

# Impacts of Fleet Electrification on Grid Infrastructure

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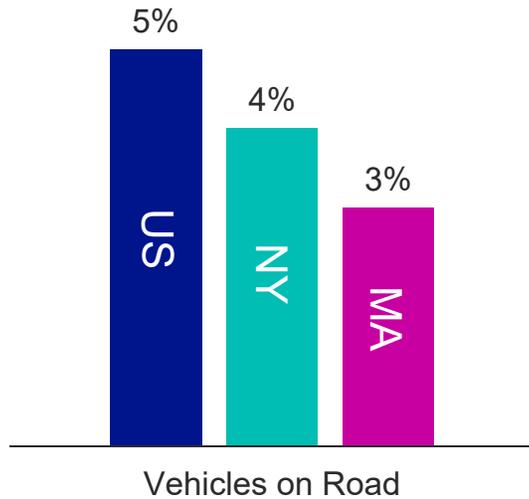
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nationalgrid

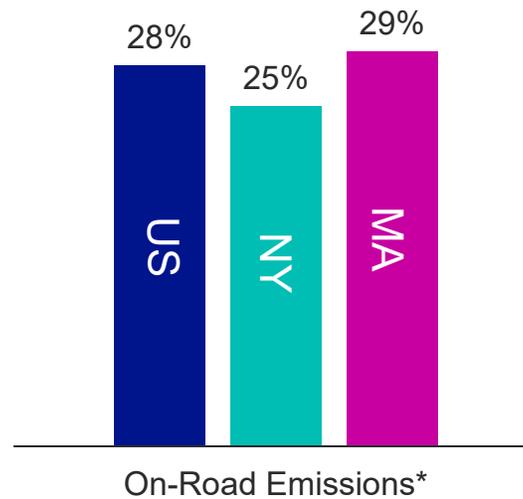


## Why does fleet electrification matter?

Fleet trucks and buses **are a small fraction** of vehicles on the road...



...but produce about a **quarter of on-road emissions**...



...and **up to 150x as much harmful PM2.5 pollution** as a passenger vehicle.

**30-150x**

## Fleet electrification is coming

Electrification offers savings for fleet owners

**Many EV models already at cost parity**  
with ICE counterparts

**Battery costs projected to fall 58% in next decade** (already fell 90% since 2010)

Businesses to benefit from **lower maintenance costs of electric vehicles**

Source: NACFE 2018 analysis of TCO for MHDVs. BNEF 2021 analysis of battery costs.

**National Grid**

Electrification of public fleets will reduce emission and make **clean public transportation a reality**



**Biden administration** proposing electrification of federal fleet and funding for electric buses



**New York** has set 2035 target to decarbonize public transportation

# The clean fleet revolution depends on the electric grid



## What do we need to know to ready the grid for fleet electrification?

Where will electric fleets be located?

What will each fleet's charging needs be?

How much (peak) electric demand will be added to the system?

What electric grid infrastructure will be needed to support **fully electric fleets**?

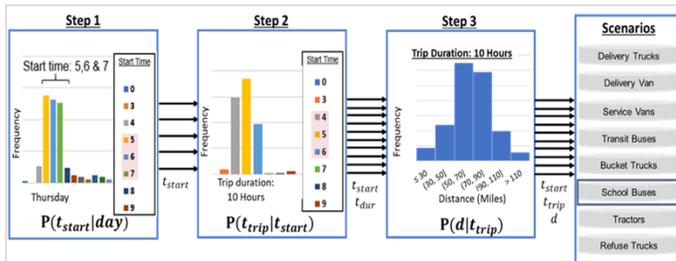
And how can we start preparing right now?

# Methodology: Overview of Modeling

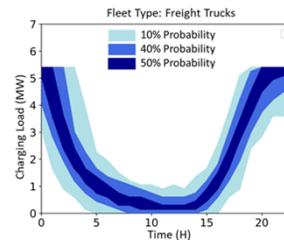
Monte Carlo simulation used to evaluate **fleet schedules**

Fleet schedules used to develop **charging profiles**

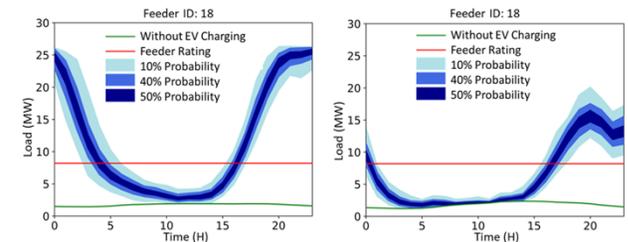
Charging profiles **mapped to nearest feeder** and aggregated to determine **load impact**



Variables for each vehicle's trip  
 → start time, duration, and distance traveled



(a) Winter-Full Charging Strategy



(a) Winter-Full Charging Strategy

(b) Summer-Full Charging Strategy

Charging profiles dependent on:

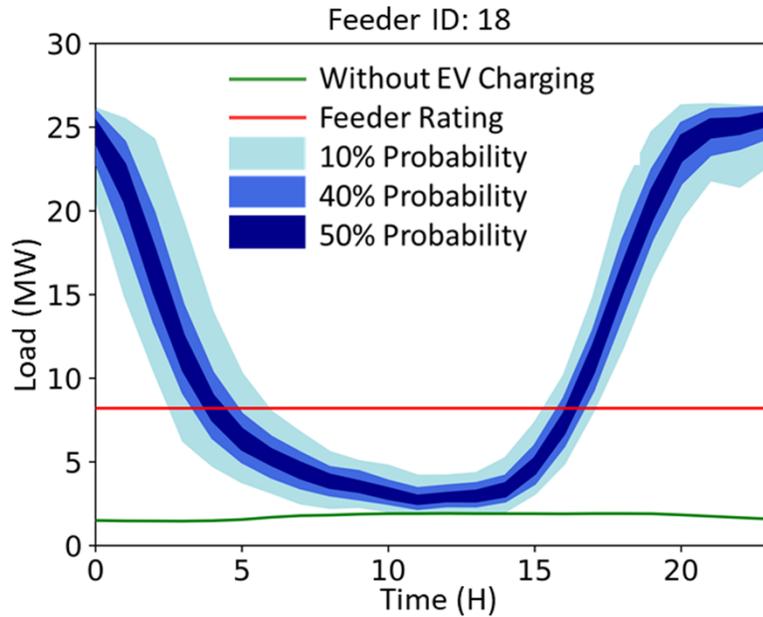
- Seasons: Summer and Winter
- Charging Strategies: Full Charging & Minimum Charging
- Fleet Type: Class 3-8

51 Fleets mapped to 19 Feeders:

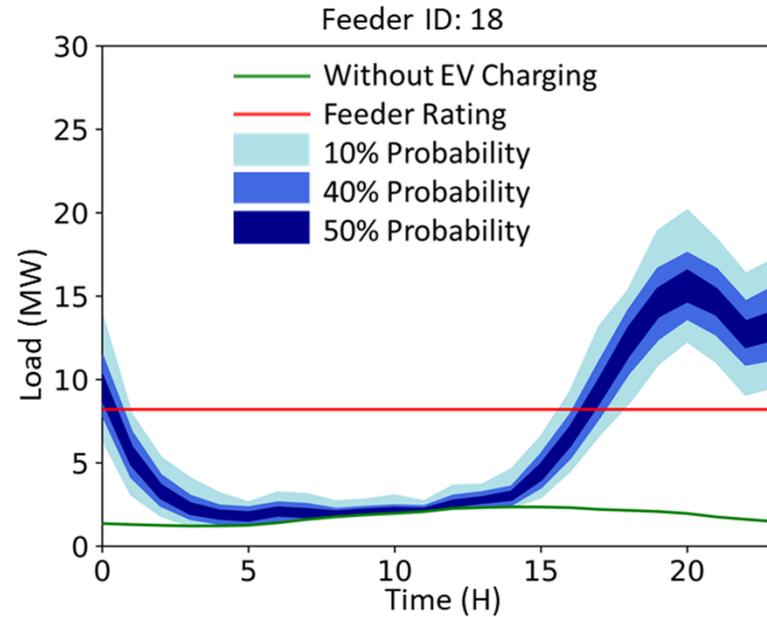
- Load impact determined for the various charging profiles of each fleet

# How much electric demand could fully electric fleets add at certain areas of grid?

**Winter charging load** at one feeder supporting 400+ electric MHDVs

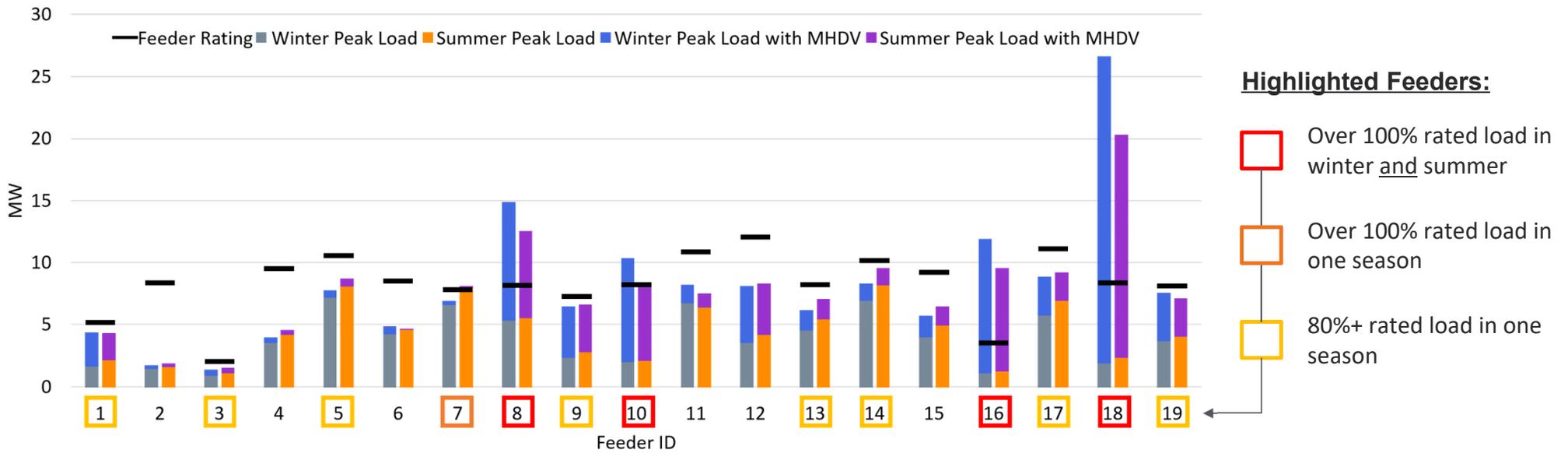


**Summer charging load** at the same feeder



# Impacts will be felt differently at different areas of the grid

**Impact of fleet electrification on feeders: Load vs feeder rating**

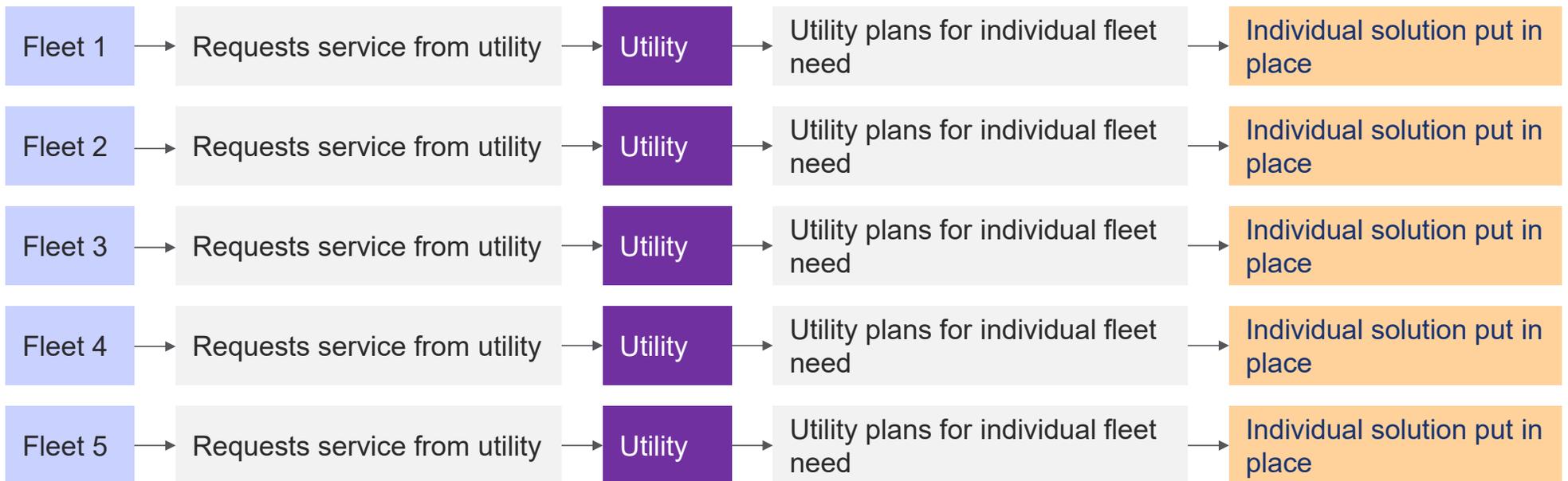


## **What can we do to enable the clean fleet transition?**

- 1. We need to proactively plan for needs of electric fleets**
- 2. We need to take an “end-to-end” view of solutions**
- 3. Wherever possible, solutions should address multiple needs at once**

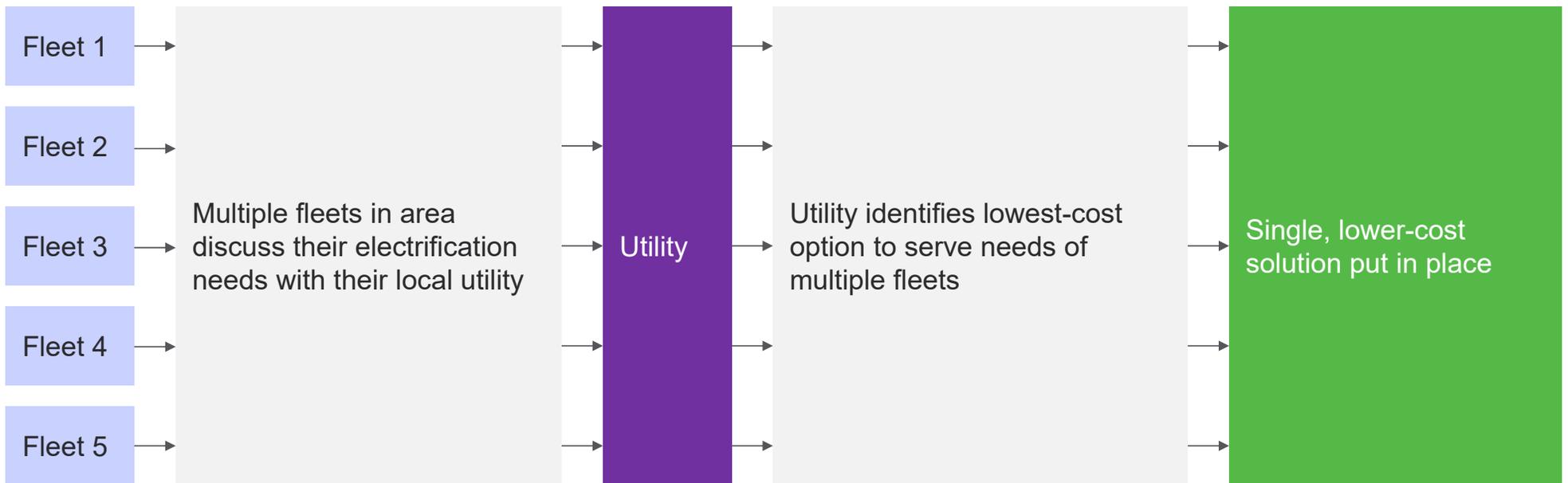
# We need to proactively plan for needs of electric fleets

## Current utility process to plan for needs of electric fleets



## We need to proactively plan for needs of electric fleets

Another way to plan for grid needs of electric fleets:



## We need to take an “end-to-end” view of solutions

Transmission

Distribution

Distributed Energy  
Resources

Charging Programs

# Solution highlight: transmission



Legend:



Fleet locations



Distribution feeder



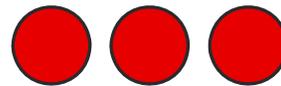
Nearby transmission line

## Solution highlight: transmission



Opportunity: transmission to enable fleet electrification

### Legend:



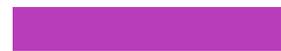
Fleet locations



Distribution feeder



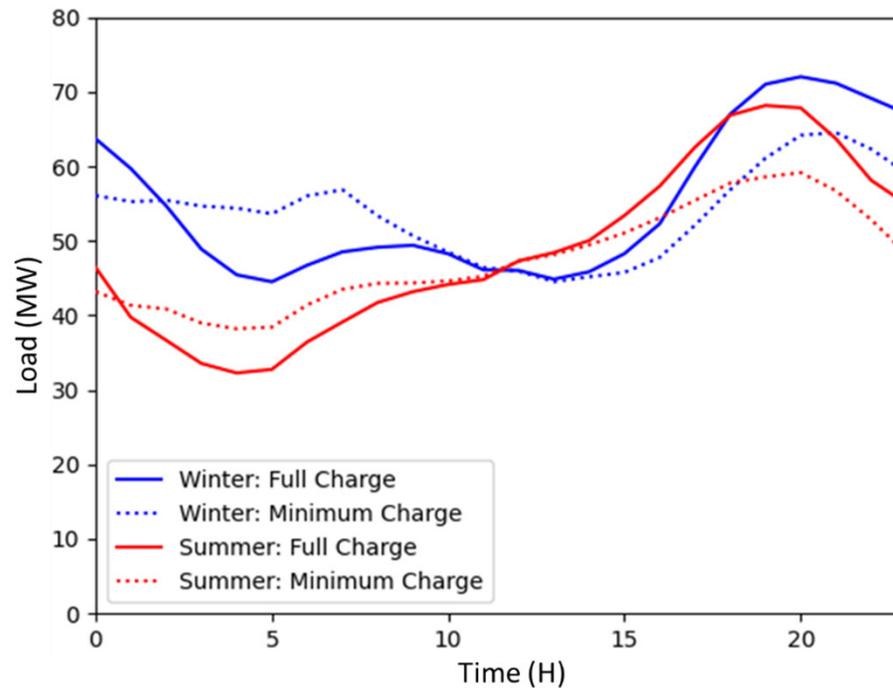
Nearby transmission line



New transmission/distribution infrastructure

## Solution highlight: charging strategy

**Effect of charging strategy on substation load:**  
Previously highlighted “fleet cluster” substation



**Wherever possible, solutions should address multiple needs at once**

Fleet  
electrification

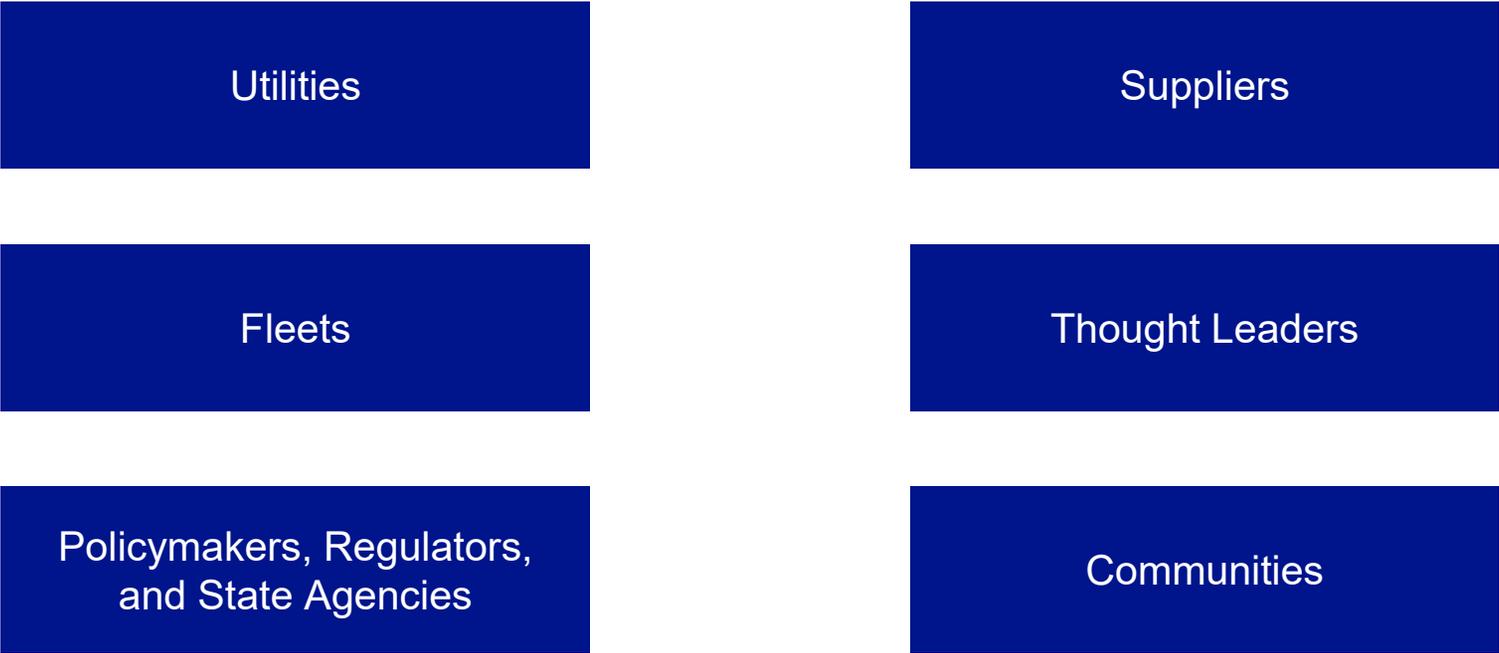
Light duty  
electrification

Other growth in  
electrification

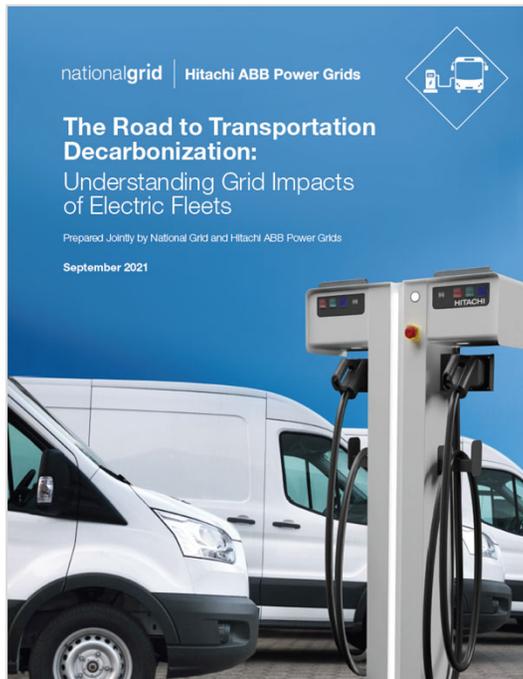
Generation  
capacity

Asset condition  
and reliability

# We can work together to make fleet electrification a reality



## National Grid and Hitachi Energy (formerly Hitachi ABB Power Grids) released a report with further details



**Published September 2021**

Available at: [ngrid.com/fleet-electrification-study](https://ngrid.com/fleet-electrification-study)