



# Resource Planning at the Grid Edge

ESIG Down-Under

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## Outline ~ 10 minutes

- ▶ HCE system overview
- ▶ Split between Bulk/Distributed
- ▶ Behind-the-Meter Retail Programs
- ▶ Integrating supply and demand
- ▶ Longer-term retail rate design issues

# HCE System Overview

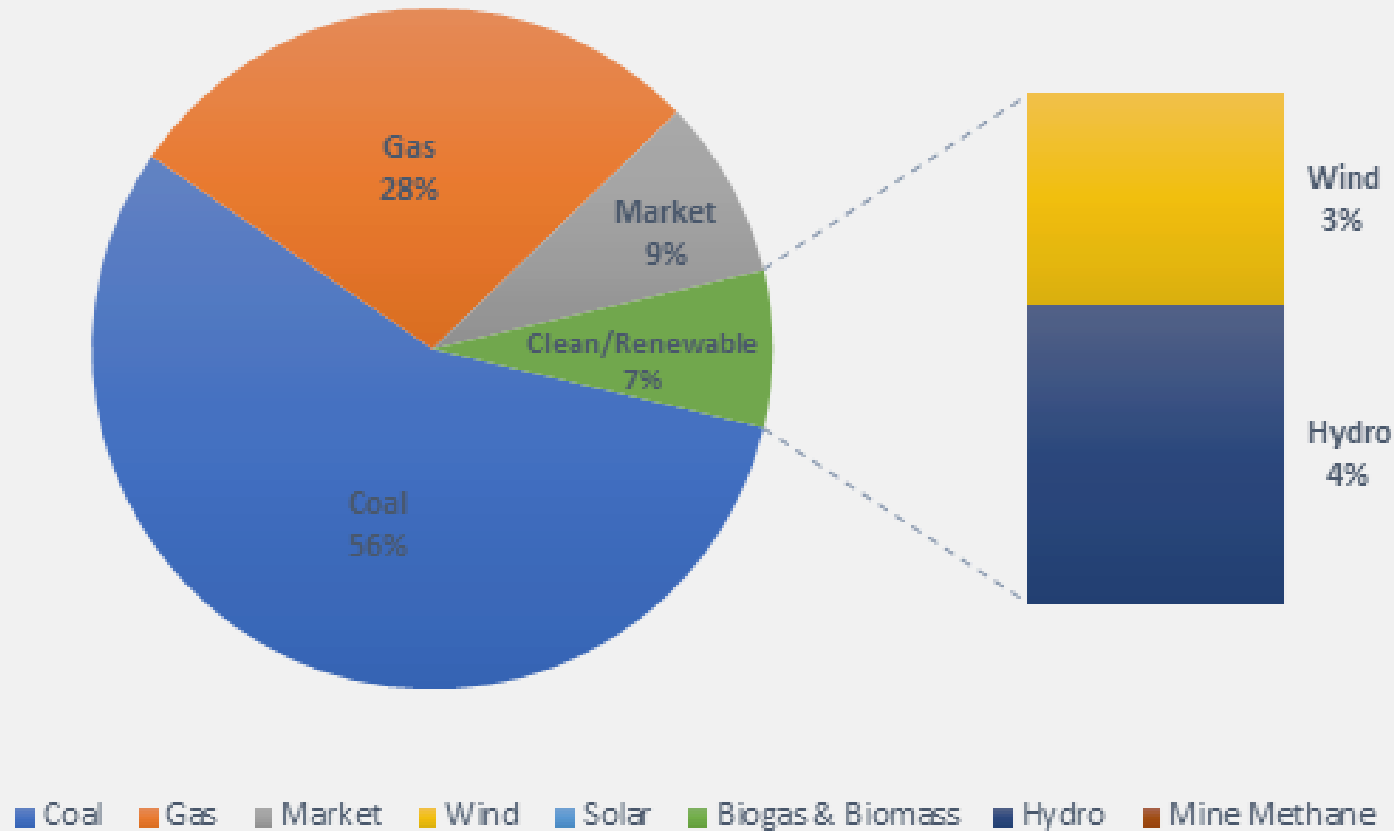


- ▶ HCE is an electric distribution cooperative
  - ▶ Winter peaking, driven by skiing and hospitality in Aspen and Vail Colorado, 50% residential, 50% C&I customers
  - ▶ Annual Energy ~1300 GWH; Annual Peak ~270 MW
- ▶ Unusual degree of Power Supply flexibility compared to other US cooperatives stemming from bankruptcy of its old Generation and Transmission cooperative supplier in the early 1990's
- ▶ Rates regulated by our customer/member-elected Board of Directors, giving greater flexibility than most state-regulated utilities

# HCE's Power Supply - 2005



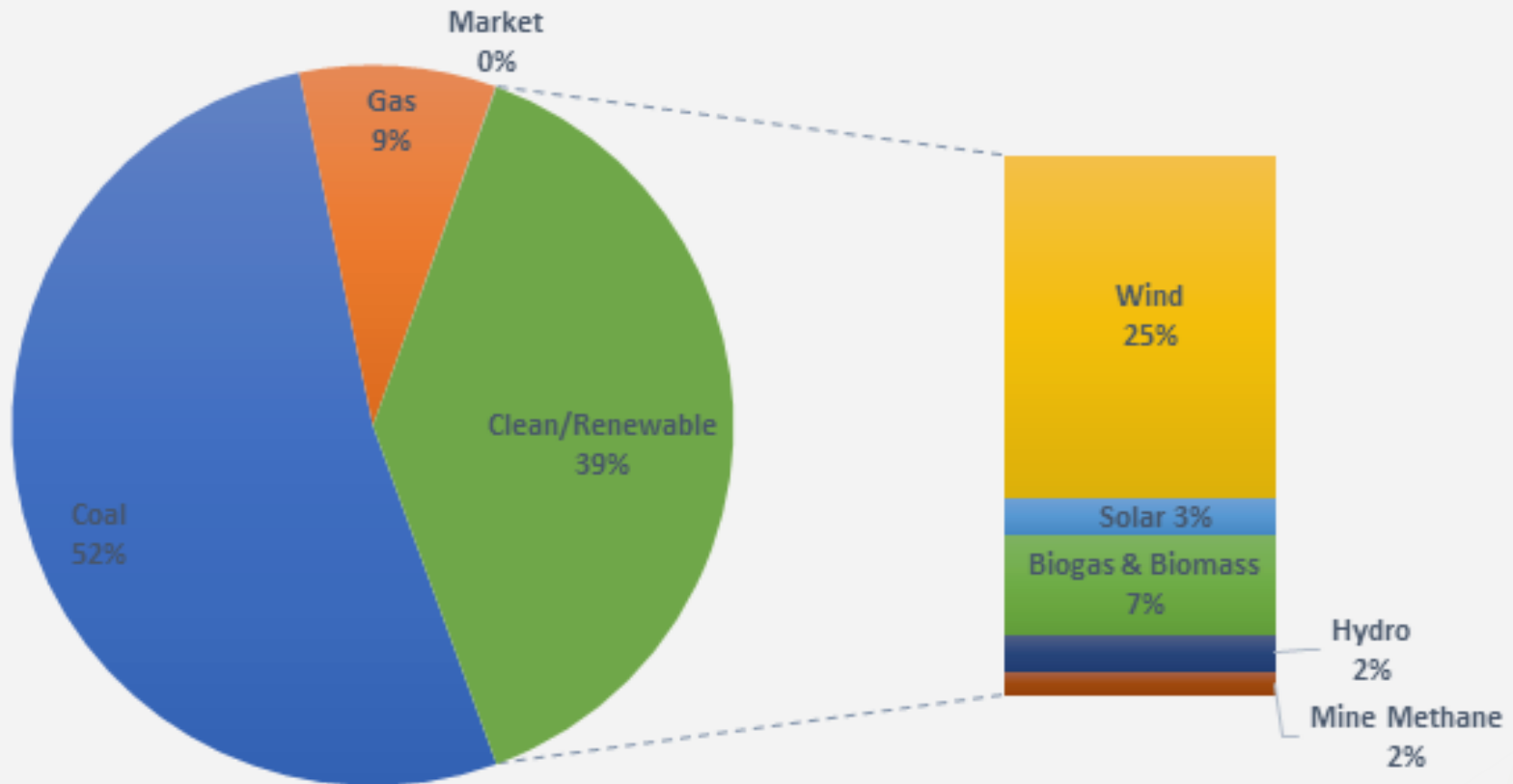
### 2005 Energy by Fuel



# HCE's Power Supply - 2018

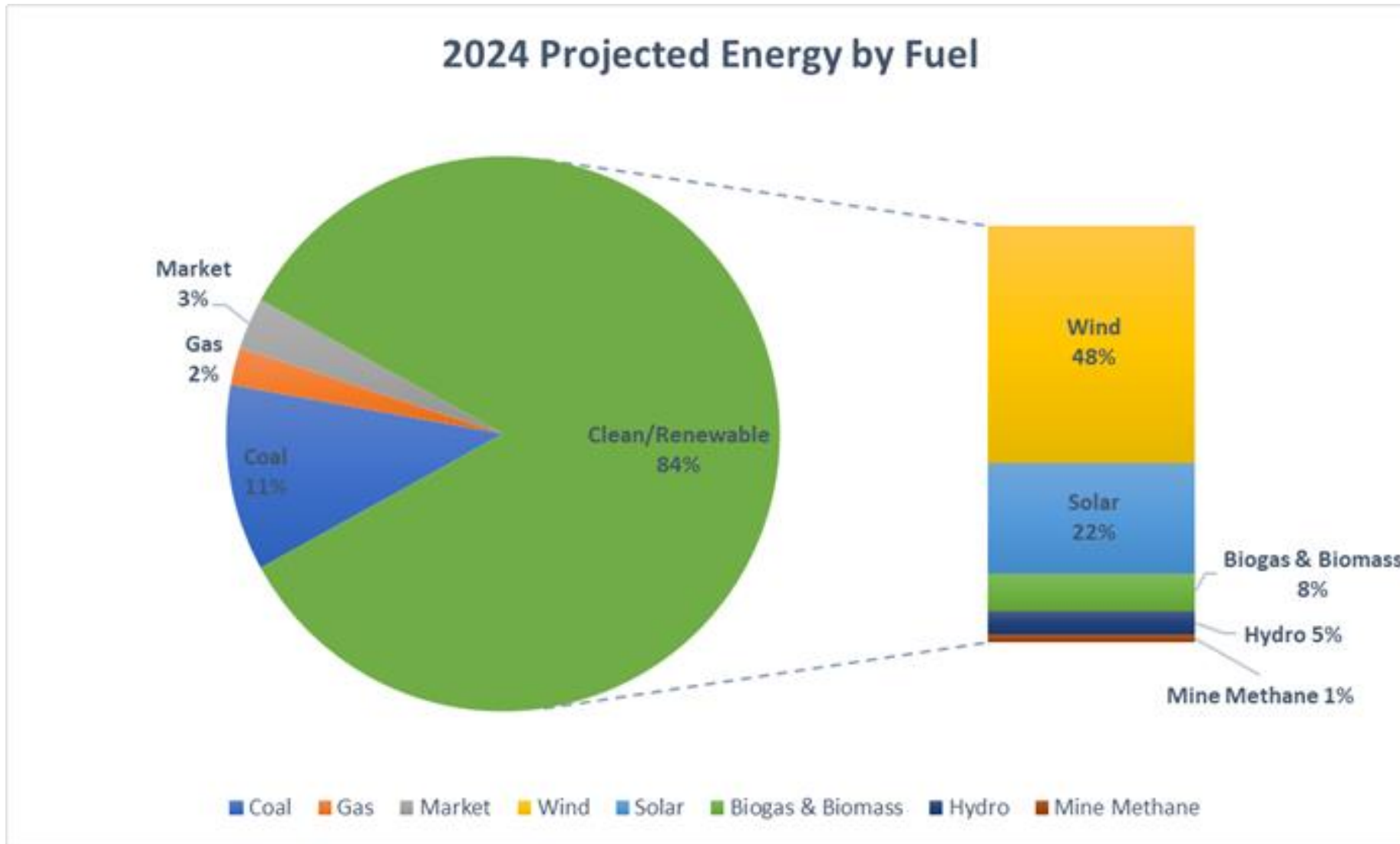


### 2018 Energy by Fuel



■ Coal ■ Gas ■ Market ■ Wind ■ Solar ■ Biogas & Biomass ■ Hydro ■ Mine Methane

# HCE Projected Power Supply Mix\* - 2024



\*Contracts in negotiation

# Grid-Edge: considerations in the split between bulk scale and local reliability



## ▶ *Bulk supply resource attributes*

### ▶ Favorable

- ▶ Lower prices for energy/capacity due to economy of scale

### ▶ Unfavorable

- ▶ Grid access rules, rules, rules (interconnection, delivery and market operations details)
- ▶ Congestion price risk and hedging
- ▶ Depending on jurisdiction and siting, may have delivery rate “pancakes” that add cost

## ▶ *Local supply resource attributes*

### ▶ Favorable

- ▶ Usually single-system coordination
- ▶ Lower delivery losses impact
- ▶ Can deploy more effectively than bulk resources to mitigate local resilience or system upgrade concerns

### ▶ Unfavorable

- ▶ Comparatively higher prices for energy/capacity
- ▶ Proliferation of resources for interface/control (100 vs. 100,000)

## ▶ Personal opinion on forecast US split for 100% RE:

- ▶ ~80% bulk, ~20% distributed, including utility and retail locations



# Distributed resource philosophy

- ▶ Our resource plan evaluates benefits of distributed resources based simply on the aggregate supply portfolio impacts, considering existing wholesale contract limitations and our corporate decision to foster customer-side net metering
- ▶ We do not impute benefit categories of capital investment deferral for delivery system impacts
  - ▶ This is more conservative than assuming the utility will be able to avoid system upgrades by reliance on a distributed resource
  - ▶ Our system dispatch and situational awareness at the distributed level is not yet up to the task of assuring deferred system investment
  - ▶ Our distribution design standards are not able to impute the level of incentive that would be fair to all customers
  - ▶ Net Metering installations, for example, in some cases cause the need for upstream distribution transformer upgrades rather than avoiding investment at the system level
- ▶ We may well hit very high levels of Renewable Energy before these thorny underlying philosophical questions are answered - if so, does that moot the issue?



# HCE Distributed & Bulk Resources

- ▶ At the 2024 projected level of ~84% annual RE content, our forecasted oversupply volume is around 5% annual energy
  - ▶ System load balance and flexibility needs increase
  - ▶ Creates a terrific opportunity for retail programs development to bring demand into alignment with supply
    - ▶ Residential battery storage; customer resilience product that provides oversupply mitigation by integrating with portfolio
    - ▶ EV optimized charging - modulate rate of charge for integration
    - ▶ Discounted rate options during renewable oversupply conditions and also to manage peak conditions

# Integrated with supply portfolio; increasing system flexibility



### ▶ Device-oriented Programs

- ▶ Behind-the-meter renewable generation incentives
- ▶ Behind-the-meter storage incentives
- ▶ Residential Storage+Resilience Program in pilot status
- ▶ Electric Vehicle chargers free in exchange for program enrollment
- ▶ Efficiency and CO2-avoidance devices, standard and custom incentives
- ▶ HCE will allocate renewable content from renewable projects to customer account(s) for project support (for example resource hosting)
- ▶ Large non-Net-Metered retail projects up to 500kW offered standard purchase with allocated renewable content
- ▶ Large non-retail distributed devices selected through resource planning solicitations

### ▶ Rate-oriented Programs

- ▶ Time of use rate option (4/1 ratio, 7 day-per-week on-peak period, no demand charges)
- ▶ Peak-time rebates for use below baseline
- ▶ Net Metering incentive support
- ▶ Zero-interest installation financing option for EV chargers and for residential storage (in pilot phase)
- ▶ Oversupply mitigation tariff for discounted supply above baseline



## Details on selected HCE Programs

- ▶ HCE subsidies for distributed renewable generation and distributed storage
  - ▶ Declining generation incentive with increasing size of resource, starting at \$500/kW
  - ▶ Up-front subsidy of \$250/kw for retail storage installations that allow HCE-system-based supply optimization; option for 0% interest financing of device and installation, with 10-year payback mostly offset through demand response credits; HCE maintains a minimum storage volume to protect customer resilience benefits
- ▶ Systems larger than 25kW up to 500kW cap may sell directly to HCE
  - ▶ HCE tracks and allocates the renewable attributes on behalf of resource owner's load(s), up to 100% of customer's annual consumption, surplus to all customers
    - ▶ Resource owner may nominate any customer's load accounts for participation in their array
- ▶ Electric Vehicle chargers - free to customer home or business in exchange for utility option to modulate rate of charging



# Development of Signaling and Dashboard

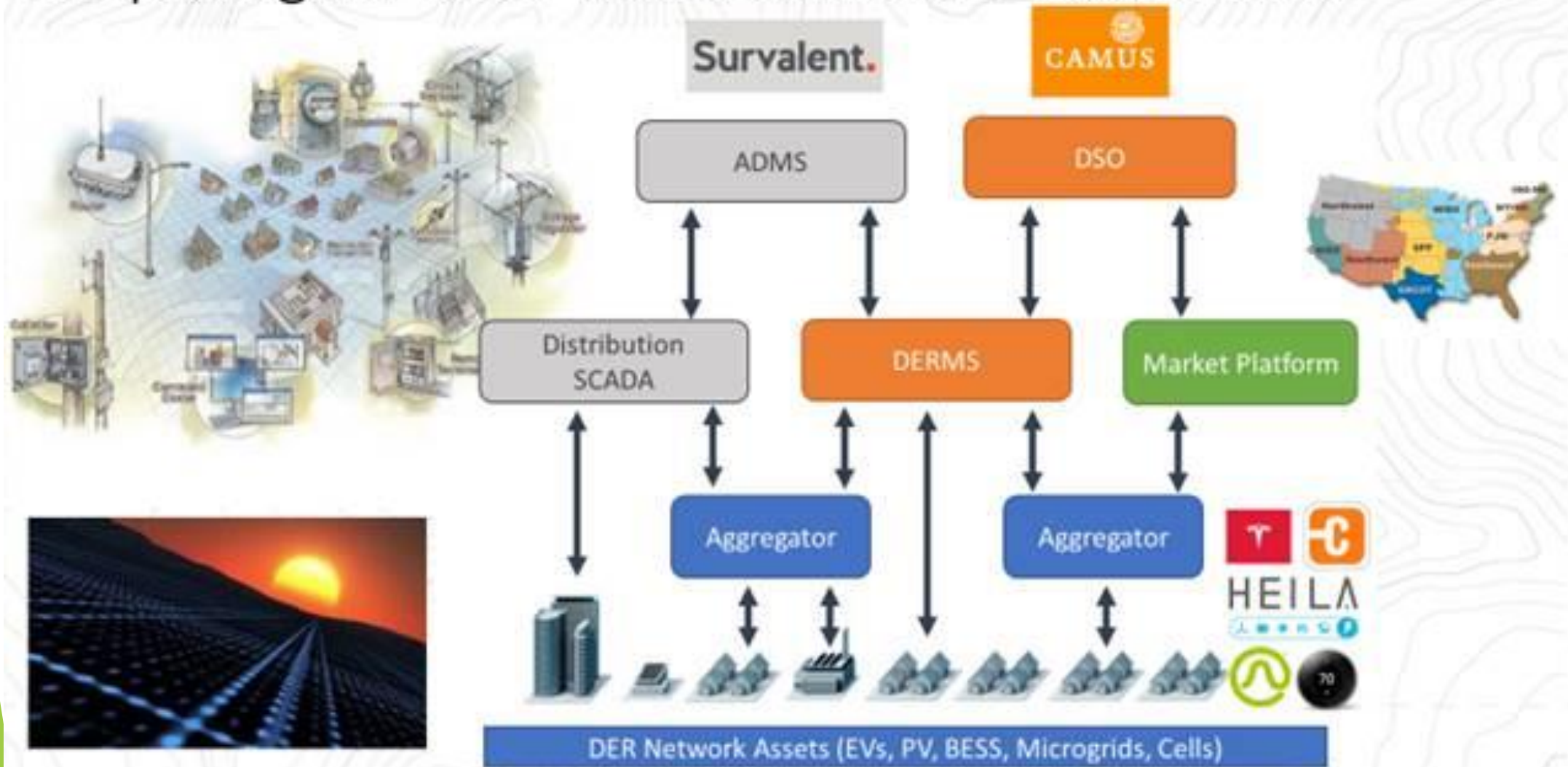
- ▶ Most distribution systems have limited SCADA-type device status and signaling capability
- ▶ Most distribution systems have little integration with resource scheduling or wholesale market optimization
  - ▶ Old utility generating fleet signaling was via internal SCADA interface
  - ▶ Now we see the distributed resources being developed by hardware and software vendors who manage signaling and control through proprietary software interfaces, in many cases requiring license fees for use
    - ▶ We are concerned that excessive reliance on proprietary interfaces could increase costs for our customers and we therefore advocate for open source device interface standards
- ▶ HCE is expanding its capacities in the areas of status/signaling and device deployment for aggregate wholesale portfolio optimization
  - ▶ Project underway with Camus Energy, will provide a situational awareness dashboard (new generation AGC/Scheduling desk?) with a signaling interface through APIs to distributed devices to provide optimization up to the wholesale portfolio level

# Increasing emphasis on forecasting and scheduling



- ▶ Forecasting next full operating day is one key aspect to optimizing system supply - day-ahead schedules/offers
  - ▶ Wind / Solar renewable resource output forecast by 0500 of current day
  - ▶ Load and Net-Load at Wholesale Interface forecasts by 0500 of current day
- ▶ These form the inputs for regional wholesale market supply optimization
- ▶ These also form signals for our retail-side programs activation
  
- ▶ Ongoing forecast updates are used to maintain situational awareness throughout the operating horizon

# Preparing for the Future & More Flexible Grid





# Longer-term retail rate design concerns

- ▶ Reduce component of fixed costs recovered in variable part of rates
  - ▶ Already a potential “political” issue
    - ▶ Those who have elected Net Metering resist changes to their fixed charges
    - ▶ Developers who want to sell more Net Metering want to keep as much cost in the variable portion of retail rates as possible, since this is the component offset by Net Metering
- ▶ Continue program development and customer education/awareness to build system flexibility and balancing through retail-side incentives
  - ▶ Customer-option peak control program has had good uptake and response, less response drop-off than traditional demand response programs
    - ▶ Offer credits for peak demand response reductions below baseline
  - ▶ Piloting customer-option discount for above-baseline consumption during renewable oversupply
- ▶ Cap the market: Establish objective criteria for retail-side flexibility procurement based on wholesale market ancillary service obligations, resource adequacy and portfolio optimization criteria
  - ▶ There is not unlimited upside to solar, wind or storage development; long-term saturation impact is a real possibility for a boom/bust cycle



**END**