Aquinnah | Tisbury | West Tisbury | Edgartown | Oak Bluffs | Chilmark

Martha's Vineyard Regional High School

CMTA

SYSTEMS+ENERGY

peak sustainability + optimal operability

WILL SYSTEMS BE EASILY CONSTRUCTED, MAINTAINED & OPERATED WHILE STILL BEING ENVIROMENTALLY RESPONSIBLE?

Sustainability

A HOLISTIC DESIGN PROCESS

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Building Orientation & Massing

Building Envelope

High Performance MEP Systems

On Site Renewables

Maximize daylighting and control solar heat gain	Optimized building envelope, low infiltration, MassStretch	All electric, high efficiency, simple, maintainable	Net Zero | Net Zero Ready

Integrated Design

Sustainability

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CMTA

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High Performance MEP Systems

On Site Renewables

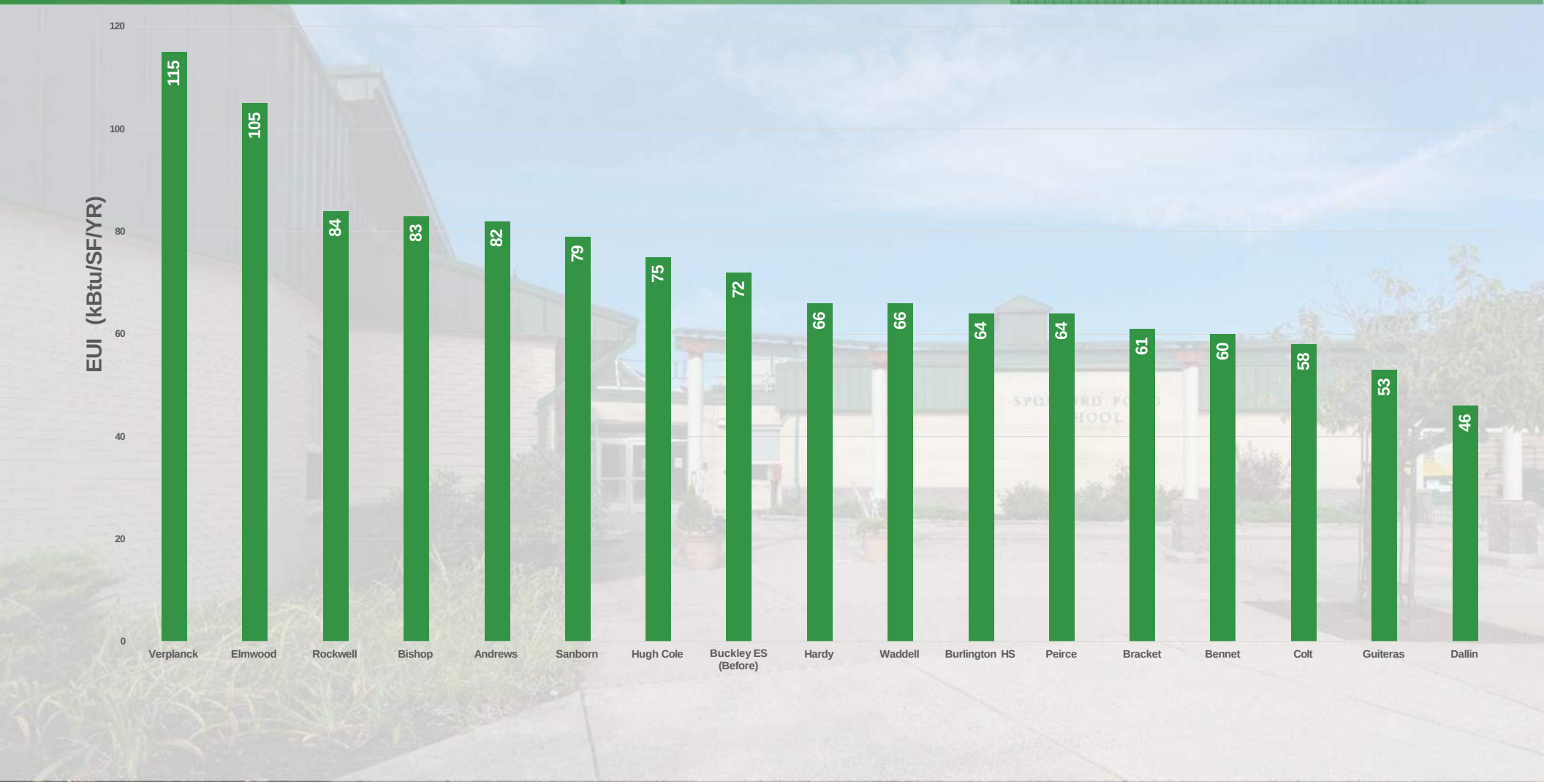
Maximize daylighting and control solar heat gain	Optimized building envelope, low infiltration, MassStretch	All electric, high efficiency, simple, maintainable	Net Zero | Net Zero Ready

Integrated Design

Existing MEP - Recap

- Two Boiler Plants
- Two Electric Services – 480/3 and 208/1
- Fossil Fuels
  - #2 Heating Oil, LP
- HVAC Operates 24/7/365
- Partial Air-Conditioning
  - PAC, Library, Administration, Interior Classrooms and IT

How does MVRHS Stack Up?



What's Important to You?

COMPETING PRIORITIES, INFORMED DECISIONS

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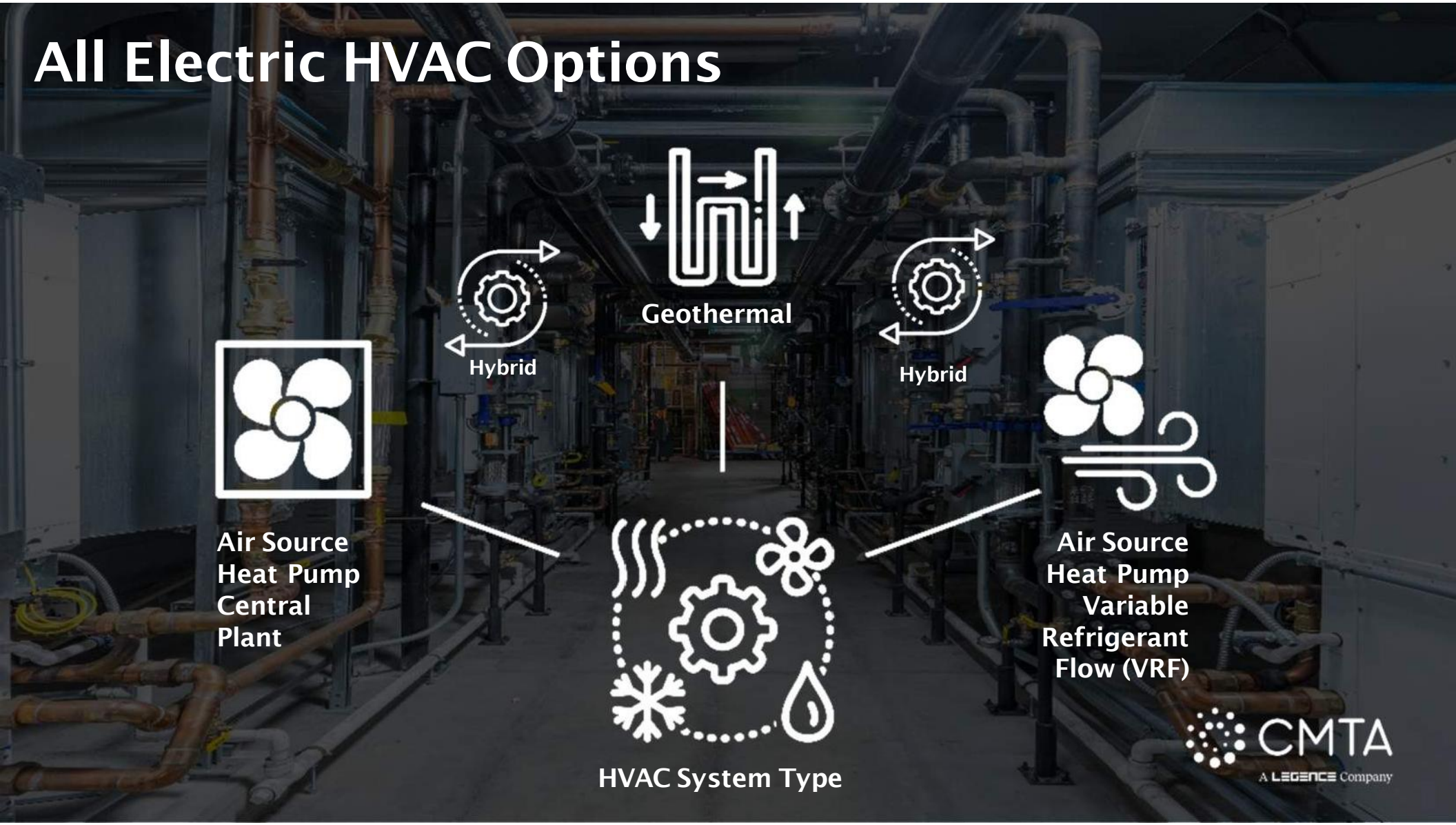
Selection Criteria

- ✓ Achieving Low Energy Use
- ✓ Acoustics
- ✓ Fewer Compressors
- ✓ First Cost
- ✓ Future Adaptability
- ✓ Individual Zoning
- ✓ Indoor Air Quality (IAQ)
- ✓ Low Life Cycle Cost
- ✓ Minimal Space Implications
- ✓ Net Zero Energy
- ✓ On Site Emissions Implications
- ✓ Operating Costs (O&M)
- ✓ Photovoltaic Installation Size
- ✓ Refrigerant Volume
- ✓ Simplicity
- ✓ Speed of Construction

All Electric HVAC Options



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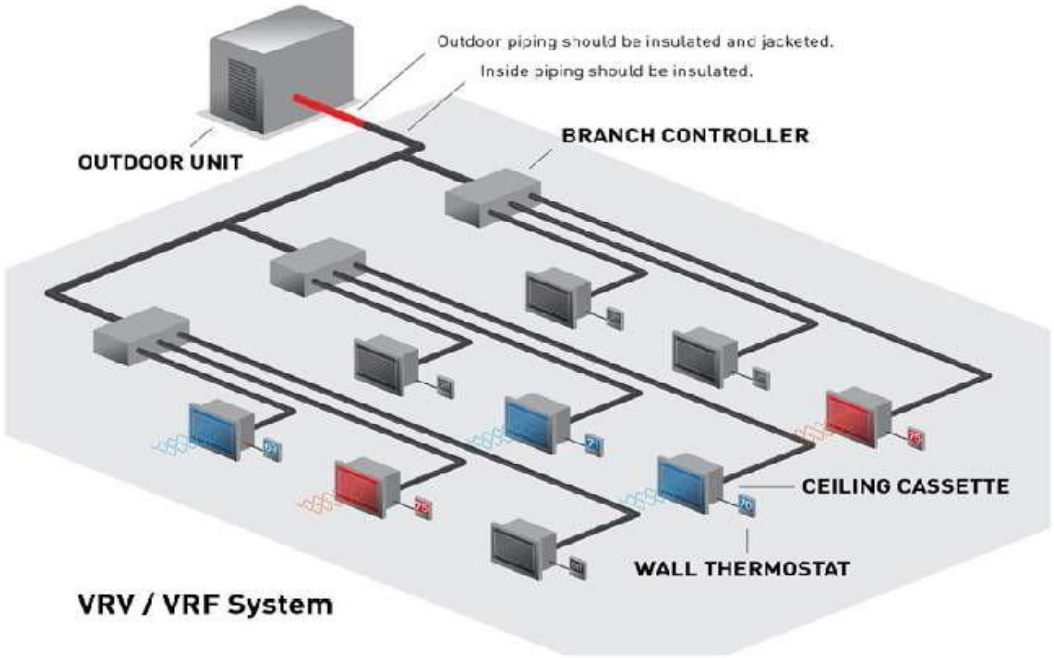
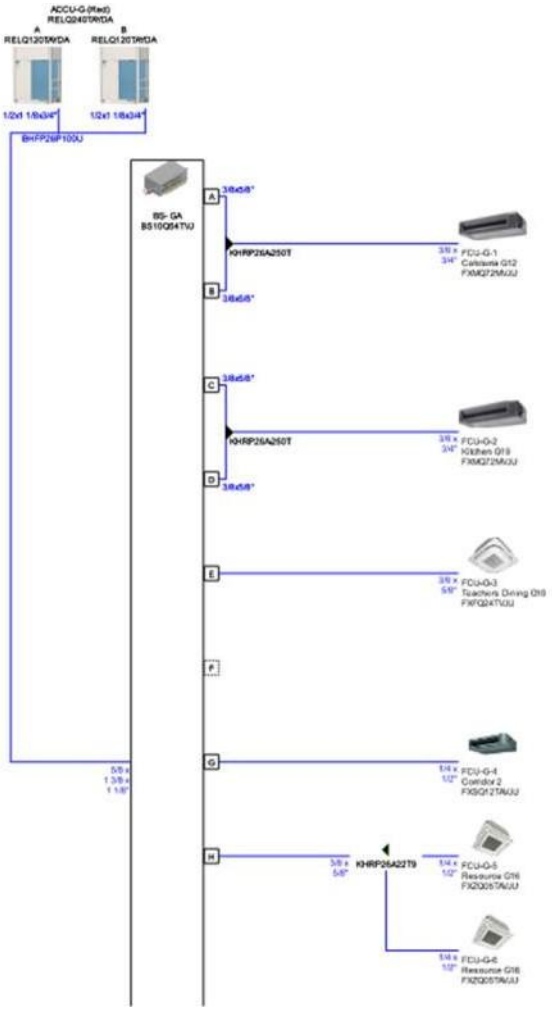
Air Source Heat Pumps - VRF

SYSTEM SCHEMATIC





HVAC System Options
Air Source Variable Refrigerant Flow (VRF)

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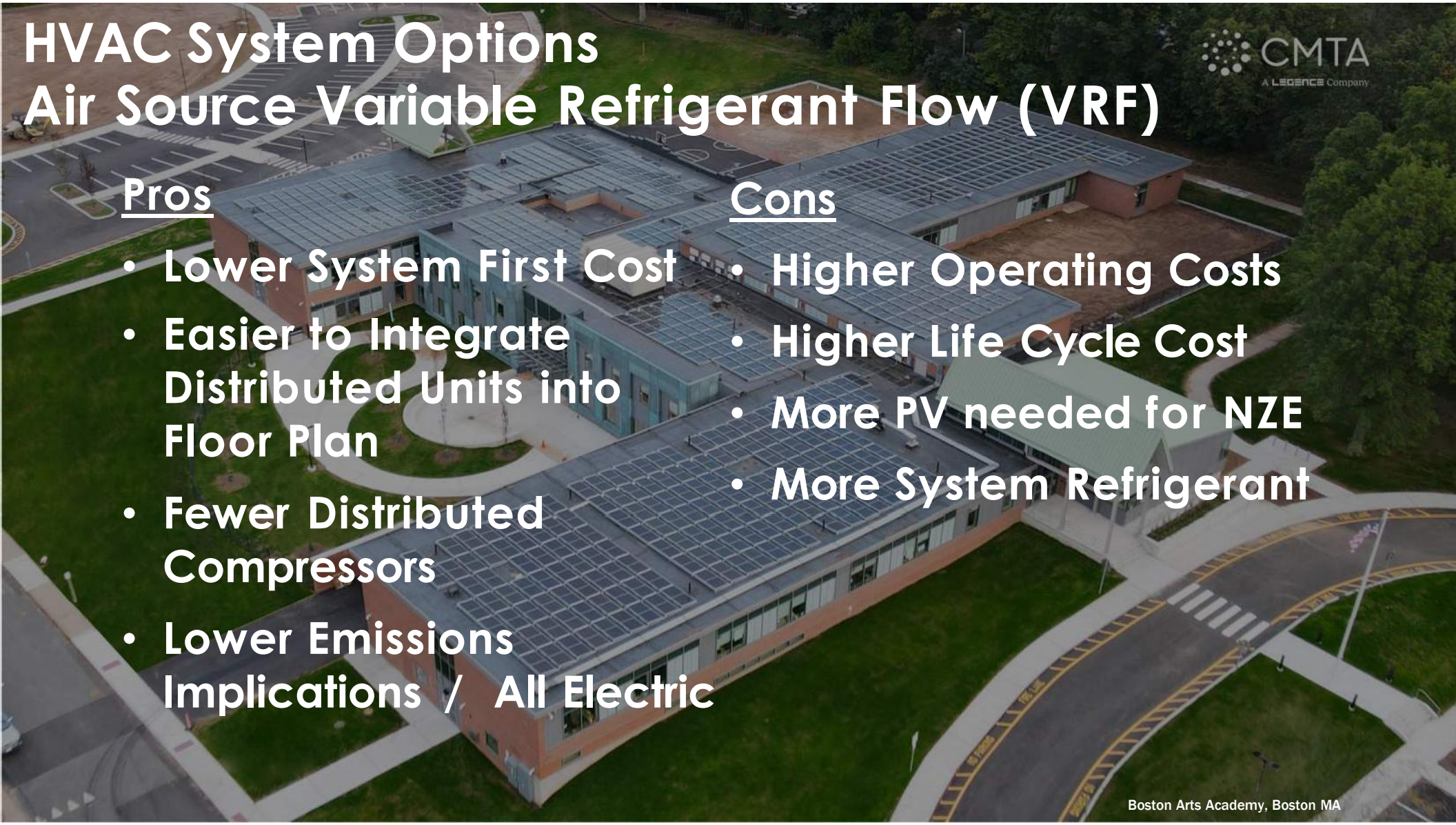


Pros

- Lower System First Cost
- Easier to Integrate Distributed Units into Floor Plan
- Fewer Distributed Compressors
- Lower Emissions Implications / All Electric

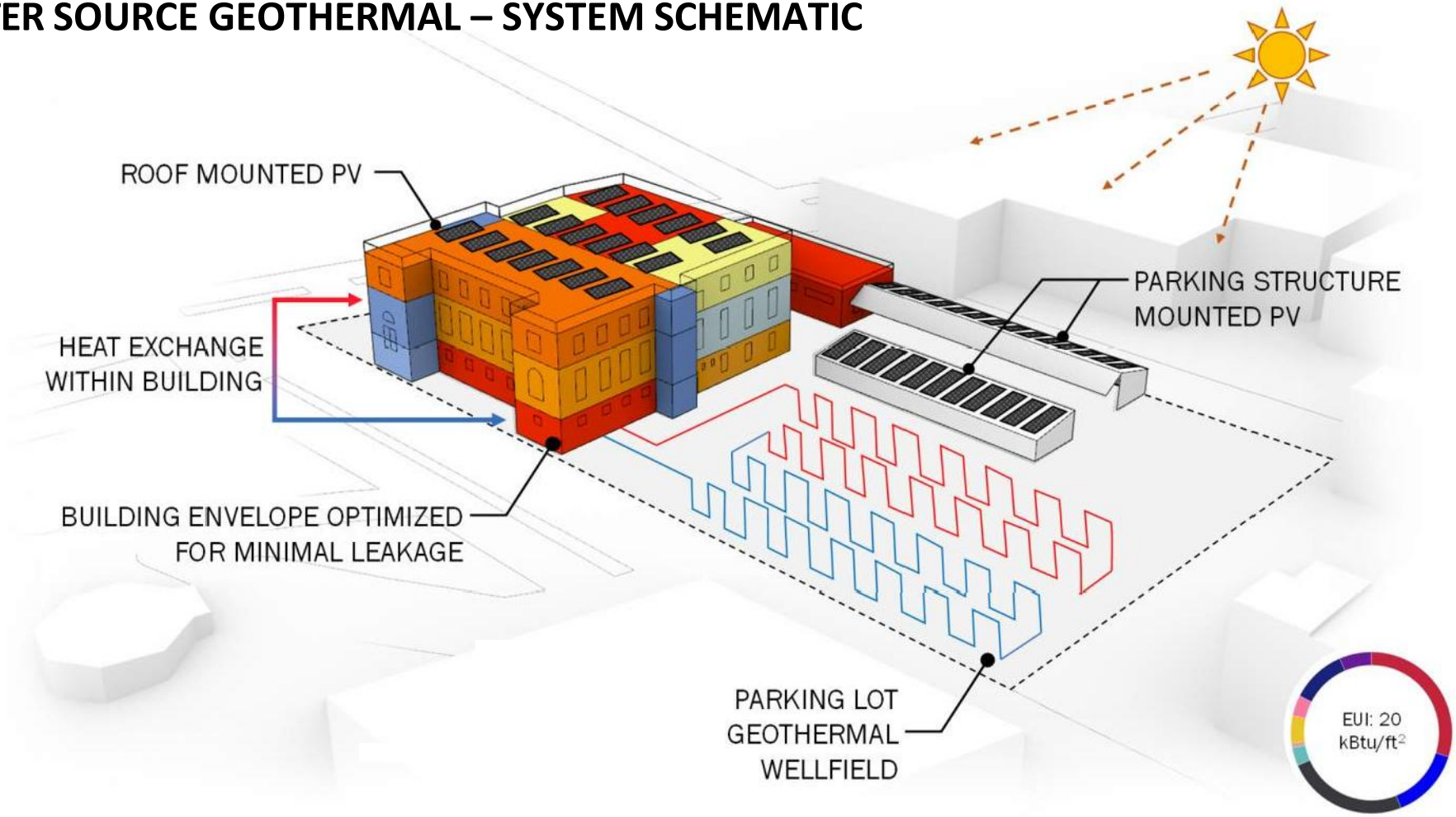
Cons

- Higher Operating Costs
- Higher Life Cycle Cost
- More PV needed for NZE
- More System Refrigerant

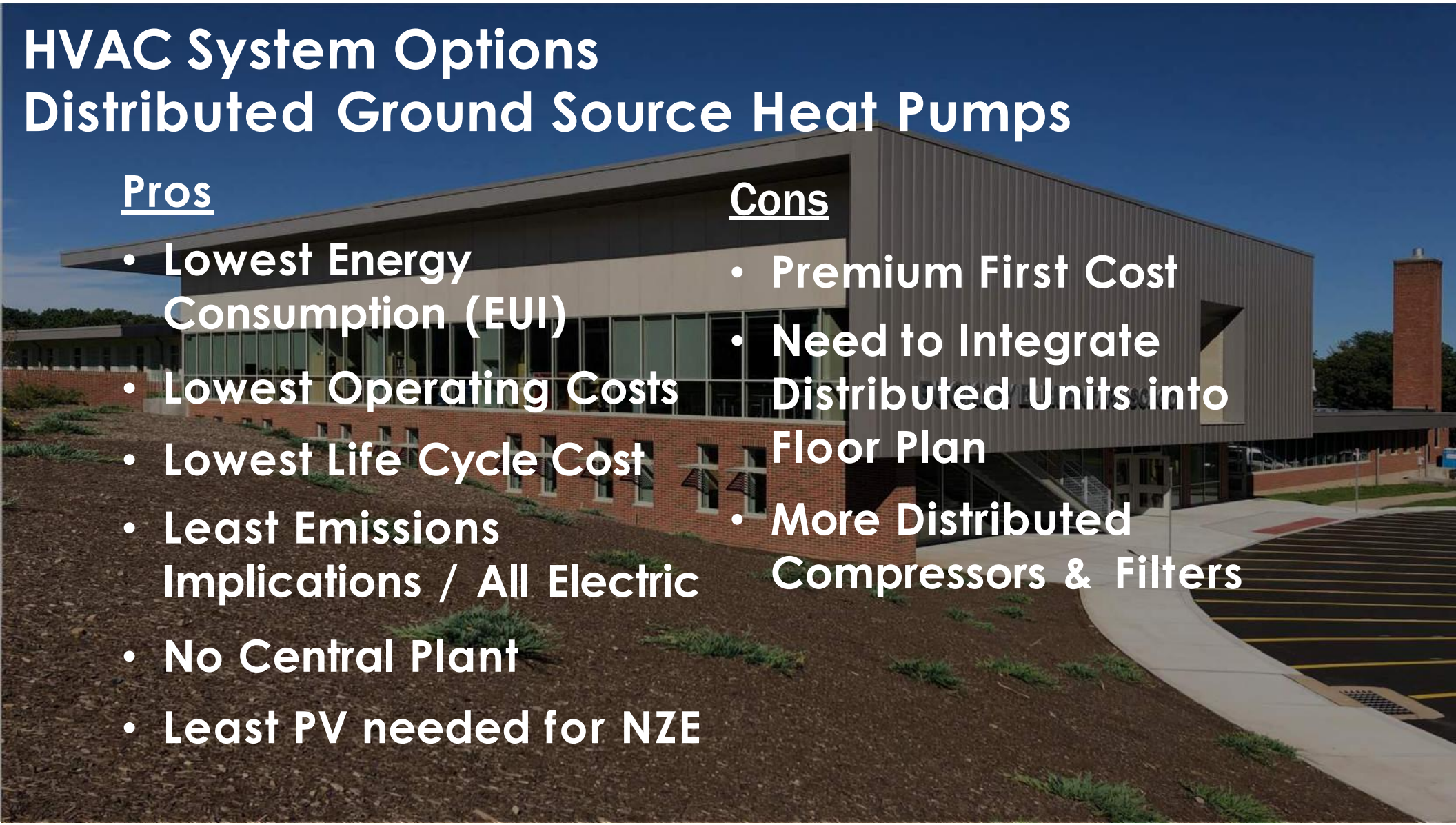
Boston Arts Academy, Boston MA

Distributed Ground Source Heat Pumps

WATER SOURCE GEOTHERMAL – SYSTEM SCHEMATIC



HVAC System Options
Distributed Ground Source Heat Pumps



Pros

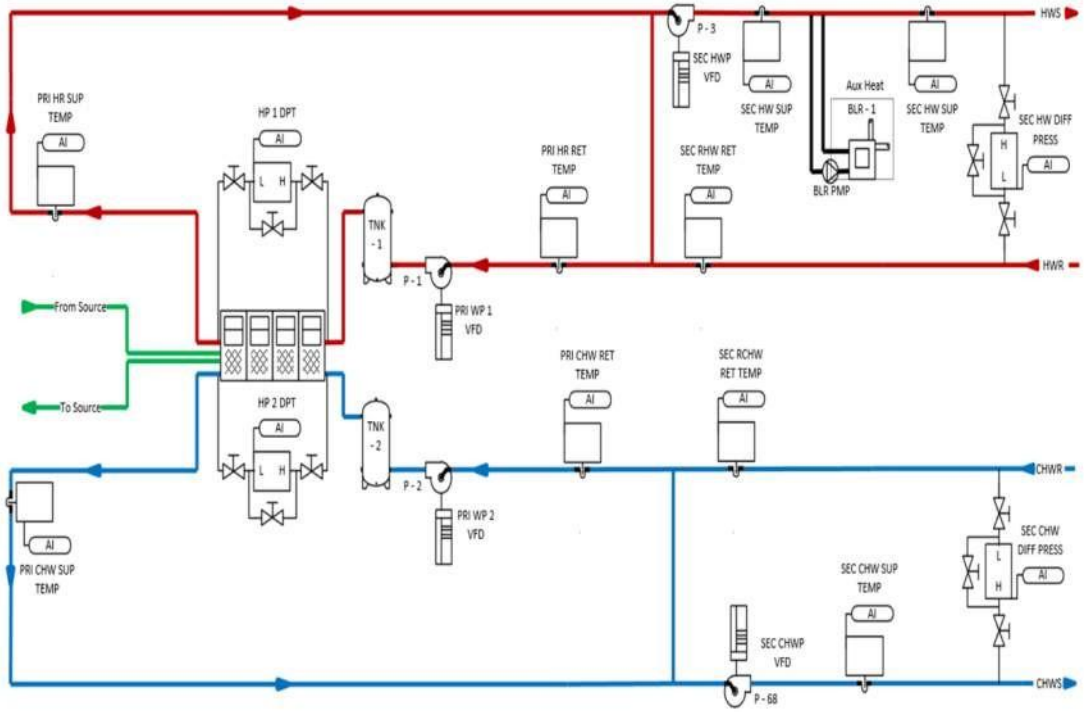
- Lowest Energy Consumption (EUI)
- Lowest Operating Costs
- Lowest Life Cycle Cost
- Least Emissions Implications / All Electric
- No Central Plant
- Least PV needed for NZE

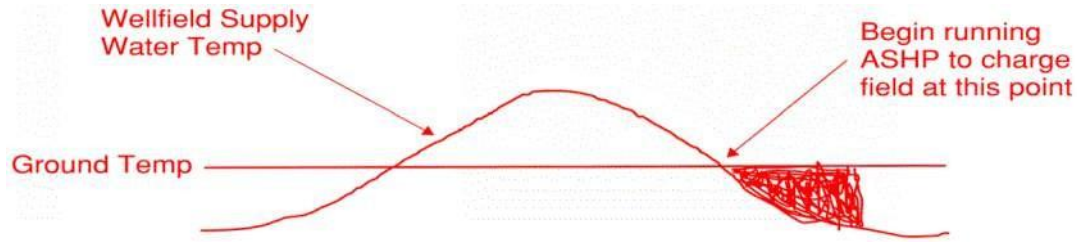
Cons

- Premium First Cost
- Need to Integrate Distributed Units into Floor Plan
- More Distributed Compressors & Filters

Hybrid Air Source / Geothermal

GROUND SOURCE / GEOTHERMAL & AIR SOURCE – PLANT OPTIONS





HVAC System Options
Hybrid Geothermal / Air Source

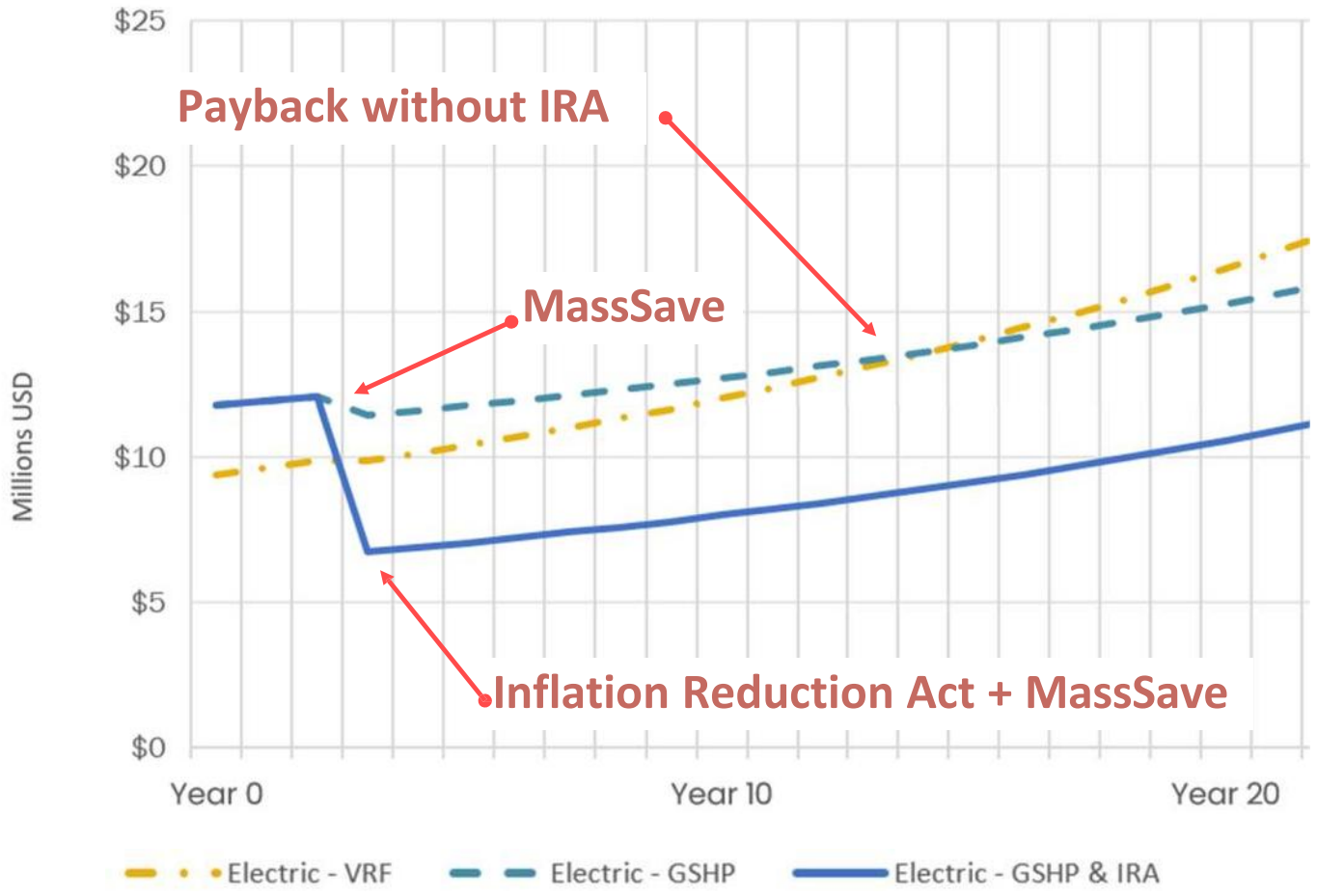
Pros

- Mid - First Cost
- Mid - Energy Consumption (EUI)
- Mid - Operating Costs
- Mid - Life Cycle Cost
- Lower Emissions Implications / All Electric

Cons

- More Equipment & Controls Needed
- Need to Integrate Distributed Units into Floor Plan
- More Distributed Compressors & Filters

Typical Life Cycle Analysis

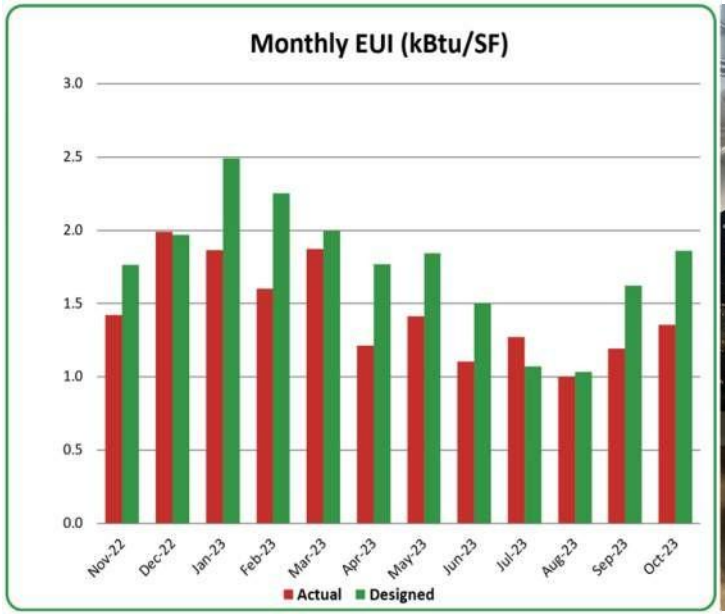


Efficient, Effective MEP Systems

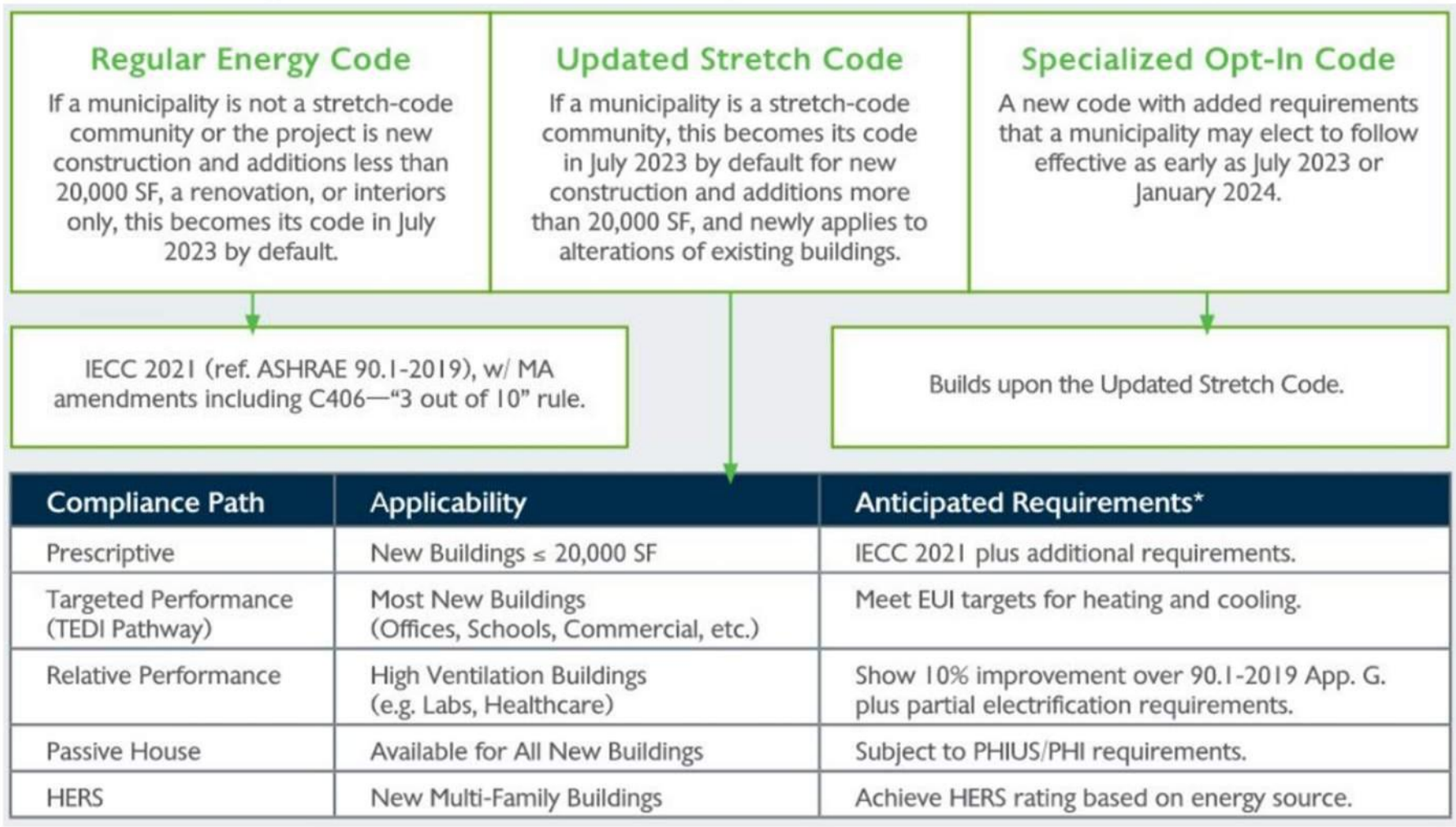
Owner "buy-in" on Systems

Simple, Repairable, Redundant

Owner Training Starts Day 1



Mass Stretch Code Implications



Regular Energy Code	Updated Stretch Code	Specialized Opt-In Code
If a municipality is not a stretch-code community or the project is new construction and additions less than 20,000 SF, a renovation, or interiors only, this becomes its code in July 2023 by default.	If a municipality is a stretch-code community, this becomes its code in July 2023 by default for new construction and additions more than 20,000 SF, and newly applies to alterations of existing buildings.	A new code with added requirements that a municipality may elect to follow effective as early as July 2023 or January 2024.
IECC 2021 (ref. ASHRAE 90.1-2019), w/ MA amendments including C406—"3 out of 10" rule.		Builds upon the Updated Stretch Code.

Compliance Path	Applicability	Anticipated Requirements*
Prescriptive	New Buildings ≤ 20,000 SF	IECC 2021 plus additional requirements.
Targeted Performance (TEDI Pathway)	Most New Buildings (Offices, Schools, Commercial, etc.)	Meet EUI targets for heating and cooling.
Relative Performance	High Ventilation Buildings (e.g. Labs, Healthcare)	Show 10% improvement over 90.1-2019 App. G. plus partial electrification requirements.
Passive House	Available for All New Buildings	Subject to PHIUS/PHI requirements.
HERS	New Multi-Family Buildings	Achieve HERS rating based on energy source.

Inflation Reduction Act

CMTA

The Inflation Reduction Act provides

tax incentives

for technologies across energy industry

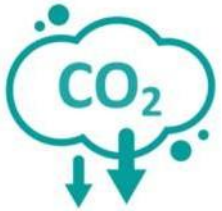
30%-40% return for Geothermal and Solar PV Investments

Renewable Energy
Solar, Wind, Geothermal

Alternative Sources
Ground Source Heat Pumps,
Fuel Cells, Microturbines,
Combined Heat and Power

Microgrid Technology

Electric Vehicles
Charging Infrastructure



Carbon Sequestration
Advanced Manufacturing, Clean Hydrogen, Zero Emission Nuclear, Biodiesel Renewable Fuel, Sustainable Aviation Fuel

Energy Storage
Biogas, Waste to Energy, Dynamic Glass


Thank You.
TAPPÉ
ARCHITECTS