

Guidehouse – Energy, Sustainability, and Infrastructure



- A diverse, inclusive team of 700+ globally
- Trusted advisors to energy companies, government agencies and NGOs, and large corporations and investors

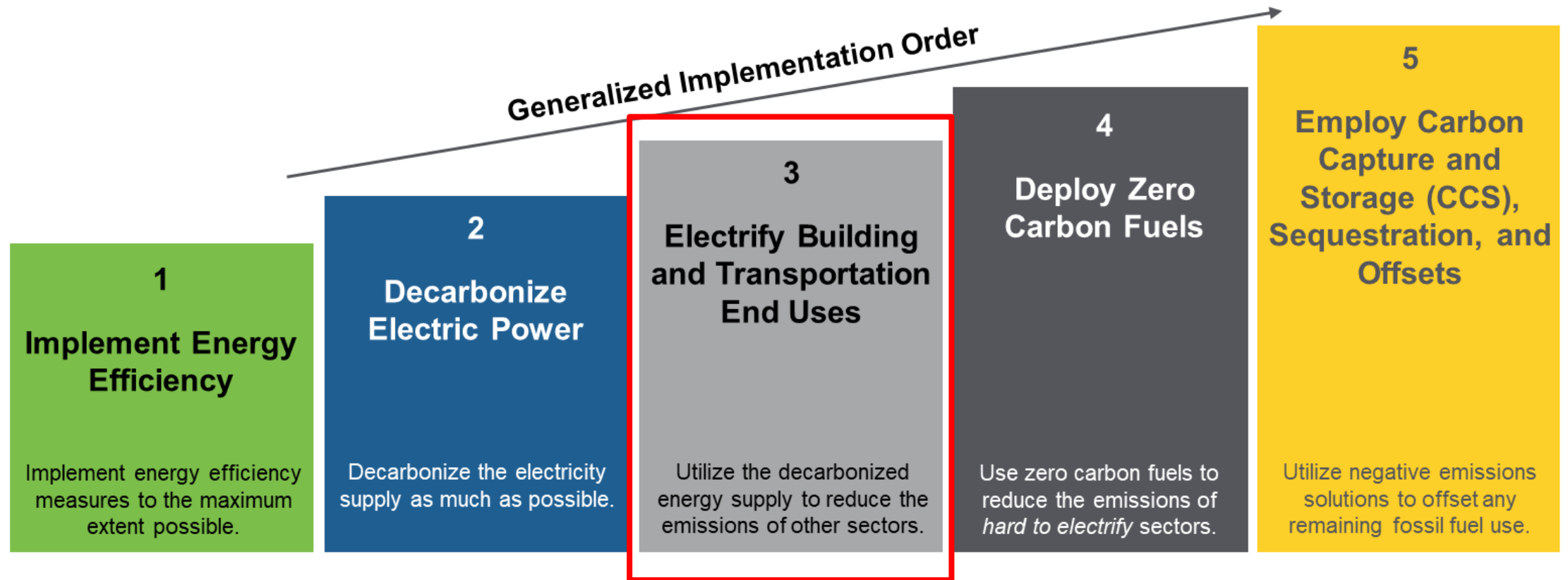


- Helping clients thrive in a rapidly changing environment
- Creating more sustainable, resilient, governments, companies, cities, and infrastructure to deliver decarbonization and sustainability results



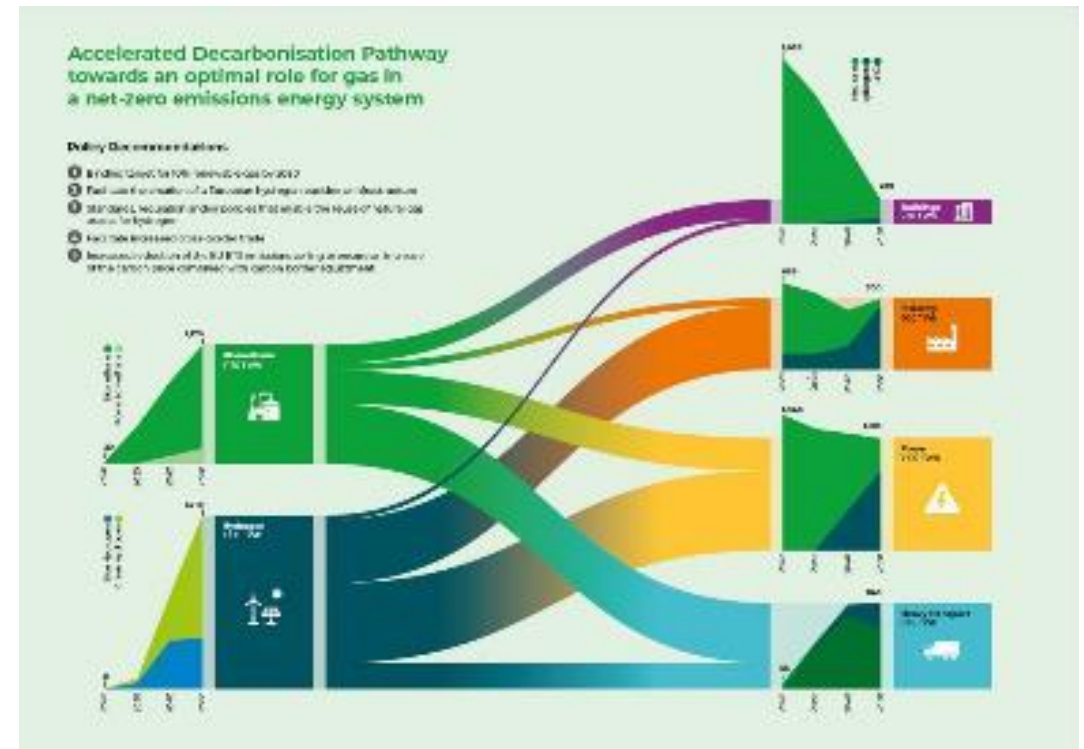
- Leading through insights to drive transformation and customer engagement
- Enabling effective use of resources and infrastructure for citizens and economies in an evolving Energy Cloud future

The Transition to Net-Zero is underway; momentum is gathering; utilities need to begin planning for and reacting now.



Economy-wide models can objectively analyzing pathways to carbon neutrality in which electrification is complemented by low carbon gas and associated gas infrastructure.

- **Pathways modeling can be used to:**
 - Solve for minimized energy system costs over the analysis horizon (e.g., 2020-2050) – including supply, infrastructure, and demand costs.
 - Determine the optimal capacity and dispatch for supply and infrastructure, as well as the optimal mix of demand-side technologies.
 - Constrain by existing and planned supply and infrastructure capacity, interim & final emissions reduction targets, and balancing energy supply and demand



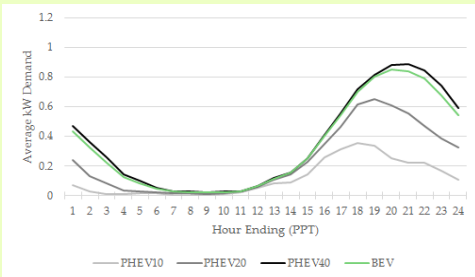
Beyond just Grid: The Transition is Changing Demand/Driver Relationships

The electrification of transport and heating, impact of climate change, and emergence of behind-the-meter DERs change everything.

Electric Vehicles



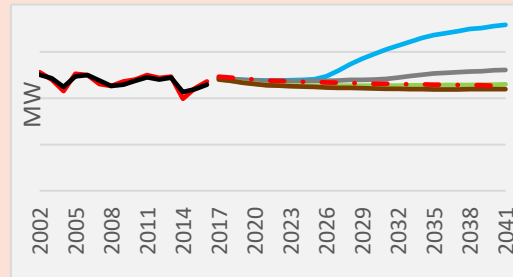
- **Risk:** Significant & consistent increases in feeder loading at peak
- **Mitigation:** Highly responsive to price signals
- **Uncertainty:** Driven largely by policy



Electrification of Home Heating



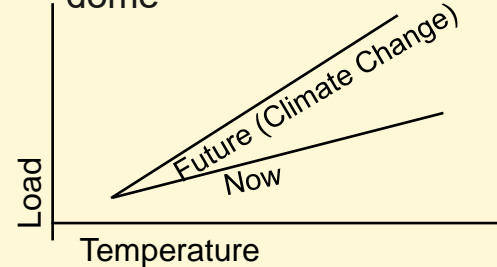
- **Risk:** Non-linear heat pump power requirements substantially increase peak & reduce load factor
- **Uncertainty:** Driven largely by policy



Climate Change



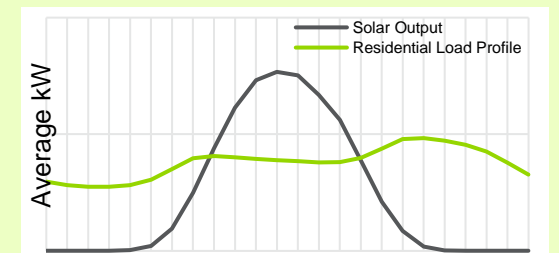
- **Risk:** Consistently higher temps will increase load's sensitivity to temperature (more A/C units)
- **Uncertainty:** Random within season – e.g., “heat dome”



Distributed Energy Resources



- **Risk:** Off-setting effects of non-utility DER adoption impact asset planning response to other risks (risk)
- **Uncertainty:** Driven largely by policy & consumer hedging



Is the grid ready for widespread EV adoption?

Broadly, we have the technology and capabilities available to make the grid ready but utilities will need to plan for and modify investments and programs to ensure that the transition happens smoothly.

Utilities need to consider two key questions:

01

When?

- When is really key - ideally people would charge their EVs at off-peak times
- Utilities have been testing their ability to shape customer behavior by structuring rates or providing incentives to customers to encourage them to charge their EVs at off-peak times

02

Where?

- Changes in distribution and transmission required as a result of changes in demand locations and patterns
- Leads to pressure on the grid in places where there was not historically

The electrification of some of the energy system that results from decarbonization will require a re-examination and changes to planning processes.

People

Load forecasters alone can't provide the load forecasts that you need.

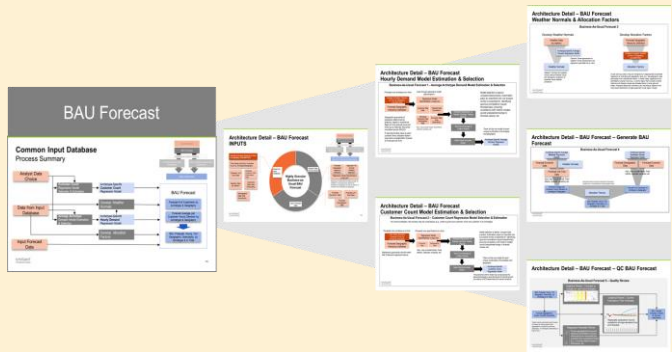
- **No model**, AI, neural net, or machine-learning **can predict policy** or characterize its implications
- **Diverse** perspectives providing evidence-based analysis are required



Process

Structural change requires planning, documentation, and flexibility.

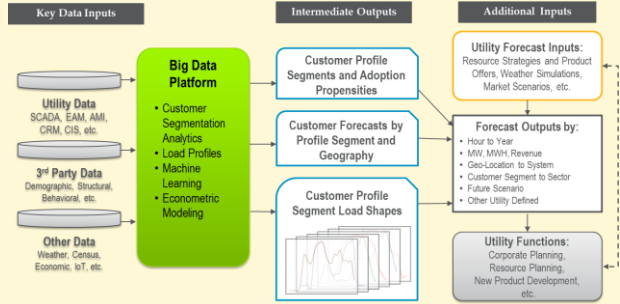
- Expanding involvement in forecasting requires **changes in governance**: who signs off on what?
- Collaboration requires communication: **who talks to whom?**



Technology

Granularity must increase across the board:

- Hourly to understand intra-daily peak migrations
- Geographic to plan for non-traditional loads and resources
- Cross-Sectional to project growth in groups without historic precedent



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