Reason to be Optimistic
We can get to 50% by 2030

Policy Levers to Reach Zero Emissions
Electrifying Building Heat and Transportation
Powered by Clean Renewable Energy

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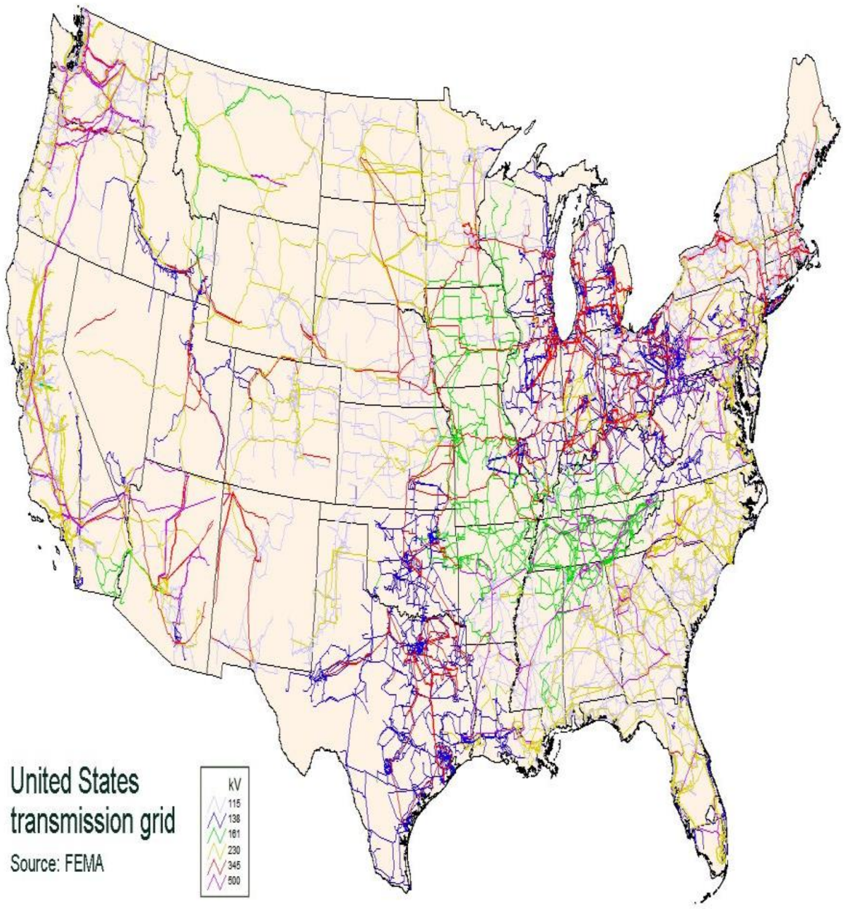
Its really relatively easy to get to 50% by 2030 and net zero by 2050

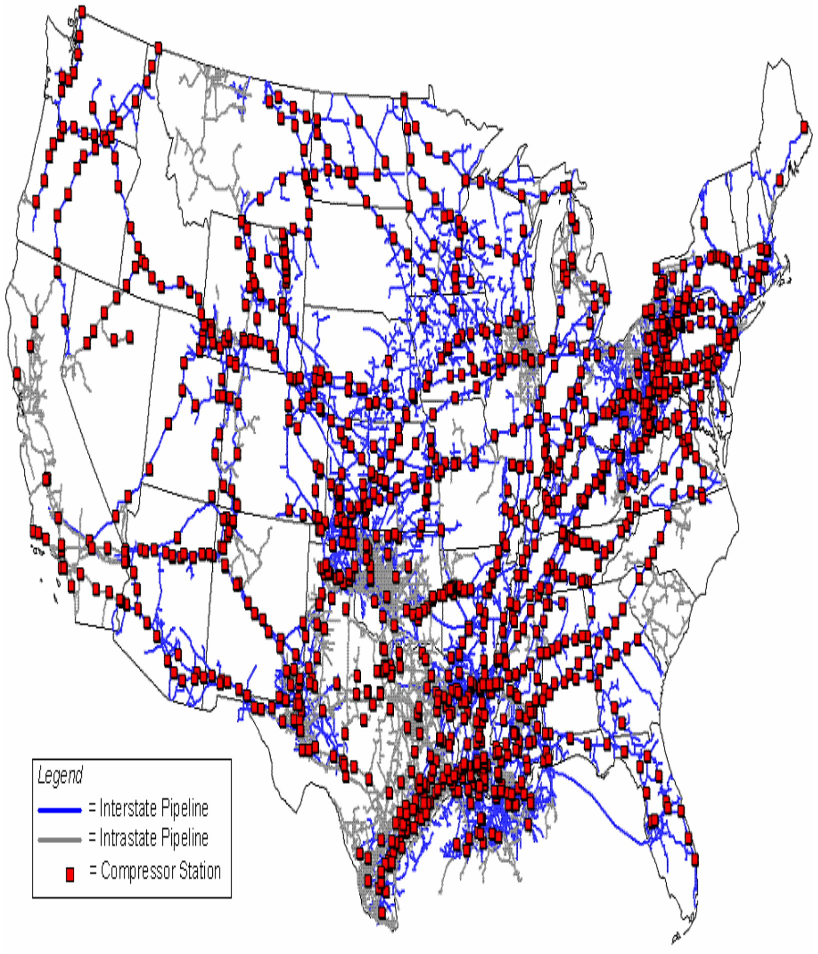
Just change the demand curve from the bottom up

The current US Energy System of pipes and wires are large enough to transverse the US over 200 times
And is over $1.2 trillion – almost 6% of US GDP



200,000 miles of electric transmission wires and 5.5 million miles of distribution wires

193,000 miles of fuel oil pipelines in US



300,000 miles of inter and intrastate natural gas pipelines and 2.1 M miles of distribution pipes

To get to 50% by 2030

Some things the Federal, State and Local Governments
With Industry partners can do well.

1. **Permit large clean renewable energy power plants**
2. **Develop more efficient energy equipment – EV and heat pumps**
3. **More energy efficient appliance standards and building code**
4. **Implement tax credits and incentives**
5. **Develop Renewable/Clean energy standards**
6. **Manage the energy systems - pipes and wires**
7. **Cap and Trade**

But this is a Partnership between you and
The Government and Industry to help mitigate GHG emissions

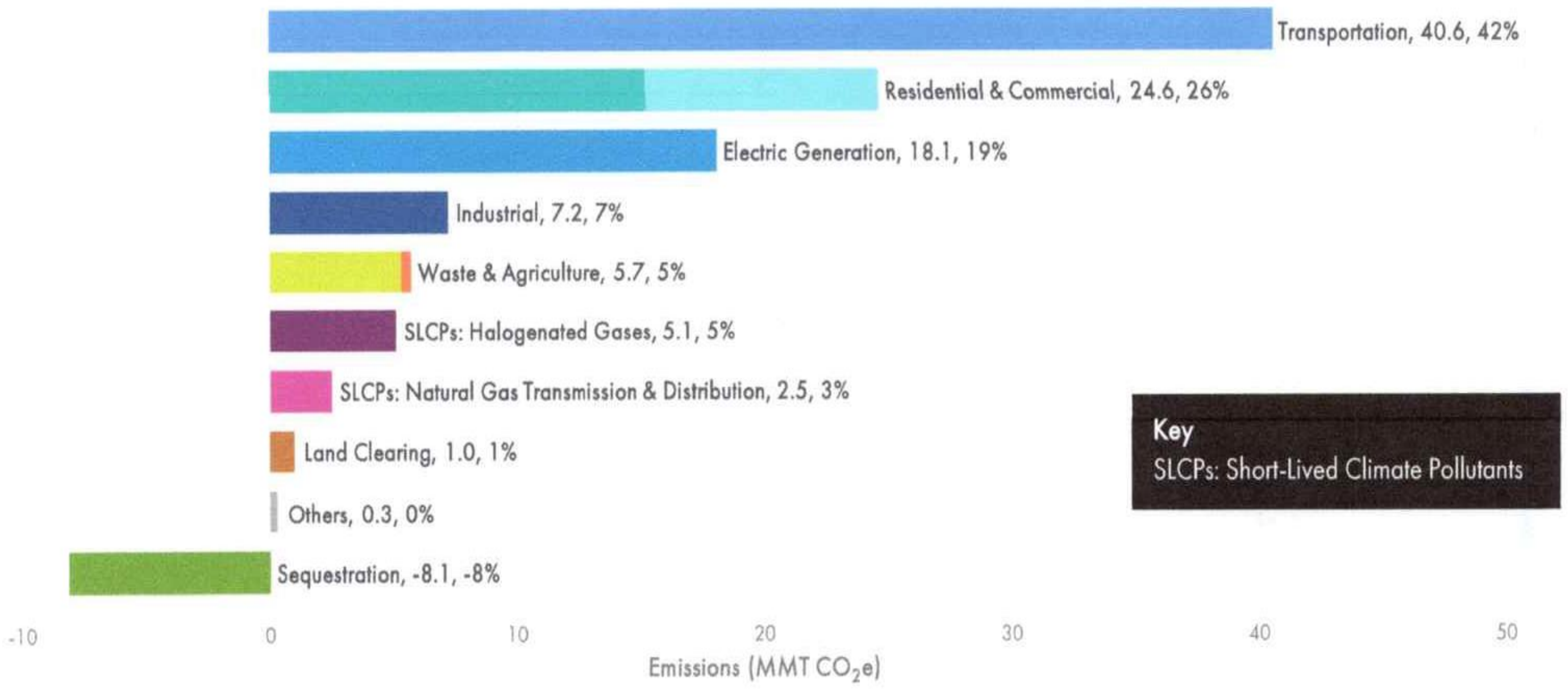
1. **You have to buy solar and wind electricity**
2. **You have to decide to add storage batteries**
3. **You have to buy EVs**
4. **You have to install a heat pump**
5. **You have to build beyond just codes and standards**
6. **You have to be the force in your municipality or school to go Gold in Energy in Sustainable Jersey**

You have to decide to actually do these things
You have to change the energy demand curves

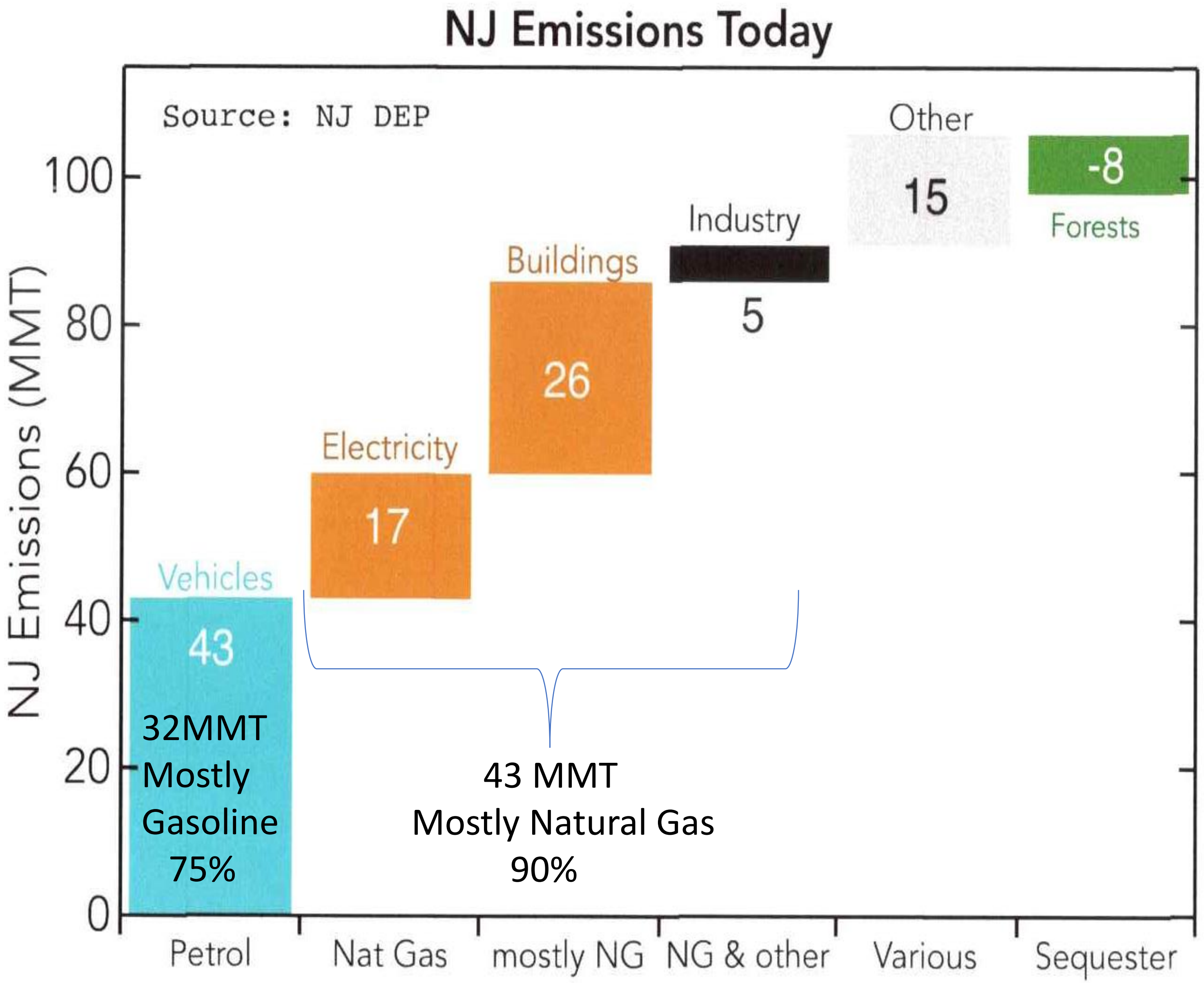
NJDEP GWRA Report 80 x 50 https://www.nj.gov/dep/climatechange/docs/nj-gwra-80x50-report-2020.pdf

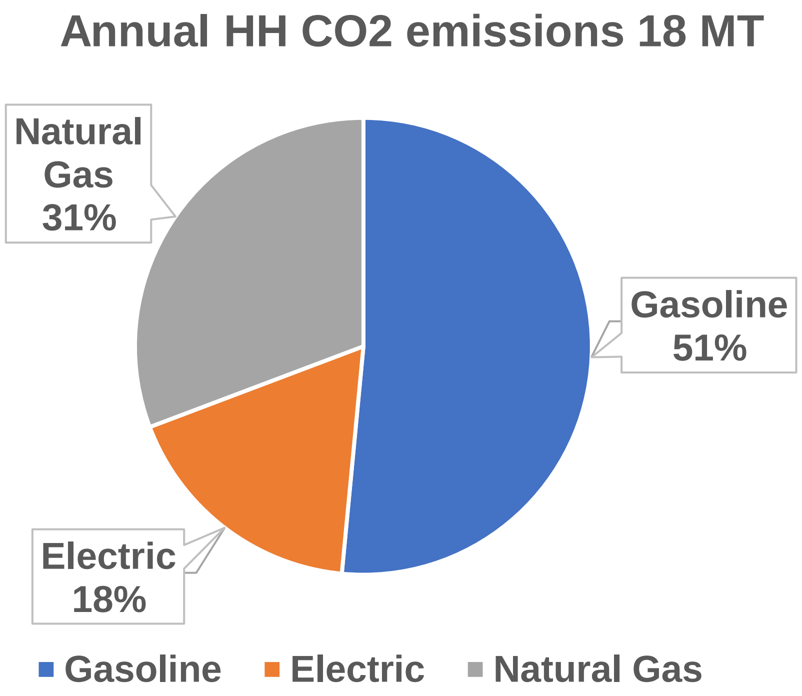
Figure ES.2. New Jersey GHG Emissions Inventory for 2018 (MMT CO₂e and Percentage).

Opportunities for emissions reductions are present in each of the categories.



New Jersey's 2019 Integrated Energy Plan - https://nj.gov/emp/





2019 Energy Master Plan – Strategies to get to 100% Clean Energy by 2050
The EMP puts mitigation in buckets – more integrated approach

2019 NJBPU EMP STRATEGIES	INTEGRATED ENERGY PLAN RECOMENADTIONS
Reduce energy use and emissions from the transportation sector	Accelerate the transition to electric vehicles powered by clean renewable electricity
Acceleration the deployment of renewable energy and DER	Continue and expand instate renewables and within PJM to supply clean electricity for the transportation and building sectors Retain near term but no expansion of existing natural gas and nuclear capacity for reliability
Maintain energy efficiency and peak demand reduction	Continue and expand existing EE and DR programs with a focus on heat pumps and EVs – powering New Jersey economy with clean energy
Reduce energy use and emissions from the building sector	Existing building electrification powered by clean renewable electricity Develop electrification programs for new construction
Decarbonize and modernize the New Jersey energy systems	Electricity to double by 2050 Plan grid modernization - integrated distribution plans Natural gas and gasoline usage declines

2019 EMP Goals

Achieving 100% clean energy and 80% reduction in 2006 greenhouse gas emissions (125 million metric tons to 24 million metric tons statewide) by 2050. 100% clean energy is defined as 100% carbon-neutral electricity generation and maximum electrification of the transportation and building sectors - specifically heating.

From the 2019 Integrated Energy Plan presentation – November 2018

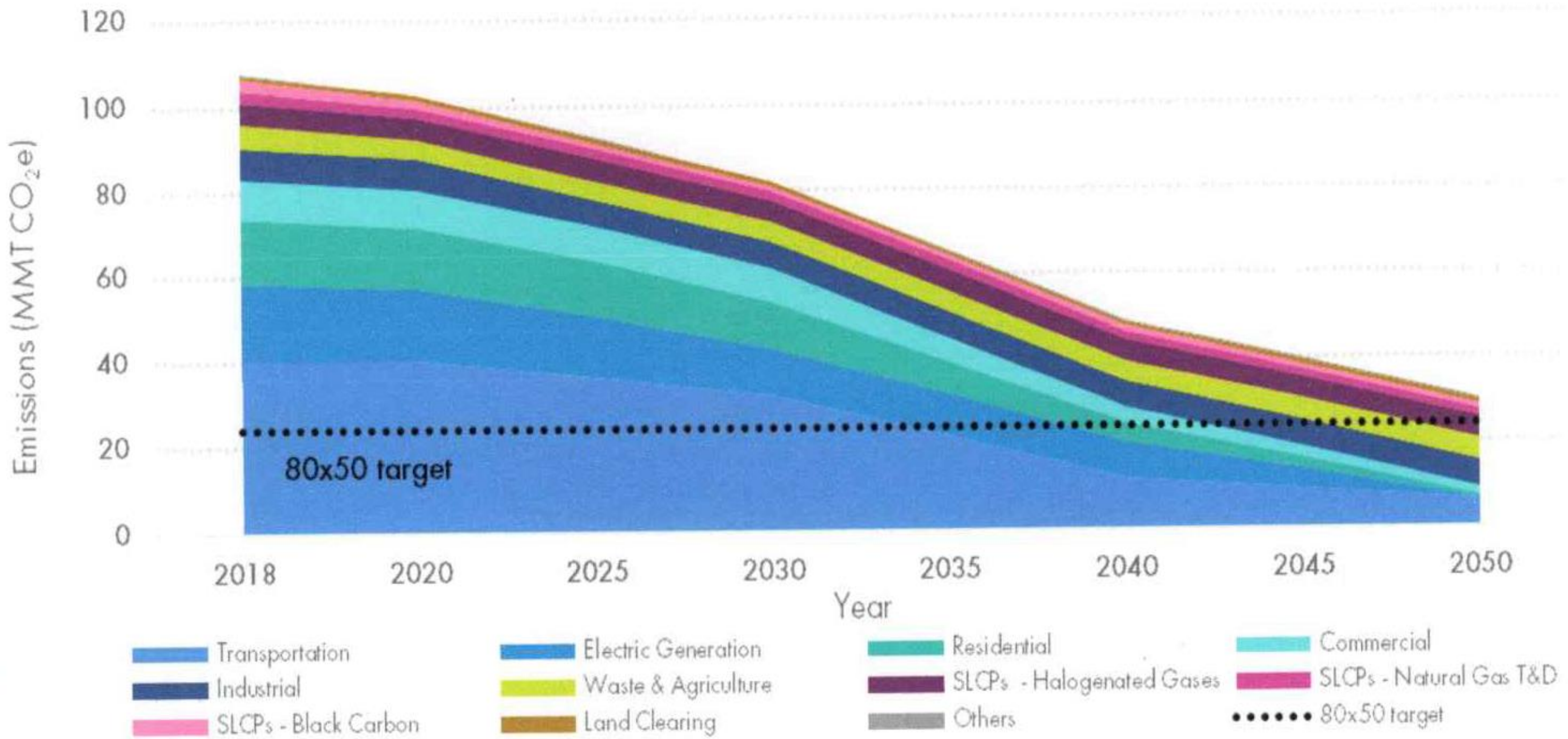
Summary of Key Finding presented by Rocky Mountain Institute

- New Jersey Can meet the goals of the 2019 EMP for 100% clean energy and 80% reduction in GHG emissions by 2050 with existing technologies
- Cost to meet the 2019 EMP goals are relatively small compared to total energy spending and offset by the benefits
- Existing policies reduce GHG emissions are a good start but are not enough to achieve the 2019 EMP goals
- The least cost energy systems are substantially different from today's energy system

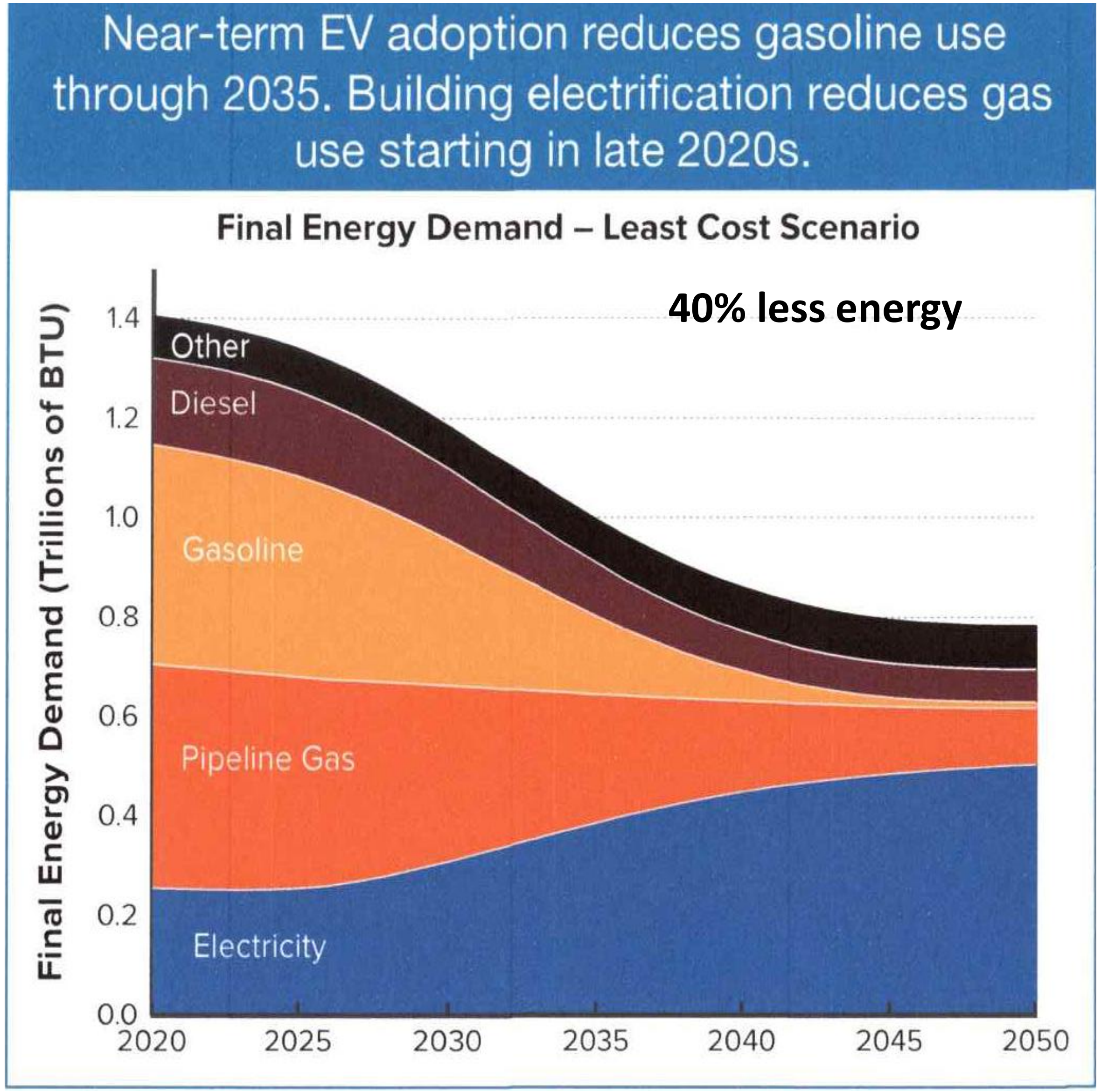
NJDEP GWRA Report 80 x 50 https://www.nj.gov/dep/climatechange/docs/nj-gwra-80x50-report-2020.pdf

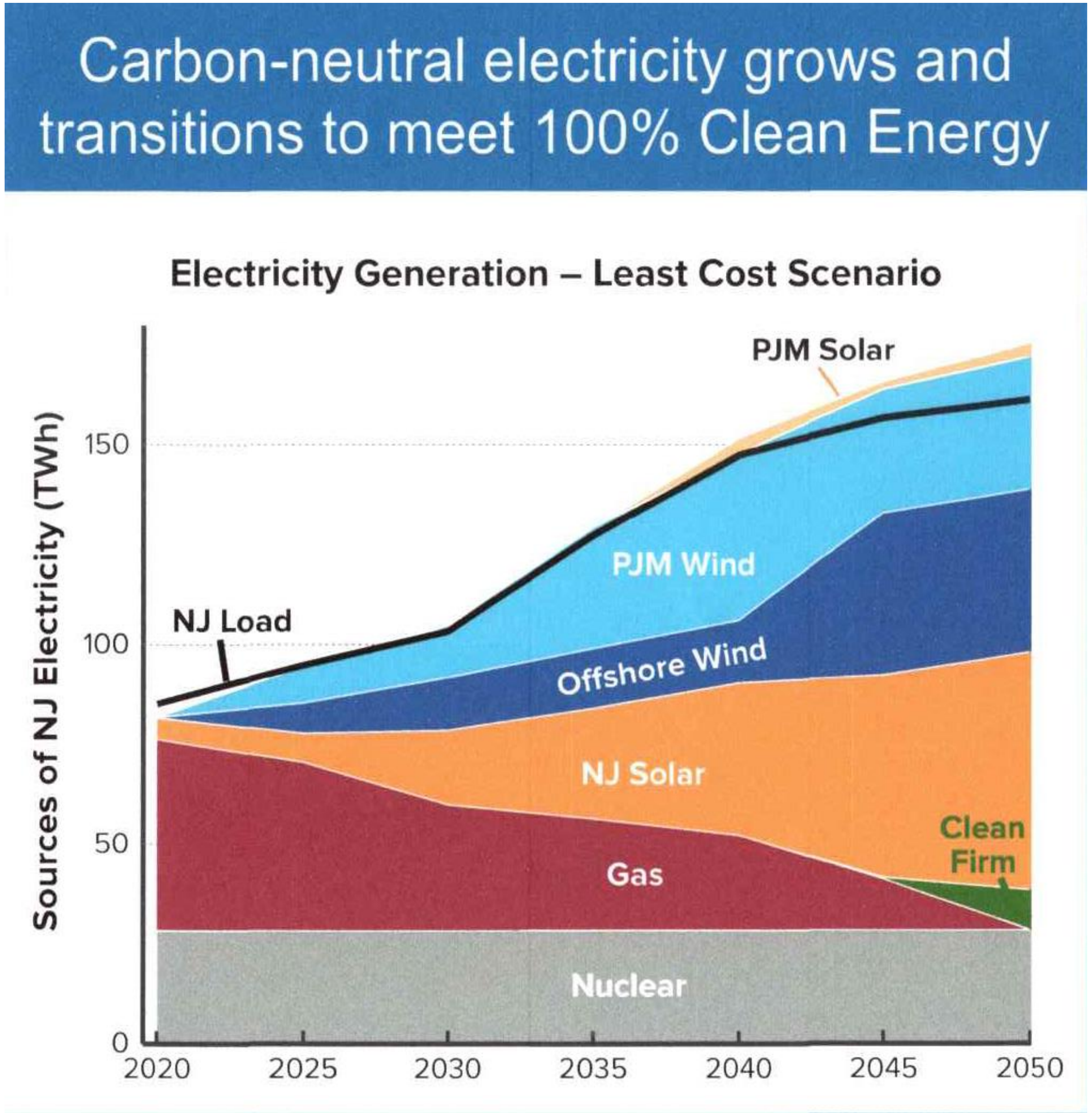
Figure ES.3. New Jersey GHG Emissions Pathway to 2050 (MMT CO_2e).

The 2019 EMP least cost pathway combined with non-energy sector strategies, and carbon sequestration (not shown) have the potential to reduce net emissions below th 80x50 target prior to 2050.

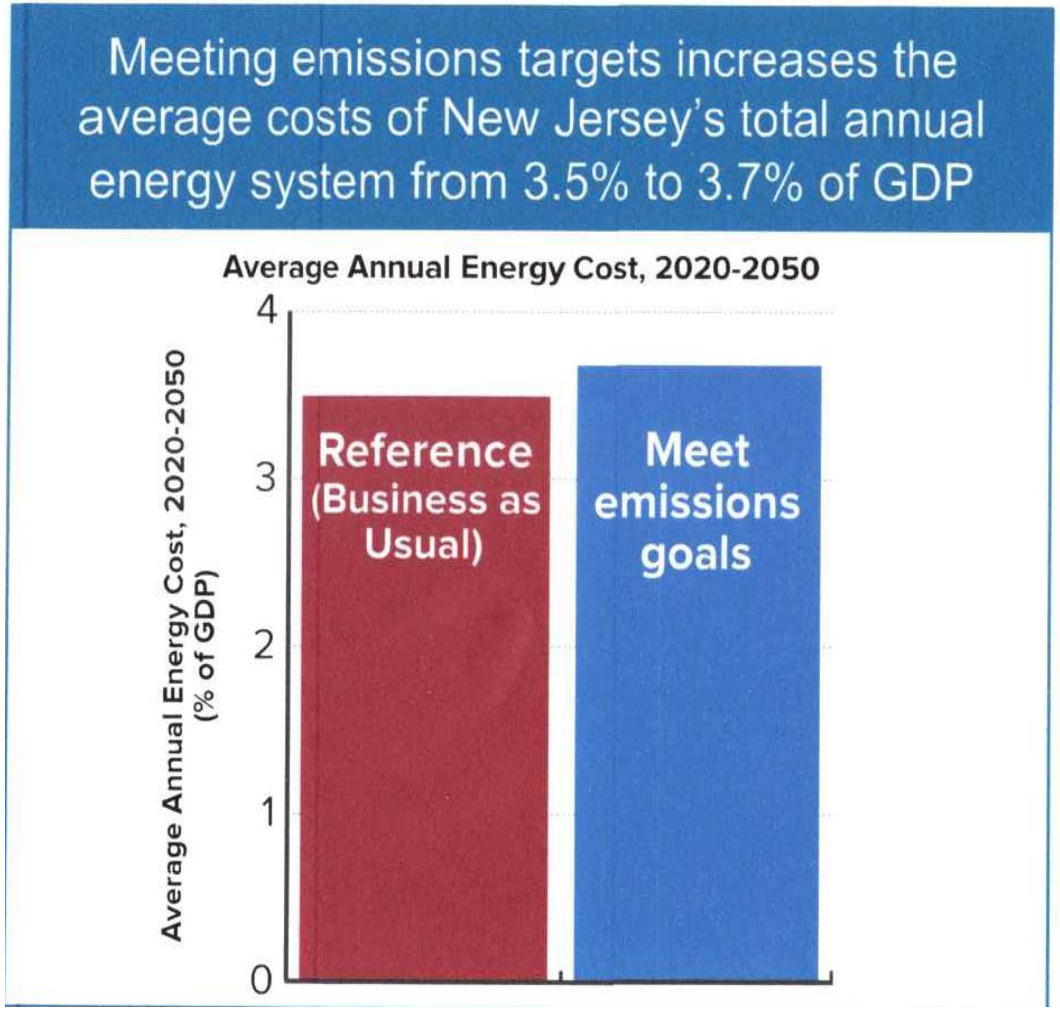


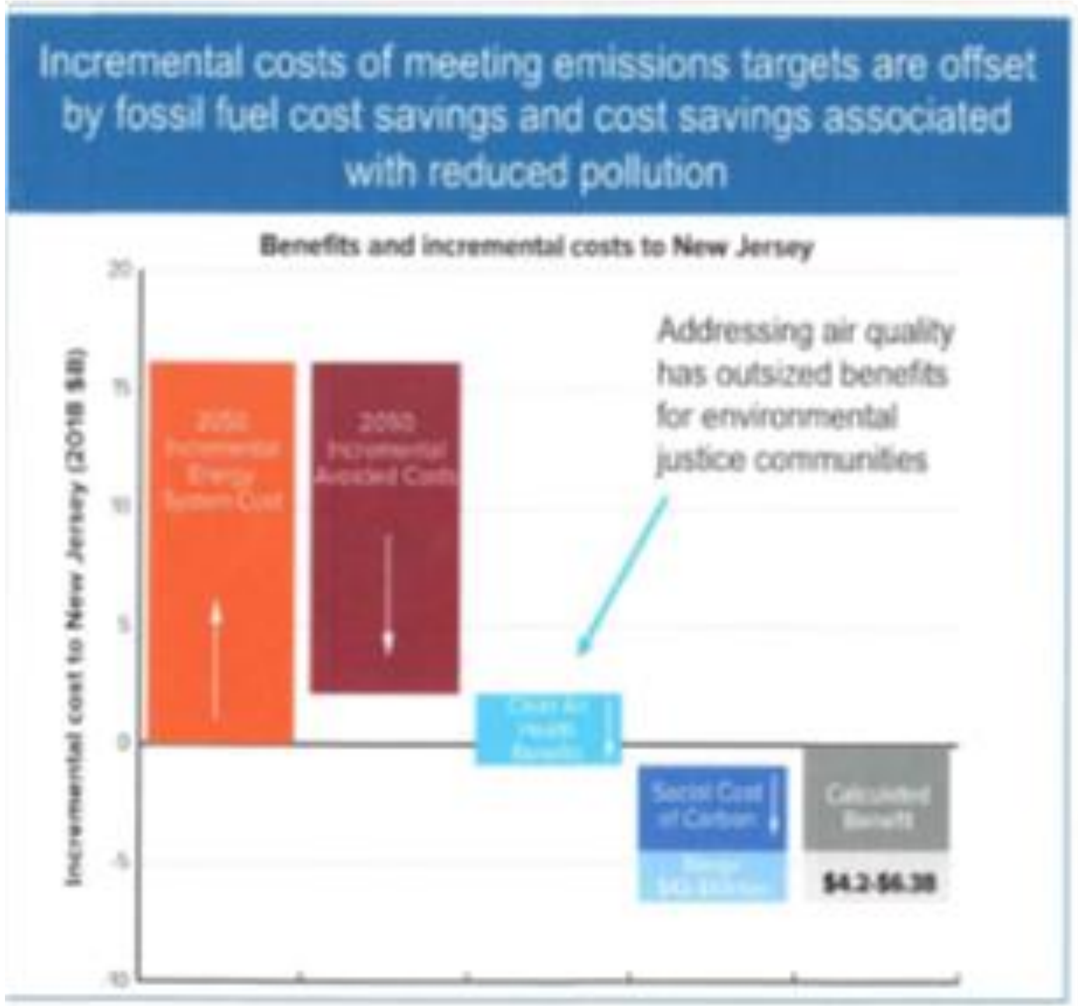
2019 Energy Master Plan – Energy system Supply and Demand





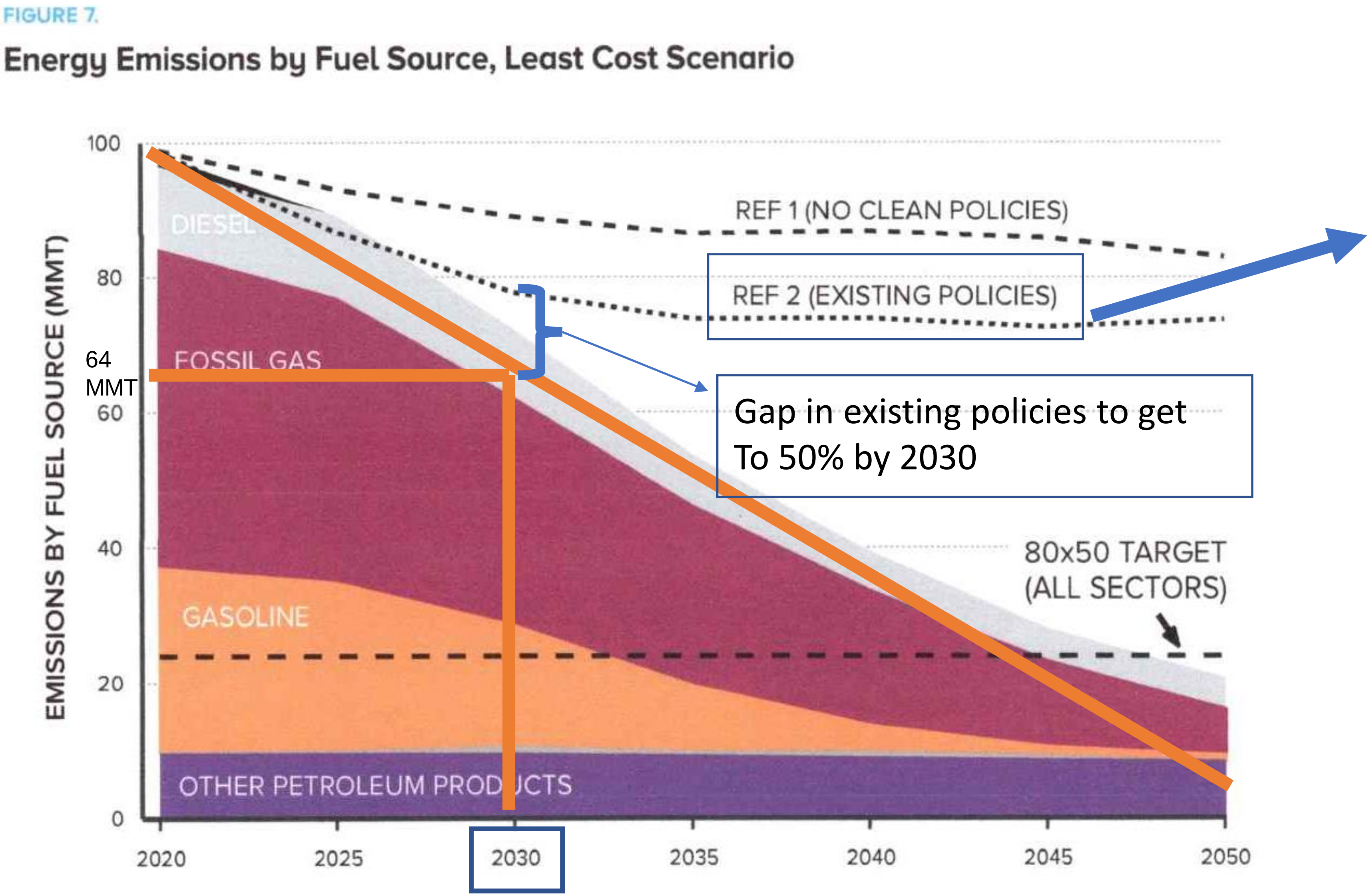
2019 Energy Master Plan – Costs and Benefits





The overall cost is a 0.2% increase in New Jersey's total GDP at an estimated cost of $2.1 billion and a benefit of $4.2 to $6.3 billion. That is a benefit to cost ratio of 2 times to 3 times. A benefit to cost ratio that is greater than one is defined as cost effective.

New Jersey's 2019 Integrated Energy Plan - https://nj.gov/emp/
Policy increases to get to 50% by 2030



Clean Energy Act of 2018 –Ref 2

The Clean Energy Act of 2018 was enacted by Governor Murphy in May 2018 and included the following:

Energy storage goal of 600 MW by 2021 and 2,000 MW by 2030

Class I RPS of 21% by 2021, 35% by 2025 and 50% by 2030 with a cap of 7% on the total cost .

Modify or replace the SREC program

A community solar program

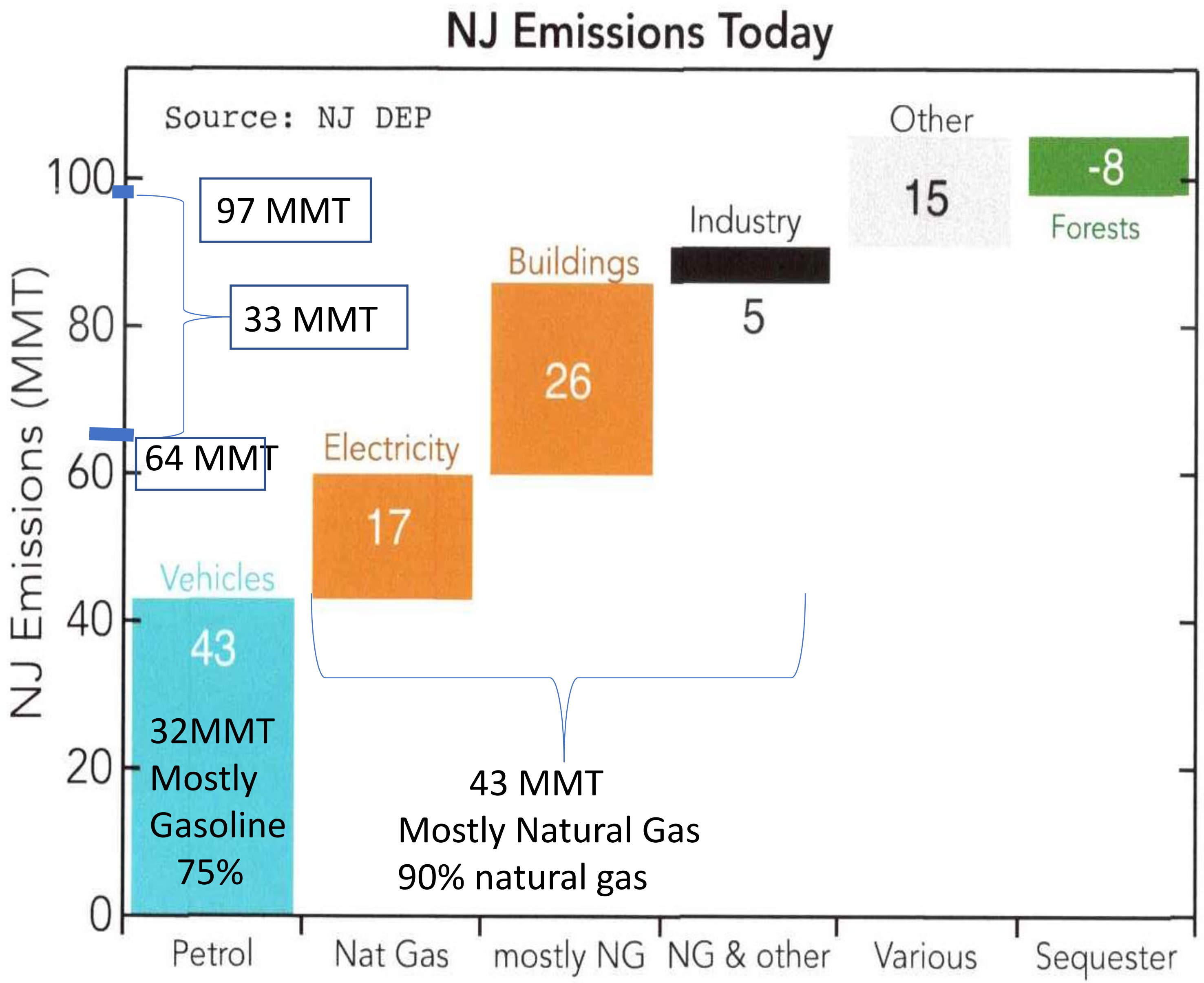
Utility EE goals of 2% annually for electricity and 0.75% for natural gas

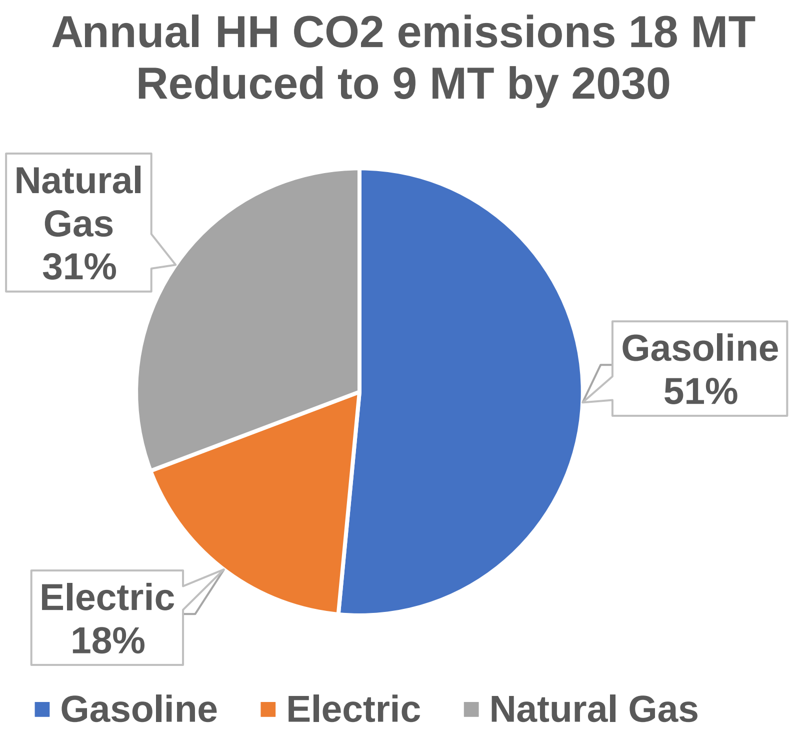
OSW goal of 3,500 MW

To get to 50% by 2030 Requires more than the 2019 EMP or about 8 MMT less

NJDEP 2019 GHG emissions inventory including sequestered GHG emissions of 8 MMT

New Jersey's 2019 Integrated Energy Plan - https://nj.gov/emp/





To get to 100% clean energy - 80 x 50 or 50 x 30

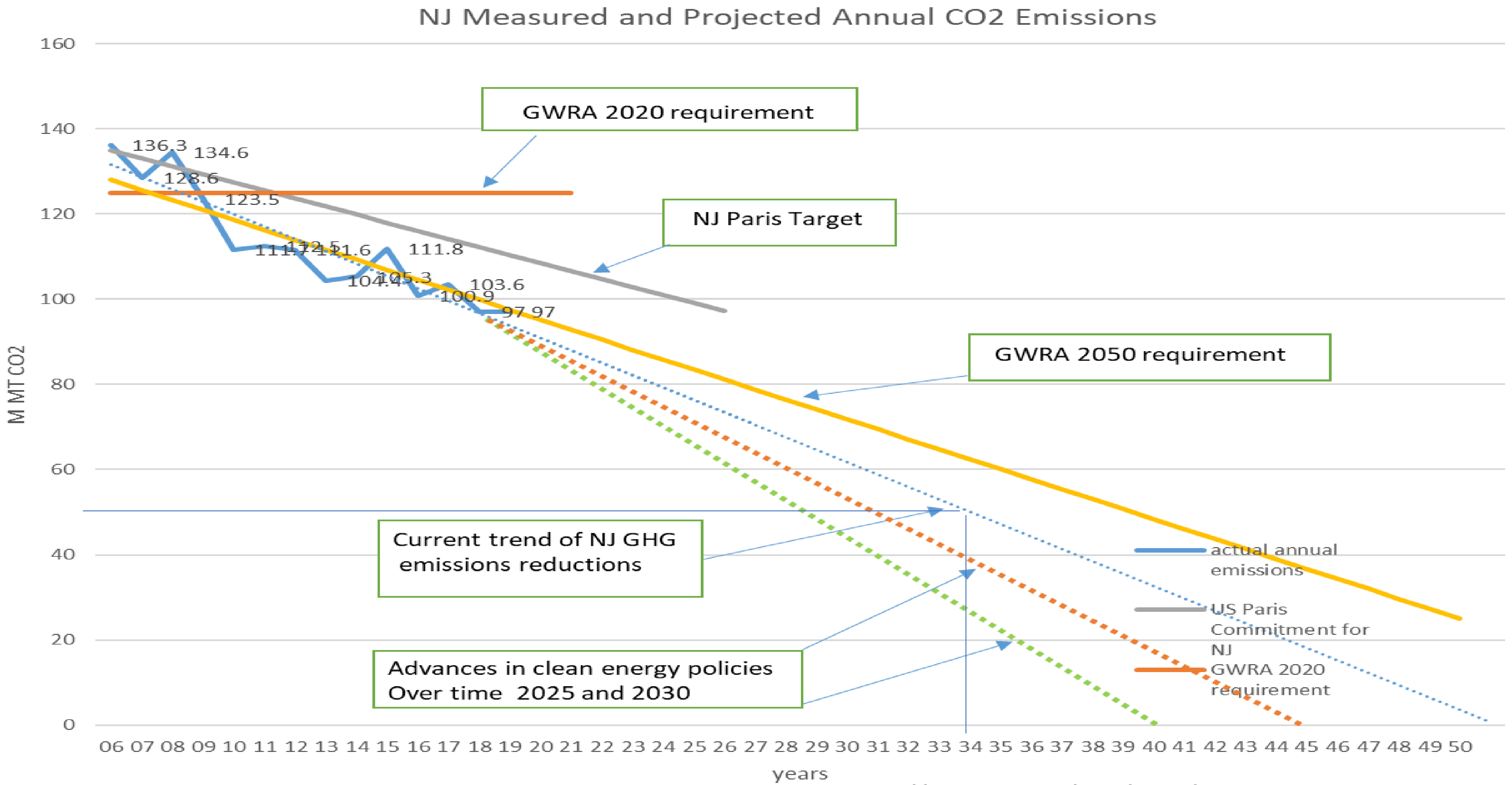
Does not depend on a federal carbon tax or a federal clean electricity standard or a state carbon cap and trade

Nice to have but you can mitigate the impacts of greenhouse gas emissions today with currently available cost effective clean energy technologies

You beat this large energy system "From the inside out" by changing the demand curve

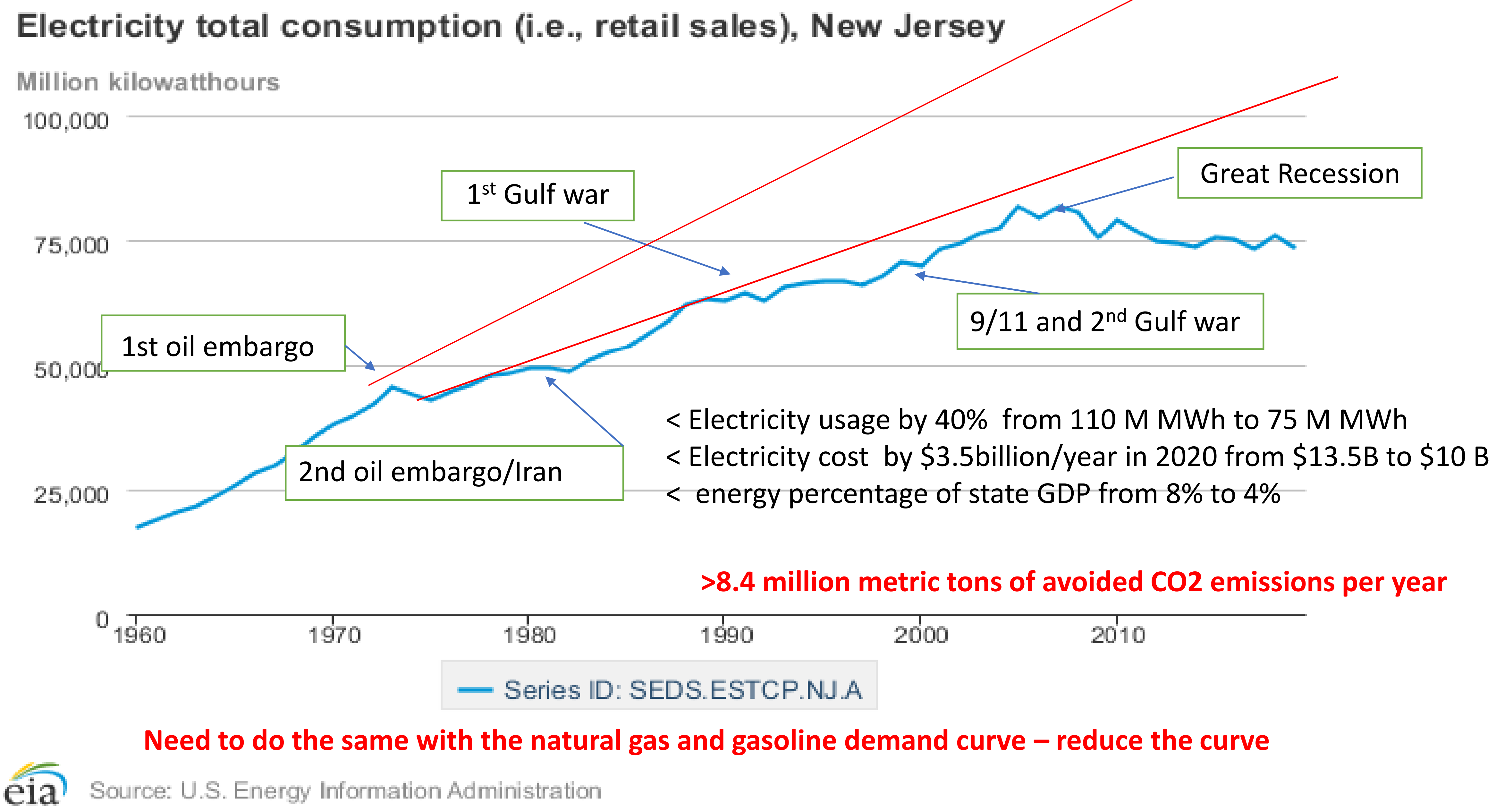
New Jersey's Progress to achieving its GHG emissions reduction goals and more Why I'm Optimistic

Getting to 50% by 2030 and beyond depends on the partnership

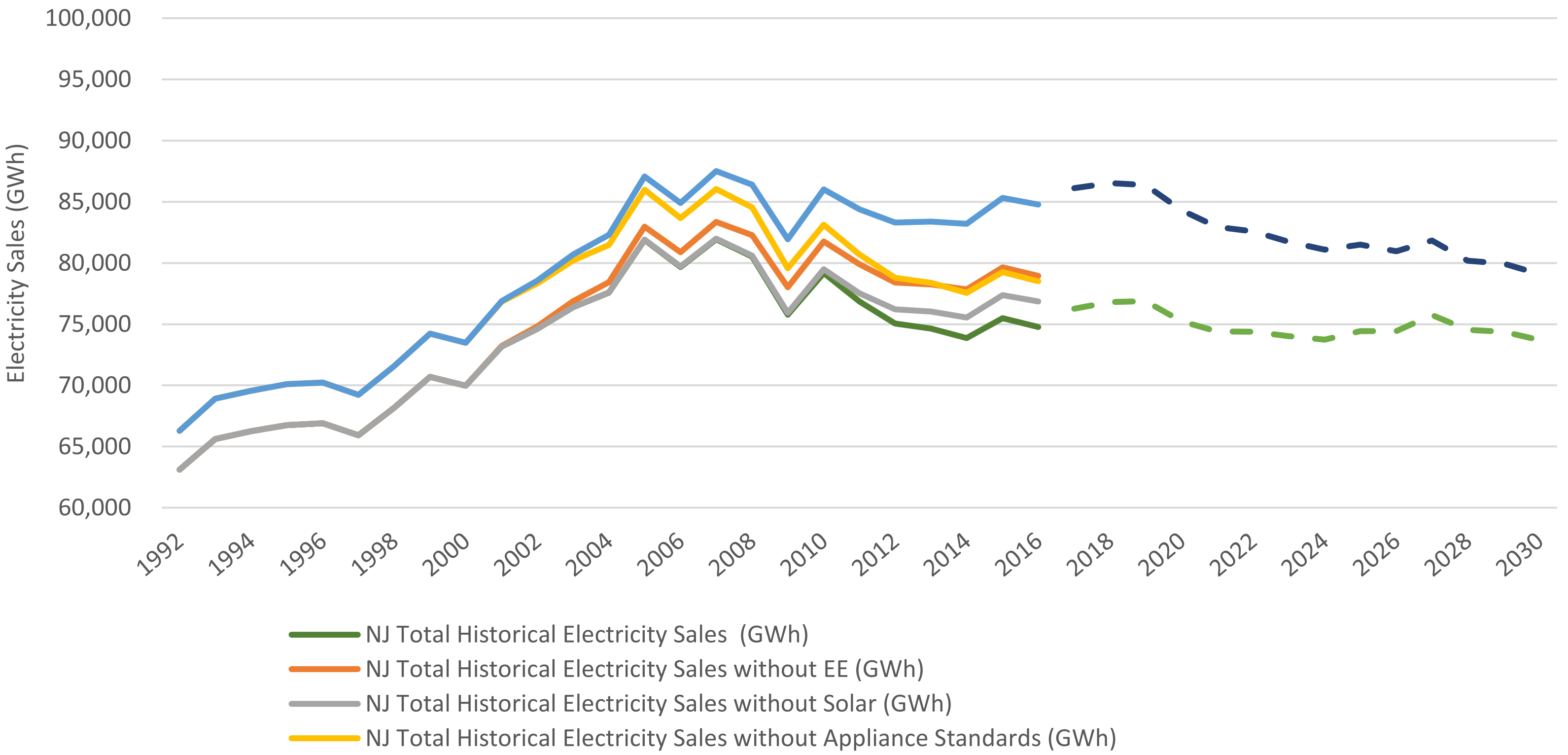


Source for actual data NJDEP GHG emissions Inventory Report https://www.nj.gov/dep/aqes/NJ_GHGinventory2015Update.pdf

Pre-1973 Energy Policies were Economic Policies – that changed with Energy Efficiency



NJ Electricity Sales with and without EE, Solar and Appliance Standard Savings
Why we can change the demand curves



The Estimated annual electricity savings in 2016 are 10 million MWh. Total electricity savings from 2009 to 2016 is represented by the area beneath the curve.

This is $1 billion in annual cost saving 0r $100/person

State of New Jersey
Energy Data Center
http://njenergydata.rutgers.edu/

To get to 100% clean energy by 2050 or 80 x 50 or 50 x 30

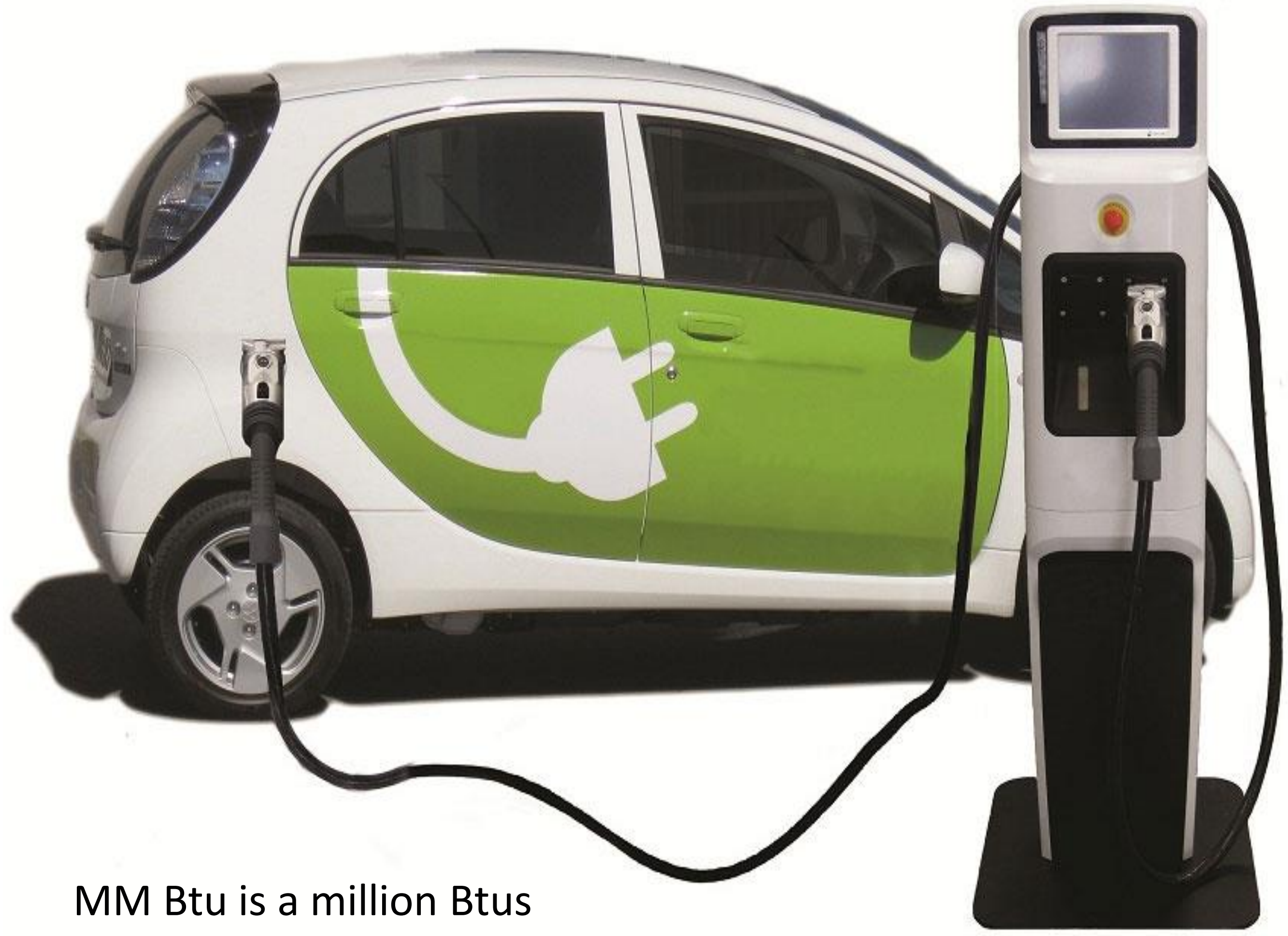
Five Cost Effective (even without subsidies) Clean Energy Technologies that can be Implemented Incrementally to Mitigate Climate Change by Reducing Greenhouse Gas Emissions

- **Solar (RE)**
- **Storage (CE)**
- **Electric Vehicles (EE)**
- **Heat Pumps (EE)**
- **Smart Grid (CE)**

You can beat this large energy system "From the inside out" by changing the demand curve

Transportation Sector - Going Electric

How to Change the Demand Curve for Oil and Gasoline
to Prevent Future Oil pipelines
Start slow and small and build into a movement



Used EV for under $20,000
40 miles RT for 260 days (5 day work week)

An average ICE vehicle
416 gal/ yr - 48.3 million Btus -$1414/yr.

An average EV
3,536 kWh /yr - 12.1 million Btu - $584/yr.

Savings $747/yr. avoiding 2.75 T of CO_2

3,536 kWh / year - 3.21kilowatts (kW) of solar
@$3/watt SPB for EV and solar 15 yrs. (ROI 6.7%)
Avoiding 4 T of CO_2
Reducing both gasoline and natural gas
demand and emissions and storage solar electricity

MM Btu is a million Btus

Building Sector - Going Electric

How to Change the Demand Curve for Natural Gas to Prevent Future Natural gas pipelines
Start slow and small and build into a movement

GWH = $1,200
230 therm – 23 million Btus $320/yr emitting 2.3T
HPWH = $2,500
2,000 kWh 6.8 million Btus $330 /yr emitting 0.5T
Avoiding 1.8 T of CO2

2,000 kWh /year = 1.5 kilowatts (kW) of solar
@ $3/W = $3,330
HPWH + solar = 10.5 years (ROI 9.5%)
Avoiding 2.3 T of CO2

Reducing natural gas demand in electric and heating sectors
A major advantage is you can store your solar electricity in the HPWH

Policy Lever to Reach Zero Emissions
Reasons to be Optimistic

Thank You

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