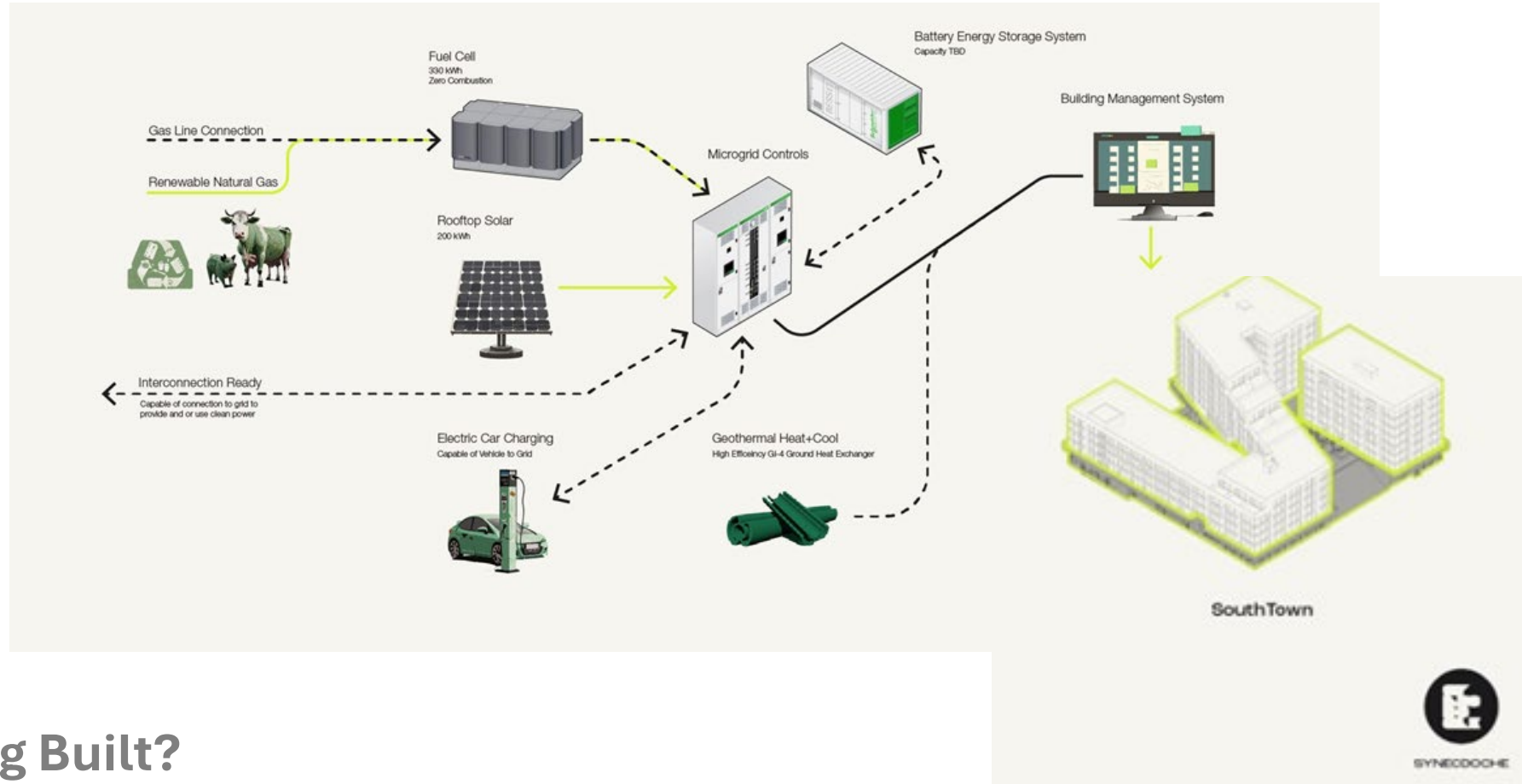


# SouthTown by 4M Rezoning Map Amendment

v1 05072024



# What Is The SouthTown Microgrid?



## Why Is It Being Built?

Three Important Reasons:

1. To allow shelter-in-place (continue to live onsite during weather events).
2. To maintain a carbon negative operation.
3. To establish and maintain energy economy for SouthTown residents.



## What is the Requested Zoning Modification?

Through the submittal of an Annual Report, SouthTown by 4M will demonstrate continuous microgrid operation at 60-75% less Carbon Intensity (CI) than electricity incumbent DTE . (Also referred to as Business As Usual)

What will power the fuel cell?

1. Renewable Natural Gas (RNG) – sustainably sourced from commercial farming operations.

What will be the outcomes?

1. Carbon Intensity Reduction: Calculated at 7,014 mT GHG **avoided** (aka CO<sub>2</sub>e) annually versus Business As Usual.
2. Increasingly lower onsite electricity costs, compared to Business As Usual.

What happens with the Greenhouse gasses?

1. The fuel cell uses a chemical process to break down the natural gas into water, hydrogen & CO<sub>2</sub> producing electricity in the process. There will be no combustion of the RNG in the fuel cell.

Note\*\*\*

2. This is a Transitional Plan. As new renewable and synthetic fuels become available, the fuel cell filters can be changed to use different fuels.

The objective to achieve higher sustainability, more resilience and lower costs is achievable with this plan.

# Anaerobically Digested Dairy RNG is Carbon Negative

1 Biogas made from organic sources through anaerobic processes contains 45-65% methane.

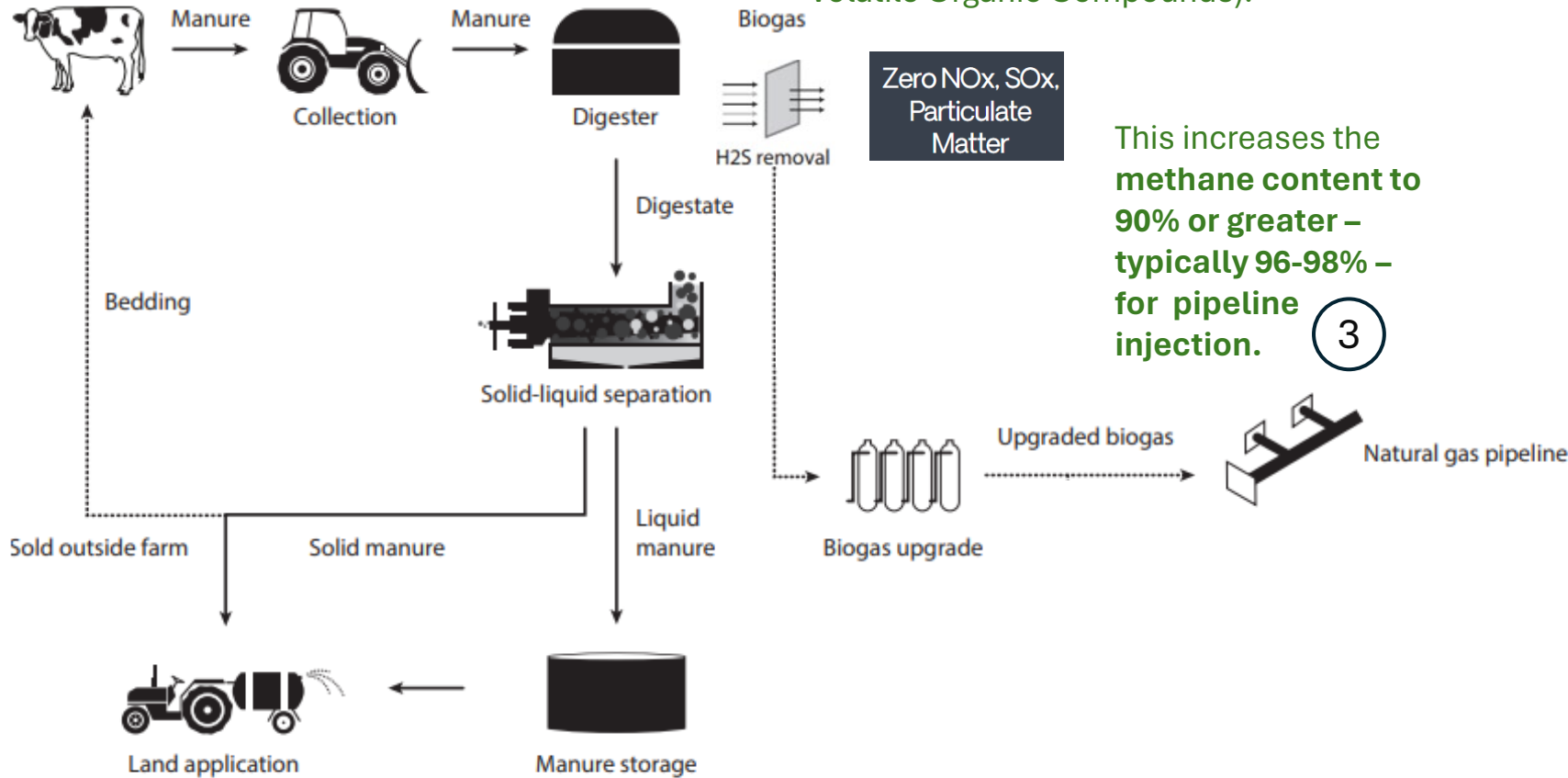
It absorbs more GHG than it emits.

2 Biogas is treated to remove moisture, particulates, contaminants and other gases (CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub> and Volatile Organic Compounds).

4 **The resulting product is renewable natural gas (RNG).**

RNG is considered carbon neutral because it comes from organic sources that previously absorbed carbon from the atmosphere.

**RNG produced by dairy farms actually captures more GHG than it emits making dairy gas a carbon negative fuel.**



This increases the methane content to 90% or greater – typically 96-98% – for pipeline injection.

3



# Fuel Cells use Chemistry to Convert RNG to Electricity Onsite.

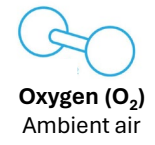
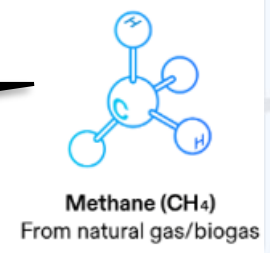
## There is NO ONSITE COMBUSTION

Biogas is treated to remove moisture, particulates, contaminants and other gases (CO<sub>2</sub>, O<sub>2</sub>, N<sub>2</sub> and Volatile Organic Compounds), before it is injected into the gas pipeline.

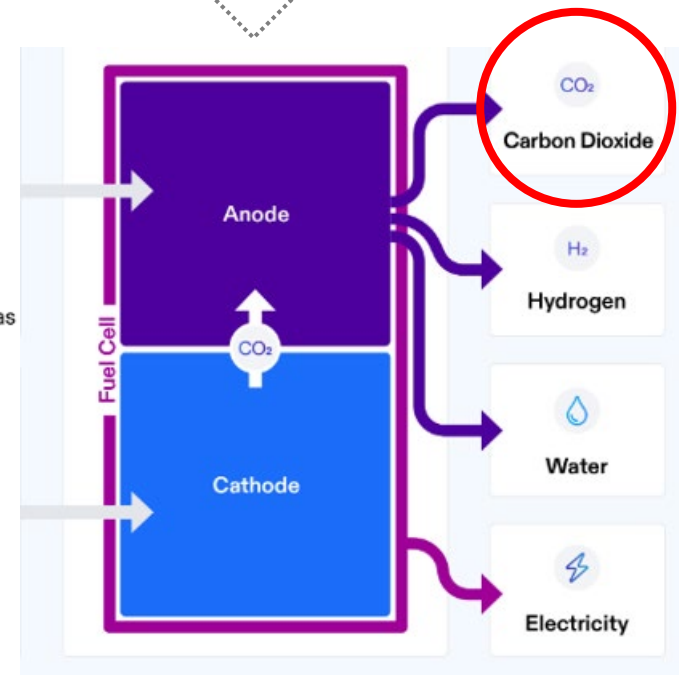
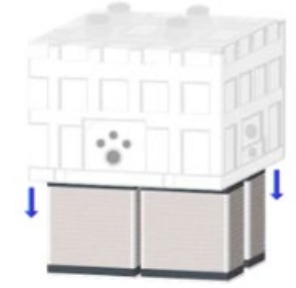


RNG Fuel Source

Natural gas pipeline



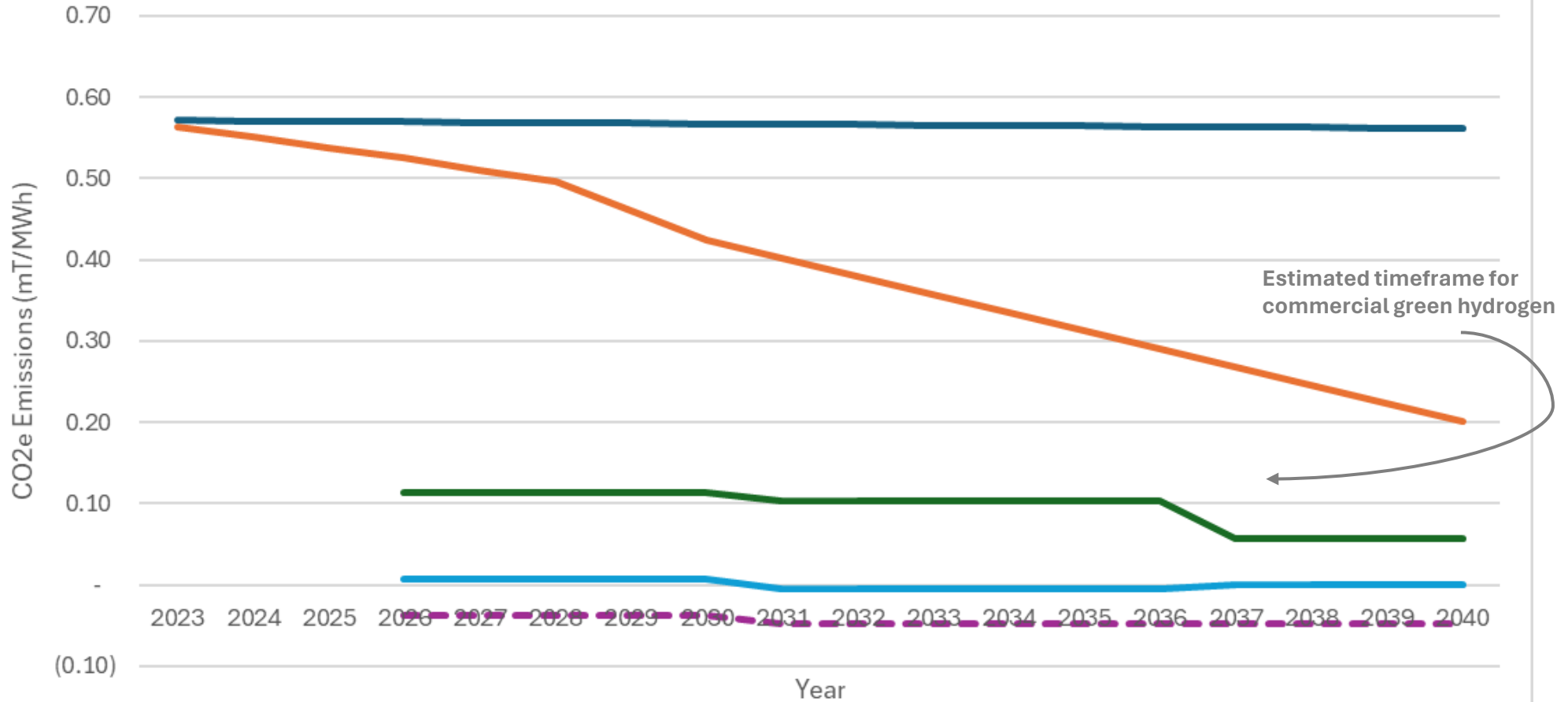
Negative Electrode (anode)  
Electrolyte  
Positive Electrode (Cathode)





# Resulting Performance. 7,000 **Scope 1+2 CO<sub>2</sub>e** Annually

(from 226k sq ft = 31.4 CO<sub>2</sub>e/SQ FT/YR )



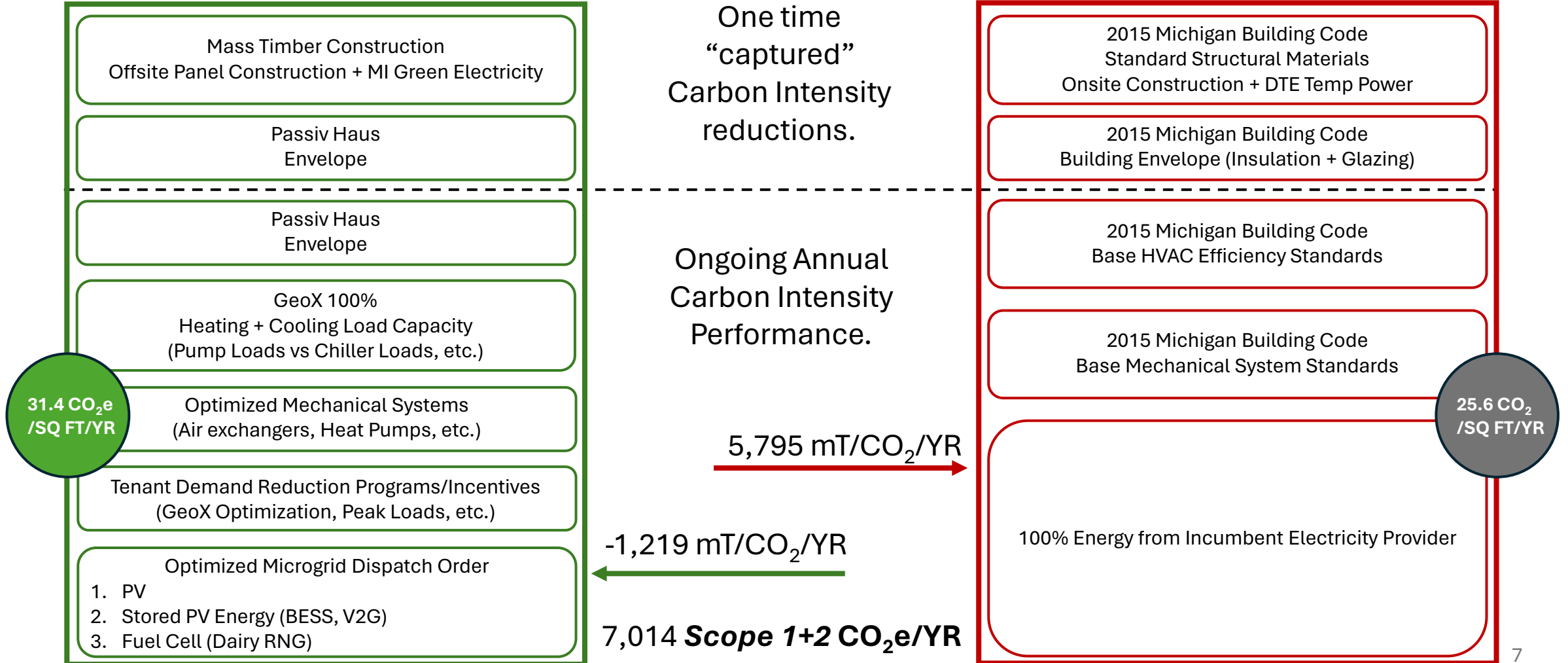
- DTECO2 mT/MWh per year (BAU)
- DTE CO2 mT/MWh per year (REF)
- SouthTown CO2 mT/MWh per year
- SouthTown w/CO2 Capture mT/MWh per yr
- SouthTown w/CO2 Capture and Dairy RNG mT/MWh per yr

# Understanding the CO<sub>2</sub>e Stack

The SouthTown Built Environment (BE) was conceptualized around achieving CO<sub>2</sub>e performance aka Net Negative Carbon Intensity outcomes. Here is how we have determined to optimize performance to achieve that objective.

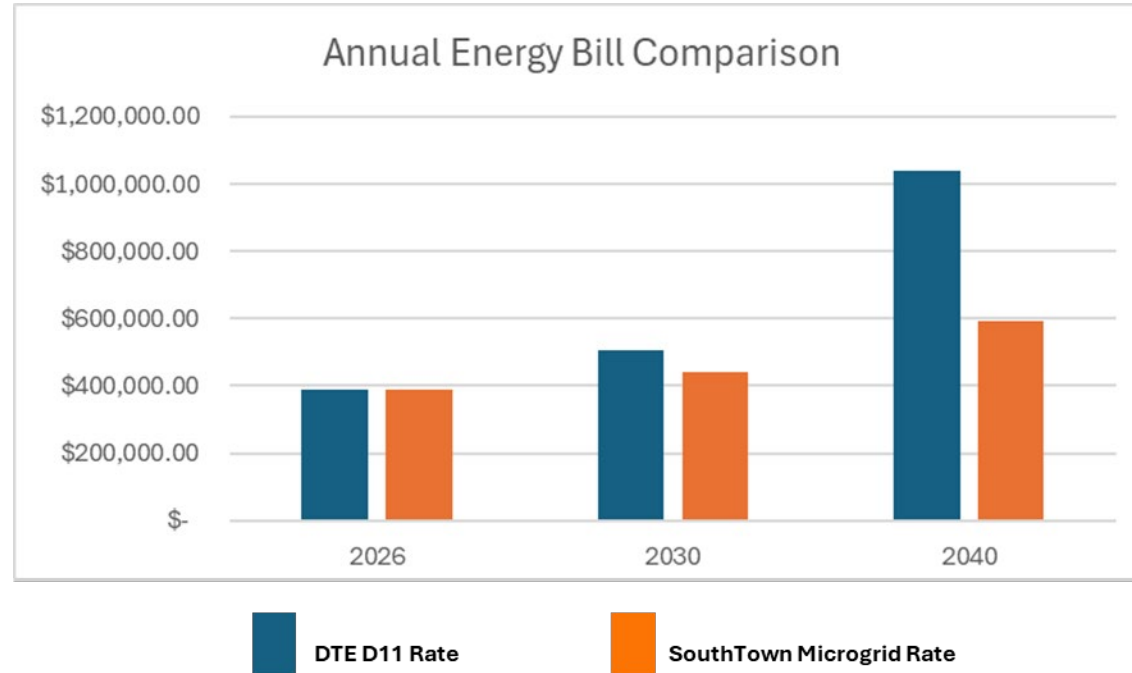
## SouthTown by 4M CO<sub>2</sub>e Stack

## Business As Usual 4M CO<sub>2</sub> Stack





# SouthTown Modeled Energy Cost Control



Internal energy pricing estimates indicate that in 2040, the DTE all-in rate will be \$0.287/kWh and SouthTown will be at \$0.163/kWh.

Based on rate increases published in the DTE IRP, from 2026 to 2040, SouthTown resident bill savings will be more than \$400,000.





## Proposed Accountability Measures

Accountability Measures will be stipulated in the Development Agreement.

There will be two periods of transition with the ultimate objective to use commercially available green hydrogen as soon as possible.

- a. Period 1: Occupancy (6/15/2027) through first major filter and maintenance (no later than 12/31/2033).
  - The SouthTown Microgrid will be fueled by the least Carbon Intensive RNG commercially available.
  - The fuel cell will be outfitted with CO<sub>2</sub> capture mechanism. Captured CO<sub>2</sub> will be permanently sequestered or sold into food-grade CO<sub>2</sub> market.
- b. Period 2: 1/1/2034 through second major filter and maintenance (no later than 12/31/2039).
  - The SouthTown Microgrid will be fueled by green hydrogen, if commercially available. If green hydrogen not commercially available, the fuel will be the least Carbon Intensive RNG commercially available.
  - The fuel cell will continue to capture CO<sub>2</sub> for as long as RNG is the fuel source.

SouthTown by 4M will report on its Microgrid Sustainability performance annually. The report will include:

1. Description of fuel type and its procurement.
2. Description of CO<sub>2</sub> Capture and its end use.
3. Carbon Intensity calculations for the Microgrid versus the Business As Usual.
4. Procurement evidence for Carbon Offsets necessary to maintain a level of Carbon Intensity 60% lower than Business As Usual.

Penalty for failure to comply with Development Agreement Accountability Measures will be fines in an amount necessary to purchase offset credits.



## Fuel Cell Background/Safety Primer

Fuel cells have been operating in and around buildings for 25 years. SouthTown's selected fuel cell is HyAxiom by Doosan designed and built in Connecticut for the last 20 years. There are nearly 800 operating units monitored 24/7 by the HyAxiom Safety Team, located in the US.

Built and operated to US and International standards within the UL, NFPA, IEEE, ANSI/CSA, ASME, and IEC families of standards.

1. Fuel cell main safety features:
  - a. Use chemical reactions to make electricity from gas molecules. It is not at combustion temperatures, nor is there a flame. The cell stack (active chemical region of the fuel cell) is wrapped in a fire-retardant blanket.
  - b. Have proven low risk of operation, highly efficiency and highly reliability at more than 8,000 hours per year.
  - c. Have no moving parts.
  - d. Have fire detection and protection systems, gas leak detection, cell stack monitoring, hot cell stack working fluid monitoring, and fluid leak detection.
  - e. Don't store combustible gases; it consumes all the gas (RNG or hydrogen) it receives for the electrical conversion.
2. Any operational or safety challenge detected by a system of numerous sensors immediately put the fuel cell into Idle mode; all the active chemical reactions are suspended from making electricity until resolution. In Idle mode, the unit stays warm. If safety systems or the operator deem that the unit needs to revert to Shutdown mode, then the external cooler is used to dissipate the internal heat as the unit cools to room temperature.