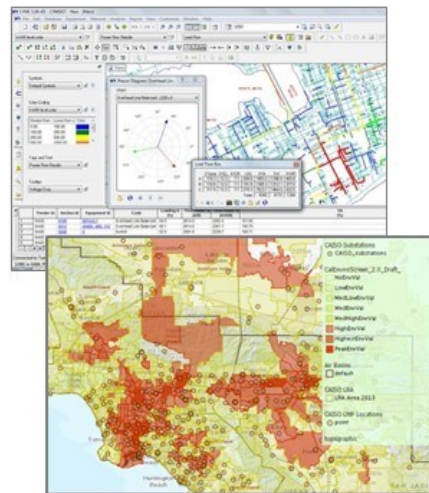
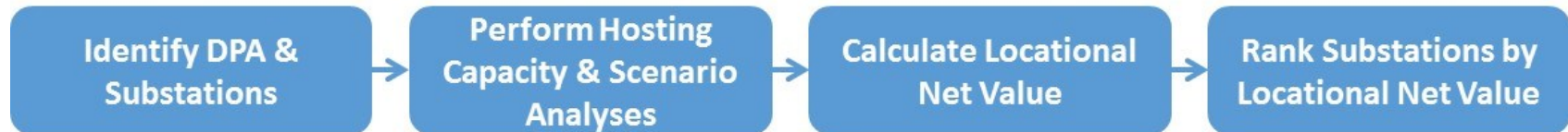
- Integrated Grid Planning
 - DER Hosting Capacity
 - Locational Benefits
 - Integration w/Trans. & Resource Planning
- Grid as an Open Platform
 - Leverage Current Investments
 - Evolve to Create “Plug & Play” System
- Integrated Distribution Operations
 - Manage distributed power flows
 - Coordinate physical flows across T-D interface
- DER Market Opportunities
 - Expanding opportunities to provide services
 - Market structures vary and should align with parties’ respective needs



Changes to Traditional Distribution Lifecycle Management Processes Required

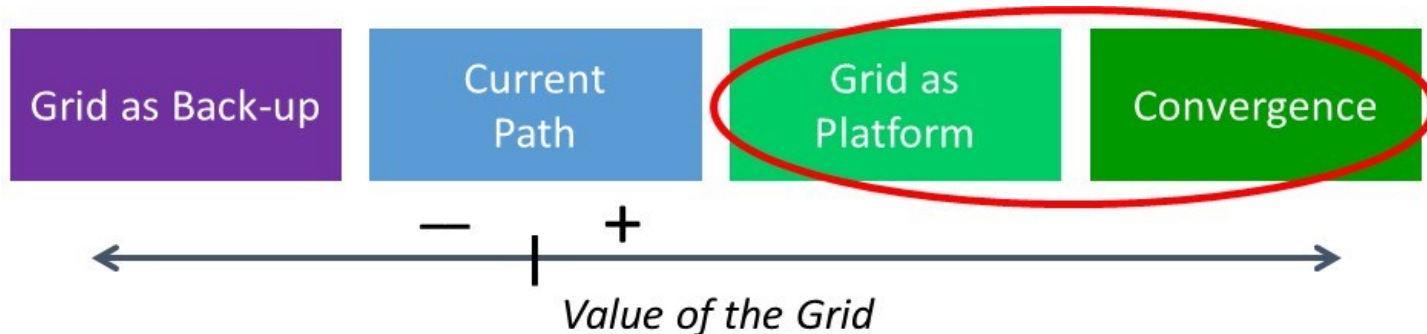
Distribution Planning Process

Integrated Grid Planning Required – California Dist. Resources Plan Example



Shift from Deterministic Engineering Analysis + System level Benefits Analysis
Toward Dynamic Engineering Methods with Locational Benefits Incorporated

What Type of Distribution Grid Do We Want?



Seamless:

- Enable multi-directional real & reactive power flows
- Enable transactions across distribution with utility distribution company, bulk power operations and wholesale market

Open & Transparent:

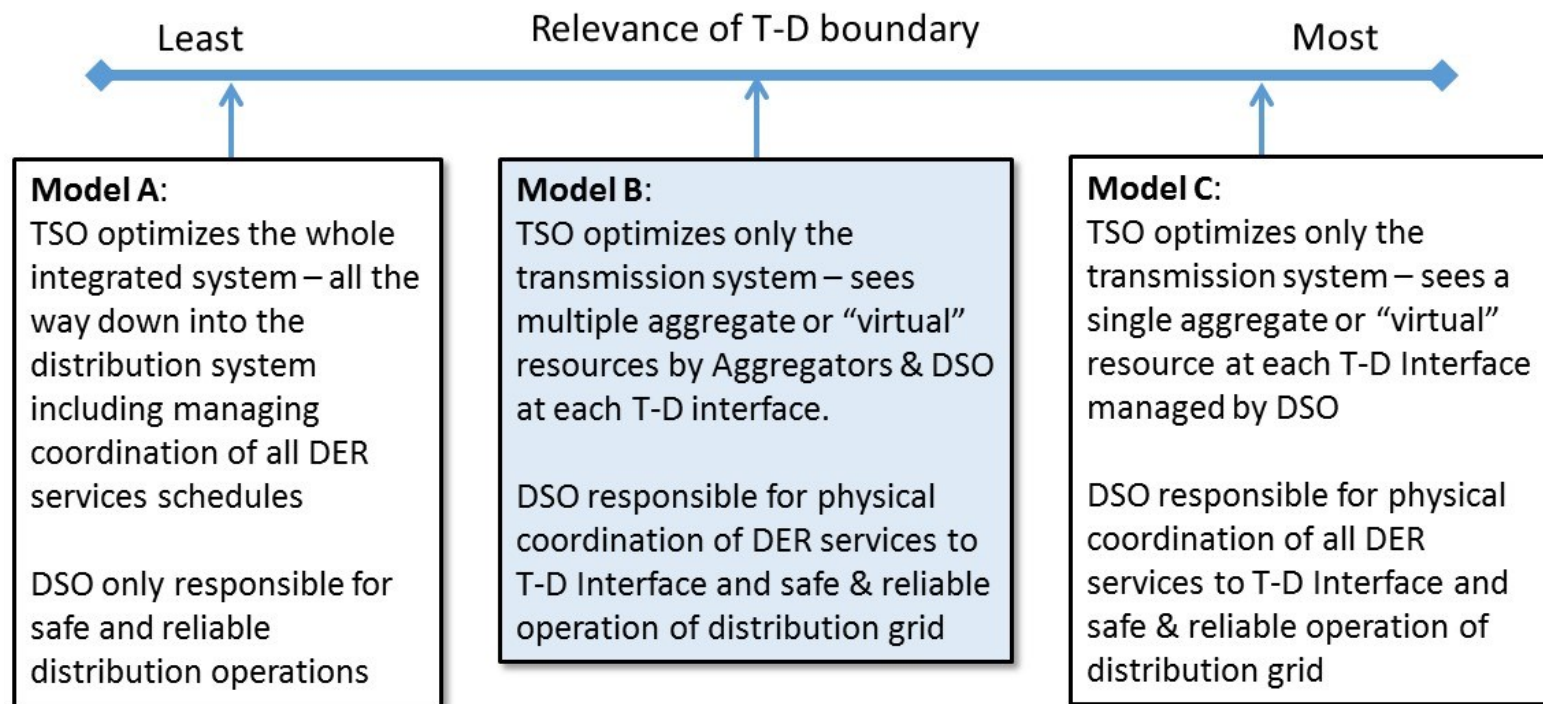
- Low barriers to access physical connections & value monetization opportunities
- Streamlined interconnection rules and processes
- Transparent processes for planning and operations
- Access to distribution planning & operational information (qualified access)
- Transparent locational value determination and monetization

Network & Convergent Value:

- Physical and operational qualities that yield greater safety and reliability benefits
- Qualities that may create greater customer/societal value from each interconnected DER ("network effects")

Integrated System Operations Evolution

Scale Adoption of DER will Require New Distribution Operational Functions & Integration with Bulk Power System Operations

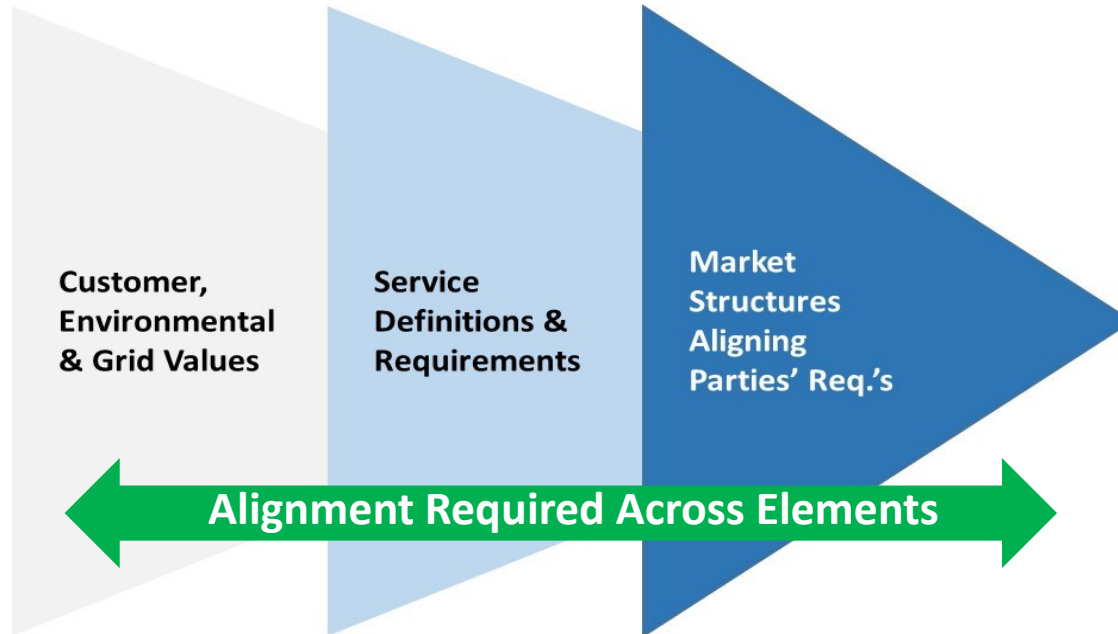


Adapted from: L. Kristov CAISO

DSO Considerations Should Start with Functional Requirements Before Deciding Roles

Distributed Market Design

Distribution Market Design has 3 Integrated Elements



Competitive Procurements w/Bi-lateral Contracts Most Likely for Distribution Opportunities
Tariff Designs & EE Program Incentives Aligned to Locational Value & Dist. Constraints

Not clear from CA MTS discussions how DMP or Spot Markets facilitate alignment



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California MTS Working Group

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