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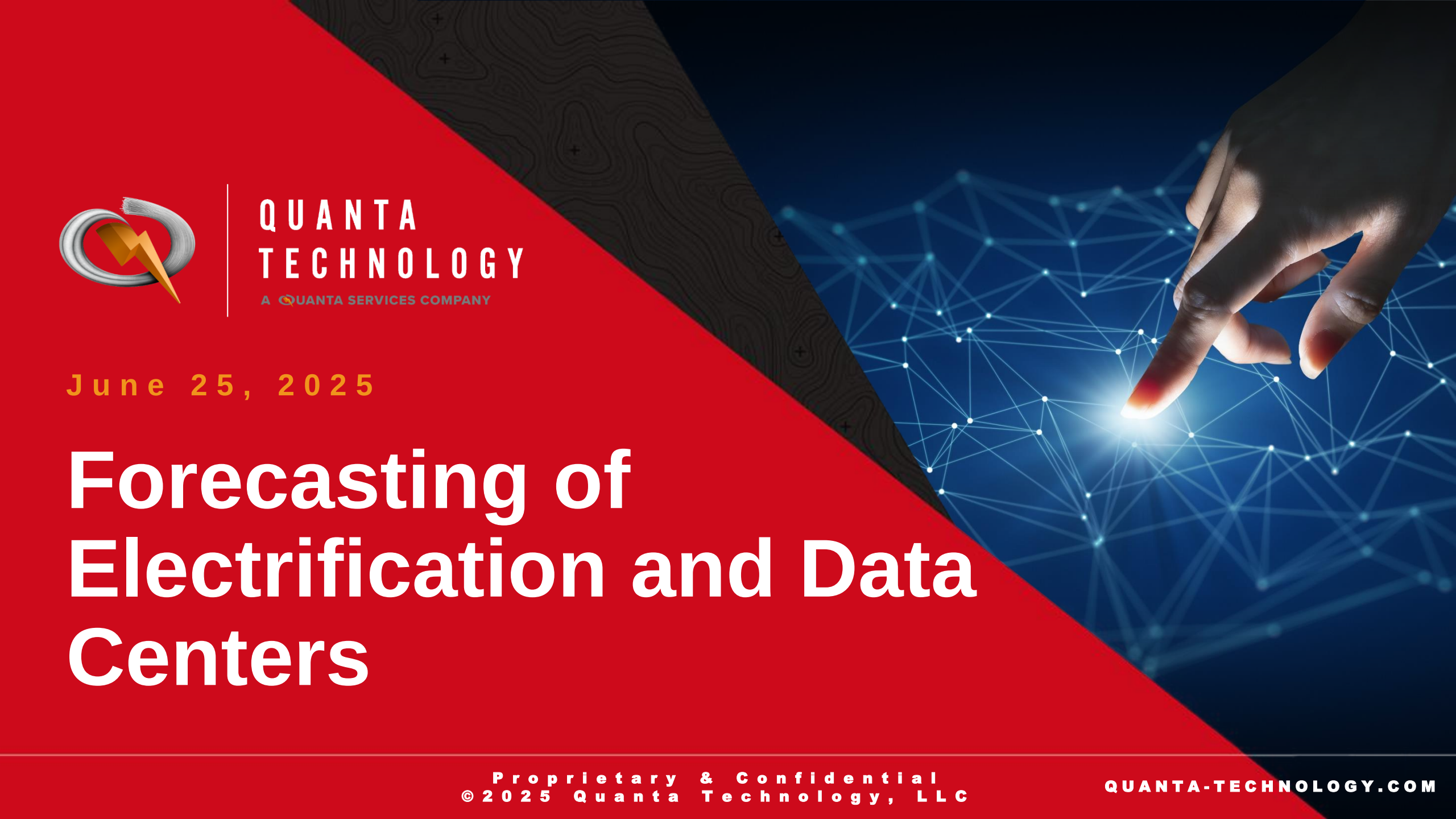

June 25, 2025

Forecasting of Electrification and Data Centers

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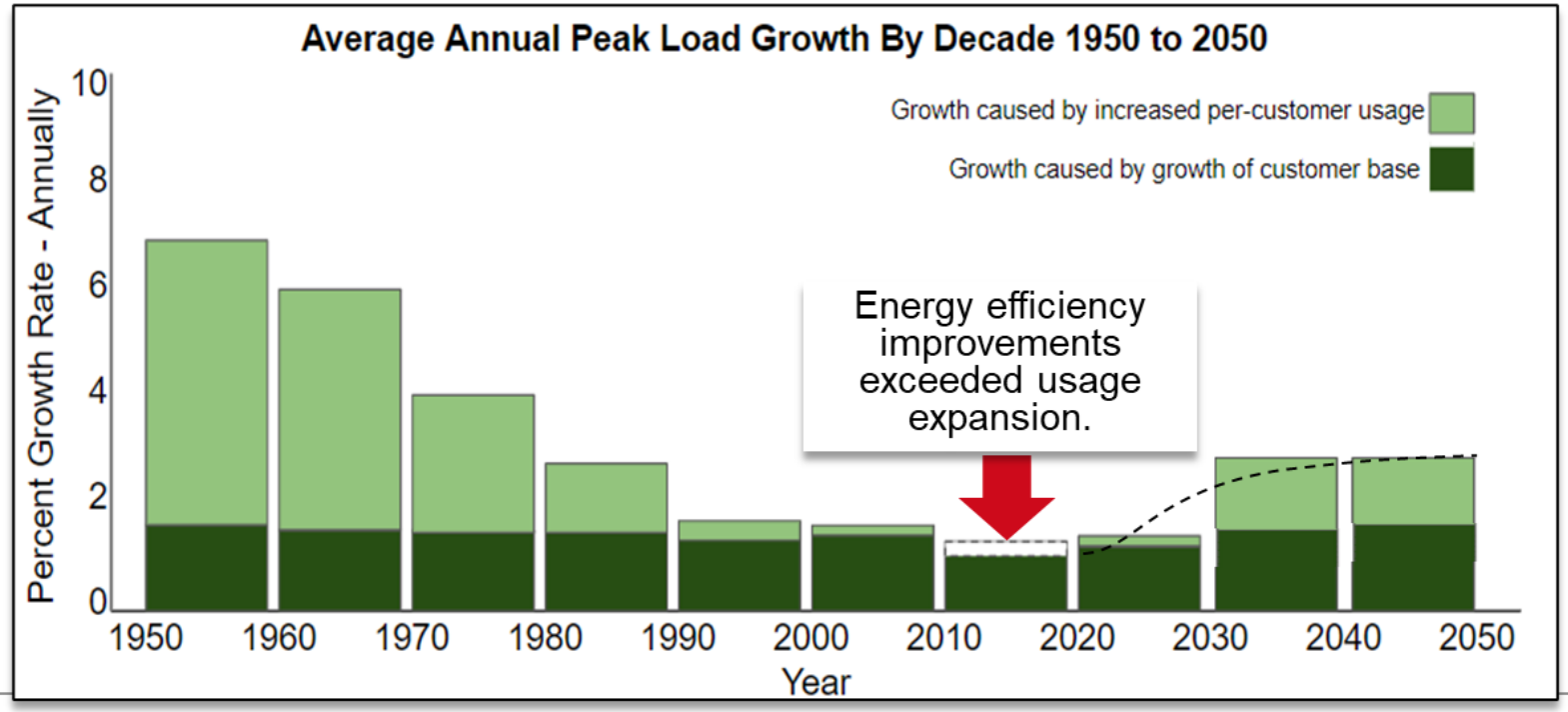
The Power Industry's Double Challenge:

- More load growth than current planners have seen.
- Load growth of different character.
  - Increase due to increase in *per-capita usage,* rather than customer-base growth.



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This increase in growth is driven by:

1 Data center industry

- Data center industry *is* the Internet.
- It is exploding with growth with several different segments.
- Industry's locational and business priorities shifted.
- Some studies project it will use 25% of all energy by 2060.

2 Electrification

- **Transportation electrification:** a shift to EVs, rail systems, and port facilities, etc.
- **Stationary electrification:** a trend toward more use of electricity for heating and industrial processes due to:
- Technological advancement
- Government policies and societal concerns

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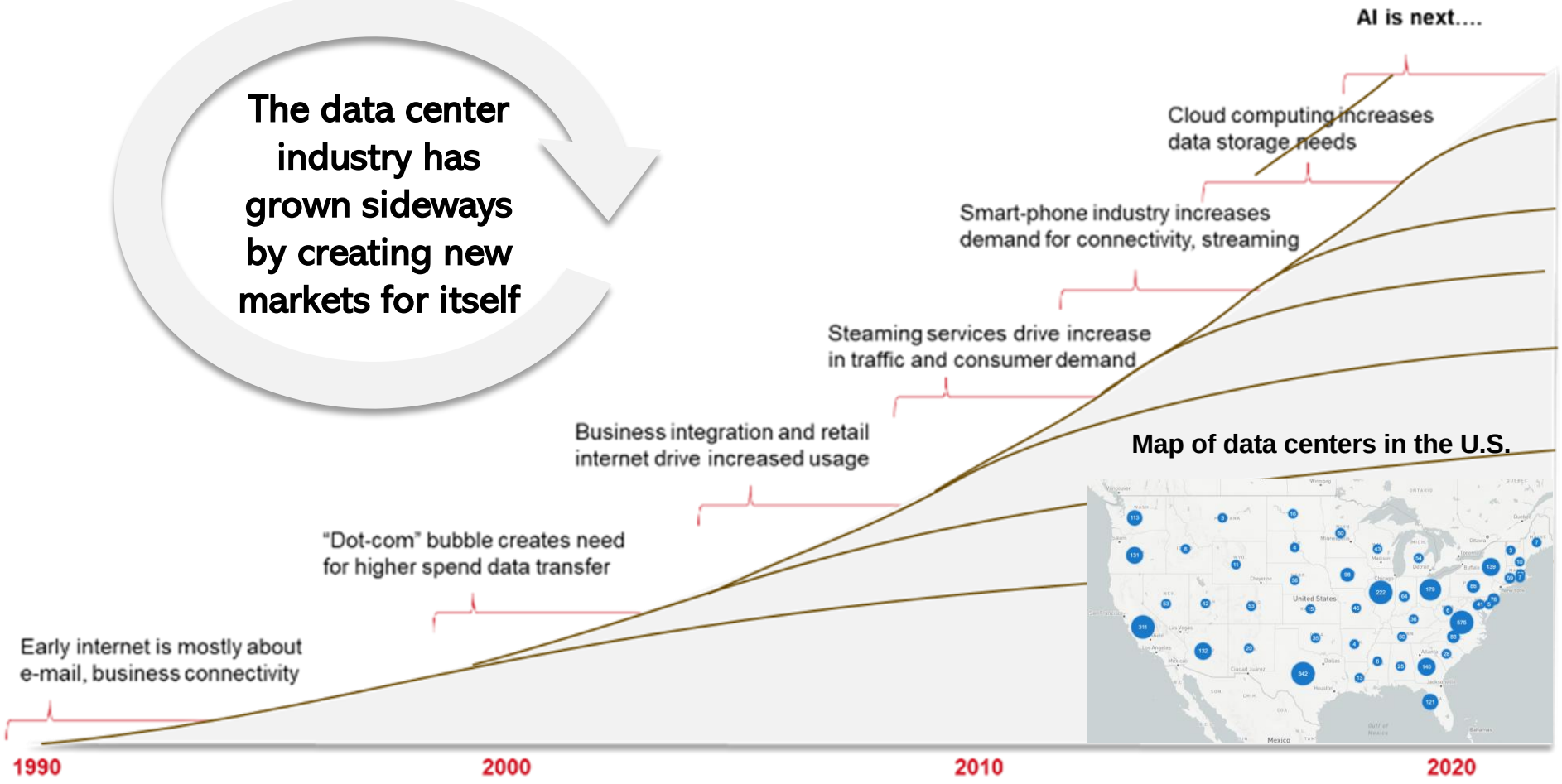
Not One Industry

The data center industry has grown sideways by creating new markets for itself



- Modeled as multi-segment industry, the data center industry creates new markets for itself
- A different market with different owners and business models:
- A different design architecture and operation.

Analogous to petroleum industry in the mid-20th century growing into the petrochemical industry.

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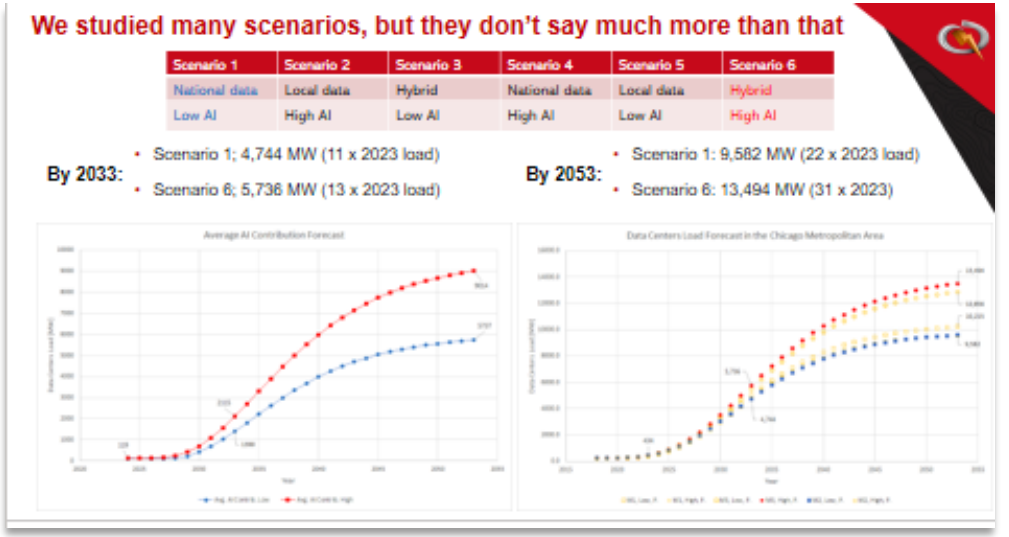
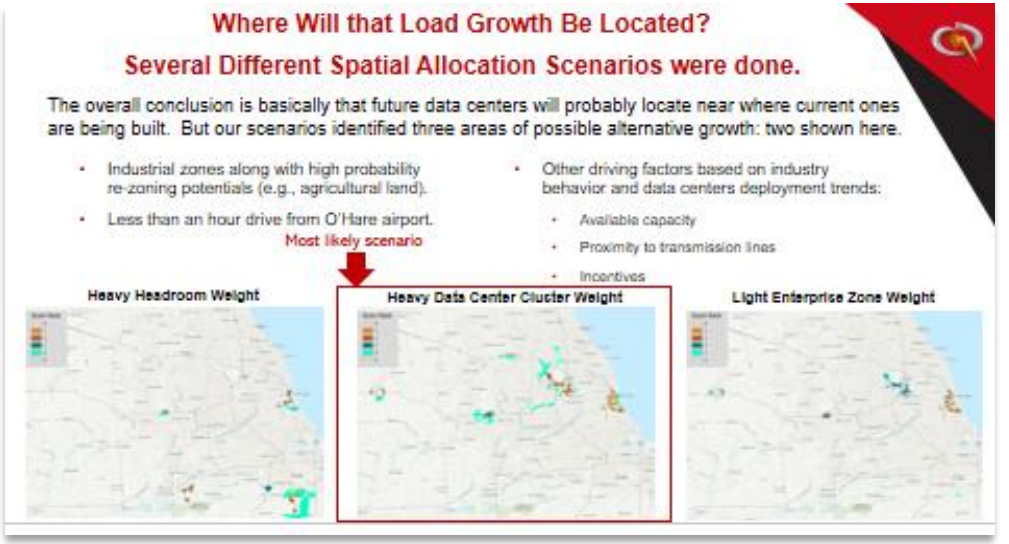
Data Center Forecast with Existing History

- **Analyze and forecast** load and growth historical trends by amount and location at the zonal, substation, or feeder level.
- **Define** load-curve shapes, breaking them into subcategories if needed.
- **Apply** locational, econo-demographic methods.
- **Develop** scenario-based forecasts when needed.
- **Ensure** a credible, transparent, and traceable methodology with solid technical credibility and a proven record of use.





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Data Center Forecast with No Past History

Templating forecast based on similar regions with historical data and local factors.

Driving factors based on industry behavior and data centers deployment trends:

- Land use and zoning
- Incentives
- Available delivery capacity
- Proximity to transmission lines
- Proximity to airports

Driving factors for deployment trends and their relative weights:

Criteria	Factors
High weight	• Fiber connectivity • Market size • Cloud availability • Power delivery
Medium weight	• Incentives • Taxes • Political stability • Vacancy • Development pipeline • Sustainability • Smart cities
Low weight	• Power cost • Land price • Environmental risk

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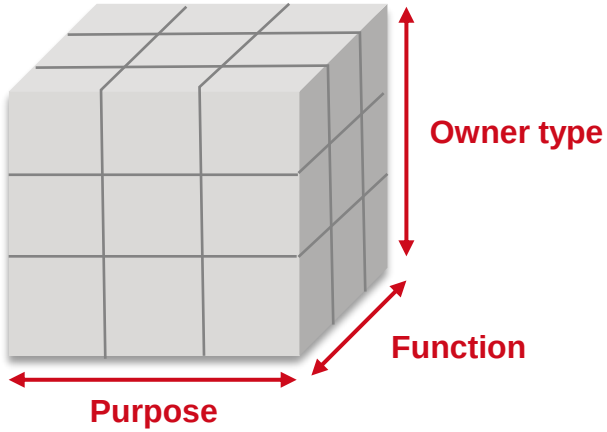
Data Center Modeling in Forecasts as well as in Siting and Operating (Load-Curve) Models

We use a categorization approach based on three basic dimensions to track and model 15 slightly to very different industry models.

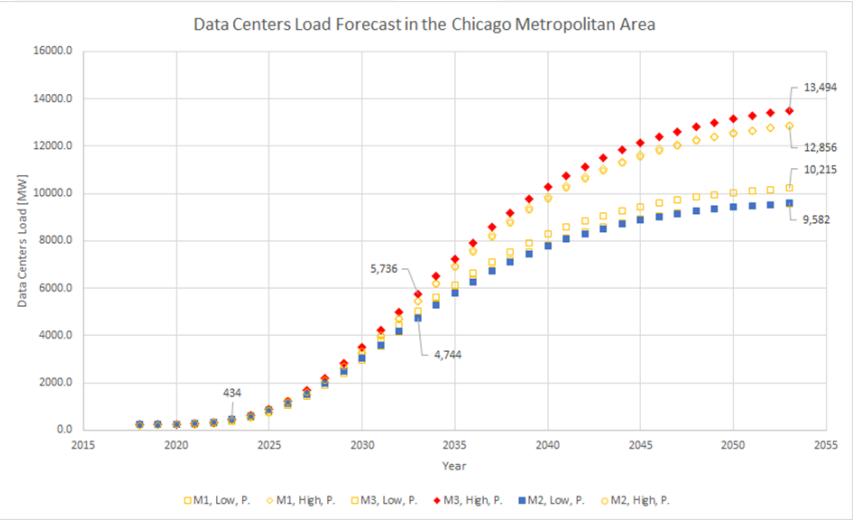
- **Econometric and demographic**
- **Societal consumer-business**
- **Industry-specific reports**



Using deep research and a data-driven reverse-engineered model of a segment's business model, location preferences, and growth aggressiveness.

Models to forecast growth:

Training set	Projections
National data	Applied to client territory
Specific territory	
Hybrid	



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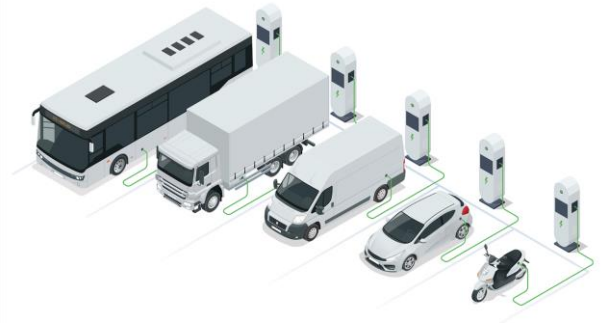
Electric Transportation Forecast



To analyze and forecast of the growth of electric transportation loads:

- *The four categories of EV forecasting must be considered.*

1. **Light-duty vehicles**

   As an end-use load category across all residential and light and medium commercial customer classes, with sensitivity to several economic and demographic variables.

2. **Public charging network (local)**

   As a new commercial customer type (think of it as the 21st century equivalent of gasoline filling stations), with retail-type sensitivities and interactions with other classes.

3. **Public charging network (over the road)**

   As a new industrial customer type (think of it as the 21st century equivalent of truck-stop), with industrial sensitivities and interactions with the system "global model".

4. **Fleets (light-, medium-, and heavy-duty)**

   As either a new industrial customer type or as a new end-use within current industrial classes. Either one will work and there is not much difference between the two.

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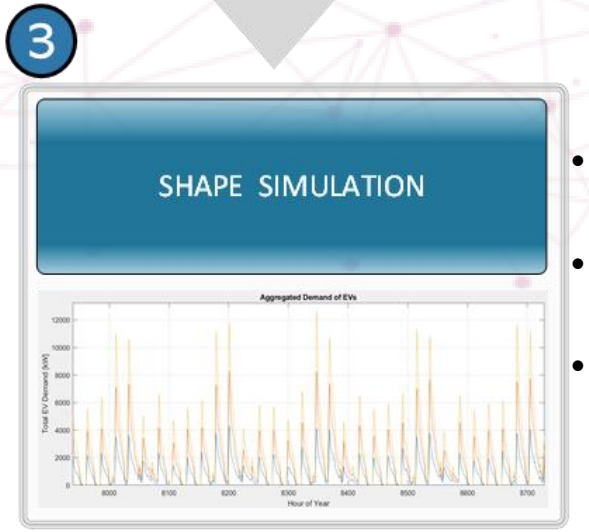
LD Forecast

- How many EVs are expected in years to come?
- How will adoption rates vary with location?
- What types of EVs will grow more at each location?

- When will EVs start and stop charging?
- What distance will each EV travel each day?
- How fast will EVs charge?



- How will EVs impact system elements?
- When will peak demand happen?
- What is the expected energy demand?

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MDHD Forecast

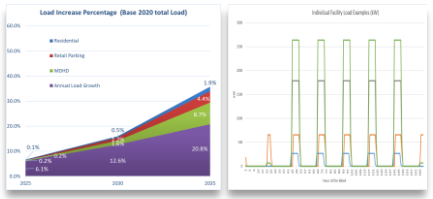
1. **Address** level bottom-up analysis to identify site locations
2. **Forecast** adoption and estimate loads
3. **Map** facility loads to feeder nodes, **Impact** analysis with hourly **Power Flow**
4. **Evaluate** mitigation options: managed charging, DERs, and infrastructure upgrades

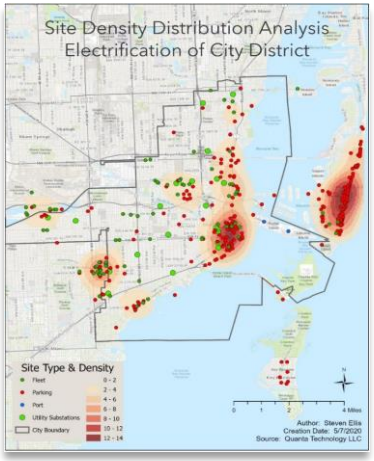
United States Department of Transportation
FMCSA
Federal Motor Carrier Safety Administration

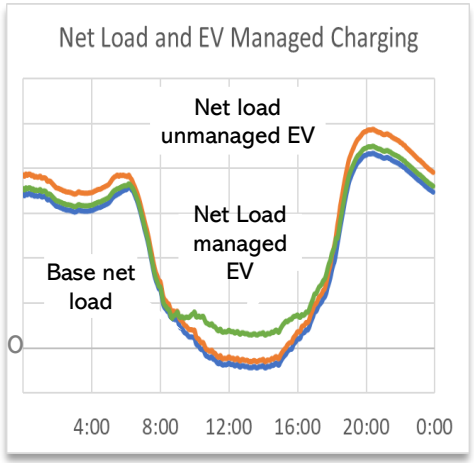
Fleet Database | GIS

SICCODE | DMV

- Adoption curves
  - Regulations
  - Economics
- Scenario analysis
- 8760 load profiles







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To wrap up:

Load forecasting is more complex and difficult.

Revisions needed to:

- Address the more complex per-capita consumption growth.
- Include study of several new “uncertainty modes” per-capita growth brings.
- Accommodate the higher growth rates that will be seen.

Planning is more complex, too, for the same, and other reasons.

T&D planning, and the forecasting behind them:

- Need more and different coordination of T&D.
- Must look/plan farther ahead.
- Need to change “data emphasis” and models to recognize several changes in our knowledge.

Middle-point coordinated T&D planning

T&D planning functions need to be better integrated:

- Mutual but transmission led planning of the substation level.
- Over a longer time-period than the lead time on T, D, DER, or NWA contract lifetimes.
- With certain characteristics.

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