

Role of Electrification in Decarbonization

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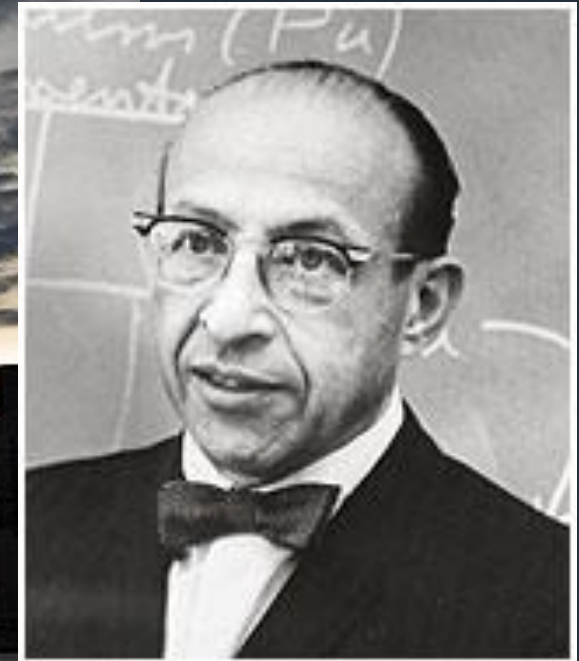
IEA-IETA-EPRI Workshop on GHG Emission Trading

**Paris, FR
11 October 2017**



EPRI – Born in a Blackout

Founded in 1972 as an independent, nonprofit center for public interest energy and environmental research



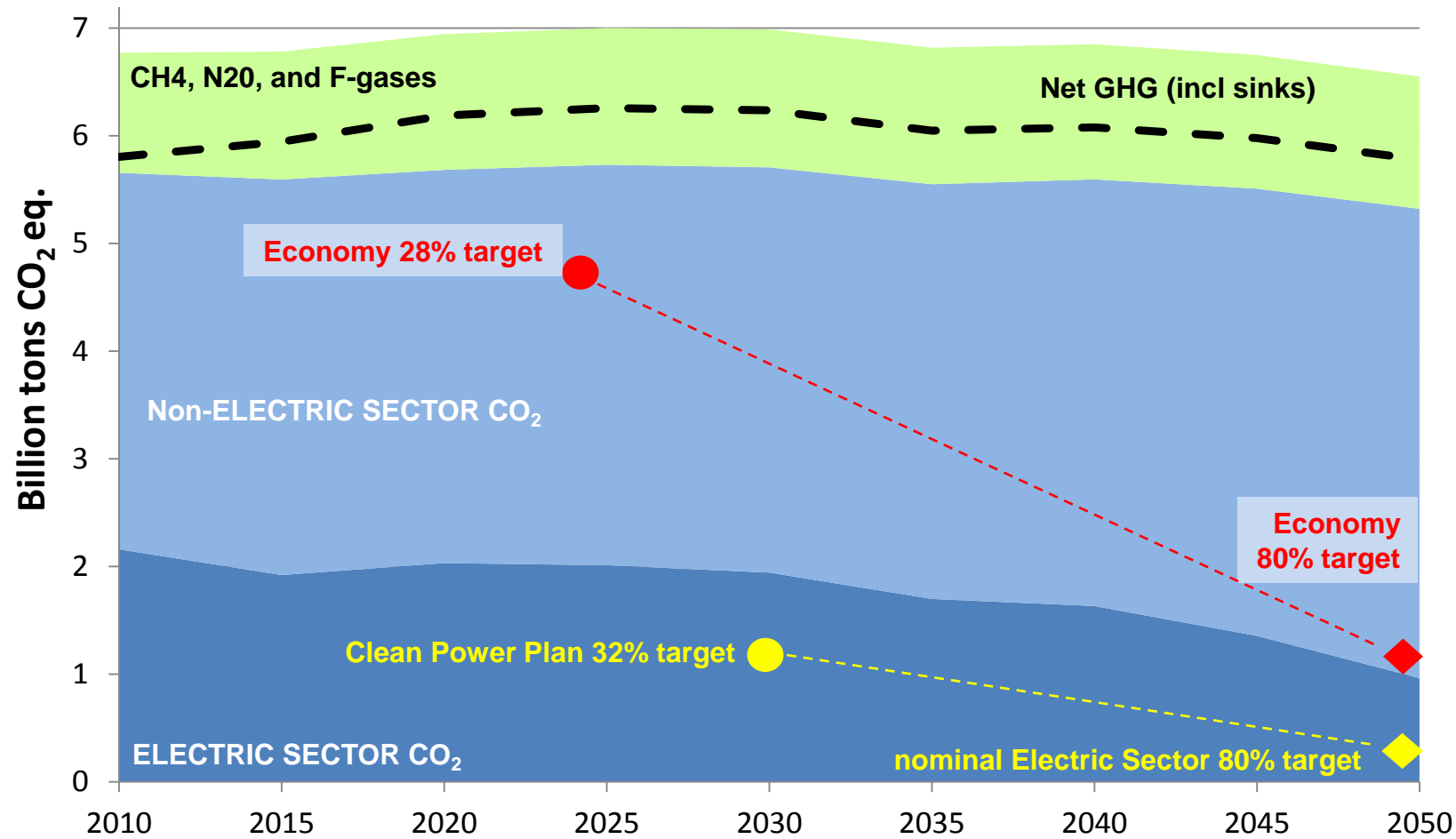
New York City, The Great Northeast Blackout, 1965

Our Members...

- 450+ participants in more than 30 countries
- EPRI members generate approximately 90% of the electricity in the United States
- International funding – nearly 25% of EPRI's research, development, and demonstrations



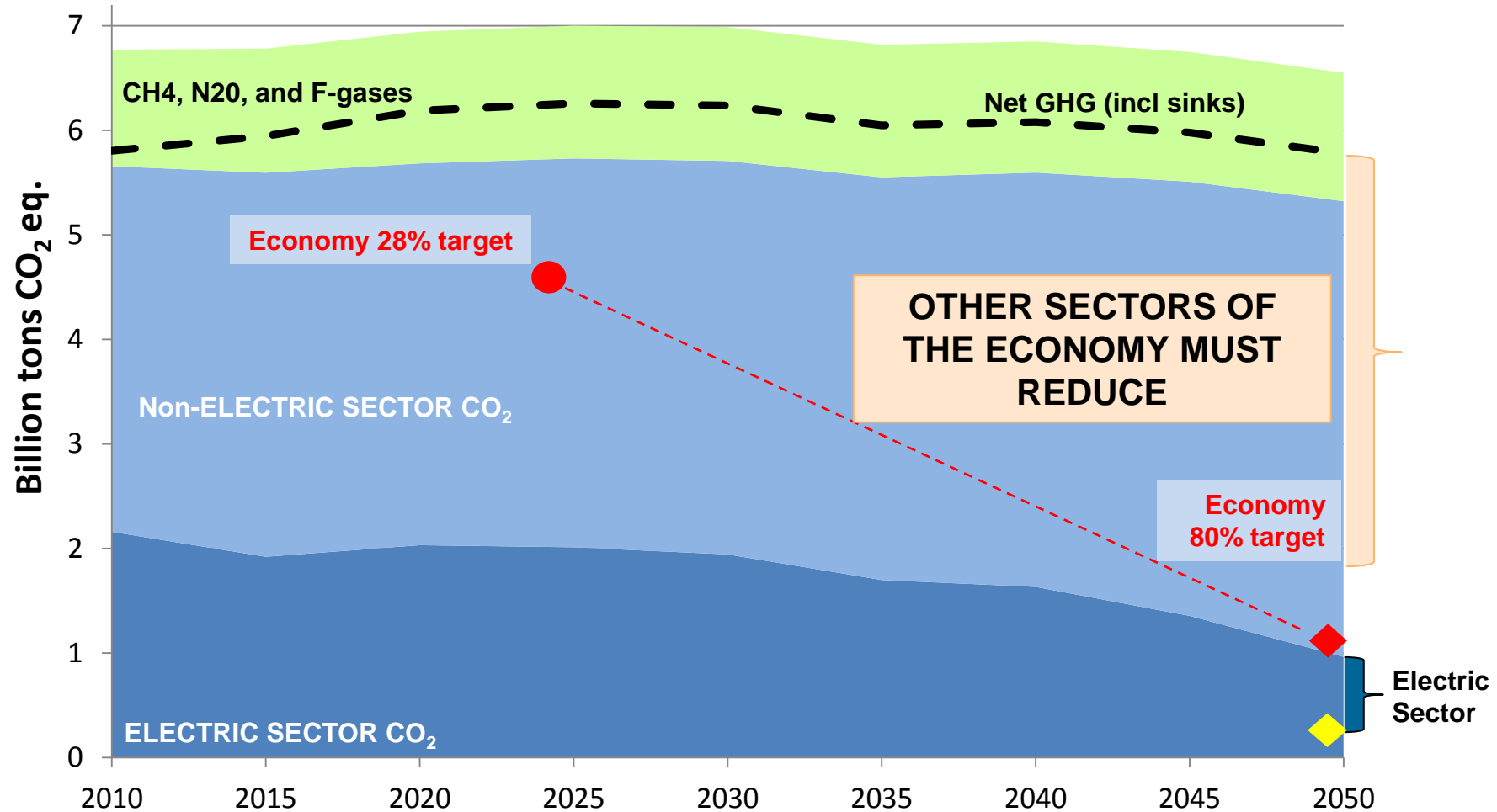
U.S. Greenhouse Gas Reduction (GHG) NDC: Economy-wide Reduction of 28% by 2025; Longer-term Goal of 80% by 2050



Source: US-REGEN data; Energy Modeling Forum 24

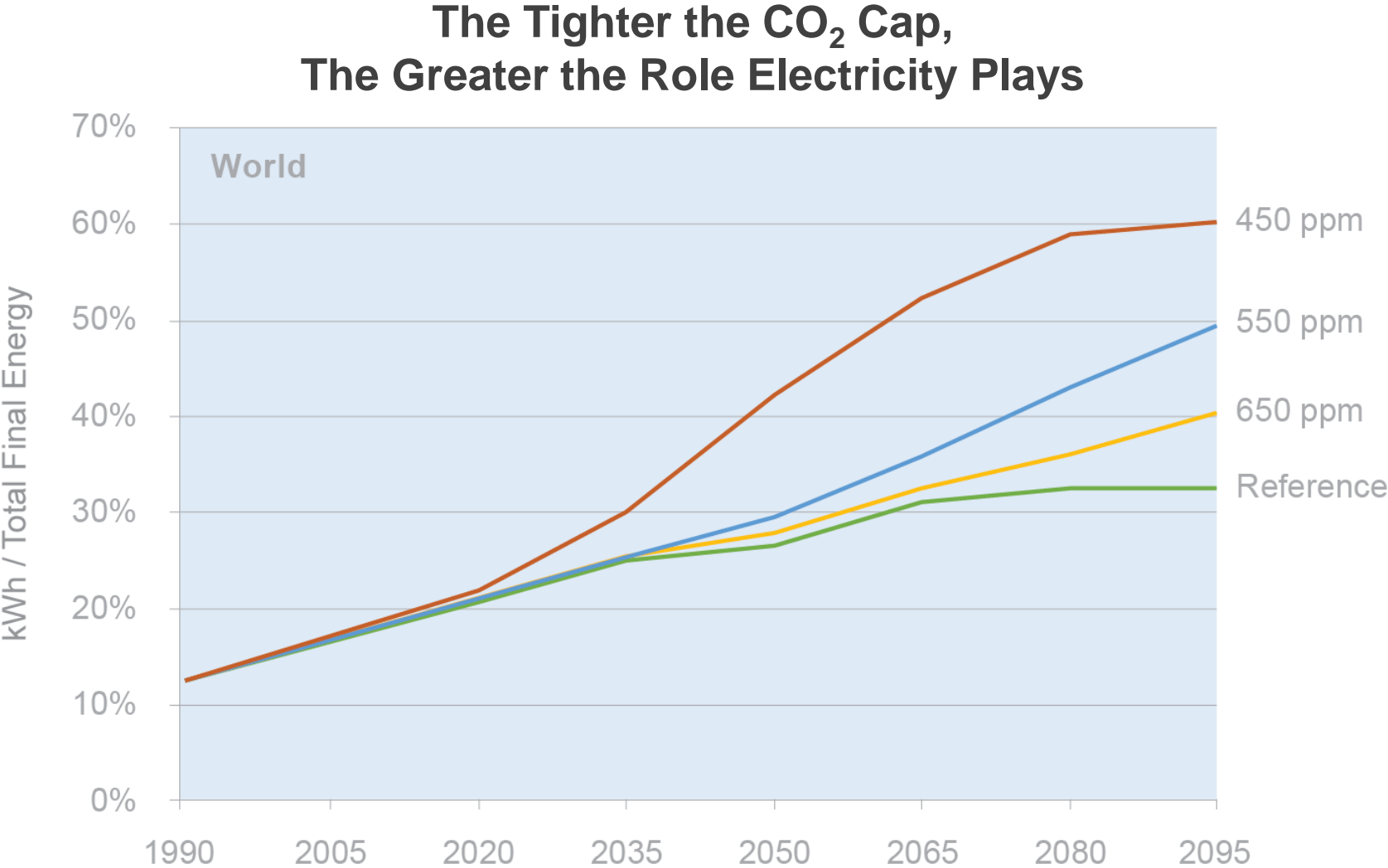
U.S. Greenhouse Gas Reduction Targets:

What Role will the Electric Sector Play in Economy Reductions?



Rest of economy must make dramatic reductions – HOW?

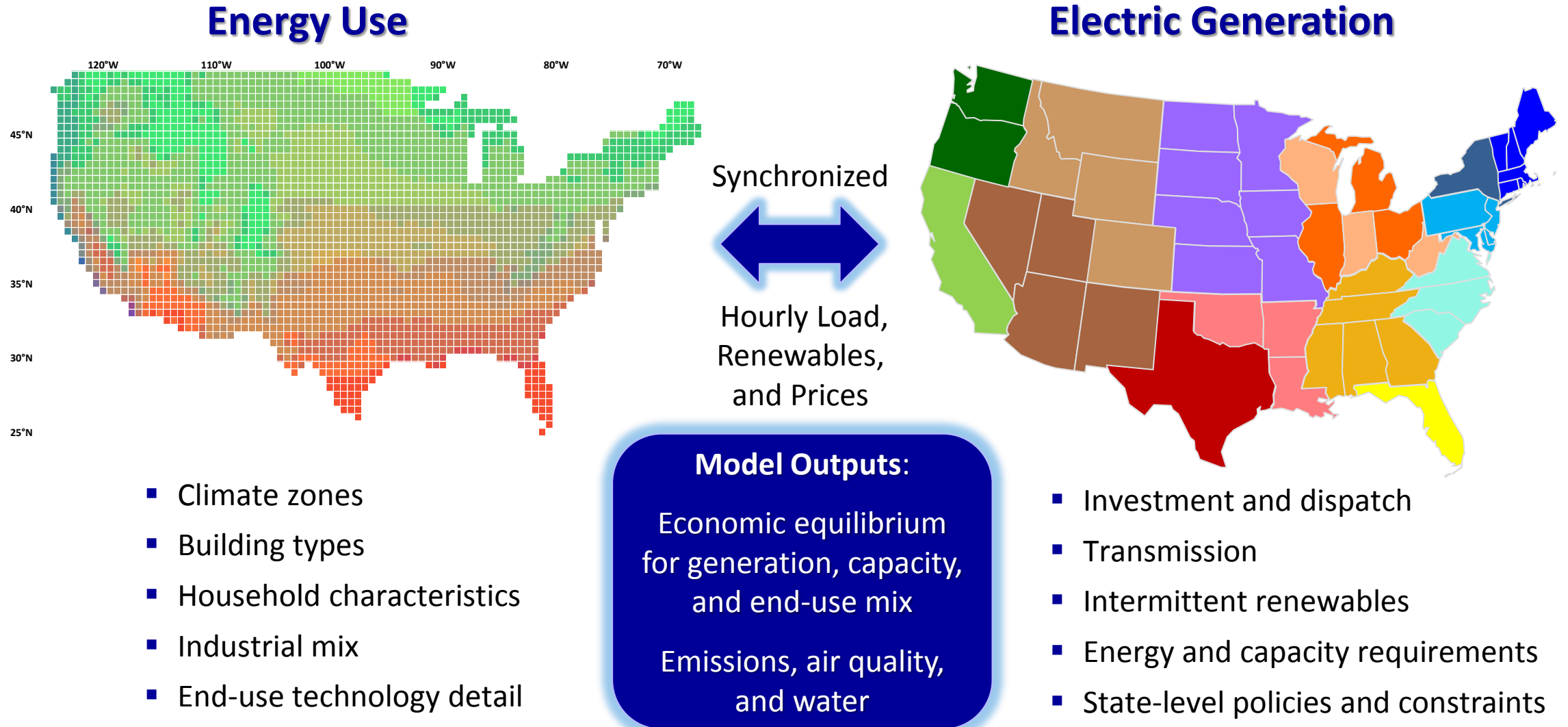
Increasing Attention on Electricity's Role in Decarbonization



Edmonds, Wilson, Wise, Weyant, 2006 *Environmental Economics and Policy*.

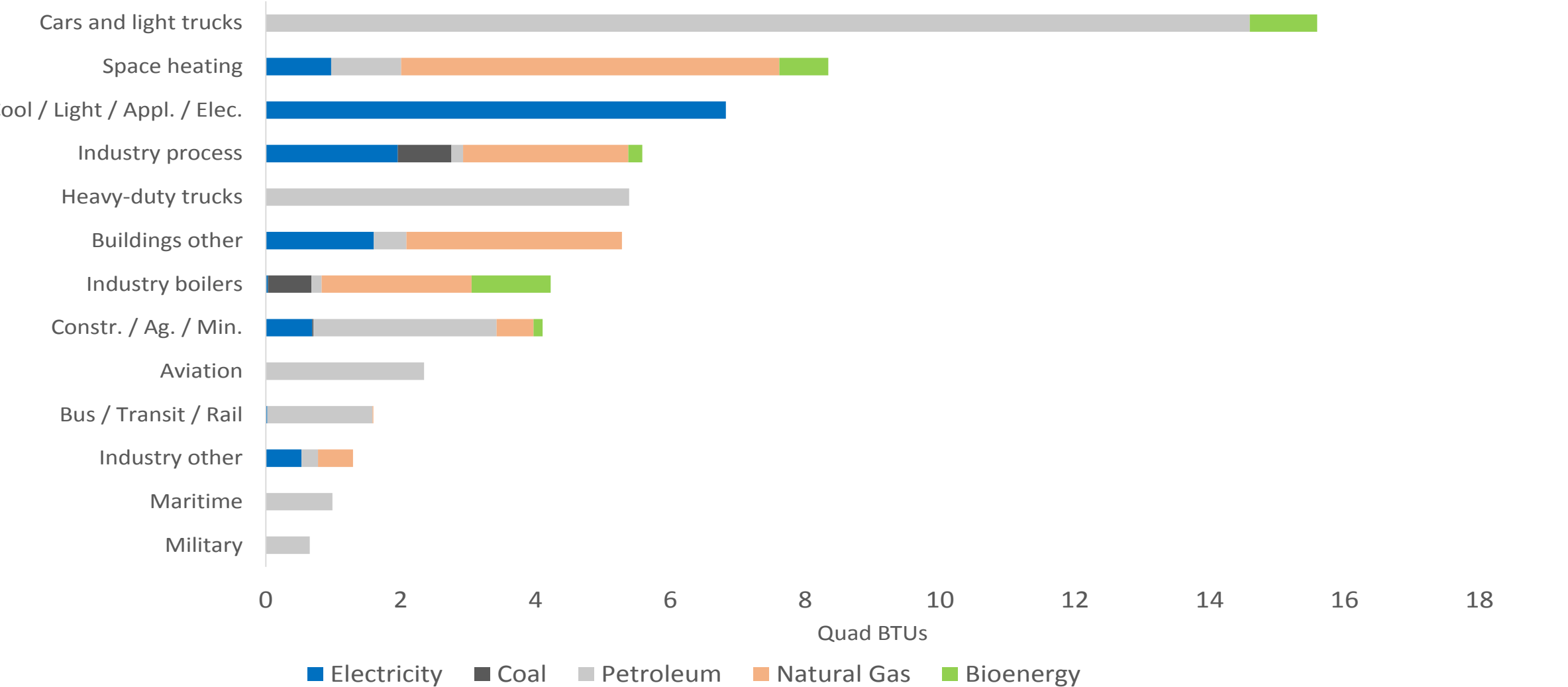
US National Electrification Assessment – forthcoming Q1 2017

Requires New Demand-side Modeling



Electrification Potential – Depends on Fuel Use and Technology

(2014 US Energy Use, Quad Btus)



National Electrification Assessment: Future Scenarios

An Iterative Process as Key Drivers Emerge

- **Reference Case**

- “Likely” technology future with no new policies; consumer adoption of economically viable technologies

- **Aggressive Technology Case**

- Rapid technology improvement/cost reductions

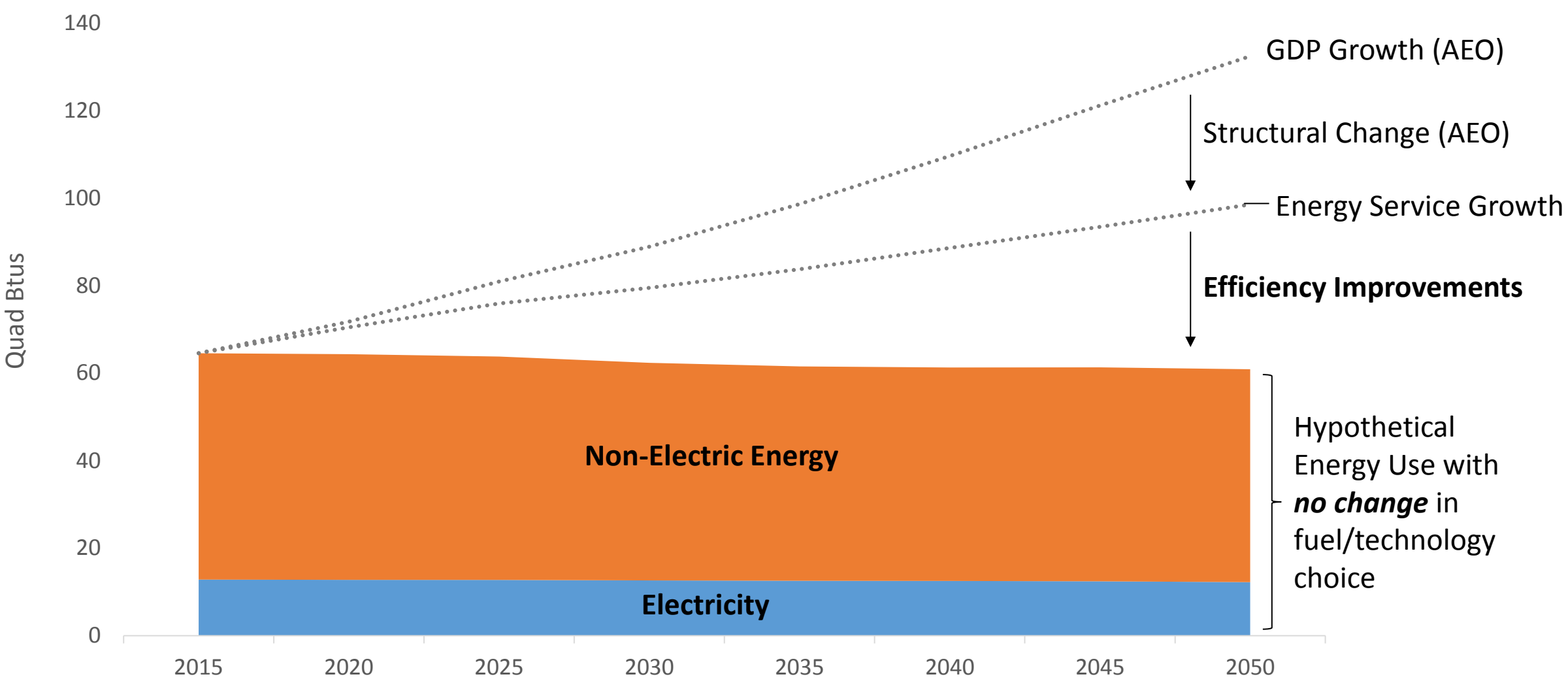
- **Economy-wide Greenhouse gas (GHG) cases**

- 2050 emissions 80% below 2005 levels
- 2050 emissions 40% below 2005 levels

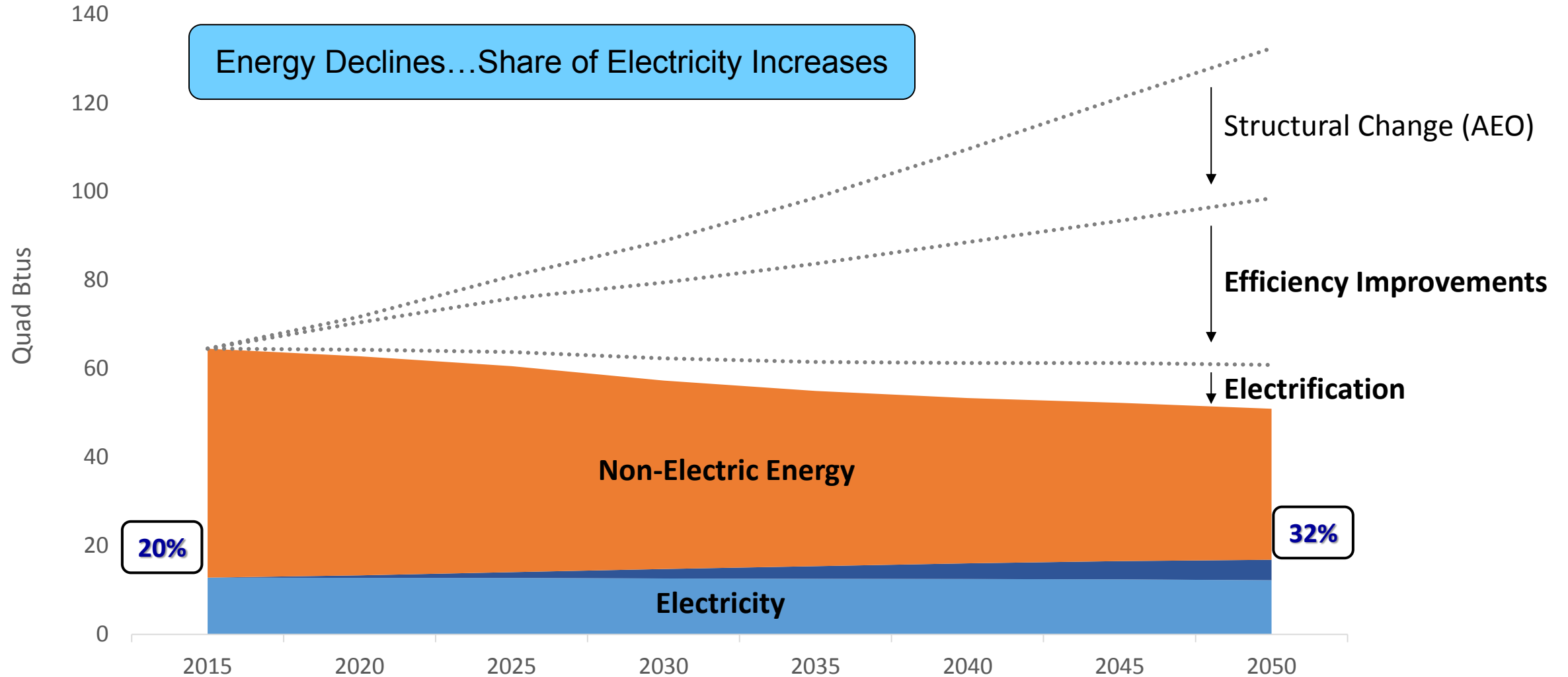
- **Electrification Policies**

- National and regional policies promote adoption of electric technologies via:
 - Electric technology tax credits (e.g., renewables)
 - Technology standards, or mandates (e.g., French/British EV mandates)
 - Focused incentive/information programs (e.g., state energy efficiency programs)

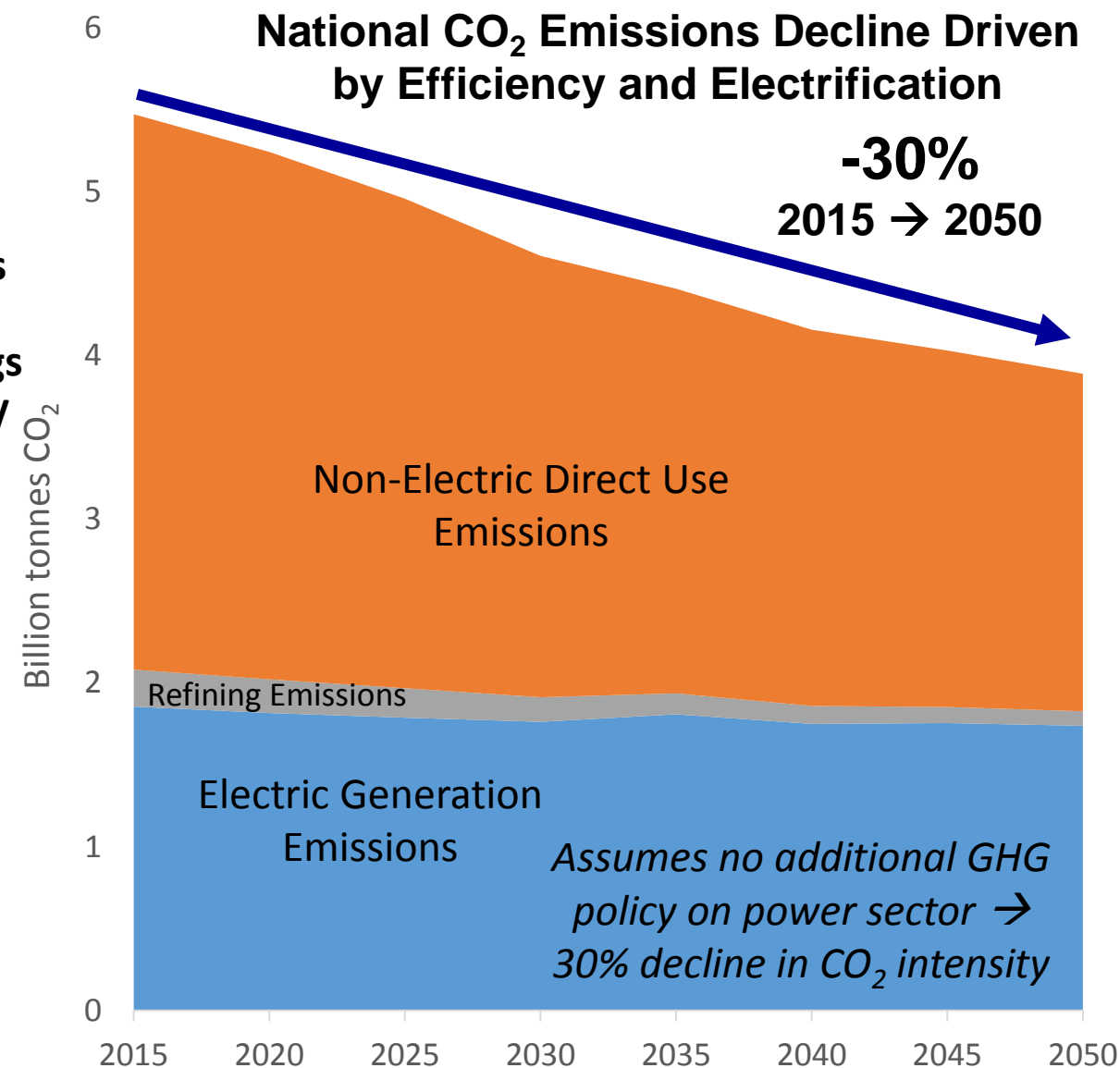
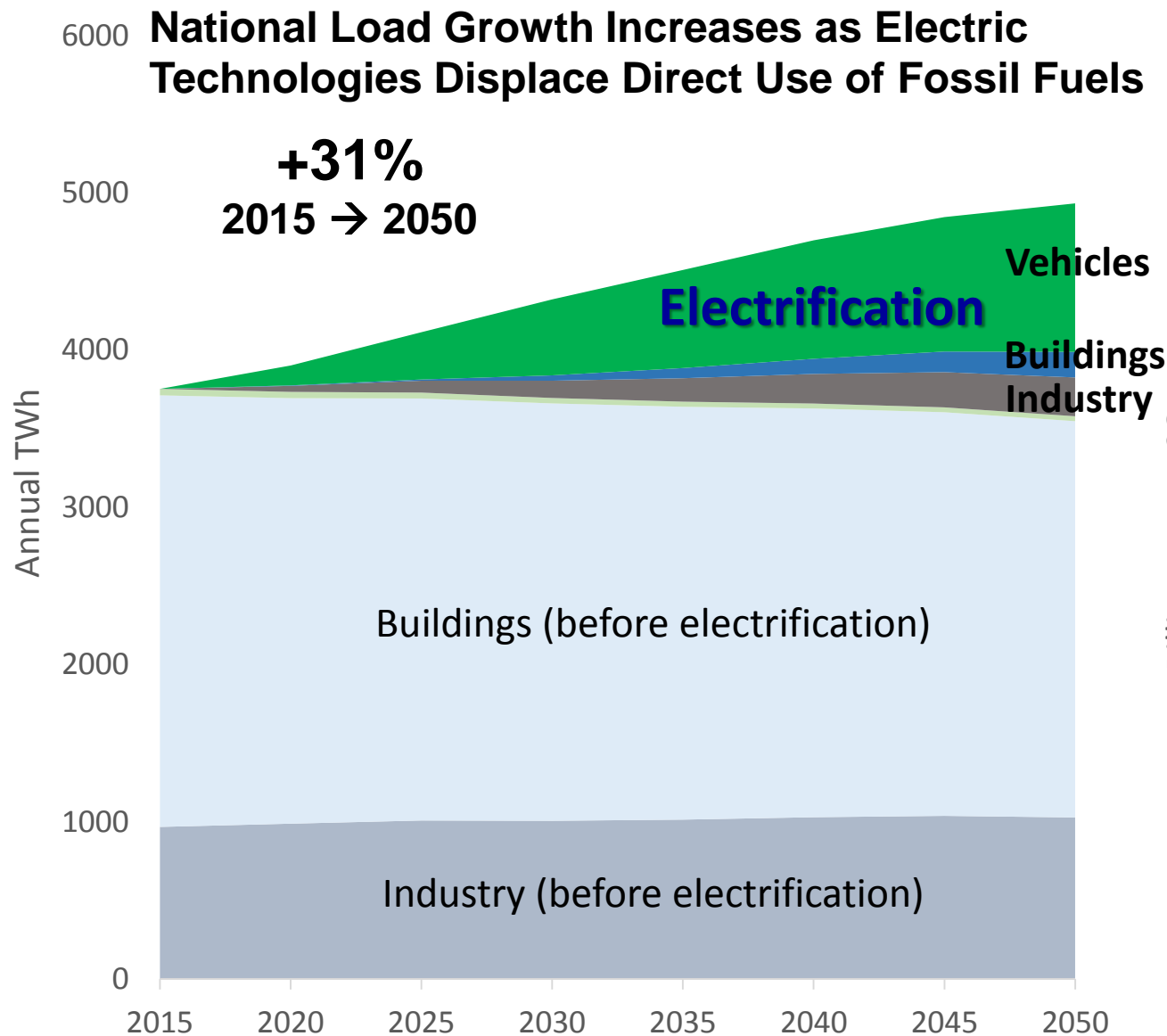
U.S. Final Energy...Drivers of Growth – Based on DOE AEO 2017



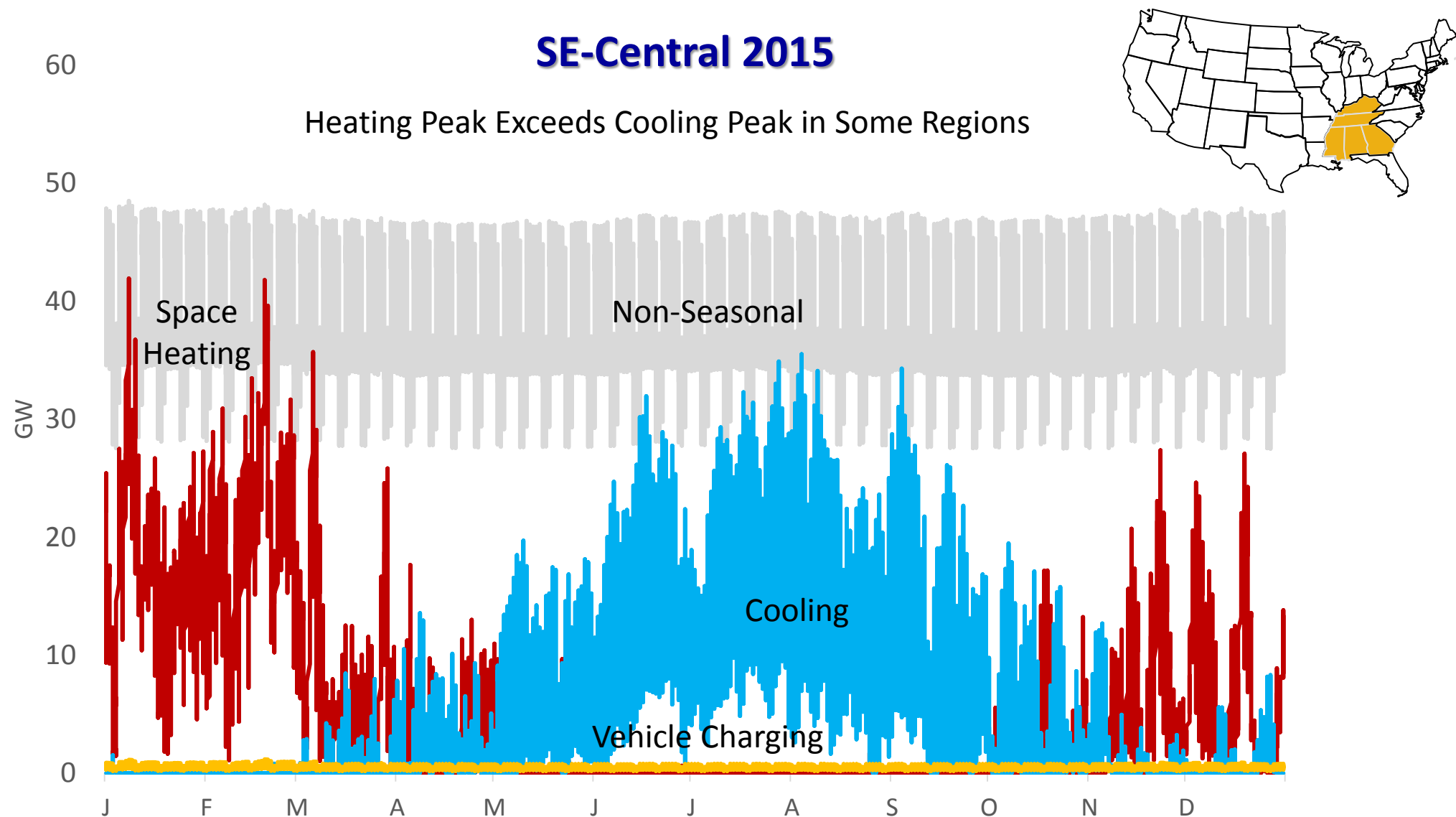
U.S. Final Energy – EPRI Projection with No Carbon Price, but Aggressive Light Duty Vehicle Assumptions



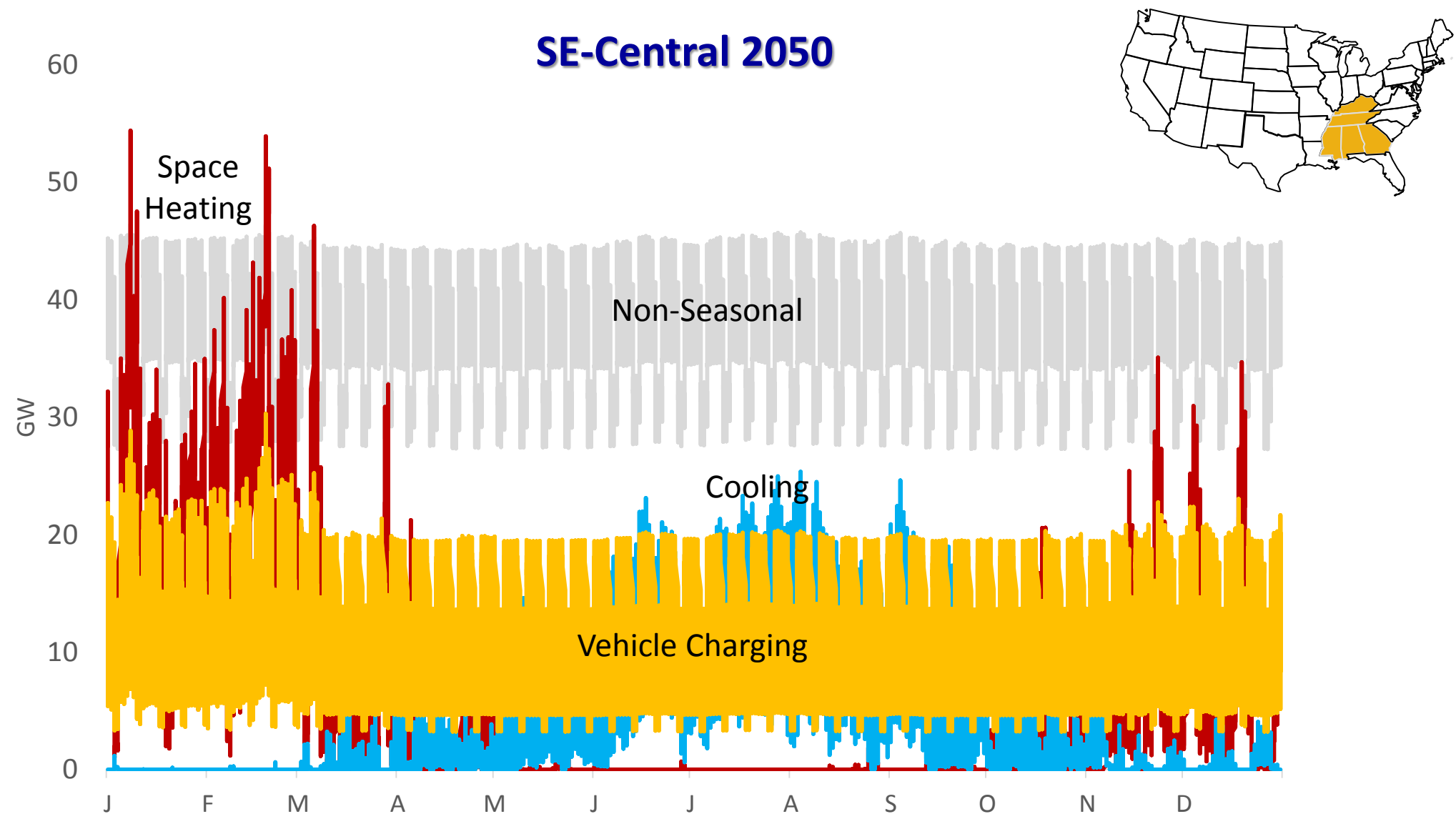
Electric Generation and CO2 Emissions ... without US Carbon Policy



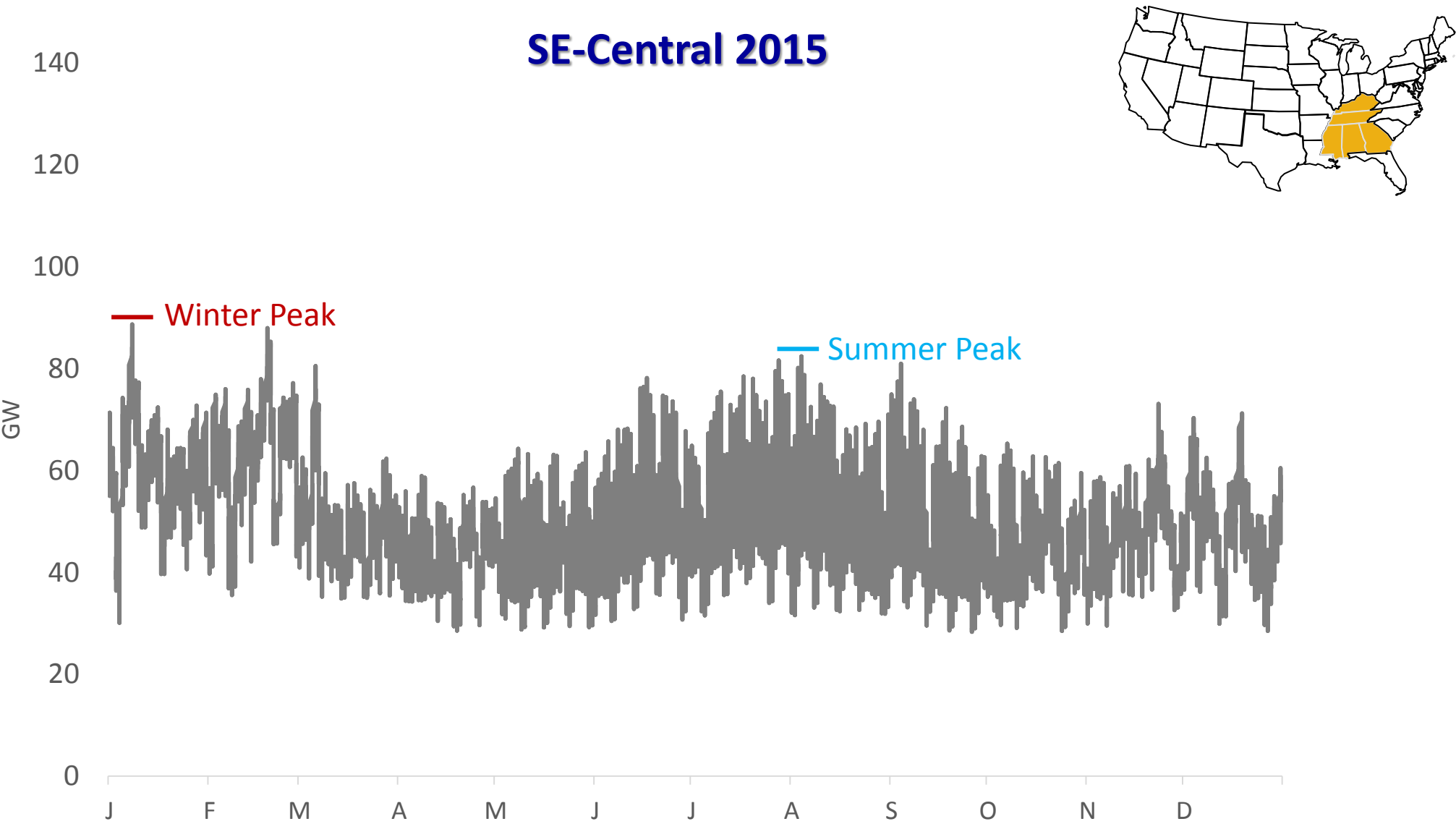
Load Shape Changes...Electrification and Efficiency Impact



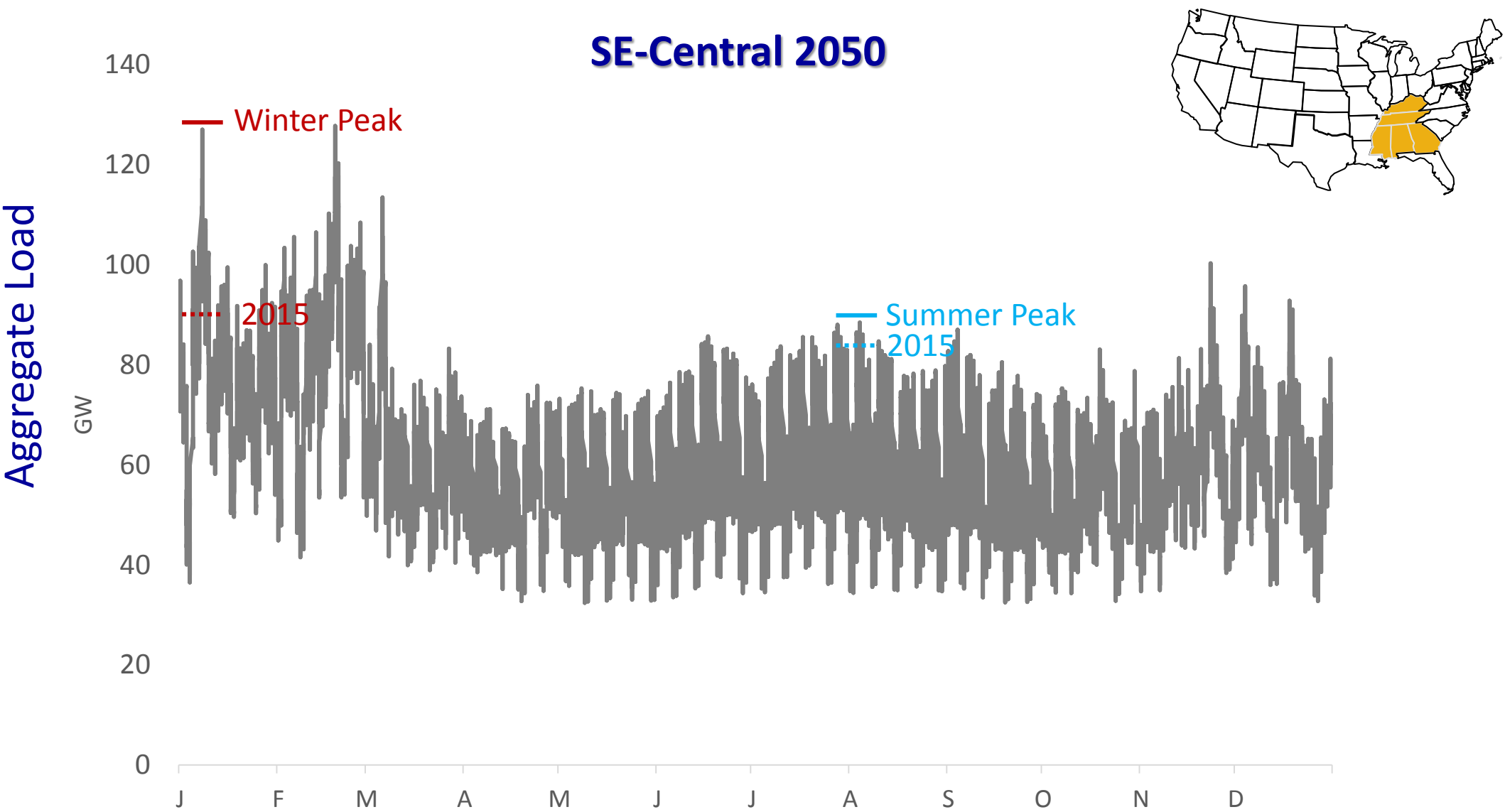
Load Shape Changes...How Will This Impact Supply Mix/Grid Assets?



Hourly Load Shape Aggregated Across Uses

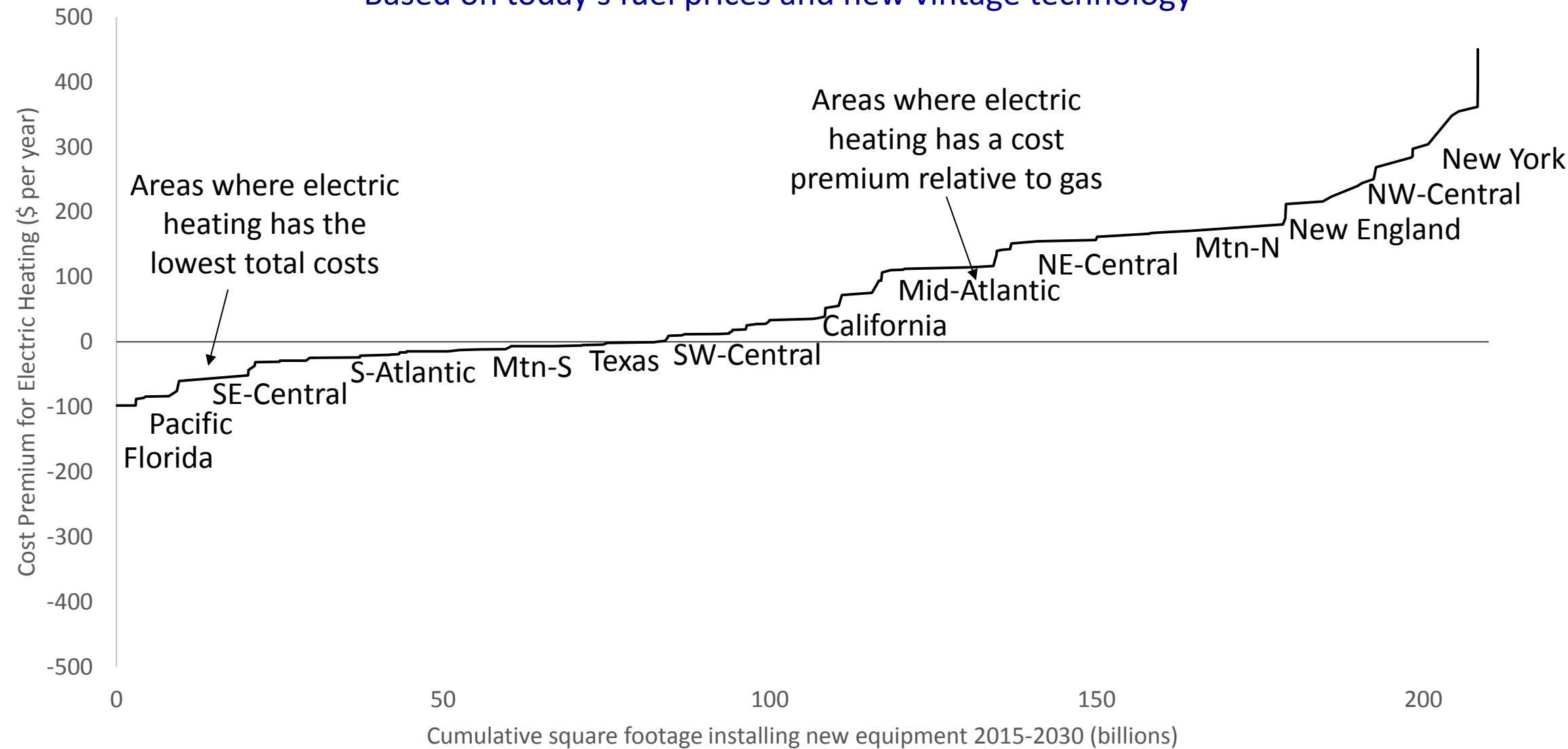


Load Shape Changes...How Will This Impact Supply Mix/Grid Assets?



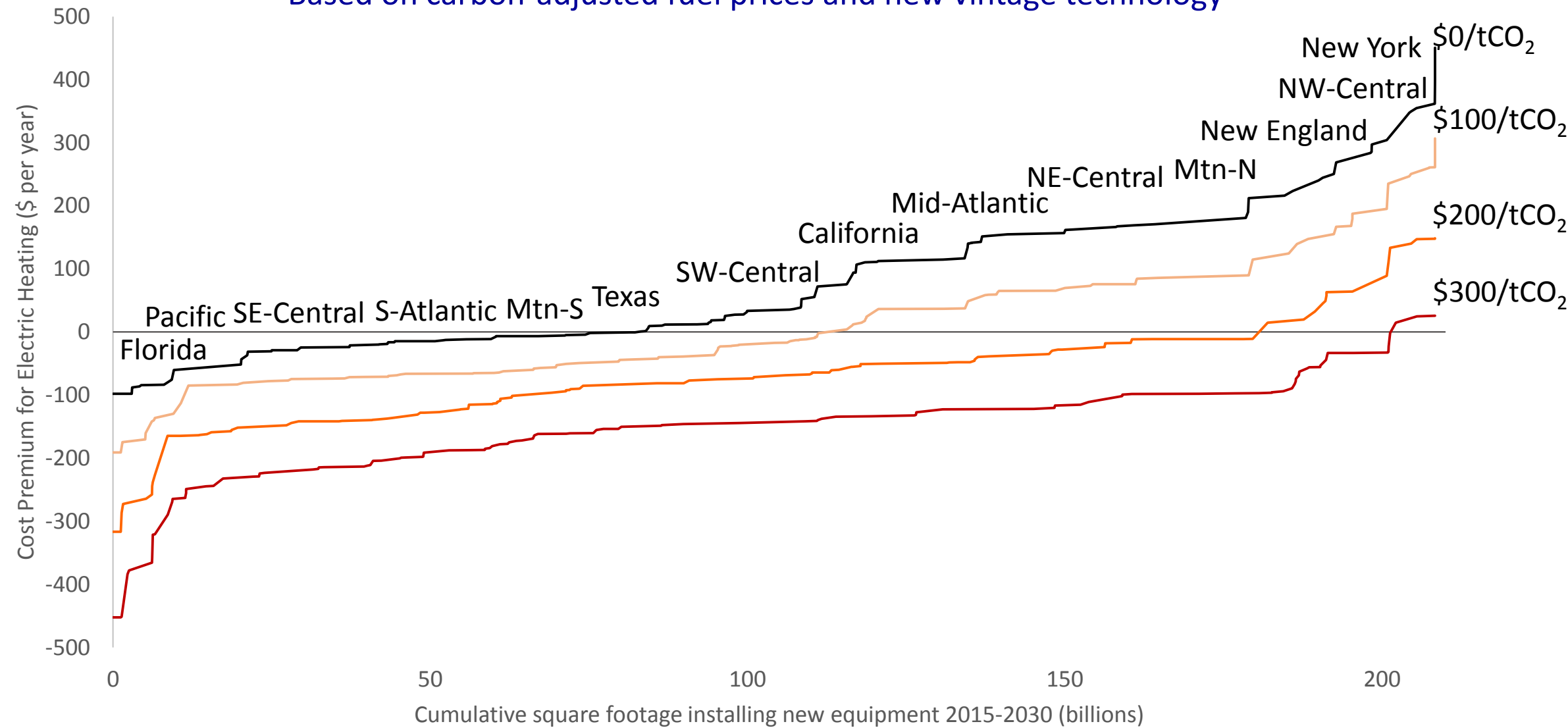
Distribution across US of Electric Heating Cost Premium

Based on today's fuel prices and new vintage technology

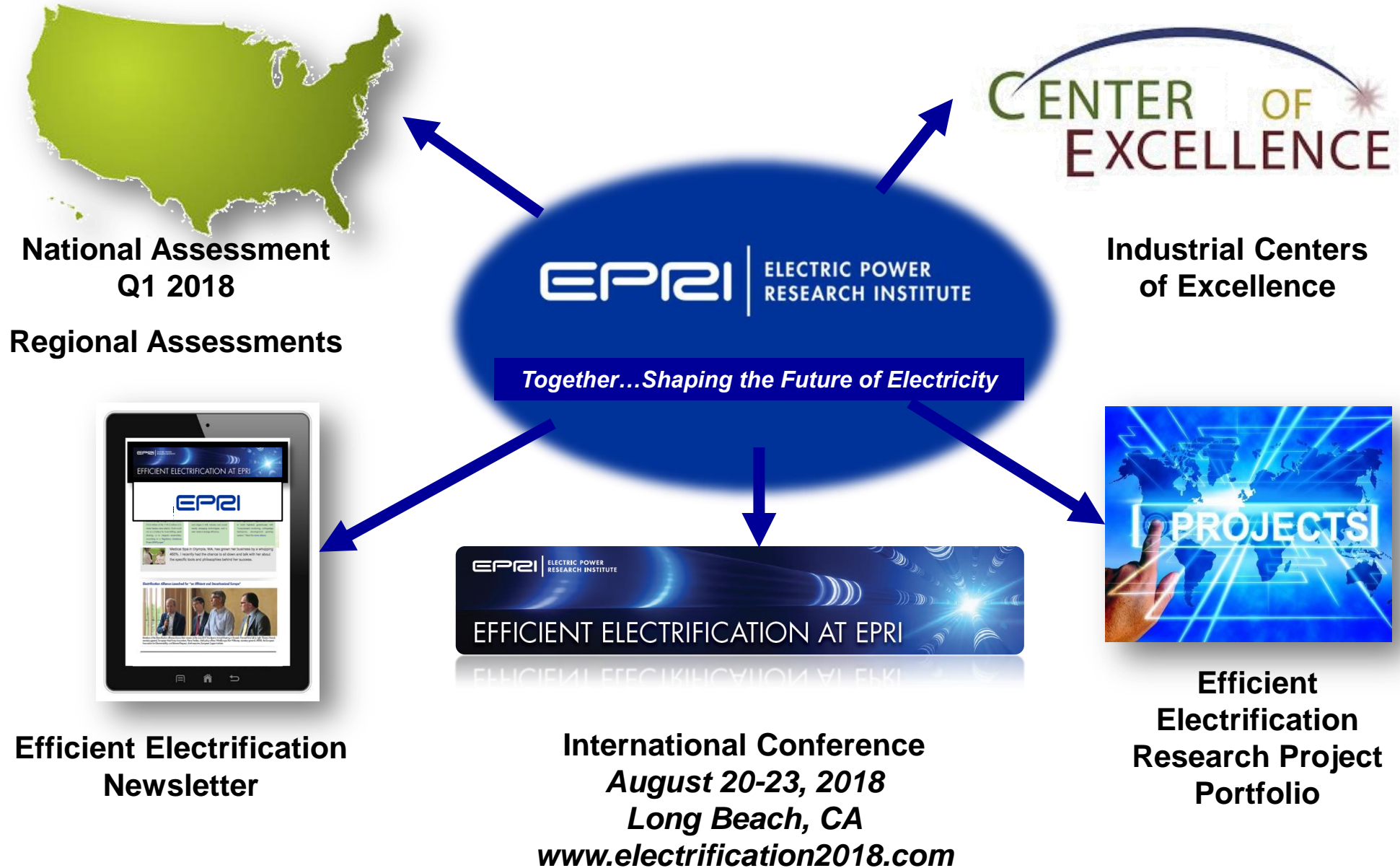


Higher carbon prices → more electric heating in the money

Based on carbon-adjusted fuel prices and new vintage technology



EPRI Initiative on Efficient Electrification – Much More to Come



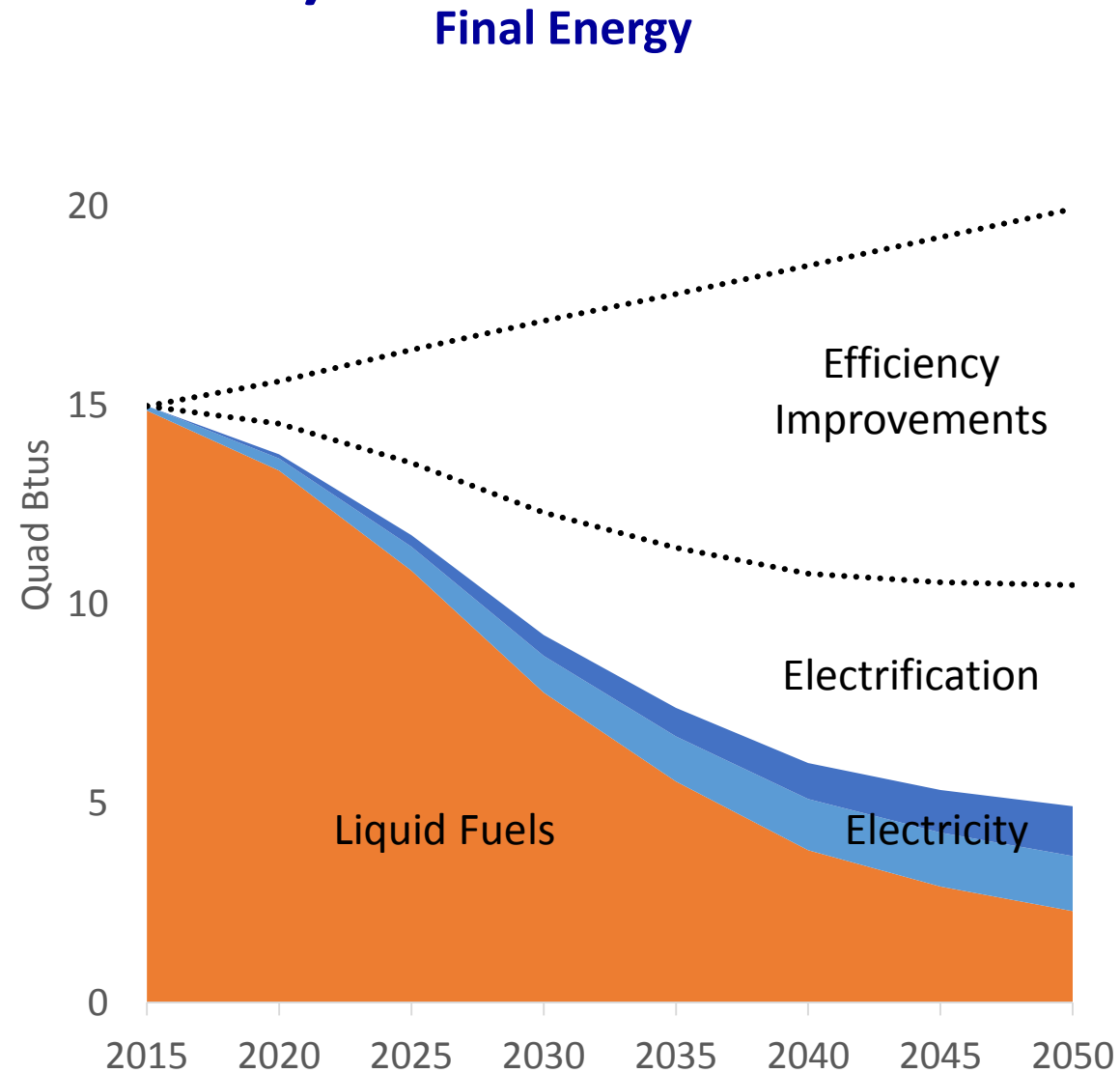
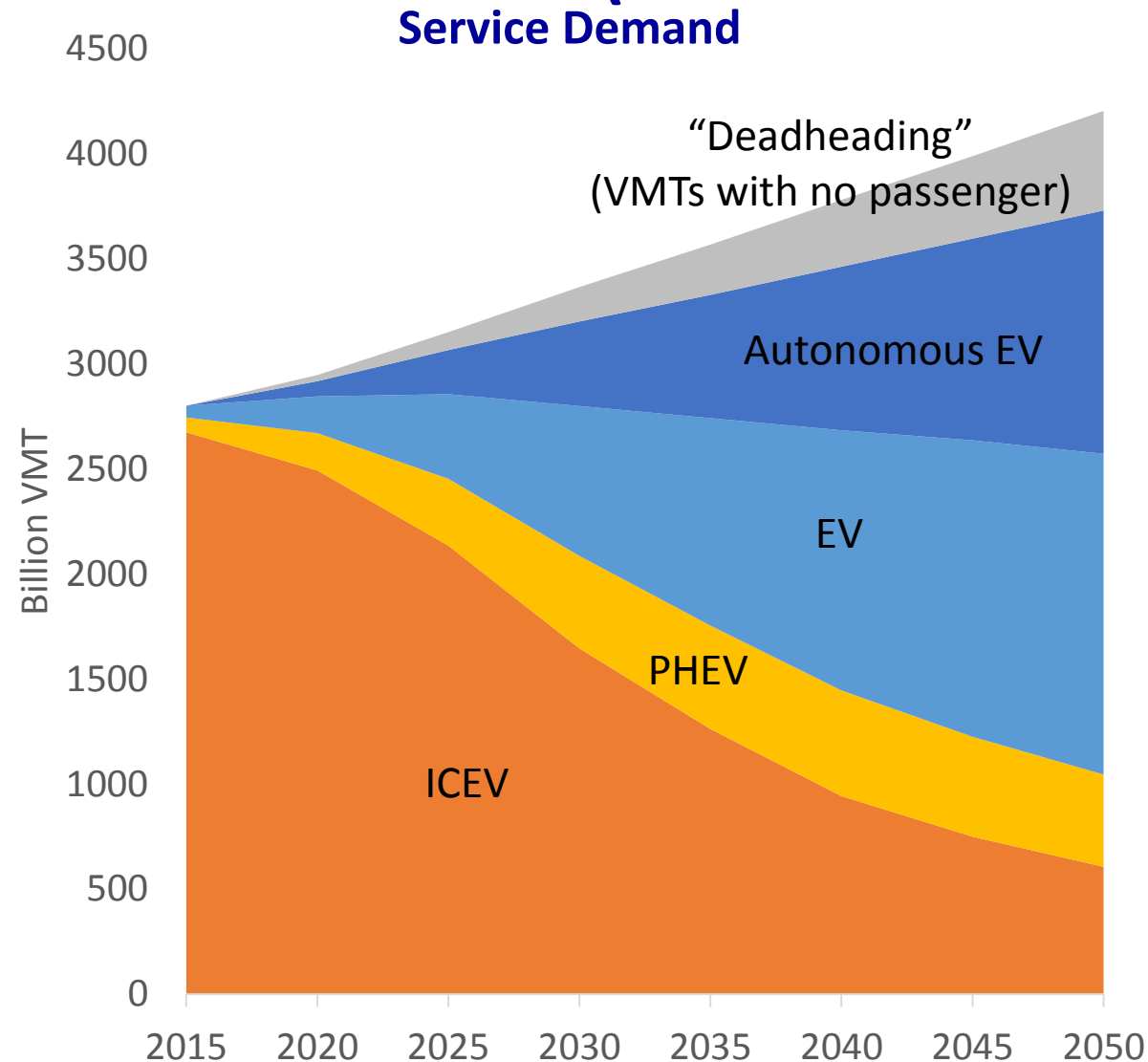
Concluding Thoughts

- Electrification very likely to play a key role in decarbonization
- Policy needs to allow this transition (or encourage it)
- Price/markets play a key role, accompanied by changes in technology and regulatory structures



Together...Shaping the Future of Electricity

Passenger Vehicles: Two Revolutions (Electric and Autonomous)



Occupied Floor Space by Main Heating Technology (RECS)

