

Transforming the Island's Energy System

- *A roadmap for resilience, a response to climate change* -



Objectives

- **Summarize the work of the Energy Working Group in modeling and analyzing the Island's energy system**
- **Outline the impacts of decarbonizing this energy system over the next two decades**
- **Provide an initial roadmap for the future carbon-free and resilient Island energy system transformation**

Outline

- **Background**
- **Island energy system today**
- **The future transformed energy system**
- **The path forward**

Background

- **Responding to the climate crisis includes both *adaptation* and *mitigation***
- **The next several decades are critical**
- **Our fossil-fuel based energy system (globally and locally) must and will be transformed**
- **A number of Island groups have been hard at work**
 - Town energy and climate committees
 - All-Island energy committee (VSEC)
 - MVC Climate Action Task Force (CATF)
 - Vineyard Power Cooperative
 - Island Climate Action Network (ICAN)

CATF Energy Transformation Working Group

- **Working group members:**
 - Richard Andre
 - Marc Rosenbaum
 - Alan Strahler
 - Tom Soldini
 - Rob Hannemann
- **Phase 1 (2019/2020)**
 - Established energy and greenhouse gas (GHG) baseline
 - Sector working papers: defining the challenge
- **Phase 2 (2020)**
 - Updated baseline (2019) and codified the process
 - Completed the Island Energy Model
 - Scenario definition and analysis
- **Phase 3: Transformation roadmap**

100% Renewable MV

Aspirational goals :

- **Reduce fossil fuel use on the Island, from a 2018 baseline:**
 - 50% by 2030
 - 100% by 2040
- **Increase the fraction of our electricity use that is renewable:**
 - To 50% by 2030
 - To 100% by 2040

MV Energy System in 2018

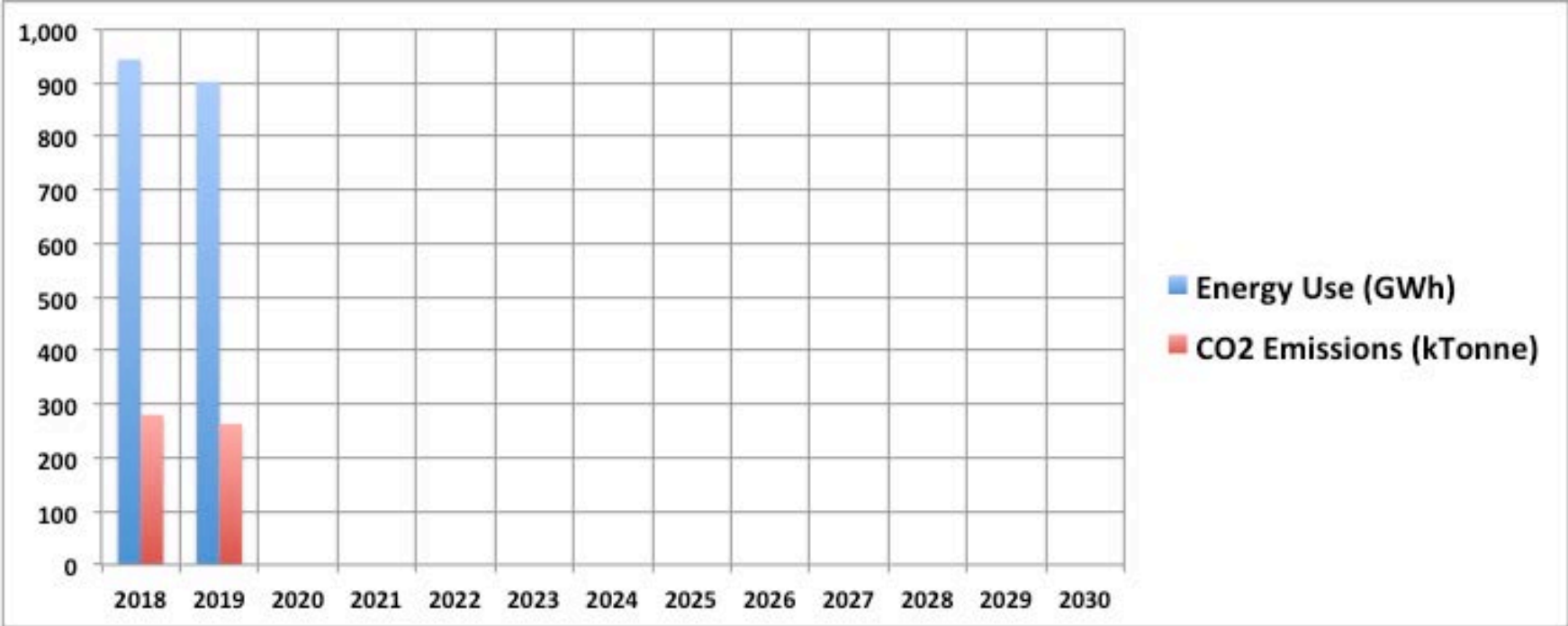
- **Total annual energy use ~ 944 GWh (electricity + fossil fuels)**
 - Transportation: 44%
 - Heating*: 28%
 - Electricity: 28%
- **CO₂ emissions: ~ 280 kTonnes/year (628 million pounds; fossil fuels + power generation)**
- **Fossil fuel use 2018:**

	Million gallons
Transportation	
Gasoline	7.23
Diesel	3.02
SSA Marine diesel	1.46
MVY Jet fuel	0.70
MVY Aviation gas	0.09

Buildings	Million gallons
Fuel Oil	2.49
LPG	7.88

** Includes cooking, etc.*

2019 Update



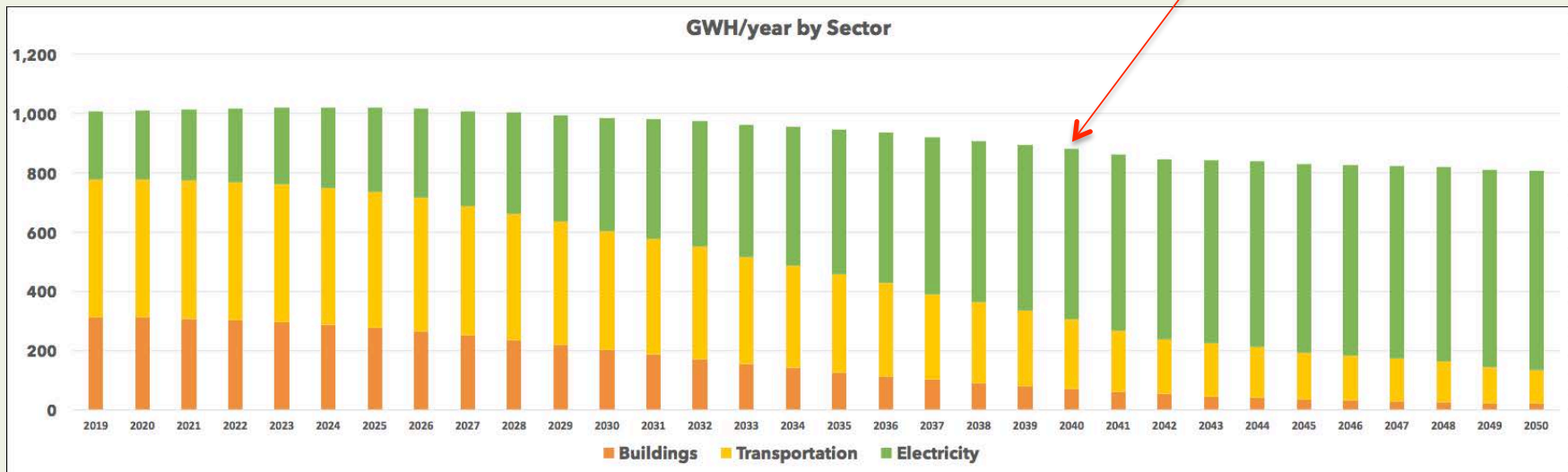
Transformation Strategy

- **Simple to state, challenging to implement**
- **Three efforts in parallel:**
 - Electrify all end uses of energy
 - Make both imported and on-Island electricity renewable
 - Increase resilience of supply and distribution

Island Energy Model* Base Case

Current statutes, current policies, current trends

*Electricity use 2.5X;
total energy use lower
by 13%*



*Fossil fuel reduction: 23% by 2030
61% by 2040*

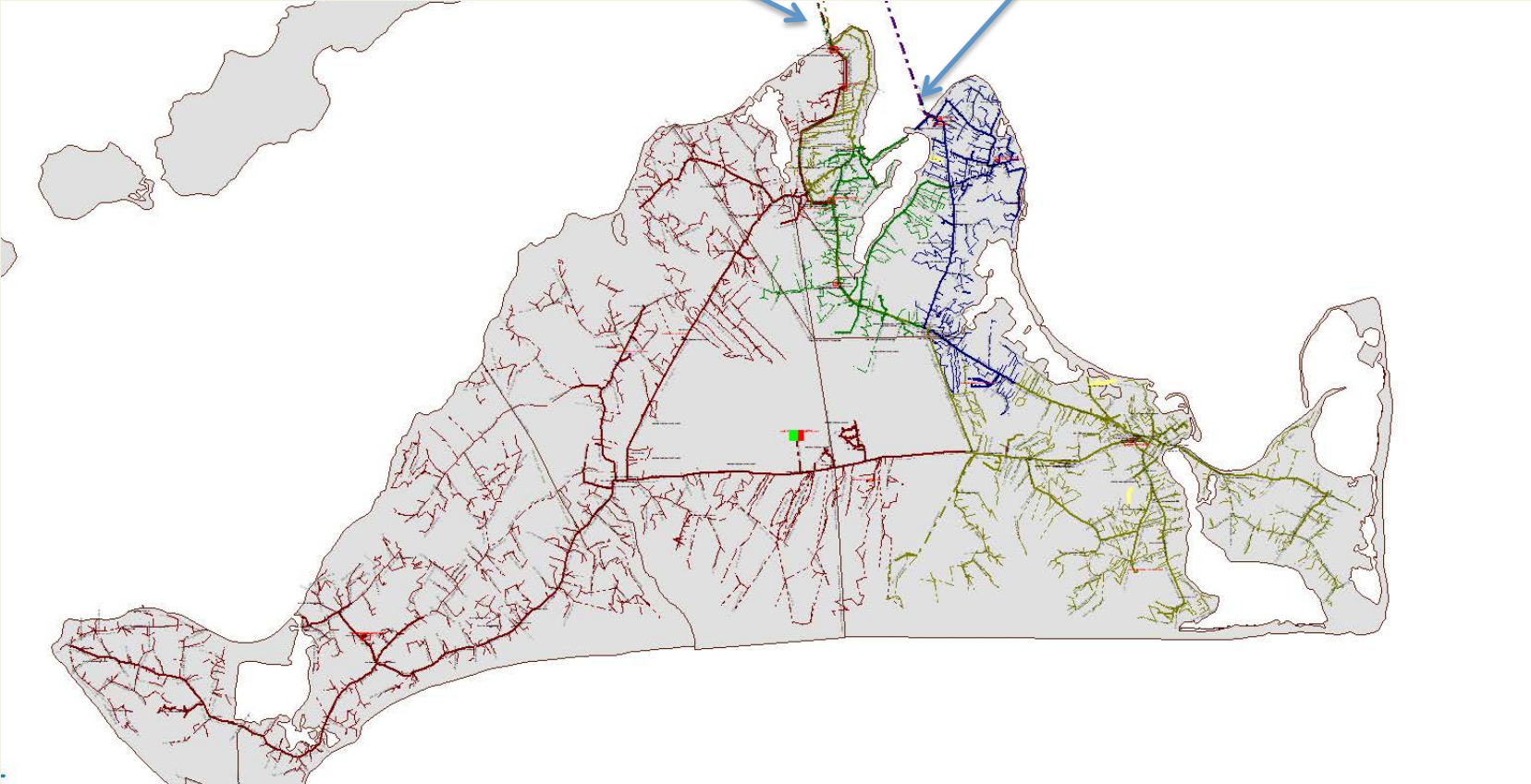
*Electricity renewable fraction: 60% by 2030
70% by 2040*

** Thanks to Luke Lefeber, Richard Andre, Marc Rosenbaum, Tom Soldini, and Alan Strahler*

The Island Grid Today

3 (23 kV) cables – West Chop

1 (23 kV) cable – East Chop



The Future Island Grid : Robust and Resilient

- **Upgrades in power supply**
 - 2 additional cables – 115 kV
 - Upgraded shore infrastructure – both sides
 - Increased on-Island solar generation + storage
 - Smart metering and control (grid IT infrastructure)
- **Upgrades for resilience**
 - Microgrid build out for critical services by 2026
 - Martha’s Vineyard “Virtual Power Plant” by 2032
 - Allows power sharing across the Island – increased resilience
 - Allows management of peak power – an advantage for Eversource
 - Underground distribution for vulnerable areas

On-Island Solar Generation (percent of total load)	
2018	7.7%
2019	9.1%
2030 (goal)	18%
2040 (goal)	25%

Following the Roadmap

- **We can achieve our goals by accelerating the base case**
- **How?**
 - Information and education
 - Politics and policies
 - Projects (EV charging, microgrids, community solar, smart grid)
 - Collaboration is key
 - Vineyard Power
 - Eversource
 - Cape Light Compact
 - CVEC
 - The Commonwealth
 - As well as....

Key Recommendations - Transportation

- **Island-wide (regional)**

- Create and fund a (small) organization* to provide information regarding cost and availability of EVs, including light, commercial, and off-road vehicles
- Work with relevant organizations (VTA, schools, SSA, companies) to accelerate adoption of electrified transportation (land vehicles by 2030)
- Establish regional plans for an integrated EV charger network

- **Towns**

- Obtain commitment for adoption of all-electric municipal vehicles by 2030
- As part of energy planning, address EV public charging at the town level
- Adopt bylaw (building code) to require all new construction to be pre-wired for 240V charging in garage or at an appropriate outdoor location

** This organization could be part of an existing group and should also serve the buildings sector*

Key Recommendations - Buildings

- **Island-wide (regional)**

- Develop central information website for cost, availability, and applicability of all-electric HVAC equipment and energy efficiency options for both new construction and retrofits
- Establish community buying programs for cost effectiveness
- Encourage common adoption of advanced building energy codes and standards
- Build an effective partnership with the Island's construction industry

- **Towns**

- Migrate to net-zero-energy designs for new municipal buildings by 2030
- Adopt advanced building energy codes for new construction and retrofits
- Continue to have a focus on energy efficiency – deep energy retrofits, lighting, etc.

Key Recommendations - Electricity

- **Island-wide (regional)**

- Support continuing focus on 100% Renewable goals – information, education, policy
- Support development of regional community solar sites*
- Work with non-municipal critical service providers to increase energy system resilience (microgrids)
- Political outreach – state and federal
- Advocacy and partnership in driving grid modernization – smart grids, “virtual power plant”

- **Towns**

- Establish short and long-term energy transformation plans
- Microgrids for critical town services by 2026
- Consider gradual adoption of underground utilities

** Aggregate solar PV goal: 25% of total energy use by 2040*

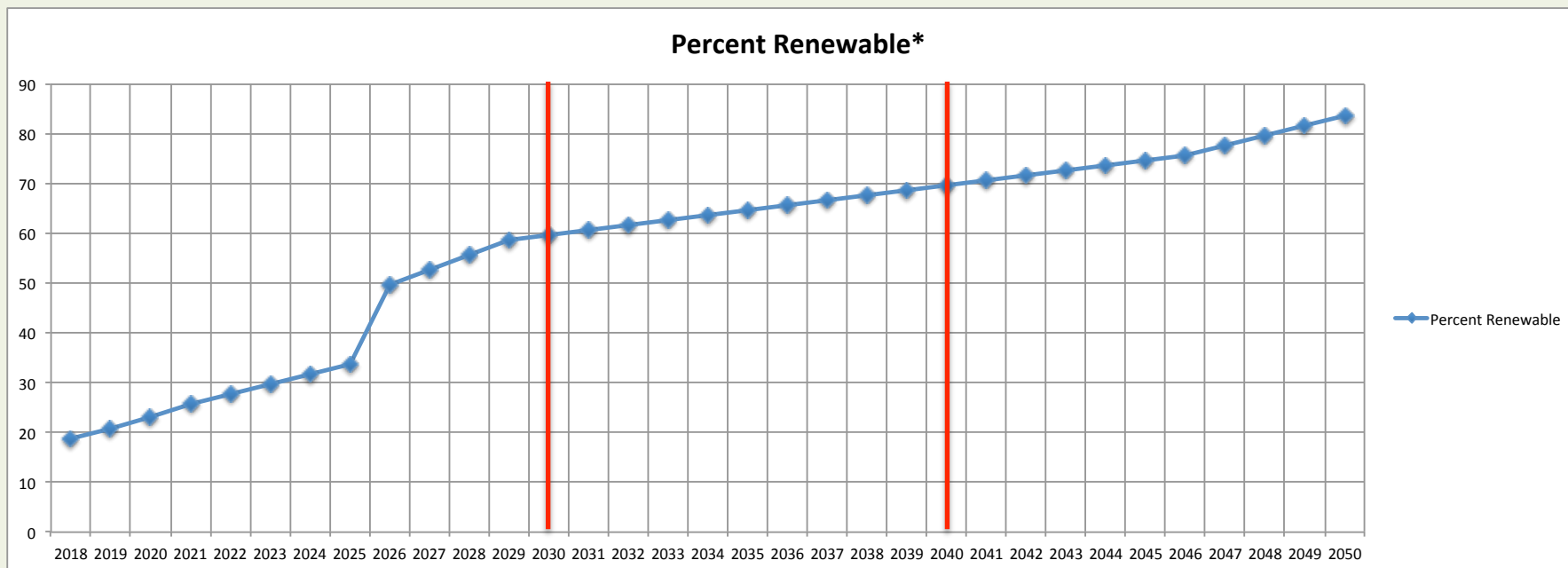
Additional Slides

The Economics of Electrification

- **Electric vehicles**
 - 30+ models available today, many more in near future
 - Life cycle costs are significantly lower than fossil-fuel vehicles (energy cost, maintenance)
- **Building heating and cooling**
 - ASHPs already have lower capital cost than fossil fuels for new construction, and have equivalent service life
 - Lower energy costs by 40% v. propane
 - Many options for retrofits
- **Heat pump water heaters**
 - For a family of four, an energy savings of more than \$350/year
 - Initial cost ~\$1100 v. ~\$300 for conventional
 - Payback time of 3+ years
- **Solar PV systems pay back in 4 – 5 years (25 year life)**

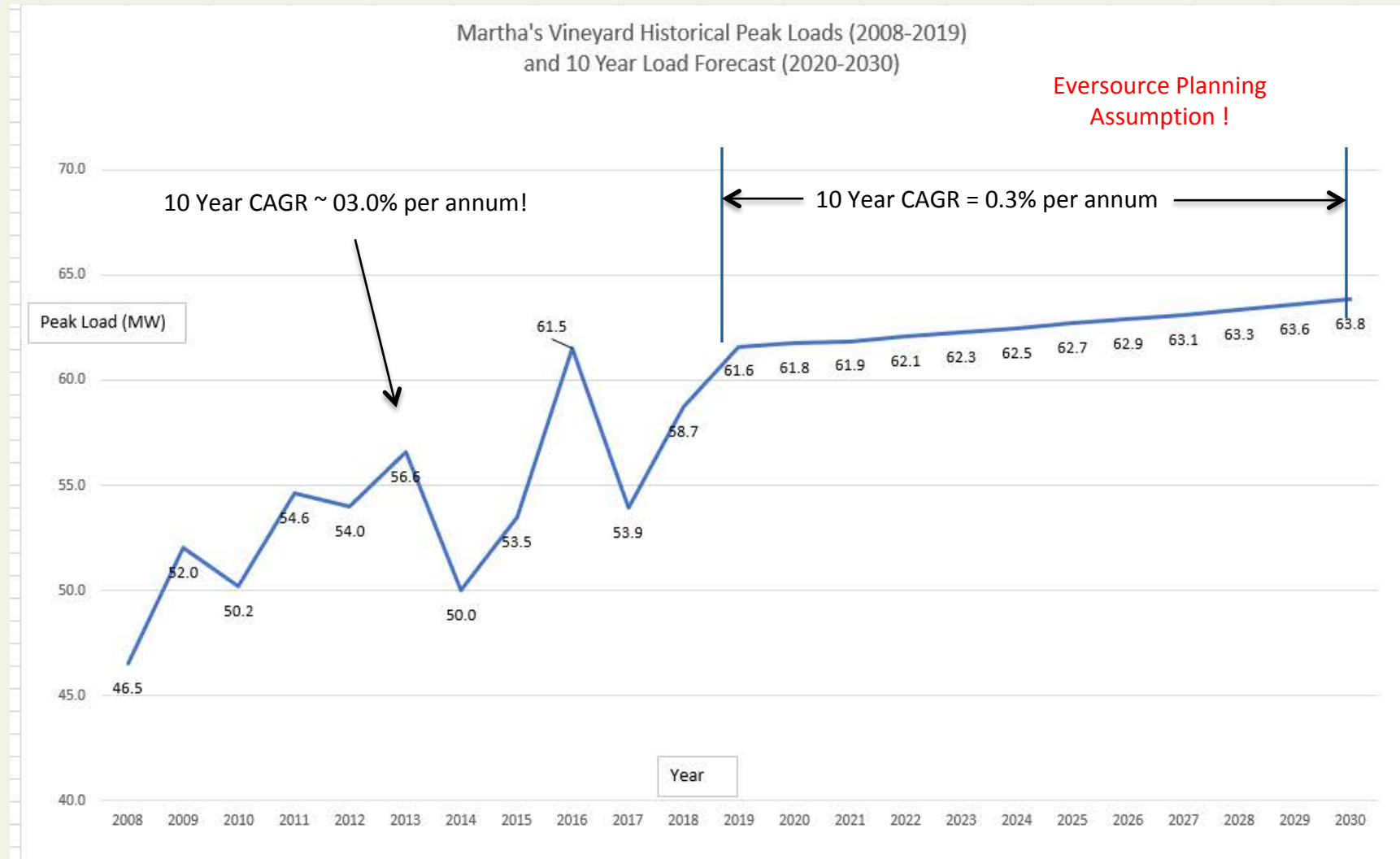
The Commonwealth's Grid is Getting Greener

Under current statutes:

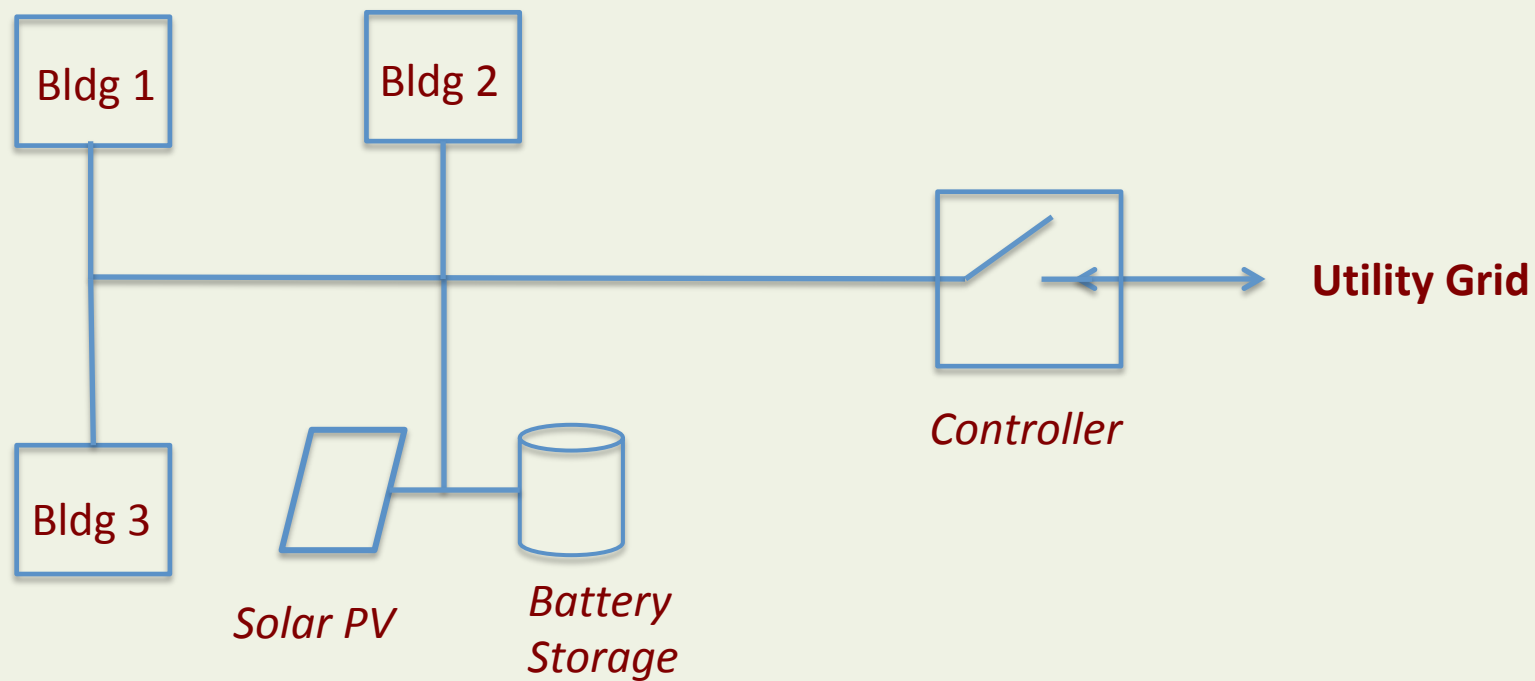


Recently passed legislation will accelerate “greening the grid”

Eversource Partnership is Key



Resilience 2026 – Microgrids for Critical Services



Resilience 2032 – Island Virtual Power Plant

- **Combines smart grid with distributed solar generation and storage**
- **Utility-operated variant:**
 - Allows response for peak load management
 - Owners are compensated for utility use of stored energy in peak periods
 - Owners are incentivized to install solar PV + batteries
 - Resilience when outages occur
 - Win-win for utility and residents
- **Community-operated variant:**
 - As above, except with third-party (or community) operation
 - Can sell power contracts on electricity markets
 - Can sell power at other than just peak load periods
 - Presumably lucrative for community participants
- **Early versions are already operating**
 - California, Hawai'i, other
 - Mass Save Connect program (Eversource)
 - Green Mountain Power