

CenTrio



Sustainability Infrastructure Plan & Decarbonization Roadmap

UPDATED VERSION 3: DECEMBER 2024



Table of Contents

1.0 Sustainable Infrastructure Plan 04

1.1 Introduction 05

2.0 Decarbonization Roadmap06

2.1 Sustainable Infrastructure Vision and Guiding Principles 07

2.2 Summary of Processes 08

2.3 Basis for Carbon Evaluation..... 09

3.0 Our Motivation10

3.1 Building a Sustainable Future 11

3.2 Establishing Sustainable Infrastructure Goals 11

3.3 Defining Elements for Long-Term Success13

4.0 Analysis of Current Systems 16

4.1 City of Chicago District Cooling System..... 18

4.2 Union Station District Energy System (City of Houston) 18

4.3 LSU HSC District Energy System19

4.4 City of Portland District Energy System19

4.5 City of Los Angeles District Energy System 20

4.6 City of Seattle 20

4.7 LSU Baton Rouge P3 Project 21

4.8 Syracuse University P3 Project..... 21

4.9 National Western Center P3 Project..... 22

4.10 Eastern Michigan University P3 Project 22

5.0 A Pathway to Low-Carbon Infrastructure 24

5.1 Utilizing Renewable Energy in our Cooling Business..... 25

5.2 Redefining How We Heat..... 25

5.3 Modernized Distribution Network 26

5.4 Modernized Distribution Network 26

5.5 The Decarbonization Pathway for our Customers 27

5.6 Guiding Strategies of Our Decarbonization Approach 28

5.7 Holistic Decarbonized Energy Solutions 29

6.0 Our Current Progress 32





1.0

Sustainable Infrastructure Plan



1.1 Introduction

The CenTrio Sustainable Infrastructure Plan (the “SIP” or the “Plan”) presents a pathway to decarbonization, advancing an implementation strategy and timeline that balances carbon mitigation, financial responsibility, and reliability. With the scope of developing and building sustainable infrastructure for the long-term, the Plan is designed to be more than a plan; it is a program that provides guidance for investment in the known low-carbon technologies of today while creating flexibility and support for the emerging and future low-carbon technologies of tomorrow.

The Plan is comprised of two separate but interconnected components: The Decarbonization Roadmap and The Implementation Strategy. While the Decarbonization Roadmap focuses on the entire CenTrio portfolio of district energy systems in their collective evolution to a lower carbon profile, the Implementation Strategy narrows down to individual system decarbonization strategies and plans.

The Decarbonization Roadmap the vision, guiding principles, and assessment framework for CenTrio’s pathway to a lower carbon future. It also presents the informed methodology, approach and timeline in a way that recognizes the need for new breakthroughs in technologies to decarbonize many parts of our modern economy. The Decarbonization Roadmap also considers and gives priority to a holistic systems thinking approach, where energy generation, demand-side management in customer buildings, and healthy distributions system solutions engender optimal energy and water resource use. Finally, the Decarbonization Roadmap considers the need for CenTrio to maintain our competitive pricing for energy services to preserve partnerships with our current customers and to attract new customers who prioritize operational sustainability. The Decarbonization Roadmap seeks to uncover our ability to make meaningful progress toward carbon neutrality by utilizing today’s technology while investing in compelling concepts as breakthroughs occur. This measured approach will allow for future flexibility as next-generation, low-carbon solutions change our energy landscape and the way we interact with our customers and communities.

The Implementation Strategy explores and analyzes viable alternative source options and technical solutions coupled to evolving regulatory practices that will propel CenTrio toward a decarbonized portfolio of district energy systems, through the lens of individual systems analyses. The Implementation Strategies, serving as individual system decarbonization pathways, assess and build upon current system energy profile opportunities to preserve quality practices, optimize existing equipment, and replace previous generation technologies wherever appropriate. Solutions to system constraints are tested against a set of collaboratively developed criteria built upon CenTrio’s core values for operational excellence and sustainability. These criteria are outlined in the Decarbonization Roadmap Section 5.6, Guiding Strategies, and Section 5.8 Accommodating Growth. The impacts of each scenario are evaluated against CenTrio’s carbon profile objectives and tested against a Base Case for each system. Data drives recommended system changes resulting in carbon mitigation pathways. Therefore, data integrity and accessibility are key components of this work; both requiring an internal technical revolution, as discussed in **Section 3.2.1 Our Approach to Building Sustainable District Energy.**



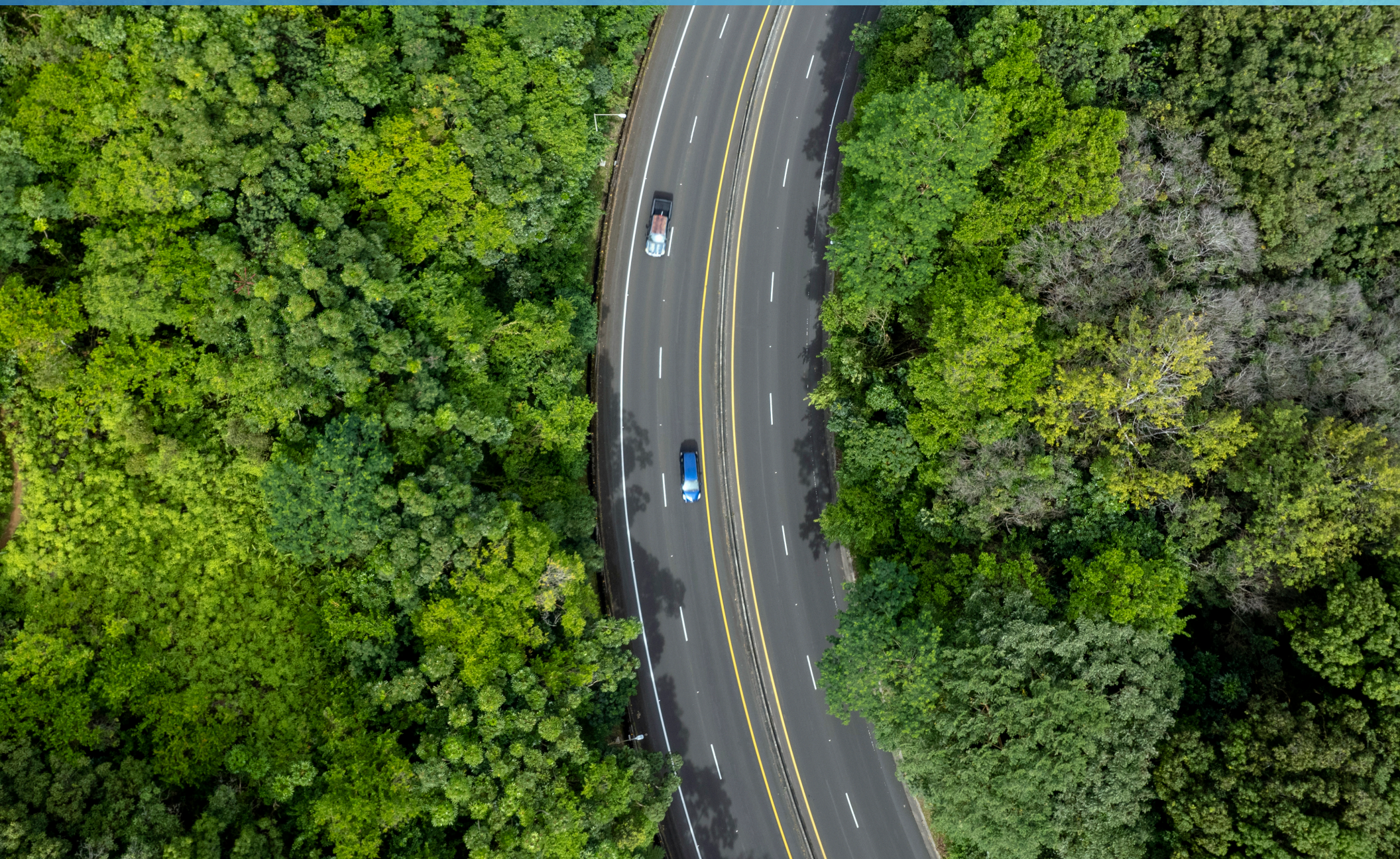
The SIP provides **guidance for investment** in known low-carbon technologies of today while creating **flexibility and support** for the emerging and future low carbon technologies of tomorrow.





2.0

Decarbonization Roadmap



2.1 Sustainable Infrastructure Vision and Guiding Principles

To align the outcomes in this Plan with the mission and priorities of CenTrio and its customers, the Project Team collaborated with internal and external stakeholders to develop the following vision statement and guiding principles.



2.1.1 Vision

To lead the transition to an energy future that balances social impact, environmental care, and financial stewardship by identifying embedded carbon as our largest risk and advancing portfolio-wide solutions for carbon mitigation, water sustainability, and resource use efficiency.

2.1.2 Guiding Principles for the Sustainable Infrastructure Plan

The following guiding principles will govern development of the SIP:

- 1. Establishing a phased Implementation Strategy** which drives progress towards our long-term vision and goals.
- 2. Establishing a process for collaboration** which ensures involvement from key internal and external stakeholders.
 - a. Designated representatives from Operations, ESG, Finance and Corporate Development work together towards mutually agreed upon goals.
 - b. Intentional alignment of our business goals with the needs of our customers
- 3. Develop an approach to Community Engagement** that allows for efficient integration of our system with neighboring communities and prioritizes system improvements which benefit marginalized and underserved communities, taking into consideration future expansion/growth opportunities and the addition of more customers, delivering positive investments in the communities we serve.

- 4. Ensuring scalability of the work** by prioritizing options which allow us to incorporate innovative advancements from one system into another.
- 5. Aligning SIP with international sustainability methodologies**
- 6. UN's SDG Goals (THE 17 GOALS | Sustainable Development)** – Direct impact on following goals:



SUSTAINABLE DEVELOPMENT GOALS

- i. SDG 3: Good Health and Wellbeing
- ii. SDG 4: Quality Education
- iii. SDG 6: Clean Water and Sanitation
- iv. SDG 7: Affordable and Clean Energy
- v. SDG 8: Decent Work and Economic Growth
- vi. SDG 9: Industry, Innovation, and Infrastructure
- vii. SDG 11: Sustainable Cities and Communities
- viii. SDG 12: Responsible Consumption and Production
- ix. SDG 13: Climate Action

- a. The One Water framework [US Water Alliance | US Water Alliance](#) – This philosophy asserts that all water—stormwater, wastewater, drinking water, surface water, groundwater, sea water, etc., has value and should be managed sustainably and inclusively.
- 7. Creating solutions that are financeable in private markets** or that carry identified sources of grant/foundation funding or long-term loan guarantees.
 - 8. Ensuring that new construction takes carbon neutrality for GHG scope 1 and 2 into consideration.**
 - 9. Supporting education and development of a green workforce** by partnering with our university partners and local high education institutions to create a research core and advancing institutional knowledge of new technologies, training employees on how to install/operate new technologies, and creating platforms for developing internships, outreach programs, and industry partnerships.



2.2 Summary of Processes

In March 2022, the CenTrio ESG and Sustainability Program began, starting with the development of the ESG and Sustainable Program framework and approach. In the months that followed, tactical items were executed while the long-term strategy was developed, including the conception of the Sustainable Infrastructure Plan. The Plan is intended and designed to support and provide guidance for our comprehensive pathway to decarbonization through a collaborative process that includes not only sustainability professionals within CenTrio, but all major functions within the organization as well. This collaborative group includes the Sustainable

Working Group, a cross-departmental working group designed to meet and advance our ESG and Sustainability program initiatives, along with individual system specific operations staff, CenTrio leadership, the Board of Directors, and customer and community representatives. The Plan is designed to be a foundationally rigid, but functionally flexible working document that can adapt to future organizational growth and incorporation of new or evolved low carbon technologies. The Plan will be reviewed and updated, if appropriate, on an annual basis.

The Decarbonization Roadmap focuses on

the entire CenTrio portfolio of owned district energy systems in their collective pathway to a lower carbon profile. The Implementation Strategy narrows down to individual system decarbonization strategies and plans. The intent of the implementation strategy is to create working documents so to be able to adapt and evolve as technologies and inputs may influence such plans as time evolves.



2.3 Basis for Carbon Evaluation

Greenhouse gas (GHG) emissions, and carbon specifically, are measured via distinct levels of scope. The Greenhouse Gas Protocol is the most widely recognized accounting tool for measuring and managing GHG. The GHG Protocol first defines direct and indirect emissions. Direct emissions include sources owned or controlled by the reporting entity. Indirect emissions are attributed to activities related to the reporting entity, but that occur elsewhere.

GHG Protocol organizes carbon emissions into three primary areas of scope as illustrated in Figure 1.

Given that the majority of CenTrio's carbon profile lies within Scopes 1 and 2 emissions, the Sustainable Infrastructure Plan is focused on analyzing and establishing an implementation plan to address the impact of only Scopes 1 and 2. The next phase of this Plan will begin with an audit that focuses on addressing the Scope 3 contributions to CenTrio's carbon profile.

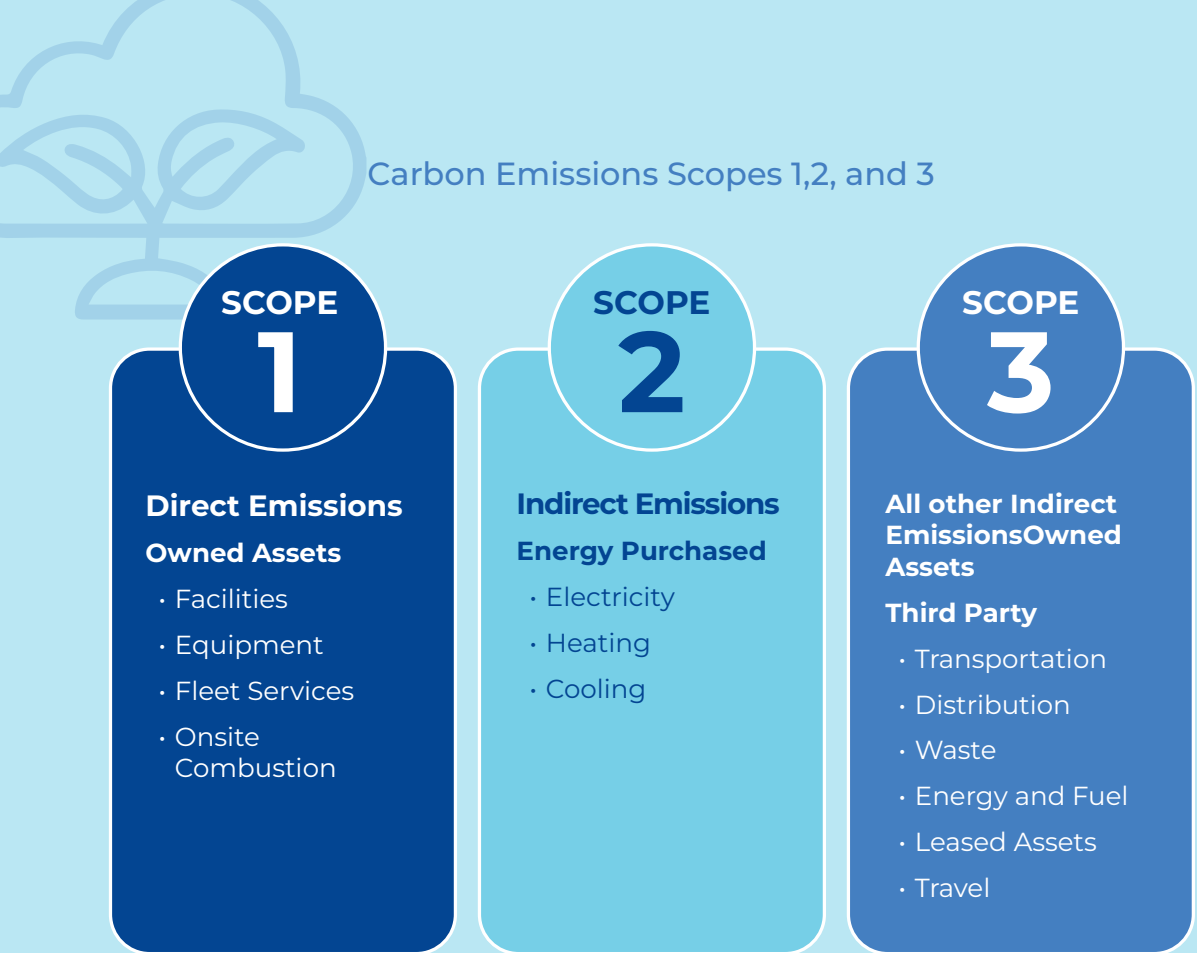


Figure 1

Carbon Emissions

Carbon evaluation also involves a variety of process descriptors, including carbon-positive, carbon-free, carbon-neutral, and decarbonization. For the purposes of this Plan, and in keeping with other formal tracking systems, the term “carbon positive” refers to instances where more carbon is mitigated than produced. The term “carbon-free” is when no emissions are created or produced. The term “carbon-neutral” refers to striking a balance between carbon generated by on-campus activities and offset either by off-site carbon-free or carbon reducing activities.

The term “decarbonization,” simply means mitigating carbon production. For example, purchasing renewable energy credits (RECs) could allow CenTrio to have carbon-neutral electricity. However, since the direct source of much of the energy comes from fossil fuels, that energy source cannot be deemed carbon-free. The exception to this scenario would be a renewably sourced electric grid, as is the case of Illinois whose electric grid is largely the result of nuclear power, and could be deemed carbon-free.



3.0 Our Motivation



On a global scale, CenTrio must consider the **impacts of sustainability** and the important ramifications that our decisions today will have **on the entire world** tomorrow



3.1 Building A Sustainable Future

At CenTrio, we have the privilege of working in an industry which keeps us closely connected to the Earth's natural resources. From river-water cooling to thermal ice storage, the inspiring reality of working so closely with the Earth's natural resources compels us to continuously improve our relationship with our environment by focusing on carbon reduction and resource sustainability.

The core motivators for our Sustainable Infrastructure Plan are derived from the sustainability principles that are the bedrock of CenTrio. We are inspired and motivated to incorporate an ethic of environmental care, social equity, and financial responsibility in all our programs, practices, and guiding documents, including this Plan. To CenTrio, sustainability is not just a responsibility or an obligation—these principles are our mindset and provide myriad growth opportunities and creative solutions to very complex community and global problems.

The strategies and framework of our operations are directly linked to the risks associated with a changing global climate; therefore, we embed sustainability within our strategic assessments and operational planning. By taking this approach, we are embarking on a meaningful journey towards a lower-carbon future that respectfully prioritizes climate resilience and the growing need for corporate environmental stewardship.

CenTrio operates under a set of standards for operational excellence which extend beyond physical plant operations, and which consider the risks and opportunities impacting our ability to sustain long-term values—and we are not alone. Our customers, our investors, and our partners also have bold, commonly shared sustainability goals. On a global scale, we must consider the impacts of sustainability and the important ramifications that our decisions today will have on the entire world tomorrow.

Sustainability Principles Are at the Core of CenTrio's Work

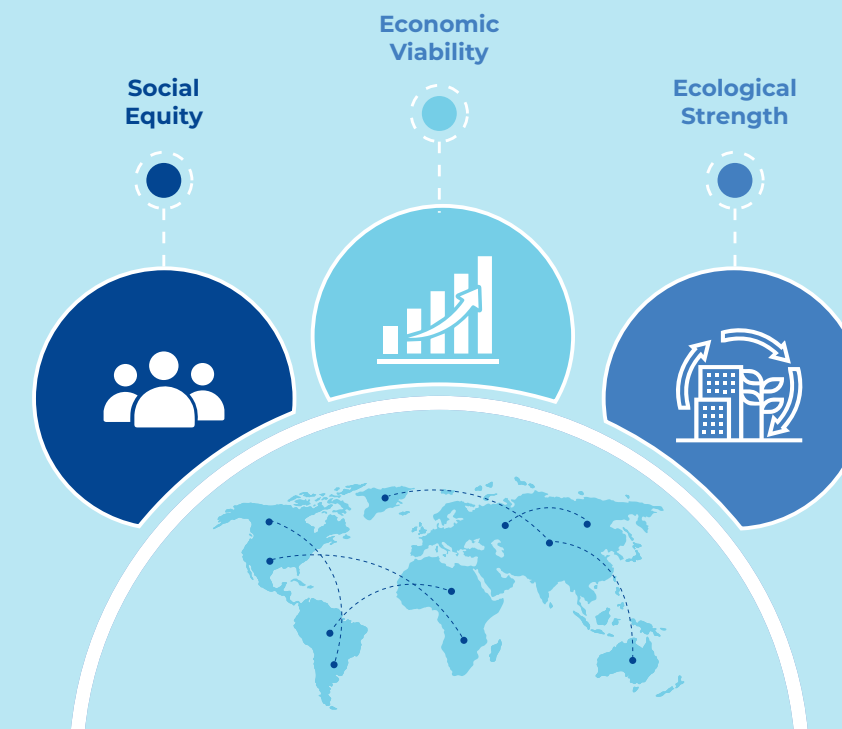


Figure 2

3.2 Establishing Sustainable Infrastructure Goals

CenTrio aims to create more resilient district energy systems through an inclusive, collaborative, and creative approach. New technological breakthroughs are still needed to bring this goal to fruition—and parallel cost mitigation efforts should be made in the interim to slow the rising cost of energy and goods amid our changing energy landscape. However, regardless of rising energy costs, real progress can be made by utilizing today's technology and investing in novel ideas which account for the next generation of low-carbon solutions.

TABLE 01: GUIDING OBJECTIVES FOR GOAL IMPLEMENTATION

DESCRIPTION	
Objective 1	Identify economical, physical (on-site) electrification opportunities
Objective 2	Identify and implement renewable electrification supply agreements
Objective 3	Identify specific decarbonization opportunities that exist now or might exist in the near future
Objective 4	Identify and implement non-fossil biofuel sources
Objective 5	Explore cutting-edge technologies and approaches
Objective 6	When growth opportunities are identified, ensure that parallel decarbonization is planned and executed on economic time horizons
Objective 7	Portfolio wide decarbonization (carbon neutrality) by end of program (2040-2050) by leveraging opportunities for vertical integration with clean generation and fuel and by aligning agreements with evolving grid regulations
Objective 8	Create a flexible, proactive program that prioritizes engaging municipal/state/federal stakeholders, making it possible to achieve full alignment with carbon reduction goals of the communities we serve
Objective 9	Creating a Research Core to establish CenTrio as a thought leader in the sustainability space
Objective 10	Collaborate with our campus and community partners to enhance the communities we serve and would like to serve through energy education
Objective 11	Establish a framework to present decision makers with financial scenarios that may include both 1) positive return on investment and 2) positive community investment, optics, and environmental stewardship
Objective 12	Establish portfolio-wide data communication architecture to support metering of resource consumption and thermal energy production, enhance operation efficiency, and position CenTrio as an energy-management resource to end users



3.2.1 Our Approach to Building Sustainable District Energy

CenTrio earns the ability to expand our services by providing reliable systems, safety, and innovation. Building a leadership position in sustainable district energy is a cornerstone of our strategic approach. CenTrio recognizes that sustainable district energy solutions yield results over time, and we endeavor to leverage our existing assets with a company leadership and sustainability awareness perspective. **CenTrio**

is committed to finding innovative solutions that will power the future of district energy. In the face of climate change, rapid population growth and dwindling natural resources, we need to leverage innovative technology first and foremost, to bring our systems and the communities they serve into harmony with our environment.

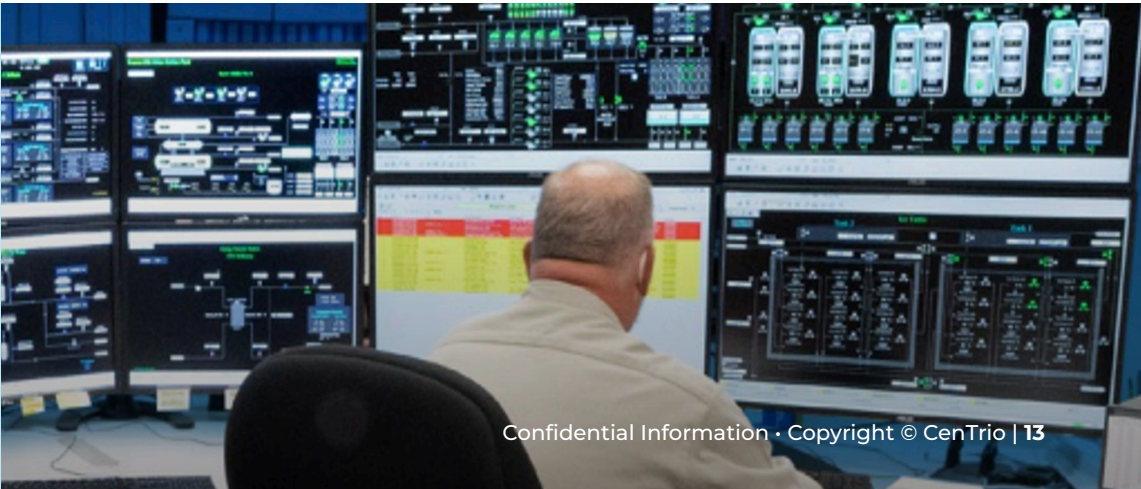


3.3 Defining Elements For Long-Term Success

Technologies change over time as an organic function of economic conditions in the local energy market. The individual systems comprising CenTrio have adapted repeatedly over the past 120 years and will continue to embrace technology and consumer priorities as drivers for collaborative innovation. We will continually invest in our digital utility model, adapting technologies and leveraging Internet of Things (IoT)-derived analytics to deliver more sustainable solutions to our customers while striving for carbon neutrality. Digitalization can help us

decarbonize and increase the share of renewable energy sources in our supply while seamlessly integrating within smarter cities and creating new markets. In addition, we must maintain awareness that the core of a thriving and equitable economy is an educated workforce. Therefore, as innovative technologies emerge and are integrated into CenTrio operations, we will endeavor to educate and train the next generation of green infrastructure workers.

The National Operating Center in Houston is our centralized monitoring and control center, optimized with dispatch, data modeling and analytics functionality. The center provides a common language and dispatch model, enables best-in-class tools, delivers greater efficiencies and opens opportunities for new markets and customers.





3.3.1 Historic Understanding of Innovative Technologies

CenTrio offers a wide range of innovative solutions that are sustainable, cost-effective, and aligned with the unique decarbonization goals of our customers, and we are actively exploring other innovative technologies as they emerge in the market. At CenTrio, we understand the

importance of investing in new technologies that enable the utilization of renewable energy sources as they evolve. Our district energy systems are source agnostic, meaning our networks are designed with flexibility to account for changing fuel sources.

Timeline of the Technological Advancement of Seattle Steam Plant from 1900 to the Present and Beyond

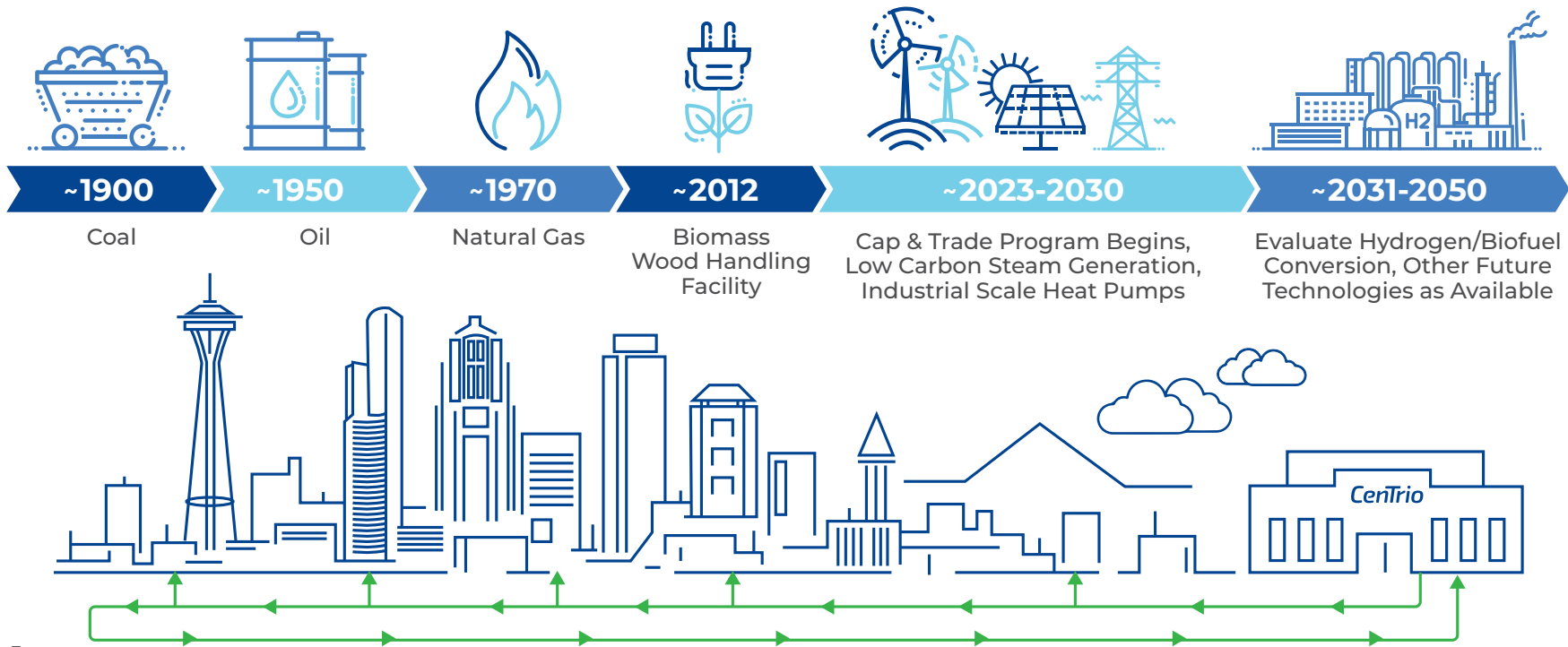


Figure 3

CenTrio offers a wide range of innovative solutions that are **sustainable, cost-effective, and aligned with the unique decarbonization goals** of our customers, and we are actively exploring other innovative technologies as they emerge in the market. At CenTrio, we understand the importance of

investing in new technologies that enable the utilization of renewable energy sources as they evolve. Our district energy systems are source agnostic, meaning our networks are designed with flexibility to account for changing fuel sources.





4.0

Analysis of Current Systems



CenTrio has the largest district energy portfolio in the United States, offering centralized cooling, heating, and electricity for cities, campuses, hospitals, and communities. CenTrio serves over 370 customers across 130+ million square feet of space. CenTrio is focused on empowering our customers to deliver on their mission by modernizing, operating, and managing their

utility systems and by transferring operational risks out of these non-core assets. CenTrio's innovations in this space include North America's largest ice battery system, in Chicago, and North America's largest sewer heat recovery system, in Denver.

CenTrio Footprint

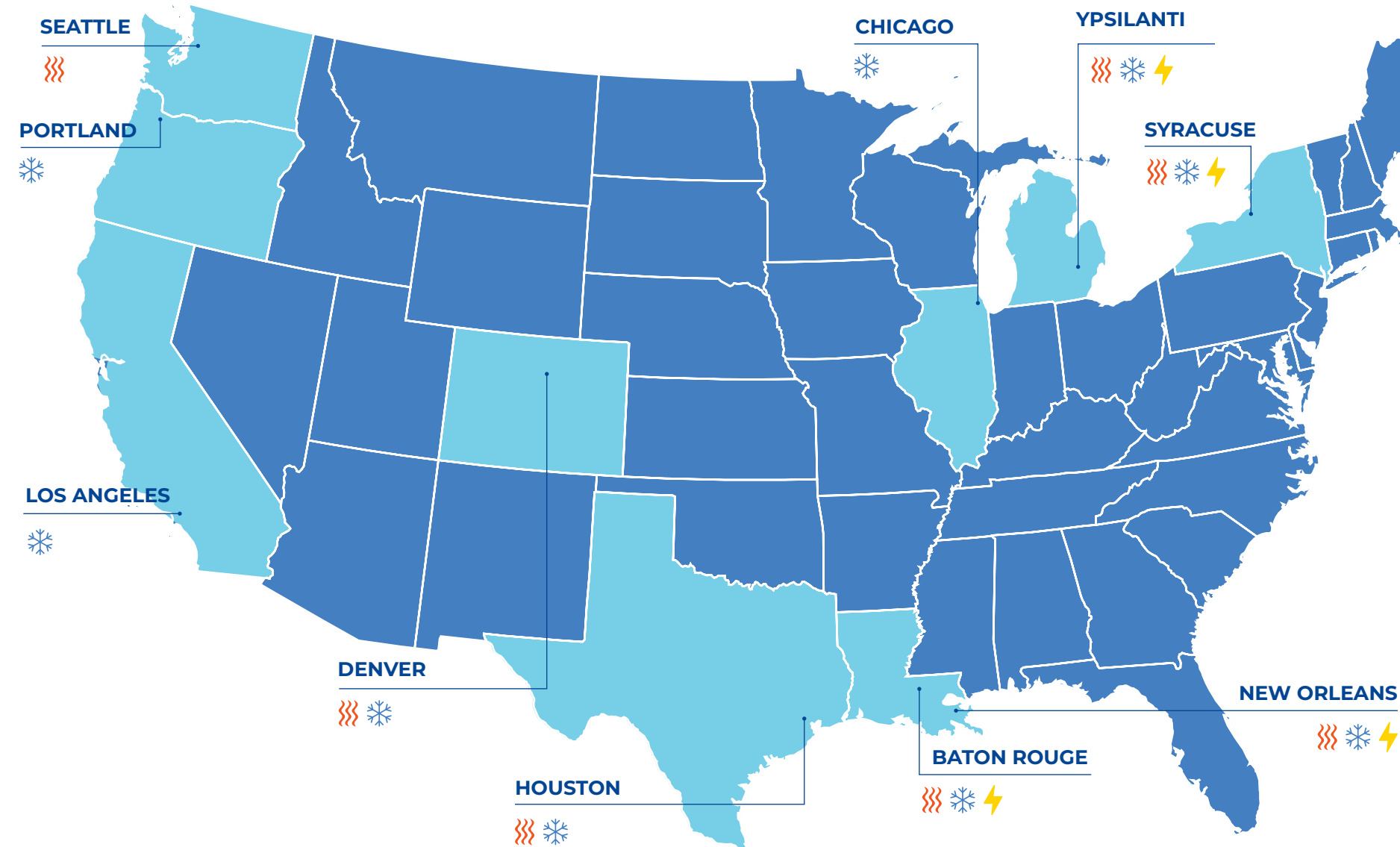


Figure 4



With over 125 customers in Chicago, CenTrio has unparalleled experience in delivering value to building owners and developers, while navigating complex regulatory challenges.



CenTrio's Union Station Plant in downtown Houston has provided chilled water services to customers since opening in March 2000.



Our New Orleans facility is specifically designed with resiliency in mind — it can withstand 20-ft storm surges and operate for 7 days completely off-grid. As a testament to its resiliency, CenTrio's operations remained running throughout Hurricane Katrina and acted as a command center for disaster relief efforts.



Our Portland facility is a closed loop system that serves 7 customers in the tavern district of downtown Portland.



4.1 City of Chicago District Cooling System

CenTrio owns and operates North America's largest downtown district cooling system in Chicago. The system features North America's largest ice thermal storage system ("ice battery"), which produces ice at night when electricity is the least expensive, and melts ice during the day to reduce peak-load electricity cost and carbon emissions. CenTrio's district also leverages the Chicago River using proprietary technologies to achieve aqua-thermal heat rejection, reducing freshwater consumption by 250,000,000 gallons annually. These advantages promote community resiliency by minimizing reliance on the city's water utility. CenTrio's ability to significantly reduce demand in times of extreme grid strain provides a major benefit to the local and regional utility and its customers. CenTrio has demonstrated the ability to remove 50 MW of demand off the electric grid by utilizing ice thermal storage.



4.2 City of Houston Union Station District Energy System

CenTrio's district cooling system in Houston has 6.6 miles of chilled water piping throughout the Houston downtown area. The system serves 39 customers in 40 mixed-use buildings representing 19.7 million square feet of space. CenTrio operates 25 electric chillers in four plants and two ice storage tanks for a total of 54,900 ton-hours of cooling capacity. The Union Station Plant occupies one block in the downtown Houston area and is supplied with power from three separate feeds from a substation located nearby. The system is expanding and adding additional chilled water to meet growing loads and new construction. Note-worthy customers include Minute Maid Park, The Allen Center, Houston Center, the Bank of America Tower, and the Westin Hotel.



4.3 LSU HSC District Energy System

CenTrio's district energy system in New Orleans provides both chilled water and steam, currently serving 24 buildings in downtown New Orleans. Our customers are primarily higher education and healthcare institutions including LSU Health Sciences Center, University Medical Center and Louisiana Cancer Research Center. Drawing on our reputation of reliability, resiliency and cost-effectiveness, CenTrio's New Orleans team is positioned to provide critical district energy services in a region projected to experience more challenging climate-related risk in the 21st century.



4.4 City of Portland District Energy System

As urban areas grow, tenants and residents demand more flexibility and space from their offices and residences. Portland is no exception; as redevelopment continues downtown, customers can rely on CenTrio for reliable, resilient and sustainable heating and cooling solutions. Our Portland facility is designed to produce 4,500 tons of cooling in a closed loop system that serves seven customers in the Tavern District of downtown, with planned expansion to 12,000 tons.



Our Los Angeles facility supports 22 buildings and serves a combined 13 million square feet of building space.



Our Seattle facility has been in operation for 130 years.



4.5 City of Los Angeles District Energy System

With facilities in Bunker Hill, Century City, Hollywood and Highland, and the Queen Mary, CenTrio's district energy operations in Los Angeles support 13 million-square feet of building space. CenTrio provides cooling and heating solutions to customers in the second-largest metropolitan region in the U.S. through its 7.8-mile distribution network. Working with CenTrio provides Los Angeles customers with reliable and cost-effective energy solutions. The growing Los Angeles district serves commercial office space, hotels, residential properties, healthcare facilities, retail complexes, higher education institutions, entertainment and arts venues. CenTrio's innovative upgrades and modernization projects have improved system efficiency and position CenTrio to deliver long-term, sustainable benefits to the city including carbon reduction.



4.6 City of Seattle

Beneath the streets and bridges of Seattle, invisible to the city above, an 18-mile network of district energy steam pipes delivers thermal energy to the growing Central Business District and First Hill neighborhoods. The 130-year-old system, operated by CenTrio since 2021, serves 126 customers in 166 buildings, providing heat to 28 million square feet of health care, residential, commercial, institutional, and governmental space. With its long record of adapting, innovating, and modernizing, CenTrio remains a vital part of the Seattle community. By applying low-carbon technologies at scale, it is poised to play a major role in helping customers, the city and the state of Washington achieve carbon reduction goals. As a carbon reduction partner with the City of Seattle, CenTrio's goal is to invest alongside our customers and the communities we serve.



4.7 LSU Baton Rouge P3 Project

CenTrio has partnered with Louisiana State University (LSU) in Baton Rouge, LA to modernize, operate, and maintain the on-campus district energy system under a long-term 30-year concession, recruiting a diverse, inclusive and local team to achieve these goals. CenTrio will invest in a significant capital improvement project that will modernize the utility systems to address near term needs and invest in future lifecycle maintenance projects that will ensure enhanced reliability. The initial modernization project includes all steam, chilled water and power facilities for the 1,000-acre main campus, which serves more than 35,000 students. This groundbreaking public-private partnership will generate substantial energy savings and uncover operational efficiencies for LSU while promoting sustainability and reliability of utility systems campus-wide, including reducing the university's carbon footprint. Throughout the lifecycle of the project and beyond, the modernization project will also provide employment and learning opportunities for minority and women-owned businesses.

LSU Baton Rouge provides steam and chilled water, delivered by three 2,000 ton steam-driven chillers.



4.8 Syracuse University P3 Project

CenTrio has partnered with Syracuse University in New York State to modernize, operate and maintain the campus-wide district energy system providing heating, cooling, and electricity under a long-term 40-year concession agreement. CenTrio is an industry partner in the University's Center of Excellence in Environmental & Energy Systems (Syracuse CoE) which catalyzes research, development and demonstrations to accelerate innovations for clean energy, healthy buildings and resilient communities. As part of the public-private partnership, CenTrio also provides heating to several third-party governmental and healthcare customers. With a collaborative approach, CenTrio is developing a modernization plan that is uniquely tailored to address the short- and long-term goals and objectives of Syracuse. The project includes initial modernization and funding of the utility system and future capital improvements. It will generate substantial energy savings, improve operational efficiencies and promote sustainability, while incorporating education opportunities.

Campus-wide district energy system at Syracuse University in New York.



4.9 National Western Center P3 Project

At the National Western Center in Denver, CenTrio and partner National Western Center Authority are leading the way for district energy systems across the country to tap wastewater as an energy input to replace fossil fuels and chart a path to a sustainable future. Rather than burning fossil fuels, the National Western Center campus is sourcing nearly 90 percent of its district heating and cooling from on-site sewer pipelines. It uses a recycled source of thermal energy - wastewater - from the City of Denver's sanitary sewer lines. Conserving a tremendous amount of water, innovative technologies thermally heat and cool more than 1 million square feet of buildings on campus. The system reduces air pollution, produces cleaner waterways, and reinvigorates the community behind it. The Authority serves customers such as the Colorado State University (CSU) Spur, City and County of Denver, and the Western Stock Show. Decarbonizing commercial buildings is an essential step to meet City of Denver goals of achieving net zero energy by 2040.

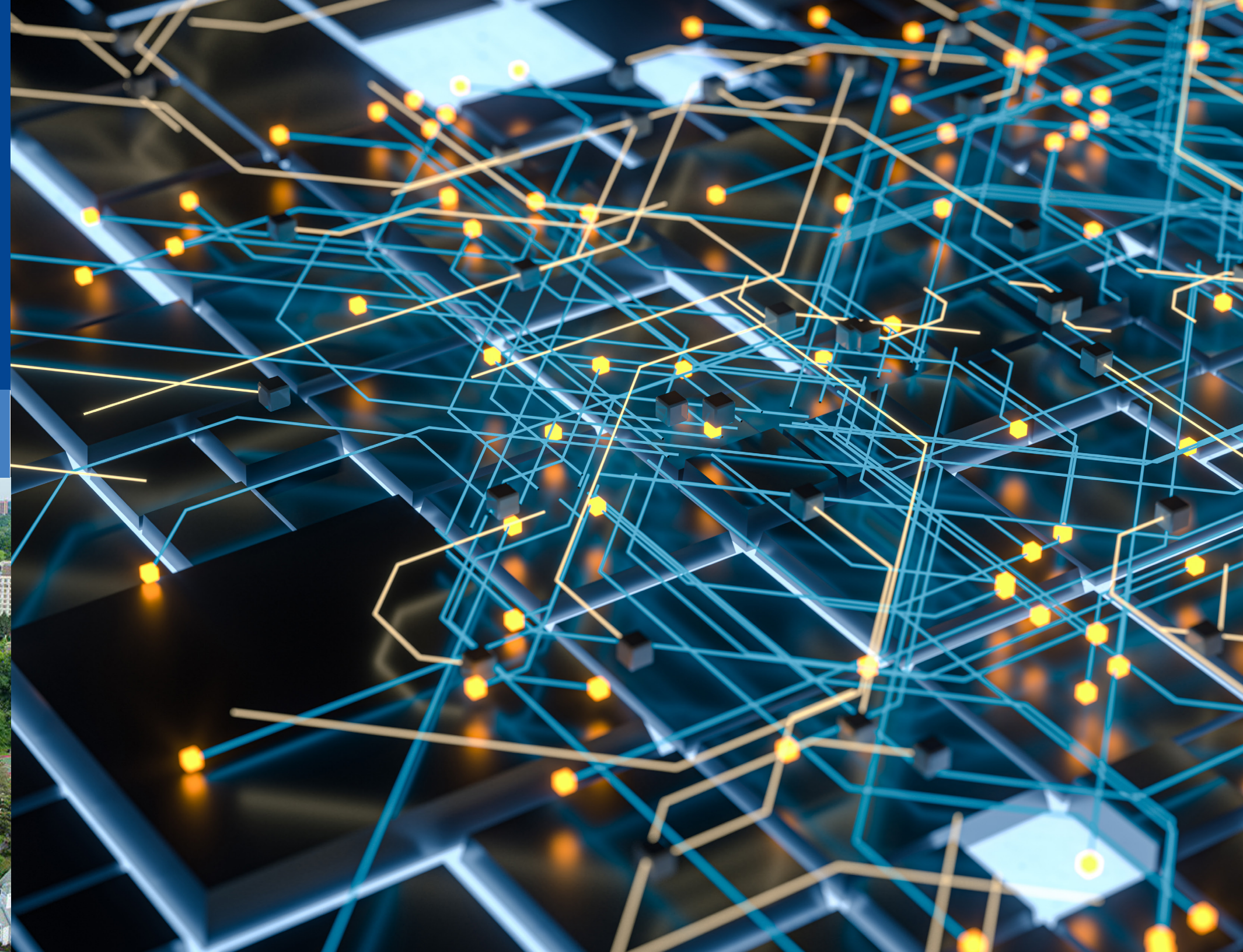
The National Western Center P3 Project was awarded the Best Constructed Project of the Year Award by P3 Awards



4.10 Eastern Michigan University P3 Project

Founded in 1849, Eastern Michigan University (EMU) is the second oldest public university in Michigan. It currently serves more than 14,000 students pursuing undergraduate, graduate, specialist, doctoral and certificate degrees. The University occupies an 800+ acre campus with five colleges and 122 buildings. At EMU, CenTrio and partner Eagle Energy Partners (EEP) is undertaking a campus energy and utility modernization effort to convert the current steam system to a lower carbon, more efficient hot water system along with a central chilled water production facility. As the highlight of the modernization work, EEP has a robust academic collaboration.

Academic collaboration brings the utility modernization effort at EMU to the core mission of the University as it focuses on educating students about energy, sustainability, and resilience in service to the surrounding community.





5.0 A Pathway to Low-Carbon Infrastructure



The effects of climate change and water scarcity are among the most significant threats to community resilience, today and in the future. As a leader in sustainability at the forefront of the energy transition, we believe we can do much more to help our customers and communities meet these challenges. By continuing to invest and modernize our systems while deploying smart, low-carbon operational and resource conservation strategies and practices, our CenTrio district energy system is the technology our communities need to transition to a low-carbon economy.

Our plan is to accelerate what we do well by scaling the proven solutions we have implemented while working with our partners and customers to ensure we are investing in future technologies. In doing so, we are finding innovative ways to optimize energy efficiency, such as transitioning to cleaner fuels, tapping into renewable energy sources, harvesting (capturing and transforming) waste into energy, capturing carbon from our process gases, and designing our facilities to thrive under projected future climate conditions. We believe that by using a broad sustainability toolset, we will simultaneously contribute to the global imperative of reducing atmospheric GHGs while also providing high-value energy solutions to our customers. Here we discuss key areas of potential progress.



5.1 Utilizing Renewable Energy in Our Cooling Business

Novel technologies and approaches continue to be applied as an alternative to conventional cooling. In 2019, CenTrio connected our Chicago cooling system to the iconic Old Post Office redevelopment by extending our network under the Chicago River into a new development area in western downtown. We also reached a long-term contract with the nearby BMO Harris Tower, which is under development, and have plans for continued expansion in the area. In 2022, this system successfully decreased its Global Warming Potential by a factor of 400 by converting an R-22 ice-based 20,000 ton-hour thermal storage system to R134a, and by crafting electricity procurement practices to become carbon-free in 2023 and beyond.



5.2 Redefining How We Heat

For several years, CenTrio has been moving from steam to hot-water systems, which deliver both economic and environmental benefits. One primary benefit arises from converting a one-way steam delivery process to a closed-loop hydronic process. The resulting reduction in industrial water demand will become increasingly important as water security becomes less certain under future climate and population conditions. Carbon footprint reductions will also be achieved in the future through renewable geo-exchange energy sources, innovative technologies to harvest and recycle waste heat, and the use of thermal storage assets. Over the past several years, CenTrio has been gradually modernizing our district energy systems, increasing the use of lower temperature hot-water systems as an alternative to conventional steam heat-transfer systems. The result: lower distribution losses, higher production efficiencies, and the ability to utilize surplus heat supplies.



5.3 Modernized Distribution Network

District energy is the technology that allows for the lowest-cost, most efficient solution for reducing greenhouse gas emissions and primary energy demand in the built environment. Because of its network of underground pipes and other energy delivery infrastructure, district energy allows for a systematic approach for decreasing carbon in multiple buildings at once, scalable to campus, multiple neighborhoods, and even an entire city. Economies of scale and efficiency of shared generation resources are fundamental to the district energy distribution network. The modernization of this very network of underground pipes also allows for a greater integration of energy efficiency, increased resiliency for all those connected to the system, and a wider variety of renewable energy sources. For these reasons, the United Nations has identified District Energy as the technology cities should deploy to decarbonize. “A transition to such systems, combined with energy efficiency measures, could contribute as much as 58 per cent of the carbon dioxide (CO₂) emission reductions required in the energy sector by 2050 to keep global temperature rise to within 2–3 degrees Celsius.”²



5.4 Conserving & Improving Water Efficiency

Given the universal scientific concern for water availability under future environmental and population pressures, we continue to accelerate our water conservation solutions. This includes cooling with river water; the use of non-potable well water; and ice-cooling storage systems. Water savings are being made possible through the integration of water management technologies within district energy systems.

Over the past few years, we have been elevating our technologies to drive even greater water conservation measures. The use of non-potable water, combined with our closed-loop, state-of-the-art water recovery and recycling solutions in district energy systems, are shedding light on new ways to conserve water and use resources efficiently. This list includes the AquaRecycling system at the W Hotel in Seattle. Using the steam condensate from the dryers of the hotel's laundry system, we are reclaiming 100% of our process water so that no extra municipal water is needed. We have also found innovative ways to reroute the condensate at the Seattle Medical Dental Building to preheat domestic hot water. By improving condensate heat recovery systems, we are conserving water and driving greater environmental efficiencies. Most recently, our Chicago system realized about \$1M in annual operational savings while reducing municipal water demand by 100 million gallons by implementing an ultra-filtration system and sourcing the Chicago River for process water.



5.5 The Decarbonization Pathway For Our Customers

For each of our 9 systems across North America, CenTrio is actively working with internal and external stakeholders to formulate a decarbonization strategy and is actively implementing various modernization projects for the betterment of these assets. For additional details on customer-specific decarbonization plans, please see the Appendix.



5.5.1 Step-Down Chart (GHGI)

The Step-Down Chart (Figure 5) shown below was generated by using 2022 metrics as a baseline (Electricity: 85,215 M ton, Fuel: 88,176 M ton, Water: 545 M ton, Total = 173,936 M ton CO₂e). Figure 5 was constructed by assuming two scenarios: 1) aggressive investment in renewable electrical generation and physical mitigation of carbon emissions by fuel-source optimization, and 2) investment in fuel-source optimization while allowing each supporting electrical grid move toward carbon-free operation per grid carbon neutrality goals. Under Scenario 1, we will purchase shares of vertically integrated renewables or physically install renewable generation capacity equivalent to 10% of our portfolio demand between 2029-2040. Fuel-related reductions are achieved by installation of low-carbon processes in the Seattle steam plant to achieve WA Climate Commitment Act compliance (reduction to 25,000 M Tons/yr emissions), complete decarbonization of Seattle (2031), and decarbonization of the New Orleans steam plant (2036). Water reductions are based on 4% process efficiency and loss-reduction improvements from 2027-2050. This timeline may be enhanced by installation of carbon-sequestration technology at the building and/or plant level. Carbon neutrality may also be achieved more quickly by installing renewable energy generation that is greater than facility demand, such that CenTrio becomes a net exporter of clean electricity. Under Scenario 2, we approach fuel-based emissions and water identically, but rather than investing in renewable energy generation, we wait for each grid operator to meet their published interim and long-term carbon neutrality goals.

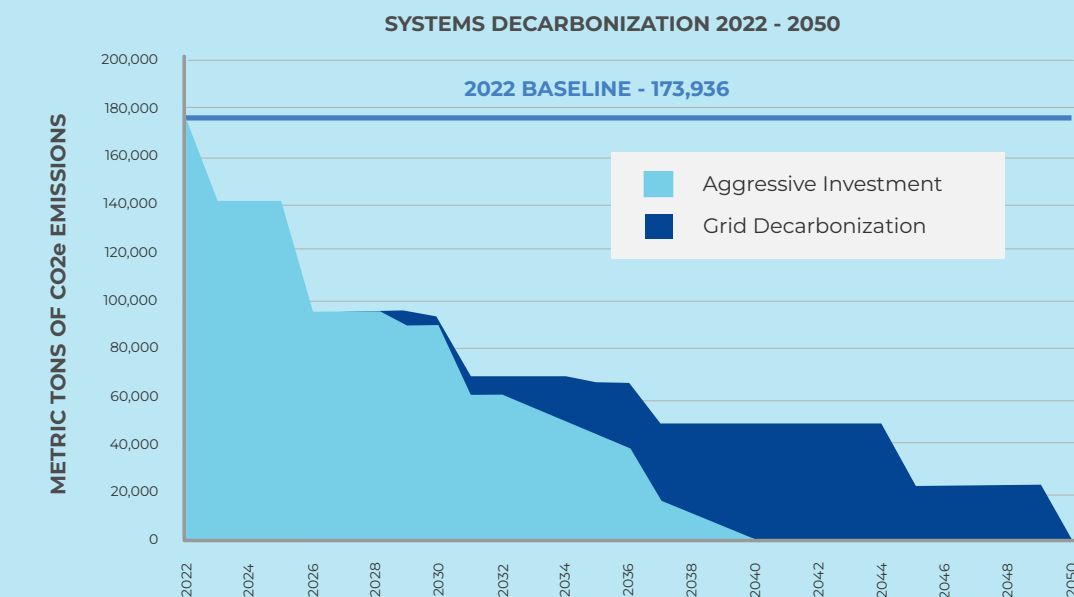


Figure 5



5.6 Guiding Strategies Of Our Decarbonization Approach

Our approach to decarbonization will be guided by effective implementation of the following seven strategies.

TABLE 02: GUIDING STRATEGIES OF OUR DECARBONIZATION APPROACH

STRATEGY	EXPLANATION
Procuring clean electrons for cooling load and plant operations and/or investing in vertically integrated renewable generation	Scenario 1: Investing in 10% of portfolio load per year 2029-2040 Scenario 2: Awaiting grid shift toward carbon-free operations
Partnering with municipalities, cities, and institutions to install renewable energy generation	Following Scenario 1 above
Replacing fossil fuels with renewable or low-carbon alternatives to maximize thermal energy utilization through applicable technologies	Low-carbon alternatives could include biofuels, H2, waste heat, and geothermal
Replacing end-of-life equipment with low-carbon technologies	Wherever fiscally sensible
Prioritizing peak-load shifting wherever feasible	This would reduce costs and enhance grid resilience
Strengthen and modernize the distribution network	Gain efficiencies: • In steam to hot water conversions, if applicable • From advances in distribution network options • Through preventive maintenance aided by continuous thermal monitoring of distribution networks
Performing client-side efficiency enhancements and engineering consultation for major customers	Potential areas of growth for CenTrio include: • Energy auditing • Dashboard and Energy/Water metering • Managed technological upgrades that leverage the IoT and can tie into our National Operations Center
Holistic assessment of risk factors associated with climate change, population increase, and urban growth	This also includes seeking long-term partnerships with local organizations who demonstrate a commitment to clean energy transformation and green workforce development
Refrigerant conversions	Moving toward lower global warming potential options
Maximize thermal energy utilization through technically and economically feasible technologies, including peaking considerations	Utilize technologies such as heat pump, heat recovery chiller, thermal storage, electrode boiler, small modular reactor, electrode boiler



5.7 Holistic Decarbonized Energy Solutions

The cities in which we operate—Chicago, Portland, Seattle, Los Angeles, New Orleans, Houston, Baton Rouge, Denver, Ypsilanti and Syracuse—all have one thing in common. Hidden beneath the streets of these cities lie mazes of pipes connected to a potential decarbonization accelerator: a central power, steam, and/or cooling system. To achieve decarbonization for each of our systems, CenTrio must first consider the fact that district energy solutions are tied to the economic development and growth of the cities and campuses our systems serve. To achieve decarbonization, all aspects of the economy must change—from occupant behaviors and customer expectations, to how we produce and deliver energy services, to how assets are managed, to how new systems are financed.

For CenTrio to achieve the decarbonization of our systems, we must right-size our capacity. This involves working with the customer to modernize existing utility systems, valuing customer building efficiencies within rate structures, championing new technological approaches, and even utilizing carbon capture technologies. CenTrio is successfully implementing this approach at Syracuse University, for example. Please see the Appendix for additional details on the Syracuse University Decarbonization Strategy.

The second way to achieve decarbonization is by making our systems more energy efficient. At CenTrio, we believe energy efficiency may be achieved through implementation of innovative technologies such as waste heat recovery, and CenTrio will work with each individual system to incorporate such technologies. At the National Western Center in Denver, for example, CenTrio is implementing this approach successfully. Please see the Appendix for additional details on the National Western Center Decarbonization Strategy.

The third way to achieve decarbonization is by incorporating low-carbon technologies. The sustainable solutions we offer can leverage existing local infrastructure and be tailored for regional needs, providing central heat in some climates and central cooling in others. Please see the Appendix for details on the Chicago System Decarbonization Strategy.

Finally, any aspect of the district energy system which cannot be physically improved upon through one of these means would be offset by renewable or carbon-free power purchases or other carbon market instruments.

Informing the Decarbonization Energy Pyramid

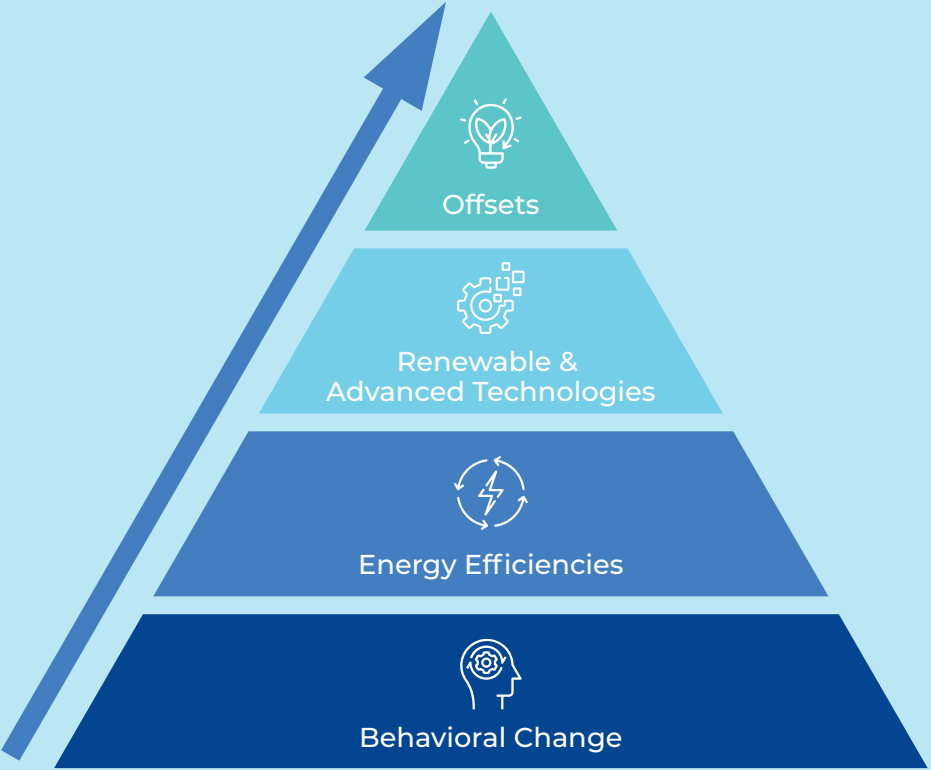


Figure 6



5.7.1 Considerations for the Future

CenTrio is well positioned to grow the company and the portfolio of services we can offer. There are two identified primary growth pathways: 1) Expansion of our public-private partnerships, and 2) Organic growth of existing facilities by adding more customers to our distribution networks. Expanding our partnerships in a sustainable and profitable manner requires extensive internal collaboration between Operations, ESG, Business Development, and Finance. From an ESG and carbon neutrality standpoint, we evaluate new opportunities against a matrix of sustainability metrics, as detailed in Tables 3 and 4.

TABLE 03: ACCOMMODATING P3 GROWTH & DEVELOPMENT FROM AN ESG PERSPECTIVE

METRIC	EXPLANATION
Metric 1	Identify partners that have demonstrated willingness to begin working toward carbon neutrality, with the following benchmarks: • Historic execution of efficiency improvements pursuant to carbon mitigation • Pledging/joining carbon pacts (e.g., Kyoto Protocol, ACUPCC, Climate Commitment, Paris Accord) • Institutional appetite for prioritizing resilience, equity, and environmental justice • Utility/Infrastructure master-plans identifying opportunities for climate positivity • Thought leadership in energy generation and distribution & climate risk (EPRI, NOAA)
Metric 2	Identify partners with strong histories of elevating the community in which they reside
Metric 3	Identify partners with excellent track record of fiscal responsibility
Metric 4	Identify partners with capacity (infrastructure, land use, municipal partnerships, etc.) to grow CenTrio’s ability to generate renewable energy that meets or exceeds local system requirements
Metric 5	Identify partners who have financed carbon mitigation programs • Green infrastructure projects • LEED buildings • Technology implementation
Metric 6	Identify partners with unique and specific business challenges such that partnering with them would elevate CenTrio’s profile as a leader in sustainability and positive community investment
Metric 7	Identify partners willing to assess sustainability, decarbonization, and greenhouse gas impacts to our scope 1 and 2 emissions, or otherwise, in good partnership with others
Metric 8	Identify partners that have strong existing relationships with local/city/state governing bodies to maintain institutional knowledge of evolving laws and regulations that will affect operational sustainability



Like public-private partnerships, organically increasing customer numbers require broad collaboration between CenTrio programs to ensure sustainable and profitable integration into our existing distribution network. ESG evaluates potential incorporation through the following metrics:

TABLE 04: ACCOMMODATING ORGANIC GROWTH FROM AN ESG PERSPECTIVE

METRIC	EXPLANATION
Metric 1	Assessment of customer's priorities and value placed on carbon reduction
Metric 2	Opportunities for positive community engagement and investment • Integrating for equity (enhances standard of living for surrounding communities) • Integrating for optics (enhances potential for future sales) • Integrating for education (enhances CenTrio’s ability to leverage educational infrastructure projects and contribute to growing a green technology workforce) • Integrating for engagement (enhances communication and bi-directional transfer of knowledge, resulting in greater trust among partners) • Integrating to create favorable economic conditions for the community • Integrating to enhance human health and wellbeing (e.g. local K-12 schools could use operational savings to purchase higher quality food)
Metric 3	Identify partners located outside of current distribution network, but who’s addition may create cascading interest in district energy services
Metric 4	Assessment of customer carbon accounting practices and ownership of environmental stewardship responsibilities (e.g. does new customer already report on Scope 1, 2, and 3 emissions? If not, are they willing to evaluate their own supply and delivery chains?)

By establishing these metrics and routinely evaluating prospective, current, and shared community decarbonization goals and targets, we can ensure that CenTrio enjoys enhanced profitability, resilience, and sustainability.

6.0 Our Current Progress and Next Steps



One of the primary reasons we collectively focus on creating solutions that enhance data availability and fidelity is that operations data is crucial to establishing business-as-usual carbon profiles against which to evaluate future solutions. The Sustainability Working Group established the year 2022 as our carbon accounting baseline year, with portfolio-wide baseline emissions of 173,936 metric tons of CO₂e. This is our baseline metric to drive change and track our progress moving forward. With growth strategies in mind, we have organized our GHG accounting evaluation tools to compare apples to apples by evaluating individual systems using normalized process comparators (e.g. gallons of cooling water per ton-hr of demand). These are discussed in detail within the Implementation Strategy section of the Plan, which outlines decarbonization strategies for each system.

We have embarked upon an ambitious carbon reduction plan, as briefly discussed in previous sections. Some of the exciting successes of 2021 and 2022 include the Sewer Heat Recovery project in Denver, the river water cooling project in Chicago (carbon-free in 2023), and the launch of our National Operating Center in Houston, where we can remotely control the LA and Portland facilities with more planned in future phases of this work. Our next opportunity lies in the Seattle steam plant, which is currently the highest emitter of CO₂ (74,894 metric tons in 2021). Due to the 2023 implementation of Washington State's cap-and-invest program targeting carbon emissions, the Seattle plant is under significant economic and political pressure to reduce emissions by about 50k metric tons per year. Therefore, as we move forward with collaboratively crafting the Implementation Strategy and setting decarbonization goals, the focus remains on potential solutions in Seattle that include both demand-side reductions such as waste heat recovery, building-side efficiency improvements, as well as supply optimization such as fuel shifting, distributed energy generation, refurbishment of pipelines, and local network integration.





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CenTrio provides reliable, cost-effective and sustainable energy solutions for higher education, healthcare and research, building owners, commercial and industrial entities, residential and multifamily properties, hospitality and entertainment complexes and data centers.

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