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# CMTA Inc.

Provider Number #401104249



# CMTA

HP-105

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March 4, 2021



# Your Presenters



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# Course Description

This course focuses on the power of passion from a school districts champion and the process of utilizing lessons learned in ten years of zero energy design. A collaborative team utilized zero energy workshops to convert an old K-8 prototype to high performance and place it on the path to zero energy. The process reveals best practices for Florida Zero Energy school design and operations, valuable information the attendees can apply to their future projects in the fast schedules for Prototype.



# Learning Objectives

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

1. Demonstrate an understanding of how utilizing past Prototypes have long-term operational cost implications.
2. Apply high performance best practices to reduce design schedules by leveraging a prototype.
3. Organize workshops resulting in collaborative design to achieve net-zero-ready for an old K-8 prototype.
4. Identify any potential schedule impacts for conversion to high performance.



An aerial rendering of a large, modern building complex, possibly a hospital or university campus. The building has a long, low profile with a central entrance area. A large parking lot is visible to the right, filled with numerous cars. The surrounding area is landscaped with many trees and green spaces. The sky is overcast and grey.

**Utilizing past Prototypes have long-term operational cost implications.**

**-Is it worth the effort to make a change?**

# Energy Costs 2017-2018

**Florida Schools**  
**~\$530,000,000**

**Osceola County**  
**~\$12,000,000**





# Energy Costs If a 50% Reduction Goal Became Reality...

Florida Schools  
~\$530,000,000

Florida Schools  
~\$265,000,000

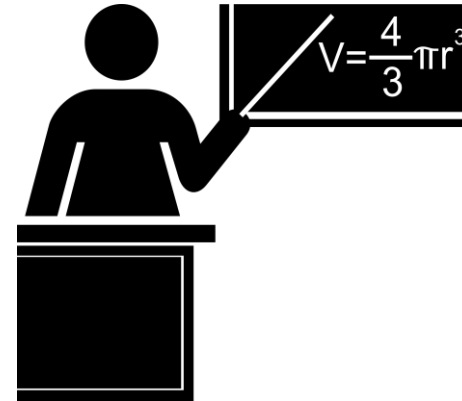
Osceola County  
~\$12,000,000

Osceola County  
~\$6,000,000



# Energy Costs

If a 50% reduction goal became reality...



**\$6,000,000**  
operating costs  
annually

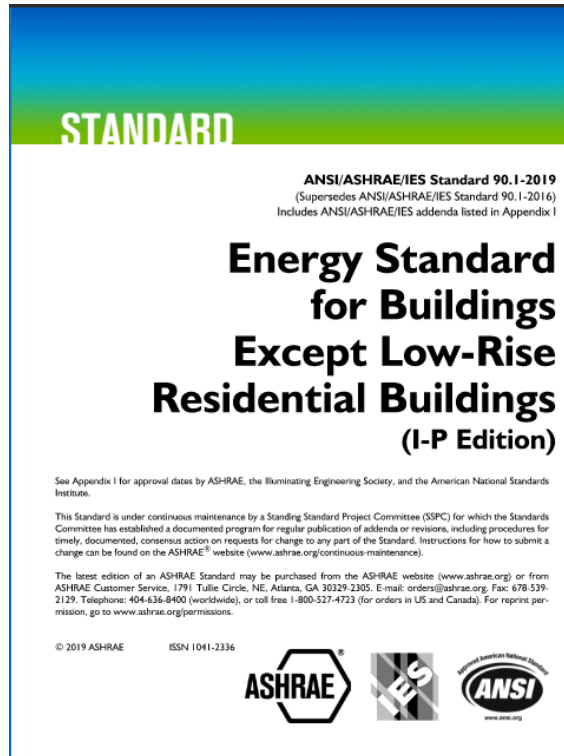
**~250 teachers and staff**  
members to keep  
classroom cleans

A photograph of a modern building with a large glass facade. The building is reflected in the glass. In the foreground, a person is walking on a paved path. The background shows a landscape with trees and a body of water.

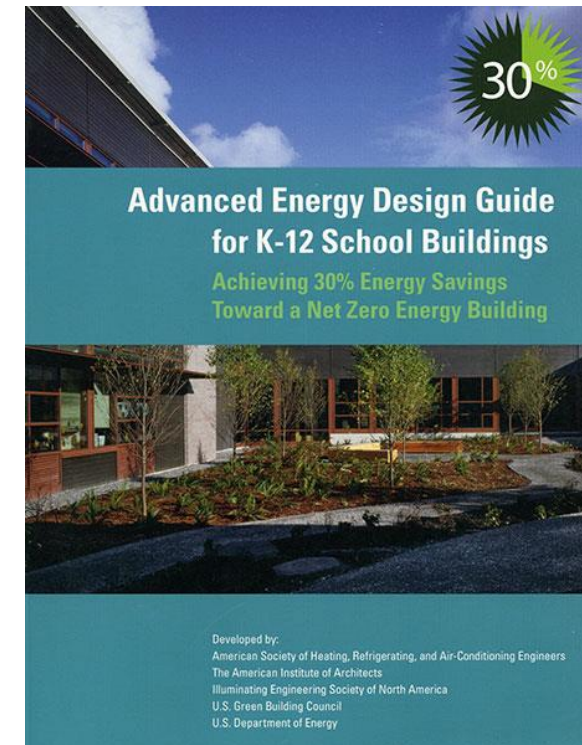
**How Do We Achieve This Goal?**

**One Project at a Time**

# Researched National Case Studies

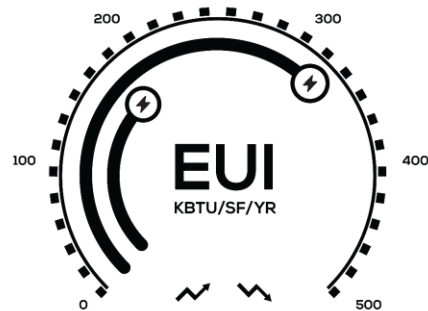
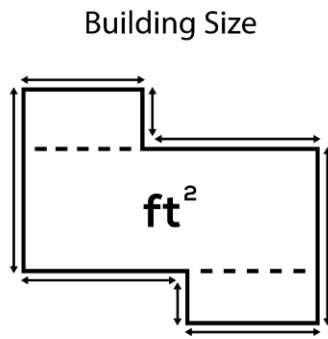
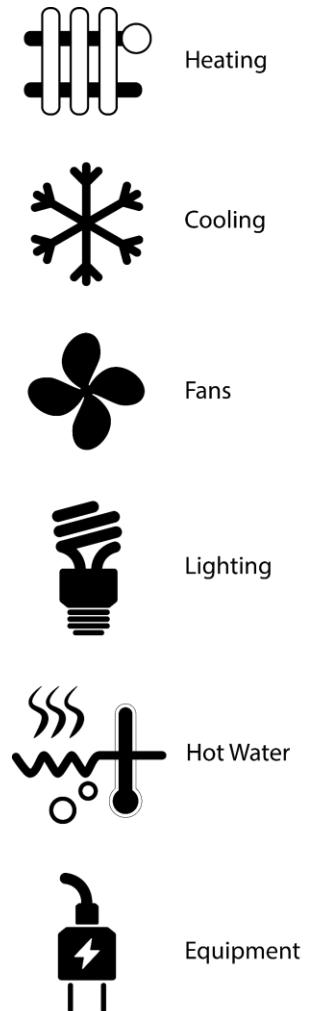


Code are evolving but are the worst we are allowed to do



AEDG provides direction for the best we can do in budget

# What is EUI?



## Energy Use Intensity

The Lower the Number, The Lower the Energy Use

# Case Study: Canoe Creek K-8



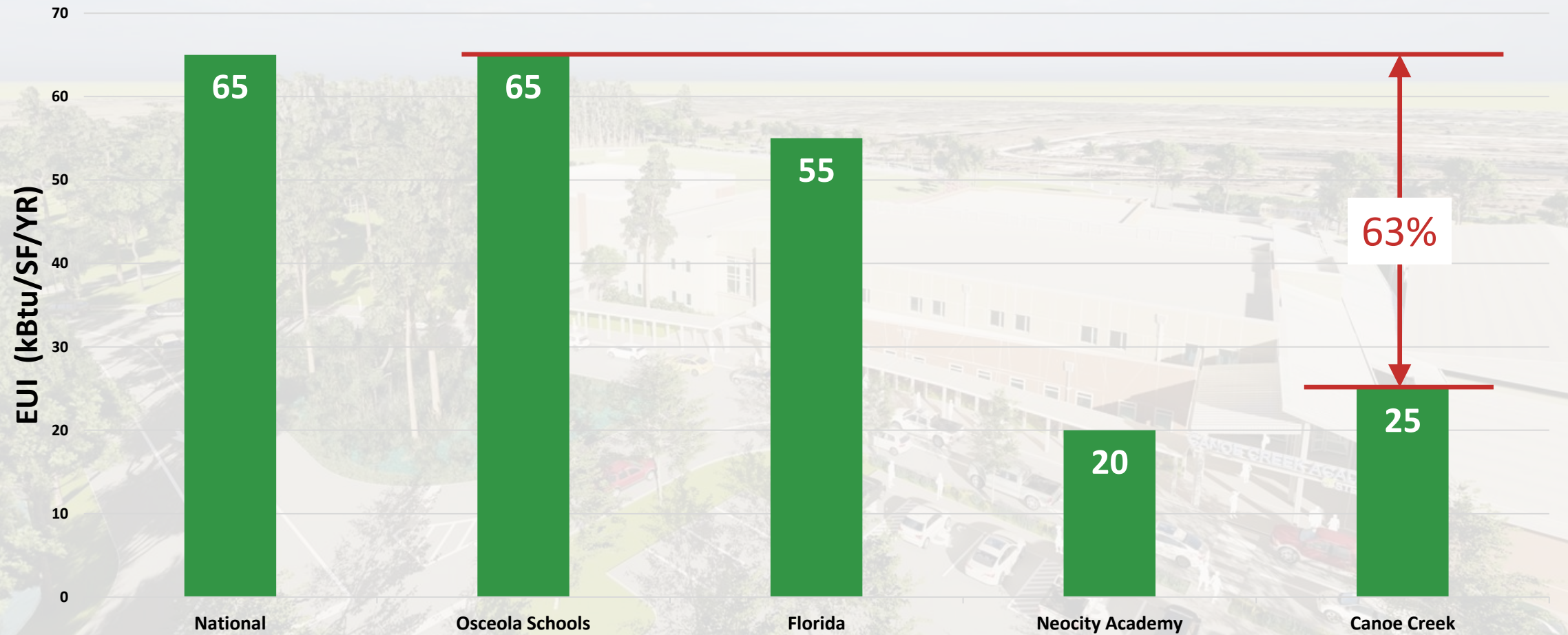
**Added to the Request for Qualifications**

**Canoe Creek Energy Goal: 25 EUI**



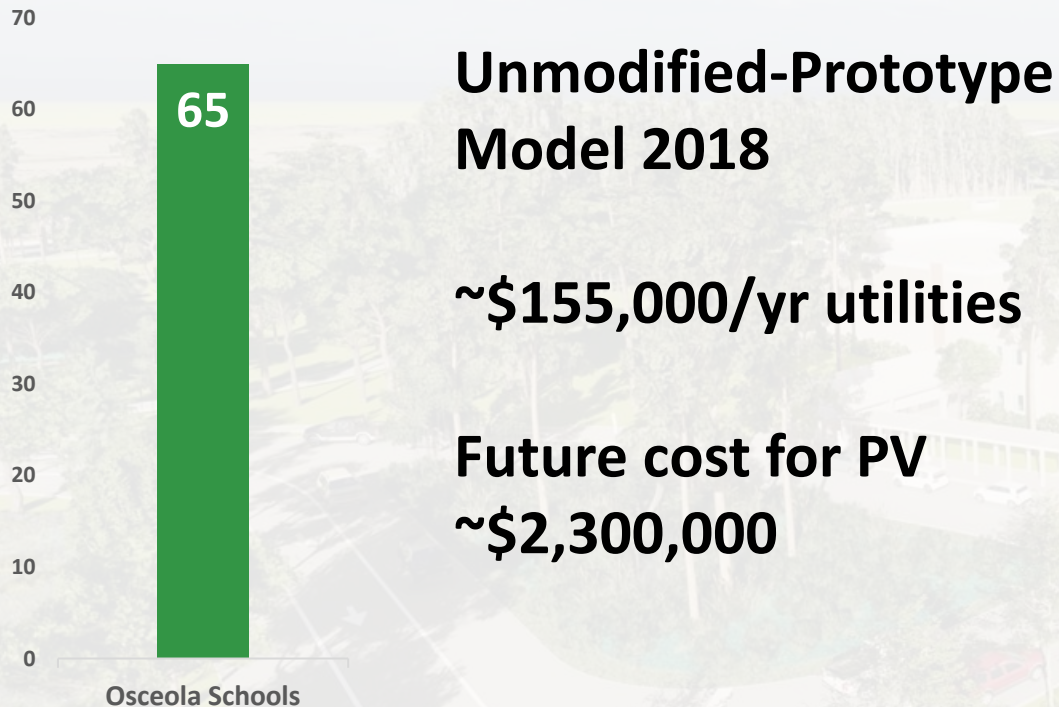
# Drastic Energy Reduction

Comparable EUIs





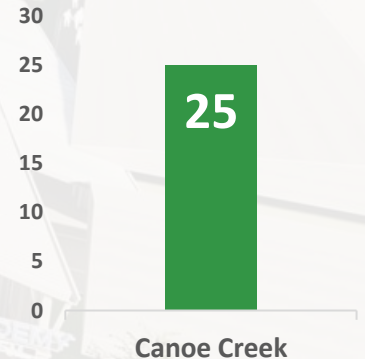
# Energy Cost and PV for Carbon Neutrality



## Canoe Creek High Performance 2020

~\$75,000/yr utilities

**Future cost for PV**  
~\$900,000



\$80,000/ year reduction in utility costs

An aerial architectural rendering of a modern building complex. The scene shows a large, multi-story building with a flat roof, surrounded by a parking lot filled with various cars. The area is landscaped with numerous trees, including palm trees and deciduous trees, and green lawns. The sky is a dark, overcast blue. The text "Prototypes - benefits and challenged for implementation of high performance best practices" is overlaid in white, bold font on the left side of the image.

**Prototypes - benefits and challenged for  
implementation of high performance best  
practices**

# Case Study: Canoe Creek K-8



## Existing Operating Campus



### OSCEOLA SCHOOL BOARD VOTES TO RETURN CANOE CREEK CHARTER ACADEMY BACK TO SCHOOL DISTRICT

Jan 9, 2020 | Kissimmee News, Osceola News, Osceola Schools, Poinciana News, St. Cloud News

★★★★★



Canoe Creek Charter Academy, a charter school south of St. Cloud, will transition back to the Osceola County School District next school year, the district announced Thursday.

The School Board voted to return the school back to the district, who originally leased the facility to the Education Foundation and owns the land on which the school is located.

Charter Schools USA, which operates the school now, the School Board and the Education Foundation collectively came to this decision, the School District said. The school will provide classroom space needed as many existing schools are reaching capacity, and this move also anticipates future growth.

Canoe Creek Charter will not be a charter school for the 2020-21 school year, instead serving K-6 students, with plans to extend to a full K-8 school in 2021-22 with all standard amenities like a gym, track, media center and fine arts programs. Students and teachers will have opportunities to remain with a Charter Schools USA-managed school or return to a district-managed





EXISTING  
PARKING

PARENT DROP OFF

EXISTING  
CANOE CREEK  
CHARTER ACADEMY

BUS DROP OFF

CONSERVATION  
AREA

CANOE CREEK ROAD

FRIARS COVE LANE







## OSCEOLA SCHOOL BOARD VOTES TO RETURN CANOE CREEK CHARTER ACADEMY BACK TO SCHOOL DISTRICT

Jan 9, 2020 | Kissimmee News, Osceola News,  
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| ★★★★★



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School District of  
**OSCEOLA COUNTY**  
FLORIDA

*...the next evolution of STEM in Osceola  
County!*

*...picturesque preserve !*

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 **STEM**  School  
*+Net-Zero Ready*

# PRELIMINARY PROGRAM

Added Capacity: 540 (New Total 1,200)

## Existing Facilities

Existing Capacity: 660

### Building 1

Administration (Future Repurpose)

Media Center (Future Repurpose)

Art Room (Future Repurpose)

Music Room (Future Repurpose)

Multi-purpose Dining (Future Repurpose)

### Grade K-2 Building 2

Classrooms (14) To Remain

### Grade 3-5 Building 3

Classrooms (16) To Remain

Gymnasium

GYM

Media Admin

Dining

Art Kitchen

Music

BUS LOOP

2-STORY CLASSROOM

## New Fusion Building

New Administration

New Media Center

Art + Music Rooms

New Kitchen + Dining

Gymnasium

Classrooms (24) + Science

*e-STEM Labs*

## Site Improvements

Visitor / Staff Parking (80+ Spaces)

New Bus Loop

New Service Yard

Additional Retention

*e-Trail*

## Field Amenities

Softball Field

Track + Soccer Field

Basketball Courts (2)

*Connection to Program*

*Environmental Preserve*

*Exterior Courts*

# Accelerated Project Delivery



NTP

150  
DAYS

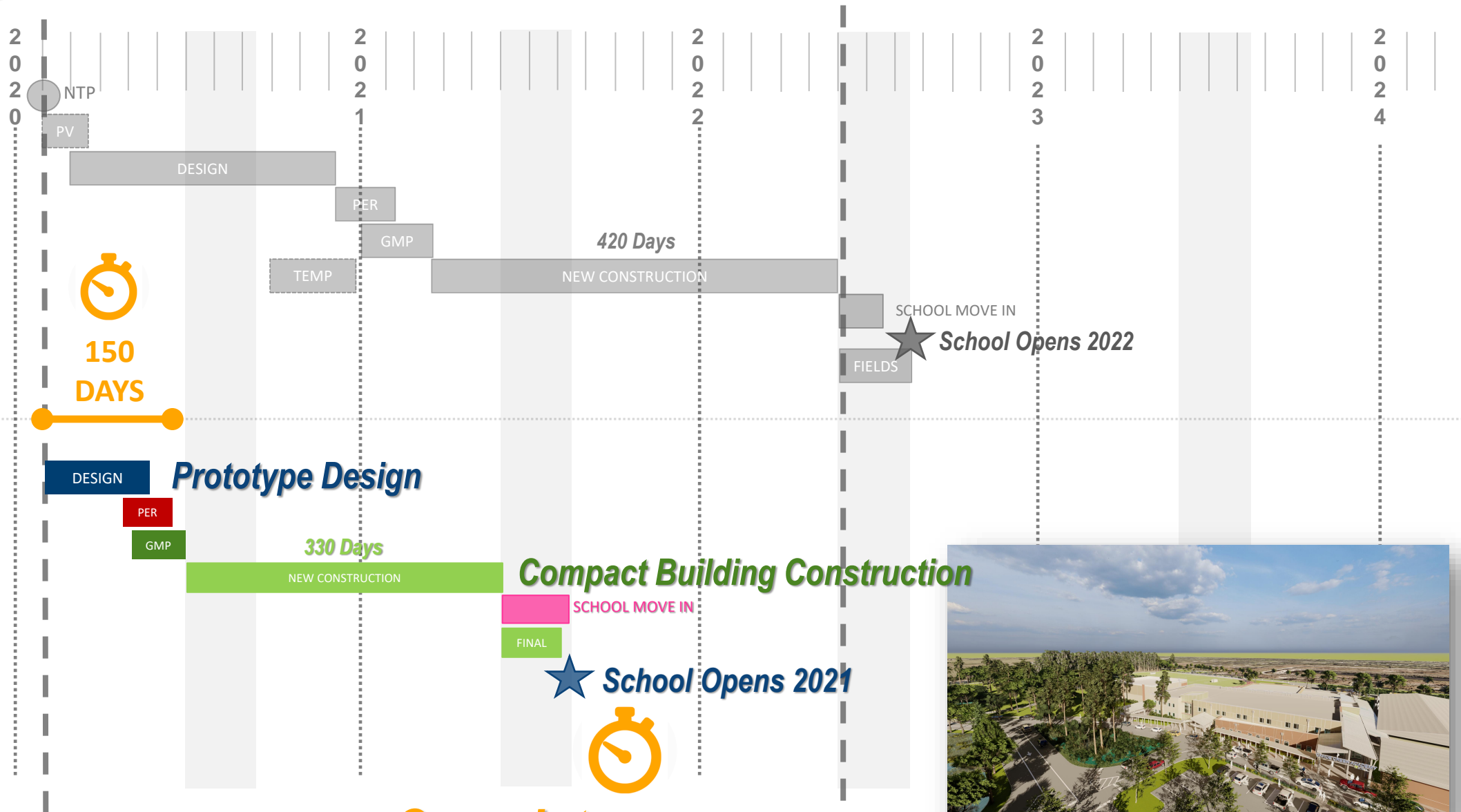
PERMIT



# Schedule

CONVENTIONAL

ACCELERATED



**Complete 1 Year Early!**



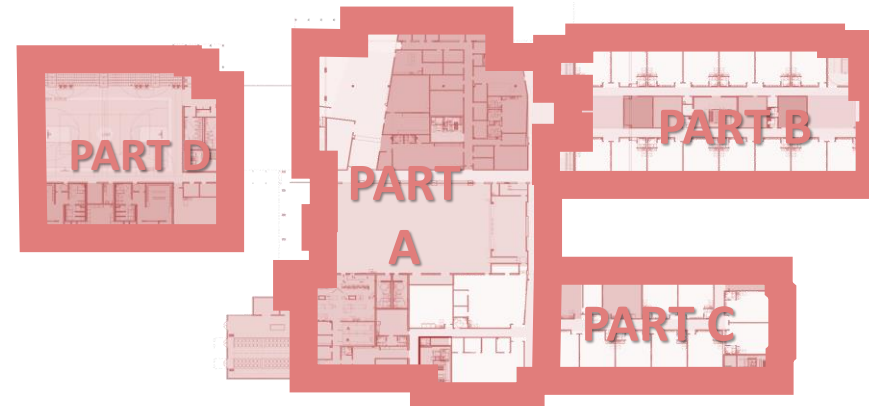
## KIT OF PARTS ...*PROTOTYPE BENIFITS*

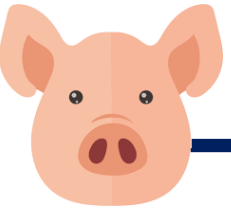
- Reusing plans for the same grade configuration provides an economic benefit to a school district.
- Shorten the design cycle
- Expedited overall project delivery.
- SREF (State Requirements for Educational Facilities) sets uniform standards



## KIT OF PARTS ...*PROTOTYPE CHALLENGES*

- Require modifications, customization or upgrade
- Implement developing new solutions to emerging educational best practices.
- Adapting to evolving pedagogy – 21<sup>st</sup> Century
- community participation

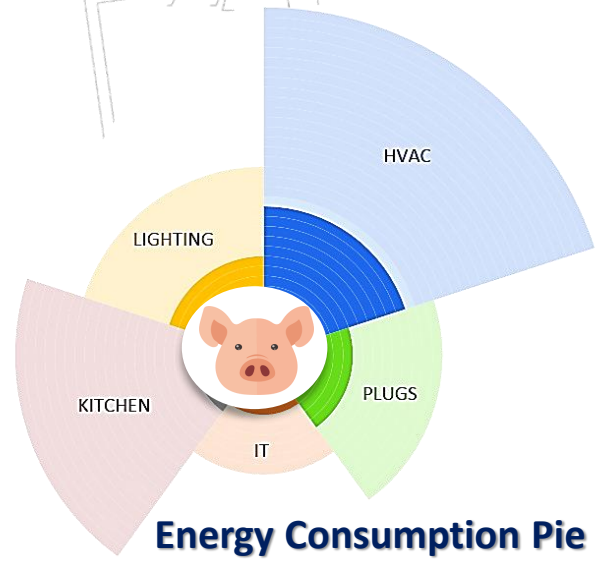
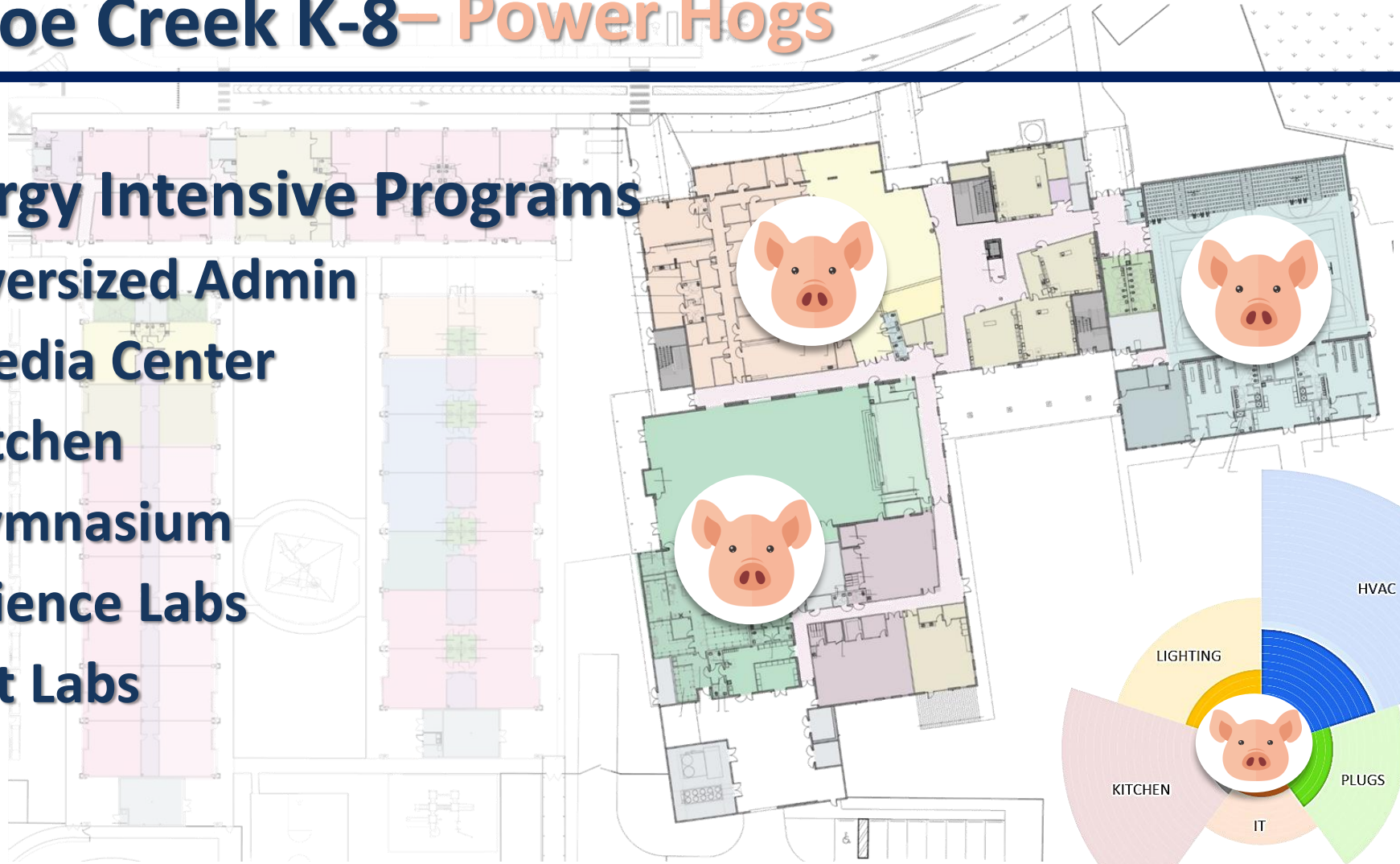




# Canoe Creek K-8— Power Hogs

## Energy Intensive Programs

- Oversized Admin
- Media Center
- Kitchen
- Gymnasium
- Science Labs
- Art Labs



Energy Consumption Pie



Eco-Garden Existing



Eco-Trail



Bio-Swale



Eco-STEM LAB K-4



Eco-STEM LAB 5-8-ground floor



Eco-Courtyard



Eco-Theater out-doors



Bio-Swale





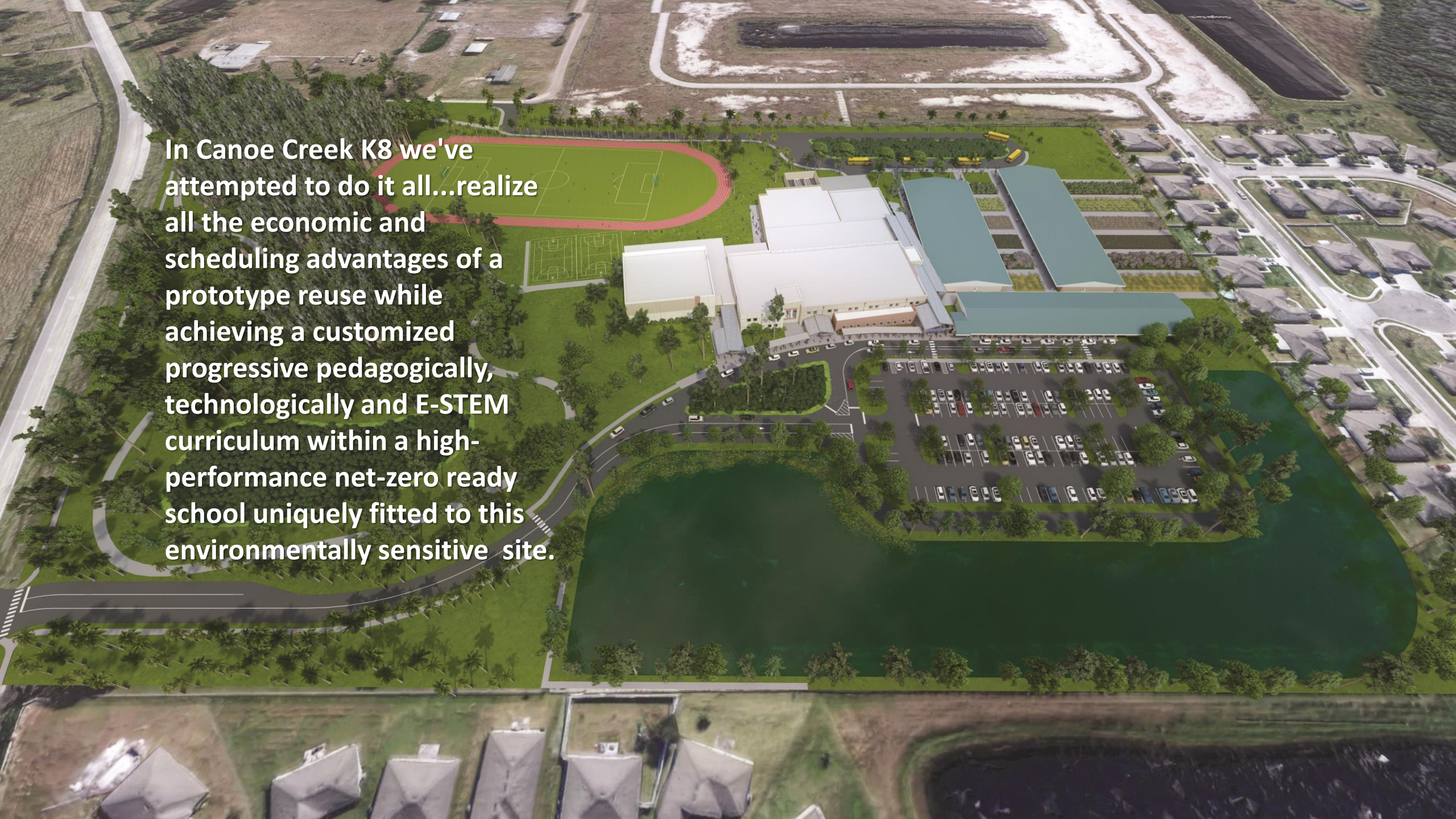




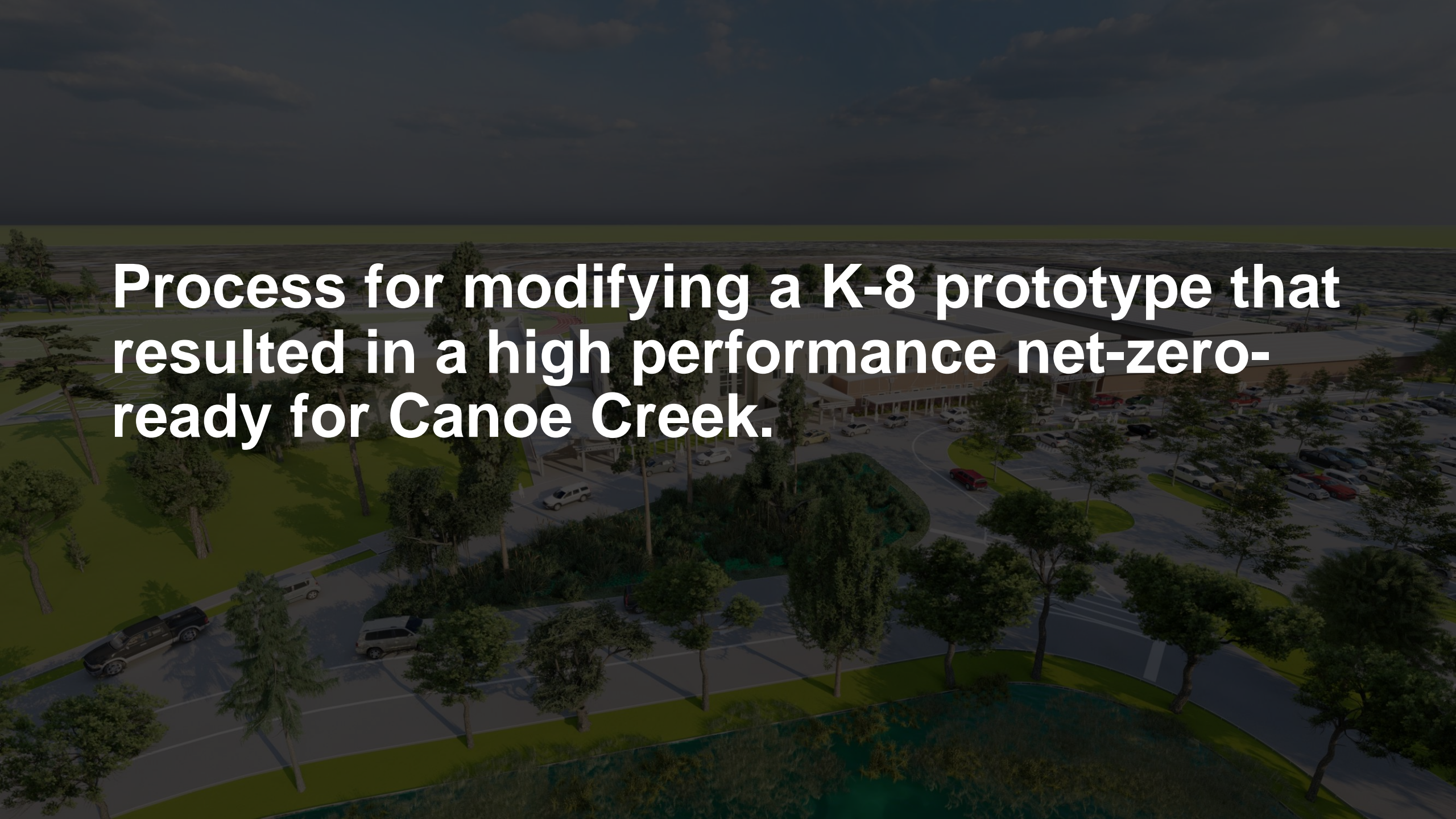
Canoe Creek K-8



01-21-21

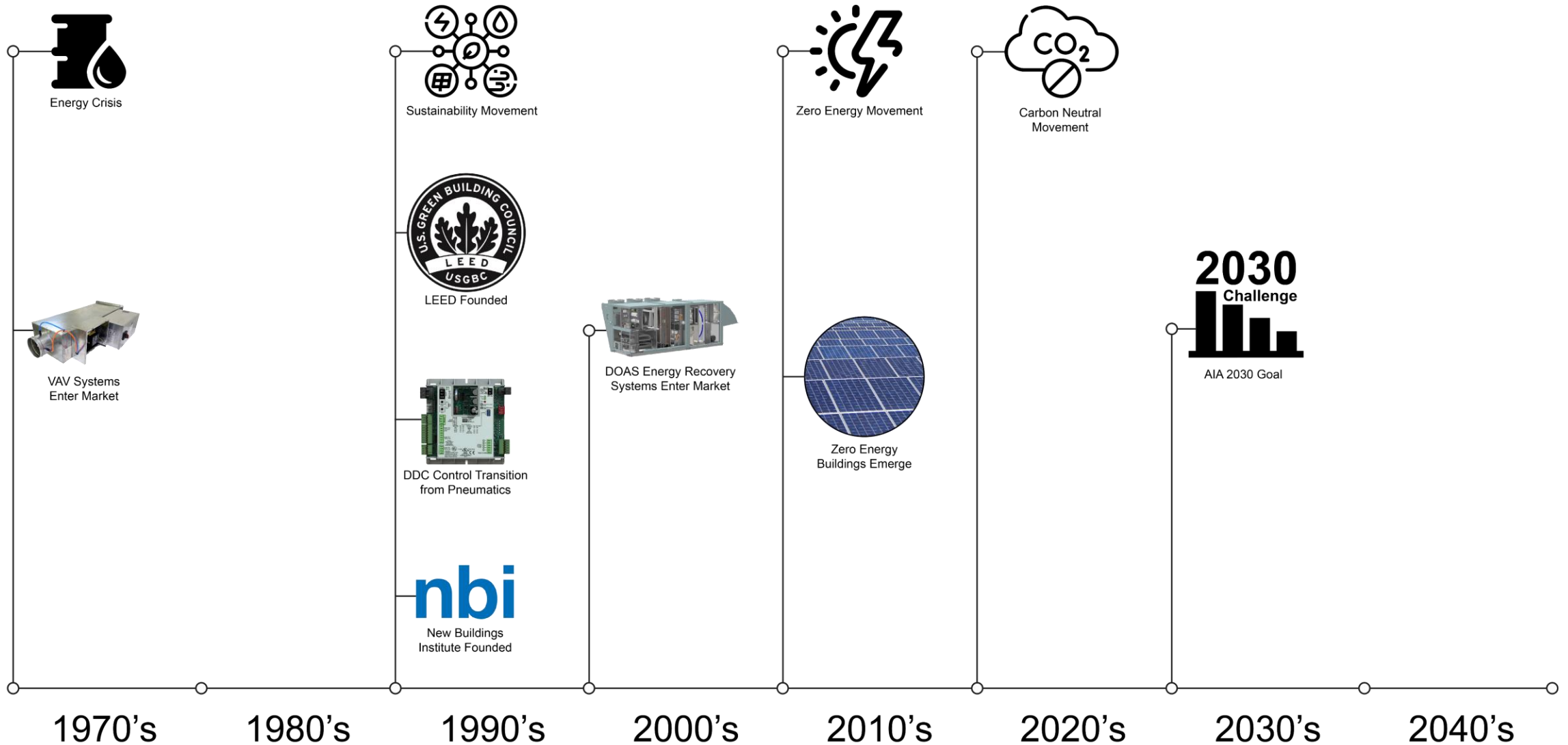
An aerial architectural rendering of a school campus. The central focus is a large, multi-winged school building with a light-colored facade and a blue roof. To the left of the building is a green athletic field with a red running track and a basketball court. A large parking lot filled with cars is situated to the right of the building. The campus is surrounded by lush greenery, including palm trees and other tropical plants. In the background, there are residential houses and a large body of water. The overall scene is presented in a top-down perspective.

In Canoe Creek K8 we've attempted to do it all...realize all the economic and scheduling advantages of a prototype reuse while achieving a customized progressive pedagogically, technologically and E-STEM curriculum within a high-performance net-zero ready school uniquely fitted to this environmentally sensitive site.

An aerial architectural rendering of a school building complex. The main building is a long, single-story structure with a light-colored facade and a flat roof. To the right of the building is a large parking lot filled with various cars. The foreground and middle ground are landscaped with numerous green trees of different sizes and types, interspersed with paved walkways and roads. The overall scene is presented in a semi-transparent, dark overlay, with the text overlaid on top.

**Process for modifying a K-8 prototype that resulted in a high performance net-zero-ready for Canoe Creek.**

# Evolution of Carbon Neutrality

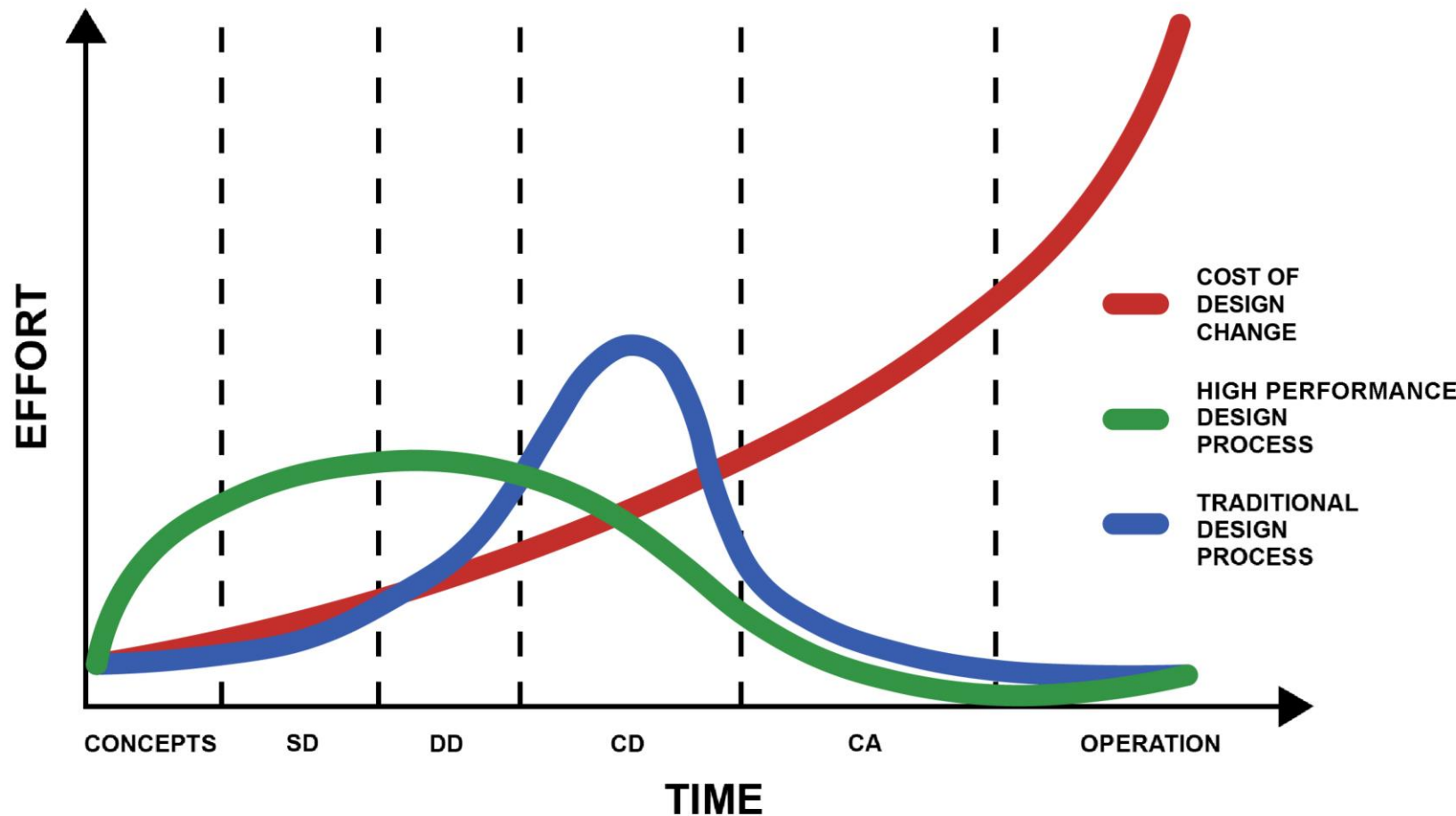


**One rule remains constant for new construction,  
renovations and retro-commissioning:**

**Reduce Demand First, Supply Second**

An aerial photograph of a large, multi-story building complex, likely a hotel or resort, with a prominent parking lot filled with cars. The building has a modern design with a mix of light and dark tones. The surrounding area is lush with greenery, including many tall palm trees and other tropical plants. The sky is clear and blue. The text is overlaid on the top half of the image.

# Process Defines High Performance Success

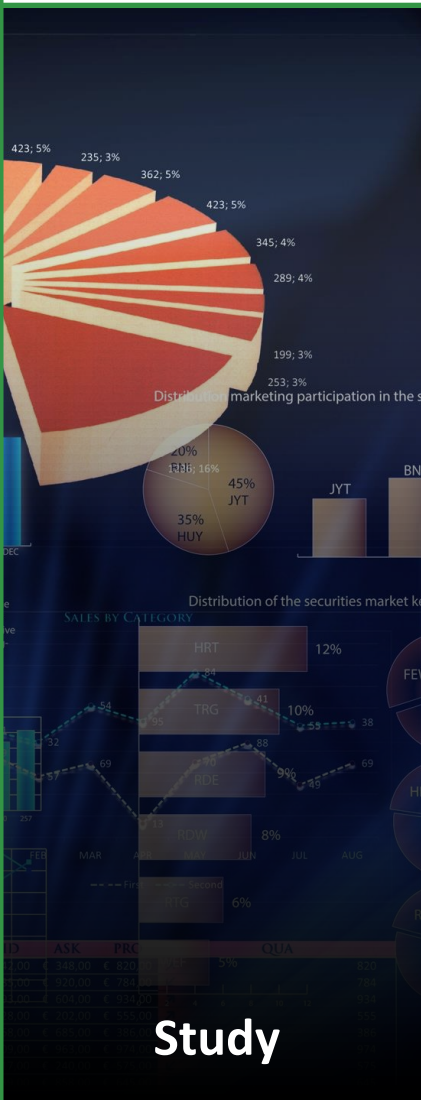


- Heavy resources and focus on early planning
- All decisions that drive drastic energy reduction and improve wellness are in the First 30% of the project

# Steps to Zero Energy Ready



65 EUI



Study



Charrette



Construction



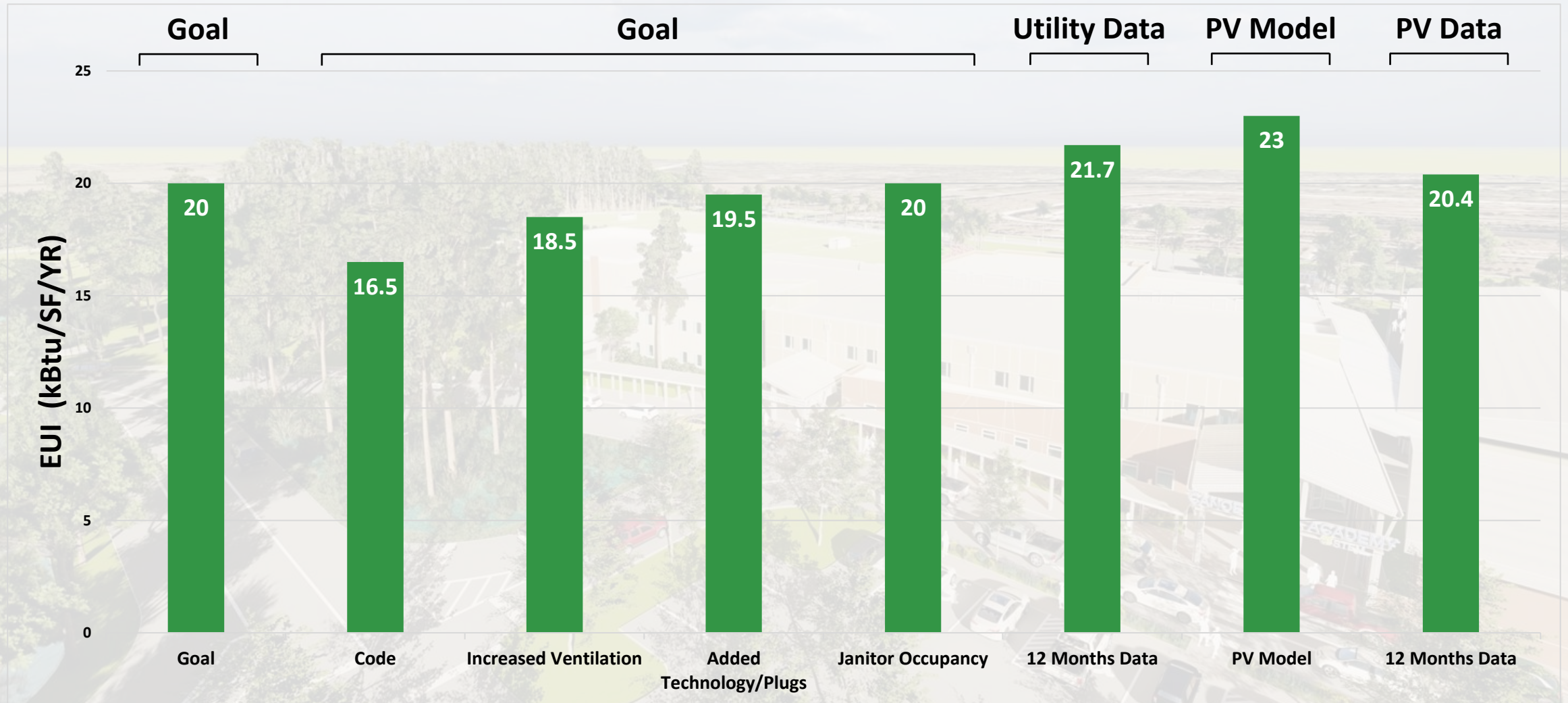
Energy Tracking



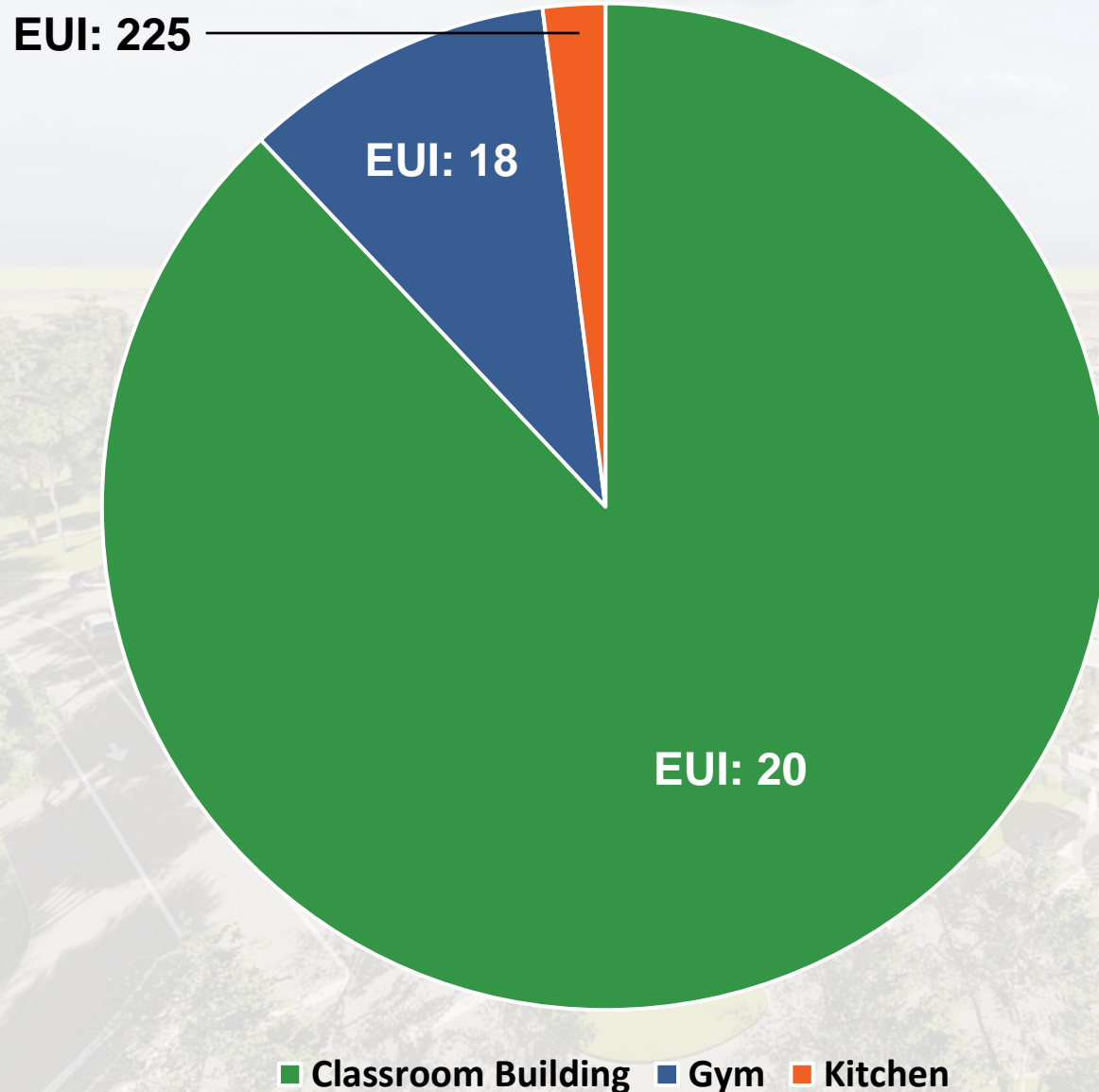
25 EUI



# Energy Data to Inform Future Performance



# Energy Data to Inform Future Performance



## Data:

### Classroom/Office/ Cafeteria

Square Feet: 88%

EUI Contribution: 17.5

### Gym

Square Feet: 10%

EUI Contribution: 2

### Kitchen

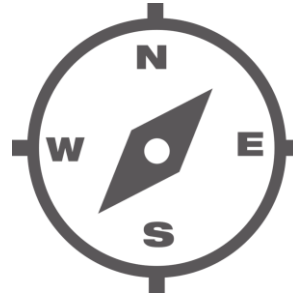
Square Feet: 2%

EUI Contribution: 4.5

# Canoe Creek K-8 – Lowering the Hurdle ...Five Steps

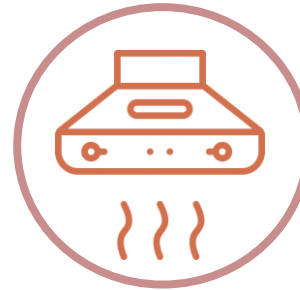
## 1. HVAC ≈ 45%

- Massing/Orientation
- Envelope/Shading
- Roof Solar Ready
- Systems
- Controls



## 2. Kitchen ≈ 20%

- Cooking
- HVAC + Lighting
- Sanitation
- Refrigeration



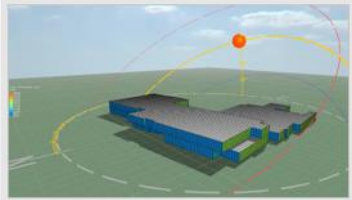
## 3. Lighting ≈ 20%

## 4. Plug Loads ≈ 10%

## 5. IT ≈ 5%



# Charrettes to Target Each Energy User



25 ★



26 ★

## FOOD SERVICE

27 ★



28 ★



29 ★

- ### FOOD SERVICE
- #### Refrigeration
- Highly insulated (R-40+) walk-in coolers/freezers with ECM motors
  - Remote refrigeration rack connected to geothermal water loop allows refrigerators to trade heat with DFW heaters year round
  - Place all possible equipment on water loop
  - Minimize/Eliminate/Consolidate refrigerators, no open glass fronts
  - Combination walk-in cooler and freezer with single entrance with strip curtains and door closer
  - Ice-Maker Waste Chill Recovery

30 ★

- ### FOOD SERVICE
- #### Lighting
- LED Lights with efficacy > 120 lumens per watt (LPW)
  - Full occupancy sensor coverage
  - Connect hood lights to room occupancy sensors
  - LED lights in hoods and walk in's
  - Decorative lighting on separate zone if present

31 ★

- ### FOOD SERVICE
- #### Water
- Utilize low flow pre-rinse head (0.65gpm vs. 1.15gpm or higher)
  - 120°F Water Storage Temperature (up size booster)
  - Ventless, Low flow dish machine
  - Drain water heat recovery
  - Interlock dish machine exhaust
  - Minimize heat pump clothes dryer

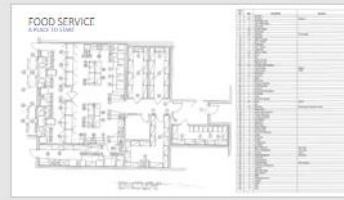
32 ★

- ### FOOD SERVICE
- #### Air
- Consolidate hoods based on type and location
  - Locate hoods by walls with side shields/wing walls in lieu of islands
  - Select hood for UL listed CFM of equipment below
  - Demand controlled hood exhaust
  - Eliminate Type 1 hoods (grease laden)
  - Minimize exhaust / eliminate make up

33 ★

- ### FOOD SERVICE
- #### Food Prep
- Combi Ovens Good, Fryers Bad
  - Eliminate open surface cooktops if possible
  - Eliminate grease laden vapors
  - Induction appliances + hot wells
  - Careful equipment selection (FSTC, Energy Star, CAEW)

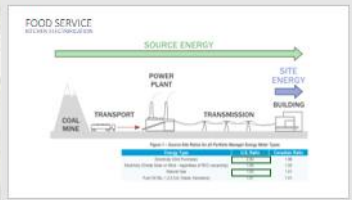
34 ★



35 ★



36 ★



37 ★



38 ★



39 ★

## LIGHTING

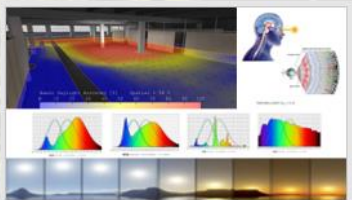
40 ★

- ### LIGHTING
- #### Energy Load Reduction
- Connected watts/so.ft. to below .4 watts/so.ft.
  - Correct Lighting Levels for the space
  - Occupancy/Vacancy Controls
  - Daylighting
  - Simple Controls

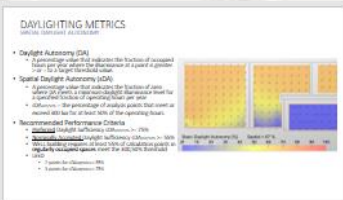
41 ★

- ### LIGHTING
- #### Energy Load Reduction
- Fixture Selection (>140 LPW)
  - Optimize Layouts
  - Exterior Motion Sensors

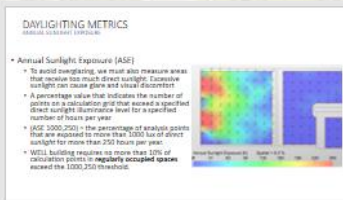
42 ★



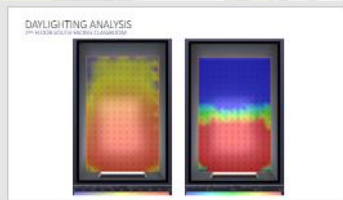
43 ★



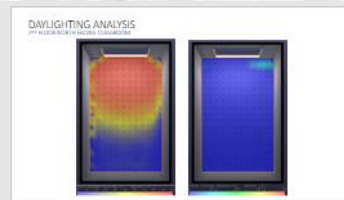
44 ★



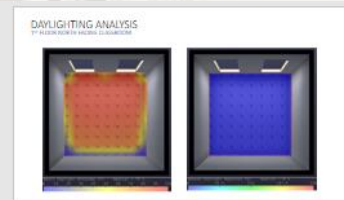
45 ★



46 ★



47 ★



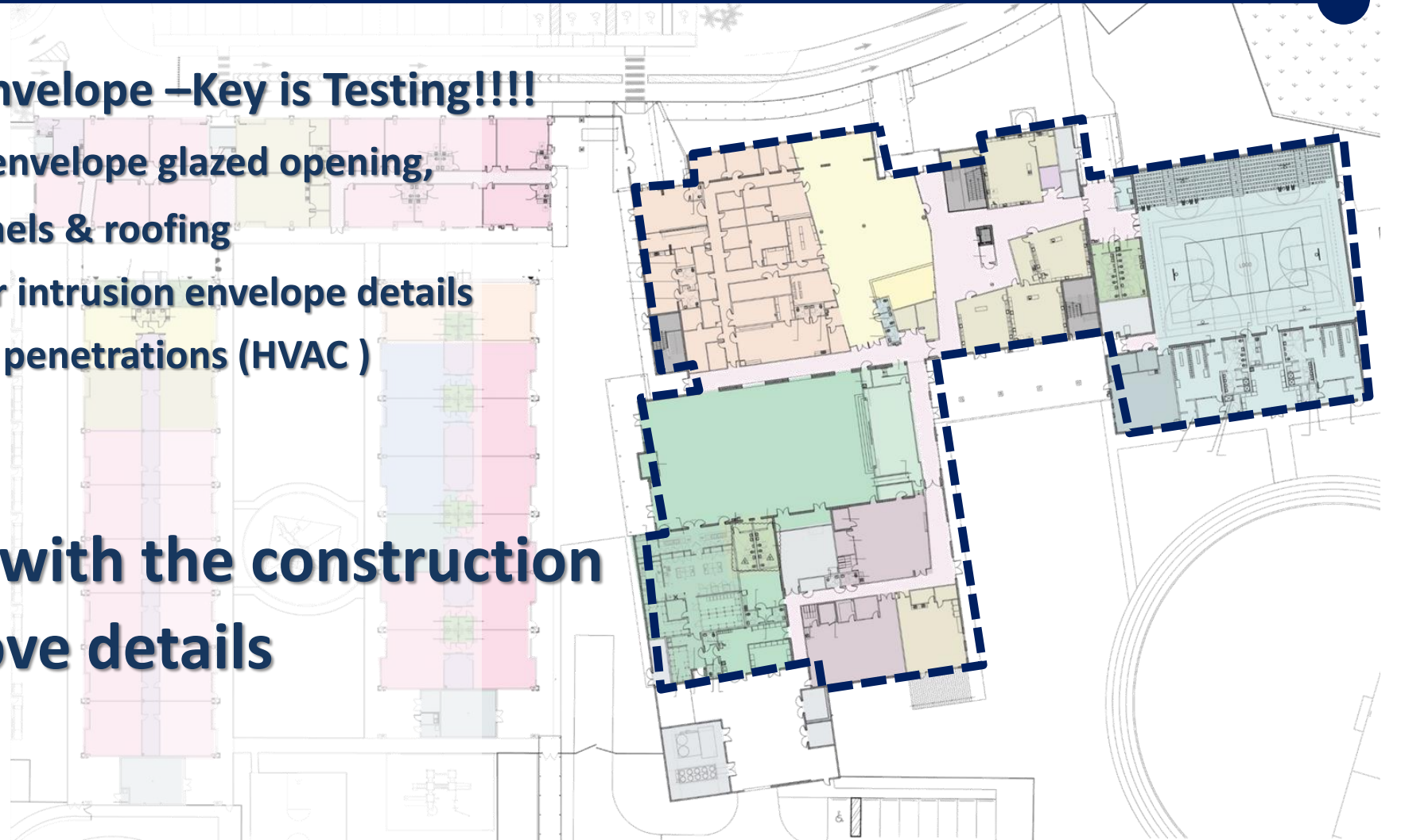
48 ★

# Canoe Creek K-8 – Construction

## Modifications to Envelope –Key is Testing!!!!

- High performance envelope glazed opening, door details, tilt panels & roofing
- Moisture and water intrusion envelope details
- Minimize Envelope penetrations (HVAC )

**Collaboration with the construction team to improve details**



# Canoe Creek K-8 – Construction

## Modifications to Envelope – Key is Testing!!!!

- Get in right in the Mockup



# Canoe Creek K-8 – Construction

## Modifications to Envelope – Key is Testing!!!!

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# Canoe Creek K-8 – Construction

## Modifications to Envelope – Key is Testing!!!!

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# Cost Shifting for Net Zero Ready - Prototypes

## Shift Costs – NOT Add Cost

As Building  
Performance  
goes up

~25%-30% smaller HVAC  
capacities than typical

Small electrical service

~30% reduction in  
lighting fixtures



# Financial



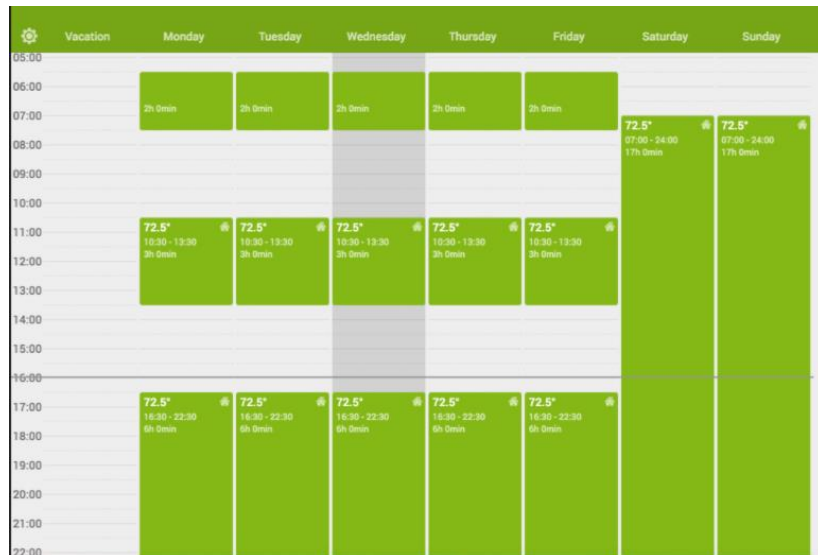
## Recommend Allocating 1% to 2% of Budget

- Design Changes
- HVAC system
- Roof upgrades
- Sealing Window
- Sealing Joints
- Pressure Testing
- Mock-up



# Operations - Getting to Zero Energy

## Unplug.



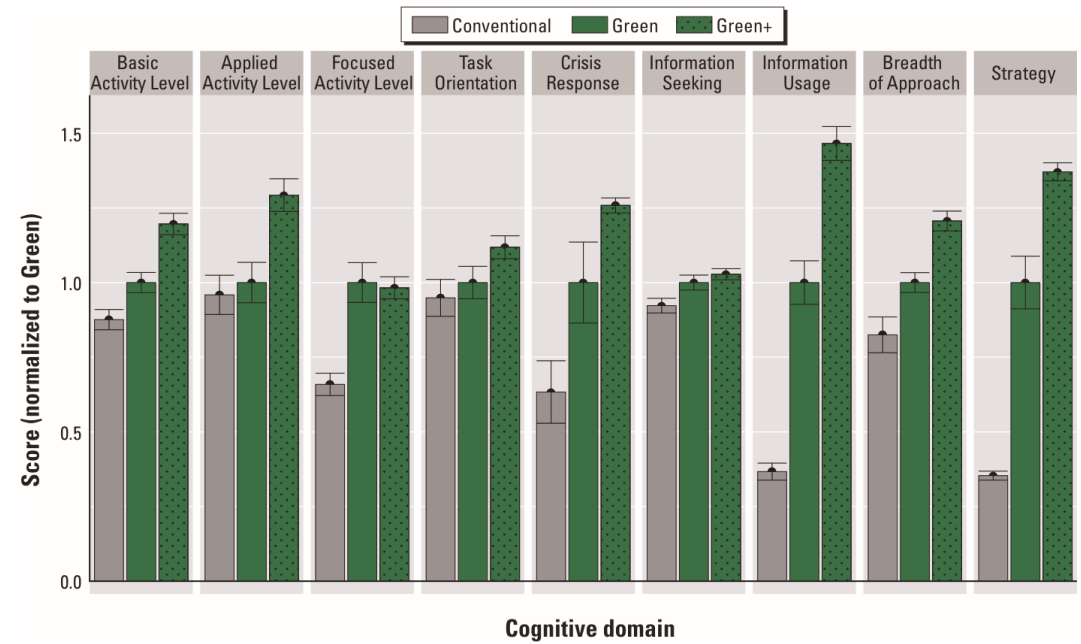
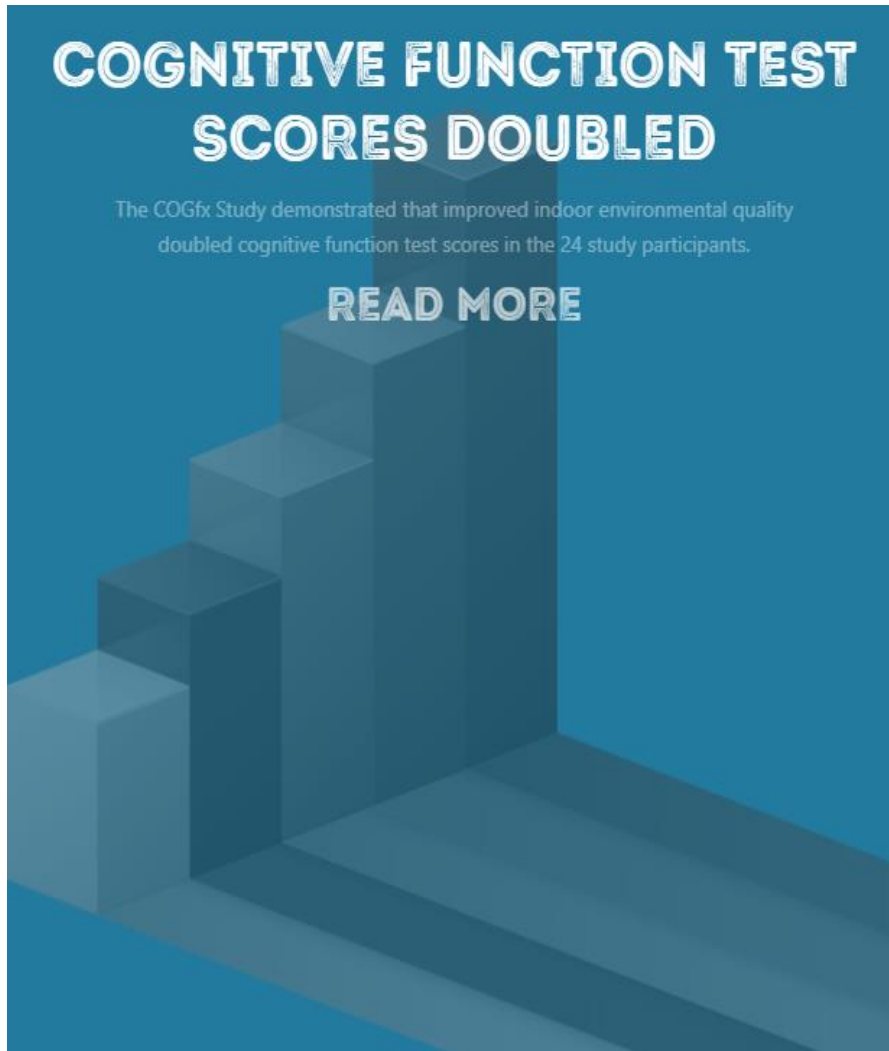
# Social- Canoe Creek K-8

Better Air Quality = Better Mental Performance

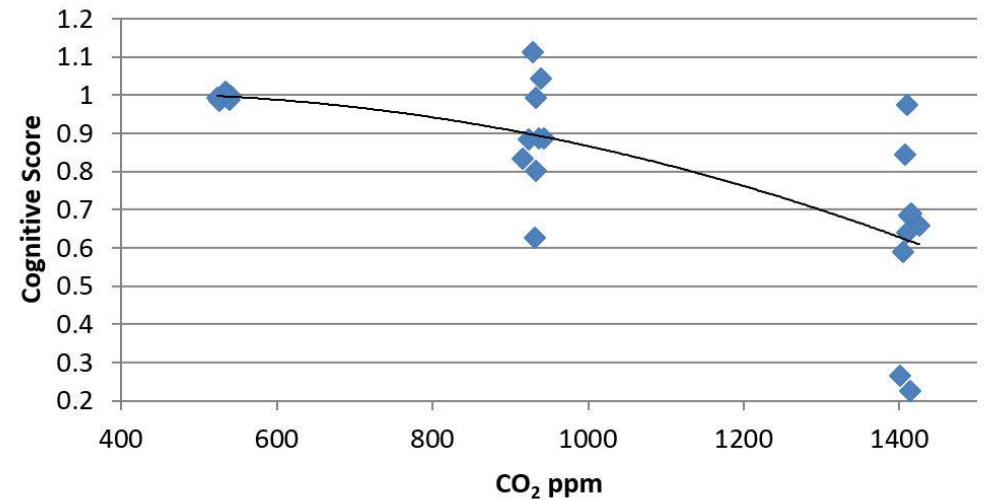
**COGNITIVE FUNCTION TEST SCORES DOUBLED**

The COGfx Study demonstrated that improved indoor environmental quality doubled cognitive function test scores in the 24 study participants.

[READ MORE](#)

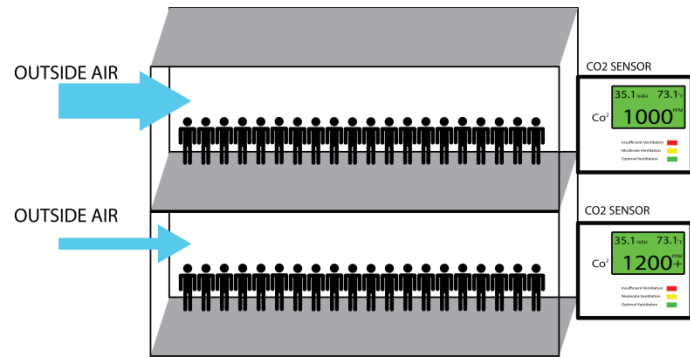


## Cognitive Performance vs. CO<sub>2</sub>

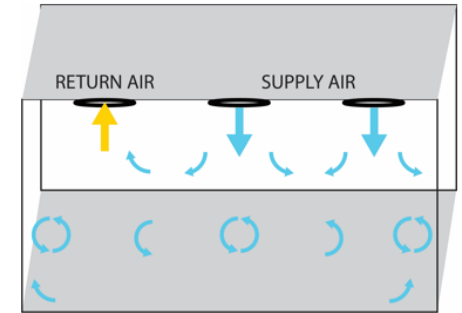
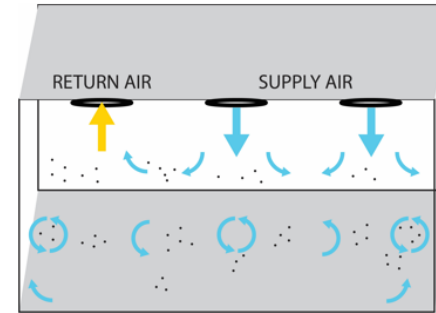
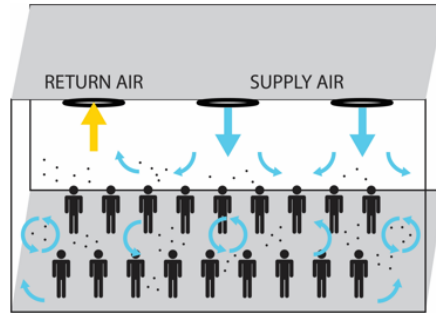


# Social - Canoe Creek K-8

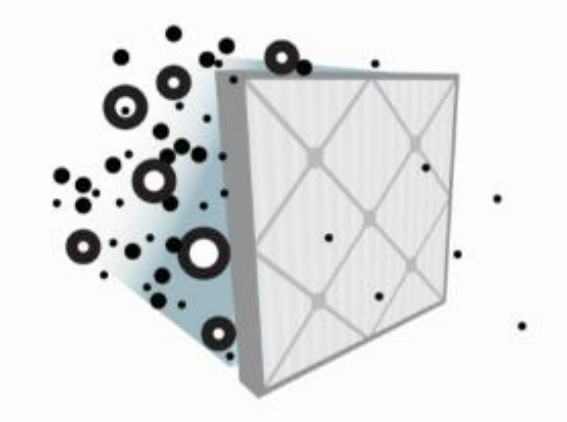
Student Success / Increase Cognitive Function / Health & Wellness



Classroom Increased Ventilation



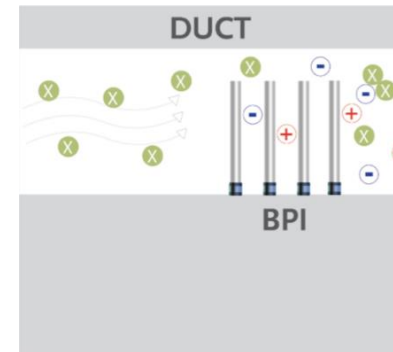
Classroom CO2 Flush



MERV 13 Filter Ready



UV Lights



Bipolar Ionization



Dehumidification

# Canoe Creek - High Performance



**SOCIAL**  
Student Success  
Increase Cognitive Function  
Health / Wellness



**ENVIRONMENTAL**  
Reduce Carbon Footprint  
Drastic Energy Reduction

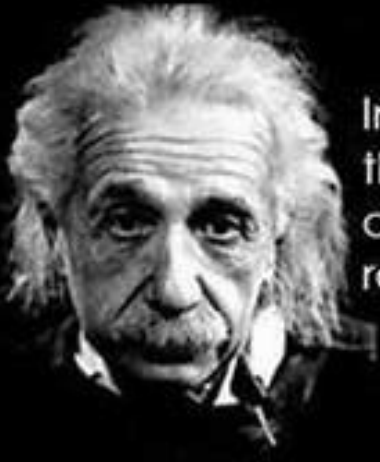


**FINANCIAL**  
Balance  
First & Life Cycle Costs

# CHANGE HAPPENS ONE PROJECT AT A TIME.....



"Nothing Happens  
until you decide"  
- Oprah Winfrey



Insanity is doing the same  
thing over and over again  
and expecting different  
results.

- Albert Einstein



**THE MOST  
DANGEROUS  
PHRASE IN THE  
LANGUAGE IS,  
'WE'VE ALWAYS  
DONE IT  
THIS WAY.'**

Rear Admiral Grace Hopper

