Week 2

ASSIGNMENT WEEK 2: What is expected

Focus: The focus of this exploratory stage in the process of creating your integrated design project is to identify:

- **Project Goals** that will guide your design decision-making
- **Measures** that can be used to quantify the performance of your design relative to each goal
- **Target Values** for each of the measures
- **Strategies** that you'd like to explore for achieving these targets

Recommended Approach: At this point in our design process, we're still working with ideas (not models). So, feel free to use whatever tools help you map out and creatively think about these issues – sketches, mindmaps, outlines, tables, or text. Start by thinking about your overall project goals. Think broadly and creatively – these goals can be related to whether the project is:

- Sustainable
- Constructable
- Operable
- Useable
- Other project goals that you'd like to explore

Using your initial list as a starting point, use these questions to help narrow down the list to three or four major goals that you'll focus on to guide your design process. What are the big goals that you'd like to explore in you design? How would you measure them? What would be a minimally acceptable value for each measure? What would be an even better (more desirable) value that you'd like to target/achieve if possible? What design strategies could you consider (model and test) for achieving those targets?

Your endpoint should be a list of your three or four guiding design goals with this information provided for each goal:

Design Goal: short description of the goal

Measure: the metric that you'll use to measure this goal

Targets:

- minimally acceptable value
- desired / target value

Strategies:

- one design strategy that I'd like to explore in my design to achieve this goal
- a second design strategy (have at least two for each goal)
- maybe a third or fourth strategy

Thinking Ahead: In the weeks ahead, we'll develop these big ideas into a detailed building design. If it helps your creative process, you can start thinking ahead to: **Building Form and Massing (Module 4):**

- Overall shape and form of your proposed design
- What will work best for meeting the program requirements as well as supporting your sustainable design strategies
- But don't dive too deeply into those issues yet! Keep this practice exercise very high level and focussed on goals, targets, and strategies.

Practice Exercise: Create a new posting highlighting:

- **your design intent/goals**
- **the measures and targets that you'll use**
- **the design strategies you're considering as you think ahead**

WEEK 1: CA Session Feedback

- Some sustainable buildings lack aesthetics, for example, **there is no need to place solar panels on the roof for a building to be aesthetically pleasing and sustainable at the same time.**
- Before thinking of a detailed design like the one proposed in Slide 26 (week 1), think of the following design considerations!
  - Start from… **Where is the building located?** New York! 🗽
  - **Does the design integrate well with the surrounding buildings?** For example, installing solar panels in a potential new skyscraper in NYC could not make sense because the other skyscrapers would partially cover my building's roof (it is just 35000 SF, so it is not a very tall building)
  - When designing the building, consider **how people interact with the building**!
- **Avoid** focusing on the **donut shape** for now (and maybe forever 🥲).

- **Action Items:**
  1. **Research sustainable design goals specific to New York City.**
  2. **Experiment with different shapes in Autodesk Forma and conduct a solar analysis for each proposed shape.**
- Extra consideration: **explore alternative locations for renewable energy sources** and consider placing them nearby instead of on the building's top!

DESIGN THINKING - PLAN for week 2!

I propose the following design thinking process before completing the assignment request (bullet point 5) :

1. **What are the major sustainability issues in NYC?** (Let's start with understanding the specific sustainability problems that affect NYC!)
2. **What are sustainable design practices that can be applied in NYC?** (Once I understood the problem, I wanted to see if there were already sustainable design practices that are implemented in NYC…)
3. **What are current sustainability policies in NYC?** (… as well as sustainable policies...)
4. **What are the most sustainable buildings currently in NYC?** (… and buildings!)
5. **I will then complete the "Practice Exercise: *Create a new posting highlighting:***
    - ***your design intent/goals***
    - ***the measures and targets that you'll use***
    - ***the design strategies you're considering as you think ahead"***

Note: points 1-2 have been strongly inspired by the publication available as a PDF here: [LINK]

1. NYC SUSTAINABILITY ISSUES (2023-2024)

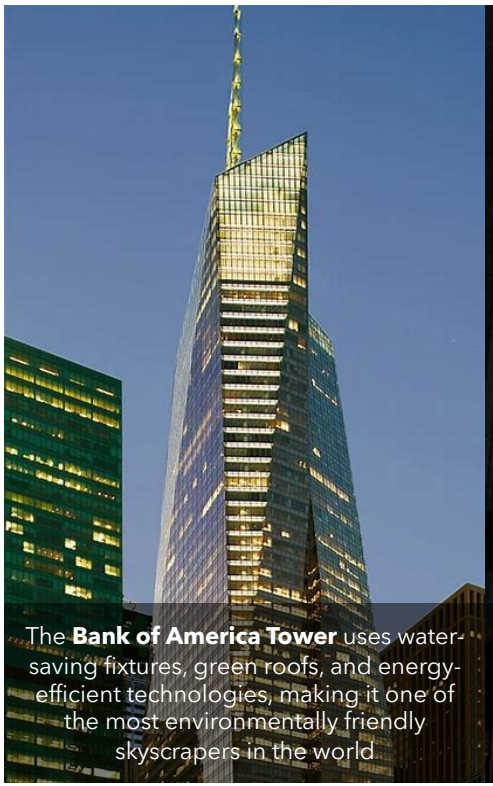
1. **Large buildings (>25,000 SF) contribute significantly to carbon emissions.**
2. Limited city-wide food waste recycling increases landfill waste.
3. Water regulations struggle to reduce harmful chemical concentrations.
4. **Challenges in delivering high-quality water, wastewater, and stormwater services.**
5. NYC Central Business District traffic causes pollution and lost productivity.
6. **Rising dangers: heat waves, extreme precipitation, flash floods, and sea level rise.**
7. Hindered sustainable transition due to inflation, mismanagement, NIMBY, and pandemics.
8. **Struggles in making the energy grid more renewable and efficient.**
9. **Moderate air quality (US AQI 65), PM2.5 concentration 3.8 times WHO guideline.**
10. **Air pollution estimated to cause 670 deaths in NYC in 2024.**

(In red are the issues that will severely affect my final design)

2. NYC SUSTAINABLE DESIGN PRACTICES

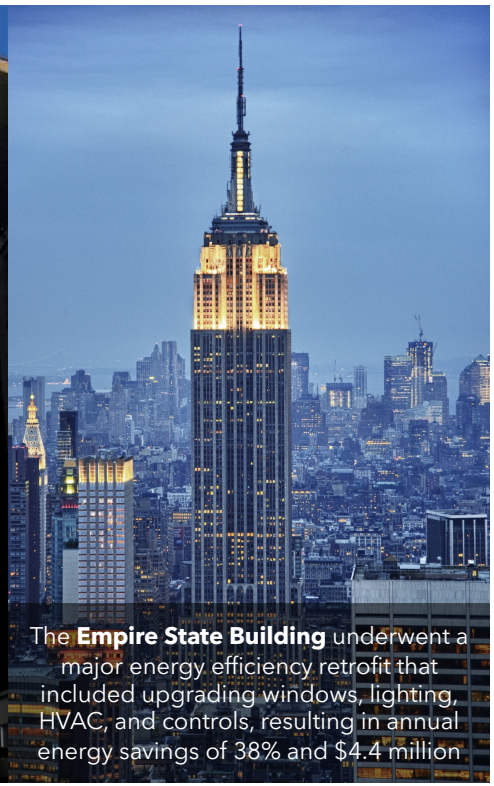
https://bpca.ny.gov/community/climate-week-nyc-water/

2. NYC SUSTAINABLE DESIGN PRACTICES



The **Bank of America Tower** uses water-saving fixtures, green roofs, and energy-efficient technologies, making it one of the most environmentally friendly skyscrapers in the world

The **New York Times Building** retrofits used the Radiance lighting tool to design an automated shading system that controls glare and heat gain, reducing lighting demand and improving occupant thermal and visual comfort.



The **Empire State Building** underwent a major energy efficiency retrofit that included upgrading windows, lighting, HVAC, and controls, resulting in annual energy savings of 38% and $4.4 million

3. NYC SUSTAINABILITY POLICIES

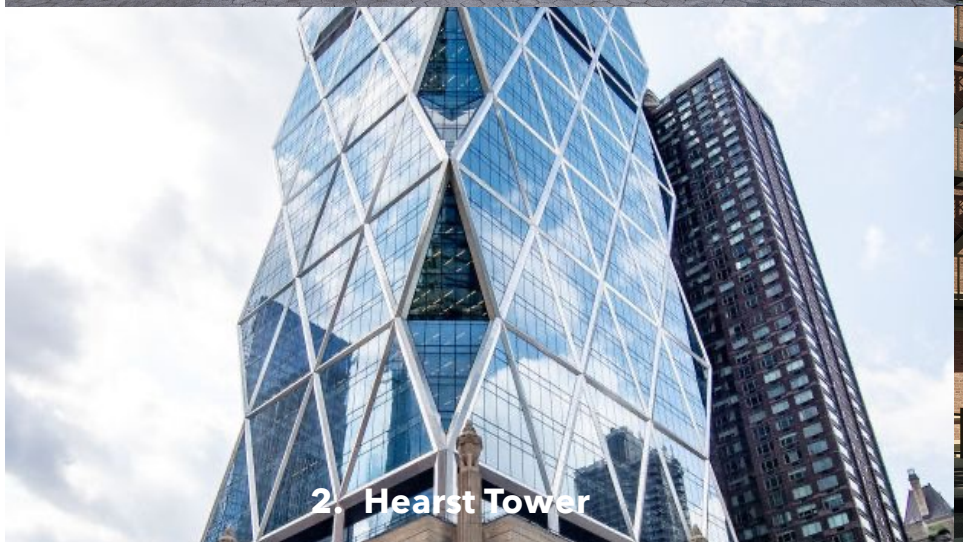
- **Greenhouse Gas Emissions Reduction:** NYC has set a target of reducing greenhouse gas emissions by 80% by 2050. This target is in line with the global Paris Agreement goal of limiting global temperature rise to 1.5 degrees Celsius.
- **Building Efficiency:** The vast majority of NYC's greenhouse gas emissions come from buildings. In 2019, NYC passed the Climate Mobilization Act, a landmark set of laws that limit emissions from new and existing **buildings over 25,000 square feet (Local Law 97)** and require solar and green roofs for new building construction (Local Laws 92 and 94). These laws will **reduce emissions from the city's largest buildings by 40% by 2030 and 80% by 2050**.
- **Clean Energy:** The administration plans to convert government operations to 100% clean electricity.
- **Transportation**: The city is working on reducing emissions from transportation. There are initiatives to prioritize public transit, walking, and biking, ensure every New Yorker can access a bike or scooter, and help New Yorkers who must drive to drive electric.
- **Waste Management:** The city is also focusing on reducing emissions from waste.
- **NYC's Green New Deal:** This plan includes $14 billion in new and committed investments, legislation, and concrete action at the City level that will ensure a nearly 30 percent additional reduction in emissions by 2030.

4. NYC MOST SUSTAINABLE BUILDINGS

1. **The Greenwich Lane**
   - LEED Gold Certified
   - Uses efficient plumbing fixtures
   - Employs a stormwater collection process
   - Uses eco-friendly materials including recycled content, local materials, low-emitting adhesives, paints, substrates, and flooring
   - Uses high-efficiency LED lighting fixtures
2. **Hearst Tower**
   - The first building in NYC to receive Gold LEED rating for core, shell, and interiors
   - Reduced energy consumption by more than 40%
   - Composts 100% of its wet food waste
   - Reduced total waste to the landfill by more than 80%
   - Lowered water usage by almost a third
3. **One World Trade Center**
   - LEED Gold Certified
   - Uses an insulated spandrel, allowing natural light into more than 90% of the office areas
   - Designed with a low-E glass coating that minimized heat gain
4. **Perch Harlem**
   - Manhattan's first passive house development
   - Consumes 80% less energy than a building of a similar size
   - Uses heavily insulated walls and triple-pane windows
   - Equipped with appliances that are Energy Star certified


1.The Greenwich Lane


3. One World Trade Center


2. Hearst Tower


542
4. Perch Harlem

5. PRACTICE EXERCISE – GOAL 1

Design Goal: Total GCH Emissions Reduction

- **Measure:** Global greenhouse gas (GHG) emissions, measured in metric tons CO_2e/yr
- **Targets:**
  - **Baseline value: 97 metric tons CO_2e/yr (see ZeroTool Calculations)**
  - **Minimally acceptable value: 30% of 97 metric tons CO_2e/yr = 29 metric tons CO_2e/yr**
  - **Desired / target value: 0 metric tons CO_2e/yr**
- **Strategies:**
  - Use of energy-efficient appliances and systems to reduce energy consumption
  - Incorporation of renewable energy sources to reduce reliance on fossil fuels (especially offsite due to space limitations)
  - Implementation of carbon capture technologies, like giant air filters or ionic liquids

5. PRACTICE EXERCISE – GOAL 2

Design Goal: Site EUI Reduction

- **Measure:** Site Energy Use Intensity (EUI), measured in kBtu/ft²/yr
- **Targets:**
  - **Baseline value: 47 kBtu/ft²/yr (see ZeroTool Calculations)**
  - **Minimally acceptable value: 30% of 47 kBtu/ft²/yr = 14.1 kBtu/ft²/yr**
  - **Desired / target value: 0 kBtu/ft²/yr**
- **Strategies:**
  - Improve the building envelope with high-performance windows, insulation, and sealing to reduce heat loss in winter and heat gain in summer.
  - Upgrade to high-efficiency HVAC systems, like using variable refrigerant flow (VRF) systems
  - Use LED lights as artificial lighting, which uses significantly less energy + implement daylighting controls that adjust the amount of artificial light based on the amount of natural light available
  - Use ENERGY STAR-certified appliances which are more energy-efficient.
  - Install an energy management system to monitor and control energy usage in real time. This can help identify inefficiencies and adjust systems for optimal performance.
  - Incorporate of renewable energy sources to reduce reliance on fossil fuels (especially offsite due to space limitations) and/or install solar panels or wind turbines on-site to generate renewable energy and offset energy consumption

5. PRACTICE EXERCISE – GOAL 3

Design Goal: Water Conservation

- **Measure:** Water usage, measured in gallons per day (gpd)
- **Targets:**
  - **Baseline value: 70 gpd per person**
  - **Minimally acceptable value: 50% of 70 gpd per person = 35 gdp per person**
  - **Desired / target value: 20 gpd per person.** This is a more ambitious goal that would require extensive water conservation measures, but it's not unheard of in high-efficiency buildings
- **Strategies:**
  - Install low-flow fixtures and appliances to reduce water usage.
  - Implement a rainwater harvesting system to collect and use rainwater.
  - Install a greywater recycling system to reuse water from sinks, showers, and laundry.
  - Use native and drought-resistant plants for landscaping to reduce irrigation needs.
  - Install a water meter for real-time monitoring and control of water usage.

5. PRACTICE EXERCISE – GOAL 4 (Optional)

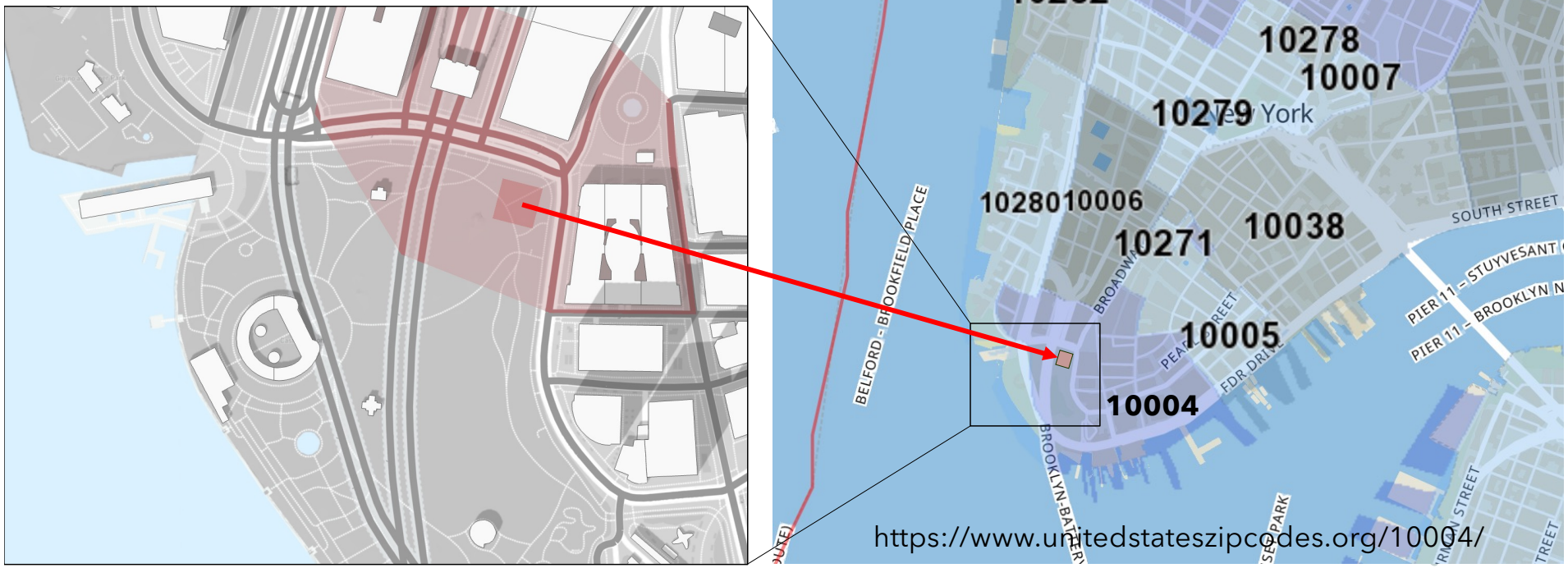
Design Goal: Improve indoor air quality.

- **Measure:** Indoor temperature, measured in degrees Fahrenheit (°F)
- **Targets:**
  - **Baseline value: 72°F per room**
  - **Minimally acceptable value: 68°F - 76°F per room.** This is the generally accepted range for thermal comfort.
  - **Desired / target value: 70°F per room.** This is a more ambitious goal that would require extensive thermal control measures, but it's not unheard of in high-efficiency buildings.

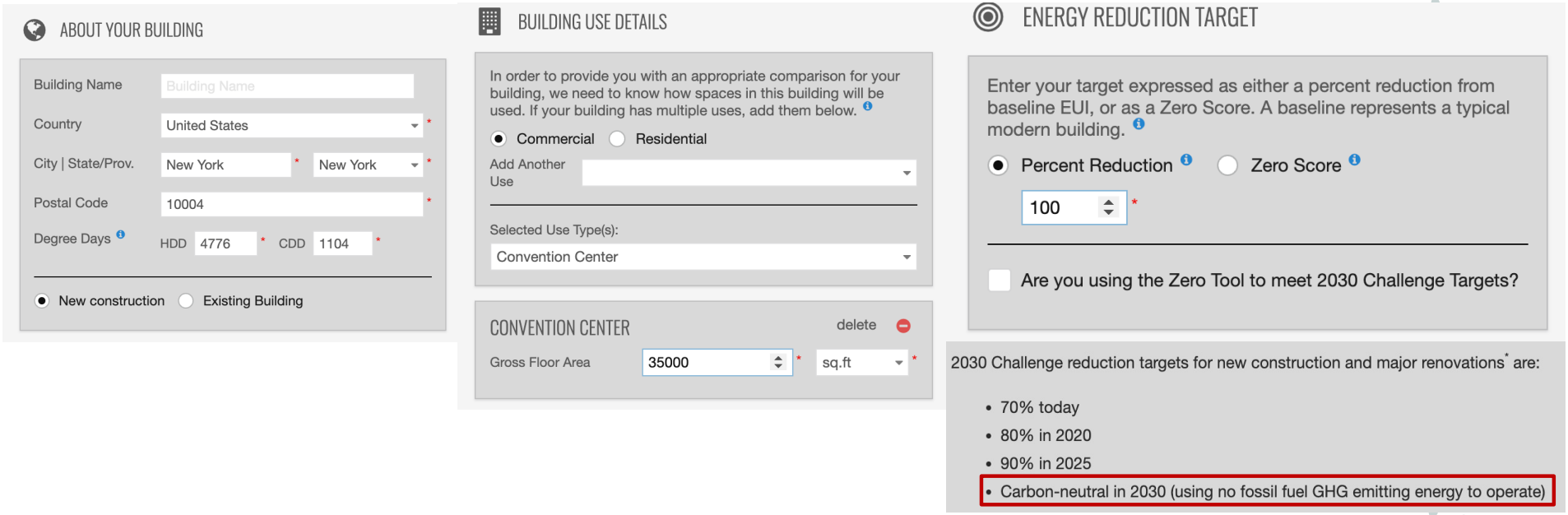
Strategies:

- Install high-efficiency HVAC systems to maintain optimal indoor temperatures.
- Implement a building insulation system to reduce heat loss in winter and heat gain in summer.
- Install energy-efficient windows to minimize heat transfer.
- Use smart thermostats for real-time monitoring and control of indoor temperatures.
- (Optional) use of passive solar design techniques to take advantage of the sun's energy for heating and cooling the building.

Site location zip code: **10004**
(Need this info in ZeroTools)



Using zip code **10004** in ZeroTools (https://www.zerotool.org/) to calculate the energy reduction baselines and targets a new construction building of type "convention center" of gross floor area of 35000 SF.



My target: being carbon neutral in 2030 (100% Reduction)

ZeroTool Calculations Results

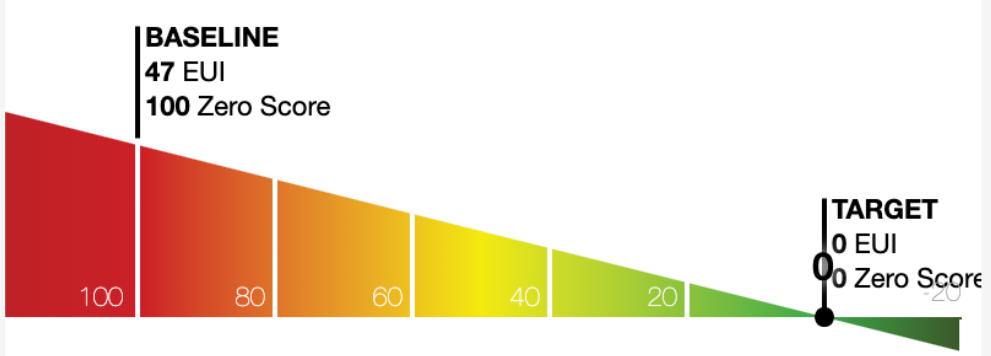
BUILDING SUMMARY

LOCATION	New York, NY	10004
USES	Convention Center	35,000 sq.ft (100.0%)

RESULTS	BASELINE	TARGET	YOUR BUILDING
EUI % Reduction from Baseline	0%	100%	N/A
Zero Score	100	0	N/A
Site EUI (kBtu/ft²/yr)	47	0	N/A
Source EUI (kBtu/ft²/yr)	70	0	N/A
Total GHG Emissions (metric tons CO_2e/yr)	97	0	N/A

RESULTS

Target EUI is 0 based on a 100% reduction



Week 3

To be continued...