Grid Services: A Potential Grid Solution in Massachusetts

Stakeholder Focus Groups

MASSACHUSETTS CLEAN ENERGY CENTER®

Introductions

THIS GRID SERVICES STUDY IS LED AND FUNDED BY MASSCEC'S NET ZERO GRID TEAM

Partners include:

State Agencies

- Department of Energy Resources (DOER)
- Attorney General's Office (AGO), Office of the Ratepayer Advocate

Massachusetts Investor-owned electric distribution companies (EDCs)

- Eversource
- Unitil
- National Grid

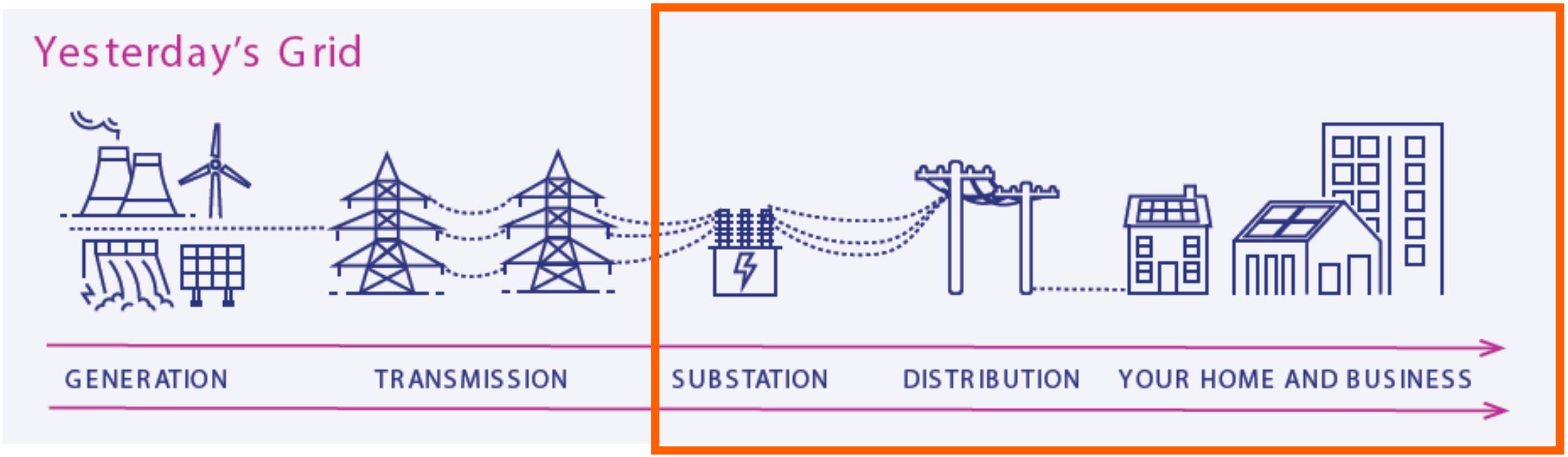
Consultants

- Rocky Mountain Institute (RMI)
- Energy and Environmental Economics (E3)

Presentation Overview

- **How the grid has traditionally worked**
- **The grid of today and the grid of the future:**
  - What makes right now a unique time
  - The main questions emerging
- **Distributed Energy Resources (DERs)**
  - What are they?
  - DERs as a potential solution
- **Introduction of the Grid Services Study**
- **Discussion**

Traditional Design of the Grid

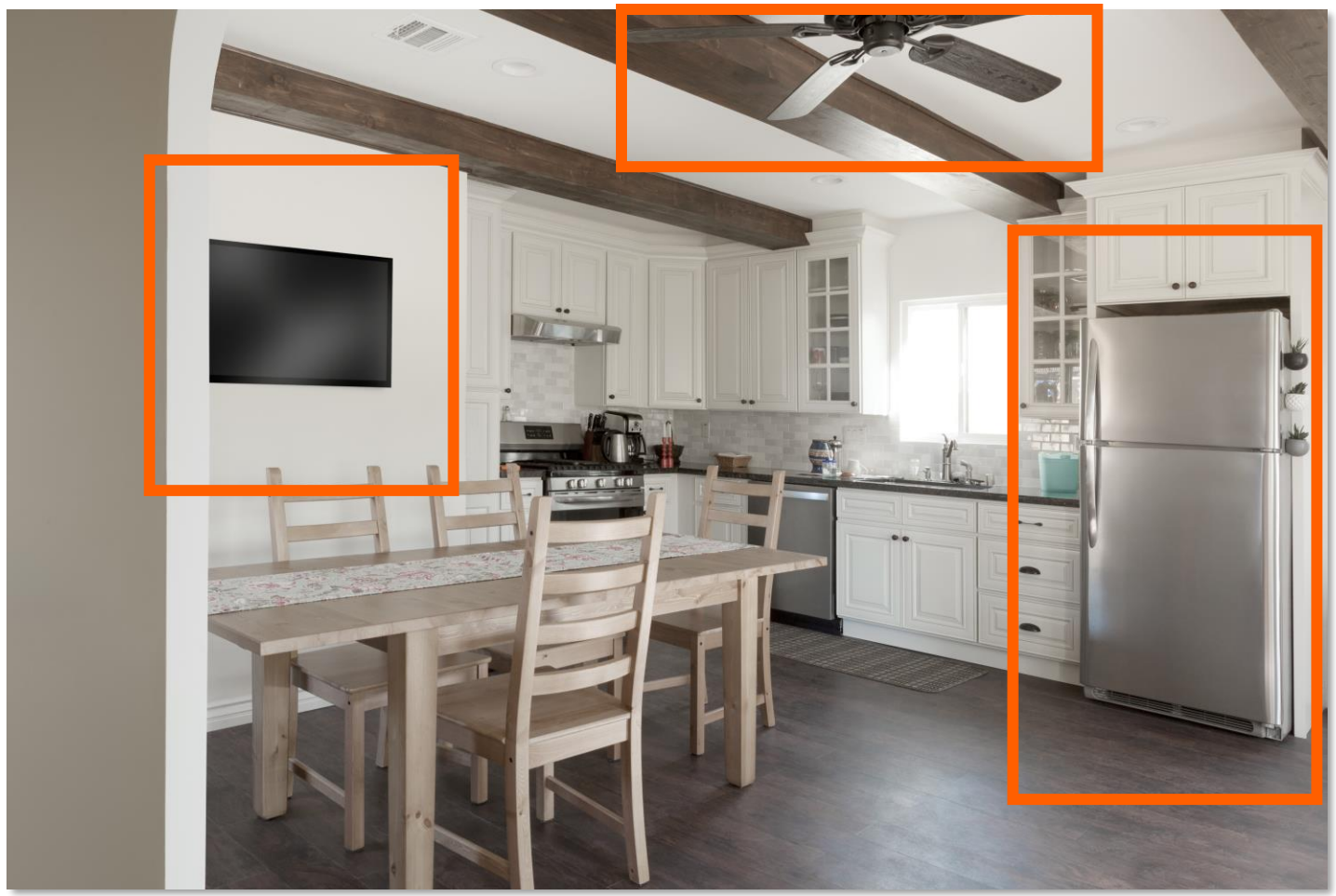


Distribution System

What is a Substation?

South Street RI Substation concept – National Grid (KITE Architects)

What the Electric Grid Was Built For



Relatively small “loads” or electric needs

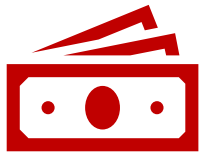
Traditional Approach to Meeting an Increase in Electricity

TRADITIONAL RESPONSE

When electricity demand increased…

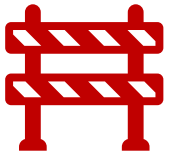
Utilities build more infrastructure

ASSOCIATED CHALLENGES



Expensive

Long Timeline

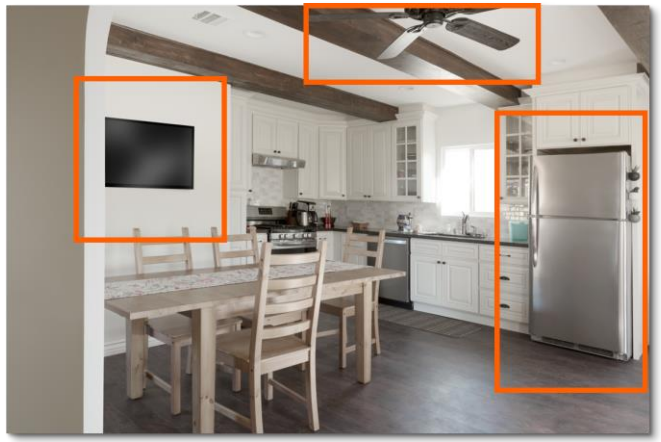


Disruption

Disproportional Burdens & Benefits

Today's Unique Context

2X **ELECTRICITY DEMAND EXPECTED TO SOAR AS MA TRANSITIONS TO A CLEAN ENERGY FUTURE**



Past
(1-2 kW of load)

+

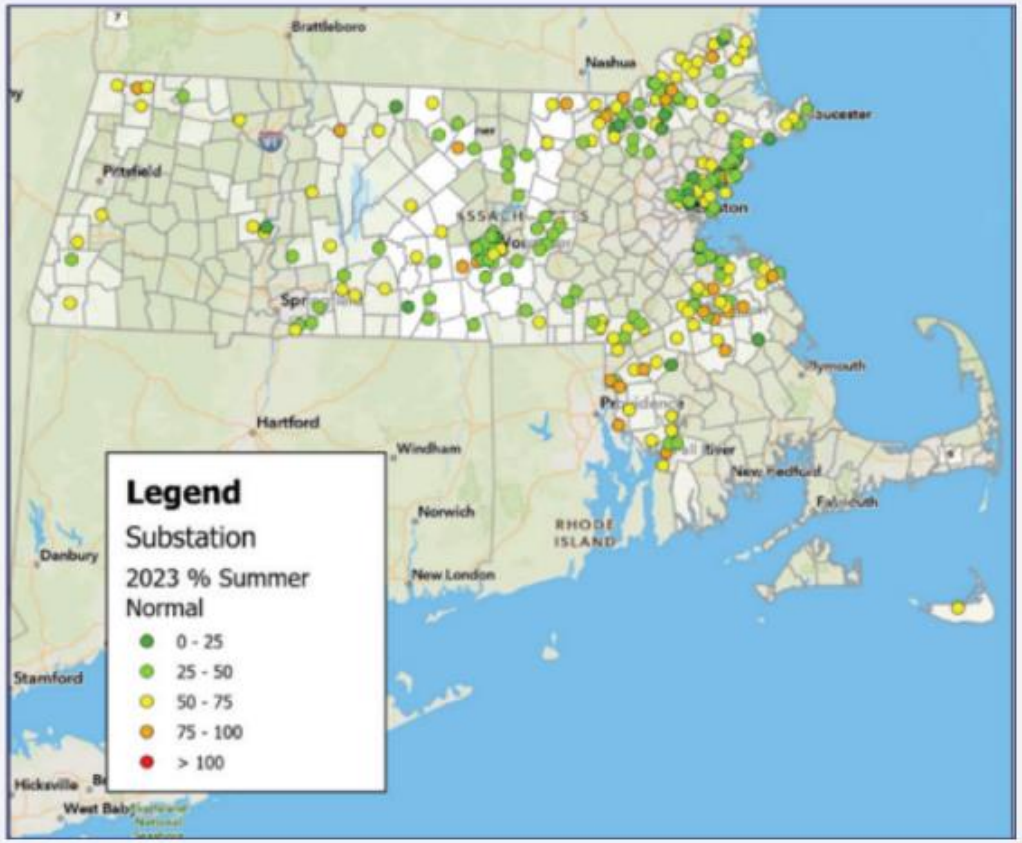
The Future
(+ 5-15 kW)

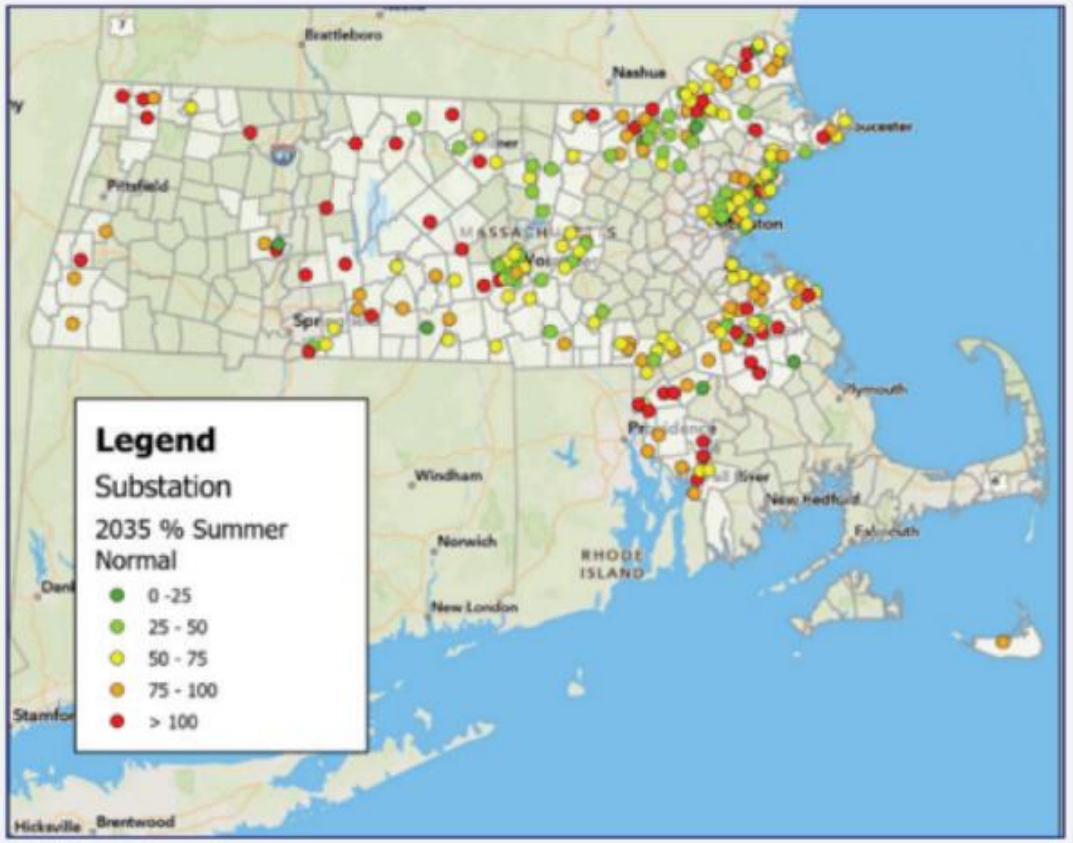
+

The Future
(+ 7-19 kW)

Example from National Grid

Exhibit 6.1: Substation Loading in 2023 and 2035 Absent Capacity Expansion





From National Grid's ESMP (Electric Sector Modernization Plan)

The Emerging Problems to Solve

This **unprecedented** level of electricity is what makes **right now a unique time and a turning point**

What new solutions can meet the unprecedented demand for electricity while **minimizing the challenge** of our traditional solutions?

How can we build **solutions that contribute to a just and equitable energy future?**

A Potential Solution: Distributed Energy Resources (DERs)

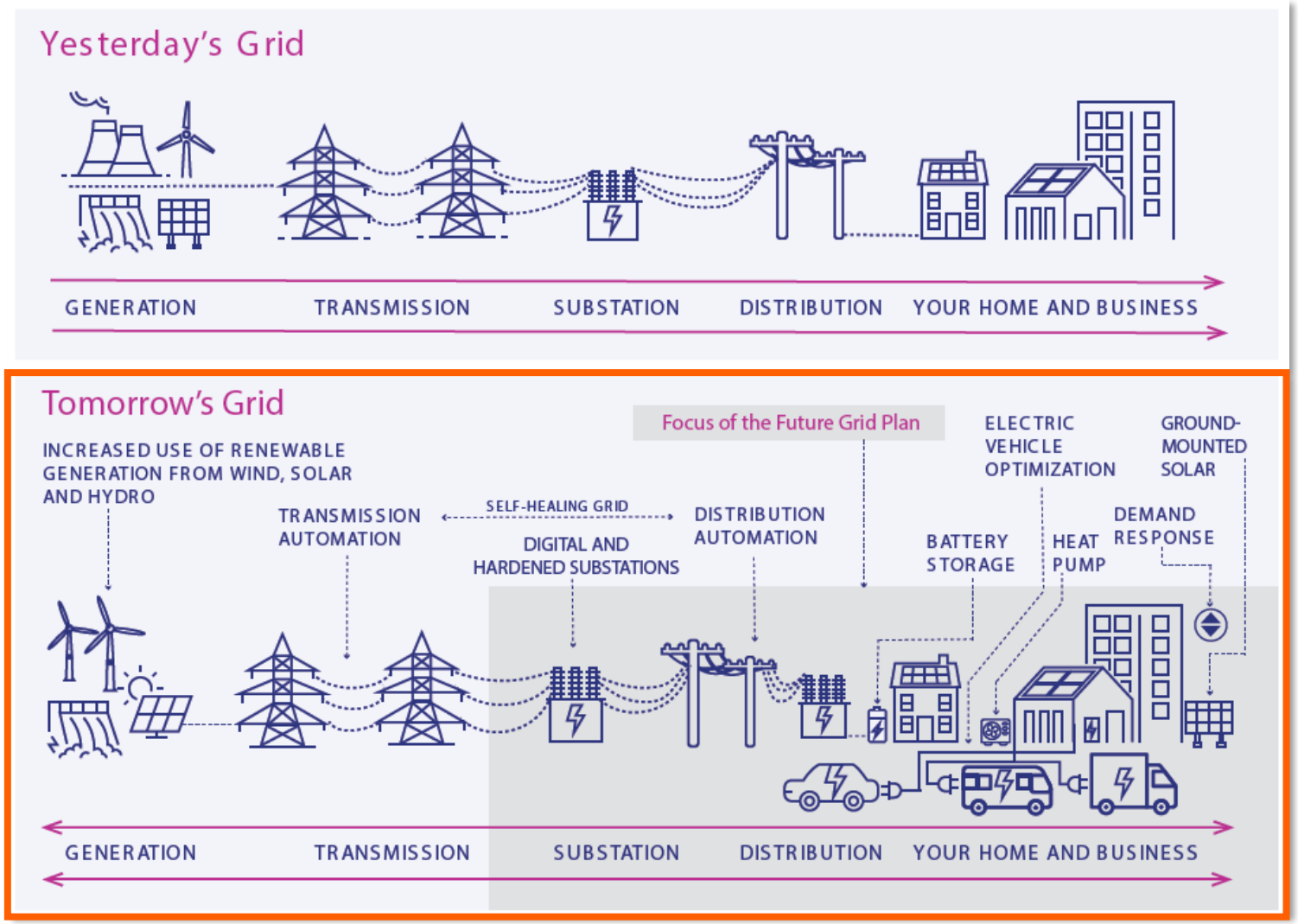
DERs

Distributed Energy Resources

- Solar (of all sizes)
- Batteries (of all sizes)
- Electric Vehicles
- Heat pumps
- Water heaters
- Smart thermostats

Sources of **energy** spread across the **distribution** grid

The Grid with DERs



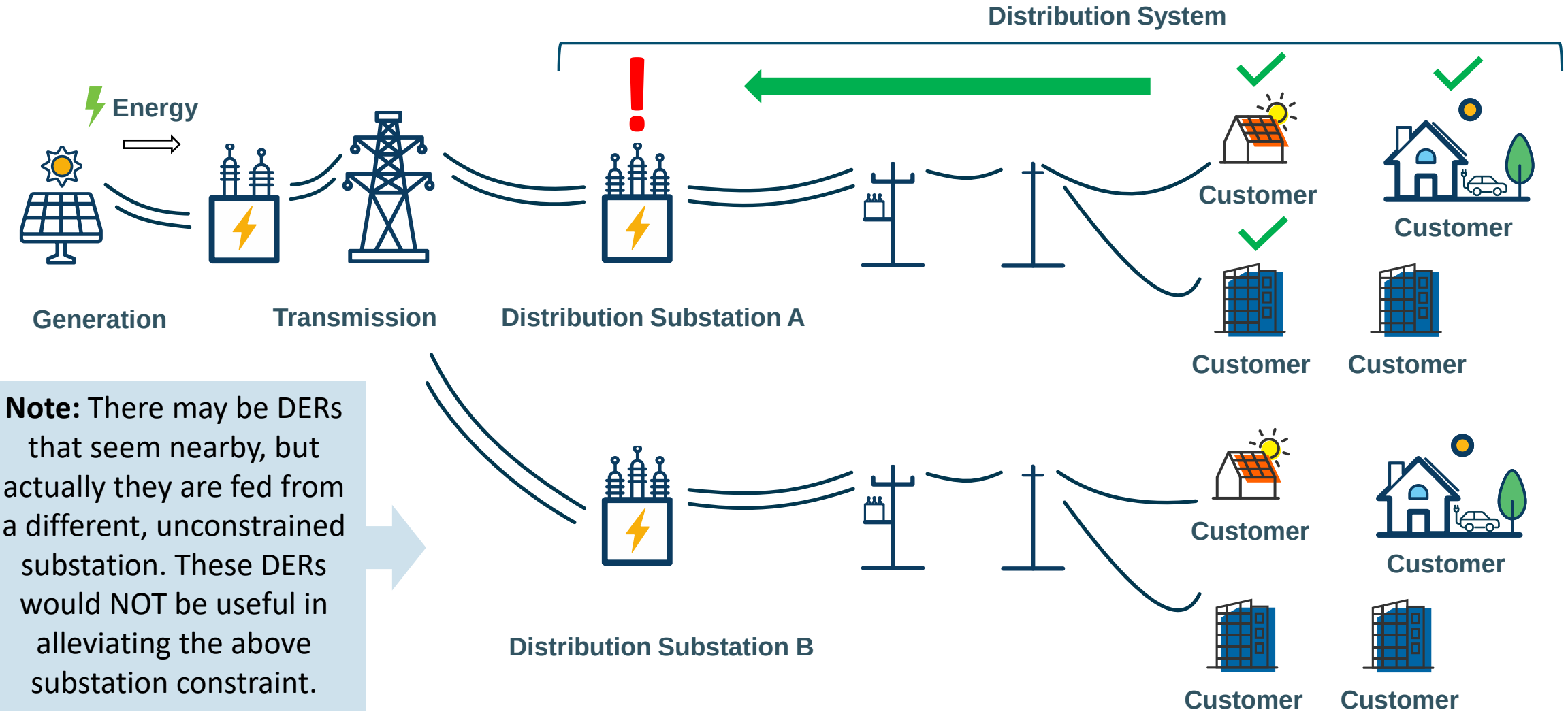
Why DERs are a Potential Solution

Located in many places on grid

Able to use and release electricity (in some cases generate)

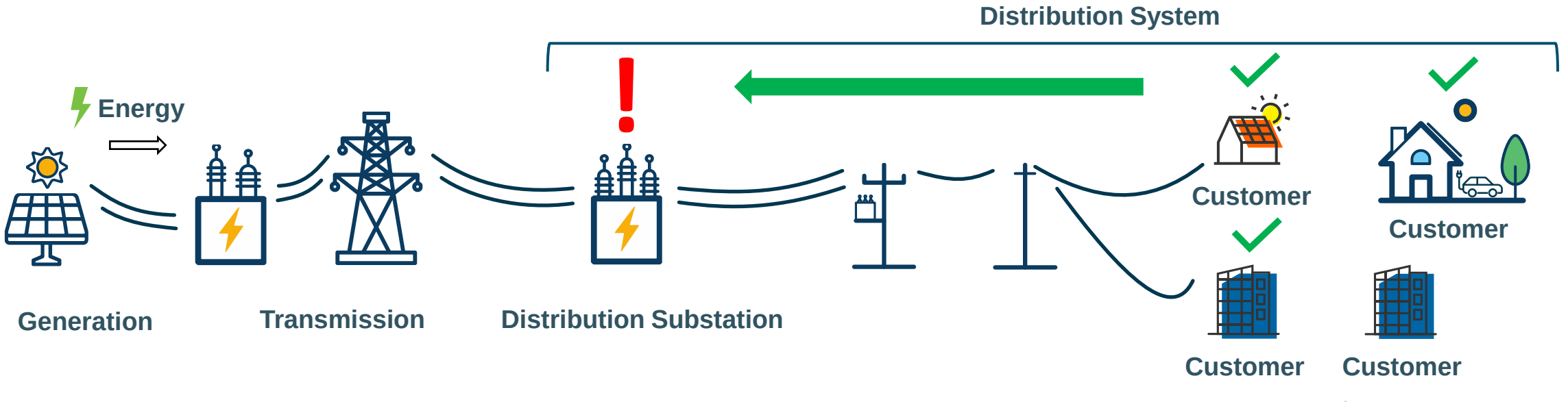
Capable of changing when and how much electricity they use/release

How DERs can be Helpful with a Local Grid Constraint



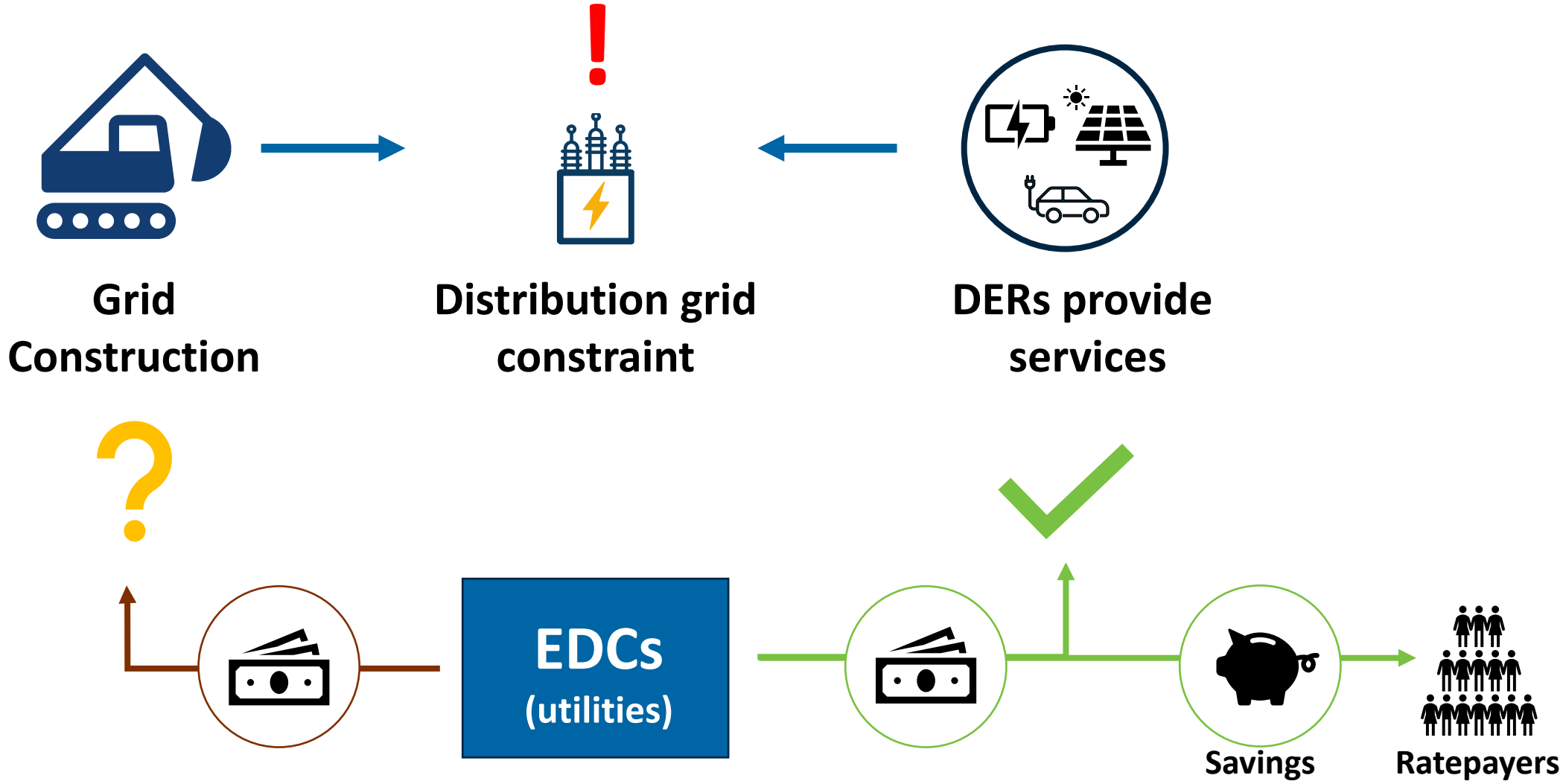
Note: There may be DERs that seem nearby, but actually they are fed from a different, unconstrained substation. These DERs would NOT be useful in alleviating the above substation constraint.

Understanding “Grid Services”



These DERs can provide **“grid services”** to the distribution grid at a specific location and in a specific timeframe.

How Grid Services Could Work



Intro to the Grid Services Study

GRID SERVICES STUDY

- A starting point
- What is the value of these location and time specific services to the grid
- How do you compensate DER owners for their services?
- How can grid services be designed as an equitable solution?

ConnectedSolutions vs. Grid Services

From National Grid

CONNECTEDSOLUTIONS

Residential and business customers can enroll qualifying devices in ConnectedSolutions to automate their energy use and receive incentives for making small, temporary adjustments during peak demand days on the ISO-NE transmission grid

SIMILARITIES

- Customers can participate, make small temporary adjustments, and receive payments

DIFFERENCES

- ConnectedSolutions responds to ISO-NE system-wide peak whereas the Grid Services Study explores local constraints that occur in a specific neighborhood or area
- Participation targeted to subset of relevant customers (though all ratepayers can benefit)

Timeline for Grid Services