# Electrification of New York State

Course Number

E-NYS-2023

Speaker: Melanie G. Stachowiak, PE

Date: November 8, 2023



Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.





#### Copyright Materials

This presentation is protected by US and International Copyright laws. Reproduction, distribution, display and use of the presentation without written permission of the speaker is prohibited.



# Course Description

This course explains the history of the Greenhouse Effect and its impact on the environment. We will review the importance of this issue and how it affects humans and their health and well-being. We will also discuss how to combat climate change including policies related to energy, carbon reduction and the transition to renewable energies. Most importantly, we will discuss a strategy for implementation including reducing energy consumption, electrification, and the use of renewables.



# Learning Objectives

At the end of this course, participants will be able to:

- 1. Understand the history of greenhouse gas and the impact on the environment
- 2. Understand how to combat climate change
- 3. Understand policies related to energy, carbon reduction and transition to renewables
- 4. Understand strategies for implementation reduce energy, electrification and renewables





# Electrification of New York

The Why, How, and What of accomplishing it

We Listen... We Understand... We Deliver...

# Why is this Important?

# Why is this important?

#### **The Greenhouse Effect:**

Greenhouse gases include carbon dioxide, methane, nitrous oxides & water vapor

Carbon Dioxide stabilizes Earth's Atmosphere

```
Remove CO2 = Greenhouse effect collapses
```

Earth is an average 59°F which is perfect to support life

Over the last century, mainly through burning of fossil fuels the level of CO2 has increased sharply

This results in excess heat being trapped and ultimately causing temperatures to rise



# Why is this important?



## Why is this important?







-O More than 200,000 new jobs added 10.000 MW of distributed solar 0 **CLEAN ENERGY ECONOMY RENEWABLE ENERGY RENEWABLE ENERGY CLEAN ELECTRICITY GHG REDUCTION RENEWABLE ENERGY**/ over 157,000 clean energy jobs -6.000 MW of distributed solar **CLEAN ENERGY STANDARD** 9.000 MW of offshore wind 100% zero-emission 85% reduction in greenhouse gas emissions from 1990 levels 70% electricity from renewable energy electricity 0 0 0 by 2025 by 2030 by 2035 **~ 2040** by 2050 now **CLEAN TRANSPORTATION** 100% light duty zero-emission **RESILIENT and DISTRIBUTED GRID GHG REDUCTION** vehicle sales 40% reduction in greenhouse 1,500 MW of energy storage gas emissions from 1990 levels **ENERGY EFFICIENCY AND** BUILDING DECARBONIZATION -0 6,000 MW of energy storage 185 TBtu end-use savings in buildings and industrial facilities 1 million electric homes and 1 million electrification-ready homes

NY Climate Leadership and Community Protection Act (CLCPA)

#### **Challenges to overcome:**

Evolution of the power grid

Ability of the grid to handle electrification

Aging infrastructure

Need for 2-way communication (not available everywhere) in order to support the introduction of distributed renewables or other sources of power

Potential supply chain issues for production and distribution of high efficiency technologies

Educated manpower for owning and operating, next generation systems will have more intelligence

Appropriate application of technology





**500 buildings** 

per day need to be decarbonized over the next 30 years



of new construction projects need to be all electric



\*Energy Efficiency and Housing Advisory Panel Recommendations Presentation to the NYS Climate Action Council for Consideration in the Scoping Plan May, 2021

# 





#### **Energy Efficiency: Holistic Approach for Largest Impact**

High performance envelope

Energy recovery

Variable air volume and flow

Decoupled dedicated ventilation systems

HVAC system occupancy controls and building optimization Retro-commissioning and addressing inefficiencies of sequencing

Modulating controls

Heat pump technology

Geothermal

High efficient lighting and lighting controls

Daylighting

Solar thermal

Low flow fixtures



#### **Electrification:**

Clean Heating and Cooling Technologies Air, water, or ground source heat pumps VRF Systems (Variable Refrigerant Flow) High Efficiency ASHP Domestic Water Heaters Hybrid systems

Electric vehicles and charging stations







#### **Electrification: Things to consider** when selecting a system

Type of Building

Building and space uses, if heating or cooling dominated

Opportunity for energy sharing within the building

Characteristics of building i.e. large amounts of glazing

Ground composition and thermal properties if considering ground source or geo-exchange (Test Well!)

Amount of outdoor air introduced such as a Lab vs Office



#### **Electrification: Infrastructure considerations**

- Early consideration, predict loads
- Review existing utility consumption and peak, benchmark building
- Sub metering to determine end-use breakdown and potential opportunity for conservation measures
- Assess existing systems and equipment including age and condition
- Consideration for future planned projects Coordination with the utility – available power Physical size and location of equipment Shutdowns and coordination Back-up power for resiliency Redundancy where possible



#### **Renewables:**

Solar Photovoltaic Wind, on or offshore

Geothermal

Energy Storage

Solar Thermal

Hydro energy

Tidal energy

Biomass/bio-fuels energy

Community & District Energy/Thermal Systems (geothermal, solar, etc.)

Integration with battery and thermal storage



#### **Geothermal and other Energy Sharing Systems:**

Individual building

Clusters

Campus

Review load profiles of buildings



#### **REC's & Purchase Power Agreements:**

Renewable Energy Credits

Current pricing for 2023 Quarter 3: \$36.62 / MWh

Purchase these to offset carbon use

Purchase power agreements can allocate a certain percentage of your energy to be from renewable sources



#### **Non-Energy & Other**

Drought resistant native landscaping

Green cleaning supplies

Lawn mowing and equipment - electric mowers, forklifts, etc.

Embodied carbon tracking and reduction (building materials)



Waste reduction (alternate vending solution with less packaging) / composting

Site water reclamation (grey-water reuse), landscape/community garden irrigation, and water reduction

Alternative transit (pedestrian / bike racks / public transportation routes)

Bottle filling stations (in lieu of single use plastic bottles)

**Recycling stations** 

Low VOC materials

Natural refrigerants that don't contribute to global warming Electric vehicle fleets and charging stations



#### FIGURE 1: LIFECYCLE STAGES

Data source: BS EN 15978:2011

STAGE BEYOND THE CONSTRUC-LIFECY-PRODUCT TION MAINTAIN AND USE END OF LIFE CLE Operational Embodied Embodied Embodied Embodied Embodied GHG Emissions 🔁 🗘 层 Time Con-Haul away Recycling Disposal Manu-Transport Replace-Refur-Water Reuse/ Extract Transport Use Mainte-Repair Energy Demolto factory facture to site struct bishment Use Use ish the waste Recovery raw nance ment materials products the building materials building **A1** A2 **A3** A5 **B2 B**3 **B4 B5 B6** C2C3 **C4** D **A4 B1 B**7 C1MODULE © New Buildings Institute



#### How do we pay for those goals?

More than \$21 billion in 91 large-scale renewable projects across the state \$6.8 billion to reduce building emissions \$1.8 billion to scale up Solar Generation More than \$1 billion for clean transportation More than \$1.2 billion in NY Green Bank commitments



#### **Incentive Programs and Grants:**

Triage and leverage programs Incentives for:

- Benchmarking
- Energy Audits
- Conservation measure identification
- Analysis and Energy Modeling
- Implementation Prequalified & Custom
- Financing and Taxes (Inflation Reduction Act)

Programs include:

- Clean Heating and Cooling
- Energy Savings and decarb efforts
- Indoor air Quality Improvements
- Energy Recovery
- Energy Storage
- Renewables
- Electric vehicles, fleets, and charging
- Greenhouse Gas Emissions Inventories
- Climate Action Plans (single building or campus)
- Electrification
- Emerging technologies











# Some Final Thoughts

# **Decarbonization is necessary to limit climate change.**

# Electrification paired with the use of renewables is intended to combat this.

#### **Reforestation and Afforestation**











# Recommended Available Tools

Benchmarking and Utility Analysis Energy Audits, including systems inventory, energy analysis, exploration of energy conservation measures Energy Modeling GHG emissions inventory / Climate action plans Feasibility Studies Sustainability Planning Green Building Programs such as LEED, PIHUS, WELL building, Energy Star New Building Institute (Embodied Carbon) ASHRAE Zero Energy and Carbon Design Guides NY Stretch Code **Incentive Triage** NYSERDA FlexTech Providers and Primary Energy Consultants Clean Heat Providers and Utility Trade Allies Design and Construction Consulting Firms and Services







# ornel CA Life. Change B

**Questions?** 

www.meengineering.com



This concludes The American Institute of Architects Continuing Education Systems Course



