# CASDEM - DPS Financial Impact Assessment

**Celeste Cizik, PE, CEM, PMP, LEED AP**
Principal | Existing Buildings Director
ccizik@group14eng.com
720-382-1705

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group14eng.com

# Agenda

1. Project Objective and Process
2. Energy and Emissions
3. Electrification
4. Renewable Energy
5. Summary and Next Steps

# Group14 Overview

WOMEN OWNED™


Just.SM

**30** Years in business

**50** Staff members

- **16** Professional Engineers
- **24** LEED A.P.s
- **7** Certified Commissioning Professionals
- **6** SkySpark Certified Professionals
- **9** Certified Energy Managers

# Group14 Overview

**Transforming the built environment to realize a more resilient future.**

| 1000+ | 300+ | 600+ | 9M+ |
|---|---|---|---|
| Completed Energy Models | LEED Certified Projects | Buildings Commissioned | Sq. Feet of Building Area Monitored |

## Our Core Services:

### Energy

At Group14 we inspire better buildings that are smarter, healthier, and more cost-efficient through innovative energy solutions.

- Energy Modeling & Consulting
- Energy Audits
- BAS Upgrade Design
- Measurement & Verification

### Sustainability

Our sustainability solutions decrease environmental footprint, maximize savings, and enhance occupant wellbeing.

- Green Building Certification
- Corporate Social Responsibility Assessment
- Life-Cycle Assessment
- Social Impact & Health

### Commissioning

We help building owners protect and grow their investments by ensuring that all building systems are installed and operating properly.

- MEP & Special Systems Commissioning
- Retro-commissioning
- Monitoring Based Commissioning (SkySpark)
- Enclosure Commissioning

# Project Objective and Process

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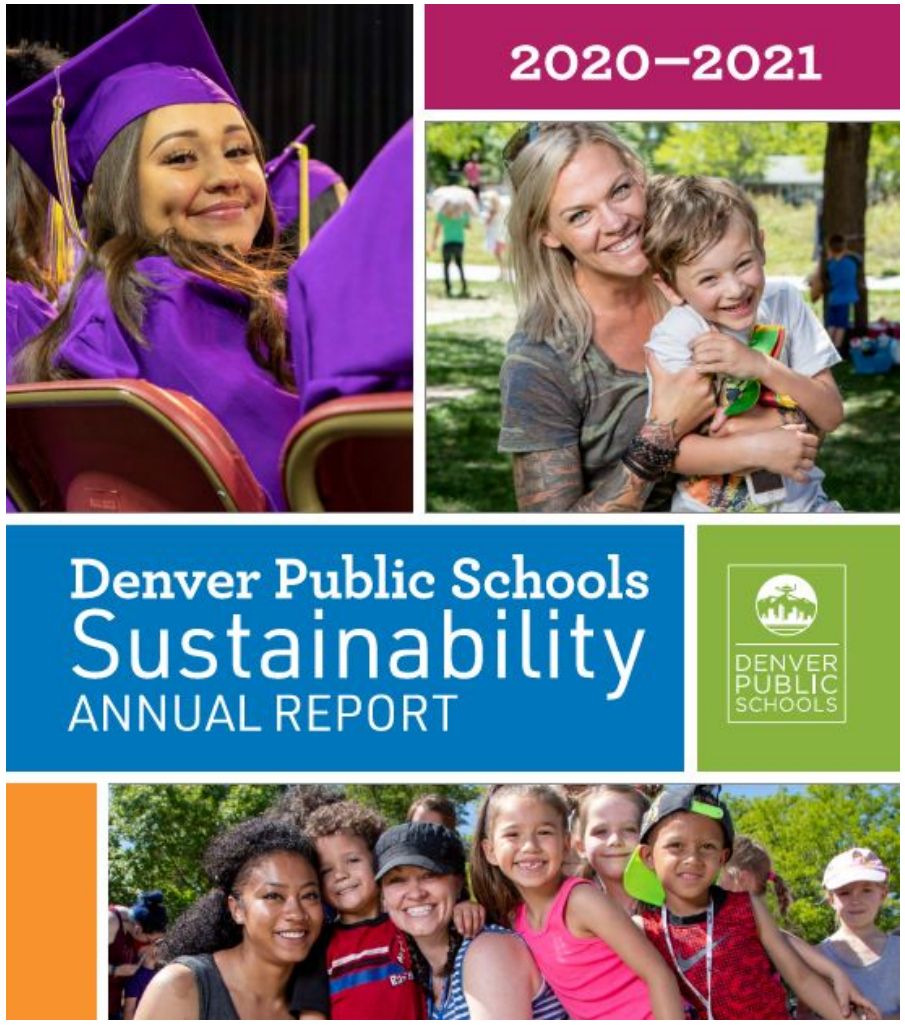
# Project Objective




DPS CLIMATE RESOLUTION
DPS Students for Climate Action

Home Our Resolution About us Art Contest Sign Our petition More

## DPS STUDENTS FOR CLIMATE ACTION

### CLEAN ENERGY

Use 100% clean electricity by 2030 in accordance with Denver's 100% Renewable Electricity Action Plan

Read More >

### DECREASE CARBON EMISSIONS

Reduce overall greenhouse gas emissions by at least 90% of the levels of district-wide greenhouse gas emissions that existed in 2010 by 2050, in line with Colorado's Climate Action Plan

Read More >

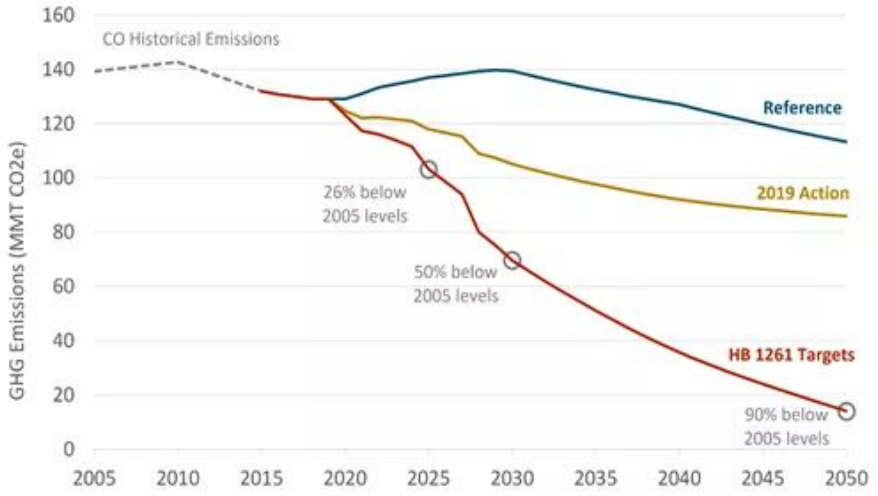
### ENVIRONMENTAL JUSTICE

Prioritize sustainability actions in schools and communities facing greater inequity and/or environmental injustice

Read More >

# Project Objective

## State of Colorado - GHG Road Map

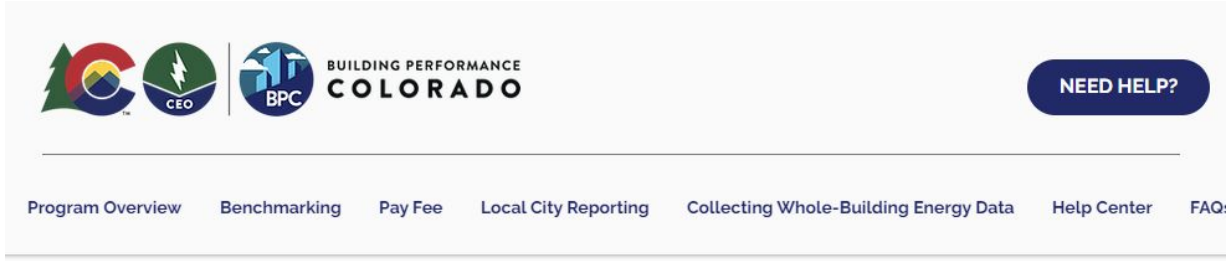



[Colorado Energy Office GHG Pollution Reduction Roadmap]

- HB19-1261 Climate Action Plan To Reduce Pollution
- Goal of 90% below 2005 levels by 2050

# Project Objective

## State of Colorado - Building Performance




BUILDING PERFORMANCE COLORADO

https://www.buildingperformanceco.com/

**Goals:**

**7%** emissions reduction by 2026

**20%** emissions reduction by 2030

- House Bill 21-1286 “Energy Performance for Buildings” passed 6/8/21
- Benchmarking by 12/1/22
- Building Performance Standard (BPS) Task Force underway to determine performance requirements

# Project Objective

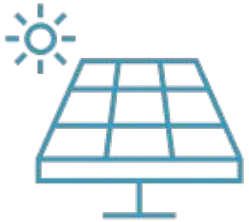
## City and County of Denver

### Denver's Climate Goals

***Denver aims to reduce greenhouse gas (GHG) emissions 65% by 2030!***

| Goal Year | GHG Emissions Reduction |
|---|---|
| 2025 | 40% |
| 2030 | 65% |
| 2040 | 100% |

Denver Climate Action



### Renewable Energy

**Goal: 100% Renewable Electricity by 2030**

Denver as an electricity consumer is nested within Xcel Energy and the broader Colorado electric system. Denver's renewable vision is to enable a rapid and equitable transition to a 100% renewable electric system in Colorado. **By 2030, 100% of Denver's community-wide electricity use will contribute to this vision.**

Denver Renewable Energy

# Project Objective

## Energize Denver - Building Ordinance

- Commercial & Multifamily buildings

Energize Denver Hub

Energize Denver Task Force Recommendations

### POLICY #1: Performance Requirements

- 1) All large buildings > 25,000 sf: EUI Target
  - Compliance through annual benchmarking
- 2) All small buildings 5,000 sf – 25,000 sf: LED lighting or solar
  - One time submittal showing proof

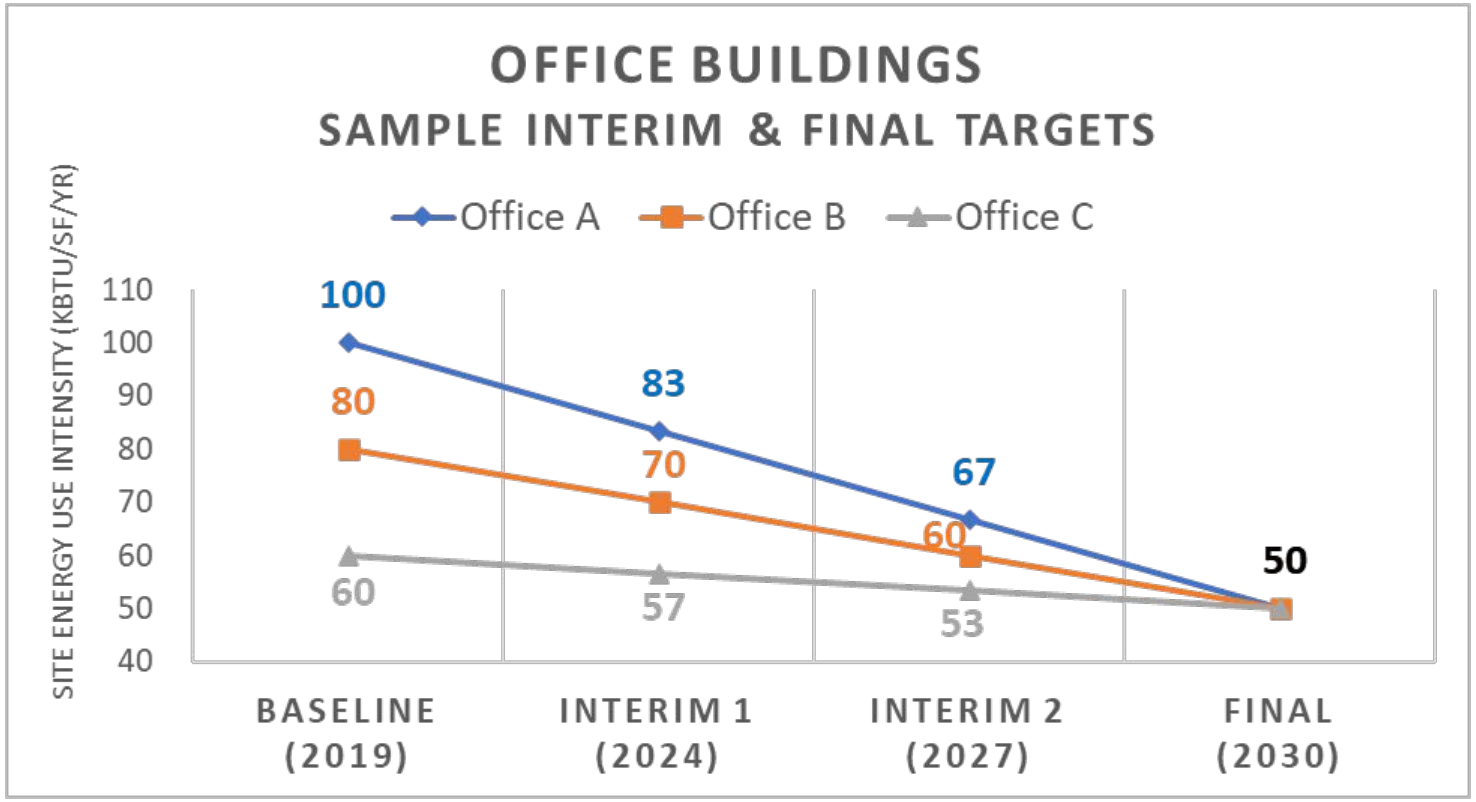
### POLICY #2: Renewable Heating and Cooling (Electrification)

- All commercial buildings, phased in by equipment type
- Partial electrification upon system replacement when cost effective
- Managed through building permits

# Project Objective

## **Energize Denver - #1 Performance Requirements** (>25,000 sq.ft.)

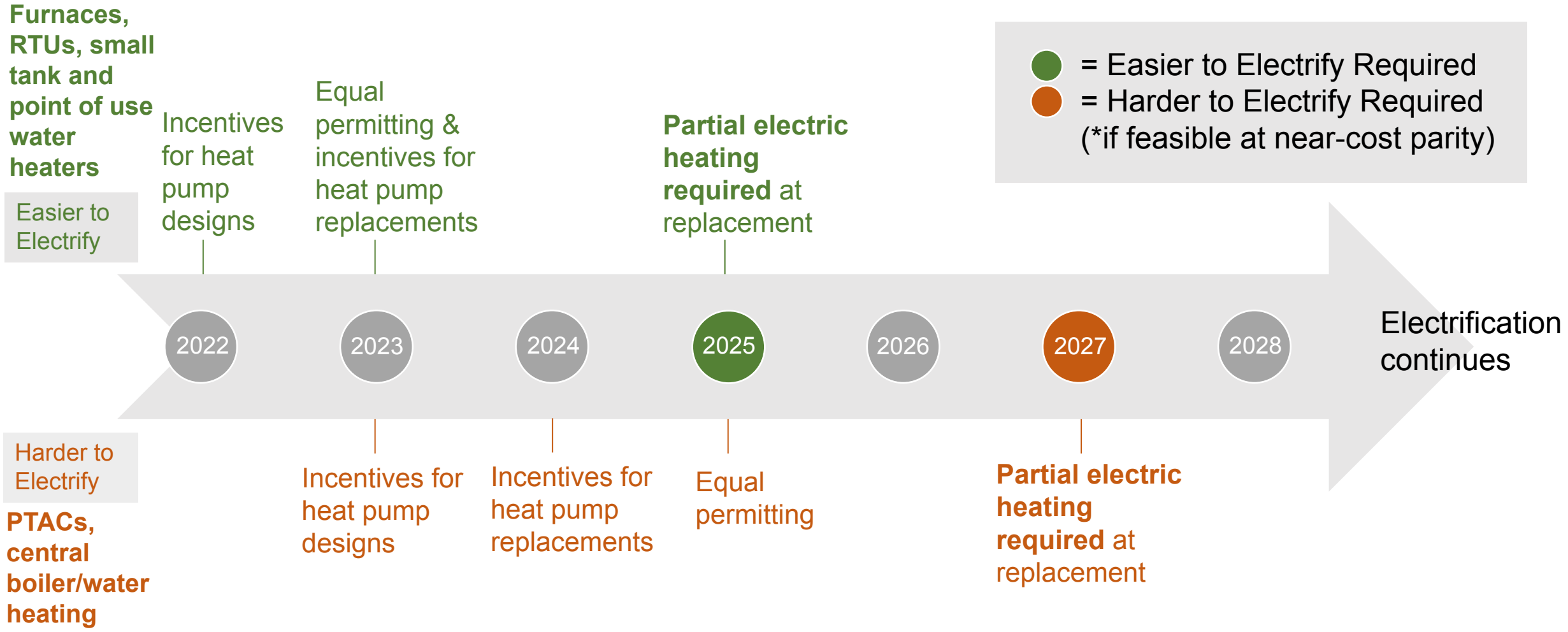
- 2030 Target for K-12 schools: **48 kBtu/sq.ft./yr**
- Track compliance through annual benchmarking - **2025, 2028, 2031**
- Solar fully credited to EUI - on site or off site




Denver Office of Climate Action, Sustainability & Resiliency (CASR)

# Project Objective

## Energize Denver - #2 Electrification



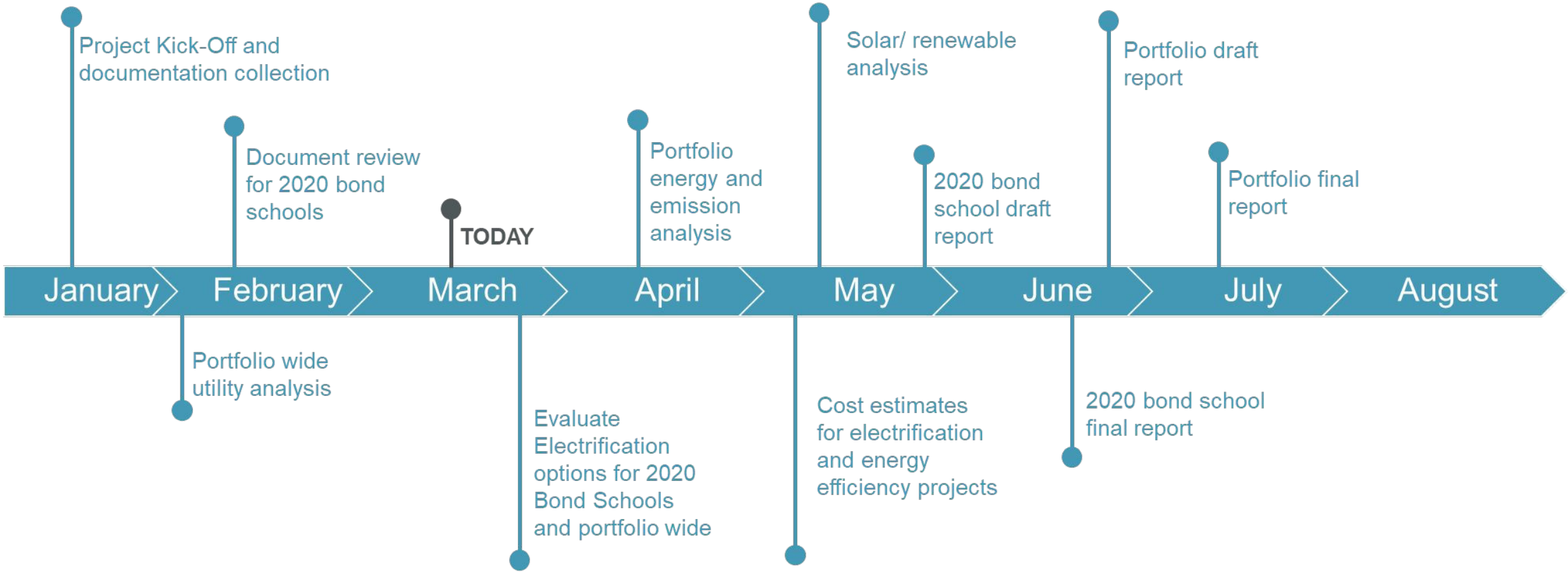
# Project Process

## DPS Project - Financial Impact Assessment Scope

| | | |
|---|---|---|
| 01 | **2020 Bond Electrification Evaluation** | • Consult on schools receiving new cooling or cooling upgrades<br>• Recommend electrification, assess costs |
| 02 | **2024 Bond Electrification and Energy Evaluation** | • Plan ahead for next bond round to include electrification<br>• Include energy improvements to meet goals |
| 03 | **Renewable Energy Assessment** | • Analyze gap to achieve 100% renewable energy by 2030 considering Xcel Energy targets<br>• Determine options and costs for new solar |
| 04 | **Portfolio Level Analysis** | • Evaluate historic energy use and emissions<br>• Assess impacts and costs for efficiency, electrification, and renewables across DPS |

# Project Process

## Financial Impact Assessment Timeline



# Energy & Emissions

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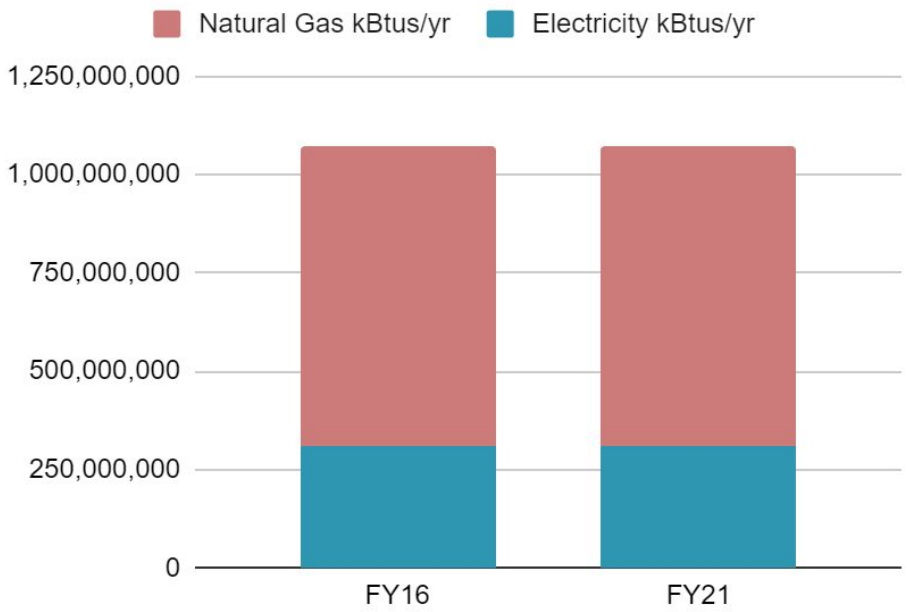
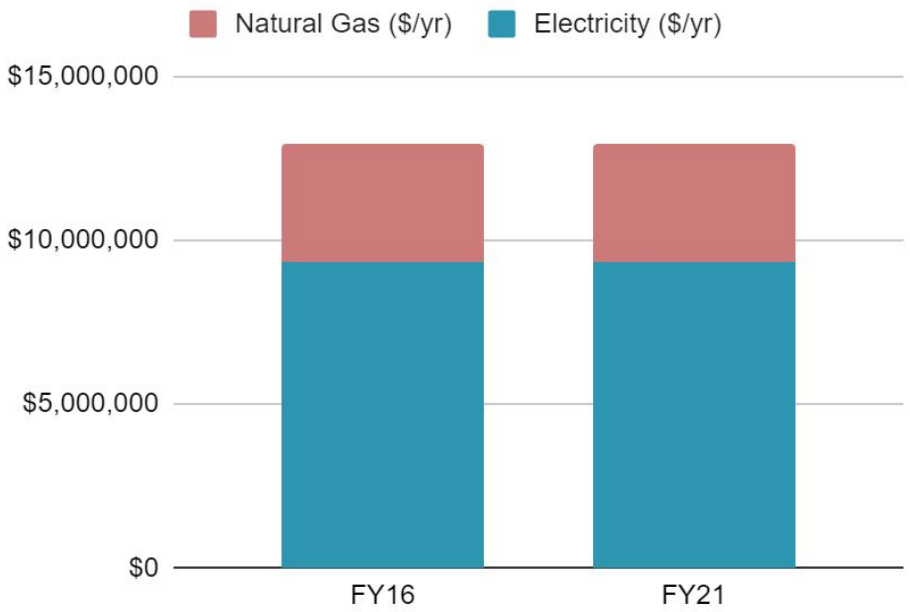
# Energy & Emissions

DPS Annual Energy in kBtus/yr




DPS Annual Energy Costs



# Energy & Emissions

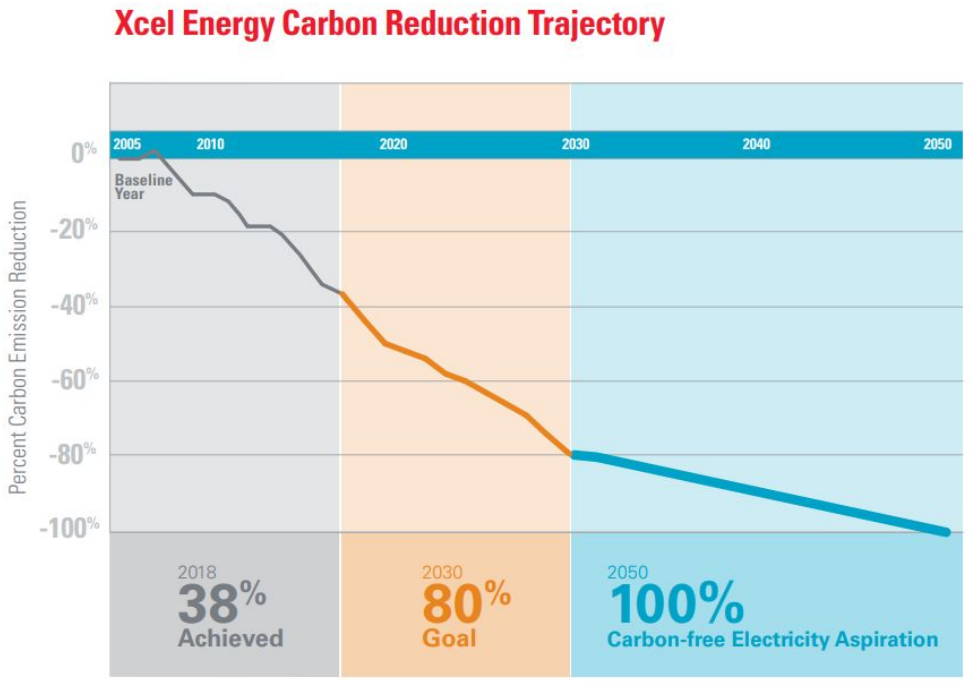
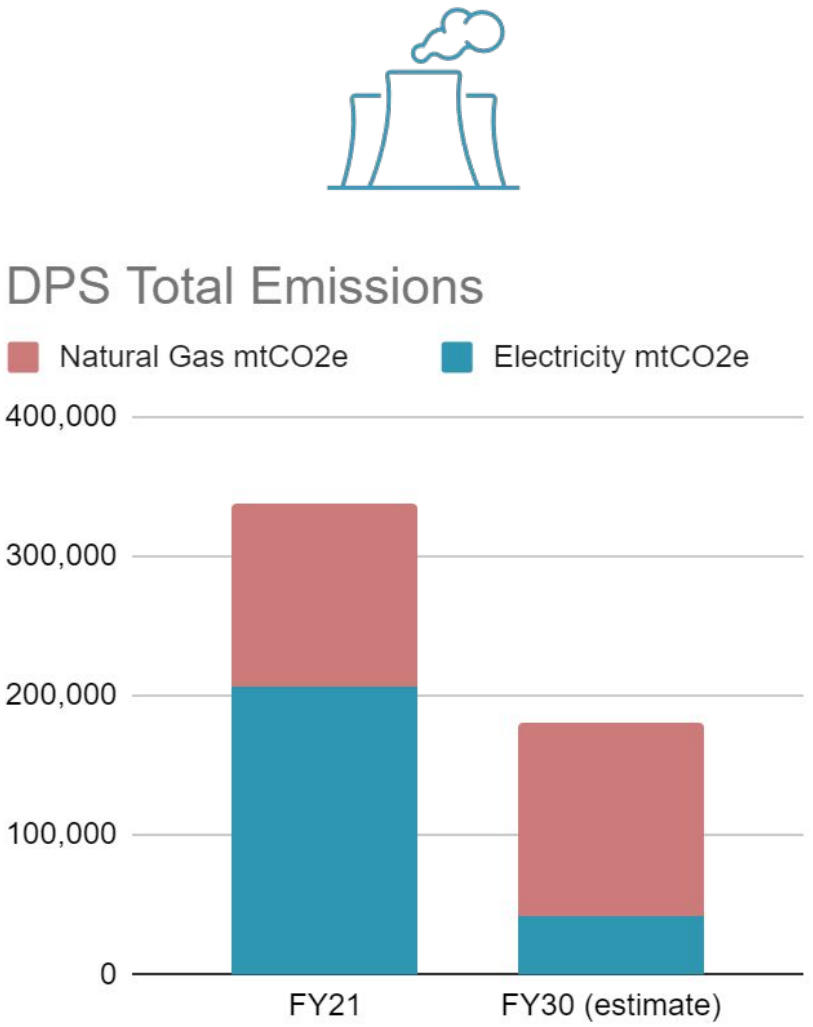
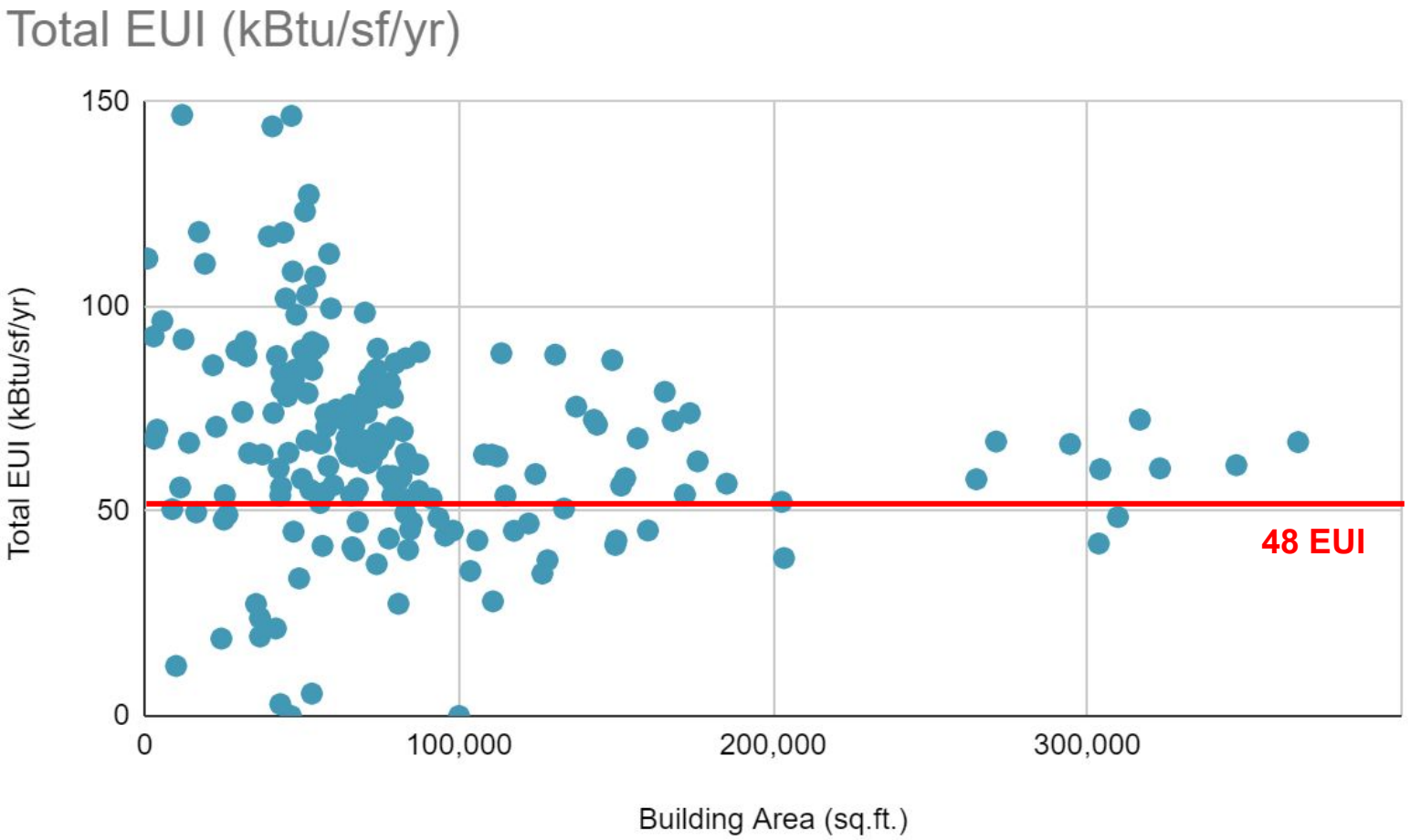
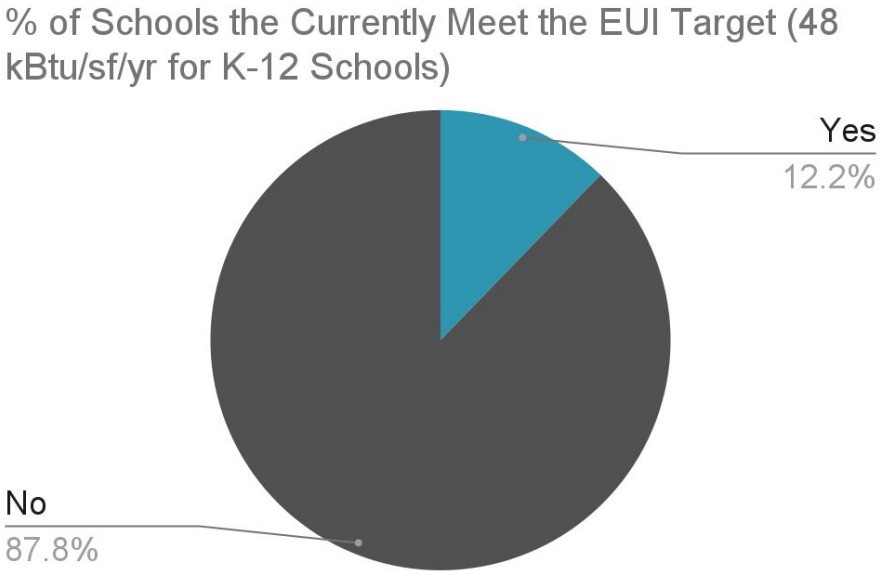



Figure 1: Our vision for the clean energy transition 2030 and 2050



# Current EUIs at DPS



# Energy & Emissions

If a **48 EUI** can be achieved for all schools, it will save:

- **25%** of total energy use
- 252,102,568 kBtu/yr

| Fuel Source | Approximate Energy Savings | | Cost Savings ($/yr) |
|---|---|---|---|
| Natural Gas Savings | 1,260,513 | therms/yr | $510,245 |
| Electricity Savings | 36,932,694 | kWh/yr | $3,673,582 |

# Energy & Emissions

How to achieve savings?

- LED lighting already done across the district
- Low cost measures: Controls upgrades and retro-commissioning
- Capital upgrades: Mechanical and controls projects identified in the Facilities Conditions Assessments
- Install heat pumps at time of equipment replacement (~300% efficient)

# Electrification

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## Electrification Drivers

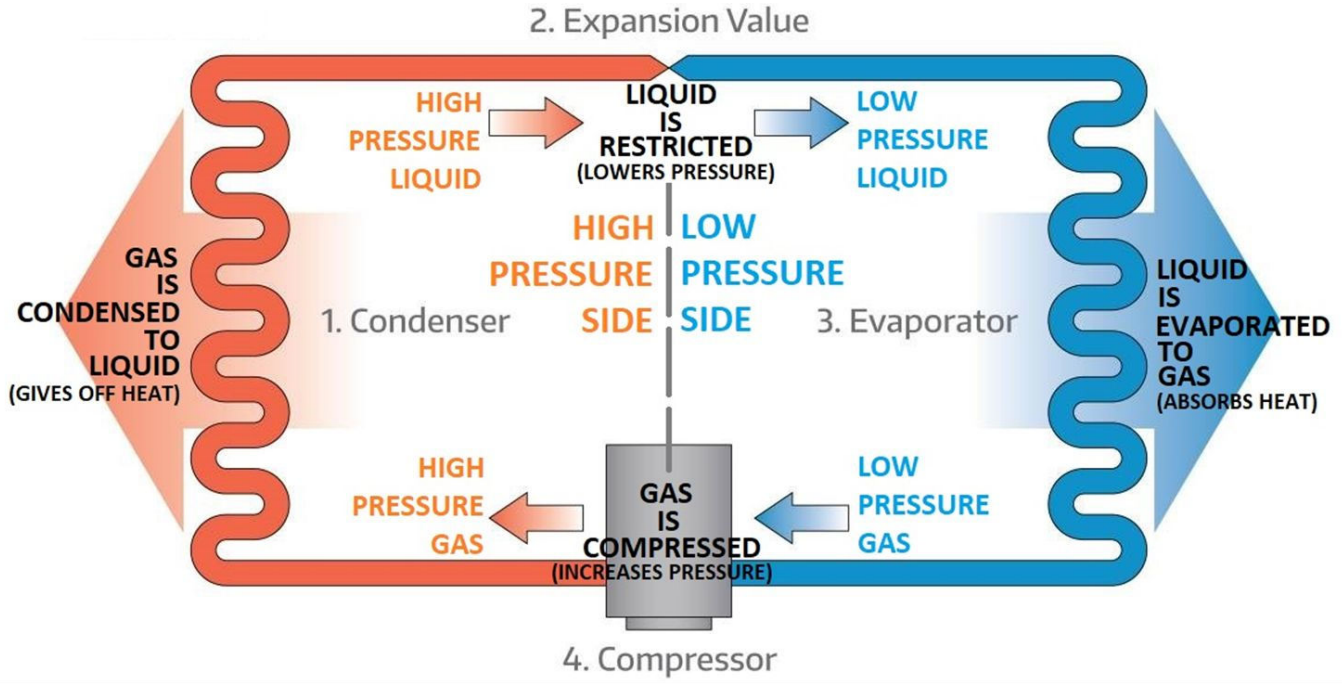
- Electricity generated by renewable energy is the only path to achieve aggressive goals for carbon reduction
- Xcel Energy has a goal of 80% carbon reduction by 2030
- Heat pump technology has advanced with more air source options for cold climates

Xcel Energy's Carbon Report

# Electrification

## 2020 bond projects being evaluated

- New mechanical cooling being added for 9 schools
- Roof-top Unit replacement planned for 5 schools



# Electrification

## Rooftop Unit (RTU) Replacement

- Include a heat pump in lieu of DX cooling only
- Similar equipment first cost
- Natural gas can remain as backup
  - Reduce peak electrical cost
  - Minimize or eliminate the need to increase the electrical supply
- Similar operating costs with high efficiency heat pump

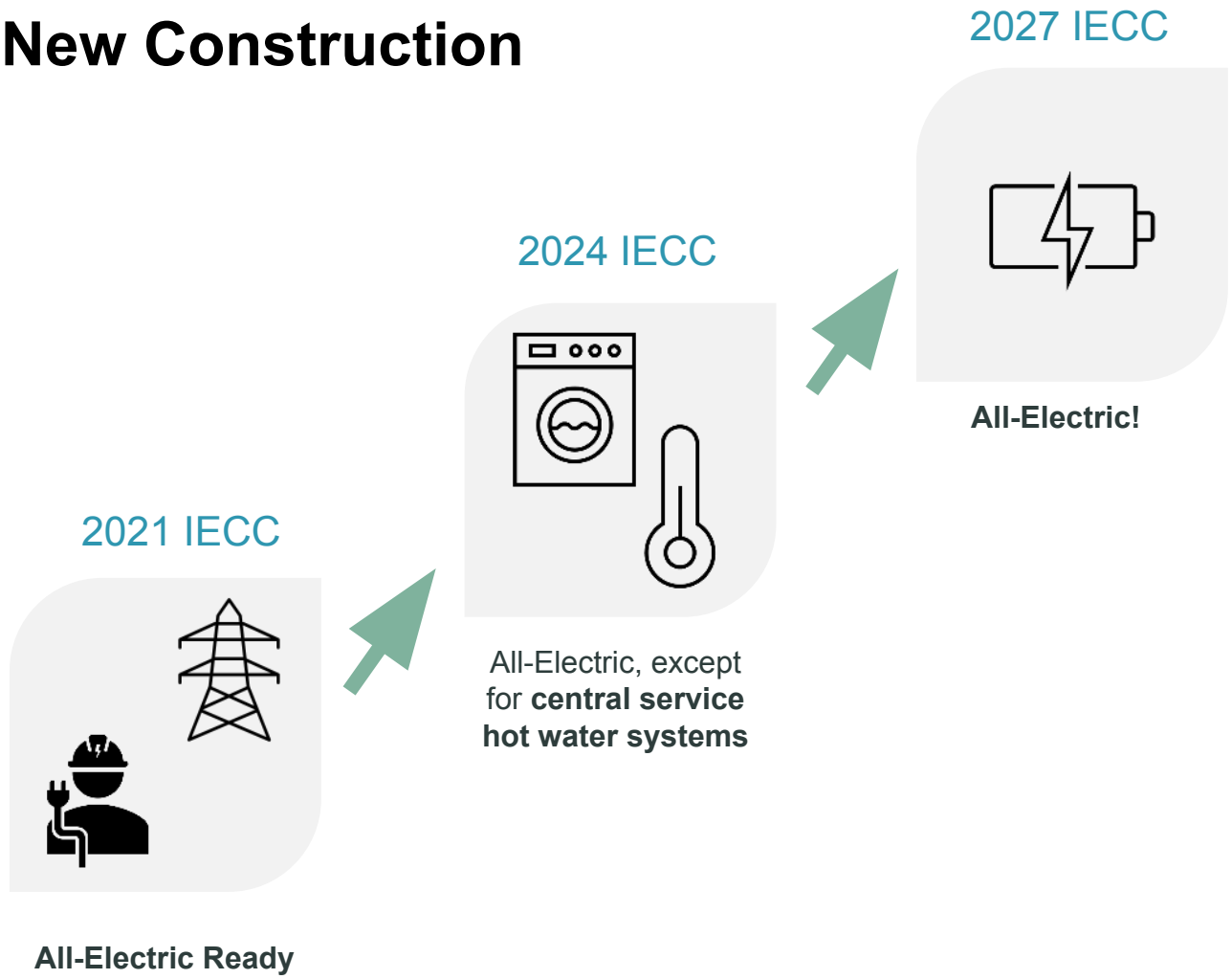
# Electrification

## New Cooling in Schools with Hydronic Heating

- **Heating:** Hydronic devices - unit ventilators, convectors, fin tube radiators, AHU coils, etc.
- **New cooling:** Typically add an air cooled chiller piped to unit ventilators and other devices
- Evaluating air source **heat pumps** - pipe into the heating water and new chilled water systems
  - Current heat pumps produce lower temp hot water (i.e. 130 deg F vs. 180 deg F) - keep boiler for colder temps
  - More complex design and control
  - Evaluate options as technology improves

# Electrification

## New Construction




- Denver code will require all electric in a few years
  - Amendment has been proposed for 2022
- More system options are available with new construction (VRF)
- More efficient envelope helps support all electric

# Renewable Energy

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# Renewable Energy

## Goal - 100% Renewable by 2030

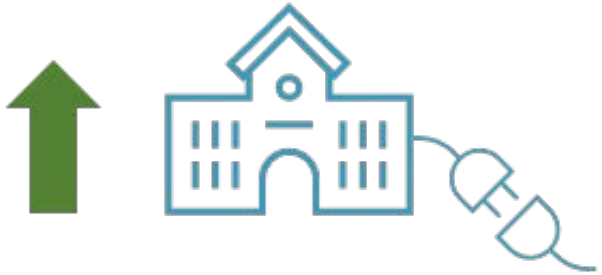
- Xcel Energy ~80% renewable by 2030, existing PV at DPS covering ~7% of energy = **13% gap**
- To cover the gap at current electricity levels, approximately:
  - **9,400 kW** of solar PV
  - **659,000 sq.ft.** of solar PV, roughly 4% of building area
  - **$18.8 million first cost** (at $2/watt; cost will vary)

# Renewable Energy

Other changes will impact the gap to achieve 100% renewable electricity

Energy Efficiency

Electric Vehicles



Electric Heating

# QUESTIONS?

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