



CAMUS

A Path to New Utility Services

The DSO Model

What path is the customer taking?

- More DERs
- Less carbon
- More backup power
- More choices & control of their experience



The Distribution System Operator (DSO) Model

Developing an ecosystem of customer engagement that allows utilities to operate their system at minimum cost, while delivering consumer choice

- What about ADMS?
 - ADMS typically does not address DER integration, not customer focused
 - Supporting customers in securely integrating their DER is a priority
- Can't you just add a DERMS?
 - Yet DERMS are focused on direct control of DER. This approach (1) does not scale well to thousands/100's of thousands of dispatchable assets and (2) does not support a customer-centric approach
 - Even at the bulk power level (with fewer assets), we've seen a move towards market-based orchestration
- Oh, so more like an ISO?
 - Yes, but at the distribution level...thus the term DSO. Controls are still part of the picture but driven by engagement of both customer-sited and utility-owned assets

Overview of Market Elements

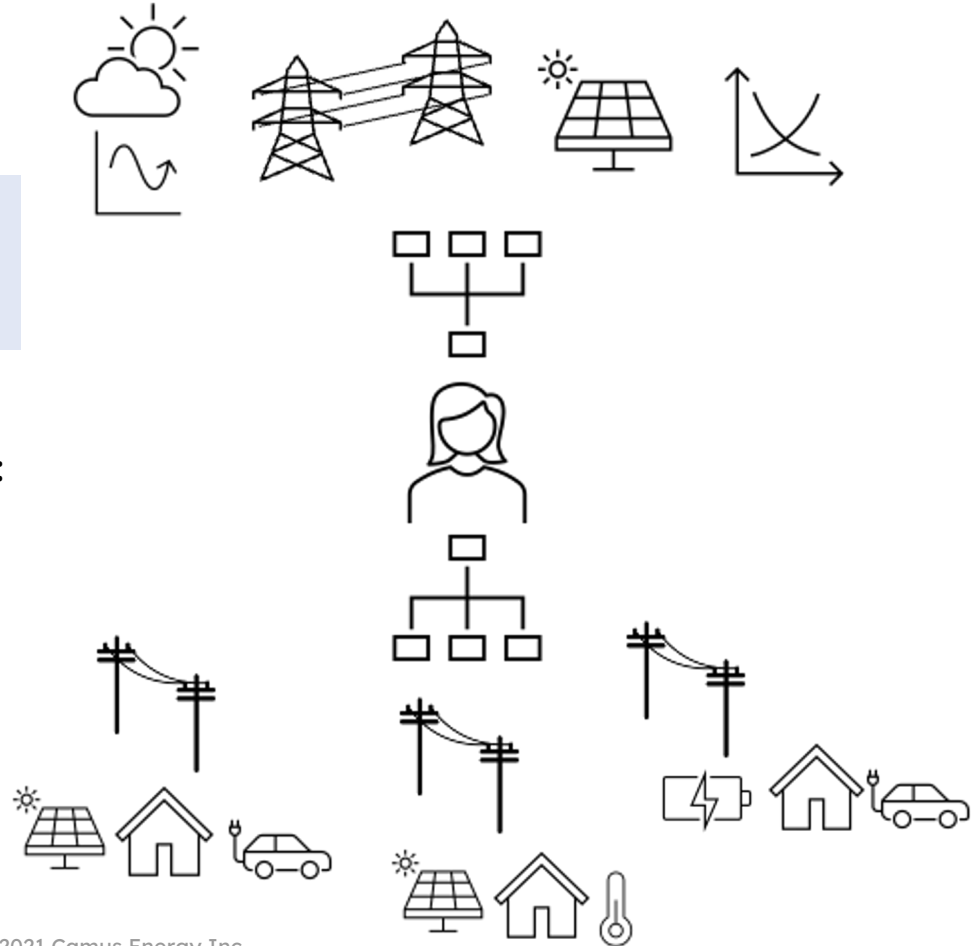
Unique opportunity to **combine awareness and insight** to provide customer base with the most **value and least cost, reliable services**

Transmission System:

- Scheduling coordination facilitated by:
 - Forecasting
 - DER and flexibility insights
- Optimized market participation

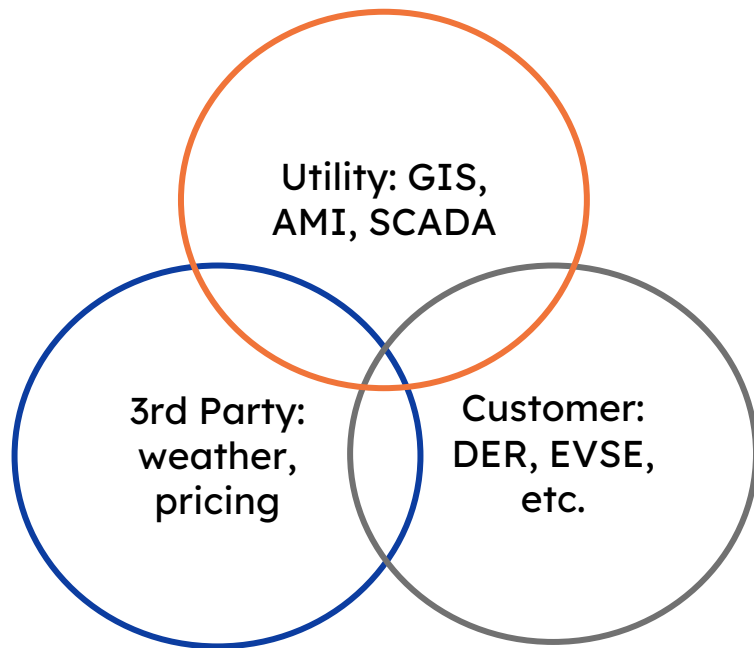
Distribution System:

- Local markets accessing DER flexibility/capacity
 - Efficient, open market design
- Valuation of local services



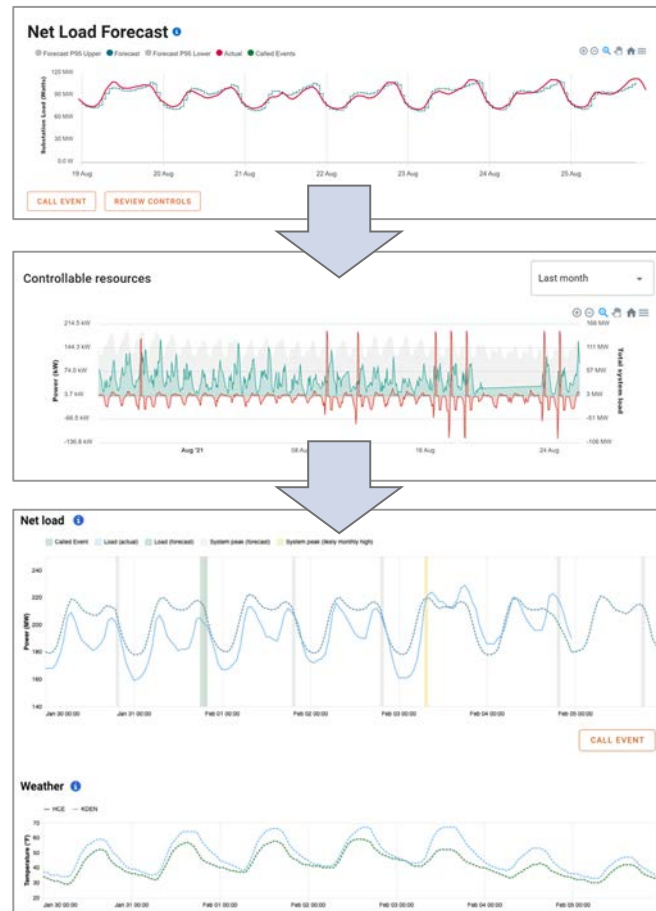
Supporting a DSO model

- A lot of the same ingredients as ADMS and DERMS:
 - **Grid Visibility** → Enhanced data integration across silos



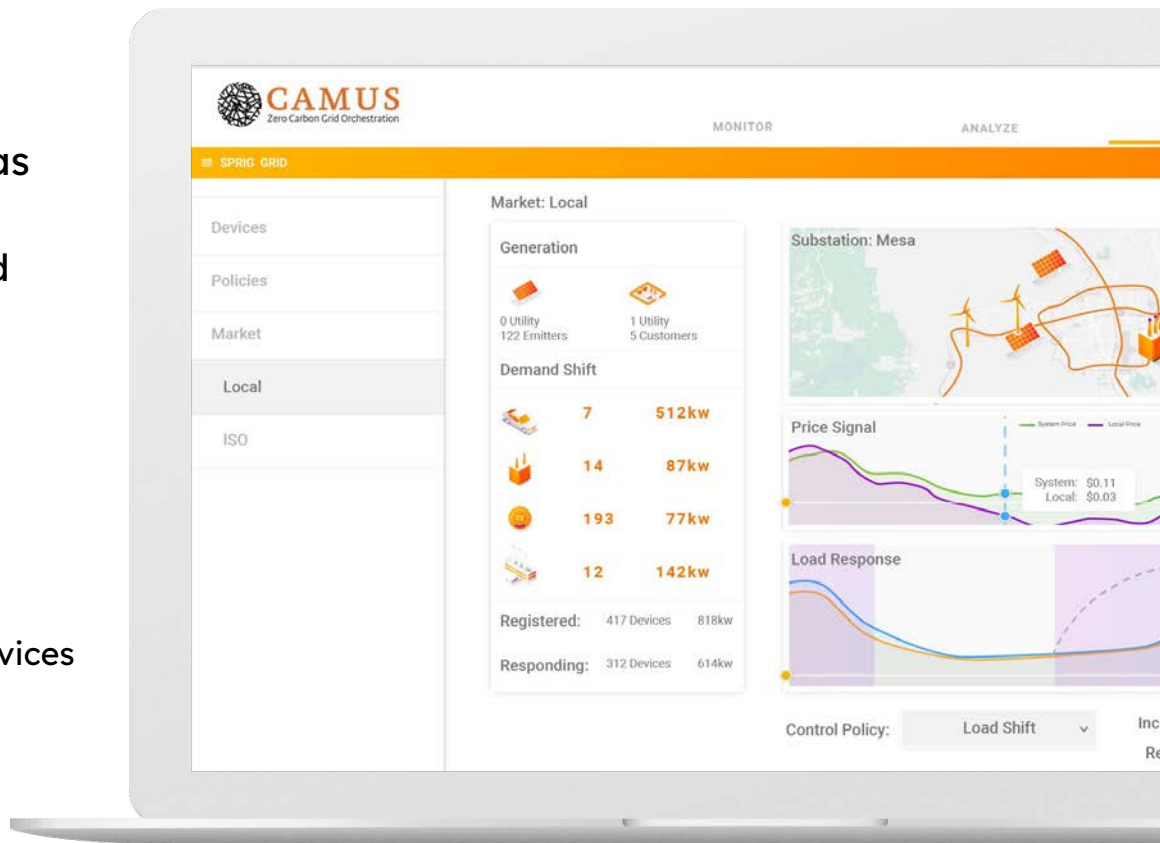
Supporting a DSO model

- A lot of the same ingredients as ADMS and DERMS:
 - **Grid Visibility** → Enhanced data integration
 - **Forecasting** → Enabling business decisions
 - System/feeder net loads
 - RE generation
 - Wholesale pricing
 - Coincident peaks
 - Customer loads/generation/DER state



Supporting a DSO model

- A lot of the same ingredients as ADMS and DERMS:
 - **Grid Visibility** → Enhanced data integration
 - **Forecasting** → Enabling business decisions
 - **Orchestration** → Market driven control
 - Dynamic valuation of services
 - Extensible design
 - Device agnostic



Procuring grid support from local DERs

Local grid insights & actions



Feeder EMME 5 identified as within 15% of a transformer limit



Behind the feeder, 157 customers own EV chargers and 32 have PV/storage systems



Curtailling load at 8pm will lower risk at EMME 5 and provide lowest-cost flexibility



DER owners are paid \$0.35/kWh for curtailed or discharged electricity

Feeder model ingests local demand forecasts

Connectivity/GIS model identifies local DERs

Dynamic pricing model establishes value of load shifting over time

Market orchestration clears; utility dispatches select EVs and batteries based on market signals

Utility workflow (with Camus platform)

THE DSO MODEL

- 1 Enables utilities to safely and reliably support evolving customer needs while minimizing operating costs.
- 2 Requires utilities to layer and integrate existing systems to provide new services to their members / customers.



Thank you!

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