



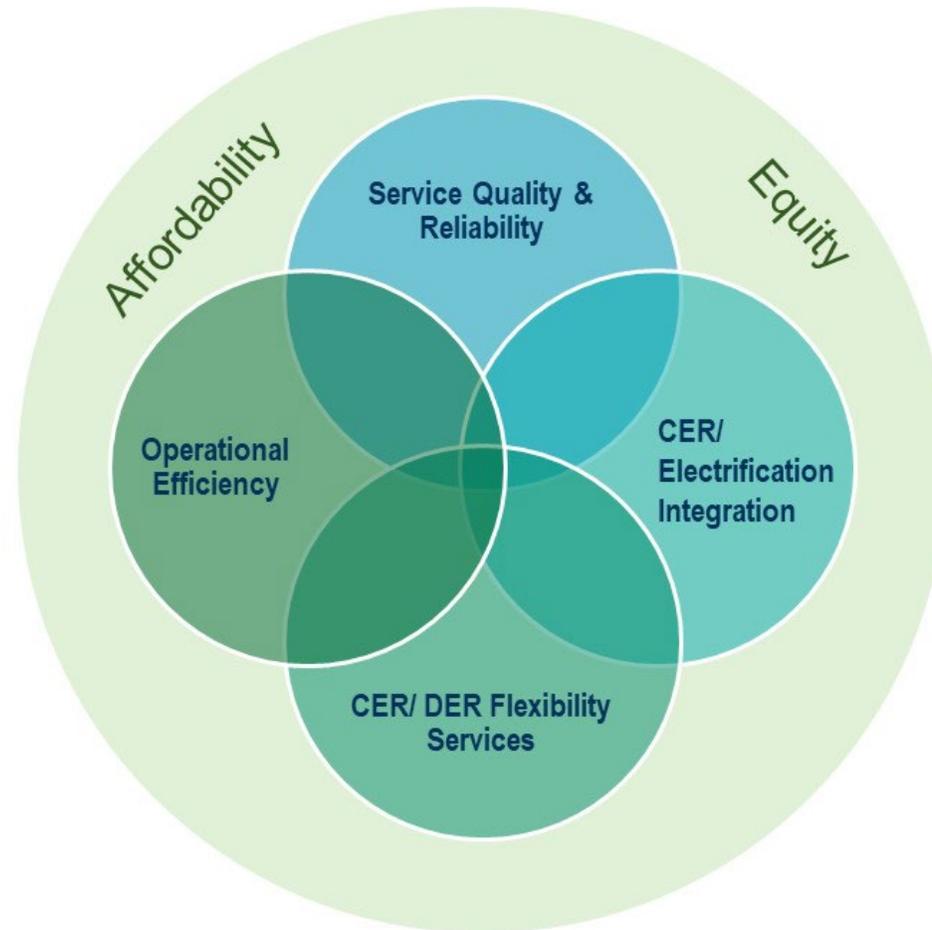
Consumer-Community Oriented Integrated Planning Emerging US Practice to Address Climate Mitigation & Adaptation

ECA Foresighting Forum

Paul De Martini
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Integrated Distribution Network Planning

Distribution network planning across the U.S. increasingly addressing 4 key overlapping areas of focus to meet customer needs equitably in the context of public policy drivers.



Planning Orientation Shaped by Perspectives

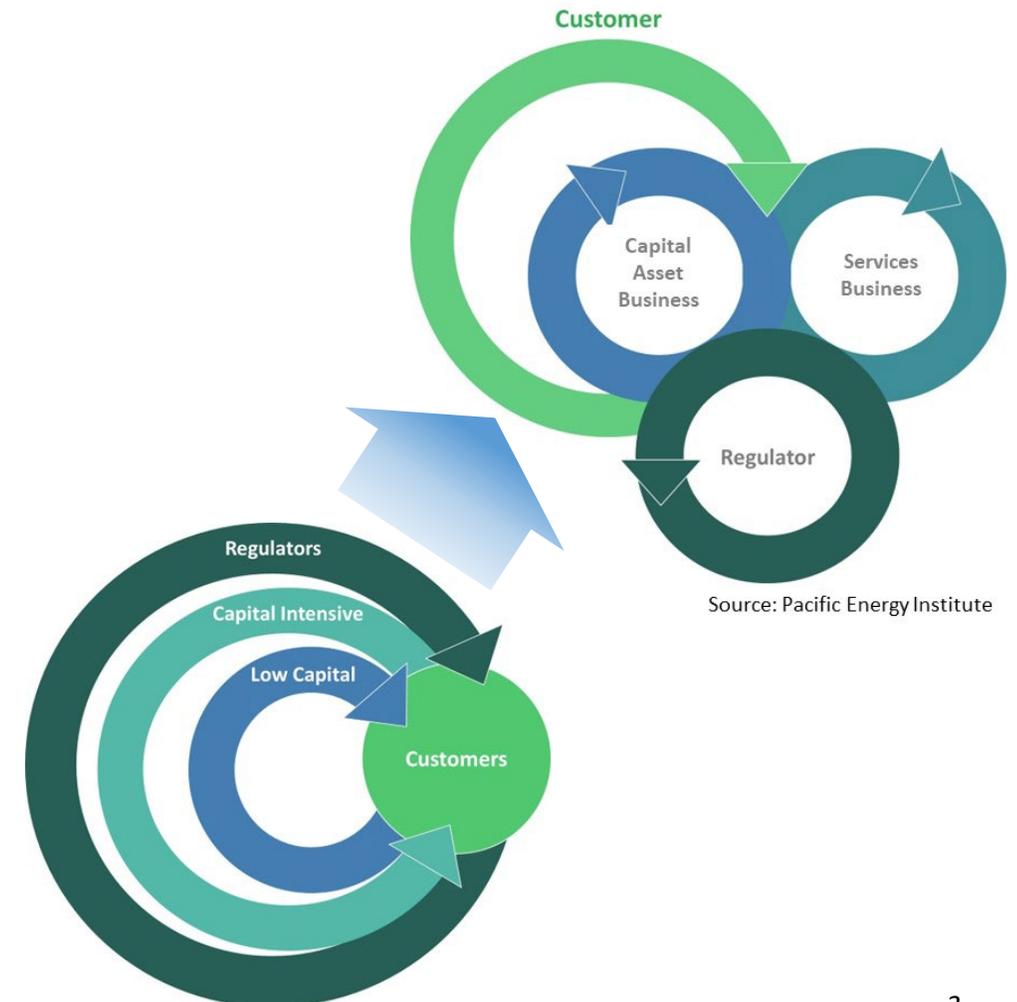
Two conflicting views have significant implications for system and distribution planning. This conflict is currently shaping the direction of electricity policy and planning in the US.

- **Traditional Supply-Oriented & Regulated View**

- Customers receive services based on what policy, regulation and industry structure (markets, utilities, etc.) provide
- Traditional view is being pursued on the grid side of the industry

- **Customer-Oriented View**

- Customers drive what services/products are offered and by extension the resulting industry structure as is the case in other services industry
- Customer view is being pursued on the customer side of the meter by various services firms



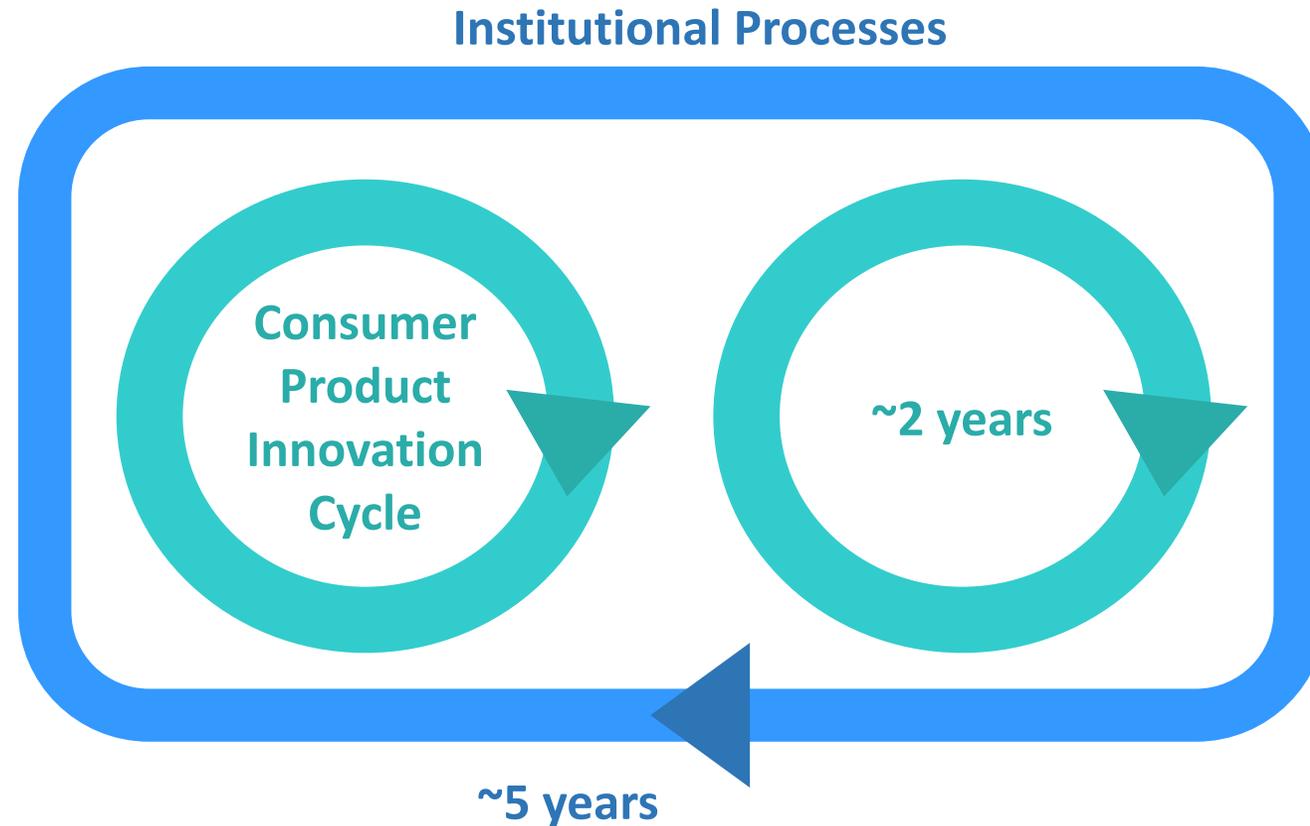
US Retail Energy & Distribution Network Landscape Evolving

Expanding diversity of services providers and distributed resources at the edge

	Yesterday	Today	Tomorrow
Power Flow	One-way	Inadvertent 2-way	Scheduled reverse flow
Solar+Storage	Load modifying resource	Grid Services	Exported energy for resource adequacy
Electrification	Load growth	Managed load	Grid storage
Microgrids	Customer BTM back-up generation	Customer BTM microgrids	Community microgrids (“minigrids”) by design
DSM	Energy efficiency & peak load management	Grid services	Grid interactive buildings (thermal & electrical storage)
Grid edge	Customer meter	BTM CER	BTM CER, Home & Building Technologies
Ecosystem	LSE, DistCo & Customer	LSE, DistCo, Aggregator, DER provider & Customer	LSE, DistCo, Aggregator, DER provider, MG Operator, EV Charging/Vehicle mfg, Building automation provider & Customer

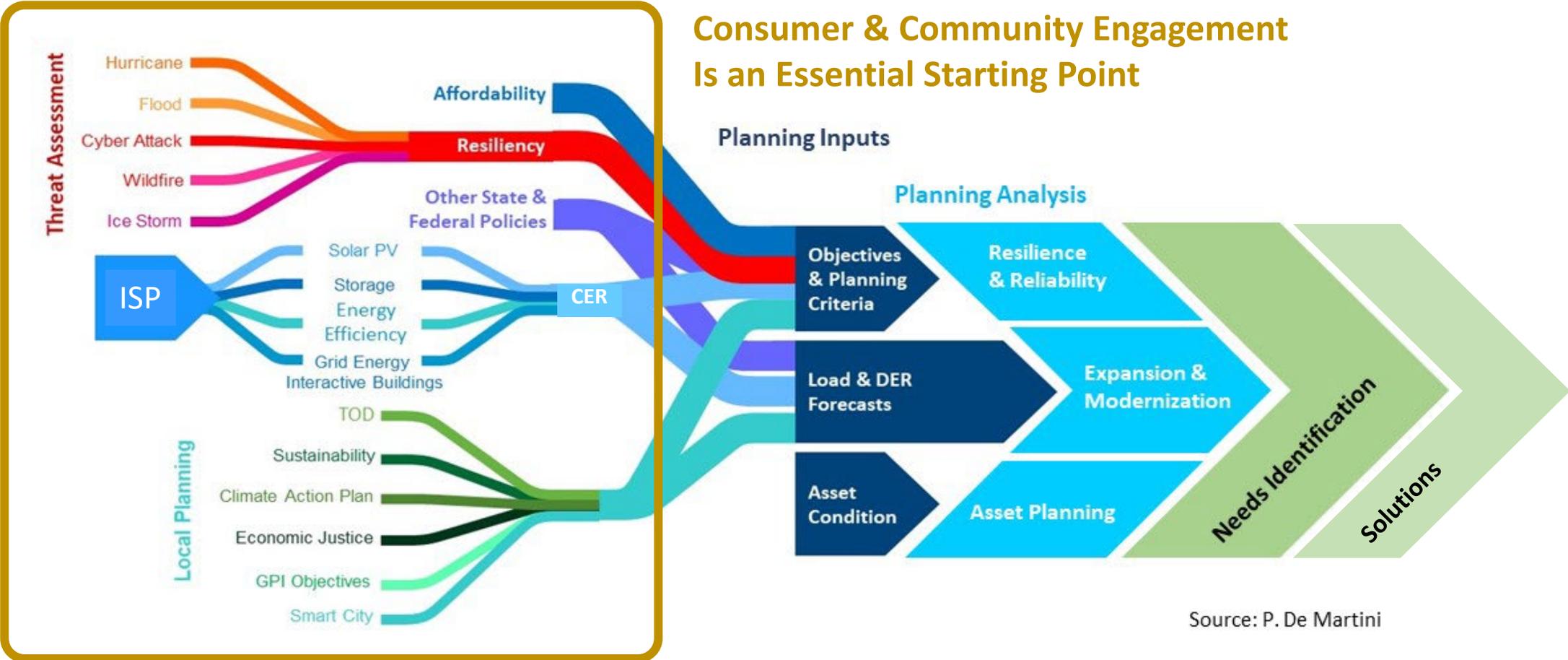
Consumer Product Innovation Clockspeed Impact

Consumer product-technology innovation cycles (clockspeed) is outpacing industry institutional decision-making process cycles



Integrated Distribution Planning Inputs

Distribution Planning Increasingly Interdependent Upon ISP/Bulk Power Use of CER and Community Sustainability & Resilience Planning



Source: P. De Martini

2030 Integrated Distribution Planning Considerations in US

Transforming the electric distribution into an energy gathering system

- State policies are driving greater distributed (community and customer) solar & storage adoption to achieve 2030 goals
 - Planned as ~20-30% of RE portfolio
 - Hedge against inability to deploy large scale RE by 2030
 - Resources for needed grid flexibility
- Roughly **10 GWdc of installed Distributed Solar (2x)** projected thru 2030
- CERs and community distributed generation and storage are planned to **contribute 30-50% of supply resources** in several states.
- Electric distribution network will need to **deliver energy from the edge across distribution and into local transmission networks**

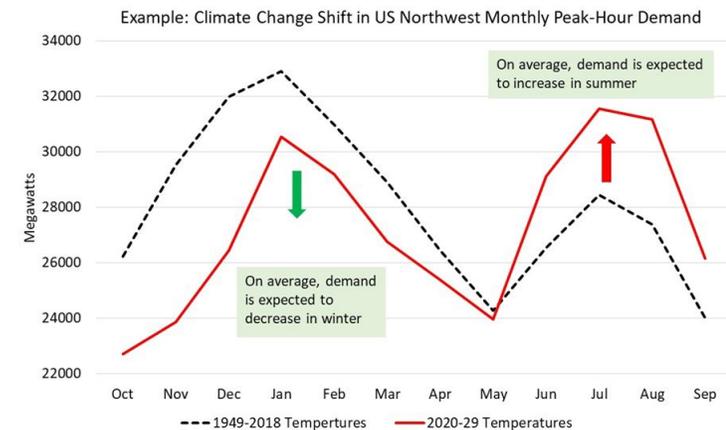
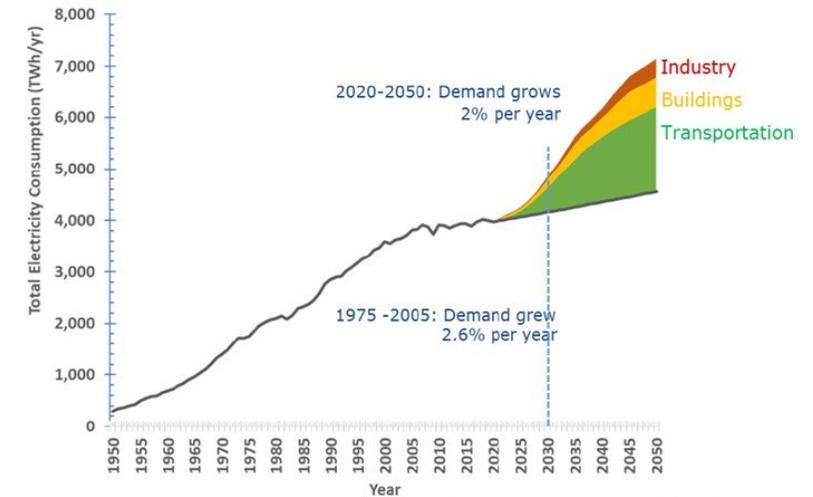
“Up to 50% of single-family homes in California are projected to have customer-sited solar, driven by improved economics, building codes and supportive but equitable policies. This will provide approximately 30 GW [40+%] of generation capacity. Additionally, 10 GW of customer-sited storage is projected by 2045.”

Pathway 2045, Southern California Edison

2030 Integrated Distribution Planning Considerations in US

Net energy consumption is outpacing supply & distribution capacity

- Electrification goals may **add 1,000 tWh of net energy use** on distribution based on models solving for 2030 goals
- Longer range EVs require longer time to charge at home (8-10hrs)
- But, this **increase may be higher** due to increasing temperature extremes
 - “An **8% increase** in summer air conditioning demand can be expected in the U.S. when the global average temperature **exceeds 1.5 degrees**”
- The carrying capacity of electric power lines decreases as ambient air temperatures rise - ~50% of US distribution system is overhead



2030 Integrated Distribution Planning Considerations in US

Consumer Use & Resources Sought to Address 30-50% of Forecast Resource Need

There is a need to more explicitly & proactively integrate consumer resources into system planning – but, changes needed to evolve policies to support/encourage consumer “co-production” of energy and flexibility

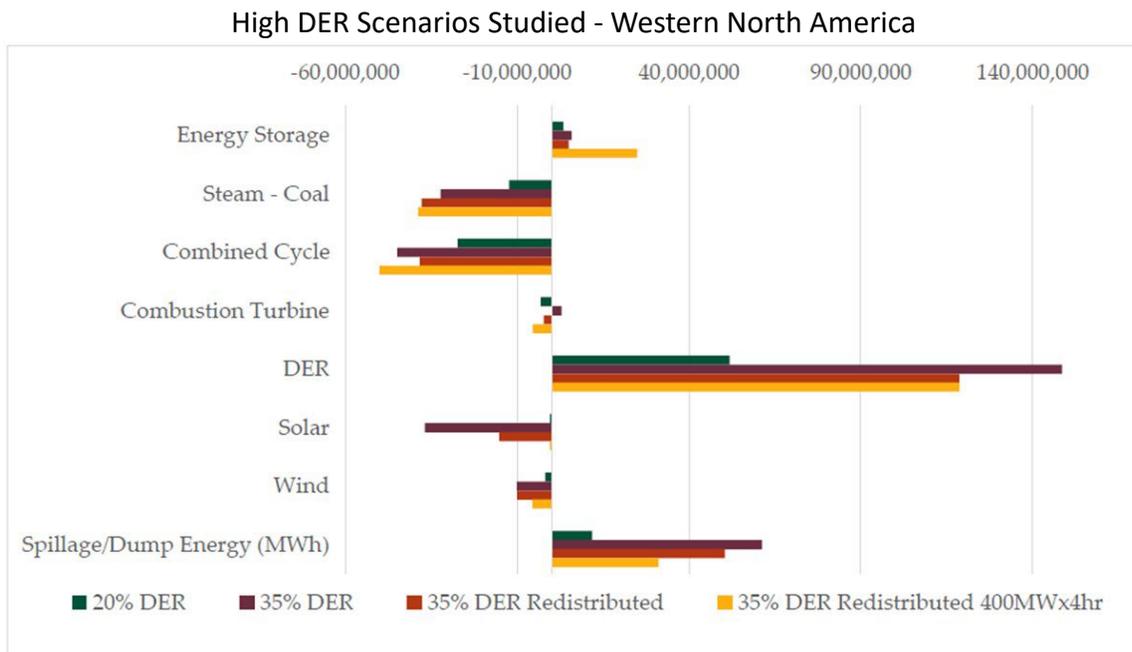


Figure 9: Largest Annual Energy Change From 2030 ADS PCM V2.2.1 vs. All Other Study Cases (MWh)

Source: Impact of High Distributed Energy Resources, WECC, 2022
https://www.wecc.org/Administrative/DER_Assessment_Report_Final.pdf

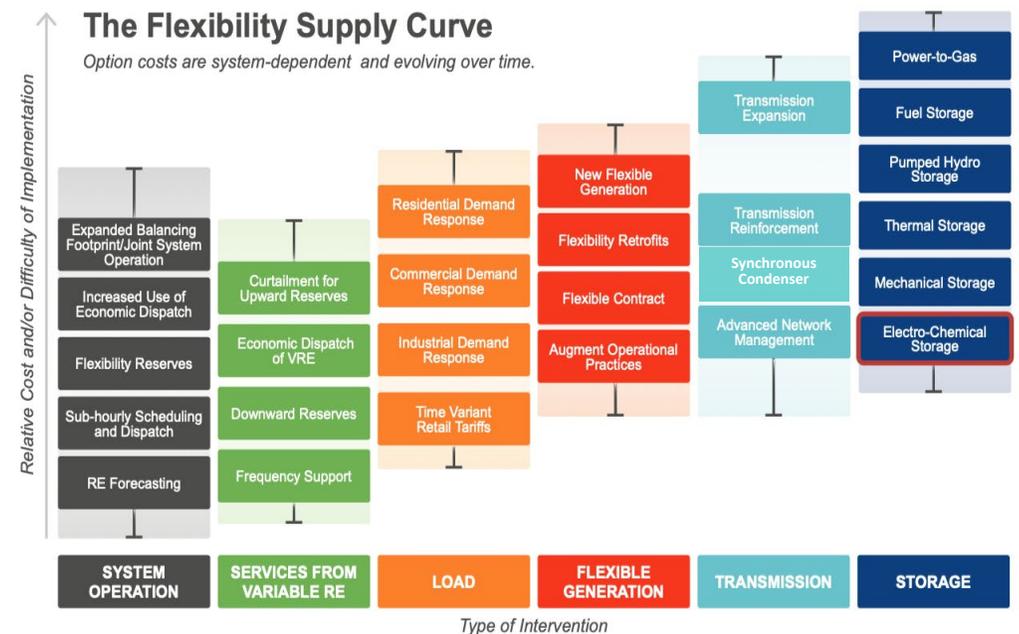


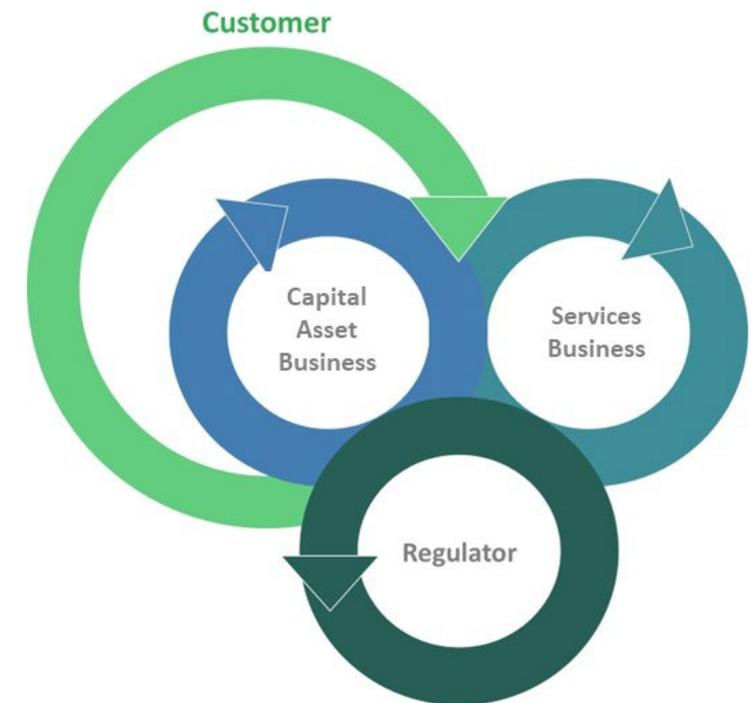
Figure 6. The flexibility supply curve

Source: NREL

US Integrated Planning Takeaways

“What got us here, is not going to get us there” Marshall Goldsmith

- **2030 Target is growing** – Scope of climate mitigation and adaption is growing in scale and complexity
- **Instantiate integrated planning to address balkanization** of planning, investment decisions and execution and **prioritize actions** toward outcomes that have the most significant climate benefits for consumers/communities
- **Role of Consumer/Prosumer is ill defined** – Policy & planning assumptions being made without explicit consumer agreement - What is the new service/co-producer compact?
- Develop **new Grid Architecture** – the Tesla-Edison architecture is no longer adequate for 21st C.
- **Address the significant institutional lag** between consumer technology innovation and institutional decision making cycles



Source: Pacific Energy Institute



pacificenergyinstitute.org