NEW YORK STATE

Department of State
Building Standards and Codes

Increasing Energy Efficiency of School Buildings and Utilizing the NYS Energy Code

November 5, 2024

Course Objectives

By the end of this training session, the learner shall be able to:

1. Recognize potential triggers within the current code
2. Better evaluate where the “low hanging fruit” may be.
3. Associate how the energy codes can help increase efficiency in schools.
4. Identify the resources available for funding, reference, and support.

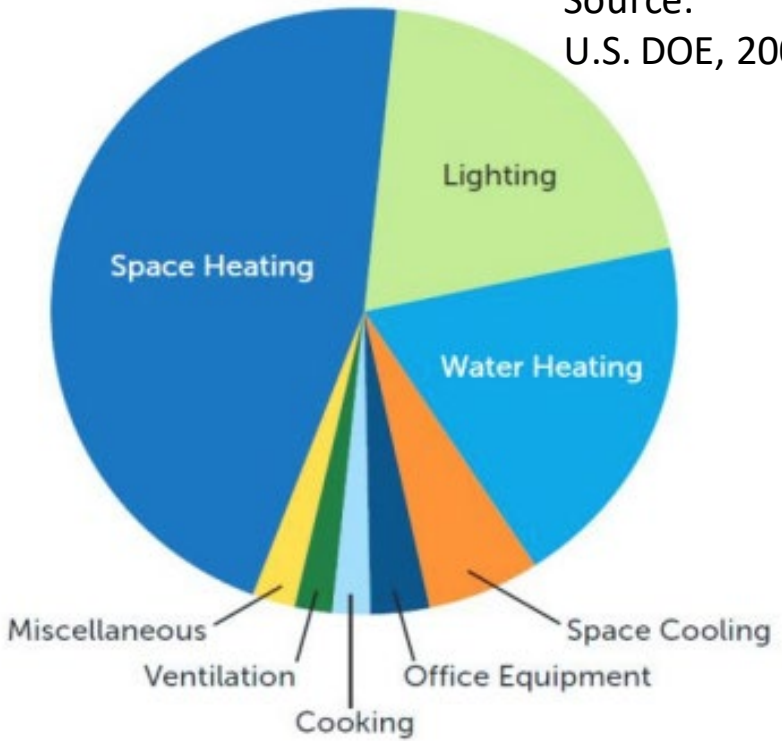
Objective 1

Recognize potential triggers within the current code.

Where are we USING our energy?

While energy use varies from school to school, this chart helps show the combined end uses of electricity and natural gas in the average school.

Source:
U.S. DOE, 2006



Energy Efficiency Programs in K-12 Schools (epa.gov)

So?
Where might the Energy Code come into play?

- New construction and/or a(n) addition(s)
- Alterations to existing buildings
- A change of occupancy or use

Potential Triggers

- HVAC system replacement
- Service Water Heating (SWH) system replacement
- Lighting & controls upgrade
- Ventilation system replacement/upgrade
- Kitchen equipment upgrade(s)
- Heat pumps
- Cooling system installation/upgrade
- Motor or pump replacement
- Better building envelope(air sealing/insulation/windows/roofs)
- Electric school bus/district vehicle replacement(s)
- Renewable energy (PV/solar-thermal/wind)
- Electrical system upgrades(to facilitate renewable energy)
- Battery Energy Storage Systems (BESS)

Objective 2

Better evaluate where the “low hanging fruit” may be.

“Low-hanging fruit”

Energy efficiency measures are often called “low-hanging fruit”.

1. They significantly lower the energy consumption and help combat global warming.
2. They are considered short-term and cost-effective investments.

Where do you begin??

Step 1: Energy Assessments	Step 2: Energy Audits	Step 3: Building Upgrades
Purpose: Obtain actionable information. Understand energy usage patterns across a portfolio of buildings and benchmark performance against similar buildings.	**Purpose:** Obtain information that can support a financial investment. Identify building components with most opportunity for energy savings.	**Purpose:** Execute building upgrades to capture energy savings, improve comfort, etc.
Scope: All buildings and facilities in your portfolio.	**Scope:** Only facilities with the highest potential for energy savings based on Step 1 results.	**Scope:** Targeted buildings and building components based on Step 2 results (i.e., audit).
Confidence in Energy Savings: Low confidence.	**Confidence in Energy Savings:** Medium confidence based on results of energy assessments (Step 1).	**Confidence in Energy Savings:** High confidence based on results of energy audits (Step 2).
Cost: No or low cost supported with staff and available energy usage data.	**Cost:** Low to high cost depending on the scope of the energy audit.	**Cost:** Higher costs that vary depending on project scope, technology, etc.
Financing Options: Not applicable.	**Financing Options:** ESPCs, Utility- and State-Supported Programs, Internal Funding.	**Financing Options:** Internal Funding, Leases, Loans, ESPCs, Bonds, ESAs.
Outcome: A reduced set of buildings meriting further exploration through an energy audit.	**Outcome:** A specific set of energy conservation measures and projected energy savings.	**Outcome:** Energy and cost savings, improved building performance and comfort.

https://www.energy.gov/scep/slsc/articles/achieving-energy-savings-small-and-medium-sized-public-facilities-strategic

What else should you consider??

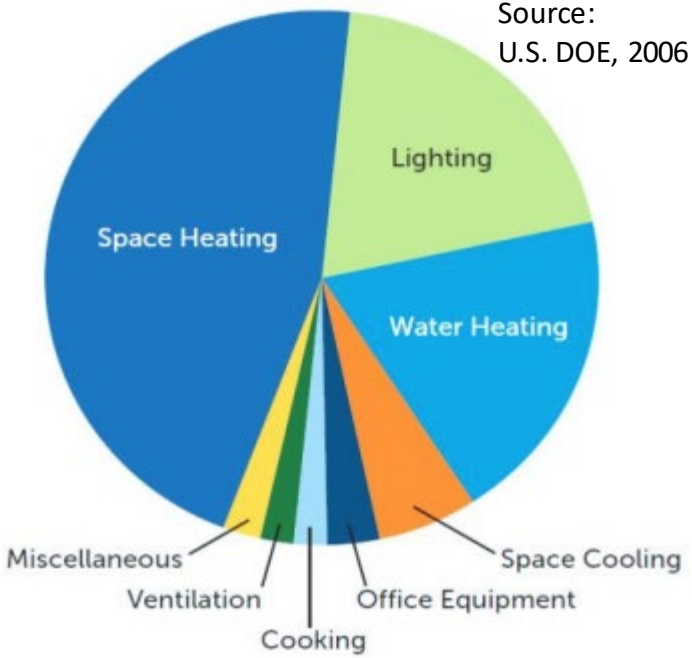
Assess and evaluate your most immediate needs and/or concerns.

Old/failing equipment/systems/components

Numerous/ongoing/expensive repairs

Combined electricity & natural gas usage in schools

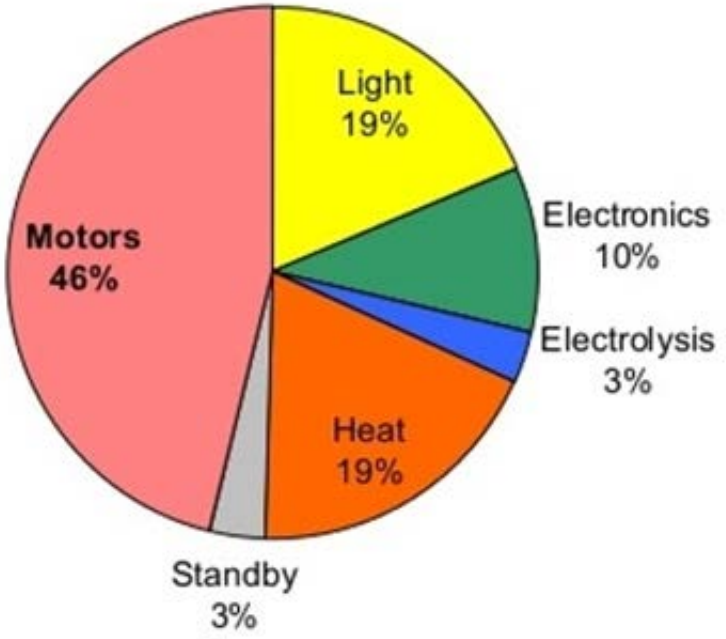
Source:
U.S. DOE, 2006



Energy Efficiency Programs in K-12 Schools (epa.gov)

Where to focus: Motors, lights and HVAC

Electric motors, lighting & HVAC accounted for 84% of global electricity demand in 2015, according to



Source: 2015 IEA data

Lighting

- K-12 schools can save up to 50% on energy use if they optimize their lighting equipment and operations.
- Equipment replacement and operating costs drive the decision-making for such investments.
- Lighting is often one of those first energy efficiency upgrade investments where the ROI is attractive and quickly seen.
- These upgrades include lighting replacement to LED (light-emitting diode) technology.
- Additional energy/cost savings are possible with new lighting technologies, controls, and design considerations.

HVAC System(s)

Annual Savings per Package for Urban Schools in Climate Zone 5A

Retrofit Package	Elementary School Annual Savings				Secondary School Annual Savings			
	Elec	Gas	CO_2	Cost	Elec	Gas	CO_2	Cost
1. BMS Replacement	1.9%	33.1%	5.5%	6.8%	0.6%	8.4%	1.9%	2.8%
2. Boiler Replacement + Controls	0.1%	10.7%	1.3%	2.3%	0.1%	8.3%	1.4%	2.4%
3. RTU Replacement + Controls	3.0%	26.8%	5.8%	5.8%	n/a (no RTUs in secondary school model)			
4. Chiller Replacement + Controls	n/a (no chiller in elementary school model)				2.1%	3.9%	2.4%	1.9%
5. HVAC Controls + Lighting + IAQ	25.1%	18.4%	24.3%	23.2%	25.8%	-9.6%*	23.3%	20.6%
6. HVAC Equip + Controls, Envelope + IAQ	4.0%	26.5%	6.6%	6.2%	4.2%	14.6%	4.9%	2.1%
7. HVAC Equip + Controls, Lighting + IAQ	26.2%	24.6%	26.0%	24.9%	27.0%	1.0%	25.1%	22.4%
8. Partial Electrification + EE + IEQ	24.2%	31.3%	25.0%	24.7%	25.9%	12.0%	24.9%	22.9%
9. Full Electrification + EE + IEQ	26.2%	91.3%	25.2%	30.1%	32.2%	91.2%	28.8%	31.7%

https://www.energy.gov/sites/default/files/2024-05/Modeled%20Retrofit%20Package%20Performance%20for%20Schools-2024.pdf

Objective 3

Associate how the energy codes can help increase efficiency in schools.

2020 ECCCNYS
Chapter 5: Existing Buildings

C501.1 Scope

The provisions of this chapter shall control the *alteration*, *repair*, *addition* and *change of occupancy* of existing buildings and structures.

[NY] C501.4 Compliance

Alterations, *repairs*, *additions* and changes of occupancy to, or relocation of, existing *buildings* and structures shall comply with the provisions for *alterations*, *repairs*, *additions* and changes of occupancy or relocation, respectively, in ***this code*** and ***ALL OTHER CODES*** that may apply.

Exception: New York City (population over 1,000,000)

Section C502- Additions

C502.1- General

Additions to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this code.

Applies to (Examples):

- Vertical Fenestration (windows/doors)
- Skylight Area
- Building Mechanical Systems
- Service Hot Water Heating Systems
- Pools and Inground Permanently Installed Spas
- Lighting Power, Systems, & Controls (interior & exterior)

Section C503- Alterations

[NY] C503.1 General

Alterations to any *building* or structure shall comply with the requirements of Section C503 and the code for new construction. *Alterations* shall be such that the existing *building* or structure is not less conforming to the provisions of this code than the *building* or structure was prior to the *alteration*. *Alterations* to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing *building* or *building* system to comply with this code.

Applies to (Examples):

- Change in Space Conditioning
- Building Envelope
- Heating & Cooling Systems
- Service Hot Water Heating Systems
- Lighting Systems (interior & exterior)

There are 8 exceptions

Section C504- Repairs

C504.1 General

Buildings and structures, and parts thereof, shall be repaired in compliance with Section C501.3 and this section. Work on nondamaged parts that are necessary for the required *repair* of damaged parts shall be included in the *repair*. Routine maintenance required by Section C501.3, ordinary *repairs* exempt from *permit* and abatement of wear due to normal service conditions shall not be subject to the requirements of this section.

Considered Repairs (Examples):

- Glass-only replacements in an existing sash and frame.
- Roof repairs.
- Air barriers are not required for roof repair where the repairs do not include repairs to the remainder of the building envelope.
- Replacement of existing doors that separate conditioned space from the exterior do not require installation of a vestibule/revolving door, and an existing vestibule may not be removed.
- Repairs where only the bulb, ballast or both in existing luminaires are replaced, provided there is no increase the installed interior lighting power.

Section C505- Change of Occupancy or Use

C505.1 General

Spaces undergoing a change in occupancy resulting in an increased demand for either fossil fuel or electricity shall comply with this code. Where the use in a space changes from one use to another use in the associated tables, the installed lighting wattage shall comply with Section C405.3. Where the space undergoing a change in occupancy or use is in a building with a fenestration area that exceeds the limitations, the space is exempt provided there is not an increase in fenestration area.

Extreme conversion:
Atlanta turns high-rise office building into high school

Does that start to get you thinking?

Some beginning thoughts…

- How old is your school or building?
- When was energy efficiency last considered?
  - What was done?
  - What wasn't done?
    - Why?
- What do you need?
- What would you like to do?
- Where do you have current concerns?

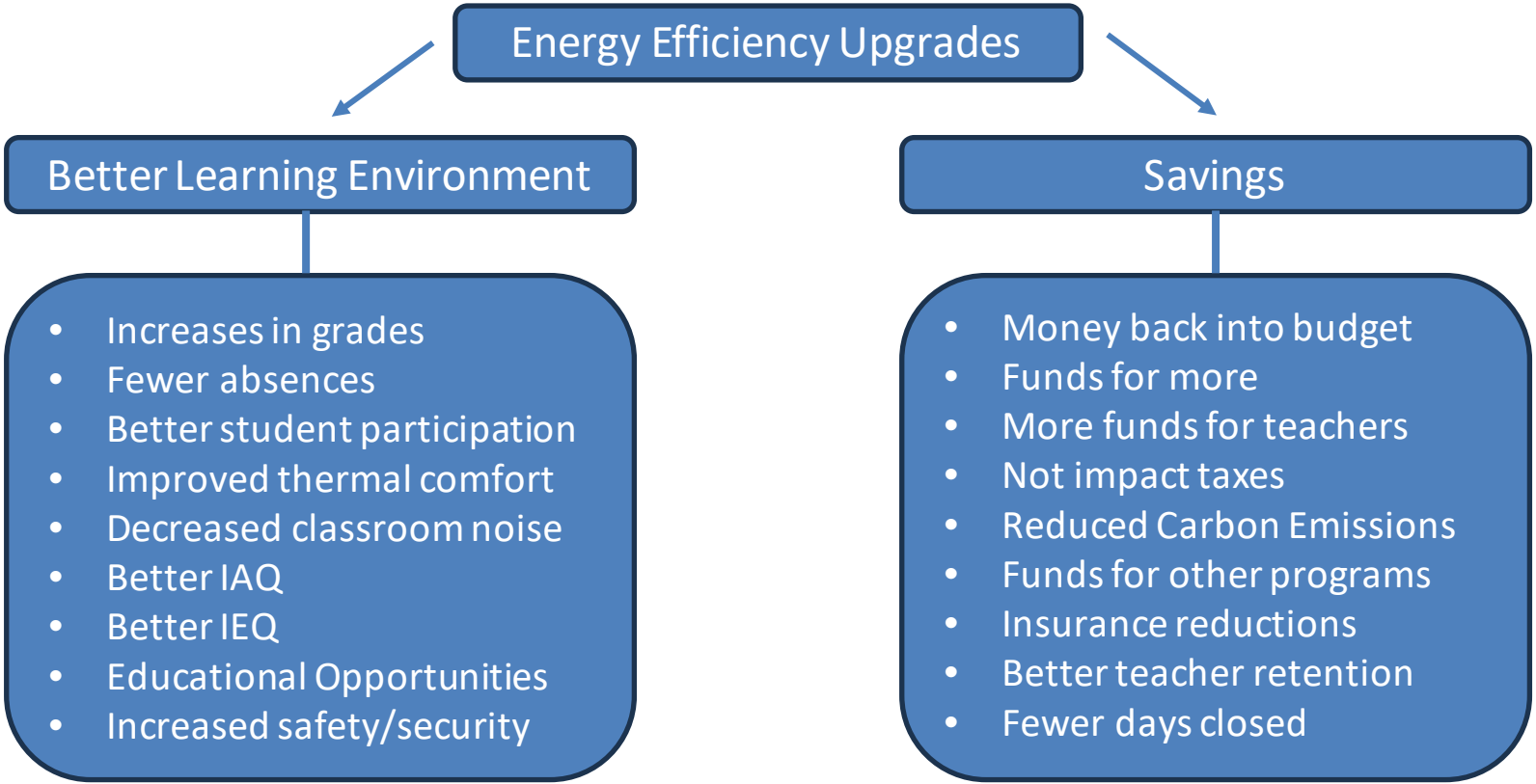
NYStretch Energy Code — 2020

An Overlay of the 2018 International Energy Conservation Code and ASHRAE Standard 90.1-2016

Current NYStretch Code Communities			
City of Beacon	Town of Esopus	Town of Orangetown	Village of Irvington
City of Canandaigua	Town of Geneva	Town of Ossining	Village of Montour Falls
City of Kingston	Town of Humphrey	Town of Philipstown	Village of Nyack
City of New Rochelle	Town of Mamaroneck	Town of Somers	Village of Oyster Bay Cove
City of New York	Town of Marbletown	Town of Southampton	Village of Philmont
Town of Bedford	Town of New Castle	Village of Athens	Village of Pittsford
Town of Bethel	Town of New Lebanon	Village of Baldwinsville	Village of Sodus
Town of Cortlandt	Town of Newfield	Village of Croton-on-Hudson	Village of Tully
Town of Danby	Town of Niskayuna	Village of Dobbs Ferry	
Town of East Hampton	Town of North Salem	Village of Hastings-on-Hudson	

Incidental(or not) Benefits You Say?

The Trickle-Down Effect



Objective 4

Identify the resources available for funding, reference, and support.

Environmental Bond Act

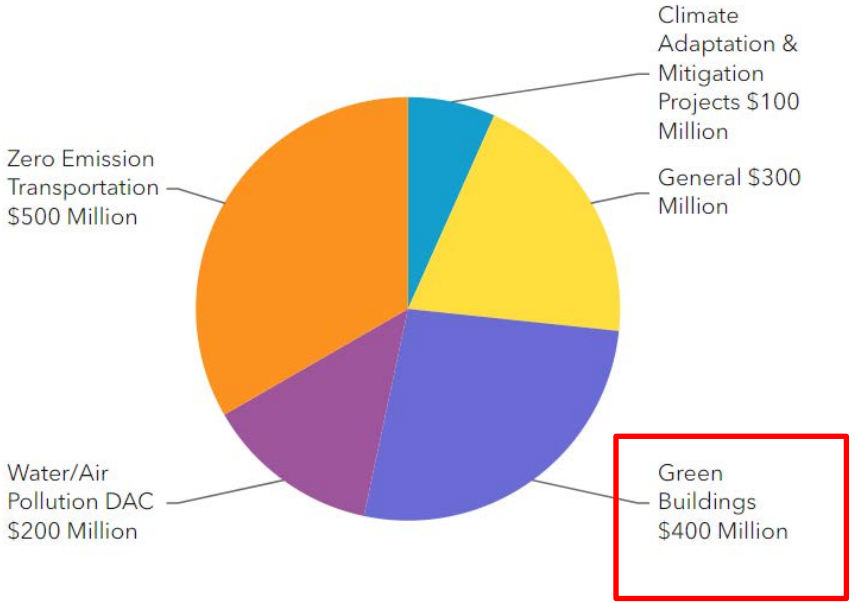
https://environmentalbondact.ny.gov/pages/funding-overview

- **Not Less Than $400 million** for **green building projects** that:
  - install, upgrade, or modify a renewable energy source at a state-owned building or for the purpose of converting or connecting a state-owned building or a public school building, or portion thereof, to a renewable energy source;
  - reduce energy use or improve energy efficiency or occupant health at a state-owned building or a public school building;
  - install a green roof at a state-owned building or a public school building;
  - install renewable heating and cooling systems at a state-owned building or a public school building; or
  - emission reduction projects.

Environmental Bond Act

- **$100 million** of this has been allocated to NYSERDA's Clean Green Schools Initiative

- To the best of my knowledge, the remaining $300 million is unassigned



Overview of Clean Green Schools Initiative (PON 4924)

- **Program Goal:**
  - The goal of the program is to help under-resourced **public** schools decarbonize their building portfolio and improve indoor air quality (IAQ) across their buildings.

- **Budget:**
  - $160 M

- **Eligibility:**
  - All existing **public school buildings** across NYS that meet the definition of an **under-resourced school** per the Program (e.g., schools which are High-Needs or located in a disadvantaged community).

Clean Green Schools Initiative - Program Structure

- This program provides funding in two tracks to support a school's pathway towards decarbonization.
  - Track I Planning: Open Enrollment (accepting apps until December 2024)
    - Provides funding for services which will help schools evaluate, plan for and facilitate energy reduction projects, clean energy projects and indoor air quality projects.
      - *Example of Eligible Projects – Energy Study, On-Site Energy Manager and Clean Heating and Cooling Design Services.*
    - Track I project costs are up to 100% funded and NYSERDA's funding ranges from **$650,000-$1,250,000 per district** depending on the district's annual energy spend.
  - Track II Installation: Competitive (closed)
    - Provides funding to implement construction projects which will help schools decarbonize their buildings.
      - *Example of Eligible Projects – Ground Source Heat Pumps, Electrification of Building Systems and High Performance Building Envelope.*

Flexible Technical Assistance Program (PON 4192)

- P12 Schools that are ineligible to participate in NYSERDA's Clean Green Schools Initiative (PON 4924) are eligible to participate in FlexTech (PON 4192) if they pay into the electric System Benefits Charge (SBC).
- Schools are eligible for a cost-share up to 75%.
- Example of Eligible Projects (e.g., technical assistance):
  - Energy audits
  - Investigation of clean heating and cooling systems (heat pumps and/or district thermal networks)
  - Targeted or comprehensive analysis of equipment or systems
  - Energy Master Planning
  - Retro-commissioning analysis
  - Load reduction studies

On-Site Energy Manager (PON 3701)

- Covers 75% of costs associated with hiring a full or part time on-site energy manager to assess energy conditions and identify energy efficiency improvements.
- Funding is capped at $100,000 for small projects (<$1m in annual energy spend) and $200,000 for large projects.
- Must pay into the System Benefits Charge (SBC) on electric bill.
- Minimum time commitment of 20 hours per week for one year; maximum time commitment of 40 hours per week for four years.
- Scope is general – OsEM can focus on activities related to energy management and efficiency.
- OsEM role can be fulfilled by permanent staff, a consultant, or a hybrid of the two; payments go directly to the consultant for projects where the consultant is the applicant.

Building Aid

- Building Aid remains available for energy efficiency upgrade projects in aidable instructional buildings with sufficient aid allowances at the time of project submission.
- A permit from Office of Facilities Planning is required in order to receive Building Aid.

Construction Permitting

- As a reminder, all construction work proposed on District property must be reviewed and permitted by Office of Facilities Planning.
- Review queue lengths, for planning purposes, can be found here: https://www.p12.nysed.gov/facplan/status.html

Energy Performance Contract

- An EPC is a type of project.
- School Board obtains an ESCO (energy service company) through an RFP (meets competitive bid requirement)
- Architect/Engineer of record submits design
- Per Regulations of the Commissioner 155.20, simple payback (SPB) must be 18 years or less
- Difference between capital and non-capital (not eligible for aid) measures

Energy Performance Contract

Common EPC measures include:

- Lighting and controls
- HVAC&R (e.g. boilers; AHU/RTU; UVs; etc.) and BMS controls (e.g. DCV, night setback)
- Solar PV
- Building envelope: insulation and weatherization
- Replace motors and transformers
- Pipe/duct insulation; steam traps
- Walk-in cooler/freezer refrigerant equipment/ECM (electrically commutated motors)
- Variable frequency drives for pumps and fans – beware of reducing pressures and flow required to meet operational needs

Energy Performance Contract

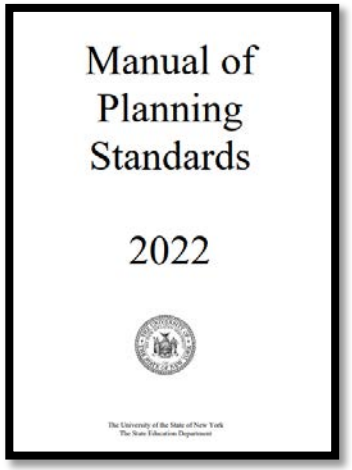
- Should we make energy improvements with a CAPITAL PROJECT or an EPC?
    - Where have you seen the above list before?
    - If you watched Chris Whittet's presentation intently as I did, you'll notice he covered many of these same measures..
    - This is because **your architects and engineers** already may know first-hand how to accomplish all these energy improvements and already know your buildings and systems intimately - **they should be the first place you turn when considering all things energy.**

Energy Performance Contract

- Please talk to your design professionals first, they should have your best ENERGY interests in mind:
  - A regular capital project may be the most effective way to achieve energy goals - if you have a friendly voter climate.
  - IF you are aware that the voter sentiment for passing budgets isn't stellar - the legislature created a pathway to achieve energy improvements with an EPC, since an EPC project only requires School Board authorization.
  - Your professionals can also assist you in describing to the voters that these energy reduction investments lower utility bills for many years to come and will save taxpayer money and free up funds for teachers, programs, and education.

Manual of Planning Standards

- When considering energy reduction project, be sure to also consider the Manual of Planning Standards (MPS) requirements.
- For example, MPS Appendix I has a lot of considerations regarding demand control ventilation
- https://www.p12.nysed.gov/facplan/documents/MPS_2022_FINAL_Revised_03-29-2023.pdf



Green Ribbon Schools Program

- Though this program is not a funding source, we would like to share that NYS has an application for this recognition program.
- The U.S. Department of Education Green Ribbon Schools (ED-GRS) program recognizes schools taking a comprehensive approach to greening their school. A comprehensive approach incorporates environmental learning with improving environmental and health impacts.
- https://www.p12.nysed.gov/facplan/GreenRibbonSchools.html

Thank you

For any inquires to Office of Facilities Planning at NYSED, please reach out to EMSCFP@nysed.gov


Questions?