In the Matter of
CenterPoint Energy Natural Gas Innovation Act (NGIA)
Innovation Plan

Petition of CenterPoint Energy

EXHIBIT K: INTERESTED PARTIES MEETING MATERIALS

PART 3 OF 3

Docket No. G-008/M-23-215

June 28, 2023

CenterPoint Innovation Plan
Regulatory Stakeholder Meeting 2 Agenda

FRIDAY, MARCH 17, 8:30AM-12:00PM CT

Please open Zoom or navigate to www.zoom.us and enter this meeting code a few minutes before 8:30AM to join the meeting:

Zoom Meeting ID: 898 0480 6890
Passcode: 783249

Pre-reads

- Slide deck from 2/24 meeting

Draft Meeting Goals

1. Review content from 2/24 and discuss additional feedback on draft pilot profile designs and draft analysis results from regulatory parties.
2. Discuss any additional input on criteria for selecting projects to include in the innovation plan.
3. Address follow-up items from 2/24 meeting
    a. Approach to R&D
    b. NGIA/CIP coordination
4. Review next steps for plan development

Draft Meeting Agenda

8:30AM **Welcome and Introductions**

8:40AM **Review and Discuss Content Covered in 2/24 Meeting**

- Presentation (30 mins)
    - Basics of what was covered
    - Follow-ups from 2/24
        - Statutory requirements
        - Lifetime costs all-in versus 5-year budget
    - Evaluation framework gaps
    - Next steps after the analysis
- Discussion (50 mins)
    - Clarifying questions

- What do you want to dig into more?
  - Two participants have asked to review pilots 7 and 8 (green hydrogen)
- Pilot profiles you're excited or concerned about?
- Any additional input on criteria for selecting pilot projects?

10:00AM BREAK

10:15AM Continued discussion (as needed)

10:30 AM Approach to R&D

- Presentation (10 mins)
- Discussion (20 mins)

11:00AM CIP/NGIA Coordination

- Presentation (10 mins)
  - Weatherization blitzes R&D
    - Rational for moving this to R&D
  - Industrial audit pilot
- Discussion (40 mins)

11:50 AM Next Steps

- Plan for 3rd meeting is to present a big-picture plan for the filing
  - Will include ate impacts
- CenterPoint Energy continues to welcome feedback until March 24th, after which it will be harder to incorporate.
- Willing to have focused discussions with any parties that would like it.

12:00PM ADJOURN

Regulatory Stakeholder Meeting: Discussion of Draft Detailed Analysis on Pilots Under Consideration for CenterPoint Energy's Innovation Plan

Peter Narbaitz
Director, Energy Markets & Planning, ICF

3/17/2023

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Agenda

- Welcome and Introductions
- Review and Discuss Content Covered in 2/24 Meeting

- Break

- Approach to R&D
- CIP/NGIA Coordination
- Next steps

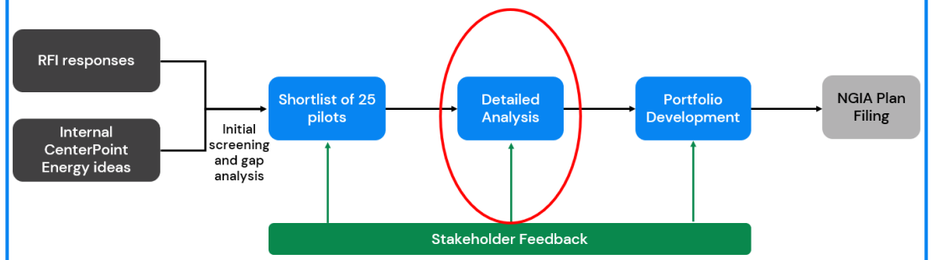
Welcome and Introductions

Review and Discuss Content Covered in 2/24 Meeting

Recap of Meeting on the 24th

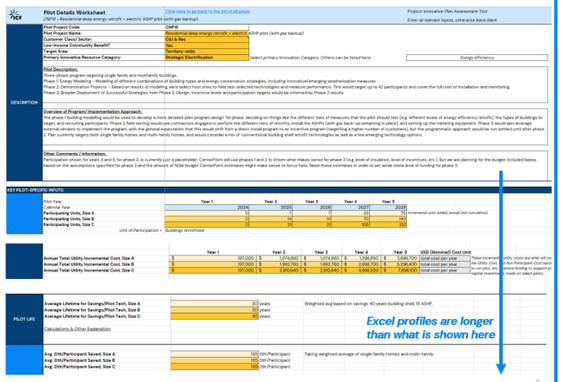
1. Overview of NGIA innovation plan development process and detailed analysis
2. Overview of the materials provided for review
3. Review of pilot project designs
4. Review of pilot project analysis framework and high-level draft results

1 Overview of NGIA Innovation Plan Development Process



2 Pilot Profile spreadsheet available to all stakeholders

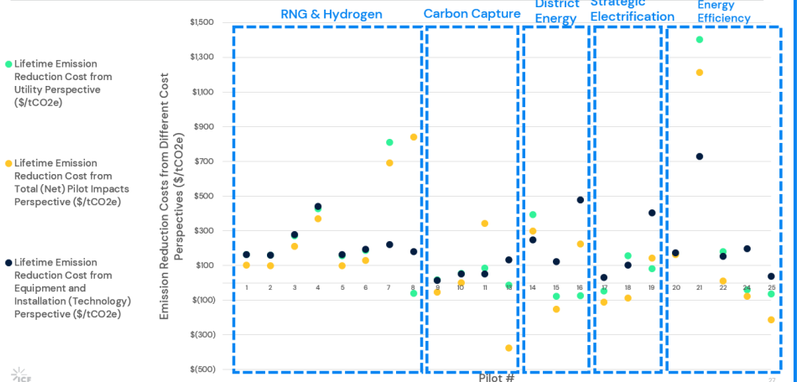
- Each of the pilots has a tab in the spreadsheet
- Orange cells contain pilot-level inputs to be pulled into analysis
- Tabs also sometimes contain calculations specific to the individual pilot
- Pilot qualitative evaluation details also captured at bottom of profiles
- Key parameters include:
  - Participation level
  - Natural gas savings
  - Changes in electricity consumption
  - Measure life
  - Utility program costs (internal, external, incentives, etc.)



3 Energy efficiency pilots – part 1

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget (total over pilot period)
20	Small/medium business GHG audit pilot	This pilot would expand the scope of CenterPoint Energy's Natural Gas Energy Analysis (NGEA) CIP energy audit to include audit information related to a business' GHG emissions and an assessment for additional GHG reduction measures such as electric air source heat pumps or hybrid heating systems, CarbinX carbon capture units, industrial heat pumps or solar thermal walls. The program would offer incentives for these measures (consistent with other NGIA program offerings), and recognize businesses who implement multiple measures as "energy leaders". Participation levels would be consistent with NGEA program goals, at approximately 250-300 customers per year.	A	992 GHG audits (5% implement)	$2,151,769
			B	1,240 GHG audits (5% implement)	$2,622,211
			C	1,488 GHG audits (5% implement)	$3,092,653
21	Residential Gas Heat Pump	Gas heat pumps represent an emerging technology category with the potential to replace residential furnaces and water heaters, offering an opportunity to lower GHG emissions and customer costs through higher efficiency. Gas heat pumps have achieved over 1.3 system Coefficient of Performance (COP) in laboratory conditions. While several commercial-sector gas heat pumps are already available, there are four manufacturers aiming to deploy residential systems in 2023-24. An initial pilot phase would include market research and analysis to prioritize which gas heat pump units should be included in the field testing. Outreach would be conducted to recruit CenterPoint customers to participate in the pilot, and contractors would be engaged to train them to install and maintain the heat pumps, with support from equipment manufacturers. The installations would be metered and trial data analyzed to develop reporting metrics that would better inform the opportunity for gas heat pumps to be part of future CIP or NGIA programs. This pilot would cover all the installation costs for participating customers.	A	6 units	$491,446
			B	10 units	$609,076
			C	20 units	$903,152
22	Gas Heat Pump for Commercial Buildings	This pilot involves a demonstration of gas heat pumps offering space and/or water heating for commercial buildings (particularly in cold climates). Natural gas fired heat pumps are an emerging new technology that allows natural gas heating, cooling, and water heating to exceed a COP of 1 and increase efficiency of gas end uses. There are many different types of gas fired heat pump under development, at various stages of readiness, and many different application types of this technology. Some companies have commercially available gas heat pumps in market, and they are typically utilized in commercial buildings with high hot water consumption such as multifamily, small commercial and/or recreational facilities.	A	3 units	$680,257
		As the technology is new to market and is not yet considered cost effective for CIP, this pilot involves demonstration site	B	6 units	$1,139,825

4 Emission Reduction Costs (Pilot Size B) – draft results



Follow Ups from the 24th – Statutory Requirements

General Statutory Requirements to Keep in Mind

- Strategic electrification is defined to require gas backup
- There is an overall cost cap of approximately $90M over the five-year plan
- In addition, there is a bonus amount available only for certain kinds of RNG equal to approximately $15M over the five years

Special Requirements for the First Plan

- All utilities
  - Costs must be 50%+ for RNG, biogas, power-to-hydrogen or power-to-ammonia (low carbon fuels)
- CenterPoint Only
  - Residential deep energy retrofit + electric ASHP pilot (with gas backup)
    - Must facilitate very specifically defined and ambitious retrofit standard in at least some homes
  - Industrial hard-to-electrify pilot
  - Small/medium business GHG audit pilot
  - District energy pilot required but may not be more than 20% of plan costs

Follow Ups from the 24th – Lifetime Costs vs. 5 Year Costs (Pilot Size B)

#	Pilot (all values for size B)	Total Cost of Pilot (All Years) - Not including utility savings ($)	Total 5-Year Cost of Pilots - Not including utility savings ($)	Utility Costs Towards NGIA 5-Year Budget (S)	Pilot Life (years)
1	RNG Proposal – Organics 1	$ 8,568,712	$ 2,578,513	$ 2,578,513	10
2	RNG Proposal – Organics 2	$ 19,330,139	$ 5,806,927	$ 5,806,927	10
3	RNG Archetype – WRRF	$ 48,077,610	$ 19,245,230	$ 19,245,230	10
4	RNG Archetype - Dairy	$ 46,441,870	$ 18,582,077	$ 18,582,077	10
5	RNG Archetype - Food Waste	$ 50,168,675	$ 20,079,442	$ 20,079,442	10
6	RNG Archetype - Landfill Gas	$ 49,304,415	$ 19,742,595	$ 19,742,595	10
7	Hydrogen Blending	$ 27,648,264	$ 4,965,921	$ 4,693,620	20
8	Industrial Hydrogen	$ 3,441,703	$ 3,441,703	$ 2,163,128	20
9	Industrial Methane Leaks	$ 2,951,124	$ 2,951,124	$ 2,466,290	5
10	Urban Tree Offsets	$ 536,500	$ 536,500	$ 536,500	1
11	Industrial Carbon Capture	$ 3,547,600	$ 3,547,600	$ 4,156,908	20
13	Commercial Carbon Capture	$ 4,345,000	$ 4,345,000	$ 3,675,284	20
14	Networked Geothermal	$ 28,448,420	$ 6,422,799	$ 6,207,158	40
15	Existing District Energy	$ 3,109,000	$ 3,109,000	$ 676,830	30
16	New District Energy	$ 582,270	$ 582,270	$ 271,690	30
17	Industrial Electrification	$ 1,126,600	$ 1,126,600	$ 843,778	20
18	Commercial Hybrid Heating	$ 6,774,000	$ 6,774,000	$ 6,454,988	15
19	Res. Deep Energy Retrofits	$ 12,434,370	$ 12,434,370	$ 12,215,187	32
20	Sm./Med C&I GHG Audit	$ 2,731,400	$ 2,731,400	$ 2,622,211	18
21	Res. Gas Heat Pumps	$ 615,000	$ 615,000	$ 609,076	15
22	Com. Gas Heat Pumps	$ 1,205,000	$ 1,205,000	$ 1,139,825	15
24	C&I Solar Thermal	$ 581,913	$ 581,913	$ 469,743	20
25	Large C&I GHG Audit	$ 1,981,375	$ 1,981,375	$ 1,277,010	20
Total	Sum of Size B for All Pilots	$ 325,885,960	$ 145,321,359	$ 138,185,698	N/A

Some pilots would be expected to incur costs outside of 5-year window of first NGIA plan

Expected utility cost test benefits (e.g. commodity cost savings) reduce the impact of different pilots vs. the NGIA cost-cap (budget)

Evaluation Framework Gaps – Electricity GHG Intensity

When pilot location is known, electric-utility-specific generation mix information is leveraged (Xcel Base Case generation mix).

For pilots where electricity provider is not yet set, a state-specific NREL Standard Scenario is required by the Frameworks Order:

- Though no specific NREL scenario is mandated, Fresh Energy's March 2022 filing recommended use of the Mid-case "No Policy Change" NREL-MN standard scenario with electrification
- NREL has since updated their Standard Scenarios in December 2022
- ICF worked with CNP to identify the NREL Standard Scenario: Mid-Case, Nascent Techs, Current Policies - Minnesota scenario as the best updated match to what was previously discussed

Innovative Resource Pilot Category	Grid Mix Used
RNG/Biogas	Xcel or NREL
Green H2	Carbon-free electricity
Carbon Capture	NREL or N/A
District Energy	Xcel or NREL
Strategic Electrification	NREL/Wind 50/50
Energy Efficiency	Xcel or NREL

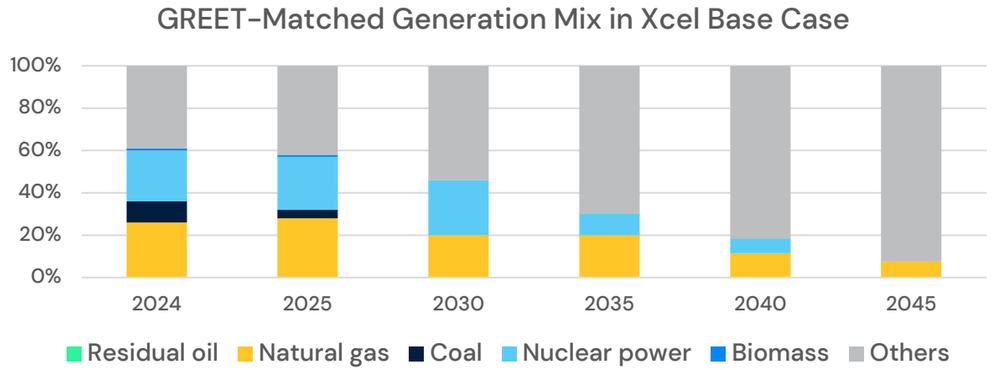
Electricity GHG details of note:

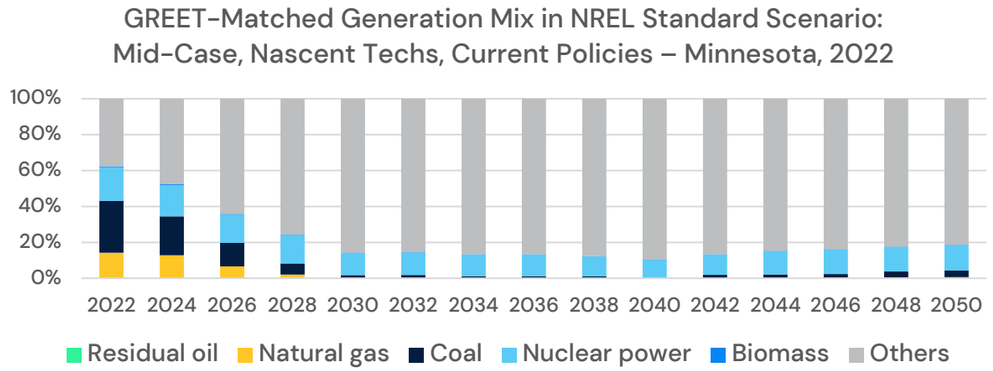
- NREL updated 2022 scenarios for current policies reflect IRA impacts
  - NREL's 2021 Standard Scenarios did not
  - Xcel IRP was filed ahead of IRA, so its electricity data does not reflect these impacts
- CNP's pilot emissions profiles reflected the impact of updated grid metrics on 5-year intervals, starting in 2025 for both NREL and Xcel data

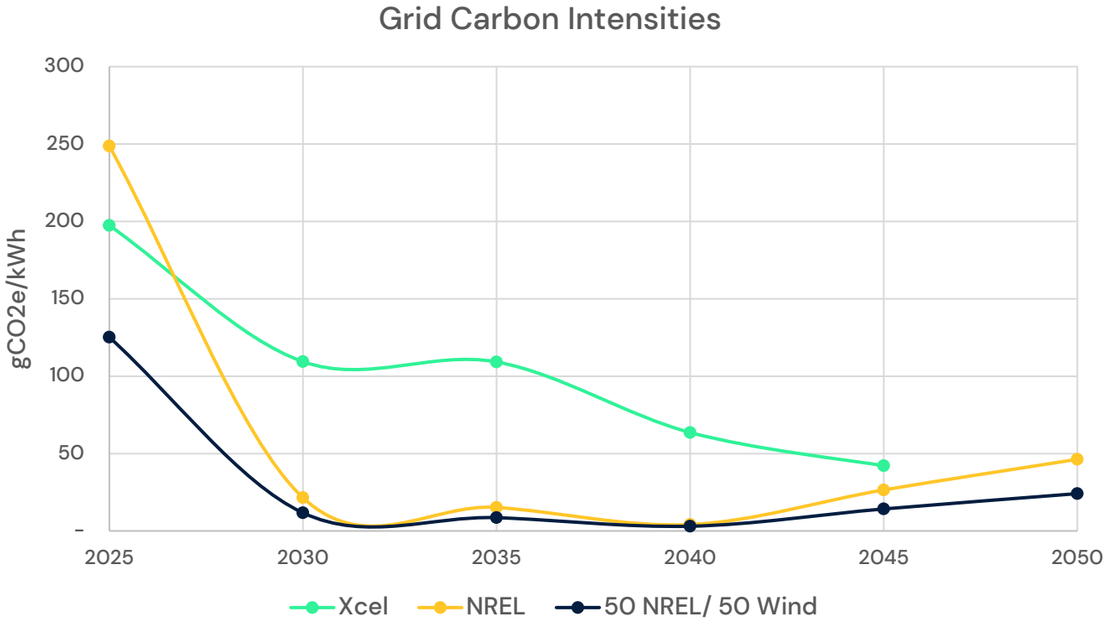
Sources: Docket No. G-999/CI-21-566, Midwest Energy Plan | Xcel Energy, Fresh Energy March 2022 filing, NREL Scenario Viewer | Standard Scenarios 2022 (nrel.gov)

Mapping Electricity Data to GREET for GHG Intensity

- Xcel Base Case and NREL Standard Scenario's generation categories must be mapped against GREET categories for GHG modeling
- Electricity generated from hydropower, solar, wind, and geothermal (grouped as "Others" in GREET) is treated as zero-emission by GREET
  - Assumes NREL's battery generation refers to stored renewable electricity based on guidance in NREL 2022 Standard Scenarios Technical Report
  - Canadian imports also assumed to be zero-emissions via NREL ReEDS Model Documentation; consistent Fresh Energy approach in their March 2022 filing







- Xcel Base Case data not available for 2050 (Midwest Energy Plan | Xcel Energy , Xcel 2020-2034 IRP: Upper Midwest Energy Plan - Reply Comments.pdf (xcelenergy.com))
- NREL 50/ Wind 50 split based on Xcel Energy's proposed methodology for calculating the GHG intensity of electricity used in strategic electrification pilots (1/13/22 CNP Filing Exhibit B)

Evaluation Framework Gaps – Carbon Capture

- Frameworks order: "When calculating the greenhouse gas intensity of a carbon capture project, utilities shall use project-specific data as available and principles consistent with Argonne GREET, unless it is demonstrated that an alternate method is appropriate."
  - GREET (Greenhouse gases, Regulated Emissions, and Energy use in Transportation) is a model meant to model transportation fuel emissions on a lifecycle basis
  - GREET lacks explicit guidance on carbon capture modeling, so the approach taken is to follow lifecycle emissions accounting principles
- Because Minnesota lacks sufficient geology for CO2 sequestration, Pilots 11 and 13 assume carbon utilization

lifecycle analysis by the University of British Columbia indicates significant lifecycle GHG emission reductions because using the byproduct from CarbinX units displaces conventional potassium carbonate's production emissions

- Assuming NO displacement credit relative to conventional concrete production
- Assuming only 60% of captured CO2 is sequestered in concrete (via CarbonCure study)

Next Steps

- Discussions and updates to the assumptions for different pilots based on feedback received
- Once the analysis of pilots is finalized, the portfolio development will begin to prioritize which pilots fit into NGIA portfolio(s)
- Additional analysis is also on-going, on aspects such as new job impacts and rate impacts
- Some additional ‘portfolio level’ costs will also need to be added to all the pilots

Discussion

-Clarifying questions
-What do you want to dig into more?
-Pilot profiles you're excited or concerned about?
-Any additional input on criteria for selecting pilot projects?

Selection of Details on Hydrogen Pilots (#7 / 8)

#7 - Green Hydrogen Blending into Natural Gas Distribution System

- Electrolyzer + Solar PV owned by CenterPoint
- 1 MW on-site solar PV + 1 MW electrolyzer
- Size A: assumes 19% capacity factor for solar generation, no grid electricity purchases
- Size B: 19% from on-site solar + grid electricity purchases to get electrolyzer to 95% capacity factor
- Grid electricity purchases through Xcel Energy's Windsource have relatively modest incremental cost ($0.0065 / kWh) and count as carbon-free under NGIA*
- Assume project leverages ITC tax credit (instead of PTC) getting 30% upfront rebate for both solar PV and electrolyzer**

#8 - Green Hydrogen Archetype - Industrial or Large Commercial Facility Electrolyzer Pilot

- Electrolyzer owned by industrial facility (CNP customer)
- Assumes 5 MW on-site electrolyzer, no on-site solar
- Archetype project conservatively assumes 38% capacity factor for electrolyzer, based on average wind capacity utilization from AEO reference case (e.g. electrolyzer would only produce hydrogen when renewable electricity could be supplied by grid)
- Different pilot sizes (A/B/C) represent additional facilities implementing the same archetype project
- Grid electricity through Xcel Energy's Windsource
- Assumes project qualifies for $3/kg PTC rebate through IRA

*From NGIA Frameworks Order: "Carbon-free electricity includes dedicated carbon-free generation, electricity purchased pursuant to a Commission approved green-tariff program, and, for approval on a case-by-case basis, other carbon-free generation supported by a demonstration that the greenhouse gas intensity of the connected electric grid is not adversely impacted."

**Inflation Reduction Act rules not yet finalized: It is still unclear whether the IRA will allow grid electricity purchases covered by RECS or green tariff programs to count towards reaching the $3/kg incentive level PTC incentive (or if will need daily or hourly load match)

Approach to R&D

Research & Development (R&D) Approach

- Relatively smaller in scale research projects or studies
- Uncertain, difficult to quantify, or nominal GHG benefits

- Initial Innovation Plan filing will:
  - Include investments up to 10% of total incremental Innovation Plan costs for R&D
  - Specify R&D projects to be funded in first two years of plan (these will be presented in the third public engagement meeting)
    - Prioritize foundational activities and innovative resources underrepresented in Pilot Shortlist
  - Reserve funding for R&D in future years in a general R&D budget

- Annual Status Reports will:
  - Report progress/results of completed R&D
  - Propose R&D to be implemented in the upcoming year

- External R&D proposals accepted by CenterPoint on an on-going basis for consideration

Discussion

CIP/NGIA Coordination

Commission Approved Requirements

To be eligible for inclusion in innovation plans, utilities must:

a. **Demonstrate that proposed energy efficiency and strategic electrification investments are not included in the utility's current conservation improvement program (CIP) Triennial Plan, and state whether the utility does or does not intend to include any of the proposed investments in future CIP Triennial Plans;**

b. **For proposed energy efficiency and strategic electrification investments in measures that have been included in past CIP plans, provide historical measure level performance data since 2010; and**

c. **Clearly demonstrate why the proposed energy efficiency and strategic electrification investments could not reasonably be included in the utility's conservation improvement program.**

Neighborhood Weatherization Blitzes

- Create an entirely new weatherization program under NGIA, mirroring CIP incentives
- Test marketing approaches under NGIA to drive existing/new weatherization incentives (Utility, State, Federal)

- What are the incremental energy savings assumptions for Blitzes (above and beyond CIP, i.e., how many additional weatherization projects are completed as a result of the Blitzes' outreach efforts)? Unknown
- What is the difference between an NGIA weatherization project and CIP weatherization project? Must avoid competition/customer confusion/duplicative services
- How will energy savings be tracked and accounted for? CIP is subject to cost-effectiveness thresholds, energy savings goals and also has opportunity for financial incentive tied to savings.

- Avoids customer confusion and competition between NGIA/CIP programs
- Simplifies NGIA/CIP implementation: tracking participation and spending and reporting
- NGIA provides a testing ground for eventual inclusion in CIP
- NGIA R&D because unknown incremental ghg/energy savings benefits, or potentially zero GHG savings credited to NGIA if incentives paid from CIP
- There is enough R&D funding that it does not limit the contemplated program size

Industrial GHG Audit Program

- Incremental costs to expand Process Efficiency and Commercial Efficiency to include identification of non-CIP measures to be paid for through NGIA

- Example: Industrial electric heat pumps may often be cost-ineffective in CIP

- First, determine if measure could work in CIP as a custom measure or otherwise
  - If it can, then the CIP process will be followed and won't proceed under NGIA
- Second, determine if the measure would cost under a certain $/ton on a lifetime basis
  - Specific $/ton value TBD but will be included in filing
  - If passes this screen, CenterPoint would pay a rebate amount for measure installation
- Third, all measures rebated through this NGIA pilot would be subject to third-party evaluation to verify savings

Discussion

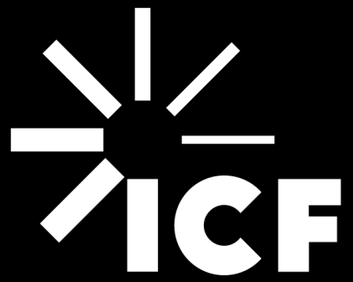
Next Steps

Next Steps

- Plan for 3rd meeting is to present a big-picture plan for the filing
  - Will include rate impacts

- CenterPoint Energy continues to welcome feedback until March 24th, after which it will be harder to incorporate

- Willing to have focused discussions with any parties that would like it



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Appendix 1:

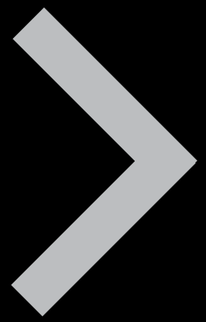
Slides from Feb 24th stakeholder meeting

Summary of Draft Detailed Analysis on Pilots Under Consideration for CenterPoint Energy's Innovation Plan

Peter Narbaitz
Director, Energy Markets & Planning, ICF

2/24/2023

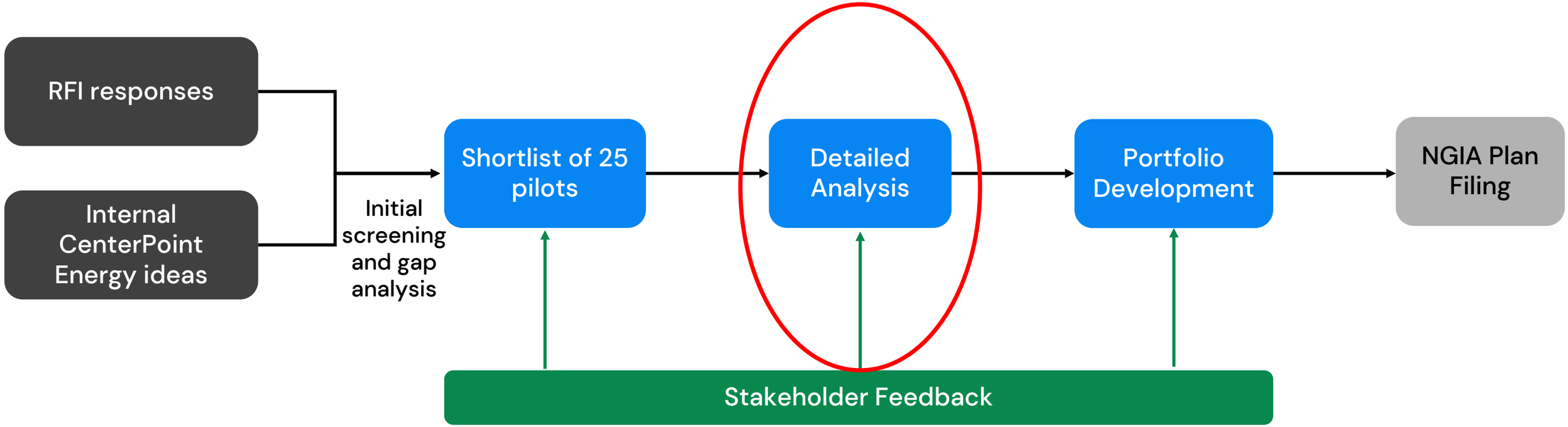
Agenda



- Overview of NGIA innovation plan development process and detailed analysis
- Review of pilot project designs
- Break
- Review of pilot project analysis framework and high-level draft results
- Open discussion
- Next steps

Overview of NGIA Innovation Plan Development Process and Detailed Analysis

Overview of NGIA Innovation Plan Development Process



Focus of this second stakeholder meeting is the draft detailed analysis: should any of the pilot structures (e.g. programmatic approach) or assumptions (e.g. costs, energy savings, GHGs, etc) be refined before we proceed to develop potential portfolios?

Reminder of pilot shortlist

#	Pilot	Innovation Category
1	RNG Proposal - Anaerobic Digestion of Organic Materials	RNG/Biogas
2	RNG Proposal -Anaerobic Digestion of East Metro Food Waste	RNG/Biogas
3	RNG Archetype – WRRF	RNG/Biogas
4	RNG Archetype - Dairy Manure	RNG/Biogas
5	RNG Archetype – Food Waste	RNG/Biogas
6	RNG Archetype - Landfill Gas	RNG/Biogas
7	Green Hydrogen Blending into Natural Gas Distribution System	Hydrogen/Ammonia
8	Green Hydrogen Archetype - Industrial Facility Electrolyzer Pilot	Hydrogen/Ammonia
9	Industrial Methane and Refrigerant Leak Reduction Program	Carbon Capture
10	Urban Tree Carbon Offset Program	Carbon Capture
11	Archetype Carbon Capture Project for Industrial Facility	Carbon Capture
12	Carbon Capture through Methane Pyrolysis at Industrial Facility	Carbon Capture
13	Carbon Capture for Commercial Buildings	Carbon Capture
14	New Networked Geothermal Systems Pilot	District Energy
15	Decarbonizing Existing District Energy Systems	District Energy (plus Carbon Capture, Strategic Electrification, Energy Efficiency, RNG/Biogas, Power-to-Hydrogen)
16	New District Energy System	District Energy (plus Carbon Capture, Strategic Electrification, Energy Efficiency, RNG/Biogas, Power-to-Hydrogen)
17	Industrial Electrification Incentive Program	Strategic Electrification
18	Commercial hybrid heating pilot	Strategic Electrification
19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	Strategic Electrification (plus Energy Efficiency)
20	Small/medium business GHG audit pilot	Energy Efficiency (plus Carbon Capture, Strategic Electrification)
21	Residential Gas Heat Pump	Energy Efficiency
22	Gas Heat Pump for Commercial Buildings	Energy Efficiency
23	Neighborhood Weatherization Blitzes	Energy Efficiency
24	Solar Thermal Heating for C&I	Energy Efficiency
25	Industrial GHG Audit Pilot	Energy Efficiency (plus Carbon Capture, Strategic Electrification, Power-to-Hydrogen, RNG/Biogas)

What are we talking about when we say detailed analysis?

- For example, the number of participants, level of gas savings, costs (equipment, installation, utility program admin, incentives, etc.), increase in electricity consumption, measure lifetime, RNG carbon intensity, etc.
- These 'pilot-level parameters' will be combined with 'system-level parameters' defined by NGIA legislation (e.g. gas retail rate, commodity cost, GHG-intensity of electricity, discount rate, etc.) in order to complete the cost-benefit analysis

	Pilot 1	Pilot 2	Pilot 3
Perspectives			
NGIA Utility Perspective			
NGIA Participants Perspective (including specific impacts on low- and moderate-income participants)			
NGIA Nonparticipating Customers Perspective (including specific impacts on low- and moderate-income customers)			
Effects on Other Energy Systems and Energy Security			
Environment			
GHG Emissions			
Other Pollution (including any environmental justice costs or benefits)			
Waste reduction and reuse (including reduction of water use)			
Policy (e.g., natural gas throughput, renewable energy goals)			
Socioeconomic			
Net Job Creation			
Economic Development			
Public Co-Benefits			
Market Development			
Innovation			
Direct Innovation Support			
Resource Scalability and Role in a Decarbonized System			

Pilot Profile spreadsheet available to all stakeholders

- Each of the pilots has a tab in the spreadsheet
- Orange cells contain pilot-level inputs to be pulled into analysis
- Tabs also sometimes contain calculations specific to the individual pilot
- Pilot qualitative evaluation details also captured at bottom of profiles
- Key parameters include:
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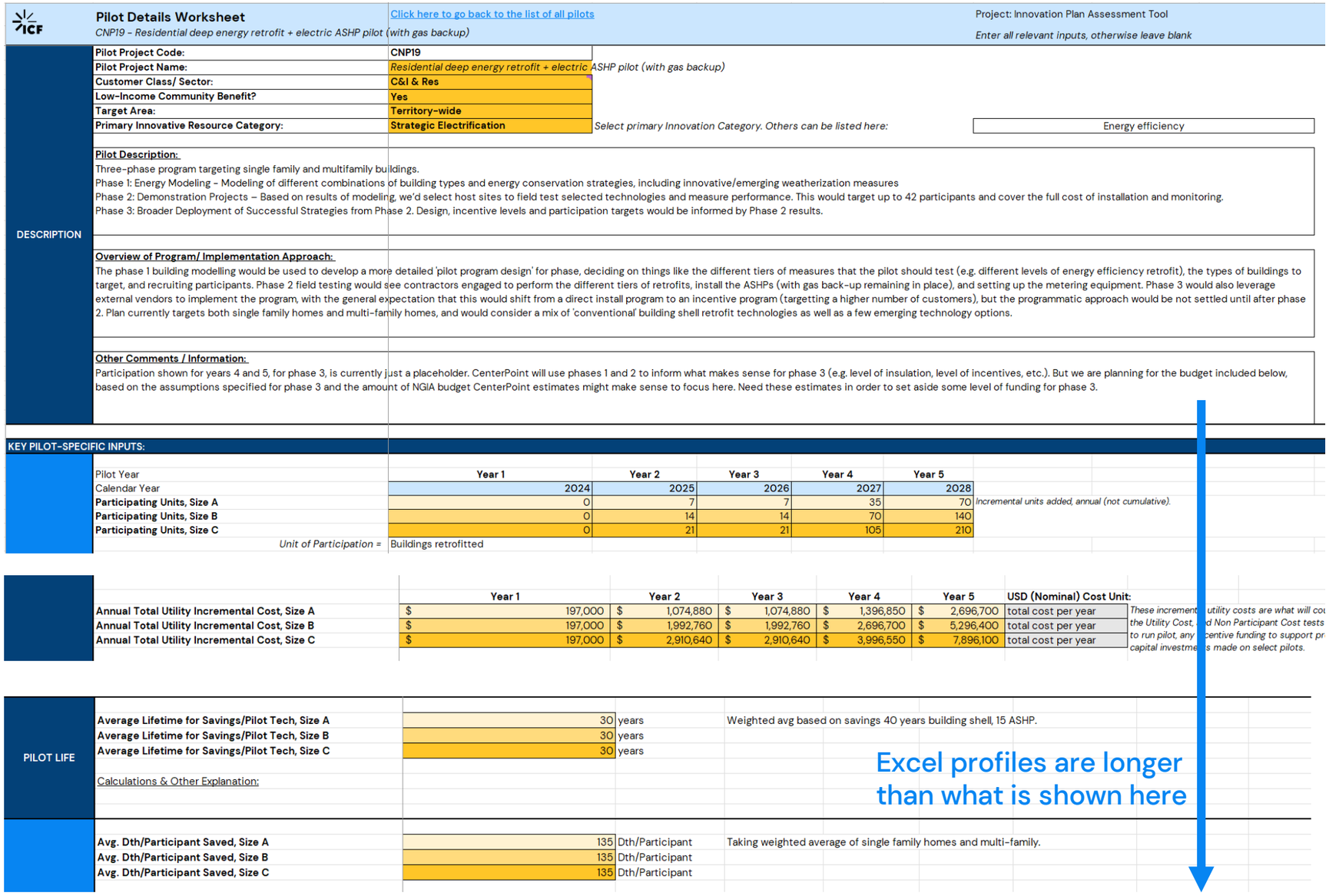


Pilot Details Worksheet
CNP19 - Residential deep energy retrofit + electric ASHP pilot (with gas backup)

Click here to go back to the list of all pilots

Project: Innovation Plan Assessment Tool
Enter all relevant inputs, otherwise leave blank

DESCRIPTION

Pilot Project Code:	CNP19
Pilot Project Name:	*Residential deep energy retrofit + electric ASHP pilot (with gas backup)*
Customer Class/ Sector:	C&I & Res
Low-Income Community Benefit?	Yes
Target Area:	Territory-wide
Primary Innovative Resource Category:	Strategic Electrification

Select primary Innovation Category. Others can be listed here: Energy efficiency

Pilot Description:
Three-phase program targeting single family and multifamily buildings.
Phase 1: Energy Modeling - Modeling of different combinations of building types and energy conservation strategies, including innovative/emerging weatherization measures
Phase 2: Demonstration Projects – Based on results of modeling, we'd select host sites to field test selected technologies and measure performance. This would target up to 42 participants and cover the full cost of installation and monitoring.
Phase 3: Broader Deployment of Successful Strategies from Phase 2. Design, incentive levels and participation targets would be informed by Phase 2 results.

Overview of Program/ Implementation Approach:
The phase 1 building modelling would be used to develop a more detailed 'pilot program design' for phase, deciding on things like the different tiers of measures that the pilot should test (e.g. different levels of energy efficiency retrofit), the types of buildings to target, and recruiting participants. Phase 2 field testing would see contractors engaged to perform the different tiers of retrofits, install the ASHPs (with gas back-up remaining in place), and setting up the metering equipment. Phase 3 would also leverage external vendors to implement the program, with the general expectation that this would shift from a direct install program to an incentive program (targetting a higher number of customers), but the programmatic approach would be not settled until after phase 2. Plan currently targets both single family homes and multi-family homes, and would consider a mix of 'conventional' building shell retrofit technologies as well as a few emerging technology options.

Other Comments / Information:
Participation shown for years 4 and 5, for phase 3, is currently just a placeholder. CenterPoint will use phases 1 and 2 to inform what makes sense for phase 3 (e.g. level of insulation, level of incentives, etc.). But we are planning for the budget included below, based on the assumptions specified for phase 3 and the amount of NGIA budget CenterPoint estimates might make sense to focus here. Need these estimates in order to set aside some level of funding for phase 3.

KEY PILOT-SPECIFIC INPUTS:

Pilot Year	Year 1	Year 2	Year 3	Year 4	Year 5	
Calendar Year	2024	2025	2026	2027	2028	
Participating Units, Size A	0	7	7	35	70	*Incremental units added, annual (not cumulative).*
Participating Units, Size B	0	14	14	70	140	
Participating Units, Size C	0	21	21	105	210	
Unit of Participation =	Buildings retrofitted					

	Year 1	Year 2	Year 3	Year 4	Year 5	USD (Nominal) Cost Unit:
Annual Total Utility Incremental Cost, Size A	$ 197,000	$ 1,074,880	$ 1,074,880	$ 1,396,850	$ 2,696,700	total cost per year
Annual Total Utility Incremental Cost, Size B	$ 197,000	$ 1,992,760	$ 1,992,760	$ 2,696,700	$ 5,296,400	total cost per year
Annual Total Utility Incremental Cost, Size C	$ 197,000	$ 2,910,640	$ 2,910,640	$ 3,996,550	$ 7,896,100	total cost per year

These increment utility costs are what will co the Utility Cost, d Non Participant Cost tests to run pilot, any centive funding to support pr capital investme s made on select pilots.

PILOT LIFE

Average Lifetime for Savings/Pilot Tech, Size A	30	years	Weighted avg based on savings 40 years building shell, 15 ASHP.
Average Lifetime for Savings/Pilot Tech, Size B	30	years	
Average Lifetime for Savings/Pilot Tech, Size C	30	years	

Calculations & Other Explanation:

Avg. Dth/Participant Saved, Size A	135	Dth/Participant	Taking weighted average of single family homes and multi-family.
Avg. Dth/Participant Saved, Size B	135	Dth/Participant	
Avg. Dth/Participant Saved, Size C	135	Dth/Participant	

Excel profiles are longer than what is shown here

Review of pilot project designs

RNG and biogas pilots

#	Pilot	Description	Pilot Size	Pilot Scale (Dth/year)	Estimated Pilot Budget (total over pilot period*)
1	Hennepin County RNG Project - Anaerobic Digestion of Organic Materials	An RFI respondent (Hennepin County) is planning to build an anaerobic digestion (AD) facility that would be capable of processing at least 26,000 tons per year of organics to produce RNG and soil/agricultural products. CenterPoint Energy would enter into a contract with this producer to purchase a portion of the RNG - including the commodity and environmental attributes.	A	8,288	$ 608,263
			B	41,440	$ 2,578,513
			C	82,880	$ 5,041,326
2	Ramsey/Washington R&E RNG Project - Anaerobic Digestion of East Metro Food Waste	An RFI respondent (Ramsey/Washington Recycling & Energy) is planning a system to recover organics from municipal solid waste and divert these materials to a future anaerobic digestion facility to produce RNG. CenterPoint Energy would enter into a contract with the RNG producer to purchase a portion of the RNG - including the commodity and environmental attributes.	A	18,168	$ 1,195,458
			B	95,762	$ 5,806,927
			C	190,767	$ 11,453,164
3	RNG Archetype – Water Resource Recovery Facility (WRRF)	For Pilots 3-6, the "RNG Archetypes", CenterPoint Energy would purchase RNG - including the commodity and environmental attributes - from multiple RNG producers that have developed RNG projects using a variety of feedstocks. CenterPoint may also support RNG project development by directly investing in the biogas upgrading equipment (required to produce pipeline-quality RNG) for a limited number of RNG projects, to reduce developers' required capital. We have developed an estimate of expected carbon intensity for each type of feedstock to inform our analysis of potential GHG reductions from a portfolio of RNG purchases. For the "RNG Archetypes" CenterPoint would plan to hold a competitive RFP process to assess actual RNG projects, ensure the company receives the best possible pricing / emission reductions, and then would select the ultimate portfolio of projects funded through the first NGIA plan.	A	10,000	$ 789,220
			B	300,000	$ 19,245,230
			C	600,000	$ 38,317,597
4	RNG Archetype - Dairy Manure		A	10,000	$ 1,989,220
			B	100,000	$ 18,582,077
			C	200,000	$ 37,006,199
5	RNG Archetype – Food Waste		A	10,000	$ 949,220
			B	250,000	$ 20,079,442
			C	500,000	$ 39,989,747
6	RNG Archetype - Landfill Gas		A	100,000	$ 4,537,699
			B	450,000	$ 19,742,595
			C	900,000	$ 39,301,145

Power-to-hydrogen pilots

#	Pilot	Description	Pilot Size	Pilot Scale (Electrolyzer Capacity Installed)	Estimated Pilot Budget (total over pilot period*)
7	Green Hydrogen Blending into Natural Gas Distribution System	CenterPoint Energy would develop a second hydrogen blending project. The project would be built on CenterPoint Energy property and would include installation of dedicated photovoltaic solar panels to power the electrolyzer. Hydrogen produced from the electrolyzer would be injected directly into the CenterPoint Energy distribution system as it is produced. CenterPoint Energy would own all components of installed system, including electrolyzer and PV systems. This represents a next phase in CenterPoint Energy's hydrogen production work, gaining experience using dedicated renewables to produce hydrogen and in turn drive down the costs of the blending projects.	A	1 MW	$2,131,530
			B	1 MW	$4,693,620
			C	**	
8	Green Hydrogen Archetype - Industrial Facility Electrolyzer Pilot	CenterPoint Energy would offer incentives covering a portion (100%, up to a max of $1.5 million) of the equipment and installation costs of green hydrogen production systems (electrolyzers) for on-site use by industrial or large commercial customers, displacing natural gas use by these facilities. These systems would be installed onsite for 1-3 customers, who would own and operate the systems. CenterPoint has not yet identified specific customers for the projects, so a 5 MW 'archetype' was chosen to assess to the pilot for the time being, considering that a number of existing customers should be large enough for that size of electrolyzer (some could be higher). The projects would be expected to purchase renewable electricity from grid to supply the electrolyzers, and so even with potential IRA incentives and the upfront funding from CenterPoint Energy, participants in this pilot would be committing to a considerable cost increase in their electricity supply in order to decarbonize (part of) their heating load. Some additional programmatic support to identify potential sites and assist with feasibility studies for the projects is also envisioned. CenterPoint Energy would create a measurement and verification plan to monitor system performance for a period of time following installation.	A	5 MW (1 facility)	$1,076,997
			B	10 MW (2 facilities)	$2,163,128
			C	15 MW (3 facilities)	$3,429,787

Carbon capture pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Pilot Budget (total over pilot period)
9	Industrial Methane and Refrigerant Leak Reduction Program	Large industrial and commercial CenterPoint Energy customers would be encouraged to participate in this program, targeting between 25-50 new facilities per year. In their first year of participation, facilities would receive a 'sweep survey' to identify and quantify behind the meter methane leaks, as well as planning support to establish a systematic leak repair program. These services would be provided by a 3rd party vendor and fully funded through the pilot. The program would also offer incentives to partially offset the costs of repairing identified leaks. Program participants would also receive follow-up 'sweep surveys' every 2 years of the 5-year NGIA framework, as an approach to testing how well the impacts can be sustained. There is significant uncertainty on the level of leaks, as well as expectations that leak levels can vary widely between facilities. To that end, we have made conservative estimates of leak reductions, and ultimately actual leak levels (and impact of repairs) will be documented through the initial and follow up leak sweeps.	A	50 facilities	$ 1,187,842
			B	125 facilities	$ 2,466,290
			C	250 facilities	$ 4,687,580
10	Urban Tree Carbon Offset Program	CNP would purchase and retire City Forest Credits (CFC) Carbon+ Credits that are generated from locally planted urban trees. These also help improve air quality, reduce stormwater runoff, reduce energy costs, and cool urban heat islands. Pilot scales represent 25%, 50%, and 100% of the credits expected to be available from the RFI respondent.	A	4,500 credits	$ 292,750
			B	9,000 credits	$ 536,500
			C	18,000 credits	$ 1,024,000
11	Archetype Carbon Capture Project for Industrial Facility	CenterPoint Energy would offer incentives covering a portion (100% up to a max of $1.5 million) of the equipment and installation costs for carbon capture systems at 1 to 3 industrial or large commercial customers. These customers would own and operate the systems. CenterPoint has not yet identified specific customers for the projects, so an 'archetype' project size was chosen to assess to the pilot for the time being, considering that a number of existing customers should be large enough for that size of carbon capture unit here (some could be higher). Some additional programmatic support to identify potential sites, recruit participants, and assist with feasibility and Life Cycle Assessment (LCA) emissions studies for the projects is also envisioned. The LCA support is particularly important given that Minnesota is not in proximity to the main regions for geological sequestration of carbon, and so the focus will likely be on carbon 'utilization'. CenterPoint Energy would create a measurement and verification plan to monitor system performance for a period of time following installation.	A	1 facility	$ 2,172,254
			B	2 facilities	$ 4,156,908
			C	3 facilities	$ 6,141,561
12	Carbon Capture through Methane Pyrolysis at Industrial Facility	This has been re-assigned to be considered with the R&D projects, given the lack of data about technology performance and lifecycle carbon emission reductions from the by-product use.			
13	Carbon Capture for Commercial Buildings	CenterPoint Energy would offer prescriptive rebates to commercial customers that install CarbinX carbon capture systems at their facilities. These small-scale carbon capture units connect to existing natural-gas heating equipment, capture CO2 gas and convert it to a solid potassium carbonate, and work as an economizer, recapturing waste heat for use in the building (e.g. reducing natural gas consumption in addition to the carbon capture). The program would target up to 300 customers per year. Customers would own and operate CarbinX units, with standard support from the manufacturer. In addition to the manufacturer maintaining the units, they arrange for the potassium carbonate by-product to be collected on a regular basis, with customers earning revenue for its sale.	A	340 CarbinX systems	$ 1,970,677
			B	675 CarbinX systems	$ 3,675,284
			C	1350 CarbinX systems	$ 7,245,568

District energy pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget (total over pilot period*)
14	New Networked Geothermal Systems Pilot	CenterPoint Energy would explore the development of a new "Networked Geothermal" system to provide building heating and cooling for a neighborhood(s) in our service territory. This involves installation of a new 'distributed' geothermal system where individual customers would have a heat pump accessing a common water loop (instead of their own geothermal loops, or ASHPs). This pilot includes a feasibility study, planning and modeling, site selection, design and construction, and measurement and verification of a new networked geothermal system. The proposed approach follows pilots being planned by gas utilities, including National Grid, in Massachusetts. CenterPoint Energy would own and operate the geothermal shared loop system, which would be installed in phases over the 5-year program period. Entire sections of the neighborhood(s) would be shifted off the natural gas distribution system at the same time. In addition to converting gas space and water heating to ground source heat pumps drawing on the shared loop, any other gas appliances would be converted to electric appliances. The pilot program would cover all of these upfront costs for customers, requiring only a roughly 5% co-payment / participant fee from customers in the participating neighborhood. Neighborhood(s) including a low-income community with varied loads (e.g. residential, retail, office, grocery, etc.) would be preferred.	A	200-ton system capacity	$ 2,791,264
			B	500-ton system capacity	$ 6,207,158
			C	1000-ton system capacity	$ 11,188,673
15	Decarbonizing Existing District Energy Systems**	CNP would provide incentives to help our customers decrease carbon emissions of their existing district energy systems via a variety of tactics (converting to hot water pipes, using green hydrogen, ground source heat pumps, renewable natural gas, carbon capture). Incentives would support feasibility or engineering studies and/or project implementation. CenterPoint Energy would provide an incentive in support of feasibility/engineering studies looking at opportunities to reduce emissions from existing district energy customers, with the utility planning to cover 20% of the total study cost up to a cap of $30,000. While incentive approaches/structures to encourage customers to adopt the findings of these studies are still under consideration, CenterPoint is considering leveraging a similar approach to CIP custom programs, with incentives determined based on the minimum of three cost caps (in CIP, this is 1 year payback, 50% of incremental costs, or $5/Dth annual gas savings). CenterPoint expects the $/Dth cap to be the limiting factor for most projects considered under NGIA, and is considering higher incentive levels than the $5/Dth for NGIA incentives. Projects that are eligible for rebates in CIP would not be eligible for these NGIA rebates.	A	1 district energy system project	$189,180
			B	2 district energy system projects	$676,830
			C	3 district energy system projects	$1,511,939
16	New District Energy System	CenterPoint Energy would provide incentives for existing natural gas customers to install new centralized district energy systems using geothermal heat pumps or decarbonized gases. Depending on the specific approach, these customers could fall under district energy or strategic electrification categories. The cost/savings estimates included for this pilot are based on a specific RFI respondent that has already completed an engineering study for such a conversion. The additional participation units included in the pilot are an option to support additional customers to study and implement a similar approach over the 5-year NGIA plan window. The plan for study and implementation incentives would be the same as for pilot 15.	A	1 new district energy system	$ 133,160
			B	2 new district energy systems	$ 271,690
			C	3 new district energy systems	$ 454,590

Strategic electrification pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget (total over pilot period)
17	Industrial Electrification Incentive Program	Vendor-implemented program that would pilot industrial electric heat pumps to improve efficiency of low-to-medium temperature industrial processes. Program would target up to 9 industrial customers and would cover the full cost of the equipment installation. Program would include a monitoring period to collect data on project performance. Planned phases: • Phase 1: The program would begin with a study looking at technical potential, heat pump technologies to be used, and identification of potential customers who could pilot heat pump technologies. • Phase 2: Installation at 3 - 9 facilities, including system design, installation and commissioning • Phase 3: Measurement and verification of system performance, and analysis of results.	A	3 facilities	$ 520,807
			B	6 facilities	$ 843,778
			C	9 facilities	$ 1,122,549
18	Commercial hybrid heating pilot	Vendor-implemented program that would target small-to-medium commercial facilities. The program would provide incentives to retrofit existing HVAC rooftop units with hybrid heating systems. Hybrid heating systems use electric heat pumps to heat the building on warmer days, and switch to traditional gas heating under a specified outdoor air temperature. The programmatic approach used here is based on a similar program run by ConEd in New York. This would be a direct install program from the perspective of vendor handling all aspects of the equipment installation, but the customer would pay the bulk of the vendor costs (60%), with CenterPoint Energy covering the remaining portion of installation costs (40%) and some program administration costs. A significant budget for monitoring/metering, analysis, and reporting on the system results is also included in the pilot funding. This pilot would be conducted in coordination with ETA, which has chosen hybrid rooftop units as one of its focus technologies. ETA is focused on driving market transformation, but does not have the ability to offer customer incentives such as those included in this NGIA pilot, so there is a lot of natural synergy between both efforts.	A	70 facilities	$ 3,782,865
			B	135 facilities	$ 6,454,988
			C	200 facilities	$ 9,127,110
19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	Three-phase pilot program targeting single family and multi-family buildings to test a combination of deep energy retrofits and air-source heat pumps with gas back-up. Planned phases of pilot are: • Phase 1: Study Scoping & Program Design - Modeling of different combinations of building types and energy conservation strategies, including innovative/emerging weatherization measures, and finalization of different 'Tiers' of energy retrofit for the pilot testing • Phase 2: Demonstration Projects - Based on results of phase 1 modeling, we'd select host sites to field test selected technologies and measure performance. Pilot would cover the full cost of installation and monitoring, targeting 14 to 42 buildings. • Phase 3: Broader Deployment of Successful Strategies from Phase 2 - Envision a shift to an on-going incentive program (e.g. not covering full installation costs), targeting 105 - 315 buildings. Final design, incentive levels, and participation targets would be informed by Phase 2 results.	A	119 buildings	$ 6,460,093
			B	238 buildings	$ 12,215,187
			C	357 buildings	$ 17,970,280

Energy efficiency pilots – part 1

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget (total over pilot period)
20	Small/medium business GHG audit pilot	This pilot would expand the scope of CenterPoint Energy's Natural Gas Energy Analysis (NGEA) CIP energy audit to include audit information related to a business' GHG emissions and an assessment for additional GHG reduction measures such as electric air source heat pumps or hybrid heating systems, CarbinX carbon capture units, industrial heat pumps or solar thermal walls. The program would offer incentives for these measures (consistent with other NGIA program offerings), and recognize businesses who implement multiple measures as "energy leaders". Participation levels would be consistent with NGEA program goals, at approximately 250-300 customers per year.	A	992 GHG audits (5% implement)	$2,151,769
			B	1,240 GHG audits (5% implement)	$2,622,211
			C	1,488 GHG audits (5% implement)	$3,092,653
21	Residential Gas Heat Pump	Gas heat pumps represent an emerging technology category with the potential to replace residential furnaces and water heaters, offering an opportunity to lower GHG emissions and customer costs through higher efficiency. Gas heat pumps have achieved over 1.3 system Coefficient of Performance (COP) in laboratory conditions. While several commercial-sector gas heat pumps are already available, there are four manufacturers aiming to deploy residential systems in 2023-24. An initial pilot phase would include market research and analysis to prioritize which gas heat pump units should be included in the field testing. Outreach would be conducted to recruit CenterPoint customers to participate in the pilot, and contractors would be engaged to train them to install and maintain the heat pumps, with support from equipment manufacturers. The installations would be metered and trial data analyzed to develop reporting metrics that would better inform the opportunity for gas heat pumps to be part of future CIP or NGIA programs. This pilot would cover all the installation costs for participating customers.	A	6 units	$491,446
			B	10 units	$609,076
			C	20 units	$903,152
22	Gas Heat Pump for Commercial Buildings	This pilot involves a demonstration of gas heat pumps offering space and/or water heating for commercial buildings (particularly in cold climates). Natural gas fired heat pumps are an emerging new technology that allows natural gas heating, cooling, and water heating to exceed a COP of 1 and increase efficiency of gas end uses. There are many different types of gas fired heat pump under development, at various stages of readiness, and many different application types of this technology. Some companies have commercially available gas heat pumps in market, and they are typically utilized in commercial buildings with high hot water consumption such as multifamily, small commercial and/or recreational facilities. As the technology is new to market and is not yet considered cost effective for CIP, this pilot involves demonstration site installations with equipment monitoring, energy savings documentation, understanding of costs and benefits and a resulting case study. Some sites could be available for site walk-throughs so that contractors, design firms and other technology specifiers can gain first-hand experience and exposure to the technology. GAHPs are included in the Minnesota Efficient Technology Accelerator's (ETA) starter portfolio. That is a market transformation initiative that will work to accelerate adoption of emerging technologies. This NGIA pilot field demonstration would complement the strategy and planning work that will be completed within the ETA program, and could be completed in coordination with ETA.	A	3 units	$680,257
			B	6 units	$1,139,825
			C	9 units	$ 1,661,893

Energy efficiency pilots – part 2

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget (total over pilot period)
23	Neighborhood Weatherization Blitzes	The "Neighborhood weatherization blitzes" proposes an intensive marketing and outreach approach to increase the participation in our existing CIP weatherization offerings. There is uncertainty in the effectiveness of this approach and start-up requires notable time and resource investment, so we will start with a Research & Development project to design and test different outreach campaigns to evaluate their effectiveness for consideration in CIP.			
24	Solar Thermal Heating for C&I	This pilot would offer incentives for customers who install transpired solar air systems, which help facilities that have large make-up air loads reduce their energy consumption. The pilot would offer commercial and industrial customers an incentive to partially offset the cost to install the solar wall. This assumes that the projects in question, which have relatively high upfront costs, would not be cost-effective enough to qualify for any CIP incentives (if any projects did qualify for CIP they would be directed to that program instead of NGIA). Support for initial feasibility study is also included. While incentive approaches/structures to encourage customers to adopt the findings of these studies are still under consideration, CenterPoint is considering leveraging a similar approach to CIP custom programs, with incentives determined based on the minimum of three cost caps (in CIP, this is 1 year payback, 50% of incremental costs, or $5/Dth annual gas savings). CenterPoint expects the $/Dth cap to be the limiting factor for most projects considered under NGIA, and is considering higher incentive levels than the $5/Dth for NGIA incentives. Projects that are eligible for rebates in CIP would not be eligible for these NGIA rebates.	A	10 projects	$ 329,495
			B	15 projects	$ 469,743
			C	25 projects	$ 750,238
25	Industrial GHG Audit Pilot	Expansion of existing CIP Process Efficiency and Commercial Efficiency programs. This would build off the existing CIP programs, enhancing those energy audits to include GHG emissions context/data, as well as emission reduction opportunities. Additional GHG reduction measures might include electric heat pumps or hybrid heating systems, CarbinX carbon capture units, industrial heat pumps or solar thermal walls. Audit participation levels would be consistent with Process Efficiency and Commercial Efficiency. The program would offer specialized incentives to help customers implement audit recommendations. A new 'custom incentive stream' would be established for specific types of technologies that have not traditionally been cost-effective under CIP but could leverage funding from NGIA to help them proceed. Incentive levels expected to take a similar approach to outline in pilot 24 above. There are a number of types of opportunities identified in past CIP audits, where recommendations are not typically implemented. The focus categories would be: 1. Electric heat pumps for certain process hot water needs (including reviewing and applying appropriate new technologies) 2. Heat recovery opportunities for process hot water/ process cooling and winter makeup air heating 3. Process efficiency improvements through improved process heat exchange / integration	A	5 projects	$ 945,005
			B	10 projects	$ 1,277,010
			C	15 projects	$ 1,609,015

Q&A

Break

Review of pilot project analysis high-level draft results

-Draft quantitative results
-Qualitative implications
-R&D plan

Pilot names

Pilot Key / #	Short-Hand Name	Full Pilot Name
CNP01	Hennepin County RNG	Hennepin County RNG Project - Anaerobic Digestion of Organic Materials
CNP02	Ramsey-Washington RNG	Ramsey-Washington RNG Project - Anaerobic Digestion of East Metro Food Waste
CNP03	RNG Archetype – WRRF	RNG Archetype – WRRF
CNP04	RNG Archetype - Dairy	RNG Archetype - Dairy Manure
CNP05	RNG Archetype - Food Waste	RNG Archetype – Food Waste
CNP06	RNG Archetype - Landfill Gas	RNG Archetype - Landfill Gas
CNP07	Hydrogen Blending	Green Hydrogen Blending into Natural Gas Distribution System
CNP08	Industrial Hydrogen	Green Hydrogen Archetype - Industrial or Large Commercial Facility Electrolyzer Pilot
CNP09	Industrial Methane Leaks	Industrial Methane and Refrigerant Leak Reduction Program
CNP10	Urban Tree Offsets	Urban Tree Carbon Offset Program
CNP11	Industrial Carbon Capture	Archetype Carbon Capture Project for Industrial or Large Commercial Facility
CNP13	Commercial Carbon Capture	Carbon Capture Rebates for Commercial Buildings
CNP14	Networked Geothermal	New Networked Geothermal Systems Pilot
CNP15	Existing District Energy	Decarbonizing Existing District Energy Systems
CNP16	New District Energy	New District Energy System
CNP17	Industrial Electrification	Industrial Electrification Incentive Program
CNP18	Commercial Hybrid Heating	Commercial hybrid heating pilot
CNP19	Res. Deep Energy Retrofits	Residential deep energy retrofit + electric ASHP pilot (with gas backup)
CNP20	Sm./Med C&I GHG Audit	Small/medium business GHG audit pilot
CNP21	Res. Gas Heat Pumps	Residential Gas Heat Pump
CNP22	Com. Gas Heat Pumps	Gas Heat Pump for Commercial Buildings
CNP24	C&I Solar Thermal	Solar Thermal Heating for C&I
CNP25	Large C&I GHG Audit	Industrial and Large Commercial GHG Audit Pilot

Lifetime GHG emission reductions

This metric represents the net reduction in greenhouse gas emissions over the lifetime of the measures implemented in a pilot. While the relevant types of emissions vary by pilot, the general components are 1) net emissions reductions from project-related changes in consumption of natural gas and electricity, and 2) reduced emissions from pilot-specific lifecycle emissions calculations (e.g. carbon intensity of RNG, carbon capture savings, etc.). More specifics on the calculations are provided below.

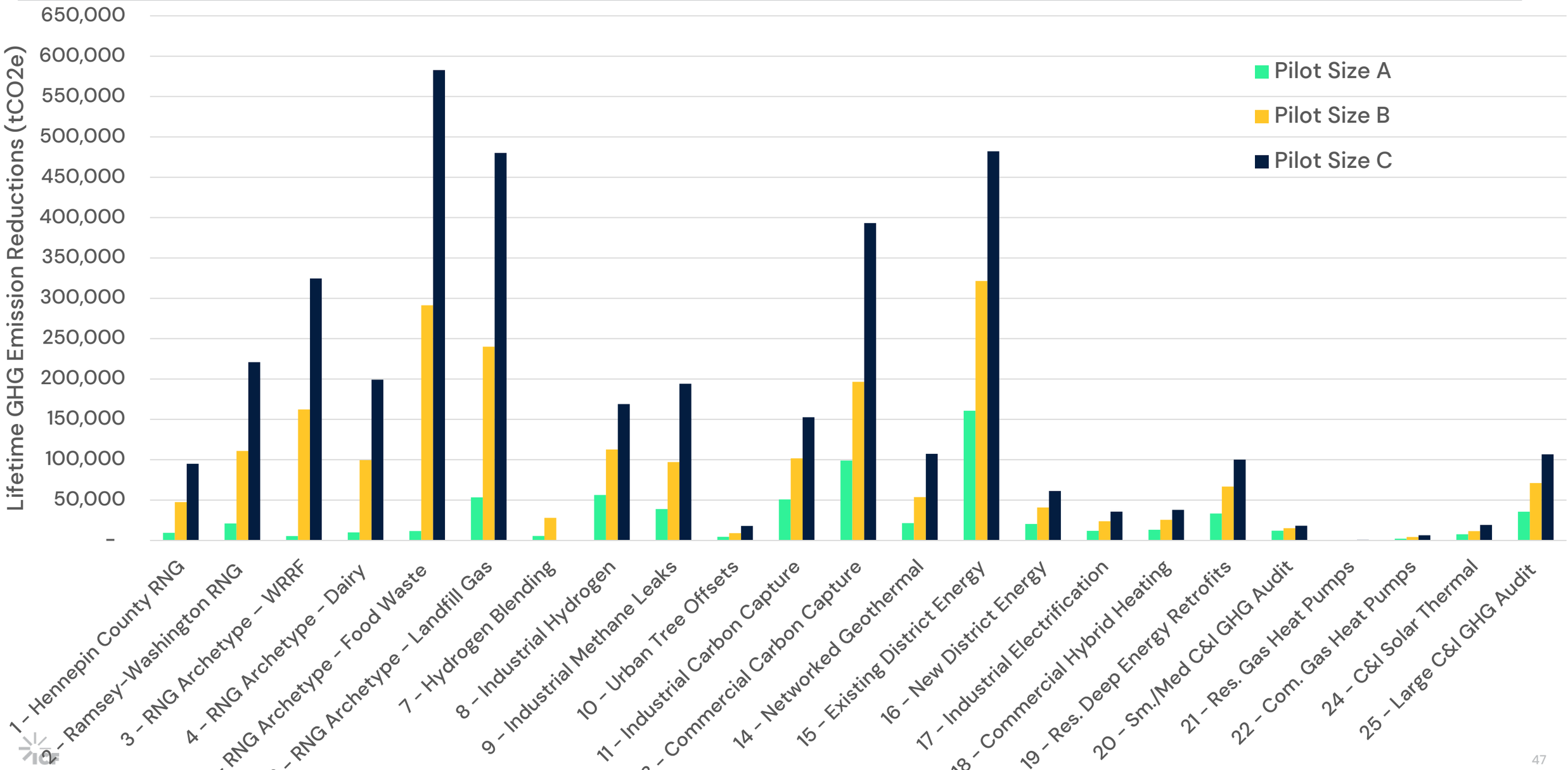
Lifetime GHG Emissions Reduction (tCO2e) = [*(1) Net electricity savings/additions impact* + *(2) Net natural gas lifecycle emissions impact* + *(3) Net lifecycle GHG savings*] x *Measure life* x *Number of participating units*

(1) Net electricity savings/additions impact (tCO2e per participant) = *Annual kWh saved/added per participant* x Electric emissions factor (*tCO2e per kWh)*

(2) Net natural gas lifecycle emissions impact (tCO2e per participant) = *Average annual Dth saved per participant* x *Geologic gas lifecycle emissions factor (tCO2e per Dth)*

(3) Net lifecycle GHG savings (tCO2e per participant) = *other lifecycle GHG savings (annual tCO2e savings per participant)*

Scale of lifetime GHG emission reductions by pilot – draft results

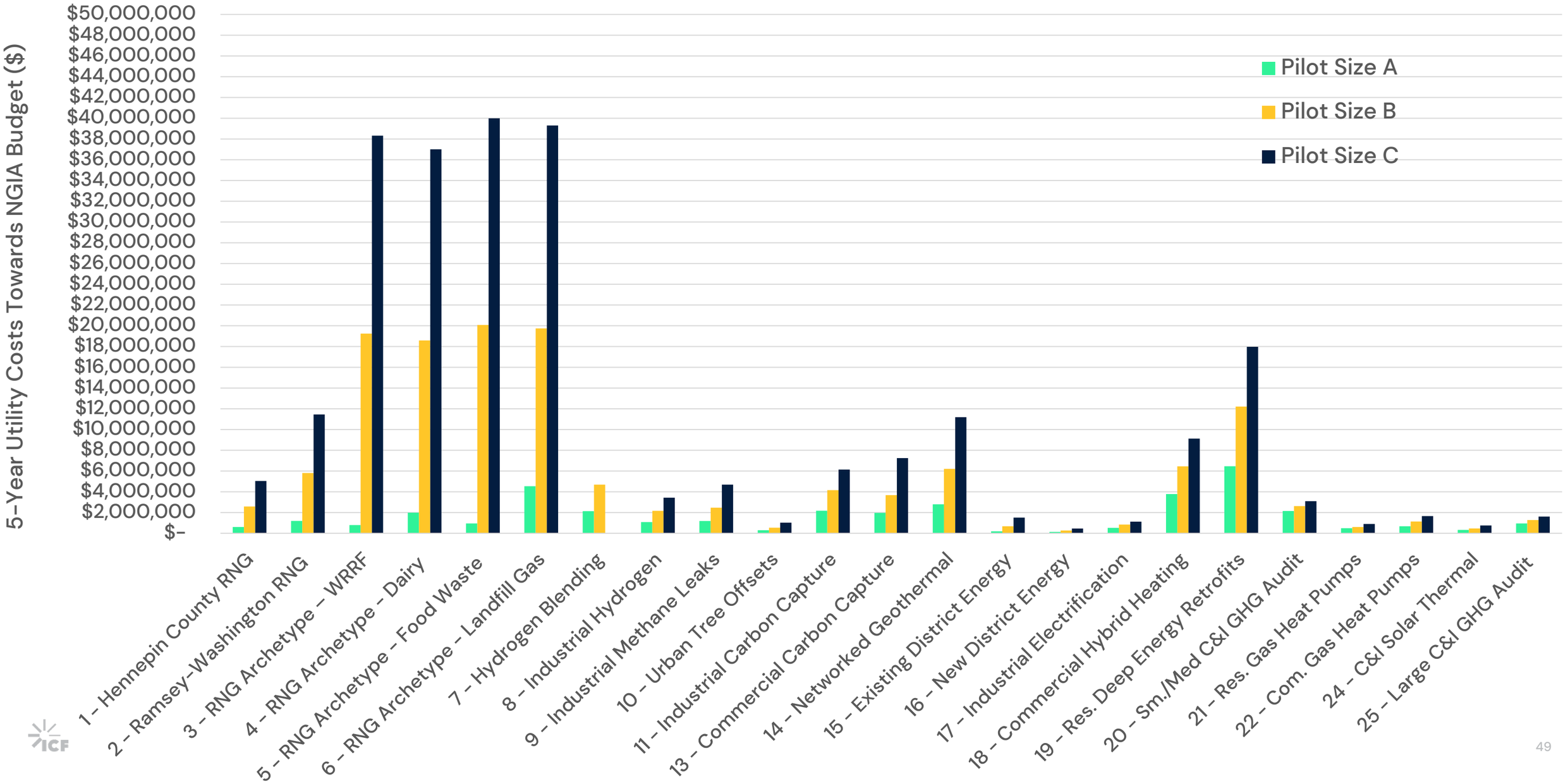


5-Year utility costs towards NGIA budget

This metric represents the cost for different pilots that will count against the statutory cost-caps established for CenterPoint Energy's spending under NGIA. While the relevant types of costs vary by pilot, the three main cost components are the budget for CenterPoint Energy staff and vendors to deliver the pilots, incentive payments to customers, and any revenue requirements for capital investments made as part of certain pilots. Then, based on the NGIA framework, the pilot costs compared to the cost caps would account for some expected utility savings, such as reduced natural gas commodity costs. More specifics on the calculations are provided below.

5-years utility costs towards NGIA budget ($2024-$2028) = *Net incremental O&M costs ($)*
+ *Annual revenue requirement for capital projects ($)*
+ *Incentives ($)*
- *Natural gas commodity savings ($)*

Scale of budgets by pilot and size options – draft results



Emission reduction costs

For each of the emission reduction cost metrics showcased here, we take a different cost metric and divide it by the same lifetime GHG emissions.

Utility cost perspective includes only costs the utility will pay and excludes costs paid by participants or others. This perspective is highly sensitive to the level of participant incentive selected. This perspective also does not include benefits of GHG or other pollutant reductions.

The total (net) pilot impacts looks to capture 'all the value and cost streams' that have been quantified in this analysis. It includes costs the utility, to the participant, and the value of GHG and other pollutant savings.

The equipment and installation costs simply looks at the total upfront cost to purchase and install the relevant technology, stripping out the impacts of different incentive levels and/or supplemental pilot budgets for programmatic support (like program administration, marketing and customer recruitment, etc). This perspective may help better understand the ongoing cost of a technology at scale separately from start-up administrative costs.

Emission reduction costs (continued)

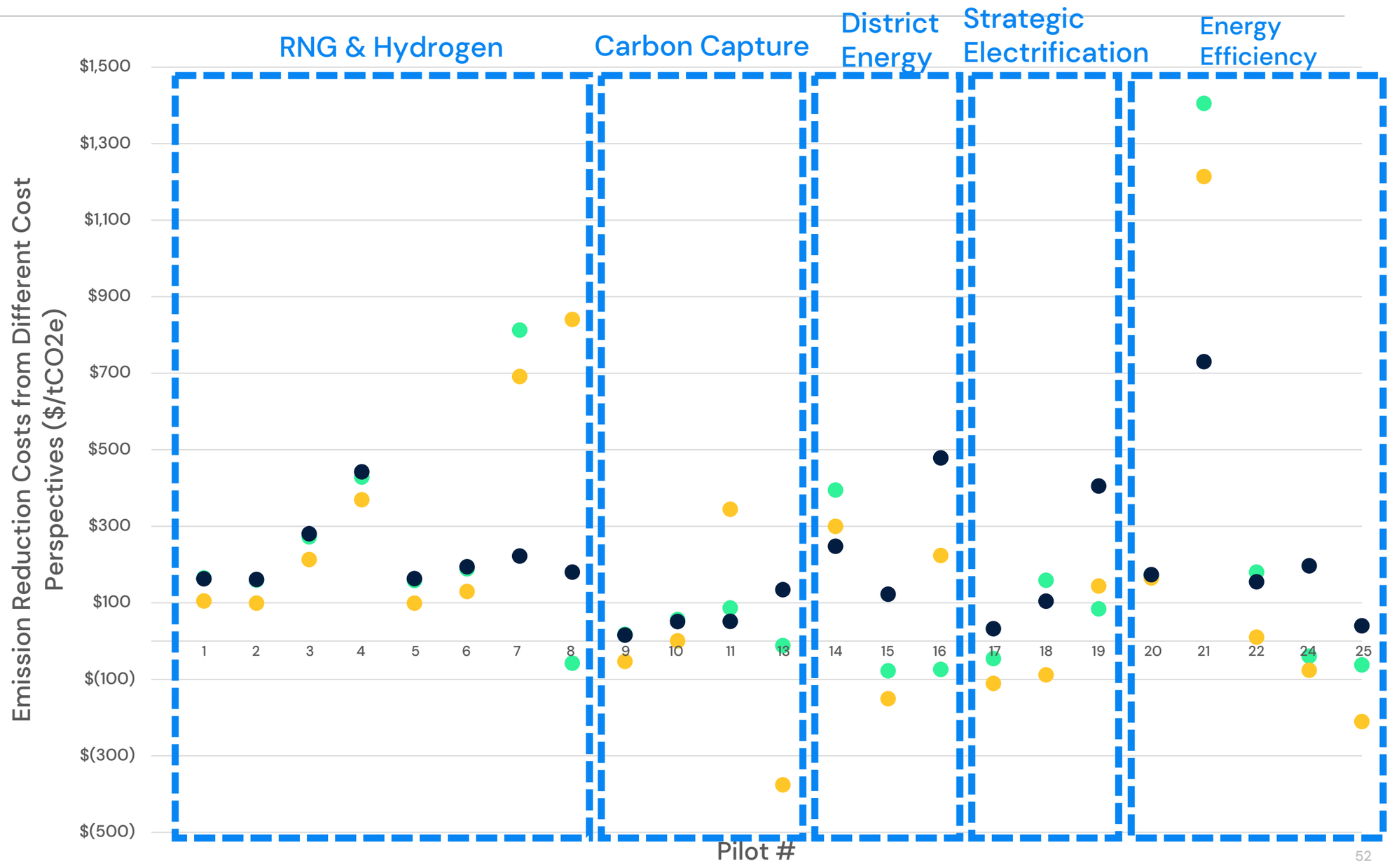
- Lifetime emission reduction cost from utility perspective ($2023/tCO2e) = [*UCT test costs ($2023)* – *UCT test benefits ($2023)*] / *Lifetime GHG emissions reduction (tCO2e)*

- Lifetime emission reduction cost from total (net) pilot impacts perspective ($2023/tCO2e) = [*UCT test costs ($2023)* + *PCT test costs ($2023)* – *UCT test benefits ($2023)* - *PCT test benefits ($2023)* + *social cost of GHG emission reductions ($2023)* + *social cost of non-GHG emission reductions ($2023)* + *third party funding ($2023)*]/ *Lifetime GHG emissions reduction (tCO2e)*

- Lifetime emission reduction cost from equipment and installation (technology) perspective ($2023/tCO2e) = *Equipment and installation costs ($2023)* / *Lifetime GHG emissions reduction (tCO2e)*

Emission Reduction Costs (Pilot Size B) – draft results

- Lifetime Emission Reduction Cost from Utility Perspective ($/tCO2e)
- Lifetime Emission Reduction Cost from Total (Net) Pilot Impacts Perspective ($/tCO2e)
- Lifetime Emission Reduction Cost from Equipment and Installation (Technology) Perspective ($/tCO2e)



Snapshot of notable pilot projects from NGIA 'perspectives'

- NGIA Utility Perspective
  - Costs from utility perspective vary based on range of factors, including if customers are contributing part of the installation costs (e.g. lower utility contribution) and projects reductions in gas throughput (commodity cost savings lower UCT)

- NGIA Participants Perspective (including specific impacts on low- and moderate-income participants)
  - Networked geothermal and res. deep energy retrofit pilots could be targeted towards low- and moderate-income customers/neighborhoods
  - A number of industrial and commercial focused pilots may help participants achieve their own corporate GHG reduction goals making them more competitive with GHG-conscious customers
  - Some pilot projects, such as energy efficiency, will reduce customer costs, while others, such as hydrogen, will increase them

- NGIA Nonparticipating Customers Perspective (including specific impacts on low- and moderate-income customers)
  - Rate impacts to be discussed in the third round of stakeholder meetings
  - RNG and hydrogen blending projects will reduce the GHG intensity of gas, reducing the GHG emissions from all CenterPoint Energy customers
  - Hennepin County RNG includes an anaerobic digestion facility proposed in an Environmental Justice 'area of concern'. Hennepin County has initiated community engagement activities to evaluate the potential for disproportionate adverse impacts and consider ways to reduce those impacts from the project. Hennepin County will continue the community engagement process as the project progresses.

- Effects on Other Energy Systems and Energy Security
  - Reliance on locally produced RNG and green hydrogen reduces dependence on out-of-state geologic gas which may have benefits for energy security, and is a decarbonization approach built off existing energy infrastructure
  - The two pilots involving hybrid heating systems, and the two pilots involving gas heat pumps, would explore decarbonization opportunities that can help mitigate growth in winter electric peak demand from space heating electrification

Snapshot of notable pilot projects for environmental criteria

- GHG Emissions
  - Quantitative results include both lifetime GHG savings (tCO2e) and the social cost (value) of GHG emissions (reductions)
  - RNG projects capture and recover methane (higher global warming potential than CO2) and put that gas to productive use

- Other Pollution
  - Quantitative results also include the social cost (value) of non-GHG air pollutants emissions (reductions)
  - Anaerobic digestion of dairy manure can improve agricultural practices that harm water quality, air quality, and local odors
  - The industrial methane leak detection and repair program could also identify refrigerant leaks, to further reduce environmental and GHG impacts

- Waste reduction and reuse (including reduction of water use)
  - Hennepin County's RNG project has the potential to be a state model for organics recycling and beneficial use; this and the other 'food waste' RNG projects can help to demonstrate an effective use of anaerobic digestion in MN to process residential and commercial source-separated organics (as opposed to landfilling)
  - All RNG pilots, digestion of organic materials for energy production is effective way to decarbonize waste

- Policy (e.g., natural gas throughput, renewable energy goals)
  - The RNG, hydrogen, networked geothermal, strategic electrification, new district energy, solar thermal, and potentially the C&I GHG audit pilot increase use of renewable energy
  - All pilots except carbon capture pilots and urban tree planting decrease geologic gas throughput

Snapshot of notable pilot projects from socioeconomic criteria

- Net Job Creation
  - IMPLAN modelling to quantify the net job creation from pilots is still on-going

- Economic Development
  - The hydrogen pilots allow local firms and workers to gain experience in hydrogen, which is a growing industry
  - A number of projects support improved industrial competitiveness in Minnesota, by helping industry become more efficient, while other pilots could entice corporate R&D teams to concentrate their initial decarbonization efforts at Minnesota facilities
  - Pilots seeking higher IRA incentives would follow wage/labor IRA requirements
  - The networked geothermal pilot would represent a large-scale build out of a new type of utility infrastructure
  - CenterPoint Energy is planning to include budget for workforce development to support various projects at the portfolio level

- Public Co-Benefits
  - The first two RNG pilots have the additional benefit of supporting local municipalities
  - In the Urban Tree offset pilot, new street trees will shade homes and buildings, reducing cooling and heating costs over time; in addition to sequestering carbon, these trees also increase the stormwater infiltration rate of the urban soils and promote habitat diversity throughout the city

- Market Development
  - Many pilots may be located through CenterPoint Energy's service territory; projects may have a significant impact on individual customer's GHG emissions helping them achieve their GHG emissions goals and supporting their competitiveness with GHG-conscious customers

Snapshot of notable pilot projects from innovation criteria

- Direct Innovation Support
  - Many of the pilots are small-scale field testing, with most or all of costs covered for CenterPoint Energy customers, in order to better understand an emerging technology and how it could be scaled
  - Hennepin County's RNG project has the potential to be a state model for organics recycling and beneficial use
  - The RNG pilots provide CenterPoint Energy with experience in purchasing low-carbon fuels, and the hydrogen blending and new district energy pilots provide experience with a different way of providing energy
  - Carbon capture and hydrogen pilots explore emerging options to reduce emissions from hard to electrify industrial end-uses
  - The residential deep energy retrofit pilot (including hybrid heating) could help answer questions on balance of energy efficiency retrofits vs. strategic electrification, while also supporting testing of new building retrofit technologies

- Resource Scalability and Role in a Decarbonized System
  - Hybrid heating targets the largest residential and commercial sector uses of natural gas and in the 2021 Minnesota G21 study the 'electrification with gas back up' scenario had smallest total cost increase by 2050
  - All deep emission reductions pathways rely on a lot of decarbonized gases to reach emission reduction targets:
    - All scenarios in the 2021 Minnesota G21 study use all available biomethane resources, and hydrogen blending, before tapping into more expensive decarbonized gases.
    - Even in the G21 high electrification case, 2050 RNG demand in Minnesota would be much greater (50-100 times) than the annual volume of decarbonized gas production assumed in the detailed analysis
  - Residential and commercial hybrid heating and gas heat pumps were selected for the Minnesota Efficient Technology Accelerator's (ETA) starter portfolio, and taking a collaborative approach with the Center for Energy and Environment (CEE) on these pilots offers can amplify the effects of both NGIA and ETA.
  - Hydrogen and carbon capture are expected to be important tools in a decarbonized energy system; through IRA and IIJA the federal government has invested heavily in scaling up and reducing the costs of hydrogen production and carbon capture

Research & Development (R&D) Approach

- Relatively smaller in scale research projects or studies
- Uncertain, difficult to quantify, or nominal GHG benefits

- Initial Innovation Plan filing will:
  - Include investments up to 10% of total incremental Innovation Plan costs for R&D
  - Specify R&D projects to be funded in first 1-2 years of plan (these will be presented in the third public engagement meeting)
  - Reserve funding for R&D in future years in a general R&D budget

- Annual Status Reports will:
  - Report progress/results of completed R&D
  - Propose R&D to be implemented in the upcoming year

- External R&D proposals accepted by CenterPoint on an on-going basis for consideration

Full list of potential R&D projects under consideration

Primary Innovative Resource	Reference # for RFI /Source	Project Title
Biogas/Renewable Natural Gas	2	Minnesota's Renewable Natural Gas Potential
Biogas/Renewable Natural Gas	37	Planning Toolkit for RNG and Biogas Project Development
Biogas/Renewable Natural Gas	38	Renewable Energy Match (REM)
Biogas/Renewable Natural Gas	47	Ideas for Increased Biomethane Production
Biogas/Renewable Natural Gas	80	Maximizing Minnesota Renewable Natural Gas (RNG) Opportunities
Biogas/Renewable Natural Gas	100	Design a portal that partners potential projects with qualified developers
Biogas/Renewable Natural Gas	CNP Internal-11	Small-scale Biodigester at University Campus
Biogas/Renewable Natural Gas	CNP Internal-17	RNG Potential Study
Biogas/Renewable Natural Gas	Post-Stakeholder Meeting - 108	Sustainable Hydrogen Production Using the Sandwich Gasifier
Biogas/Renewable Natural Gas	Gap Analysis	Support for Development of Thermal Gasification RNG Production Processes
Carbon Capture	57	Carbon Capture for Residential and Commercial Buildings
Carbon Capture	63	Quantification of Existing and Future Nature-Based Carbon Capture
Carbon Capture	87	Commercial Building and CHP Scale Carbon Capture Market Study and Pilot Field Testing
Carbon Capture	Post-Stakeholder Meeting - 106	Carbon Utilization – Novel Technology
Carbon Capture	CNP Internal-3	Carbon Capture through Methane Pyrolysis at Industrial Facility
District Energy	10	Feasibility Analysis and Market Assessment of Clean District Energy Opportunities for CenterPoint Energy
District Energy	33	Power-to-Hydrogen Potential Study for Existing District Heating Systems in Minneapolis
Energy Efficiency	13	Innovation Incubator
Energy Efficiency	17	Emerging Technology Strategic Incentives Fund
Energy Efficiency	95	High Performance Building Envelope Initiative
Energy Efficiency	12, 35, and 99	Neighborhood Weatherization Blitzes
Power-to-Ammonia	8	Utilization of Green Ammonia for Thermal Energy Applications
Power-to-Ammonia	Post-Stakeholder Meeting - 105	Green Ammonia - Novel Technology
Strategic Electrification	65	Integrated Energy Systems for Self-powered Single-family and Multifamily Residential HVAC and Water Heating
Strategic Electrification	67	Electrification Qualified Service Provider (eQSP) Program
Power-to-Hydrogen	Post-Stakeholder Meeting - 107	Green Hydrogen and CO2 --> RNG
General	Gap Analysis	CenterPoint Minnesota Net Zero Study

Q&A and Discussion: pilot project analysis high-level draft results

Questions for participants

- Do you have any clarifying questions (seeking to better understand what was presented)?
- Was there anything that was surprising to you?
- Do you have any questions or initial take-aways from the draft analysis results?

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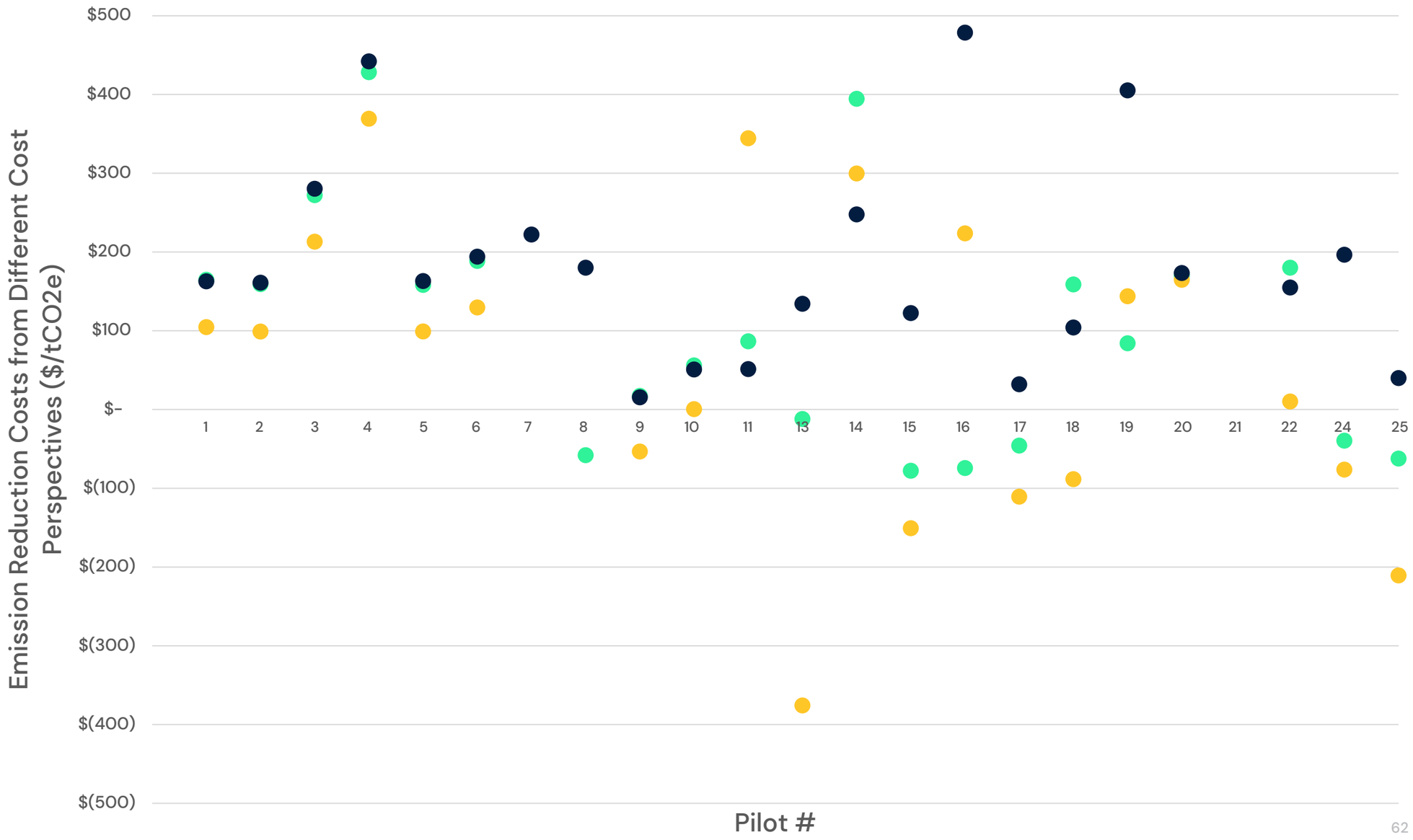
About ICF

ICF (NASDAQ:ICFI) is a global consulting and digital services company with over 7,000 full- and part-time employees, but we are not your typical consultants. At ICF, business analysts and policy specialists work together with digital strategists, data scientists and creatives. We combine unmatched industry expertise with cutting-edge engagement capabilities to help organizations solve their most complex challenges. Since 1969, public and private sector clients have worked with ICF to navigate change and shape the future.

Emission Reduction Costs (Pilot Size B) – removing outliers

- Lifetime Emission Reduction Cost from Utility Perspective ($/tCO2e)
- Lifetime Emission Reduction Cost from Total (Net) Pilot Impacts Perspective ($/tCO2e)
- Lifetime Emission Reduction Cost from Equipment and Installation (Technology) Perspective ($/tCO2e)



Lifetime GHG emission reductions by pilot (tCO2e)

#	Pilot	Pilot Size A	Pilot Size B	Pilot Size C
1	RNG Proposal – Organics 1	9,500	47,500	95,000
2	RNG Proposal – Organics 2	21,041	110,906	220,935
3	RNG Archetype – WRRF	5,409	162,284	324,568
4	RNG Archetype - Dairy	9,958	99,585	199,169
5	RNG Archetype - Food Waste	11,655	291,386	582,773
6	RNG Archetype - Landfill Gas	53,355	240,096	480,191
7	Hydrogen Blending	5,599	27,993	-
8	Industrial Hydrogen	56,330	112,661	168,991
9	Industrial Methane Leaks	38,831	97,077	194,154
10	Urban Tree Offsets	4,500	9,000	18,000
11	Industrial Carbon Capture	50,865	101,731	152,596
13	Commercial Carbon Capture	99,029	196,601	393,202
14	Networked Geothermal	21,471	53,677	107,355
15	Existing District Energy	160,731	321,463	482,194
16	New District Energy	20,441	40,882	61,323
17	Industrial Electrification	11,896	23,792	35,688
18	Commercial Hybrid Heating	13,279	25,609	37,940
19	Res. Deep Energy Retrofits	33,380	66,760	100,139
20	Sm./Med C&I GHG Audit	12,138	15,172	18,207
21	Res. Gas Heat Pumps	235	391	783
22	Com. Gas Heat Pumps	2,154	4,307	6,461
24	C&I Solar Thermal	7,687	11,531	19,218
25	Large C&I GHG Audit	35,560	71,120	106,680

5-Year Utility Costs Towards NGIA Budget ($)

#	Pilot	Pilot Size A	Pilot Size B	Pilot Size C
1	RNG Proposal – Organics 1	$ 608,263	$ 2,578,513	$ 5,041,326
2	RNG Proposal – Organics 2	$ 1,195,458	$ 5,806,927	$ 11,453,164
3	RNG Archetype – WRRF	$ 789,220	$ 19,245,230	$ 38,317,597
4	RNG Archetype - Dairy	$ 1,989,220	$ 18,582,077	$ 37,006,199
5	RNG Archetype - Food Waste	$ 949,220	$ 20,079,442	$ 39,989,747
6	RNG Archetype - Landfill Gas	$ 4,537,699	$ 19,742,595	$ 39,301,145
7	Hydrogen Blending	$ 2,131,530	$ 4,693,620	$ -
8	Industrial Hydrogen	$ 1,076,997	$ 2,163,128	$ 3,429,787
9	Industrial Methane Leaks	$ 1,187,842	$ 2,466,290	$ 4,687,580
10	Urban Tree Offsets	$ 292,750	$ 536,500	$ 1,024,000
11	Industrial Carbon Capture	$ 2,172,254	$ 4,156,908	$ 6,141,561
13	Commercial Carbon Capture	$ 1,970,677	$ 3,675,284	$ 7,245,568
14	Networked Geothermal	$ 2,791,264	$ 6,207,158	$ 11,188,673
15	Existing District Energy	$ 189,180	$ 676,830	$ 1,511,939
16	New District Energy	$ 133,160	$ 271,690	$ 454,590
17	Industrial Electrification	$ 520,807	$ 843,778	$ 1,122,549
18	Commercial Hybrid Heating	$ 3,782,865	$ 6,454,988	$ 9,127,110
19	Res. Deep Energy Retrofits	$ 6,460,093	$ 12,215,187	$ 17,970,280
20	Sm./Med C&I GHG Audit	$ 2,151,769	$ 2,622,211	$ 3,092,653
21	Res. Gas Heat Pumps	$ 491,446	$ 609,076	$ 903,152
22	Com. Gas Heat Pumps	$ 680,257	$ 1,139,825	$ 1,661,893
24	C&I Solar Thermal	$ 329,495	$ 469,743	$ 750,238
25	Large C&I GHG Audit	$ 945,005	$ 1,277,010	$ 1,609,015

Emission Reduction Costs from Multiple Perspectives ($/tCO2e)

All Values for Pilot Size B

#	Pilot	Lifetime Emission Reduction Cost from Utility Perspective ($/tCO2e)	Lifetime Emission Reduction Cost from Total (Net) Pilot Impacts Perspective ($/tCO2e)	Lifetime Emission Reduction Cost from Equipment and Installation (Technology) Perspective ($/tCO2e)
1	RNG Proposal – Organics 1	$ 165	$ 105	$ 163
2	RNG Proposal – Organics 2	$ 159	$ 99	$ 161
3	RNG Archetype – WRRF	$ 272	$ 213	$ 280
4	RNG Archetype - Dairy	$ 428	$ 369	$ 442
5	RNG Archetype - Food Waste	$ 158	$ 99	$ 163
6	RNG Archetype - Landfill Gas	$ 189	$ 129	$ 194
7	Hydrogen Blending	$ 813	$ 691	$ 222
8	Industrial Hydrogen	$ (58)	$ 840	$ 180
9	Industrial Methane Leaks	$ 17	$ (53)	$ 15
10	Urban Tree Offsets	$ 56	$ 0	$ 51
11	Industrial Carbon Capture	$ 87	$ 344	$ 51
13	Commercial Carbon Capture	$ (12)	$ (376)	$ 134
14	Networked Geothermal	$ 394	$ 300	$ 248
15	Existing District Energy	$ (78)	$ (151)	$ 122
16	New District Energy	$ (74)	$ 224	$ 478
17	Industrial Electrification	$ (46)	$ (111)	$ 32
18	Commercial Hybrid Heating	$ 159	$ (88)	$ 104
19	Res. Deep Energy Retrofits	$ 84	$ 144	$ 405
20	Sm./Med C&I GHG Audit	$ 170	$ 165	$ 173
21	Res. Gas Heat Pumps	$ 1,405	$ 1,214	$ 730
22	Com. Gas Heat Pumps	$ 180	$ 10	$ 155
24	C&I Solar Thermal	$ (40)	$ (76)	$ 196
25	Large C&I GHG Audit	$ (62)	$ (211)	$ 40

Resources Included in NGIA

- Must be from biomass
- Distinction is pipeline quality or not

- From solar thermal or ground-source

- Does not include “investments” that can reasonably be included in the Conservation Improvement Program

- Produced using a carbon-free power source

- Cannot add to electric peak
- Customer must still use gas (partial electrification only)

- Very broad definition

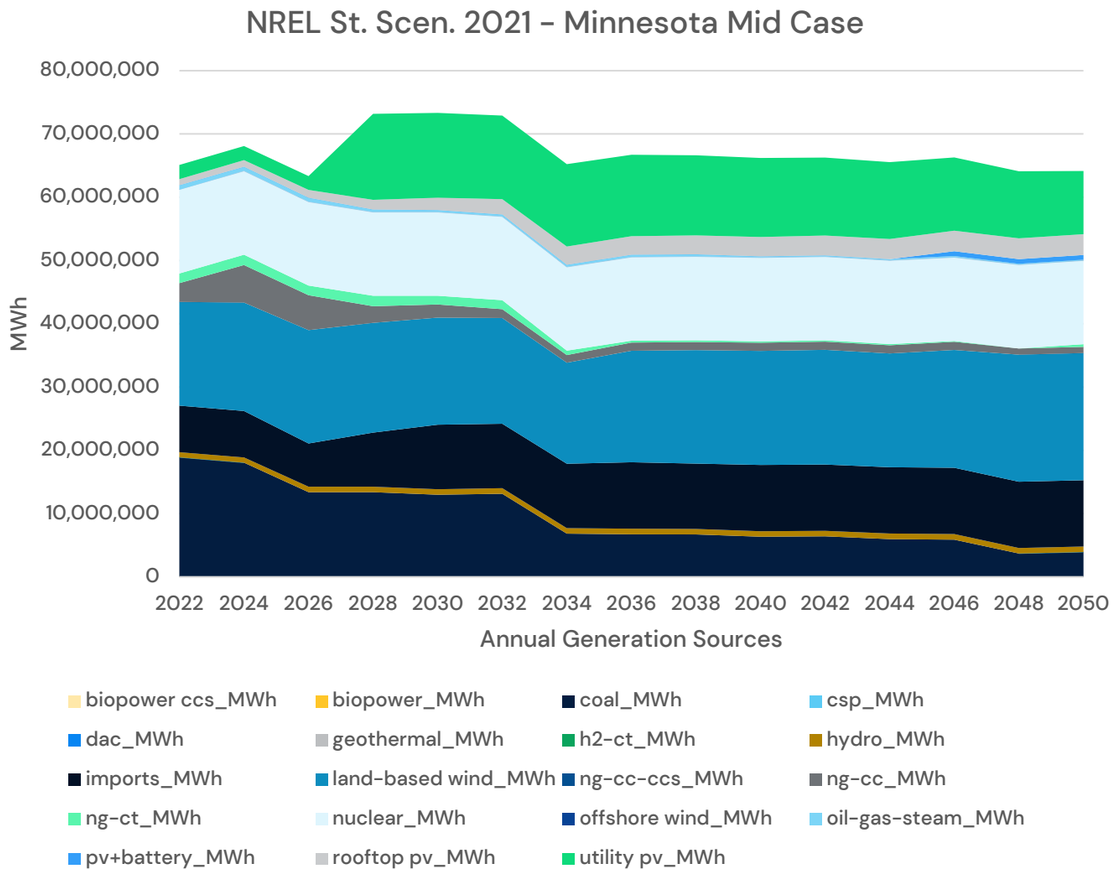
Special Requirements for the First Plan

- All utilities
  - Costs must be 50%+ for RNG, biogas, power-to-hydrogen or power-to-ammonia (low carbon fuels)
- CenterPoint Only
  - Residential deep energy retrofit + electric ASHP pilot (with gas backup)
  - Industrial hard-to-electrify pilot
  - Small/medium business GHG audit pilot
  - District energy pilot

Appendix 2:

Additional context

Fresh Energy's Proposed NREL Grid Mix, 2021



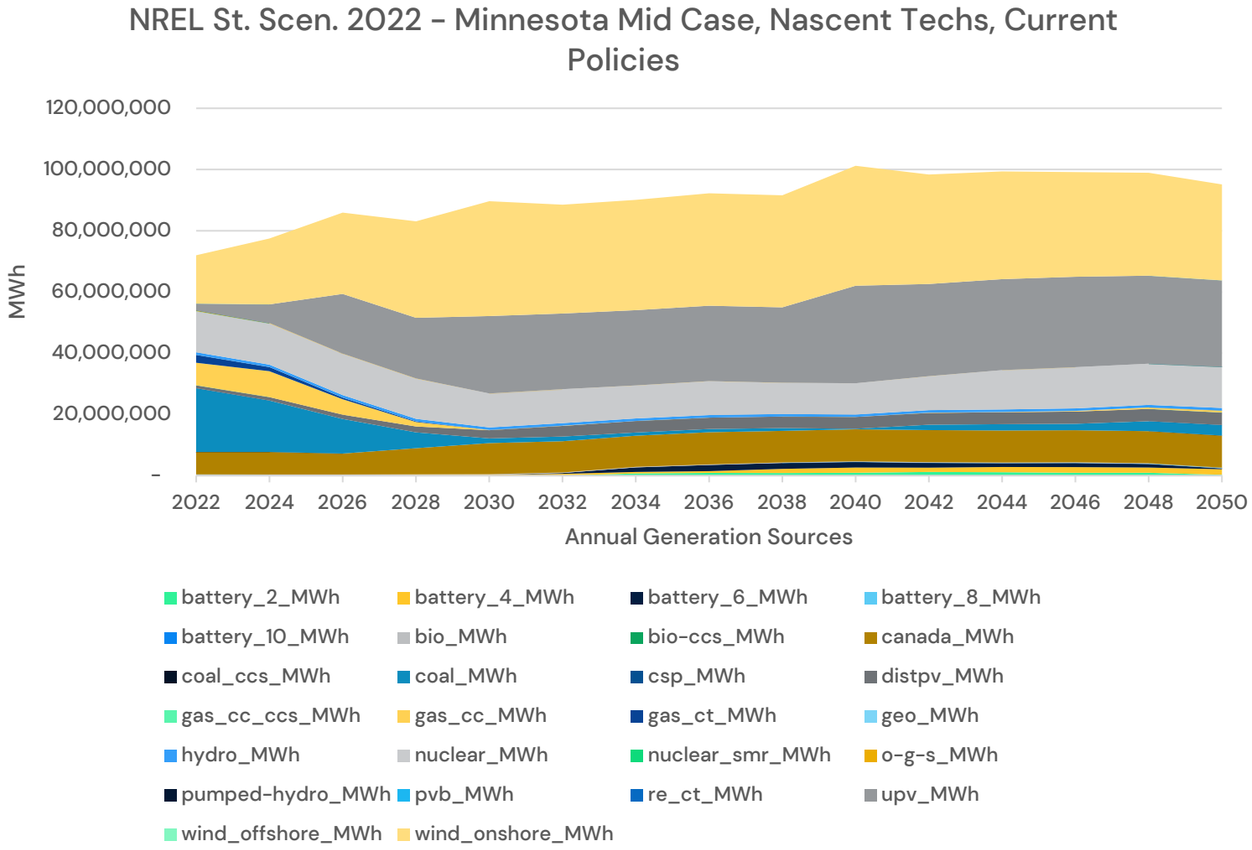
Fresh Energy referenced the 2021 NREL Standard Scenarios, Minnesota, Mid-case. They proposed using the Mid-case plus electrification (a modification to NREL's Mid-case), shown below.

Fresh Energy's filed "NREL Standard Scenarios, Minnesota, Mid-case + electrification [2021]"							
	Coal	Hydro + Canadian Imports	Wind	NG	Nuclear	Solar	Other
2022	29.2%	12.3%	24.8%	7.7%	20.0%	4.8%	1.2%
2024	26.6%	11.8%	24.8%	11.1%	19.2%	5.5%	1.0%
2026	21.4%	12.3%	28.8%	8.9%	21.2%	6.3%	1.1%
2028	21.4%	15.1%	28.7%	6.1%	21.2%	6.7%	0.8%
2030	21.6%	18.0%	27.6%	3.2%	21.5%	7.4%	0.6%
2032	18.5%	15.9%	24.0%	2.3%	19.0%	19.8%	0.5%
2034	10.2%	16.1%	31.4%	1.5%	19.3%	21.1%	0.5%
2036	10.1%	16.6%	31.4%	1.2%	19.2%	20.9%	0.5%
2038	8.9%	14.4%	39.9%	1.1%	17.0%	18.3%	0.4%
2040	9.0%	14.7%	37.8%	1.0%	17.1%	20.0%	0.2%
2042	9.2%	14.9%	35.9%	1.2%	17.4%	21.2%	0.2%
2044	8.4%	13.8%	38.7%	1.1%	16.0%	21.7%	0.2%
2046	8.0%	13.1%	39.5%	1.0%	15.3%	22.9%	0.2%
2048	4.6%	12.0%	47.1%	0.9%	14.0%	21.2%	0.1%
2050	3.4%	12.3%	46.9%	1.0%	14.3%	21.9%	0.1%

Sources: Fresh Energy March 2022 filing, NREL Standard Scenario Viewer 2021

NREL Standard Scenarios, 2022

- 2022 Standard Scenarios appear to have a wider range of generation categories than the 2021



NREL Category	GREET Category
battery_2_MWh	Others
battery_4_MWh	Others
battery_6_MWh	Others
battery_8_MWh	Others
battery_10_MWh	Others
bio_MWh	Biomass
bio-ccs_MWh	0.9 to Others, 0.1 to Biomass
canada_MWh	Others
coal_ccs_MWh	0.9 to Others, 0.1 to Coal
coal_MWh	Coal
csp_MWh	Others
distpv_MWh	Others
gas_cc_ccs_MWh	0.9 to Others, 0.1 to Gas
gas_cc_MWh	Gas
gas_ct_MWh	Gas
geo_MWh	Others
hydro_MWh	Others
nuclear_MWh	Nuclear
nuclear_smr_MWh	Nuclear
o-g-s_MWh	Residual Oil
pumped-hydro_MWh	Others
pvb_MWh	Others
re_ct_MWh	Others
upv_MWh	Others
wind_offshore_MWh	Others
wind_onshore_MWh	Others

Sources: ICF Analysis, NREL 2022 Standard Scenarios Technical Report

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CenterPoint Energy Innovation Plan

Regulatory Engagement Meeting 2

Friday, March 17th, 8:30AM-12:00 PM CT

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Meeting Context and Summary

Meeting Context

On Friday, March 17, 2023, CenterPoint Energy (CenterPoint), with technical support from ICF and facilitative support from the Great Plains Institute (GPI), hosted the second of three planned regulatory engagement meetings that will inform the development of CenterPoint's first innovation plan. The regulatory engagement meetings are planned to complement a series of three separate public engagement meetings. The meeting was held in an online format via Zoom.

CenterPoint is preparing its voluntary innovation plan in accordance with the Natural Gas Innovation Act (NGIA), which was signed into law by Governor Walz on June 26, 2021. The full text of NGIA is available here. The innovation plan will be evaluated by the Minnesota Public Utilities Commission (Commission) in accordance with the framework approved in Commission Docket No. 21-566.[1]

The first public engagement meeting, which took place on September 23, 2022, provided attendees with an overview of the legislative and regulatory context for natural gas utility innovation plans in Minnesota. It also provided an opportunity for participants to provide feedback on the selection of an initial list of 28 pilot project ideas for a short-list and several research and development initiatives to be evaluated for inclusion in the innovation plan.[2] More details about that meeting are included in the Meeting 1 summary and notes.[3] Following Meeting 1, CenterPoint held the first regulatory engagement meeting to further discuss the pilots, but more specifically for an audience that plans to participate in the regulatory process. More details about that meeting are included in the regulatory engagement meeting 1 summary and notes.[4]

In advance of the second pair of meetings (February 24, 2023 for public engagement and March 17, 2023 for regulatory parties, though any parties were welcome to attend either meeting) CenterPoint and ICF further refined the list of pilot projects down to 23 and conducted a detailed analysis of each of those pilots. The analysis included a profile of assumptions for each of the

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[1] Docket No. G-999/CI-21-566. "In the Matter of Establishing Frameworks to Compare Lifecycle Greenhouse Gas Emissions Intensities of Various Resources, and to Measure Cost-Effectiveness of Individual Resources and of Overall Innovation Plans."

[2] Due to the smaller budget for research and development and greater uncertainty about the likely effects of these initiatives on greenhouse gas emissions reductions, research and development initiatives will not be subject to as detailed an analysis as potential pilot projects.

[3] https://airtable.com/shrzEkaPgghbXVdva/tblCg3frZs5eAhKfz/viwL68BswfecTGjoZ/recmP2N741RaguLos/fld9jMuW4cXQ7NnUh/attz2TvNGjDnMmoyo

[4] https://airtable.com/shrIqHCeYD5SeGwoX

pilot projects, organized in a spreadsheet that was sent to all registrants in advance of the February 24 meeting. The analysis was designed to look at the NGIA evaluation framework categories developed under Docket No. 21-566, and listed below.[5] Notably, the final selections for pilots to include in the innovation plan will be decided based on a combination of quantitative and qualitative factors as described in the NGIA Evaluation Framework.

NGIA EVALUATION FRAMEWORK

Perspectives	NGIA utility perspective
	NGIA participants perspective (including specific impacts on low- and moderate-income participants)
	NGIA nonparticipating customers perspective (including specific impacts on low- and moderate-income participants)
	Effects on other energy systems and energy security
Environment	Greenhouse gas (GHG) emissions
	Other pollution (including any environmental justice costs or benefits)
	Waste reduction and reuse (including reduction of water use)
	Policy (e.g., natural gas throughput, renewable energy goals)
Socioeconomic	Net job creation
	Economic development
	Public co-benefits
	Market development
Innovation	Direct innovation support
	Resource scalability and role in a decarbonized system

The March 17, 2023 regulatory engagement meeting builds off of CenterPoint's February 24, 2023 second public engagement meeting, but was intended more specifically for an audience that plans to participate in the regulatory process.

[5] *Note:* As stated in this summary, CenterPoint and ICF considered all qualitative and quantitative aspects of the NGIA evaluation framework when analyzing the shortlisted pilots. However, some aspects of the analysis were not ready to be presented at the March 17, 2023, meeting (e.g., the evaluation of net job creation, which was conducted via the IMPLAN Economic Model). The findings from analyses that were not ready to be presented at this meeting will be presented at the third public and regulatory engagement meetings.

Meeting Summary

The primary goals of the March 17, 2023 regulatory engagement meeting were as follows:

1. Review content from the February 24, 2023 meeting and discuss additional feedback on draft pilot profile designs and draft analysis results from regulatory parties.
2. Discuss any additional input on criteria for selecting projects to include in the innovation plan.
3. Address follow-up items from the February 24, 2023 meeting including:
    a. Approach to research and development (R&D)
    b. NGIA/Conservation Improvement Program (CIP) coordination
4. Review next steps for plan development

The meeting contained several presentations and opportunities for feedback. First, CenterPoint and ICF presented an overview of the February 24, 2023 public engagement meeting. Then GPI facilitated an open discussion intended to obtain feedback and perspectives from regulatory parties in response to the public meeting. This discussion included an opportunity to ask clarifying questions and identify topics, pilots, and pilot selection criteria worthy of more detailed discussion. Second, CenterPoint and ICF presented and solicited feedback on two key topics identified in the February 24, 2023 meeting: CenterPoint's approach to R&D and coordination between NGIA and CIP initiatives. GPI staff facilitated Q&A and discussion throughout the meeting. Below, we have captured a series of high-level feedback themes, followed by the more detailed meeting notes.

FEEDBACK THEMES:

- **Understanding the pilot profiles and analysis**: Participants had several general and clarifying questions about the pilot profiles, scope of pilots, and analysis results. Specifically, many participants had questions regarding the potential power-to-hydrogen pilot initiatives, including questions related to deployment schemes and size differences, where the hydrogen source(s) would come from, and how these pilots would differ from CenterPoint's existing hydrogen initiative.
- **Legislative considerations**: Some attendees wanted more information about how and to what extent CenterPoint has considered recent state and federal legislation, including Minnesota's new 100% clean electricity law and the Inflation Reduction Act (IRA). Attendees also continued prior discussions around coordination between NGIA and the state's Conservation Improvement Program (CIP), which was updated via passage of the ECO Act in the same year that NGIA was passed, with the two bills both addressing energy efficiency and electrification.
- **Pilot project implementation considerations**: Several participants were interested in better understanding what implementation of specific pilots might look like, such as where a pilot could be deployed and how it could be financed with the support of tax credits. Participants were also interested in implementation implications, such as whether Minnesota has the types of manufacturing companies that might be both interested in and able to pursue certain pilots (e.g., whether Minnesota has cement

manufacturers that could utilize carbon captured onsite through certain Carbon Capture pilots).

- **Parties' roles and responsibilities in individual pilots:** Participants were interested in better understanding the roles and responsibilities of separate parties that would likely be involved in individual pilot projects. Specifically, several participants sought clarity on which parties would own and operate certain components of deployed pilots. For example, a participant sought clarity on who would own what parts of Pilot #14 (New Networked Geothermal Systems Pilot), including the system itself and individual ground-source-heat pump (GSHP) components. Participants had similar questions regarding who would own on-site solar facilities and electrolyzers that would support power-to-hydrogen pilots.

Meeting Notes

Notes are in an alphanumeric format for reference purposes only; the numbers and letters do not indicate any prioritization or ranking.

Introduction and Agenda Overview

1. Welcome, agenda overview, and introductions by GPI, CenterPoint, and ICF
2. Today's meeting is a space for discussion, specifically for participants who intend on engaging in the regulatory process to discuss CenterPoint's shortlist of 23 pilot projects that could potentially be included in the Company's first NGIA innovation plan filing.
    a. CenterPoint welcomes feedback on analysis assumptions, process, etc.
3. Participants were asked to adhere to following meeting ground rules:
    a. **Respect each other.** Help us to collectively uphold respect for each other's experiences and opinions, even in difficult conversations. We need everyone's wisdom to achieve better understanding and develop robust solutions.
    b. **Enable honestly through non-attribution.** Outside of this group, you may share what was said and who was present, but please refrain from sharing who said what without first obtaining permission. All meeting notes and materials will also adhere to this.

Review and Discussion of February 24, 2023 Public Meeting

Meeting Overview and Follow-ups

1. February 24 Meeting Agenda Items:
    a. Overview of NGIA innovation plan development process and detailed analysis
    b. Overview of the NGIA Pilot Profiles Workbook (Excel spreadsheet) provided to meeting participants for review
        i. Walk participants through details of analysis – pilot assumptions, etc.
    c. Review of pilot project designs
    d. Review of pilot project analysis framework and high-level draft results
        i. Examined evaluation materials – quantitative and qualitative measures
2. General NGIA statutory requirements:
    a. Strategic electrification requires gas back up
    b. Ballpark budget: overall cost cap of approx. $90M over the five-year plan
        i. Bonus funding (approx. $15M over the five-year plan) available for certain types of renewable natural gas (RNG) initiatives that meet other objectives (municipal waste beneficial use, etc.)
3. Special NGIA statutory requirements for the first innovation plan:
    a. At least 50% of all utility costs must go towards RNG, biogas, power-to-hydrogen, and/or power-to-ammonia
4. CenterPoint-specific statutory requirement:
    a. Residential deep energy retrofit + electric air-source heat pump (ASHP) pilot (with gas back up)

        i. Must facilitate specifically defined and ambitious retrofit standards in at least some homes
    b. Pilot for industrial hard-to-electrify customers
    c. Small/medium business GHG audit pilot
    d. District energy pilot required (can't be more than 20% of plan costs)
5. Lifetime pilot costs vs. 5-year costs for pilot deployment over the life of the innovation plan (for all values for pilot size B)[6]
    a. Total cost of pilot (all years) – not including utility savings: shows all costs that are incurred over the lifetime of a pilot
    b. Total 5-year cost of pilots – not including utility savings: costs incurred within the first 5-years only
    c. Utility costs towards NGIA 5-year budget – commodity cost savings
    d. Note: some of these numbers are the same for certain pilots
    e. *Question*: The restrictions of 50% for RNG etc. and no more than 20% of total plan costs for district energy in the total plan, is my assumption correct that those are costs for the first 5 years?
        i. *Answer*: Yes
    f. *Question*: Do savings also include IRA benefits that could be utilized by CenterPoint for NGIA plans?
        i. *Answer*: The cost figures being presented here only represent costs to CenterPoint, so they do include IRA benefits, but only the ones that are directly accessible to CenterPoint. Tax credits, rebates, etc. that participants are eligible for are not reflected in these numbers, but CenterPoint is considering those for the purposes of the participant cost test.
6. Electricity GHG Intensity
    a. When the location of a pilot is known, electric utility-specific generation mix information (Xcel Energy's generation mix base case) is leveraged
    b. For pilots where the electricity provider is not known, a state-specific National Renewable Energy Laboratory (NREL) standard scenario is required by the Commission's Frameworks Order
        i. NREL updated their Standards Scenarios in December 2022
    c. ICF worked with CenterPoint to identify the NREL Standard Scenario: Mid-Case, Nascent Technologies, Current Policies - Minnesota scenario as the best updated match to what was previously discussed by interested parties prior to the Commission's Frameworks Order
    d. NREL updated 2022 scenarios to reflect current IRA policy impacts
    e. Scenarios were mapped against Argonne National Laboratory's GREET model categories for GHG modeling
        i. GREET: Greenhouse gases, Regulated Emissions, and Energy use in Technologies

[6] Pilot sizes refer to the pilot scale, with size A representing the smallest, size B medium, and size C as the largest.

   f. Electricity generated from hydropower, solar, wind, and geothermal were treated as zero-emissions by GREET
   g. Xcel's latest integrated resource plan provides Xcel's planned grid mix out until 2045 and Xcel has stated their intention to reach net zero by 2050.
7. *Question*: Have you considered updating electricity emission assumptions based on Minnesota's 100 percent carbon free electricity standard?
   a. *Answer*: This new legislation is so recent and decisions in the Frameworks Order and Xcel's integrated resource plan were made before this information was finalized. However, it is not anticipated that this new legislation will drastically change the data or pilot selection
      i. In terms of practical impacts, it could change how certain pilots are viewed from one evaluation criteria of many.
   b. ICF to check if this sensitivity could be included
   c. Note that NREL will likely incorporate this change in policy in its next update, which will then be reflected in GHG emissions calculations in CenterPoint's future NGIA status reports
8. *Participant comment*: Our request would just be to provide updates as they come in regarding new electrification scenarios and provide analysis/discussion about impacts of things like the 100 percent bill, etc.

Evaluation Framework Gaps

1. Framework order: "When calculating the greenhouse gas intensity of a carbon capture project, utilities shall use project-specific data as available and principles consistent with the GREET model, unless it is demonstrated that an alternate method is appropriate"
   a. Generally, this model is meant for transportation fuel emissions on a life cycle basis
   b. Since GREET lacks explicit guidance on carbon capture modeling, ICF takes an approach that follow lifecycle emissions accounting principles as required by the Commission's Frameworks Order
2. For the carbon capture pilots (Pilot #11, Archetype Carbon Capture Project for Industrial or Large Commercial Facility, and Pilot #13, Carbon Capture Rebates for Commercial Buildings), note that Minnesota lacks sufficient geology for CO_2 sequestration, so these pilots assume carbon utilization
   a. Pilot #11 (Archetype Carbon Capture Project for Industrial or Large Commercial Facility)
      i. Incentive payments for large CenterPoint customers to own and operate a carbon capture unit
      ii. Pilot is based on an archetype which will need to be refined if and when the pilot moves forward—CenterPoint would need to identify and recruit interested industrial facilities and mold this archetype to a specific industrial facility/customer
      iii. Significant uncertainty about how the captured CO_2 gas will be utilized, which affects lifecycle GHG intensity, so NGIA pilot will fund project-specific lifecycle assessments

        iv. Current assumption is modeled on GHG impact on novel processes for CO2 utilization in cement—assumes that lifecycle GHG savings smaller than the amount of CO_2 physically captured by these units
    b. Pilot #13 (Carbon Capture Rebates for Commercial Buildings)
        i. Incentive payments to support medium or large CenterPoint customers install standardized CarbinX unit from CleanO2 Carbon Capture Technologies, Inc. (CleanO2)
        ii. CarbinX units produce a solid carbonate byproduct, which CleanO2 uses to produce soap and other products for commercial sale.
        iii. Existing lifecycle analysis indicates significant lifestyle GHG emission reductions because using the byproduct form CarbinX units would displace conventional potassium carbonate production emissions
        iv. Net lifecycle GHG savings for the pilot would exceed the amount of CO2 physically captured by the CarbinX units due to displacement of other sources of carbon emissions and emissions reductions resulting from the energy efficiency improvement through CarbinX units' heat recovery component
3. *Question*: Does Minnesota have any cement manufacturers?
    a. *Answer*: Yes, based on initial research, there are multiple cement and concrete producers in the state, whereby CO_2 could be used with cement to create fortified concrete if the business were interested in pursuing this type of project
4. Pilot #7 (Green Hydrogen Blending on Natural Gas Distribution System)
    a. 1MW on-site solar PV + 1MW electrolyzer owned by CenterPoint
    b. Size considerations for this pilot:
        i. Size A: assumes 19% capacity factor for solar generation, no grid electricity purchases
        ii. Size B: 19% from on-site solar + grid electricity purchases to get electrolyzer to 95% capacity factor
        iii. CenterPoint still deciding whether to include a Size C version of this pilot for consideration
    c. Assumes project leverages the investment tax credit (ITC), which would allow it to receive up to 30% upfront rebate for both the solar PV and electrolyzer
5. Pilot #8 (Green Hydrogen Archetype – Industrial or Large Commercial Facility Electrolyzer Pilot)
    a. Electrolyzer would be owned by industrial facility (CenterPoint customer)
    b. Assumes 5MW on-site electrolyzer, no on-site solar
    c. Different pilot sizes (A/B/C) represent additional industrial facilities implementing the same archetype
    d. Assumes project qualifies for $3/kg production tax credit (PTC) rebate through IRA
6. Note that Pilot #7 would be owned and operated by CenterPoint, whereas Pilot #8 would require the industrial facility to make big investments in hydrogen themselves
    a. Incentives from NGIA and IRA will be big drivers for Pilot #8

Next Steps Related to the February 24, 2023 Meeting

1. CenterPoint is open to further discussion with interested groups
2. Engagement participant feedback deadline: March 24, 2023 is the deadline for providing feedback on the pilot assumptions, so CenterPoint can move forward with building portfolios. That said, CenterPoint is always open to conversations to discuss what is possible
3. Once the analysis is finalized, will begin to prioritize which pilots will fit into the innovation plan portfolio(s)
4. Additional analysis is also ongoing on aspects such as new job impacts and rate impacts
5. Some additional portfolio-level costs will also need to be added to all the pilots

Q&A Following the February 24, 2023 Meeting

1. *Question*: Would Pilot #8 (Green Hydrogen Archetype -Industrial Facility Electrolyzer Pilot), or the scope under Pilot #7 (Green Hydrogen Blending into Natural Gas Distribution System) or elsewhere, include green hydrogen produced from organic anaerobic digester with pyrolysis on the back end? In other words, if green hydrogen were produced from this process could CenterPoint use it if plan is approved as currently proposed.
    a. *Answer*: Methane pyrolysis is not exactly green hydrogen. Green Hydrogen, (and power-to-hydrogen as defined in NGIA) is specifically producing hydrogen via electrolysis using carbon-free electricity. With that said, the carbon capture category is more flexible and would accommodate methane pyrolysis, since carbon (that would otherwise be released to the atmosphere) is captured in solid form when producing hydrogen via this process. Pilot #11 (Archetype Carbon Capture Project for Industrial or Large Commercial Facility) could include this technology.
2. *Question*: Can you speak to how these pilots compare to CenterPoint's current ongoing H_2 pilot (size, cost, etc.)?
    a. *Answer*: This would be an additional electrolyzer of the same size as the existing hydrogen pilot. Trying to explore possibilities of driving down the cost of hydrogen blending. CenterPoint is planning to take advantage of installing its own solar generation as this could potentially lower costs.
3. *Question*: Why does Pilot #8 (Green Hydrogen Archetype -Industrial Facility Electrolyzer Pilot) assume no on-site (or co-located) solar? Is it because it would be located/owned by the customer?
    a. *Answer*: Ultimately the customer will be making significant investments and CenterPoint is there to support them; can't direct them what to do. It would be up to the customer to build on-site solar; the pilot doesn't preclude it.
4. *Question*: Does anyone know if the 30% ITC is always available "up front" or could it be that they require the project to take a tax credit each year until the credit is used up.
    a. *Answer*: There are different options to choose between. The ITC is upfront, based off capital cost, but in PTC could be ongoing

5. *Question*: In Pilot #8 (Green Hydrogen Archetype -Industrial Facility Electrolyzer Pilot), is the 5MW size flexible?
    a. Answer: Yes, it is flexible depending on what the customer wants—5 MW is just a modeling assumption.
6. *Question*: Is it possible for one customer to be eligible for more than one project at the same time?
    a. *Answer*: Yes, it's possible--nothing would preclude this, but implementation details aren't fully fleshed out.
7. *Question*: If Pilot #8 (Green Hydrogen Archetype -Industrial Facility Electrolyzer Pilot) uses a green tariff, is it true that it would not have to limit the electrolyzer capacity factor in order to be considered to run on carbon-free electricity? And you are only assuming the 38% capacity factor here (based on wind) because of the uncertainty whether the IRA PTC rules will allow use of green tariff electricity to get the full $3/kg H_2?
    a. *Answer*: Yes that is correct, that is why the assumption was built into it like it was. It is not a requirement, just an assumption. If the rules shake out differently, so would the capacity factor. Ultimately each specific project would evaluate the best path forward based on final IRS rules once they are set.
8. *Question*: In Pilot #7 (Green Hydrogen Blending into Natural Gas Distribution System), if CenterPoint is owning and operating the facility, what determines where and how those facilities come to be and how do others come into play?
    a. *Answer*: CenterPoint would engage specialists to lead or assist with the design, procurement and construction of the solar and electrolyzers and other system components, but in general it would be a CenterPoint project. Element of blending directly into gas distribution system, so needs to be carefully planned out similar to our existing project and remain under CenterPoint's control.
9. *Note*: This specific initial innovation plan is still in development, but the opportunity to consider new ideas for inclusion in the plan will soon close. However, CenterPoint is always open to hear ideas and happy to discuss and see what is possible, including ideas that could potentially be considered in future plan iterations.
10. *Question*: In the way that Pilot #14 (New Networked Geothermal Systems Pilot) was considered, who would own what? Would CenterPoint invest in it? But then customer would own and pay for a ground-source heat pump (GSHP)? How does this work and how does it affect overall cost?
    a. *Answer*: Final decisions have not been made, this would be part of the initial phase of the project.. In our modelling, cost is built on the following assumptions: CenterPoint would own and operate piping and distribution to customers' homes and facilities. Customers would own and operate GSHP to get space and water heating needs met. There would be participation fees that reflect smaller than usual costs of technology. Certain costs are considered to be capital expenditures (piping, etc.) recovered over a 40-year life, as opposed to installing heat pump equipment, cost for staff, which would be considered operational expenditures. However, this pilot would start with a feasibility study which would further define pilot operation.

11. *Question*: Can you please talk about how you are thinking of and evaluating the role of technology, especially in the context of a decarbonized future
    a. *Answer*: This first plan will be a lot of testing out of technologies supported by broader studies. The first R&D plan will propose a net-zero carbon study for MN. Scalability will also be one of the qualitative factors.

Approach to R&D Initiatives

1. The NGIA statute specifically calls out R&D projects
    a. Innovation plan filers may include investments up to 10% of total incremental costs in their plan for R&D initiatives
2. R&D distinction (compared to full pilot projects)
    a. Relatively smaller in scale research projects or studies
    b. Uncertain, difficult to quantify, or nominal GHG reduction benefits
3. CenterPoint is proposing R&D project funding timeline flexibility – to propose more R&D in annual NGIA status reports going forward
    a. Flexibility for new R&D projects given that technology is constantly evolving and there is so much opportunity with IRA funding
        i. Provides a way for R&D efforts to be less constrained by the 5-year plan duration
    b. Specific R&D projects that would be funded in the first two years must be included in the first innovation plan filing as those will come before the first NGIA status report
        i. Prioritizing foundational activities and innovative resources underrepresented in Pilot Shortlist for initial list of R&D
    c. Will reserve funding for R&D in future years in a general R&D budget
4. Annual status reports will report progress/results of completed R&D and propose R&D to be implemented in the upcoming year
5. CenterPoint will accept R&D proposals on an ongoing basis for future consideration

CIP/NGIA Coordination

1. To be eligible for inclusion in innovation plans, utilities must:
    a. Demonstrate that proposed energy efficiency and strategic electrification investment are not included in the utility's current CIP triennial plan, and state whether the utility does or does not intend to include any of the proposed investments in the future CIP triennial plans;
    b. For proposed energy efficiency and strategic electrification investments in measures that have been included in past CIP plans, provide historical measure level performance data since 2010; and
    c. Clearly demonstrate why the proposed energy efficiency and strategic electrification investments could not reasonably be included in the utility's CIP.

Weatherization Blitzes

1. PUC Order: CenterPoint must demonstrate why energy efficiency investments cannot reasonably be included in CIP
2. CenterPoint considered two approaches:
    a. Create an entirely new weatherization program under NGIA, with incentives that are similar to those in CIP.
    b. Test marketing approaches under NGIA to drive existing/new weatherization incentives (utility, state, federal)
3. Question to consider:
    a. What are the incremental energy savings assumptions for weatherization blitzes (above and beyond CIP, i.e., how many additional weatherization projects are completed as a result of the weatherization blitz outreach efforts)?
    b. What is the difference between an NGIA weatherization project and CIP weatherization project? Must avoid competition/customer confusion/duplicative services
    c. How will energy savings be tracked and accounted for? CIP is subject to cost-effectiveness thresholds, energy savings goals and also has opportunity for financial incentive tied to savings.
4. CenterPoint's approach/rationale for its current proposal
    a. Use NGIA to test marketing approaches to drive weatherization
    b. Simplify NGIA and CIP implementation
    c. Use NGIA as testing ground for eventual inclusion in CIP
    d. This marketing opportunity could be tested and—if shown to be effective—could be more broadly included in future CIP plans
        i. Potential to serve as a feeder approach
    e. There is enough R&D funding that does not need to limit contemplated program size
    f. This is an additional investment in weatherization, not CenterPoint's only such investment

Industrial GHG Audit Program

1. Expanding the existing CIP Process Efficiency and Commercial Efficiency program which includes industrial and large commercial audits
    a. Looking for opportunities that are cost-effective
    b. Doesn't make sense to launch a separate audit program
    c. The additional cost for audits would be paid for through NGIA and NGIA would pay for certain projects identified projects that can't go through CIP
2. May identify opportunity to engage in other commercial/industrial-focused NGIA pilots such as industrial carbon capture, hydrogen, etc., in which case customers would be transitioned to those pilots for those opportunities
3. If NGIA strategic electrification or efficiency measures are identified, CenterPoint will follow this process:
    a. First, determine if measure could work in CIP as a custom measure or otherwise

        i. If it can, then the CIP process will be followed and won't proceed under NGIA
    b. Second, determine if the measure would cost under a certain $/ton on a lifetime basis
        i. Specific $/ton value to be determined but will be included in filing
        ii. If passes this screen, CenterPoint would pay a rebate amount for measure installation
    c. Third, all measures rebated through this NGIA pilot would be subject to third-party evaluation to verify savings

Next Steps

1. Plan for third meeting (likely May) is to present a big-picture plan for filing, including rate impacts
    a. Like the first two pairings of innovation plan meetings, the third meeting will have one meeting targeted to any/all interested parties and another meeting targeted towards regulatory parties.
    b. Plan will be filed after the third pair of meetings (targeting mid-year filing)
2. CenterPoint continues to welcome feedback/focused discussion/engagement from interested parties until March 24th, after which it will be more difficult to incorporate into the initial innovation plan
3. Participants and other interested parties may reach out with further questions and/or feedback via the email address dedicated to this initiative: InnovationPlan@CenterPointEnergy.com.
4. Still have participation stipends
5. Will send out notes from meeting

Public Engagement Meeting #3: Review of CenterPoint Energy's Draft Innovation Plan

Peter Narbaitz
Director, Energy Markets & Planning, ICF

5/12/2023

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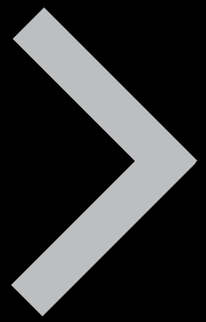
Agenda



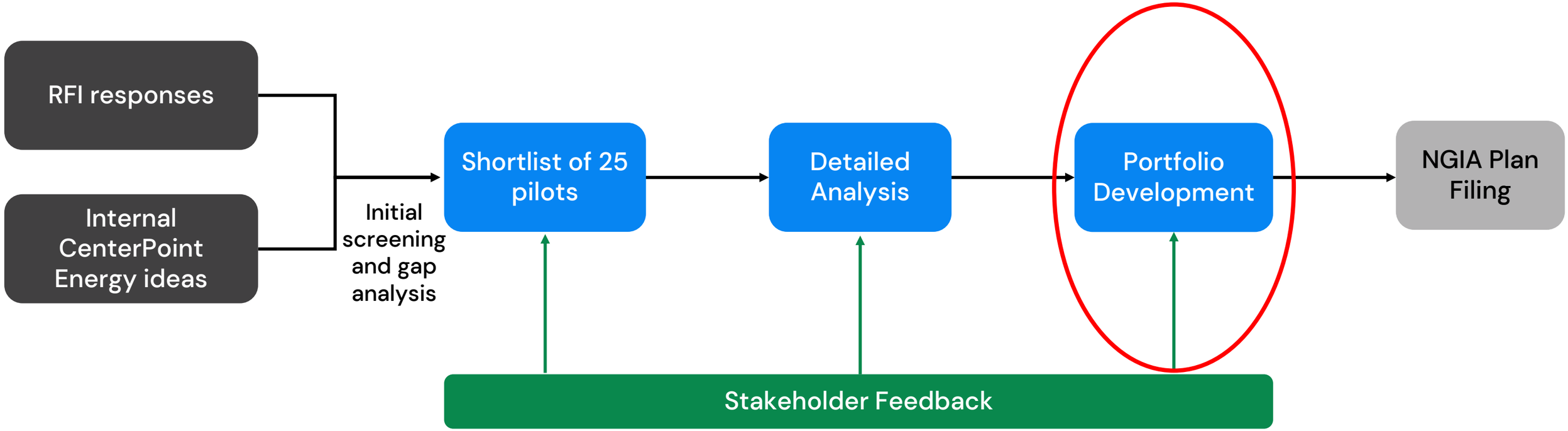
- Overview of NGIA requirements and innovation plan development process
- Review of pilot projects selected for draft innovation plan
- Cost and emissions impacts of the draft innovation plan
- Draft IMPLAN modelling of job impacts
- Discussion

- Break

- R&D projects selected for draft innovation plan
- Rate impacts for draft innovation plan
- Final thoughts and next steps

Overview of NGIA Innovation Plan Development Process and NGIA Requirements

Overview of NGIA Innovation Plan Development Process



Focus of this third public engagement meeting is feedback on the draft portfolio of pilots selected for CNP's Innovation Plan: what feedback do you have on the draft portfolio of pilots that should be considered before a final NGIA Innovation Plan is filed with the utilities commission?

Portfolio Frameworks Chart

- NGIA frameworks document prescribe the table shown here to present results for the pilots included in NGIA portfolio
- Some evaluation criteria are quantitative, other parts are qualitative
  - Cost-effectiveness does not boil down to a number
  - Will assess cost-effectiveness primarily from the societal perspective (all-in perspective)
- Previous stakeholder meeting provided and discussed assumptions feeding into the analysis for each of these pilots (and some updates have been made since then)

	Pilot 1	Pilot 2	Pilot 3
Perspectives			
NGIA Utility Perspective			
NGIA Participants Perspective (including specific impacts on low- and moderate-income participants)			
NGIA Nonparticipating Customers Perspective (including specific impacts on low- and moderate-income customers)			
Effects on Other Energy Systems and Energy Security			
Environment			
GHG Emissions			
Other Pollution (including any environmental justice costs or benefits)			
Waste reduction and reuse (including reduction of water use)			
Policy (e.g., natural gas throughput, renewable energy goals)			
Socioeconomic			
Net Job Creation			
Economic Development			
Public Co-Benefits			
Market Development			
Innovation			
Direct Innovation Support			
Resource Scalability and Role in a Decarbonized System			

Reminder – Statutory Requirements

General Statutory Requirements to Keep in Mind

- Strategic electrification is defined to require gas backup
- There is an overall cost cap of approximately $90M over the five-year plan
- In addition, there is a bonus amount available only for certain kinds of RNG equal to approximately $15M over the five years
- Up to 10% of budget can be allocated to “research and development” (in this case about $10.6M)

Special Requirements for the First Plan

- All utilities
  - Costs must be 50%+ for RNG, biogas, power-to-hydrogen or power-to-ammonia (low carbon fuels)
- CenterPoint Only
  - Residential deep energy retrofit + electric ASHP pilot (with gas backup)
    - Must facilitate very specifically defined and ambitious retrofit standard in at least some homes
  - Industrial hard-to-electrify pilot
  - Small/medium business GHG audit pilot
  - District energy pilot required but may not be more than 20% of plan costs

Overview of Draft NGIA Innovation Plan

General Thoughts / Approach to Portfolio Development

General strategies to developing draft CenterPoint NGIA portfolio

- Aim for a 'balanced portfolio', covering different innovative resource types while meeting all statutory requirements and balancing competing priorities
  - For example, >50% of utility costs need to be for low-carbon fuels. To maximize funding in other areas the approach aimed to be only slightly above the 50% mark.
- Maximize innovation and learnings by including as many different pilots as possible
- Prioritize funding for some of the more innovative options that could help CNP evolve its business to support customers in reducing emissions; aim to help the utility gain experience in these areas through this portfolio
  - With some pilots, additional learning moments were not anticipated if the size of the pilot was increased
- Aimed to produce a 'reasonable cost portfolio', but not compromising on innovation for the sake of just using the lowest-cost options
- Generally chose larger sizes for pilots that are commercialized technologies, seem highly scalable and have high potential for long-term emission reductions – networked geothermal, commercial hybrid heating, residential deep energy retrofits

Summary of Pilots Selected for Draft CenterPoint Innovation Plan Portfolio

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio[1]	Description of this Size of Pilot
Renewable Natural Gas (RNG)	1	RNG Proposal – Anaerobic Digestion of Organic Materials	B	Assume 10-year contract to purchase 41,440 Dth / year
	2	RNG Proposal – Anaerobic Digestion of East Metro Food Waste	B	Assume 10-year contract to purchase 152,613 Dth / year
	3	RNG Archetype – WRRF	B	Assume 10-year contract to purchase 50,000 Dth / year[2]
	4	RNG Archetype – Dairy Manure	A	Assume 10-year contract to purchase 10,000 Dth / year[2]
	5	RNG Archetype – Food Waste	B	Assume 10-year contract to purchase 220,000 Dth / year[2]
	6	RNG Archetype – Landfill Gas	A	Assume 10-year contract to purchase 100,500 Dth / year[2]
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	1 MW electrolyzer + 1 MW solar PV
	8	Green Hydrogen Archetype – Industrial or Large Commercial Facility Electrolyzer	A	One facility installing 5 MW electrolyzer
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	50 facilities participate in leak surveys and repairs
	10	Urban Tree Carbon Offset Program	A	4,500 carbon credits purchased
	11	Archetype Carbon Capture Project for Industrial or Large Commercial Facility	A	One facility installing carbon capture system
	13	Carbon Capture Rebates for Commercial Buildings	A	325 CarbinX systems installed
District Energy	14	New Networked Geothermal Systems	C	1000-ton capacity system installed
	15	Decarbonizing Existing District Energy Systems	B	2 existing district energy sites supported
	16	New District Energy System	B	2 new district energy sites supported
Strategic Electrification	17	Industrial Electrification Incentive Program	A	Industrial heat pumps piloted at 3 facilities
	18	Commercial Hybrid Heating	B	135 facilities install hybrid gas-electric rooftop units
	19	Residential Deep Energy Retrofit + Electric ASHP Pilot (with Gas Backup)	B	238 buildings (SFH + Multi-family) participate across 3 phases
Energy Efficiency	20	Small/Medium Business GHG Audit	A	992 GHG audits, with 3% implementing measures from NGIA
	21	Residential Gas Heat Pump	A	6 homes install gas heat pumps
	22	Gas Heat Pump for Commercial Buildings	A	3 buildings install gas heat pumps
	24	Solar Thermal Heating for C&I	None	N/A
	25	Industrial and Large Commercial GHG Audit	A	50 GHG audits, 5 projects implemented with NGIA incentive

Key Takeaways:

- Able to fit most of pilots into the portfolio with at least size A
- Projects from the pilot that is not included (#24) would still be eligible for an incentive through pilot #25
- How project sizes are defined varies significantly by innovation category and pilot type (e.g. some are direct install programs, while incentives in others only cover a fraction of expected customer costs)

[1] Note that size A is smallest option included for each pilot, size C is the largest. More details on pilot sizes are available in the Appendix, slides 30 to 36.

[2] These values included in current portfolio for budgeting purposes, however CNP intends to hold an RFP process and the final mix of RNG sources could vary significantly (based on the responses to that RFP).

Details on Draft NGIA Innovation Plan Portfolio Budget Breakdown

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio	Utility Costs Towards NGIA Budget	
				$	% of Portfolio
Renewable Natural Gas (RNG)	1	RNG Proposal - Anaerobic Digestion of Organic Materials	B	$ 2,856,761	3%
	2	RNG Proposal -Anaerobic Digestion of East Metro Food Waste	B	$ 10,160,063	10%
	3	RNG Archetype – WRRF	B	$ 4,010,633	4%
	4	RNG Archetype - Dairy Manure	A	$ 2,241,062	2%
	5	RNG Archetype – Food Waste	B	$ 19,321,990	18%
	6	RNG Archetype - Landfill Gas	A	$ 5,351,763	5%
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	$ 5,183,888	5%
	8	Green Hydrogen Archetype - Industrial or Large Commercial Facility Electrolyzer Pilot	A	$ 1,379,484	1%
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	$ 1,371,302	1%
	10	Urban Tree Carbon Offset Program	A	$ 329,301	0%
	11	Archetype Carbon Capture Project for Industrial or Large Commercial Facility	A	$ 2,513,519	2%
	13	Carbon Capture Rebates for Commercial Buildings	A	$ 1,445,823	1%
District Energy	14	New Networked Geothermal Systems Pilot	C	$ 11,754,257	11%
	15	Decarbonizing Existing District Energy Systems	B	$ 1,218,753	1%
	16	New District Energy System	B	$ 345,592	0%
Strategic Electrification	17	Industrial Electrification Incentive Program	A	$ 571,343	1%
	18	Commercial hybrid heating pilot	B	$ 7,198,434	7%
	19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	B	$ 13,703,275	13%
Energy Efficiency	20	Small/medium business GHG audit pilot	A	$ 1,929,754	2%
	21	Residential Gas Heat Pump	A	$ 382,229	0%
	22	Gas Heat Pump for Commercial Buildings	A	$ 765,026	1%
	24	Solar Thermal Heating for C&I	None	$ -	0%
	25	Industrial and Large Commercial GHG Audit Pilot	A	$ 1,096,406	1%
Total Pilot Portfolio				**$ 95,130,658**	**90%**
Additional R&D Budget		R&D Projects - Low Carbon Fuels (25%)		$ 2,642,615	2.5%
		R&D Projects - Other (75%)		$ 7,927,846	7.5%
Total Portfolio (incl. R&D)				**$ 105,701,119**	**100%**

Key Takeaways:

- Draft portfolio uses 100% of the estimated budget, with 50.3% of utility costs in this 5-year plan for low-carbon fuels
- After low-carbon fuels use the required 50% (pilots 1 to 8, plus 25% of R&D) of budget, pilots 14, 18, and 19 use up most of remaining (non-R&D) budget
- Portfolio-level costs for the NGIA innovation plan have been distributed between pilots in the values shown here (making them higher than previous versions)
- 25% of the funding set aside for R&D projects has been earmarked for low-carbon fuels projects, in order to reach the 50% overall requirement
- As discussed previously utility costs towards NGIA budget are reduced by pilot commodity cost savings

Details on Draft NGIA Innovation Plan Portfolio GHG Emission Reductions

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio	Lifetime GHG Savings		Emission Reduction Cost from Utility Perspective	Emission Reduction Cost from Total (Net) Pilot Impacts Perspective
				tCO2e	% of Portfolio	$/tCO2e	$/tCO2e
Renewable Natural Gas (RNG)	1	RNG Proposal - Anaerobic Digestion of Organic Materials	B	28,221	2%	$272	$221
	2	RNG Proposal - Anaerobic Digestion of East Metro Food Waste	B	175,263	15%	$156	$105
	3	RNG Archetype – WRRF	B	26,556	2%	$313	$261
	4	RNG Archetype - Dairy Manure	A	9,895	1%	$465	$414
	5	RNG Archetype – Food Waste	B	254,739	21%	$157	$105
	6	RNG Archetype - Landfill Gas	A	53,621	4%	$207	$155
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	27,993	2%	$821	$767
	8	Green Hydrogen Archetype - Industrial or Large Com. Electrolyzer Pilot	A	56,330	5%	-$11	$829
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	38,831	3%	$29	-$33
	10	Urban Tree Carbon Offset Program	A	4,500	0%	$67	$12
	11	Archetype Carbon Capture Project for Industrial or Large Com. Facility	A	50,865	4%	$66	$294
	13	Carbon Capture Rebates for Commercial Buildings	A	55,150	5%	$1	-$62
District Energy	14	New Networked Geothermal Systems Pilot	C	107,355	9%	$393	$389
	15	Decarbonizing Existing District Energy Systems	B	124,030	10%	-$27	-$53
	16	New District Energy System	B	40,882	3%	-$19	$351
Strategic Electrification	17	Industrial Electrification Incentive Program	A	11,896	1%	$10	$10
	18	Commercial hybrid heating pilot	B	25,609	2%	$217	$41
	19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	B	66,760	6%	$159	$295
Energy Efficiency	20	Small/medium business GHG audit pilot	A	5,642	0%	$322	$328
	21	Residential Gas Heat Pump	A	235	0%	$1,464	$1,346
	22	Gas Heat Pump for Commercial Buildings	A	2,154	0%	$296	$192
	24	Solar Thermal Heating for C&I	None	0	0%	$0	$0
	25	Industrial and Large Commercial GHG Audit Pilot	A	35,560	3%	-$6	-$81
Total Pilot Portfolio				**1,202,087**	**100%**	$152	$182
Additional R&D Budget		R&D Projects - Low Carbon Fuels (25%)		0	0%		
		R&D Projects - Other (75%)		0	0%		
Total Portfolio (incl. R&D)				**1,202,087**	**100%**	$161	$191

- These values include updated emission reductions and costs (based on feedback received, additional review, and added portfolio-level costs)
- The **utility cost perspective** includes only costs the utility will pay and excludes costs paid by participants or others. This perspective is highly sensitive to the level of participant incentive selected. This perspective also does not include benefits of GHG or other pollutant reductions.
- The **total (net) pilot impacts** looks to capture 'all the value and cost streams' that have been quantified in this analysis. It includes costs the utility, to the participant, and the value of GHG and other pollutant savings.
- Additional updated results tables for all pilot sizes can be found in the Appendix.

Combined Details on Draft NGIA Innovation Plan Portfolio

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio	Utility Costs Towards NGIA Budget		Lifetime GHG Savings		Emission Reduction Cost from Utility Perspective	Emission Reduction Cost from Total (Net) Pilot Impacts Perspective
				$	% of Portfolio	tCO2e	% of Portfolio	$/tCO2e	$/tCO2e
Renewable Natural Gas (RNG)	1	RNG Proposal - Anaerobic Digestion of Organic Materials	B	$ 2,856,761	3%	28,221	2%	$272	$221
	2	RNG Proposal -Anaerobic Digestion of East Metro Food Waste	B	$ 10,160,063	10%	175,263	15%	$156	$105
	3	RNG Archetype – WRRF	B	$ 4,010,633	4%	26,556	2%	$313	$261
	4	RNG Archetype - Dairy Manure	A	$ 2,241,062	2%	9,895	1%	$465	$414
	5	RNG Archetype – Food Waste	B	$ 19,321,990	18%	254,739	21%	$157	$105
	6	RNG Archetype - Landfill Gas	A	$ 5,351,763	5%	53,621	4%	$207	$155
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	$ 5,183,888	5%	27,993	2%	$821	$767
	8	Green Hydrogen Archetype - Industrial or Large Com. Electrolyzer Pilot	A	$ 1,379,484	1%	56,330	5%	-$11	$829
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	$ 1,371,302	1%	38,831	3%	$29	-$33
	10	Urban Tree Carbon Offset Program	A	$ 329,301	0%	4,500	0%	$67	$12
	11	Archetype Carbon Capture Project for Industrial or Large Com. Facility	A	$ 2,513,519	2%	50,865	4%	$66	$294
	13	Carbon Capture Rebates for Commercial Buildings	A	$ 1,445,823	1%	55,150	5%	$1	-$62
District Energy	14	New Networked Geothermal Systems Pilot	C	$ 11,754,257	11%	107,355	9%	$393	$389
	15	Decarbonizing Existing District Energy Systems	B	$ 1,218,753	1%	124,030	10%	-$27	-$53
	16	New District Energy System	B	$ 345,592	0%	40,882	3%	-$19	$351
Strategic Electrification	17	Industrial Electrification Incentive Program	A	$ 571,343	1%	11,896	1%	$10	$10
	18	Commercial hybrid heating pilot	B	$ 7,198,434	7%	25,609	2%	$217	$41
	19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	B	$ 13,703,275	13%	66,760	6%	$159	$295
Energy Efficiency	20	Small/medium business GHG audit pilot	A	$ 1,929,754	2%	5,642	0%	$322	$328
	21	Residential Gas Heat Pump	A	$ 382,229	0%	235	0%	$1,464	$1,346
	22	Gas Heat Pump for Commercial Buildings	A	$ 765,026	1%	2,154	0%	$296	$192
	24	Solar Thermal Heating for C&I	None	$ -	0%	0	0%	$0	$0
	25	Industrial and Large Commercial GHG Audit Pilot	A	$ 1,096,406	1%	35,560	3%	-$6	-$81
Total Pilot Portfolio				**$ 95,130,658**	**90%**	**1,202,087**	**100%**	$152	$182
Additional R&D Budget		R&D Projects - Low Carbon Fuels (25%)		$ 2,642,615	2.5%	0	0%		
		R&D Projects - Other (75%)		$ 7,927,846	7.5%	0	0%		
Total Portfolio (incl. R&D)				**$ 105,701,119**	**100%**	**1,202,087**	**100%**	$161	$191

Qualitative Costs and Benefits of the Draft Portfolio

- **Cost-effectiveness does not boil down to a number**
- **Given that all the pilots are included in this draft portfolio, all of the qualitative benefits and costs are relevant**
- **A more detailed summary of key qualitative impacts can be found in slides 47 to 50, a high level selection is included below:**
  - Hybrid heating targets the largest residential and commercial sector uses of natural gas and in the 2021 Minnesota G21 study the 'electrification with gas back up' scenario had smallest total cost increase by 2050
  - Residential and commercial hybrid heating and gas heat pumps were selected for the Minnesota Efficient Technology Accelerator's (ETA) starter portfolio, and taking a collaborative approach with the Center for Energy and Environment (CEE) on these pilots offers can amplify the effects of both NGIA and ETA.
  - All deep emission reductions pathways (including in G21 study) rely on a lot of decarbonized gases to reach GHG reduction targets
  - The RNG pilots provide CenterPoint Energy with experience in purchasing low-carbon fuels, and the hydrogen blending and new district energy pilots provide experience with a different way of providing energy
  - RNG Pilots 1 and 2 support organics recycling and beneficial use of byproducts
  - The RNG, hydrogen, networked geothermal, strategic electrification, new district energy, solar thermal, and potentially the C&I GHG audit pilot increase use of renewable energy
  - All pilots except carbon capture pilots and urban tree planting decrease geologic gas throughput
  - A number of projects support improved industrial competitiveness in Minnesota, by helping industry become more efficient, while other pilots could entice corporate R&D teams to concentrate their initial decarbonization efforts at Minnesota facilities
  - Pilots seeking higher IRA incentives would follow wage/labor IRA requirements
  - CenterPoint Energy is planning to include budget for workforce development to support various projects at the portfolio level
  - Many of the pilots are small-scale field testing, with most or all of costs covered for CenterPoint Energy customers, in order to better understand an emerging technology and how it could be scaled

IMPLAN Methodology for Assessment of Net Job Impacts

- IMPLAN analyzes macroeconomic effects of an economic activity on a single, pre-specified economic region (in this case, for Minnesota)
- Model is based on the input-output relationships between industries and sectors, using published data from the Bureau of Economic Analysis
- IMPLAN results are presented using commonly-accepted categories
- Definition of output categories
  - **Direct** – jobs created from the direct impacts on the industries that are directly related to the technology implemented by the pilot projects
  - **Indirect** – supply chain jobs created by the inter-industry linkages resulting from direct spending on materials, equipment, and construction
  - **Induced** – jobs created downstream in all local industries, due to the increased consumption expenditures associated with the direct and indirect jobs
- IMPLAN is used to estimate the regional economic impacts of the pilot projects, including job creation potential supported by CenterPoint Energy's Natural Gas Utility Innovation Plan investment. IMPLAN estimates employment by aggregated sector.

Details on Draft NGIA Innovation Plan Portfolio Net Job Impacts

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio	Net Direct Jobs Creation	Net Indirect Jobs Creation	Net Induced Jobs Creation
				# of FTEs	# of FTEs	# of FTEs
Renewable Natural Gas (RNG)	1	RNG Proposal - Anaerobic Digestion of Organic Materials	B	46	17	25
	2	RNG Proposal -Anaerobic Digestion of East Metro Food Waste	B	112	62	70
	3	RNG Archetype – WRRF	B	33	18	21
	4	RNG Archetype - Dairy Manure	A	7	15	8
	5	RNG Archetype – Food Waste	B	161	88	100
	6	RNG Archetype - Landfill Gas	A	45	24	27
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	43	59	45
	8	Green Hydrogen Archetype - Industrial or Large Com. Electrolyzer Pilot	A	164	98	120
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	9	5	7
	10	Urban Tree Carbon Offset Program	A	1	0	0
	11	Archetype Carbon Capture Project for Industrial or Large Com. Facility	A	23	26	28
	13	Carbon Capture Rebates for Commercial Buildings	A	88	51	55
District Energy	14	New Networked Geothermal Systems Pilot	C	115	129	186
	15	Decarbonizing Existing District Energy Systems	B	142	84	89
	16	New District Energy System	B	49	31	45
Strategic Electrification	17	Industrial Electrification Incentive Program	A	11	5	6
	18	Commercial hybrid heating pilot	B	40	23	25
	19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	B	44	31	96
Energy Efficiency	20	Small/medium business GHG audit pilot	A	13	9	9
	21	Residential Gas Heat Pump	A	2	1	1
	22	Gas Heat Pump for Commercial Buildings	A	3	2	2
	24	Solar Thermal Heating for C&I	None	-	-	-
	25	Industrial and Large Commercial GHG Audit Pilot	A	21	13	13
Total Portfolio				1,171	793	979
Additional R&D Budget		R&D Projects - Low Carbon Fuels (25%)				
		R&D Projects - Other (75%)				
Total Portfolio (incl. R&D)				1,171	793	979

Number of jobs calculated as full-time equivalent (FTE), representing one year of work (2080 work hours), aggregated over the project lifetime.

Key Takeaways:

- All pilots are expected to drive a net increase in jobs in Minnesota
- Some of the determinants about whether one pilot created more or less jobs include:
  - Types of spending (e.g., costs for installation will have more Minnesota job impacts than costs for equipment manufacturing)
  - Total costs in a pilot, instead of utility funding (e.g., some pilots fully fund implementation of projects, while other pilots include a utility incentive and significant additional funding from customers or 3rd parties)
  - Pilot lifetime: many of the pilots will continue to operate after the five-year program

Portfolio job creation impact does not include unquantified employment opportunities generated by R&D projects

Discussion

Overview of R&D Project Selection

Research & Development (R&D) Approach

- Research and Development (R&D) distinction:
  - Relatively smaller in scale research projects or studies
  - Uncertain, difficult to quantify, or nominal GHG benefits

- Approach to selecting R&D projects
  - Initial Innovation Plan filing will:
    - Include investments up to 10% of total incremental Innovation Plan costs for R&D
    - Specify R&D projects to be funded in first two years of plan
      - Prioritize foundational activities and innovative resources underrepresented in Pilot Shortlist
    - Reserve funding for R&D in future years in a general R&D budget
  - Annual Status Reports will:
    - Report progress/results of completed R&D
    - Propose R&D to be implemented in the upcoming year
  - External R&D proposals accepted by CenterPoint on an on-going basis for consideration

R&D Projects Selected for Initial Filing

#	R&D Project	Description	Estimated Budget
A	CenterPoint Minnesota Net Zero Study	A study to help CenterPoint understand different pathways the Company could take for its gas utility business in Minnesota to reach net zero emissions by 2050. The study will include development of base year emissions and business-as-usual emissions growth scenario, consideration of potential emissions reductions strategies, development of specific pathways to net-zero to be modeled, and modeling of impacts of the selected pathways (e.g., impacts on gas and electricity consumption, customer costs, and emissions reductions). The analysis will be summarized in a final report.	$ 220,000
B	Weatherization Blitzes	The “Neighborhood weatherization blitzes” proposes to test intensive, novel and community-based marketing and outreach approach to increase the participation in CenterPoint Energy's existing CIP weatherization offerings. There is uncertainty in the effectiveness of this approach and start-up requires notable time and resource investment, so we will start with a Research & Development project to design and test different outreach campaigns to evaluate their effectiveness for consideration in CIP.	$ 800,000
C	High Performance Building Envelope Initiative – Commercial New Construction	High performing commercial building envelopes are a critical part of the effort to reduce GHG emissions, but are rarely incorporated into new commercial construction, especially in small and medium-sized buildings. There are many market barriers that limit the demand for high performance envelopes. This proposal outlines a multi-faceted strategy to address these barriers and start the process of creating a more focused and streamlined approach to high performance building envelope design and integration into new commercial construction in Minnesota.	$ 400,000
D	Assessing next-generation micro-Carbon Capture for Commercial Buildings	The proposed project will investigate the carbon capture effectiveness and waste heat recovery efficiency of CleanO2's next-generation CarbinX units (version 4.0) which claims mitigation of up to 20 metric tons of CO2 emissions per year. For residential and commercial buildings, distributed carbon capture is an emerging technology for decarbonization. These technologies can be integrated with boilers or water heaters to reduce carbon emissions from gas combustion. This project will demonstrate installation of CarbinX 4.0 with existing gas-fired space or water heating equipment and document its installed performance, carbon capture effectiveness, energy savings, economics, and best practices for installation, operation, and maintenance. This assessment will also identify areas of improvement with respect to product design and operation to support continued technology development. Additionally, the project will collect feedback from facility staff and identify codes, standards, regulations, and policies which may be potential barriers to broader deployment of promising distributed carbon capture technologies.	$ 275,000
E	Green Ammonia - Novel Technology	The green ammonia technology – termed MOVAPS (Modular One Vessel Ammonia Production System) is the development of a micro, modular ammonia making reactor, which would produce ammonia in one vessel, and thereby replace the need for a separate electrolyzer and the Haber Bosch process. It runs at ambient temperature and pressure, can run at a variable capacity and has a low CAPEX and OPEX. With these characteristics, it could be set up in a distributive fashion for small-scale applications, or could also be used in large production systems.	$ 100,000
F	RNG Potential Study	This project will select three regions of the CenterPoint Energy service territory and analyze the potential for development of an RNG production facility. Targeted regions will be selected based on, among other factors, whether they can accept a high amount of RNG throughout the year, and nearby agricultural or processing activity that may provide a source of feedstock. This analysis will provide an inventory of existing and potential feedstock available in a 50-75 mile radius, and will assess quantity, seasonal availability, and essential characteristics such as biomethane potential, nutrient (NPK) content, moisture content, and total solids for each feedstock type. Additionally, the study will include a preliminary techno-economic analysis of RNG production at the site if feedstock analysis identifies suitable feedstock availability and prices and estimate the potential digestate quality and quantity based on the expected feedstock mix.	$ 60,000
G	Utilization of Green Ammonia for Thermal Energy Applications	Green ammonia is an innovative resource that has potential to significantly reduce greenhouse gas emissions in the industrial, agriculture, and commercial sectors. With more widespread availability of green ammonia, using it for energy applications has become increasingly attractive. However, ammonia alone is not a suitable direct replacement for natural gas or propane due to is lower reactivity and slower burning velocity. Research and development are needed to determine how anhydrous ammonia can be used in industrial burner applications like boilers, duct burners, and grain dryers. This research project will investigate turbulent burners for ammonia combustion blended with reactive fuels like hydrogen, syngas from biomass gasification, and natural gas. Experiments will be conducted in an application-relevant laboratory test burner apparatus with the capability to measure flame stability and emissions metrics. The project will focus on operational ranges possible with already developed swirl burner technology and develop new burner designs that can eventually be incorporated into existing industrial heating equipment. The primary outcome of the two-year research project will be a set of operating ranges and burner concepts that can be applied to industrial burners used in grain drying for agriculture applications and in boilers for district heating.	$ 205,000

RFI R&D projects to be considered for future years of funding

Primary Innovative Resource	Reference # for RFI /Source	Project Title
Biogas/RNG	2	Minnesota's Renewable Natural Gas Potential
Biogas/RNG	37	Planning Toolkit for RNG and Biogas Project Development
Biogas/RNG	38	Renewable Energy Match (REM)
Biogas/RNG	47	Ideas for Increased Biomethane Production
Biogas/RNG	80	Maximizing Minnesota Renewable Natural Gas (RNG) Opportunities
Biogas/RNG	100	Design a portal that partners potential projects with qualified developers
Biogas/RNG	CNP Internal-11	Small-scale Biodigester at University Campus
Biogas/RNG	CNP Internal-17	RNG Potential Study
Biogas/RNG	Post-Stakeholder Meeting - 108	Sustainable Hydrogen Production Using the Sandwich Gasifier
Biogas/RNG	Gap Analysis	Support for Development of Thermal Gasification RNG Production Processes
Carbon Capture	87	Commercial Building and CHP Scale Carbon Capture Market Study and Pilot Field Testing
Carbon Capture	Post-Stakeholder Meeting - 106	Carbon Utilization – Novel Technology
Strategic Electrification	67	Electrification Qualified Service Provider (eQSP) Program
Power-to-Hydrogen	Post-Stakeholder Meeting - 107	Green Hydrogen and CO2 --> RNG

Additionally, CenterPoint Energy will be establishing a process to accept external R&D proposals for consideration on an on-going basis.

Overview of Draft Rate Impacts

Types of Costs included in Innovation Plan

- **Capital Costs**
  - Long-lived investments that CenterPoint will make
  - Examples outside of NGIA include pipes, meters, etc.
  - Examples in NGIA include hydrogen electrolyzer and solar panels, new networked geothermal system, potential capital investment in RNG projects
  - CenterPoint recovers capital costs over the life of the asset including return for debt and equity costs

- **Gas or Fuel Costs**
  - Costs for fuel that supplies energy to customers
  - Examples outside of NGIA plan include costs for natural gas commodity and demand
  - Examples in NGIA include RNG costs, costs for electricity for CenterPoint-owned hydrogen electrolyzer
  - CenterPoint recovers gas costs via the Purchased Gas Adjustment (PGA) mechanism which is adjusted monthly

- **Operations and Maintenance (O&M) Costs**
  - Generally, anything that isn't capital or gas costs
  - Examples in NGIA include rebates, vendor costs, plan development costs
  - CenterPoint Energy recovers most O&M via delivery charges, some costs (e.g. CIP) are recovered in special riders

CenterPoint Energy's Proposal for Recovering NGIA Costs

- Propose to recover eligible fuel costs via the Purchased Gas Adjustment (PGA)
  - Includes costs for RNG and electricity to fuel CenterPoint's hydrogen electrolyzer (other than supplied by on site solar)

- For other costs (capital & O&M) propose a two-part structure similar to what is used in CIP
  - Certain costs to be included in delivery rates (this is like the Conservation Cost Recovery Charge or CCRC)
  - Remainder of costs to be included in a special rider (this is like the Conservation Cost Recovery Adjustment or CCRA)
  - Rider part will include annual true-up

- We are proposing to match program costs with rate classes that may benefit from the program
  - All classes would pay for resources that serve all customers like RNG, hydrogen electrolyzer, urban tree offsets
  - Commercial/industrial (C&I) customers would pay for pilots for which only serve C&I, residential would pay for pilots that only serve residential

- Looking for thoughts from this group on best ways to communicate with customers and represent these costs on the bill

Expected Bill Impacts during First NGIA Plan

Class	Year 1 Impact	Year 5 Impact
Residential	$3.0M	$16.1M
C&I Non-Transport	$4.6M	$10.8M
C&I Transport	$1.3M	$1.5M
Total	**$8.8M**	**$28.4M**

Mechanism	Year 1 Recovery	Year 5 Recovery
PGA	$0	$11.6M
Rider/Delivery Charges Applying to All Classes	$4.4M	$8.2M
Rider/Delivery Charges Applying to Residential	$0.8M	$5.7M
Rider/Delivery Charges Applying to C&I	$3.6M	$3.0M
Total	**$8.8M**	**$28.4M**

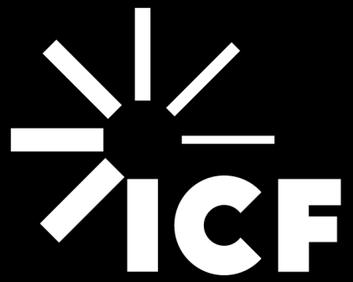
Average annual residential customer impact as follows:

- Year 1: $3.56
- Year 2: $10.09
- Year 3: $14.60
- Year 4: $15.69
- Year 5: $19.27

Final Thoughts and Next Steps

Final Thoughts and Next Steps

- Any final thoughts from the group today?
- CenterPoint Energy continues to welcome feedback until May 26th, after which it will be harder to incorporate
- Willing to have focused discussions with any parties that would like it
- Plan is for NGIA plan to be filed by the end of June



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Appendix – Review of pilot project designs

RNG and biogas pilots

#	Pilot	Description	Pilot Size	Pilot Scale (Dth/year)	Estimated Pilot Budget* (total over pilot period**)
1	Hennepin County RNG Project - Anaerobic Digestion of Organic Materials	An RFI respondent (Hennepin County) is planning to build an anaerobic digestion (AD) facility that would be capable of processing at least 26,000 tons per year of organics to produce RNG and soil/agricultural products. CenterPoint Energy would enter into a contract with this producer to purchase a portion of the RNG - including the commodity and environmental attributes.	A	8,288	$632,174
			B	41,440	$2,565,952
			C	82,880	$4,983,175
2	Ramsey/Washington R&E RNG Project - Anaerobic Digestion of East Metro Food Waste	An RFI respondent (Ramsey/Washington Recycling & Energy) is planning a system to recover organics from municipal solid waste and divert these materials to a future anaerobic digestion facility to produce RNG. CenterPoint Energy would enter into a contract with the RNG producer to purchase a portion of the RNG - including the commodity and environmental attributes.	A	18,168	$1,283,500
			B	152,613	$9,125,802
			C	190,767	$11,351,320
3	RNG Archetype – Water Resource Recovery Facility (WRRF)	For Pilots 3-6, the "RNG Archetypes", CenterPoint Energy would purchase RNG - including the commodity and environmental attributes - from multiple RNG producers that have developed RNG projects using a variety of feedstocks. CenterPoint may also support RNG project development by directly investing in the biogas upgrading equipment (required to produce pipeline-quality RNG) for a limited number of RNG projects, to reduce developers' required capital. We have developed an estimate of expected carbon intensity for each type of feedstock to inform our analysis of potential GHG reductions from a portfolio of RNG purchases. For the "RNG Archetypes" CenterPoint would plan to hold a competitive RFP process to assess actual RNG projects, ensure the company receives the best possible pricing / emission reductions, and then would select the ultimate portfolio of projects funded through the first NGIA plan.	A	10,000	$852,930
			B	50,000	$3,602,364
			C	300,000	$20,064,460
4	RNG Archetype - Dairy Manure		A	10,000	$2,012,930
			B	20,000	$3,961,297
			C	100,000	$18,604,100
5	RNG Archetype – Food Waste		A	10,000	$972,930
			B	220,000	$17,355,076
			C	500,000	$39,124,820
6	RNG Archetype - Landfill Gas		A	100,500	$4,806,972
			B	450,000	$20,749,922
			C	900,000	$41,245,541

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.
**This represents the estimated utility pilot budget over the five-year period for CenterPoint's first NGIA plan. Some pilots could involve costs that stretch beyond 5 years (e.g. 10-year RNG contract, or a networked geothermal capital investment), but those additional costs are captured elsewhere.

Power-to-hydrogen pilots

#	Pilot	Description	Pilot Size	Pilot Scale (Electrolyzer Capacity Installed)	Estimated Pilot Budget* (total over pilot period**)
7	Green Hydrogen Blending into Natural Gas Distribution System	CenterPoint Energy would develop a second hydrogen blending project. The project would be built on CenterPoint Energy property and would include installation of dedicated photovoltaic solar panels to power the electrolyzer. Hydrogen produced from the electrolyzer would be injected directly into the CenterPoint Energy distribution system as it is produced. CenterPoint Energy would own all components of installed system, including electrolyzer and PV systems. This represents a next phase in CenterPoint Energy's hydrogen production work, gaining experience using dedicated renewables to produce hydrogen and in turn drive down the costs of the blending projects.	A	1 MW	$2,100,067
			B	1 MW	$4,656,185
			C	***	-
8	Green Hydrogen Archetype - Industrial Facility Electrolyzer Pilot	CenterPoint Energy would offer incentives covering a portion (100%, up to a max of $1.5 million) of the equipment and installation costs of green hydrogen production systems (electrolyzers) for on-site use by industrial or large commercial customers, displacing natural gas use by these facilities. These systems would be installed onsite for 1-3 customers, who would own and operate the systems. CenterPoint has not yet identified specific customers for the projects, so a 5 MW 'archetype' was chosen to assess to the pilot for the time being, considering that a number of existing customers should be large enough for that size of electrolyzer (some could be higher). The projects would be expected to purchase renewable electricity from grid to supply the electrolyzers, and so even with potential IRA incentives and the upfront funding from CenterPoint Energy, participants in this pilot would be committing to a considerable cost increase in their electricity supply in order to decarbonize (part of) their heating load. Some additional programmatic support to identify potential sites and assist with feasibility studies for the projects is also envisioned. CenterPoint Energy would create a measurement and verification plan to monitor system performance for a period of time following installation.	A	5 MW (1 facility)	$1,239,057
			B	10 MW (2 facilities)	$2,474,441
			C	15 MW (3 facilities)	$3,896,791

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.
**This represents the estimated utility pilot budget over the five-year period for CenterPoint's first NGIA plan. Some pilots could involve costs that stretch beyond 5 years (e.g. 10-year RNG contract, or a networked geothermal capital investment), but those additional costs are captured elsewhere.
***Only including two sizes for this planned pilot for now, still investigating whether it would make sense to add a third size incorporating battery storage to increase capacity factors without (or less) grid electricity.

Carbon capture pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Pilot Budget* (total over pilot period)
9	Industrial Methane and Refrigerant Leak Reduction Program	Large industrial and commercial CenterPoint Energy customers would be encouraged to participate in this program, targeting between 25-50 new facilities per year. In their first year of participation, facilities would receive a 'sweep survey' to identify and quantify behind the meter methane leaks, as well as planning support to establish a systematic leak repair program. These services would be provided by a 3rd party vendor and fully funded through the pilot. The program would also offer incentives to partially offset the costs of repairing identified leaks. Program participants would also receive follow-up 'sweep surveys' every 2 years of the 5-year NGIA framework, as an approach to testing how well the impacts can be sustained. There is significant uncertainty on the level of leaks, as well as expectations that leak levels can vary widely between facilities. To that end, we have made conservative estimates of leak reductions, and ultimately actual leak levels (and impact of repairs) will be documented through the initial and follow up leak sweeps.	A	50 facilities	$1,231,708
			B	125 facilities	$2,610,763
			C	250 facilities	$4,861,378
10	Urban Tree Carbon Offset Program	CNP would purchase and retire City Forest Credits (CFC) Carbon+ Credits that are generated from locally planted urban trees. These also help improve air quality, reduce stormwater runoff, reduce energy costs, and cool urban heat islands. Pilot scales represent 25%, 50%, and 100% of the credits expected to be available from the RFI respondent.	A	4,500 credits	$295,780
			B	9,000 credits	$539,530
			C	18,000 credits	$1,027,030
11	Archetype Carbon Capture Project for Industrial Facility	CenterPoint Energy would offer incentives covering a portion (100% up to a max of $1.5 million) of the equipment and installation costs for carbon capture systems at 1 to 3 industrial or large commercial customers. These customers would own and operate the systems. CenterPoint has not yet identified specific customers for the projects, so an 'archetype' project size was chosen to assess to the pilot for the time being, considering that a number of existing customers should be large enough for that size of carbon capture unit here (some could be higher). Some additional programmatic support to identify potential sites, recruit participants, and assist with feasibility and Life Cycle Assessment (LCA) emissions studies for the projects is also envisioned. The LCA support is particularly important given that Minnesota is not in proximity to the main regions for geological sequestration of carbon, and so the focus will likely be on carbon 'utilization'. CenterPoint Energy would create a measurement and verification plan to monitor system performance for a period of time following installation.	A	1 facility	$2,257,651
			B	2 facilities	$4,300,117
			C	3 facilities	$6,341,332
12	Carbon Capture through Methane Pyrolysis at Industrial Facility	Given the lack of data about technology performance and lifecycle carbon emission reductions from the by-product use, this shortlisted pilot did not undergo detailed analysis. This has been re-assigned to be considered for a future R&D project or as a potential technology to be deployed in the industrial carbon capture pilot.			
13	Carbon Capture for Commercial Buildings	CenterPoint Energy would offer prescriptive rebates to commercial customers that install CarbinX carbon capture systems at their facilities. These small-scale carbon capture units connect to existing natural-gas heating equipment, capture CO2 gas and convert it to a solid potassium carbonate, and work as an economizer, recapturing waste heat for use in the building (e.g. reducing natural gas consumption in addition to the carbon capture). The program would target up to 300 customers per year. Customers would own and operate CarbinX units, with standard support from the manufacturer. In addition to the manufacturer maintaining the units, they arrange for the potassium carbonate by-product to be collected on a regular basis, with customers earning revenue for its sale.	A	325 CarbinX systems	$1,298,643
			B	660 CarbinX systems	$2,365,488
			C	1335 CarbinX systems	$4,667,428

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

District energy pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget* (total over pilot period**)
14	New Networked Geothermal Systems Pilot	CenterPoint Energy would explore the development of a new "Networked Geothermal" system to provide building heating and cooling for a neighborhood(s) in our service territory. This involves installation of a new 'distributed' geothermal system where individual customers would have a heat pump accessing a common water loop (instead of their own geothermal loops, or ASHPs). This pilot includes a feasibility study, planning and modeling, site selection, design and construction, and measurement and verification of a new networked geothermal system. The proposed approach follows pilots being planned by gas utilities, including National Grid, in Massachusetts. CenterPoint Energy would own and operate the geothermal shared loop system, which would be installed in phases over the 5-year program period. Entire sections of the neighborhood(s) would be shifted off the natural gas distribution system at the same time. In addition to converting gas space and water heating to ground source heat pumps drawing on the shared loop, any other gas appliances would be converted to electric appliances. The pilot program would cover all of these upfront costs for customers, requiring only a roughly 5% co-payment / participant fee from customers in the participating neighborhood. Neighborhood(s) including a low-income community with varied loads (e.g. residential, retail, office, grocery, etc.) would be preferred.	A	200-ton system capacity	$2,706,777
			B	500-ton system capacity	$5,637,833
			C	1000-ton system capacity	$10,557,712
15	Decarbonizing Existing District Energy Systems***	CNP would provide incentives to help our customers decrease carbon emissions of their existing district energy systems via a variety of tactics (converting to hot water pipes, using green hydrogen, ground source heat pumps, renewable natural gas, carbon capture). Incentives would support feasibility or engineering studies and/or project implementation. CenterPoint Energy would provide an incentive in support of feasibility/engineering studies looking at opportunities to reduce emissions from existing district energy customers, with the utility planning to cover 20% of the total study cost up to a cap of $30,000. While incentive approaches/structures to encourage customers to adopt the findings of these studies are still under consideration, CenterPoint is considering leveraging a similar approach to CIP custom programs, with incentives determined based on the minimum of three cost caps (in CIP, this is 1 year payback, 50% of incremental costs, or $5/Dth annual gas savings). CenterPoint expects the $/Dth cap to be the limiting factor for most projects considered under NGIA, and is considering higher incentive levels than the $5/Dth for NGIA incentives. Projects that are eligible for rebates in CIP would not be eligible for these NGIA rebates.	A	1 district energy system project	$475,753
			B	2 district energy system projects	$1,094,688
			C	3 district energy system projects	$1,945,963
16	New District Energy System	CenterPoint Energy would provide incentives for existing natural gas customers to install new centralized district energy systems using geothermal heat pumps or decarbonized gases. Depending on the specific approach, these customers could fall under district energy or strategic electrification categories. The cost/savings estimates included for this pilot are based on a specific RFI respondent that has already completed an engineering study for such a conversion. The additional participation units included in the pilot are an option to support additional customers to study and implement a similar approach over the 5-year NGIA plan window. The plan for study and implementation incentives would be the same as for pilot 15.	A	1 new district energy system	$175,806
			B	2 new district energy systems	$310,412
			C	3 new district energy systems	$493,178

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.
**This represents the estimated utility pilot budget over the five-year period for CenterPoint's first NGIA plan. Some pilots could involve costs that stretch beyond 5 years (e.g. 10-year RNG contract, or a networked geothermal capital investment), but those additional costs are captured elsewhere.
***Note – for now this pilot has been based on high-level assumptions surrounding potential strategic electrification project at a large district energy customer. This customer is already conducting and engineering study of decarbonization options, but the timing of the study did not allow for the final results to be known in time to inform the costs/savings/approach in the NGIA plan filing.

Strategic electrification pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget* (total over pilot period)
17	Industrial Electrification Incentive Program	Vendor-implemented program that would pilot industrial electric heat pumps to improve efficiency of low-to-medium temperature industrial processes. Program would target up to 9 industrial customers and would cover the full cost of the equipment installation. Program would include a monitoring period to collect data on project performance. Planned phases: • **Phase 1:** The program would begin with a study looking at technical potential, heat pump technologies to be used, and identification of potential customers who could pilot heat pump technologies. • **Phase 2:** Installation at 3 - 9 facilities, including system design, installation and commissioning • **Phase 3:** Measurement and verification of system performance, and analysis of results.	A	3 facilities	$513,182
			B	6 facilities	$832,513
			C	9 facilities	$1,107,757
18	Commercial hybrid heating pilot	Vendor-implemented program that would target small-to-medium commercial facilities. The program would provide incentives to retrofit existing HVAC rooftop units with hybrid heating systems. Hybrid heating systems use electric heat pumps to heat the building on warmer days, and switch to traditional gas heating under a specified outdoor air temperature. The programmatic approach used here is based on a similar program run by ConEd in New York. This would be a direct install program from the perspective of vendor handling all aspects of the equipment installation, but the customer would pay the bulk of the vendor costs (60%), with CenterPoint Energy covering the remaining portion of installation costs (40%) and some program administration costs. A significant budget for monitoring/metering, analysis, and reporting on the system results is also included in the pilot funding. This pilot would be conducted in coordination with ETA, which has chosen hybrid rooftop units as one of its focus technologies. ETA is focused on driving market transformation, but does not have the ability to offer customer incentives such as those included in this NGIA pilot, so there is a lot of natural synergy between both efforts.	A	70 facilities	$3,799,172
			B	135 facilities	$6,465,657
			C	200 facilities	$9,132,143
19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	Three-phase pilot program targeting single family and multi-family buildings to test a combination of deep energy retrofits and air-source heat pumps with gas back-up. Planned phases of pilot are: • **Phase 1: Study Scoping & Program Design -** Modeling of different combinations of building types and energy conservation strategies, including innovative/emerging weatherization measures, and finalization of different 'Tiers' of energy retrofit for the pilot testing • **Phase 2: Demonstration Projects -** Based on results of phase 1 modeling, we'd select host sites to field test selected technologies and measure performance. Pilot would cover the full cost of installation and monitoring, targeting 14 to 42 buildings. • **Phase 3: Broader Deployment of Successful Strategies from Phase 2 -** Envision a shift to an on-going incentive program (e.g. not covering full installation costs), targeting 105 - 315 buildings. Final design, incentive levels, and participation targets would be informed by Phase 2 results.	A	119 buildings	$6,553,565
			B	238 buildings	$12,308,327
			C	357 buildings	$18,063,089

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

Energy efficiency pilots – part 1

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget* (total over pilot period)
20	Small/medium business GHG audit pilot	This pilot would expand the scope of CenterPoint Energy's Natural Gas Energy Analysis (NGEA) CIP energy audit to include audit information related to a business' GHG emissions and an assessment for additional GHG reduction measures such as electric air source heat pumps or hybrid heating systems, CarbinX carbon capture units, industrial heat pumps or solar thermal walls. The program would offer incentives for these measures (consistent with other NGIA program offerings), and recognize businesses who implement multiple measures as "energy leaders". Participation levels would be consistent with NGEA program goals, at approximately 250-300 customers per year.	A	992 GHG audits (3% implement)	$1,733,311
			B	1,240 GHG audits (3% implement)	$2,082,852
			C	1,488 GHG audits (3% implement)	$2,432,393
21	Residential Gas Heat Pump	Gas heat pumps represent an emerging technology category with the potential to replace residential furnaces and water heaters, offering an opportunity to lower GHG emissions and customer costs through higher efficiency. Gas heat pumps have achieved over 1.3 system Coefficient of Performance (COP) in laboratory conditions. While several commercial-sector gas heat pumps are already available, there are four manufacturers aiming to deploy residential systems in 2023-24. An initial pilot phase would include market research and analysis to prioritize which gas heat pump units should be included in the field testing. Outreach would be conducted to recruit CenterPoint customers to participate in the pilot, and contractors would be engaged to train them to install and maintain the heat pumps, with support from equipment manufacturers. The installations would be metered and trial data analyzed to develop reporting metrics that would better inform the opportunity for gas heat pumps to be part of future CIP or NGIA programs. This pilot would cover all the installation costs for participating customers.	A	6 units	$343,319
			B	10 units	$555,308
			C	20 units	$914,123
22	Gas Heat Pump for Commercial Buildings	This pilot involves a demonstration of gas heat pumps offering space and/or water heating for commercial buildings (particularly in cold climates). Natural gas fired heat pumps are an emerging new technology that allows natural gas heating, cooling, and water heating to exceed a COP of 1 and increase efficiency of gas end uses. There are many different types of gas fired heat pump under development, at various stages of readiness, and many different application types of this technology. Some companies have commercially available gas heat pumps in market, and they are typically utilized in commercial buildings with high hot water consumption such as multifamily, small commercial and/or recreational facilities. As the technology is new to market and is not yet considered cost effective for CIP, this pilot involves demonstration site installations with equipment monitoring, energy savings documentation, understanding of costs and benefits and a resulting case study. Some sites could be available for site walk-throughs so that contractors, design firms and other technology specifiers can gain first-hand experience and exposure to the technology. GAHPs are included in the Minnesota Efficient Technology Accelerator's (ETA) starter portfolio. That is a market transformation initiative that will work to accelerate adoption of emerging technologies. This NGIA pilot field demonstration would complement the strategy and planning work that will be completed within the ETA program, and could be completed in coordination with ETA.	A	3 units	$687,149
			B	6 units	$1,148,452
			C	9 units	$1,669,754

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

Energy efficiency pilots – part 2

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget* (total over pilot period)
23	Neighborhood Weatherization Blitzes	The "Neighborhood weatherization blitzes" proposes an intensive marketing and outreach approach to increase the participation in our existing CIP weatherization offerings. There is uncertainty in the effectiveness of this approach and start-up requires notable time and resource investment, so we will start with a Research & Development project to design and test different outreach campaigns to evaluate their effectiveness for consideration in CIP.			
24	Solar Thermal Heating for C&I	This pilot would offer incentives for customers who install transpired solar air systems, which help facilities that have large make-up air loads reduce their energy consumption. The pilot would offer commercial and industrial customers an incentive to partially offset the cost to install the solar wall. This assumes that the projects in question, which have relatively high upfront costs, would not be cost-effective enough to qualify for any CIP incentives (if any projects did qualify for CIP they would be directed to that program instead of NGIA). Support for initial feasibility study is also included. While incentive approaches/structures to encourage customers to adopt the findings of these studies are still under consideration, CenterPoint is considering leveraging a similar approach to CIP custom programs, with incentives determined based on the minimum of three cost caps (in CIP, this is 1 year payback, 50% of incremental costs, or $5/Dth annual gas savings). CenterPoint expects the $/Dth cap to be the limiting factor for most projects considered under NGIA, and is considering higher incentive levels than the $5/Dth for NGIA incentives. Projects that are eligible for rebates in CIP would not be eligible for these NGIA rebates.	A	10 projects	$335,229
			B	15 projects	$473,703
			C	25 projects	$750,652
25	Industrial GHG Audit Pilot	Expansion of existing CIP Process Efficiency and Commercial Efficiency programs. This would build off the existing CIP programs, enhancing those energy audits to include GHG emissions context/data, as well as emission reduction opportunities. Additional GHG reduction measures might include electric heat pumps or hybrid heating systems, CarbinX carbon capture units, industrial heat pumps or solar thermal walls. Audit participation levels would be consistent with Process Efficiency and Commercial Efficiency. The program would offer specialized incentives to help customers implement audit recommendations. A new 'custom incentive stream' would be established for specific types of technologies that have not traditionally been cost-effective under CIP but could leverage funding from NGIA to help them proceed. Incentive levels expected to take a similar approach to outline in pilot 24 above. There are a number of types of opportunities identified in past CIP audits, where recommendations are not typically implemented. The focus categories would be: 1. Electric heat pumps for certain process hot water needs (including reviewing and applying appropriate new technologies) 2. Heat recovery opportunities for process hot water/ process cooling and winter makeup air heating 3. Process efficiency improvements through improved process heat exchange / integration	A	5 projects	$984,795
			B	10 projects	$1,300,099
			C	15 projects	$1,615,402

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

Appendix – Review of pilot project analysis high-level draft results

-Draft quantitative results
-Qualitative implications

Combined Details on Draft NGIA Innovation Plan Portfolio

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio	Utility Costs Towards NGIA Budget		Lifetime GHG Savings		Emission Reduction Cost from Utility Perspective	Emission Reduction Cost from Total (Net) Pilot Impacts Perspective	Emission Reduction Cost from Equipment and Installation (Technology) Perspective
				$	% of Portfolio	tCO2e	% of Portfolio	$/tCO2e	$/tCO2e	$/tCO2e
Renewable Natural Gas (RNG)	1	RNG Proposal - Anaerobic Digestion of Organic Materials	B	$ 2,856,761	3%	28,221	2%	$272	$221	$261
	2	RNG Proposal -Anaerobic Digestion of East Metro Food Waste	B	$ 10,160,063	10%	175,263	15%	$156	$105	$155
	3	RNG Archetype – WRRF	B	$ 4,010,633	4%	26,556	2%	$313	$261	$291
	4	RNG Archetype - Dairy Manure	A	$ 2,241,062	2%	9,895	1%	$465	$414	$431
	5	RNG Archetype – Food Waste	B	$ 19,321,990	18%	254,739	21%	$157	$105	$158
	6	RNG Archetype - Landfill Gas	A	$ 5,351,763	5%	53,621	4%	$207	$155	$202
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	$ 5,183,888	5%	27,993	2%	$821	$767	$214
	8	Green Hydrogen Archetype - Industrial or Large Com. Electrolyzer Pilot	A	$ 1,379,484	1%	56,330	5%	-$11	$829	$175
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	$ 1,371,302	1%	38,831	3%	$29	-$33	$15
	10	Urban Tree Carbon Offset Program	A	$ 329,301	0%	4,500	0%	$67	$12	$49
	11	Archetype Carbon Capture Project for Industrial or Large Com. Facility	A	$ 2,513,519	2%	50,865	4%	$66	$294	$60
	13	Carbon Capture Rebates for Commercial Buildings	A	$ 1,445,823	1%	55,150	5%	$1	-$62	$225
District Energy	14	New Networked Geothermal Systems Pilot	C	$ 11,754,257	11%	107,355	9%	$393	$389	$232
	15	Decarbonizing Existing District Energy Systems	B	$ 1,218,753	1%	124,030	10%	-$27	-$53	$40
	16	New District Energy System	B	$ 345,592	0%	40,882	3%	-$19	$351	$463
Strategic Electrification	17	Industrial Electrification Incentive Program	A	$ 571,343	1%	11,896	1%	$10	$10	$32
	18	Commercial hybrid heating pilot	B	$ 7,198,434	7%	25,609	2%	$217	$41	$100
	19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	B	$ 13,703,275	13%	66,760	6%	$159	$295	$383
Energy Efficiency	20	Small/medium business GHG audit pilot	A	$ 1,929,754	2%	5,642	0%	$322	$328	$263
	21	Residential Gas Heat Pump	A	$ 382,229	0%	235	0%	$1,464	$1,346	$707
	22	Gas Heat Pump for Commercial Buildings	A	$ 765,026	1%	2,154	0%	$296	$192	$152
	24	Solar Thermal Heating for C&I	None	$ -	0%	0	0%	$0	$0	$0
	25	Industrial and Large Commercial GHG Audit Pilot	A	$ 1,096,406	1%	35,560	3%	-$6	-$81	$38
Total Pilot Portfolio				**$ 95,130,658**	**90%**	**1,202,087**	**100%**	$152	$182	$175
Additional R&D Budget		R&D Projects - Low Carbon Fuels (25%)		$ 2,642,615	2.5%	0	0%			
		R&D Projects - Other (75%)		$ 7,927,846	7.5%	0	0%			
Total Portfolio (incl. R&D)				**$ 105,701,119**	**100%**	**1,202,087**	**100%**	$161	$191	$184

Pilot names

Pilot Key / #	Short-Hand Name	Full Pilot Name
CNP01	Hennepin County RNG	Hennepin County RNG Project - Anaerobic Digestion of Organic Materials
CNP02	Ramsey-Washington RNG	Ramsey-Washington RNG Project - Anaerobic Digestion of East Metro Food Waste
CNP03	RNG Archetype – WRRF	RNG Archetype – WRRF
CNP04	RNG Archetype - Dairy	RNG Archetype - Dairy Manure
CNP05	RNG Archetype - Food Waste	RNG Archetype – Food Waste
CNP06	RNG Archetype - Landfill Gas	RNG Archetype - Landfill Gas
CNP07	Hydrogen Blending	Green Hydrogen Blending into Natural Gas Distribution System
CNP08	Industrial Hydrogen	Green Hydrogen Archetype - Industrial or Large Commercial Facility Electrolyzer Pilot
CNP09	Industrial Methane Leaks	Industrial Methane and Refrigerant Leak Reduction Program
CNP10	Urban Tree Offsets	Urban Tree Carbon Offset Program
CNP11	Industrial Carbon Capture	Archetype Carbon Capture Project for Industrial or Large Commercial Facility
CNP13	Commercial Carbon Capture	Carbon Capture Rebates for Commercial Buildings
CNP14	Networked Geothermal	New Networked Geothermal Systems Pilot
CNP15	Existing District Energy	Decarbonizing Existing District Energy Systems
CNP16	New District Energy	New District Energy System
CNP17	Industrial Electrification	Industrial Electrification Incentive Program
CNP18	Commercial Hybrid Heating	Commercial hybrid heating pilot
CNP19	Res. Deep Energy Retrofits	Residential deep energy retrofit + electric ASHP pilot (with gas backup)
CNP20	Sm./Med C&I GHG Audit	Small/medium business GHG audit pilot
CNP21	Res. Gas Heat Pumps	Residential Gas Heat Pump
CNP22	Com. Gas Heat Pumps	Gas Heat Pump for Commercial Buildings
CNP24	C&I Solar Thermal	Solar Thermal Heating for C&I
CNP25	Large C&I GHG Audit	Industrial and Large Commercial GHG Audit Pilot

Lifetime GHG emission reductions

This metric represents the **net reduction in greenhouse gas emissions over the lifetime of the measures implemented in a pilot.** While the relevant types of emissions vary by pilot, the general components are 1) net emissions reductions from project-related changes in consumption of natural gas and electricity, and 2) reduced emissions from pilot-specific lifecycle emissions calculations (e.g. carbon intensity of RNG, carbon capture savings, etc.). More specifics on the calculations are provided below.

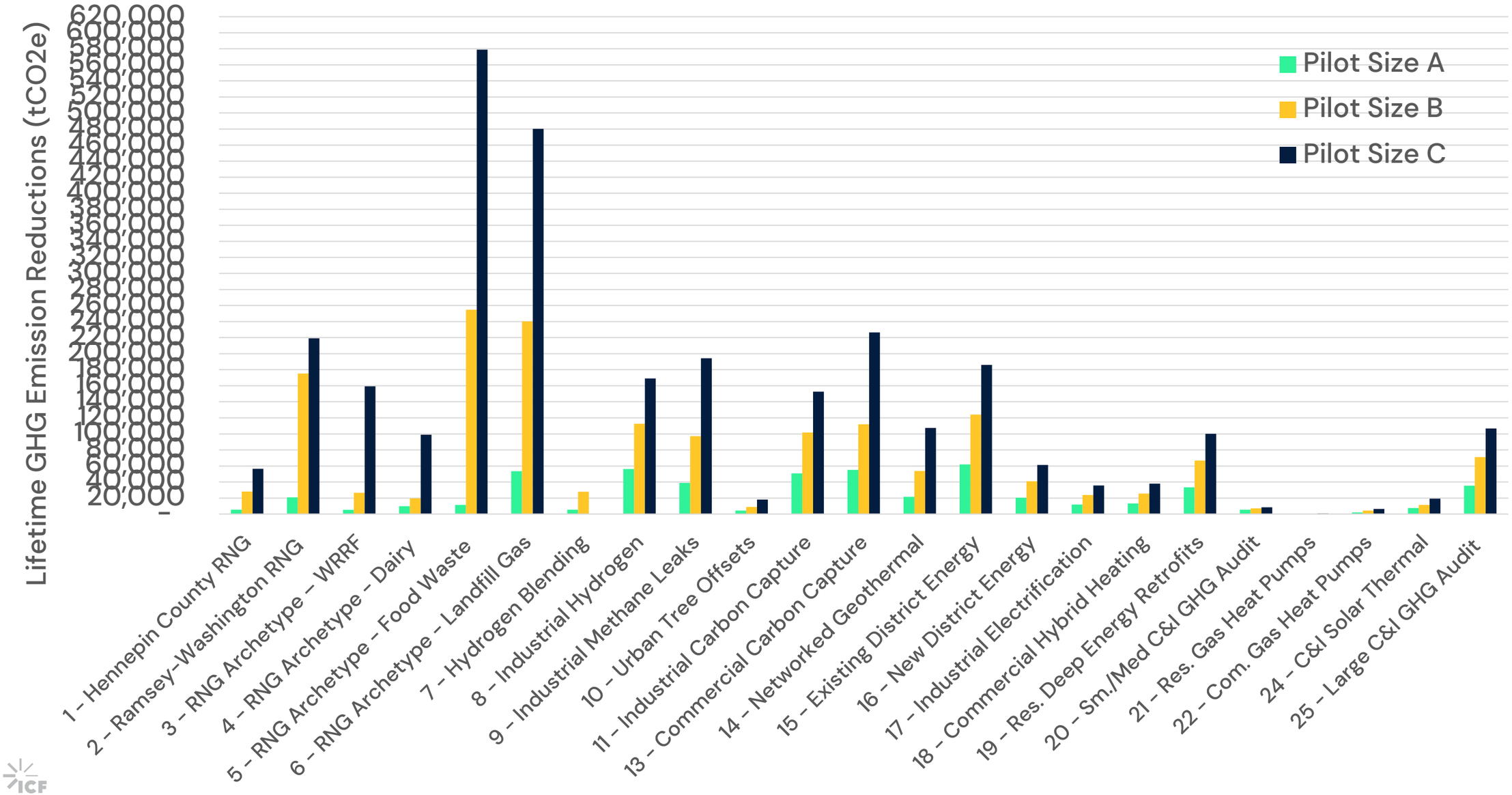
Lifetime GHG Emissions Reduction (tCO2e) = [*(1) Net electricity savings/additions impact* + *(2) Net natural gas lifecycle emissions impact* + *(3) Net lifecycle GHG savings*] x *Measure life* x *Number of participating units*

(1) Net electricity savings/additions impact (tCO2e per participant) = *Annual kWh saved/added per participant* x Electric emissions factor (*tCO2e per kWh)*

(2) Net natural gas lifecycle emissions impact (tCO2e per participant) = *Average annual Dth saved per participant* x *Geologic gas lifecycle emissions factor (tCO2e per Dth)*

(3) Net lifecycle GHG savings (tCO2e per participant) = *other lifecycle GHG savings (annual tCO2e savings per participant)*

Scale of lifetime GHG emission reductions by pilot



5-Year utility costs towards NGIA budget

This metric represents the **cost for different pilots that will count against the statutory cost-caps established for CenterPoint Energy's spending under NGIA**. While the relevant types of costs vary by pilot, the three main cost components are the budget for CenterPoint Energy staff and vendors to deliver the pilots, incentive payments to customers, and any revenue requirements for capital investments made as part of certain pilots. Then, based on the NGIA framework, the pilot costs compared to the cost caps would account for some expected utility savings, such as reduced natural gas commodity costs. More specifics on the calculations are provided below.

5-years utility costs towards NGIA budget ($2024-$2028) = *Net incremental O&M costs ($)*

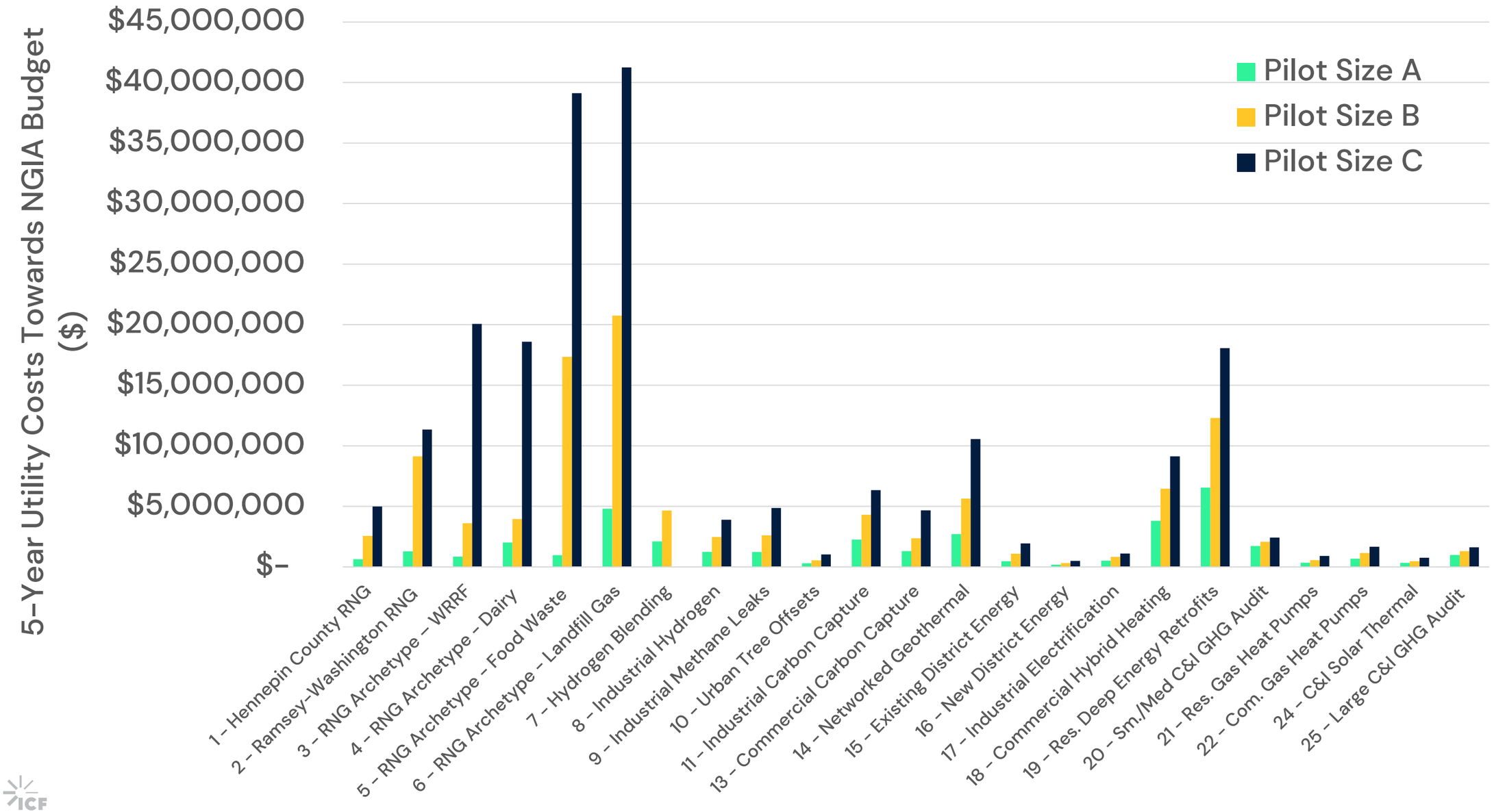
\+ *Annual revenue requirement for capital projects ($)*

\+ *Incentives ($)*

– *Natural gas commodity savings ($)*

Scale of budgets* by pilot and size options

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.



Emission reduction costs

For each of the emission reduction cost metrics showcased here, we take a different cost metric and divide it by the same lifetime GHG emissions.

Utility cost perspective includes only costs the utility will pay and excludes costs paid by participants or others. This perspective is highly sensitive to the level of participant incentive selected. This perspective also does not include benefits of GHG or other pollutant reductions.

The **total (net) pilot impacts** looks to capture 'all the value and cost streams' that have been quantified in this analysis. It includes costs the utility, to the participant, and the value of GHG and other pollutant savings.

The **equipment and installation costs** simply looks at the total upfront cost to purchase and install the relevant technology, stripping out the impacts of different incentive levels and/or supplemental pilot budgets for programmatic support (like program administration, marketing and customer recruitment, etc). This perspective may help better understand the ongoing cost of a technology at scale separately from start-up administrative costs.

Emission reduction costs (continued)

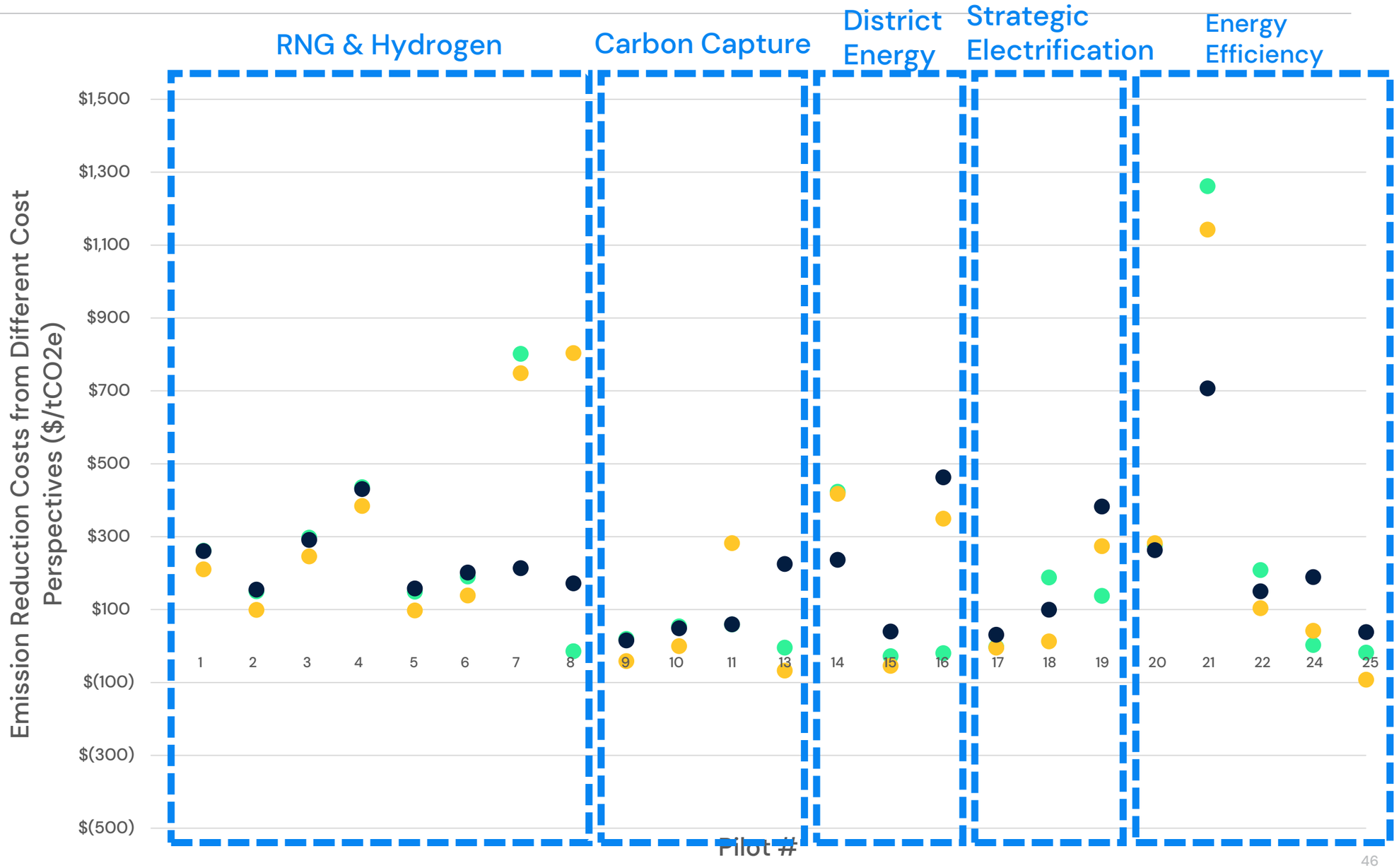
- **Lifetime emission reduction cost from utility perspective** ($2023/tCO2e) = [*UCT test costs ($2023) – UCT test benefits ($2023)*] / *Lifetime GHG emissions reduction (tCO2e)*

- **Lifetime emission reduction cost from total (net) pilot impacts perspective** ($2023/tCO2e) = [*UCT test costs ($2023) + PCT test costs ($2023) – UCT test benefits ($2023) - PCT test benefits ($2023) + social cost of GHG emission reductions ($2023) + social cost of non-GHG emission reductions ($2023) + third party funding ($2023)*]/ *Lifetime GHG emissions reduction (tCO2e)*

- **Lifetime emission reduction cost from equipment and installation (technology) perspective** ($2023/tCO2e) = *Equipment and installation costs ($2023) / Lifetime GHG emissions reduction (tCO2e)*

Emission Reduction Costs (Pilot Size B)

- Lifetime Emission Reduction Cost from Utility Perspective ($/tCO2e)
- Lifetime Emission Reduction Cost from Total (Net) Pilot Impacts Perspective ($/tCO2e)
- Lifetime Emission Reduction Cost from Equipment and Installation (Technology) Perspective ($/tCO2e)



Snapshot of notable pilot projects from NGIA 'perspectives'

- **NGIA Utility Perspective**
  - Costs from utility perspective vary based on range of factors, including if customers are contributing part of the installation costs (e.g. lower utility contribution) and projects reductions in gas throughput (commodity cost savings lower UCT)

- **NGIA Participants Perspective (including specific impacts on low- and moderate-income participants)**
  - Networked geothermal and res. deep energy retrofit pilots could be targeted towards low- and moderate-income customers/neighborhoods
  - A number of industrial and commercial focused pilots may help participants achieve their own corporate GHG reduction goals making them more competitive with GHG-conscious customers
  - Some pilot projects, such as energy efficiency, will reduce customer costs, while others, such as hydrogen, will increase them

- **NGIA Nonparticipating Customers Perspective (including specific impacts on low- and moderate-income customers)**
  - Rate impacts to be discussed in the third round of stakeholder meetings
  - RNG and hydrogen blending projects will reduce the GHG intensity of gas, reducing the GHG emissions from all CenterPoint Energy customers
  - Hennepin County RNG includes an anaerobic digestion facility proposed in an Environmental Justice 'area of concern'. Hennepin County has initiated community engagement activities to evaluate the potential for disproportionate adverse impacts and consider ways to reduce those impacts from the project. Hennepin County will continue the community engagement process as the project progresses.

- **Effects on Other Energy Systems and Energy Security**
  - Reliance on locally produced RNG and green hydrogen reduces dependence on out-of-state geologic gas which may have benefits for energy security, and is a decarbonization approach built off existing energy infrastructure
  - The two pilots involving hybrid heating systems, and the two pilots involving gas heat pumps, would explore decarbonization opportunities that can help mitigate growth in winter electric peak demand from space heating electrification

Snapshot of notable pilot projects for environmental criteria

- **GHG Emissions**
  - Quantitative results include both lifetime GHG savings (tCO2e) and the social cost (value) of GHG emissions (reductions)
  - RNG projects capture and recover methane (higher global warming potential than CO2) and put that gas to productive use

- **Other Pollution**
  - Quantitative results also include the social cost (value) of non-GHG air pollutants emissions (reductions)
  - Anaerobic digestion of dairy manure can improve agricultural practices that harm water quality, air quality, and local odors
  - The industrial methane leak detection and repair program could also identify refrigerant leaks, to further reduce environmental and GHG impacts

- **Waste reduction and reuse (including reduction of water use)**
  - RNG Pilots 1 and 2 have the potential to be a state model for organics recycling and beneficial use; they, as well as the other 'food waste' RNG projects, can help to demonstrate an effective use of anaerobic digestion in MN to process residential and commercial source-separated organics (as opposed to landfilling)
  - All RNG pilots, digestion of organic materials for energy production is effective way to decarbonize waste

- **Policy (e.g., natural gas throughput, renewable energy goals)**
  - The RNG, hydrogen, networked geothermal, strategic electrification, new district energy, solar thermal, and potentially the C&I GHG audit pilot increase use of renewable energy
  - All pilots except carbon capture pilots and urban tree planting decrease geologic gas throughput

Snapshot of notable pilot projects from socioeconomic criteria

- **Net Job Creation**
  - IMPLAN modelling to quantify the net job creation from pilots is still on-going

- **Economic Development**
  - The hydrogen pilots allow local firms and workers to gain experience in hydrogen, which is a growing industry
  - A number of projects support improved industrial competitiveness in Minnesota, by helping industry become more efficient, while other pilots could entice corporate R&D teams to concentrate their initial decarbonization efforts at Minnesota facilities
  - Pilots seeking higher IRA incentives would follow wage/labor IRA requirements
  - The networked geothermal pilot would represent a large-scale build out of a new type of utility infrastructure
  - CenterPoint Energy is planning to include budget for workforce development to support various projects at the portfolio level

- **Public Co-Benefits**
  - The first two RNG pilots have the additional benefit of supporting local municipalities
  - In the Urban Tree offset pilot, new street trees will shade homes and buildings, reducing cooling and heating costs over time; in addition to sequestering carbon, these trees also increase the stormwater infiltration rate of the urban soils and promote habitat diversity throughout the city

- **Market Development**
  - Many pilots may be located through CenterPoint Energy's service territory; projects may have a significant impact on individual customer's GHG emissions helping them achieve their GHG emissions goals and supporting their competitiveness with GHG-conscious customers

Snapshot of notable pilot projects from innovation criteria

- **Direct Innovation Support**
  - Many of the pilots are small-scale field testing, with most or all of costs covered for CenterPoint Energy customers, in order to better understand an emerging technology and how it could be scaled
  - RNG Pilots 1 and 2 have the potential to be a state model for organics recycling and beneficial use
  - The RNG pilots provide CenterPoint Energy with experience in purchasing low-carbon fuels, and the hydrogen blending and new district energy pilots provide experience with a different way of providing energy
  - Carbon capture and hydrogen pilots explore emerging options to reduce emissions from hard to electrify industrial end-uses
  - The residential deep energy retrofit pilot (including hybrid heating) could help answer questions on balance of energy efficiency retrofits vs. strategic electrification, while also supporting testing of new building retrofit technologies

- **Resource Scalability and Role in a Decarbonized System**
  - Hybrid heating targets the largest residential and commercial sector uses of natural gas and in the 2021 Minnesota G21 study the 'electrification with gas back up' scenario had smallest total cost increase by 2050
  - All deep emission reductions pathways rely on a lot of decarbonized gases to reach emission reduction targets:
    - All scenarios in the 2021 Minnesota G21 study use all available biomethane resources, and hydrogen blending, before tapping into more expensive decarbonized gases.
    - Even in the G21 high electrification case, 2050 RNG demand in Minnesota would be much greater (50-100 times) than the annual volume of decarbonized gas production assumed in the detailed analysis
  - Residential and commercial hybrid heating and gas heat pumps were selected for the Minnesota Efficient Technology Accelerator's (ETA) starter portfolio, and taking a collaborative approach with the Center for Energy and Environment (CEE) on these pilots offers can amplify the effects of both NGIA and ETA.
  - Hydrogen and carbon capture are expected to be important tools in a decarbonized energy system; through IRA and IIJA the federal government has invested heavily in scaling up and reducing the costs of hydrogen production and carbon capture

Lifetime GHG emission reductions by pilot (tCO2e)

#	Pilot	Pilot Size A	Pilot Size B	Pilot Size C
1	RNG Proposal – Organics 1	5,644	28,221	56,442
2	RNG Proposal – Organics 2	20,865	175,263	219,079
3	RNG Archetype – WRRF	5,311	26,556	159,335
4	RNG Archetype - Dairy	9,895	19,790	98,952
5	RNG Archetype - Food Waste	11,579	254,739	578,953
6	RNG Archetype - Landfill Gas	53,621	240,096	480,191
7	Hydrogen Blending	5,599	27,993	-
8	Industrial Hydrogen	56,330	112,661	168,991
9	Industrial Methane Leaks	38,831	97,077	194,154
10	Urban Tree Offsets	4,500	9,000	18,000
11	Industrial Carbon Capture	50,865	101,731	152,596
13	Commercial Carbon Capture	55,150	111,997	226,539
14	Networked Geothermal	21,471	53,677	107,355
15	Existing District Energy	62,015	124,030	186,044
16	New District Energy	20,441	40,882	61,323
17	Industrial Electrification	11,896	23,792	35,688
18	Commercial Hybrid Heating	13,279	25,609	37,940
19	Res. Deep Energy Retrofits	33,380	66,760	100,139
20	Sm./Med C&I GHG Audit	5,642	7,052	8,462
21	Res. Gas Heat Pumps	235	391	783
22	Com. Gas Heat Pumps	2,154	4,307	6,461
24	C&I Solar Thermal	7,687	11,531	19,218
25	Large C&I GHG Audit	35,560	71,120	106,680

5-Year Utility Costs Towards NGIA Budget* ($)

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

#	Pilot	Pilot Size A	Pilot Size B	Pilot Size C
1	RNG Proposal – Organics 1	$ 632,174	$ 2,565,952	$ 4,983,175
2	RNG Proposal – Organics 2	$ 1,283,500	$ 9,125,802	$ 11,351,320
3	RNG Archetype – WRRF	$ 852,930	$ 3,602,364	$ 20,064,460
4	RNG Archetype - Dairy	$ 2,012,930	$ 3,961,297	$ 18,604,100
5	RNG Archetype - Food Waste	$ 972,930	$ 17,355,076	$ 39,124,820
6	RNG Archetype - Landfill Gas	$ 4,806,972	$ 20,749,922	$ 41,245,541
7	Hydrogen Blending	$ 2,100,067	$ 4,656,185	$ -
8	Industrial Hydrogen	$ 1,239,057	$ 2,474,441	$ 3,896,791
9	Industrial Methane Leaks	$ 1,231,708	$ 2,610,763	$ 4,861,378
10	Urban Tree Offsets	$ 295,780	$ 539,530	$ 1,027,030
11	Industrial Carbon Capture	$ 2,257,651	$ 4,300,117	$ 6,341,332
13	Commercial Carbon Capture	$ 1,298,643	$ 2,365,488	$ 4,667,428
14	Networked Geothermal	$ 2,706,777	$ 5,637,833	$ 10,557,712
15	Existing District Energy	$ 475,753	$ 1,094,688	$ 1,945,963
16	New District Energy	$ 175,806	$ 310,412	$ 493,178
17	Industrial Electrification	$ 513,182	$ 832,513	$ 1,107,757
18	Commercial Hybrid Heating	$ 3,799,172	$ 6,465,657	$ 9,132,143
19	Res. Deep Energy Retrofits	$ 6,553,565	$ 12,308,327	$ 18,063,089
20	Sm./Med C&I GHG Audit	$ 1,733,311	$ 2,082,852	$ 2,432,393
21	Res. Gas Heat Pumps	$ 343,319	$ 555,308	$ 914,123
22	Com. Gas Heat Pumps	$ 687,149	$ 1,148,452	$ 1,669,754
24	C&I Solar Thermal	$ 335,229	$ 473,703	$ 750,652
25	Large C&I GHG Audit	$ 984,795	$ 1,300,099	$ 1,615,402

Emission Reduction Costs from Multiple Perspectives ($/tCO2e)

All Values for Pilot Size B

#	Pilot	Lifetime Emission Reduction Cost from Utility Perspective ($/tCO2e)	Lifetime Emission Reduction Cost from Total (Net) Pilot Impacts Perspective ($/tCO2e)	Lifetime Emission Reduction Cost from Equipment and Installation (Technology) Perspective ($/tCO2e)
1	RNG Proposal – Organics 1	$ 262	$ 211	$ 261
2	RNG Proposal – Organics 2	$ 150	$ 99	$ 155
3	RNG Archetype – WRRF	$ 298	$ 246	$ 291
4	RNG Archetype - Dairy	$ 436	$ 384	$ 431
5	RNG Archetype - Food Waste	$ 149	$ 97	$ 158
6	RNG Archetype - Landfill Gas	$ 191	$ 139	$ 202
7	Hydrogen Blending	$ 802	$ 748	$ 214
8	Industrial Hydrogen	$ (14)	$ 804	$ 172
9	Industrial Methane Leaks	$ 19	$ (41)	$ 15
10	Urban Tree Offsets	$ 54	$ (0)	$ 49
11	Industrial Carbon Capture	$ 59	$ 283	$ 60
13	Commercial Carbon Capture	$ (4)	$ (67)	$ 225
14	Networked Geothermal	$ 423	$ 417	$ 236
15	Existing District Energy	$ (28)	$ (54)	$ 40
16	New District Energy	$ (20)	$ 350	$ 463
17	Industrial Electrification	$ (3)	$ (4)	$ 31
18	Commercial Hybrid Heating	$ 188	$ 13	$ 100
19	Res. Deep Energy Retrofits	$ 138	$ 274	$ 383
20	Sm./Med C&I GHG Audit	$ 276	$ 282	$ 263
21	Res. Gas Heat Pumps	$ 1,262	$ 1,143	$ 707
22	Com. Gas Heat Pumps	$ 209	$ 104	$ 150
24	C&I Solar Thermal	$ 3	$ 42	$ 189
25	Large C&I GHG Audit	$ (18)	$ (92)	$ 38

Resources Included in NGIA

- Renewable Natural Gas (RNG) & Biogas
  - Must be from biomass
  - Distinction is pipeline quality or not
- District Energy
  - From solar thermal or ground-source
- Energy efficiency
  - Does not include “investments” that can reasonably be included in the Conservation Improvement Program
- Power-to-hydrogen & power-to-ammonia
  - Produced using a carbon-free power source
- Strategic electrification
  - Cannot add to electric peak
  - Customer must still use gas (partial electrification only)
- Carbon Capture
  - Very broad definition

Special Requirements for the First Plan

- All utilities
  - Costs must be 50%+ for RNG, biogas, power-to-hydrogen or power-to-ammonia (low carbon fuels)
- CenterPoint Only
  - Residential deep energy retrofit + electric ASHP pilot (with gas backup)
  - Industrial hard-to-electrify pilot
  - Small/medium business GHG audit pilot
  - District energy pilot

CenterPoint Energy Innovation Plan

Public Engagement Meeting 3 Summary and Notes

Friday, May 12th, 8:30AM-12:00 PM CT

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Meeting Context and Summary

Meeting Context

On Friday, May 12, 2023, CenterPoint Energy (CenterPoint), with technical support from ICF and facilitative support from the Great Plains Institute (GPI), hosted the third of three planned public engagement meetings that will inform the development of CenterPoint's first innovation plan. The meeting was held virtually via Zoom.

CenterPoint is preparing its voluntary innovation plan in accordance with the Natural Gas Innovation Act (NGIA), which was signed into law by Governor Walz on June 26, 2021. The full text of NGIA is available here. The innovation plan will be evaluated by the Minnesota Public Utilities Commission (Commission) in accordance with the framework approved in Commission Docket No. 21-566.[1]

Prior Engagement Meetings

The first public engagement meeting, which took place on September 23, 2022, provided attendees with an overview of the legislative and regulatory context for natural gas utility innovation plans in Minnesota. It also provided an opportunity for participants to provide feedback on an initial list of 28 pilot project ideas and several research and development (R&D) initiatives to be evaluated for inclusion in the innovation plan.

In preparation for the second public engagement meeting, CenterPoint and ICF further refined the list of pilot projects down to 23 and conducted a detailed analysis of each of those pilot concepts. The analysis was designed to look at the holistic NGIA evaluation framework categories developed under Docket No. 21-566. The purpose of the second meeting was to help participants understand the analysis and provide them an opportunity to give feedback on the refined list of 23 pilots. Meeting notes and summaries for both prior engagement meetings can be found here.

Meeting Summary

At this third and final public engagement meeting, CenterPoint shared and sought feedback on its proposed list of pilot projects and R&D projects to be included in its draft innovation plan (expected to be filed late June 2023).

Approximately 50 individuals representing state and local governmental agencies, environmental advocates, clean energy advocates, consumer advocates, the private sector, and

[1] Docket No. G-999/CI-21-566. "In the Matter of Establishing Frameworks to Compare Lifecycle Greenhouse Gas Emissions Intensities of Various Resources, and to Measure Cost-Effectiveness of Individual Resources and of Overall Innovation Plans."

community organizations attended the meeting. The goals for this third public engagement meeting were as follows:

1. Share a draft portfolio of projects for inclusion in CenterPoint Energy's Innovation Plan, and solicit feedback on that portfolio, including the following questions:
    a. What do participants like about the draft portfolio?
    b. What changes would participants suggest?

2. Share and solicit feedback on an initial assessment of rate impacts of the draft Innovation Plan portfolio of projects.

CenterPoint and ICF first presented and solicited feedback on the draft pilot portfolio, including considerations related to cost and emissions implications, as well as workforce impacts. Second, CenterPoint and ICF presented and solicited feedback on the proposed R&D projects, which have a separate funding category under NGIA. Finally, CenterPoint and ICF presented and solicited feedback regarding estimated rate implications on the innovation plan, including feedback on how to communicate these rate changes to customers. Staff from the Great Plains Institute facilitated Q&A and discussion throughout the meeting.

Below, we have captured key feedback themes from the meeting. The notes that follow capture the full details, including comments shared both orally and via the meeting chat. Attendees were also encouraged to share their perspectives in the post-meeting survey and were invited to contact CenterPoint with any additional ideas or questions at InnovationPlan@centerpointenergy.com.

Feedback Themes:

Overall, participants in this meeting had questions to help them better understand the proposed projects and the estimated impacts of those projects but provided somewhat limited feedback on potential changes to the portfolio of projects. The following list of feedback themes therefore represents some of the more significant questions and points of discussion posed by attendees.

- **IRA/IIJA:** CenterPoint's planned approach to pursuing IRA/IIJA funding to support pilot projects, and whether CenterPoint has included tax credits in its calculations;
- **Pilot implementation:** Implementation details specific to certain pilots;
- **Economic impacts and workforce development:** Anticipated portfolio-wide economic impacts, as determined via IMPLAN modeling, including pilot-related workforce development considerations; and
- **Rates:** Rate implications and clarifications regarding CenterPoint's approach to NGIA cost recovery.

Meeting Notes

Notes are in an alphanumeric format for reference purposes only; the numbers and letters do not indicate any prioritization or ranking.

Introductions and Agenda Overview

1. Participants were asked to adhere to the following meeting ground rules:
    a. **Respect the time.** Our time together is limited and valuable. Please be mindful of the time and of other's opportunity to participate.
    b. **Respect each other.** Help us to collectively uphold respect for each other's experiences and opinions, even in difficult conversations. We need everyone's wisdom to achieve better understanding and develop robust solutions.
    c. **Please use "raise hand" and chat features.** We have a large group this morning, to help make space to hear from as many stakeholders as possible, please use the "raise hand" or chat features to indicate you would like to participate in the conversation.
    d. **Enable honesty through non-attribution.** Outside of this group, you may share what was said and who was present, but please refrain from sharing who said what without first obtaining permission. All meeting notes and materials will also adhere to this.
2. CenterPoint thanks all parties for their involvement throughout the innovation plan development process.

Meeting Context and Purpose

1. Today provides an opportunity to discuss draft innovation plan components (pilot and R&D projects) in advance of the filing.
2. Participants' honest thoughts and feedback at this meeting will help CenterPoint file a well-informed plan.

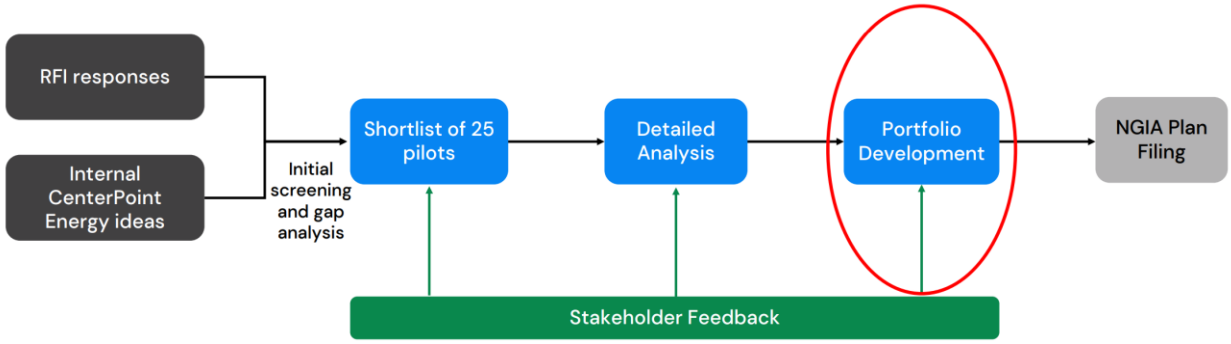
Overview of NGIA Statutory Requirements

1. General NGIA statutory requirements for any utility filing any innovation plan:
    a. Strategic electrification generally requires gas backup per NGIA definition
    b. $90M cost cap for five-year plan life, with a $15M bonus available for certain renewable natural gas (RNG) types
    c. Up to 10% of the utility's budget can be used for R&D
        i. In CenterPoint's case, this allows for ~$10.6M to be directed towards R&D
2. Special requirements for utilities filing their first innovation plan:
    a. For all utilities:
        i. At least 50% of costs must go towards low-carbon fuel initiatives (RNG, biogas, power-to-hydrogen, power-to-ammonia)
    b. CenterPoint-specific pilot requirements:

i. Residential deep energy retrofit plus electric air source heat pump (ASHP) with gas backup—must help meet a specific ambitious retrofit standard in at least some homes.
ii. Pilot targeting a hard-to-electrify industrial sector
iii. Small/medium business greenhouse gas (GHG) audit pilot
iv. District energy pilot (cannot be more than 20% of plan costs)

Overview of Innovation Plan Development Process

1. There are three points of stakeholder feedback in the Innovation Plan development process:
    a. Developing a shortlist of 25 pilots
    b. Conducting a detailed analysis
    c. Portfolio development
2. NGIA innovation plan development process chart—we are currently at the portfolio development phase in advance of plan filing:



3. The NGIA frameworks order established the cost effectiveness criteria used to evaluate pilot projects
    a. Criteria present a holistic way to evaluate the cost effectiveness of pilots
    b. Framework consists of a mix of quantitative and qualitative criteria including environmental, socioeconomic, and innovative categories, as well as a category that evaluates pilot implications according to different perspectives.

Draft Innovation Plan Portfolio

1. Refer to Slide 10 in the slides available here in the resource library to review the draft list of pilots selected for inclusion in CenterPoint's first innovation plan
2. Aimed to develop a balanced portfolio that covered different innovative resource types while meeting all statutory requirements and balancing competing priorities
3. Wanted to maximize innovation and learning opportunities by including as many pilots as possible
4. Prioritized funding for some of the more innovative pilots
    a. Some pilots offer significant future potential
    b. CenterPoint wants to learn more about these technologies and gain experience with them now so they are well-positioned to use them moving forward.
        i. Other pilots don't require as much funding for CenterPoint to learn available lessons
5. Aimed to produce a reasonable cost portfolio without compromising on innovation
6. CenterPoint was able to fit almost all shortlisted pilots into its draft portfolio in some deployment size/scale.

   a. Note that project size definitions vary significantly by innovation category and pilot type
      i. The size categories (A=smallest, B=medium, and C=largest) provide a sense of scale, but actual sizes may vary significantly between innovation categories.
   b. Generally pursued larger pilot sizes for scalable commercial technologies with long-term emissions reduction opportunities and/or pilots with a lot of learning potential for CenterPoint and high levels of support from interested parties. Examples of these include:
      i. Networked geothermal
      ii. Commercial hybrid heating
      iii. Residential deep energy retrofits
   c. In some cases, participation levels for larger pilots were deemed unlikely to be able to be achieved successfully, so CenterPoint pursued smaller size options in these instances.
   d. Only one shortlisted pilot (solar thermal heating for commercial/industrial customers) has not been included in the draft portfolio:
      i. However, this type of technology will remain eligible for an incentive through an included pilot (industrial/large commercial GHG audit)
7. Specific RNG project considerations:
   a. Pilots 1 (Anaerobic Digestion of Organic Materials) and 2 (Anaerobic Digestion of East Metro Food Waste) are specific projects being discussed with counties and project developers.
      i. CenterPoint will directly negotiate contracts with those project developers.
      ii. No contracts have been signed yet.
   b. Archetype Pilots 3–6 (Water Resource Recovery Facility, Dairy Manure, Food Waste, and Landfill Gas)
      i. CenterPoint will solicit best projects via an RFP process.
      ii. Seeking proposals offering attractive qualities like best cost, best emissions reductions etc.
      iii. Dekatherm/year values included in portfolio for budget estimation purposes.
8. *Question:* Will CenterPoint be incorporating native grasses into the design for the Urban Tree Carbon Offset Program (Pilot 10) for water infiltration benefits?
   a. *Answer:* This pilot is an existing carbon offset program. CenterPoint would be happy to reach out to the organization managing the program to hear their perspective on alternative vegetation strategies, such as native grasses.
9. *Question:* Will CenterPoint think about what materials installers would use to avoid unsustainable materials/resources (recommends pursuing sustainable insulation materials)?
   a. *Answer:* This pertains to embodied carbon, which might fit into currently unassigned R&D funding, or potentially into the building retrofit pilot.

Budget Breakdown

1. Several portfolio-level costs are factored into the overall innovation plan budget
   a. Draft portfolio uses full estimated budget
      i. 50.3% of utility costs allocated to low-carbon fuels for the first innovation plan (Pilots 1–8 and 25% of the R&D budget), consistent with the 50% minimum budget statutory requirement.

        ii. Pilots 14 (New Networked Geothermal Systems Pilot), 18 (Commercial hybrid heating pilot), and 19 (Residential deep energy retrofit + electric ASHP pilot) use most of the remaining non-R&D budget. These are large, costly pilots, but were identified as high-priority and thus included at a larger size to enable more learning and market transformation.
    b. Budget allows for R&D flexibility throughout the innovation plan life
    c. Portfolio-level costs (e.g., regulatory work, program management) have been distributed between pilots—allocated based on their cost to the overall NGIA budget, which proportionally increased all pilot costs.
        i. CenterPoint had to wait until this stage in plan development to distribute these costs across the budget because they first needed to understand which pilots would be included at what deployment sizes/scales.
    d. Commodity cost savings within the five-year plan window have been applied to utility costs, so presented pilot costs have been reduced by those savings.
2. *Question:* Would any IRA/IIJA funds, tax credits, etc. subtract from utility costs towards the NGIA budget? How are those types of benefits applied here?
    a. *Answer:* Pilot 7 (Green Hydrogen Blending into Natural Gas Distribution System) offers a good example in response to this question. For Pilot 7, CenterPoint would install an electrolyzer and photovoltaic panels (which would be used to power the electrolyzer) as a capital investment. Capital investment costs have been reduced by anticipated IRA funding; this would result in direct utility cost reductions.
        i. Alternatively, if customers are receiving incentives (e.g., through the Weatherization Blitz R&D initiative, which would incentivize customers to install certain technologies), this would be factored into the participant cost test, which does not directly affect the utility budget.
3. *Question:* Are anticipated IRA/IIJA-related incentives already factored into some of the budget numbers?
    a. *Answer:* Costs have already been included in instances in which an IRA incentive would directly reduce utility costs. However, certain elements of IRA implementation don't yet have established rules (for example, we don't yet know how easy/difficult it will be to qualify for certain tax credits). CenterPoint has made assumptions where possible (erring on the conservative side when there is uncertainty), but some unknowns remain. The budget estimates reflect the best current knowledge.

Greenhouse Gas Reductions

1. Values presented represent pilots' lifetime GHG savings and the estimated costs to achieve those emissions reductions.
    a. Lifetimes vary by pilot
        i. For example, networked geothermal has long project life
        ii. Other projects have shorter operational lifespans for an individual installation (e.g., heat pumps have an ~15-year life)
    b. Note: Emissions reductions of R&D pilots were not evaluated.
2. GHG emissions reduction costs are shown from two different perspectives:
    a. Utility cost perspective: costs the utility will pay
        i. Excludes costs paid by participants or others.
        ii. Highly sensitive to the selected level of participant incentivization.
        iii. Does not include co-benefits of reducing GHG/other pollutant emissions.

   b. Total net pilot impacts: costs to the utility, participants, and the larger value of reducing GHG/other pollutant emissions
      i. Aims to capture all values and cost streams quantified in the analysis
3. *Question:* what carbon intensity modeling are you using for the dairy manure RNG costs (Pilot 4)? Argonne GREET?
   a. *Answer:* NGIA requires use of Argonne GREET. For Dairy RNG in this innovation plan, CenterPoint is using the defaults from the Argonne GREET 2022 fuel cycle model as a placeholder value (and is changing the NREL grid mix where identified in the NGIA frameworks).
      i. The most commonly discussed carbon intensity scores are typically for California's Low-Carbon Fuel Standard, which builds upon GREET and guides policy decisions regarding avoided methane credits. This results in a difference in carbon intensity scores, which is more significant for dairy RNG projects.
      ii. As part of the RFP process, CenterPoint will be able to use more project-specific values.
   b. *Follow-up comment:* If you use a site-specific value rather than GREET's default value, the resulting carbon intensity scores are significantly lower than what you get even when using California's values.
      i. *Follow-up response:* California Air Resources Board provides guidance on how to evaluate avoided emissions, but CenterPoint needs project-specific information to do so. The pilot archetypes are currently "best guesses," that will be refined to a much more project-specific level at the RFP phase.
4. *Question:* What do the negative numbers in the two emissions reductions columns on slide 13 indicate?
   a. *Answer:* Negative numbers in those columns for some pilots represents saving customers money over time. Negative numbers in the utility perspective column can represent commodity cost savings that cover or exceed most costs. Net impact values (last column) include a carbon emissions reduction value.

Qualitative Costs and Benefits

1. Cost effectiveness does not boil down to a number
2. All qualitative costs and benefits discussed in the second public engagement meetings are relevant, since all of those pilots have been included in some form in the draft portfolio
3. See Slides 47–50 for a detailed summary of key qualitative impacts.

IMPLAN Methodology for Modeling Net Job Impacts

1. IMPLAN is an economic modeling tool that analyzes the macroeconomic impacts of an economic activity in a specified economic region (in this case, MN)
   a. Model is based on input–output relationships between industries and sectors, according to commonly-accepted categories.
      i. Simplified, IMPLAN answers the question, "If you spend $1 in one industry, what impacts does that action have on other industries and sectors?"
      ii. Allows analysis of links between/across industries and sectors
   b. Estimates employment by aggregated sector

2. Three different IMPLAN output categories for jobs created throughout a project's life (not just the five-year plan duration) across MN's economy.
    a. Direct: Jobs created in sectors in which CenterPoint is directly spending NGIA innovation plan money
        i. Typically 40-60% of job impacts are direct (remainder are combination indirect/induced)
    b. Indirect: Upstream supply-chain related jobs in industries in which CenterPoint is not directly spending money, but that support pilots through materials, equipment, and construction
    c. Induced: Jobs created downstream in all local industries (e.g., workers using earned money in the local economy)
3. *Question:* Are you planning on doing outreach to under-privileged community members and providing stipends for training so the workforce can be developed in those communities?
    a. *Answer:* Workforce development is a huge part of this work. CenterPoint has a workforce development line item in the innovation plan budget as a portfolio-level cost. CenterPoint has not yet identified where that money would be best spent, but would be happy to work with this commenter to help figure this out
4. *Question:* Is CenterPoint considering any potential negative employment impacts in certain sectors based on the resources that would be displaced (e.g. fossil gas) in the IMPLAN model?
    a. *Answer:* Yes, the IMPLAN model accounts for net impacts, which include negative employment impacts (i.e., job losses). Many pilots will lead to energy savings, which is generally considered a good thing, but does have a negative effect on energy producer jobs. Accounting for this is challenging, especially since many energy sector contributions operate on a national scale, but the IMPLAN analysis is conducted at the state-level.
5. *Question:* Did CenterPoint do an assessment of jobs created per dollar invested?
    a. *Answer:* Yes, an analysis of jobs/dollar or input/worker was completed for all impacts to make sure the results seemed reasonable.
6. *Question:* Is there an analysis of employment impacts for the disability community?
    a. *Answer:* IMPLAN does not get more granular than modeling statewide jobs across the three output categories (direct, indirect, induced), so CenterPoint did not conduct a specific analysis on this.

Overview of R&D Project Selection

1. NGIA lacks a clear R&D definition, so CenterPoint established the following qualities to distinguish R&D projects from fully deployed pilots in the innovation plan. R&D projects are:
    a. Relatively smaller in scale
    b. Uncertain, difficult to quantify, or nominal GHG reduction benefits
2. R&D project selection considerations for CenterPoint's first innovation plan:
    a. Up to 10% plan costs (statutory requirement)
    b. R&D project funding specified for first 2 years of innovation plan
        i. Reserves funding for R&D in future plan years in the R&D budget
        ii. Prioritizing R&D for foundational activities and resources that are underrepresented in the pilot portfolio
        iii. Annual status reports will report progress on included R&D initiatives and identify how remaining R&D budget will be spent

3. Will accept external R&D proposals on an ongoing basis for consideration in future years and plan iterations.
4. Seven R&D projects included in CenterPoint's initial innovation plan filing (see slide 20 for details on each R&D project):
    a. CenterPoint Minnesota Net Zero Study
    b. Weatherization Blitzes
        i. Added benefit: Testing different outreach approaches that may be more effective than what CenterPoint currently uses could identify approaches that may also be highly effective for CenterPoint's CIP initiatives.
    c. High Performance Building Envelope Initiative—Commercial New Construction
    d. Assessing Next-generation Micro Carbon Capture for Commercial Buildings
        i. Demonstration of next-generation CarbinX units (like those used in Pilot 13, Carbon Capture for Commercial Buildings, but with a higher rate of carbon capture).
        ii. If found to be successful, the next generation CarbinX units could potentially deployed in future plan years to improve the Pilot 13 carbon capture rate.
    e. Green Ammonia—Novel Technology
    f. RNG Potential Study
        i. Some parts of the system are better suited than others for year-round RNG, feedstock availability varies, etc.
    g. Utilization of Green Ammonia for Thermal Energy
5. *Question:* Will these R&D projects all be completed within the first two years of the innovation plan, or will they persist for the full five-year plan duration?
    a. *Answer:* None will continue for the full five-year plan period, but some would last more than two years. The estimated budget for these seven R&D projects falls well under the 10% maximum of the innovation plan budget for R&D (40% of the allotted 10% R&D budget).
6. *Question:* Will results be filed?
    a. *Answer:* Yes, results will be reported in annual status reports
7. R&D projects to be considered for future years include projects received through the NGIA RFI (see list on slide 21).
    a. CenterPoint will continue accepting R&D ideas on an ongoing basis and will set up a process to do so.
8. CenterPoint will send out a communication to all RFI respondents to close the loop on current R&D project status decisions.

Overview of Draft Rate Impacts

1. Three types of costs included in the innovation plan
    a. Capital costs: long-lived investments to be made by CenterPoint
        i. NGIA examples: hydrogen electrolyzer and solar panels, new networked geothermal system, potential RNG capital investments
        ii. CenterPoint recovers capital costs over the life of the asset including return
    b. Gas or fuel costs: costs for fuel that supplies energy to customers
        i. NGIA examples: RNG costs, electricity costs to power the CenterPoint-owned hydrogen electrolyzer
        ii. CenterPoint recovers gas/fuel costs via the Purchased Gas Adjustment (PGA) mechanism, which is adjusted monthly
    c. Operations and maintenance (O&M) costs: generally "anything else"

i. NGIA examples: rebates, vendor costs, plan development costs
ii. CenterPoint recovers most O&M costs via delivery charges or occasionally via special riders, as is the case for CIP costs.

Proposed NGIA Cost Recovery Mechanism

1. Fuel costs to be recovered via PGA, which would include RNG and electricity costs (except electricity supplied by onsite solar)
2. Proposing a two-part structure to recover other "non-fuel" costs, which would be similar to the CIP approach.
    a. Certain costs to be included in delivery rates, as is the case with the Conservation Cost Recovery Charge (CCRC) for CIP.
        i. CCRC-type rate would be included in upcoming rate case
    b. Remaining costs to be recovered via a special rider, like the Conservation Cost Recovery Adjustment (CCRA)
        i. CCRA-type rate would include an annual true-up outside of a rate case.
3. Propose to match program costs with the rate classes that may benefit from program (see slides)
    a. Generally, all customers would pay for more general costs that serve all customers (e.g., RNG resources, hydrogen electrolyzer, urban tree offsets)
    b. Some costs will be directed more specifically based on target customer classes (e.g., commercial/industrial customers will pay for pilots that only serve the commercial/industrial classes, residential customers will pay for pilots that only serve the residential class)

Bill Impacts

1. See slide 25 for expected bill impacts for the first year of innovation plan implementation
    a. Slide 25 makes a distinction between commercial/industrial "transport customers" (who independently purchase gas from other suppliers but pay to use CenterPoint's gas transport infrastructure) vs commercial/industrial "non-transport customers" (who purchase and receive gas from CenterPoint)
    b. Transport customers do not pay fuel costs because they are not receiving RNG, hydrogen, etc. from CenterPoint, so they are not part of that cost recovery
    c. Note: Slide 25 does not display cost savings to customers (e.g., though buying less gas due to improved efficiency)
    d. Average annual residential customer rate impacts (expected) due to NGIA, per slide 25:
        i. Year 1: $3.56
        ii. Year 2: $10.09
        iii. Year 3: $14.60
        iv. Year 4: $15.69
        v. Year 5: $19.27
2. CenterPoint is seeking feedback and ideas regarding how to represent this on bills, how to communicate bill changes, etc.
3. *Question:* Have you considered exploring government subsidies or incentives, community funding models, partnerships with private organizations, or innovative financing mechanisms tailored to commercial or residential customers? Also, have you considered different cost recovery mechanisms for rural versus urban settings?
    a. *Answer:* CenterPoint is thinking about all of these aspects generally, but don't yet have specifics for individual pilots. Also, IRA assumptions are already built in.

4. *Question:* Is CenterPoint's return on equity for on capital costs included in the cost projections?
    a. *Answer:* Yes, return on equity is embedded in the costs shown on the slides
5. *Question:* How will CenterPoint determine which non-fuel costs will be included in base rates (delivery) and which to be included in the rider?
    a. Answer: For CenterPoint's upcoming rate case, non-fuel costs will mostly fall within the "CCRA equivalent" with an annual true-up. In CenterPoint's subsequent rate case, this will likely fall within the "CCRC equivalent" (delivery rates)
6. *Question:* Do these calculations include the hydrogen production tax credit and what its impact would be on resource costs?
    a. *Answer:* For hydrogen blending, CenterPoint has modeled taking the investment tax credit rather than the production tax credit, pending clarification on Department of Energy rules. CenterPoint assumed a 30% investment tax credit, which would meet labor requirements for the higher credit, but did not assume building in an energy community or other credit boosts. But in cases where the credit reflects costs to participants (not to CenterPoint), it is not included.
7. *Question:* What kind of revenue will be generated from renewable thermal credits?
    a. *Answer:* CenterPoint plans to retire credits to claim GHG emissions. It is not part of CenterPoint's current plan to sell credits.
8. *Question:* What causes the average annual residential rate impacts to increase over time (i.e., from $3.56 in Year 1 to $19.27 in Year 5)?
    a. *Answer:* We modeled an increase in activity over time to reflect the mostly likely timelines (for example, RNG projects are unlikely to be deployed in Year 1, and other projects will start with a study and then ramp up). CenterPoint is also trying to ramp up over time to get ready for the larger spending allowance in their next five-year innovation plan.

Additional Discussion Regarding Rate Impacts

1. *Question:* When will organizations find out specific information about their project/their responses to CenterPoint's RFI, what funding and timelines may look like, etc.? Will CenterPoint set up individual meetings?
    a. *Answer:* CenterPoint will send out a general communication to all RFI respondents to close the loop on whether a proposed project was included in CenterPoint's innovation plan and, if so, how it was included, but nothing will be finalized until the Commission finishes its plan review/approval process
2. *Question:* When is final plan approval expected?
    a. *Answer:* Expecting plan approval approximately 1 year after filing—CenterPoint is filing the plan at the end of June. CenterPoint expects to be able to move some implementation tasks and preparation forward pre-approval where appropriate.
    b. PUC approval process: Utility submits filing, parties provide comments, then parties have an opportunity to reply to those comments. PUC will then schedule a hearing to go over the comments, discuss the filing, etc.
3. *Question:* Will there be a new docket for this plan?
    a. *Answer:* Most likely, but not positive. If so, the PUC would add groups from existing docket's service list into the new one.

Final Thoughts & Next Steps

1. CenterPoint requests that meeting attendees complete the Innovation Plan Engagement Meeting Survey (survey link available here).
    a. Please submit additional feedback via the survey, which will be sent out after the meeting.
    b. Survey responses due **Friday, May 26, 2023.**
    c. CenterPoint especially wants to hear feedback about how to communicate with customers, what bill should look like, etc.
2. Participants and other interested parties may reach out with further questions and/or feedback via the email address dedicated to this initiative: InnovationPlan@CenterPointEnergy.com.
3. Regulatory parties meeting upcoming on **Monday May 22, 2023**.
    a. Key regulatory parties have been identified, but any additional parties are welcome to reach out if interested in attending.
    b. Participation stipends available for groups representing low income, environmental justice, racial equity, or other perspectives historically underrepresented in energy regulatory proceedings.
4. CenterPoint still targeting mid-year (late June) for the draft innovation plan filing.
5. GPI will prepare a meeting summary which will be provided to participants.

Regulatory Parties Meeting #3: Review of CenterPoint Energy's Draft Innovation Plan

Peter Narbaitz
Director, Energy Markets & Planning, ICF

5/22/2023

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Agenda

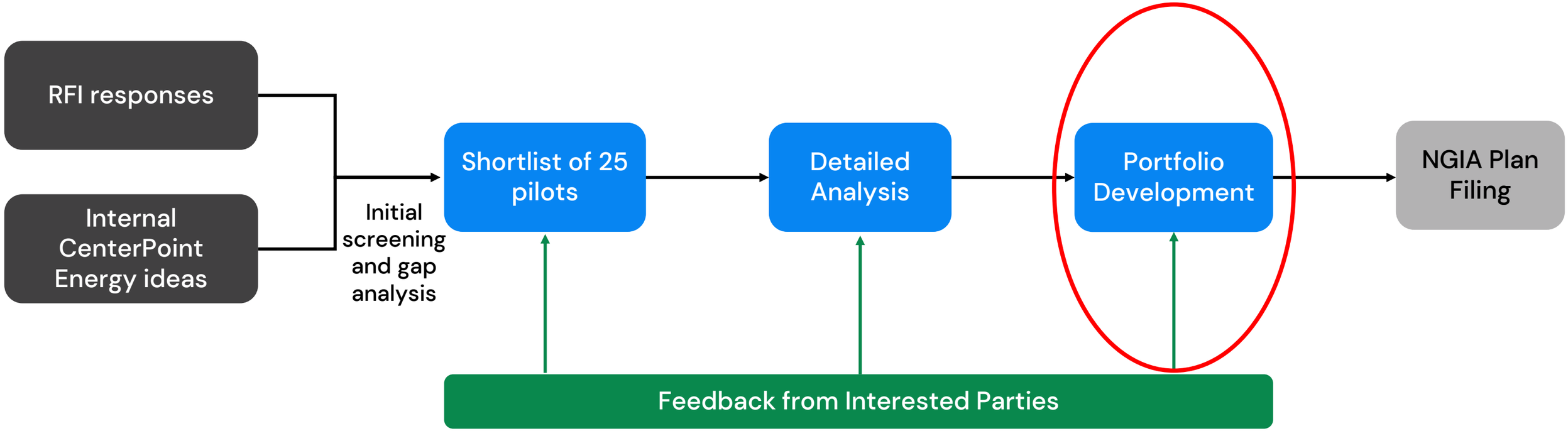
- Follow-Up Questions/Comments from May 12 Public Engagement Meeting
- Rate Impacts

- BREAK

- Alternative Portfolios
- Walk Through of Filing Components
- Structure of Pilot Descriptions
- Tracking and Verification Plan
- Wrap-Up and Next Steps

Overview of NGIA Innovation Plan Development Process and NGIA Requirements

Overview of NGIA Innovation Plan Development Process



Focus of this third public engagement meeting is feedback on the draft portfolio of pilots selected for CNP's Innovation Plan: what feedback do you have on the draft portfolio of pilots that should be considered before a final NGIA Innovation Plan is filed with the utilities commission?

Portfolio Frameworks Chart

- NGIA frameworks document prescribe the table shown here to present results for the pilots included in NGIA portfolio
- Some evaluation criteria are quantitative, other parts are qualitative
  - Cost-effectiveness does not boil down to a number
  - Will assess cost-effectiveness primarily from the societal perspective (all-in perspective)
- Previous stakeholder meeting provided and discussed assumptions feeding into the analysis for each of these pilots (and some updates have been made since then)

	Pilot 1	Pilot 2	Pilot 3
Perspectives			
NGIA Utility Perspective			
NGIA Participants Perspective (including specific impacts on low- and moderate-income participants)			
NGIA Nonparticipating Customers Perspective (including specific impacts on low- and moderate-income customers)			
Effects on Other Energy Systems and Energy Security			
Environment			
GHG Emissions			
Other Pollution (including any environmental justice costs or benefits)			
Waste reduction and reuse (including reduction of water use)			
Policy (e.g., natural gas throughput, renewable energy goals)			
Socioeconomic			
Net Job Creation			
Economic Development			
Public Co-Benefits			
Market Development			
Innovation			
Direct Innovation Support			
Resource Scalability and Role in a Decarbonized System			

Reminder – Statutory Requirements

General Statutory Requirements to Keep in Mind

- Strategic electrification is defined to require gas backup
- There is an overall cost cap of approximately $90M over the five-year plan
- In addition, there is a bonus amount available only for certain kinds of RNG equal to approximately $15M over the five years
- Up to 10% of budget can be allocated to “research and development” (in this case about $10.6M)

Special Requirements for the First Plan

- All utilities
  - Costs must be 50%+ for RNG, biogas, power-to-hydrogen or power-to-ammonia (low carbon fuels)
- CenterPoint Only
  - Residential deep energy retrofit + electric ASHP pilot (with gas backup)
    - Must facilitate very specifically defined and ambitious retrofit standard in at least some homes
  - Industrial hard-to-electrify pilot
  - Small/medium business GHG audit pilot
  - District energy pilot required but may not be more than 20% of plan costs

Overview of Draft NGIA Innovation Plan

Summary of Pilots Selected for Draft CenterPoint Innovation Plan Portfolio

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio[1]	Description of this Size of Pilot
Renewable Natural Gas (RNG)	1	RNG Proposal – Anaerobic Digestion of Organic Materials	B	Assume 10-year contract to purchase 41,440 Dth / year
	2	RNG Proposal – Anaerobic Digestion of East Metro Food Waste	B	Assume 10-year contract to purchase 152,613 Dth / year
	3	RNG Archetype – WRRF	B	Assume 10-year contract to purchase 50,000 Dth / year[2]
	4	RNG Archetype – Dairy Manure	A	Assume 10-year contract to purchase 10,000 Dth / year[2]
	5	RNG Archetype – Food Waste	B	Assume 10-year contract to purchase 220,000 Dth / year[2]
	6	RNG Archetype – Landfill Gas	A	Assume 10-year contract to purchase 100,500 Dth / year[2]
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	1 MW electrolyzer + 1 MW solar PV
	8	Green Hydrogen Archetype – Industrial or Large Commercial Facility Electrolyzer	A	One facility installing 5 MW electrolyzer
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	50 facilities participate in leak surveys and repairs
	10	Urban Tree Carbon Offset Program	A	4,500 carbon credits purchased
	11	Archetype Carbon Capture Project for Industrial or Large Commercial Facility	A	One facility installing carbon capture system
	13	Carbon Capture Rebates for Commercial Buildings	A	325 CarbinX systems installed
District Energy	14	New Networked Geothermal Systems	C	1000-ton capacity system installed
	15	Decarbonizing Existing District Energy Systems	B	2 existing district energy sites supported
	16	New District Energy System	B	2 new district energy sites supported
Strategic Electrification	17	Industrial Electrification Incentive Program	A	Industrial heat pumps piloted at 3 facilities
	18	Commercial Hybrid Heating	B	135 facilities install hybrid gas-electric rooftop units
	19	Residential Deep Energy Retrofit + Electric ASHP Pilot (with Gas Backup)	B	238 buildings (SFH + Multi-family) participate across 3 phases
Energy Efficiency	20	Small/Medium Business GHG Audit	A	992 GHG audits, with 3% implementing measures from NGIA
	21	Residential Gas Heat Pump	A	6 homes install gas heat pumps
	22	Gas Heat Pump for Commercial Buildings	A	3 buildings install gas heat pumps
	24	Solar Thermal Heating for C&I	None	N/A
	25	Industrial and Large Commercial GHG Audit	A	50 GHG audits, 5 projects implemented with NGIA incentive

Key Takeaways:

- Able to fit most of pilots into the portfolio with at least size A
- Projects from the pilot that is not included (#24) would still be eligible for an incentive through pilot #25
- How project sizes are defined varies significantly by innovation category and pilot type (e.g. some are direct install programs, while incentives in others only cover a fraction of expected customer costs)

[1] Note that size A is smallest option included for each pilot, size C is the largest. More details on pilot sizes are available in the Appendix, slides 42 to 48.

[2] These values included in current portfolio for budgeting purposes, however CNP intends to hold an RFP process and the final mix of RNG sources could vary significantly (based on the responses to that RFP).

Combined Details on Draft NGIA Innovation Plan Portfolio

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio	Utility Costs Towards NGIA Budget		Lifetime GHG Savings		Emission Reduction Cost from Utility Perspective	Emission Reduction Cost from Total (Net) Pilot Impacts Perspective
				$	% of Portfolio	tCO2e	% of Portfolio	$/tCO2e	$/tCO2e
Renewable Natural Gas (RNG)	1	RNG Proposal - Anaerobic Digestion of Organic Materials	B	$ 2,856,761	3%	28,221	2%	$272	$221
	2	RNG Proposal -Anaerobic Digestion of East Metro Food Waste	B	$ 10,160,063	10%	134,097	12%	$156	$105
	3	RNG Archetype – WRRF	B	$ 4,010,633	4%	26,556	2%	$313	$261
	4	RNG Archetype - Dairy Manure	A	$ 2,241,062	2%	9,895	1%	$465	$414
	5	RNG Archetype – Food Waste	B	$ 19,321,990	18%	254,739	22%	$157	$105
	6	RNG Archetype - Landfill Gas	A	$ 5,351,763	5%	53,621	5%	$207	$155
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	$ 5,183,888	5%	27,993	2%	$821	$767
	8	Green Hydrogen Archetype - Industrial or Large Com. Electrolyzer Pilot	A	$ 1,379,484	1%	56,330	5%	-$11	$829
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	$ 1,371,302	1%	38,831	3%	$29	-$33
	10	Urban Tree Carbon Offset Program	A	$ 329,301	0%	4,500	0%	$67	$12
	11	Archetype Carbon Capture Project for Industrial or Large Com. Facility	A	$ 2,513,519	2%	50,865	4%	$66	$294
	13	Carbon Capture Rebates for Commercial Buildings	A	$ 1,445,823	1%	55,150	5%	$1	-$62
District Energy	14	New Networked Geothermal Systems Pilot	C	$ 11,754,257	11%	107,355	9%	$393	$389
	15	Decarbonizing Existing District Energy Systems	B	$ 1,218,753	1%	124,030	11%	-$27	-$53
	16	New District Energy System	B	$ 345,592	0%	40,882	4%	-$19	$351
Strategic Electrification	17	Industrial Electrification Incentive Program	A	$ 571,343	1%	11,896	1%	$10	$10
	18	Commercial hybrid heating pilot	B	$ 7,198,434	7%	25,609	2%	$217	$41
	19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	B	$ 13,703,275	13%	66,760	6%	$159	$295
Energy Efficiency	20	Small/medium business GHG audit pilot	A	$ 1,929,754	2%	5,642	0%	$322	$328
	21	Residential Gas Heat Pump	A	$ 382,229	0%	235	0%	$1,464	$1,346
	22	Gas Heat Pump for Commercial Buildings	A	$ 765,026	1%	2,154	0%	$296	$192
	24	Solar Thermal Heating for C&I	None	$ -	0%	0	0%	$0	$0
	25	Industrial and Large Commercial GHG Audit Pilot	A	$ 1,096,406	1%	35,560	3%	-$6	-$81
Total Pilot Portfolio				**$ 95,130,658**	**90%**	1,160,921	**100%**	$158	$191
Additional R&D Budget		R&D Projects - Low Carbon Fuels (25%)		$ 2,642,615	2.5%	0	0%		
		R&D Projects - Other (75%)		$ 7,927,846	7.5%	0	0%		
Total Portfolio (incl. R&D)				**$ 105,701,119**	**100%**	**1,160,921**	**100%**	$167	$200

Details on Draft NGIA Innovation Plan Portfolio Net Job Impacts

Primary Innovation Category	#	Pilot	Pilot Size Selected for Portfolio	Net Direct Jobs Creation	Net Indirect Jobs Creation	Net Induced Jobs Creation	Direct Jobs Created per each $1 million Investment	Direct Jobs Created per each $1 million of Utility Cost towards NGIA Budget
				# of FTEs	# of FTEs	# of FTEs	# of FTEs per $1M	# of FTEs per $1M
Renewable Natural Gas (RNG)	1	RNG Proposal - Anaerobic Digestion of Organic Materials	B	46	17	25	5	16
	2	RNG Proposal -Anaerobic Digestion of East Metro Food Waste	B	112	62	70	4	11
	3	RNG Archetype – WRRF	B	33	18	21	4	8
	4	RNG Archetype - Dairy Manure	A	7	15	8	1	3
	5	RNG Archetype – Food Waste	B	161	88	100	4	8
	6	RNG Archetype - Landfill Gas	A	45	24	27	4	8
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution System	B	43	59	45	2	8
	8	Green Hydrogen Archetype - Industrial or Large Com. Electrolyzer Pilot	A	164	98	120	2	119
Carbon Capture	9	Industrial Methane and Refrigerant Leak Reduction Program	A	9	5	7	4	7
	10	Urban Tree Carbon Offset Program	A	1	0	0	3	3*
	11	Archetype Carbon Capture Project for Industrial or Large Com. Facility	A	23	26	28	1	9
	13	Carbon Capture Rebates for Commercial Buildings	A	88	51	55	3	61
District Energy	14	New Networked Geothermal Systems Pilot	C	115	129	186	2	10
	15	Decarbonizing Existing District Energy Systems	B	142	84	89	6	116
	16	New District Energy System	B	49	31	45	2	142*
Strategic Electrification	17	Industrial Electrification Incentive Program	A	11	5	6	4	19*
	18	Commercial hybrid heating pilot	B	40	23	25	3	5
	19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	B	44	31	96	1	3
Energy Efficiency	20	Small/medium business GHG audit pilot	A	13	9	9	4	7
	21	Residential Gas Heat Pump	A	2	1	1	6	5*
	22	Gas Heat Pump for Commercial Buildings	A	3	2	2	3	4*
	24	Solar Thermal Heating for C&I	None	-	-	-	-	-
	25	Industrial and Large Commercial GHG Audit Pilot	A	21	13	13	4	19
Total/Average Pilot Portfolio				1,171	793	979	3	12
Additional R&D Budget		R&D Projects - Low Carbon Fuels (25%)						
		R&D Projects - Other (75%)						
Total/Average Portfolio (incl. R&D)				1,171	793	979	3	12

* Projects with utility costs of less than $1 million towards NGIA budget

Number of jobs calculated as full-time equivalent (FTE), representing one year of work (2080 work hours), aggregated over the project lifetime.

Key Takeaways:

- All pilots are expected to drive a net increase in jobs in Minnesota
- Some of the determinants about whether one pilot created more or less jobs include:
  - Types of spending (e.g., costs for installation will have more Minnesota job impacts than costs for equipment manufacturing)
  - Total costs in a pilot, instead of utility funding (e.g., some pilots fully fund implementation of projects, while other pilots include a utility incentive and significant additional funding from customers or 3rd parties)
  - Pilot lifetime: many of the pilots will continue to operate after the five-year program

Portfolio job creation impact does not include unquantified employment opportunities generated by R&D projects

R&D Projects Selected for Initial Filing

#	R&D Project	Description	Estimated Budget
A	CenterPoint Minnesota Net Zero Study	A study to help CenterPoint understand different pathways the Company could take for its gas utility business in Minnesota to reach net zero emissions by 2050. The study will include development of base year emissions and business-as-usual emissions growth scenario, consideration of potential emissions reductions strategies, development of specific pathways to net-zero to be modeled, and modeling of impacts of the selected pathways (e.g., impacts on gas and electricity consumption, customer costs, and emissions reductions). The analysis will be summarized in a final report.	$ 220,000
B	Weatherization Blitzes	The “Neighborhood weatherization blitzes” proposes to test intensive, novel and community-based marketing and outreach approach to increase the participation in CenterPoint Energy's existing CIP weatherization offerings. There is uncertainty in the effectiveness of this approach and start-up requires notable time and resource investment, so we will start with a Research & Development project to design and test different outreach campaigns to evaluate their effectiveness for consideration in CIP.	$ 800,000
C	High Performance Building Envelope Initiative – Commercial New Construction	High performing commercial building envelopes are a critical part of the effort to reduce GHG emissions, but are rarely incorporated into new commercial construction, especially in small and medium-sized buildings. There are many market barriers that limit the demand for high performance envelopes. This proposal outlines a multi-faceted strategy to address these barriers and start the process of creating a more focused and streamlined approach to high performance building envelope design and integration into new commercial construction in Minnesota.	$ 400,000
D	Assessing next-generation micro-Carbon Capture for Commercial Buildings	The proposed project will investigate the carbon capture effectiveness and waste heat recovery efficiency of CleanO2's next-generation CarbinX units (version 4.0) which claims mitigation of up to 20 metric tons of CO2 emissions per year. For residential and commercial buildings, distributed carbon capture is an emerging technology for decarbonization. These technologies can be integrated with boilers or water heaters to reduce carbon emissions from gas combustion. This project will demonstrate installation of CarbinX 4.0 with existing gas-fired space or water heating equipment and document its installed performance, carbon capture effectiveness, energy savings, economics, and best practices for installation, operation, and maintenance. This assessment will also identify areas of improvement with respect to product design and operation to support continued technology development. Additionally, the project will collect feedback from facility staff and identify codes, standards, regulations, and policies which may be potential barriers to broader deployment of promising distributed carbon capture technologies.	$ 275,000
E	Green Ammonia - Novel Technology	The green ammonia technology – termed MOVAPS (Modular One Vessel Ammonia Production System) is the development of a micro, modular ammonia making reactor, which would produce ammonia in one vessel, and thereby replace the need for a separate electrolyzer and the Haber Bosch process. It runs at ambient temperature and pressure, can run at a variable capacity and has a low CAPEX and OPEX. With these characteristics, it could be set up in a distributive fashion for small-scale applications, or could also be used in large production systems.	$ 100,000
F	RNG Potential Study	This project will select three regions of the CenterPoint Energy service territory and analyze the potential for development of an RNG production facility. Targeted regions will be selected based on, among other factors, whether they can accept a high amount of RNG throughout the year, and nearby agricultural or processing activity that may provide a source of feedstock. This analysis will provide an inventory of existing and potential feedstock available in a 50-75 mile radius, and will assess quantity, seasonal availability, and essential characteristics such as biomethane potential, nutrient (NPK) content, moisture content, and total solids for each feedstock type. Additionally, the study will include a preliminary techno-economic analysis of RNG production at the site if feedstock analysis identifies suitable feedstock availability and prices and estimate the potential digestate quality and quantity based on the expected feedstock mix.	$ 60,000
G	Utilization of Green Ammonia for Thermal Energy Applications	Green ammonia is an innovative resource that has potential to significantly reduce greenhouse gas emissions in the industrial, agriculture, and commercial sectors. With more widespread availability of green ammonia, using it for energy applications has become increasingly attractive. However, ammonia alone is not a suitable direct replacement for natural gas or propane due to is lower reactivity and slower burning velocity. Research and development are needed to determine how anhydrous ammonia can be used in industrial burner applications like boilers, duct burners, and grain dryers. This research project will investigate turbulent burners for ammonia combustion blended with reactive fuels like hydrogen, syngas from biomass gasification, and natural gas. Experiments will be conducted in an application-relevant laboratory test burner apparatus with the capability to measure flame stability and emissions metrics. The project will focus on operational ranges possible with already developed swirl burner technology and develop new burner designs that can eventually be incorporated into existing industrial heating equipment. The primary outcome of the two-year research project will be a set of operating ranges and burner concepts that can be applied to industrial burners used in grain drying for agriculture applications and in boilers for district heating.	$ 205,000

Rate Impacts

Types of Costs included in Innovation Plan

- **Capital Costs**
  - Long-lived investments that CenterPoint will make
  - Examples outside of NGIA include pipes, meters, etc.
  - Examples in NGIA include hydrogen electrolyzer and solar panels, new networked geothermal system, potential capital investment in RNG projects
  - CenterPoint recovers capital costs over the life of the asset including return for debt and equity costs

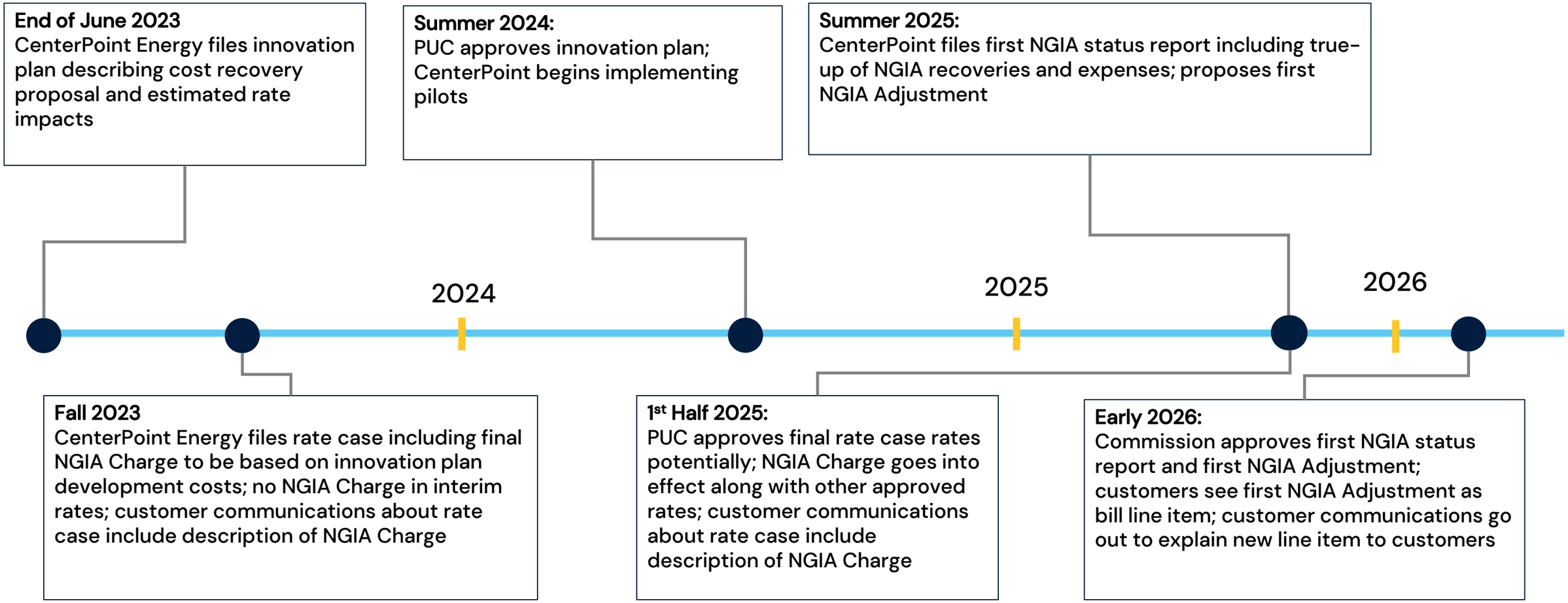
- **Gas or Fuel Costs**
  - Costs for fuel that supplies energy to customers
  - Examples outside of NGIA plan include costs for natural gas commodity and demand
  - Examples in NGIA include RNG costs, costs for electricity for CenterPoint-owned hydrogen electrolyzer
  - CenterPoint recovers gas costs via the Purchased Gas Adjustment (PGA) mechanism which is adjusted monthly

- **Operations and Maintenance (O&M) Costs**
  - Generally, anything that isn't capital or gas costs
  - Examples in NGIA include rebates, vendor costs, plan development costs
  - CenterPoint Energy recovers most O&M via delivery charges, some costs (e.g. CIP) are recovered in special riders

CenterPoint Energy's Proposal for Recovering NGIA Costs

- Propose to recover eligible fuel costs via the Purchased Gas Adjustment (PGA)
  - Includes costs for RNG and electricity to fuel CenterPoint's hydrogen electrolyzer (other than supplied by on site solar)
- For other costs (capital & O&M) propose a two-part structure similar to what is used in CIP
  - Certain costs to be included in delivery rates (this is like the Conservation Cost Recovery Charge or CCRC) - calling this the NGIA Charge for this presentation
  - Remainder of costs to be included in a special rider (this is like the Conservation Cost Recovery Adjustment or CCRA) – calling this the NGIA Adjustment for this presentation
  - Rider part will include annual true-up
- We are proposing to match program costs with rate classes that may benefit from the program
  - All classes would pay for resources that serve all customers like RNG, hydrogen electrolyzer, urban tree offsets
  - Commercial/industrial (C&I) customers would pay for pilots for which only serve C&I, residential would pay for pilots that only serve residential
- Looking for thoughts from this group on best ways to communicate with customers and represent these costs on the bill

Cost Recovery Proposal Timeline Estimates



Expected Bill Impacts during First NGIA Plan Overview

Class	Year 1 Impact	Year 5 Impact
Residential	$3.0M	$16.1M
C&I Non-Transport	$4.6M	$10.8M
C&I Transport	$1.3M	$1.5M
Total	**$8.8M**	**$28.4M**

Mechanism	Year 1 Recovery	Year 5 Recovery
PGA	$0	$11.6M
Rider/Delivery Charges Applying to All Classes	$4.4M	$8.2M
Rider/Delivery Charges Applying to Residential	$0.8M	$5.7M
Rider/Delivery Charges Applying to C&I	$3.6M	$3.0M
Total	**$8.8M**	**$28.4M**

Average annual residential customer impact as follows:

- Year 1: $3.56
- Year 2: $10.09
- Year 3: $14.60
- Year 4: $15.69
- Year 5: $19.27

Class Detail

Class	Class Sales (Million Dth)	Customers	Year 1 Impact	Year 5 Impact	Year 1 Avg. Annual Impact	Year 5 Avg. Annual Impact
Residential	74.2	833,823	$3.0M	$16.1M	$4	$19
Comm A Firm	2.3	28,475	$0.2M	$0.4M	$6	$15
Comm/Ind Firm B	6.3	20,527	$0.5M	$1.1M	$23	$55
Comm/Ind Firm C Sales	36.8	21,295	$2.8M	$6.6M	$131	$310
Comm/Ind Firm C Trans	0.8	423	$0.06M	$0.08M	$147	$180
Large General Firm Sales	1.1	22	$0.08M	$0.2M	$3,798	$8,958
Large Firm Trans	2.6	35	$0.2M	$0.2M	$5,548	$6,817
Small Dual Fuel A Sales	4.1	851	$0.3M	$0.7M	$363	$855
Small Dual Fuel A Trans	0.3	64	$0.02M	$0.03M	$363	$446
Small Dual Fuel B Sales	2.7	144	$0.2M	$0.5M	$1,421	$3,352
Small Dual Fuel B Trans	0.5	25	$0.04M	$0.04M	$1,421	$1,747
Large Vol. Dual Fuel Sales	5.9	126	$0.4M	$1.1M	$3,563	$8,403
Large Vol. Dual Fuel Trans	7.4	81	$0.6M	$0.7M	$6,933	$8,519
Large Vol. Trans Market Rate	1.4	11	$0.1M	$0.1M	$9,778	$12,016
Large Vol. Dual Fuel Market Rate Sales	1.0	11	$0.08M	$0.2M	$7,053	$16,635
Large Vol. Dual Fuel Market Rate Trans	3.5	12	$0.3M	$0.3M	$22,470	$27,612
Total	**150.8**	**905,924**	**$8.8M**	**$28.4M**	**NA**	**NA**

Estimated Commodity Savings By Class

Class	Year 1 Gas Savings	Year 5 Gas Savings	Year 1 Net Impact	Year 5 Net Impact	Year 1 Avg. Annual Net Impact	Year 5 Avg. Annual Net Impact
Residential	None	$328,625	$3.0M	$15.7M	$4	$19
Comm A Firm	$3,971	$43,225	$0.2M	$0.4M	$6	$13
Comm/Ind Firm B	$10,843	$118,019	$0.5M	$1.0M	$23	$49
Comm/Ind Firm C Sales	$63,448	$690,613	$2.8M	$5.9M	$128	$277
Comm/Ind Firm C Trans	None	None	$0.06M	$0.08M	$147	$180
Large General Firm Sales	$1,895	$20,627	$0.08M	$0.2M	$3,712	$8,021
Large Firm Trans	None	None	$0.2M	$0.2M	$5,547	$6,817
Small Dual Fuel A Sales	$6,997	$76,160	$0.3M	$0.7M	$354	$766
Small Dual Fuel A Trans	None	None	$0.02M	$0.03M	$363	$446
Small Dual Fuel B Sales	$4,641	$50,520	$0.2M	$0.4M	$1,389	$3,001
Small Dual Fuel B Trans	None	None	$0.04M	$0.04M	$1,421	$1,747
Large Vol. Dual Fuel Sales	$10,180	$110,809	$0.4M	$0.9M	$3,482	$7,523
Large Vol. Dual Fuel Trans	None	None	$0.6M	$0.7M	$6,933	$8,519
Large Vol. Trans Market Rate	None	None	$0.1M	$0.1M	$9,778	$12,016
Large Vol. Dual Fuel Market Rate Sales	$1,759	$19,151	$0.08M	$0.2M	$6,893	$14,894
Large Vol. Dual Fuel Market Rate Trans	None	None	$0.3M	$0.3M	$22,470	$27,612
Total	**$130,735**	**$1,457,749**	**$8.7M**	**$26.9M**	**NA**	**NA**

Some Notes on Cost Recovery

- Transport customers do not pay for the PGA and do not (directly) benefit from the RNG programs or hydrogen blending
- CIP-exempt customers are excluded from recovery per the NGIA statute
  - Note that CIP-exempt customers can request to be included in NGIA however no customers have yet done so
  - CIP-exempt customers will also be ineligible to participate in NGIA programs
- Market rate customers that are not CIP-exempt are included in cost recovery

Discussion

→ Break

Alternative Portfolios

Plan for Alternative Portfolios in NGIA Filing

- The statutory language on this requirement for the NGIA plan filing is as follows:

  "The utility's plan must include… collections of pilot programs that the utility estimates would, if implemented, provide approximately 50 percent, 150 percent, and 200 percent of the greenhouse gas reduction or avoidance benefits of the utility's proposed plan."

- These alternative portfolios have been constructed by including different pilots and/or pilot sizes within the portfolio
  - Alternative portfolios assume the same fixed overall portfolio-level administrative costs, continue to assume 10% of the funding would go towards R&D
  - Alternative portfolios continue to meet the NGIA requirements (>50% costs for low-carbon fuels, etc.) BUT some of these portfolios exceed the cost-cap established for the core NGIA proposal

- The following slide showcases summary results for these alternative portfolios

Details on Draft NGIA Innovation Plan Alternative Portfolios

Primary Innovation Category	#	Pilot	Alternative Portfolio 1 – 50% of GHG Savings			Alternative Portfolio 2 – 150% of GHG Savings			Alternative Portfolio 3 – 200% of GHG Savings		
			Pilot Size	Lifetime GHG Savings	Utility Cost	Pilot Size	Lifetime GHG Savings	Utility Cost	Pilot Size	Lifetime GHG Savings	Utility Cost
Renewable Natural Gas (RNG)	1	RNG Proposal - Anaerobic Digestion of Organic Materials	B	28,221	$ 3,102,303	B	28,221	$ 2,753,844	B	28,221	$ 2,565,952
	2	RNG Proposal - Anaerobic Digestion of East Metro Food	B	134,097	$ 11,033,332	C	167,621	$ 12,182,521	C	167,621	$ 11,351,320
	3	RNG Archetype – WRRF	A	5,311	$ 1,031,214	C	159,335	$ 21,533,680	C	159,335	$ 20,064,460
	4	RNG Archetype - Dairy Manure	None	0	$ -	A	9,895	$ 2,160,326	B	19,790	$ 3,961,297
	5	RNG Archetype – Food Waste	A	11,579	$ 1,176,297	B	254,739	$ 18,625,901	C	578,953	$ 39,124,820
	6	RNG Archetype - Landfill Gas	A	53,621	$ 5,811,753	B	240,096	$ 22,269,335	B	240,096	$ 20,749,922
Power-to-Hydrogen	7	Green Hydrogen Blending into Natural Gas Distribution	B	27,993	$ 5,629,449	B	27,993	$ 4,997,134	B	27,993	$ 4,656,185
	8	Green Hydrogen Archetype – Ind. or Com. Electrolyzer	A	56,330	$ 1,498,052	A	56,330	$ 1,329,787	B	112,661	$ 2,474,441
Carbon Capture	9	Industrial Methane and Refrigerant Leak Red. Program	A	38,831	$ 1,489,167	B	97,077	$ 2,801,936	B	97,077	$ 2,610,763
	10	Urban Tree Carbon Offset Program	None	0	$ -	A	4,500	$ 317,438	B	9,000	$ 539,530
	11	Archetype Carbon Capture Project for Ind. or Com.	A	50,865	$ 2,729,559	A	50,865	$ 2,422,968	B	101,731	$ 4,300,117
	13	Carbon Capture Rebates for Commercial Buildings	A	55,150	$ 1,570,093	A	55,150	$ 1,393,736	B	111,997	$ 2,365,488
District Energy	14	New Networked Geothermal Systems Pilot	A	21,471	$ 3,272,563	C	107,355	$ 11,330,801	C	107,355	$ 10,557,712
	15	Decarbonizing Existing District Energy Systems	None	0	$ -	C	186,044	$ 2,088,456	C	186,044	$ 1,945,963
	16	New District Energy System	None	0	$ -	C	61,323	$ 529,291	C	61,323	$ 493,178
Strategic Electrification	17	Industrial Electrification Incentive Program	A	11,896	$ 620,450	A	11,896	$ 550,759	C	35,688	$ 1,107,757
	18	Commercial hybrid heating pilot	A	13,279	$ 4,593,297	C	37,940	$ 9,800,844	C	37,940	$ 9,132,143
	19	Residential deep energy retrofit + electric ASHP pilot	A	33,380	$ 7,923,430	C	100,139	$ 19,385,759	C	100,139	$ 18,063,089
Energy Efficiency	20	Small/medium business GHG audit pilot	A	5,642	$ 2,095,618	B	7,052	$ 2,235,369	C	8,462	$ 2,432,393
	21	Residential Gas Heat Pump	A	235	$ 415,082	B	391	$ 595,970	C	783	$ 914,123
	22	Gas Heat Pump for Commercial Buildings	A	2,154	$ 830,781	B	4,307	$ 1,232,547	C	6,461	$ 1,669,754
	24	Solar Thermal Heating for C&I	None	0	$ -	None	0	$ -	C	19,218	$ 750,652
	25	Industrial and Large Commercial GHG Audit Pilot	A	35,560	$ 1,190,643	B	71,120	$ 1,395,299	C	106,680	$ 1,615,402
Total Pilot Portfolio				**585,615**	**$ 56,013,084**		**1,739,392**	**$ 141,933,701**		**2,324,569**	**$ 163,446,463**
Additional R&D Budget		R&D Projects - Low Carbon Fuels (25%)		0	$ 1,555,919		0	$ 3,942,603		0	$ 4,809,179
		R&D Projects - Other (75%)		0	$ 4,667,757		0	$ 11,827,808		0	$ 14,427,537
Total Portfolio (incl. R&D)				**585,615**	**$ 62,236,760**		**1,739,2392**	**$ 157,704,112**		**2,324,569**	**$ 192,367,162**
Difference from Core (Draft) NGIA Plan				**-50%**	**-41%**		**+50%**	**+49%**		**+100%**	**+82%**

Walk Through of Filing Components

Filing Body Components

- Current structure is a short filing (expect around 30 pages) with details included in a series of exhibits
  - Requesting the Commission's consideration of the filing by July 2024
- Filing body will cover
  - Regulatory information required in a miscellaneous filing
  - Overview of proposed plan and structure of filing
    - Includes pilots selected and key metrics like cost, GHG lifecycle emissions reductions, and job creation
  - Plan development process and engagement with interested parties
  - Research and development
    - Describes proposal to include only first two-years of R&D in plan but earmark remaining R&D budget for proposals to be presented in future NGIA status reports
    - Briefly describes R&D pilots proposed for first two years
  - Cost recovery proposal
    - Describes calculation of cost cap, proposed mechanisms for cost recovery, effect on average residential customer
  - Approval criteria
    - Walk through of statutory criteria required for Commission to approve a plan
  - Proposed cost-effectiveness objectives for the plan

Exhibits (Part 1)

Exhibit Short Title	Description
Compliance Matrix	Listing of statutory and regulatory requirements and where addressed in filing
Full Pilots Detailed Description	Description of each full pilot proposed in final plan; largely narrative; similar to body of Triennial CIP plan filing
R&D Pilots Detailed Descriptions	Description of each R&D pilot proposed in first two years; largely narrative
Lifecycle GHG Calculation Details	Narrative discussion of how lifecycle GHG accounting was conducted; supporting documents such as completed GREET spreadsheets
Pilot Utility Cost Estimate Details	Charts/discussion summarizing costs from the utility perspective and counting against budget cap; showing both 5-year timeframe and lifetime
Pilot Assumptions Spreadsheet	Spreadsheet detailing assumptions used for modeling shortlisted pilots; updated version of spreadsheet provided at 2nd Interested Parties Meeting

Exhibits (Part 2)

Exhibit Short Title	Description
Pilot Quantitative Calculations	Spreadsheet showing calculation of quantitative costs and benefits considered for each shortlisted pilot
Pilot Quantitative Details	Narrative description of qualitative costs and benefits considered for each shortlisted pilot
Commission Cost-Benefit Framework Chart	Completed version of chart established by the Commission in the Frameworks Order
Letter endorsing GHG Emissions Calculations	Letter from ICF endorsing GHG emissions calculations used in development of plan; fulfills statutory requirement
Tracking and Verification Plan	Description of tracking and verification proposals for each pilot/resources included in plan
IMPLAN Modeling Details	Breakdown of IMPLAN generated metrics for each shortlisted pilot
Cost Recovery Proposal Details	Spreadsheets and details on the proposed cost recovery mechanisms and expected impact on customers

Exhibits (Part 3)

Exhibit Short Title	Description
Alternative Portfolios	Describes combinations of pilots that would achieve 50%, 150%, and 200% of the lifecycle GHG reductions as proposed plan; statutory requirement
Draft RFP for RNG	Draft of RFP CenterPoint plans to issue for RNG “archetype” projects
Draft Tariff Pages	Drafts of all tariff pages that would require changes under CenterPoint’s cost recovery proposal
Utility System Report and Forecast	Statutory requirement to include certain information about CenterPoint’s overall system
Summary of RFI Responses and Other Pilots Considered	Brief summary (probably a chart or two) of all 100+ ideas submitted via the RFI or received through other channels
Interested Party Meeting Materials	Materials from meetings facilitated by GPI
Service Quality Metrics	Copy of CenterPoint Energy’s latest annual service quality filing; regulatory requirement

Exhibits (Part 4)

Exhibit Short Title	Description
Non-Technical Summary	Non-technical summary of the plan and overall filing
CIP/NGIA Coordination	Discussion for each energy efficiency and strategic electrification requirement demonstrating eligibility for NGIA vs. CIP pursuant to Commission approved criteria

All Filing Contents Summary

- In Filing Body
  - Regulatory information required in a miscellaneous filing
  - Overview of proposed plan and structure of filing
  - Plan development process and engagement with interested parties
  - R&D process proposal and selected pilots overview
  - Cost recovery proposal overview
  - Statutory approval criteria walkthrough
  - Proposed cost-effectiveness objectives for plan

Exhibits	
Compliance Matrix	Full Pilots Detailed Descriptions
R&D Pilot Descriptions	Lifecycle GHG Calculation Details
Pilot Utility Cost Estimate Details	Pilot Assumptions Spreadsheet
Pilot Quantitative Details	Pilot Qualitative Details
Letter Endorsing GHG Emissions Calcs	Tracking and Verification Plan
IMPLAN Modeling Details	Cost Recovery Proposal Details
Alternative Portfolios (50%, 100%, 150%)	Draft RFP for RNG
Draft Tariff Pages	Utility System Report and Forecast
Summary of RFI Responses and Other Pilots Considered	Interested Party Meeting Materials
Service Quality Metrics	Non-Technical Summary
CIP/NGIA Coordination	

Pilot Descriptions

Contents of Full Pilot Descriptions

- Project Description
  - Narrative overview of pilot concept
- Eligibility
  - Describes customer eligibility for participation where applicable (e.g. all residential customers)
- Budget and Participation
  - Tables showing participation estimates by year and five-year estimate of utility spending
- GHG Reduction and Natural Gas Savings
  - Specifies GHG reduction over the five-year plan and pilot lifetime
  - Also specifies natural gas savings over the five-year plan and pilot lifetime where applicable
- Customer Incentive Information
  - Describes customer incentives where applicable (e.g. 40% of costs)
- IRA Incentives Considered
  - Describes any IRA incentives considered in developing utility and participant costs
- Equity and Inclusion
  - Describes any equity/inclusion efforts relevant to the specific pilot (e.g. commitments to vendor diversity)
- Additional information
  - For certain pilots (e.g. required hydrogen safety information)

Tracking and Verification Plan

Tracking and Verification Plan (Part 1)

Innovative Resource	Tracking/Verification Plan
RNG/Biogas	• Annual verification of GHG intensity • M-RETS will be used to track and retire renewable thermal certificates (RTC)
Power-To-Hydrogen	• Will engage third-party to conduct M&V to determine hydrogen production • Will obtain records demonstrating carbon-free electricity used • For blending project will use M-RETS to track and retire (RTCs) • For customer-owned project, participation agreements will include provision prohibiting resale of environmental attributes
Carbon Capture	• Will use lifecycle assessments and/or third-party verifiers to establish GHG savings • For customer-owned project, participation agreements will include provision prohibiting resale of environmental attributes

Tracking and Verification Plan (Part 2)

Innovative Resource	Tracking/Verification Plan

Energy Efficiency, Strategic Electrification, & District Energy	• For standardized energy savings projects, will use MN Technical Reference Manual where possible and propose savings calculation methods where not
	• For custom energy savings
	  • Will engage a third party for M&V of all projects saving over 20,000 Dth
	  • CenterPoint Energy may complete verification for desk review by third-party for projects saving 1,000-20,000 Dth
	  • CenterPoint Energy engineers may complete verification without third-party review for projects saving less than 1,000 Dth
	• Will establish dedicated tracking system to record customer participation and ensure savings are not being claimed by both NGIA and CIP

Final Thoughts and Next Steps

Final Thoughts and Next Steps

- Any final thoughts from the group today?
- CenterPoint Energy continues to welcome feedback until May 26th, after which it will be harder to incorporate
- Willing to have focused discussions with any parties that would like it
- Plan is for NGIA plan to be filed by the end of June

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Appendix – Review of pilot project designs

RNG and biogas pilots

#	Pilot	Description	Pilot Size	Pilot Scale (Dth/year)	Estimated Pilot Budget* (total over pilot period**)
1	Hennepin County RNG Project - Anaerobic Digestion of Organic Materials	An RFI respondent (Hennepin County) is planning to build an anaerobic digestion (AD) facility that would be capable of processing at least 26,000 tons per year of organics to produce RNG and soil/agricultural products. CenterPoint Energy would enter into a contract with this producer to purchase a portion of the RNG - including the commodity and environmental attributes.	A	8,288	$632,174
			B	41,440	$2,565,952
			C	82,880	$4,983,175
2	Ramsey/Washington R&E RNG Project - Anaerobic Digestion of East Metro Food Waste	An RFI respondent (Ramsey/Washington Recycling & Energy) is planning a system to recover organics from municipal solid waste and divert these materials to a future anaerobic digestion facility to produce RNG. CenterPoint Energy would enter into a contract with the RNG producer to purchase a portion of the RNG - including the commodity and environmental attributes.	A	18,168	$1,283,500
			B	152,613	$9,125,802
			C	190,767	$11,351,320
3	RNG Archetype – Water Resource Recovery Facility (WRRF)	For Pilots 3-6, the "RNG Archetypes", CenterPoint Energy would purchase RNG - including the commodity and environmental attributes - from multiple RNG producers that have developed RNG projects using a variety of feedstocks. CenterPoint may also support RNG project development by directly investing in the biogas upgrading equipment (required to produce pipeline-quality RNG) for a limited number of RNG projects, to reduce developers' required capital. We have developed an estimate of expected carbon intensity for each type of feedstock to inform our analysis of potential GHG reductions from a portfolio of RNG purchases. For the "RNG Archetypes" CenterPoint would plan to hold a competitive RFP process to assess actual RNG projects, ensure the company receives the best possible pricing / emission reductions, and then would select the ultimate portfolio of projects funded through the first NGIA plan.	A	10,000	$852,930
			B	50,000	$3,602,364
			C	300,000	$20,064,460
4	RNG Archetype - Dairy Manure		A	10,000	$2,012,930
			B	20,000	$3,961,297
			C	100,000	$18,604,100
5	RNG Archetype – Food Waste		A	10,000	$972,930
			B	220,000	$17,355,076
			C	500,000	$39,124,820
6	RNG Archetype - Landfill Gas		A	100,500	$4,806,972
			B	450,000	$20,749,922
			C	900,000	$41,245,541

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.
**This represents the estimated utility pilot budget over the five-year period for CenterPoint's first NGIA plan. Some pilots could involve costs that stretch beyond 5 years (e.g. 10-year RNG contract, or a networked geothermal capital investment), but those additional costs are captured elsewhere.

Power-to-hydrogen pilots

#	Pilot	Description	Pilot Size	Pilot Scale (Electrolyzer Capacity Installed)	Estimated Pilot Budget* (total over pilot period**)
7	Green Hydrogen Blending into Natural Gas Distribution System	CenterPoint Energy would develop a second hydrogen blending project. The project would be built on CenterPoint Energy property and would include installation of dedicated photovoltaic solar panels to power the electrolyzer. Hydrogen produced from the electrolyzer would be injected directly into the CenterPoint Energy distribution system as it is produced. CenterPoint Energy would own all components of installed system, including electrolyzer and PV systems. This represents a next phase in CenterPoint Energy's hydrogen production work, gaining experience using dedicated renewables to produce hydrogen and in turn drive down the costs of the blending projects.	A	1 MW	$2,100,067
			B	1 MW	$4,656,185
			C	***	-
8	Green Hydrogen Archetype - Industrial Facility Electrolyzer Pilot	CenterPoint Energy would offer incentives covering a portion (100%, up to a max of $1.5 million) of the equipment and installation costs of green hydrogen production systems (electrolyzers) for on-site use by industrial or large commercial customers, displacing natural gas use by these facilities. These systems would be installed onsite for 1-3 customers, who would own and operate the systems. CenterPoint has not yet identified specific customers for the projects, so a 5 MW 'archetype' was chosen to assess to the pilot for the time being, considering that a number of existing customers should be large enough for that size of electrolyzer (some could be higher). The projects would be expected to purchase renewable electricity from grid to supply the electrolyzers, and so even with potential IRA incentives and the upfront funding from CenterPoint Energy, participants in this pilot would be committing to a considerable cost increase in their electricity supply in order to decarbonize (part of) their heating load. Some additional programmatic support to identify potential sites and assist with feasibility studies for the projects is also envisioned. CenterPoint Energy would create a measurement and verification plan to monitor system performance for a period of time following installation.	A	5 MW (1 facility)	$1,239,057
			B	10 MW (2 facilities)	$2,474,441
			C	15 MW (3 facilities)	$3,896,791

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.
**This represents the estimated utility pilot budget over the five-year period for CenterPoint's first NGIA plan. Some pilots could involve costs that stretch beyond 5 years (e.g. 10-year RNG contract, or a networked geothermal capital investment), but those additional costs are captured elsewhere.
***Only including two sizes for this planned pilot for now, still investigating whether it would make sense to add a third size incorporating battery storage to increase capacity factors without (or less) grid electricity.

Carbon capture pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Pilot Budget* (total over pilot period)
9	Industrial Methane and Refrigerant Leak Reduction Program	Large industrial and commercial CenterPoint Energy customers would be encouraged to participate in this program, targeting between 25-50 new facilities per year. In their first year of participation, facilities would receive a 'sweep survey' to identify and quantify behind the meter methane leaks, as well as planning support to establish a systematic leak repair program. These services would be provided by a 3rd party vendor and fully funded through the pilot. The program would also offer incentives to partially offset the costs of repairing identified leaks. Program participants would also receive follow-up 'sweep surveys' every 2 years of the 5-year NGIA framework, as an approach to testing how well the impacts can be sustained. There is significant uncertainty on the level of leaks, as well as expectations that leak levels can vary widely between facilities. To that end, we have made conservative estimates of leak reductions, and ultimately actual leak levels (and impact of repairs) will be documented through the initial and follow up leak sweeps.	A	50 facilities	$1,231,708
			B	125 facilities	$2,610,763
			C	250 facilities	$4,861,378
10	Urban Tree Carbon Offset Program	CNP would purchase and retire City Forest Credits (CFC) Carbon+ Credits that are generated from locally planted urban trees. These also help improve air quality, reduce stormwater runoff, reduce energy costs, and cool urban heat islands. Pilot scales represent 25%, 50%, and 100% of the credits expected to be available from the RFI respondent.	A	4,500 credits	$295,780
			B	9,000 credits	$539,530
			C	18,000 credits	$1,027,030
11	Archetype Carbon Capture Project for Industrial Facility	CenterPoint Energy would offer incentives covering a portion (100% up to a max of $1.5 million) of the equipment and installation costs for carbon capture systems at 1 to 3 industrial or large commercial customers. These customers would own and operate the systems. CenterPoint has not yet identified specific customers for the projects, so an 'archetype' project size was chosen to assess to the pilot for the time being, considering that a number of existing customers should be large enough for that size of carbon capture unit here (some could be higher). Some additional programmatic support to identify potential sites, recruit participants, and assist with feasibility and Life Cycle Assessment (LCA) emissions studies for the projects is also envisioned. The LCA support is particularly important given that Minnesota is not in proximity to the main regions for geological sequestration of carbon, and so the focus will likely be on carbon 'utilization'. CenterPoint Energy would create a measurement and verification plan to monitor system performance for a period of time following installation.	A	1 facility	$2,257,651
			B	2 facilities	$4,300,117
			C	3 facilities	$6,341,332
12	Carbon Capture through Methane Pyrolysis at Industrial Facility	Given the lack of data about technology performance and lifecycle carbon emission reductions from the by-product use, this shortlisted pilot did not undergo detailed analysis. This has been re-assigned to be considered for a future R&D project or as a potential technology to be deployed in the industrial carbon capture pilot.			
13	Carbon Capture for Commercial Buildings	CenterPoint Energy would offer prescriptive rebates to commercial customers that install CarbinX carbon capture systems at their facilities. These small-scale carbon capture units connect to existing natural-gas heating equipment, capture CO2 gas and convert it to a solid potassium carbonate, and work as an economizer, recapturing waste heat for use in the building (e.g. reducing natural gas consumption in addition to the carbon capture). The program would target up to 300 customers per year. Customers would own and operate CarbinX units, with standard support from the manufacturer. In addition to the manufacturer maintaining the units, they arrange for the potassium carbonate by-product to be collected on a regular basis, with customers earning revenue for its sale.	A	325 CarbinX systems	$1,298,643
			B	660 CarbinX systems	$2,365,488
			C	1335 CarbinX systems	$4,667,428

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

District energy pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget* (total over pilot period**)
14	New Networked Geothermal Systems Pilot	CenterPoint Energy would explore the development of a new "Networked Geothermal" system to provide building heating and cooling for a neighborhood(s) in our service territory. This involves installation of a new 'distributed' geothermal system where individual customers would have a heat pump accessing a common water loop (instead of their own geothermal loops, or ASHPs). This pilot includes a feasibility study, planning and modeling, site selection, design and construction, and measurement and verification of a new networked geothermal system. The proposed approach follows pilots being planned by gas utilities, including National Grid, in Massachusetts. CenterPoint Energy would own and operate the geothermal shared loop system, which would be installed in phases over the 5-year program period. Entire sections of the neighborhood(s) would be shifted off the natural gas distribution system at the same time. In addition to converting gas space and water heating to ground source heat pumps drawing on the shared loop, any other gas appliances would be converted to electric appliances. The pilot program would cover all of these upfront costs for customers, requiring only a roughly 5% co-payment / participant fee from customers in the participating neighborhood. Neighborhood(s) including a low-income community with varied loads (e.g. residential, retail, office, grocery, etc.) would be preferred.	A	200-ton system capacity	$2,706,777
			B	500-ton system capacity	$5,637,833
			C	1000-ton system capacity	$10,557,712
15	Decarbonizing Existing District Energy Systems***	CNP would provide incentives to help our customers decrease carbon emissions of their existing district energy systems via a variety of tactics (converting to hot water pipes, using green hydrogen, ground source heat pumps, renewable natural gas, carbon capture). Incentives would support feasibility or engineering studies and/or project implementation. CenterPoint Energy would provide an incentive in support of feasibility/engineering studies looking at opportunities to reduce emissions from existing district energy customers, with the utility planning to cover 20% of the total study cost up to a cap of $30,000. While incentive approaches/structures to encourage customers to adopt the findings of these studies are still under consideration, CenterPoint is considering leveraging a similar approach to CIP custom programs, with incentives determined based on the minimum of three cost caps (in CIP, this is 1 year payback, 50% of incremental costs, or $5/Dth annual gas savings). CenterPoint expects the $/Dth cap to be the limiting factor for most projects considered under NGIA, and is considering higher incentive levels than the $5/Dth for NGIA incentives. Projects that are eligible for rebates in CIP would not be eligible for these NGIA rebates.	A	1 district energy system project	$475,753
			B	2 district energy system projects	$1,094,688
			C	3 district energy system projects	$1,945,963
16	New District Energy System	CenterPoint Energy would provide incentives for existing natural gas customers to install new centralized district energy systems using geothermal heat pumps or decarbonized gases. Depending on the specific approach, these customers could fall under district energy or strategic electrification categories. The cost/savings estimates included for this pilot are based on a specific RFI respondent that has already completed an engineering study for such a conversion. The additional participation units included in the pilot are an option to support additional customers to study and implement a similar approach over the 5-year NGIA plan window. The plan for study and implementation incentives would be the same as for pilot 15.	A	1 new district energy system	$175,806
			B	2 new district energy systems	$310,412
			C	3 new district energy systems	$493,178

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.
**This represents the estimated utility pilot budget over the five-year period for CenterPoint's first NGIA plan. Some pilots could involve costs that stretch beyond 5 years (e.g. 10-year RNG contract, or a networked geothermal capital investment), but those additional costs are captured elsewhere.
***Note – for now this pilot has been based on high-level assumptions surrounding potential strategic electrification project at a large district energy customer. This customer is already conducting and engineering study of decarbonization options, but the timing of the study did not allow for the final results to be known in time to inform the costs/savings/approach in the NGIA plan filing.

Strategic electrification pilots

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget* (total over pilot period)
17	Industrial Electrification Incentive Program	Vendor-implemented program that would pilot industrial electric heat pumps to improve efficiency of low-to-medium temperature industrial processes. Program would target up to 9 industrial customers and would cover the full cost of the equipment installation. Program would include a monitoring period to collect data on project performance. Planned phases: • **Phase 1:** The program would begin with a study looking at technical potential, heat pump technologies to be used, and identification of potential customers who could pilot heat pump technologies. • **Phase 2:** Installation at 3 - 9 facilities, including system design, installation and commissioning • **Phase 3:** Measurement and verification of system performance, and analysis of results.	A	3 facilities	$513,182
			B	6 facilities	$832,513
			C	9 facilities	$1,107,757
18	Commercial hybrid heating pilot	Vendor-implemented program that would target small-to-medium commercial facilities. The program would provide incentives to retrofit existing HVAC rooftop units with hybrid heating systems. Hybrid heating systems use electric heat pumps to heat the building on warmer days, and switch to traditional gas heating under a specified outdoor air temperature. The programmatic approach used here is based on a similar program run by ConEd in New York. This would be a direct install program from the perspective of vendor handling all aspects of the equipment installation, but the customer would pay the bulk of the vendor costs (60%), with CenterPoint Energy covering the remaining portion of installation costs (40%) and some program administration costs. A significant budget for monitoring/metering, analysis, and reporting on the system results is also included in the pilot funding. This pilot would be conducted in coordination with ETA, which has chosen hybrid rooftop units as one of its focus technologies. ETA is focused on driving market transformation, but does not have the ability to offer customer incentives such as those included in this NGIA pilot, so there is a lot of natural synergy between both efforts.	A	70 facilities	$3,799,172
			B	135 facilities	$6,465,657
			C	200 facilities	$9,132,143
19	Residential deep energy retrofit + electric ASHP pilot (with gas backup)	Three-phase pilot program targeting single family and multi-family buildings to test a combination of deep energy retrofits and air-source heat pumps with gas back-up. Planned phases of pilot are: • **Phase 1: Study Scoping & Program Design -** Modeling of different combinations of building types and energy conservation strategies, including innovative/emerging weatherization measures, and finalization of different 'Tiers' of energy retrofit for the pilot testing • **Phase 2: Demonstration Projects -** Based on results of phase 1 modeling, we'd select host sites to field test selected technologies and measure performance. Pilot would cover the full cost of installation and monitoring, targeting 14 to 42 buildings. • **Phase 3: Broader Deployment of Successful Strategies from Phase 2 -** Envision a shift to an on-going incentive program (e.g. not covering full installation costs), targeting 105 - 315 buildings. Final design, incentive levels, and participation targets would be informed by Phase 2 results.	A	119 buildings	$6,553,565
			B	238 buildings	$12,308,327
			C	357 buildings	$18,063,089

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

Energy efficiency pilots – part 1

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget* (total over pilot period)
20	Small/medium business GHG audit pilot	This pilot would expand the scope of CenterPoint Energy's Natural Gas Energy Analysis (NGEA) CIP energy audit to include audit information related to a business' GHG emissions and an assessment for additional GHG reduction measures such as electric air source heat pumps or hybrid heating systems, CarbinX carbon capture units, industrial heat pumps or solar thermal walls. The program would offer incentives for these measures (consistent with other NGIA program offerings), and recognize businesses who implement multiple measures as "energy leaders". Participation levels would be consistent with NGEA program goals, at approximately 250-300 customers per year.	A	992 GHG audits (3% implement)	$1,733,311
			B	1,240 GHG audits (3% implement)	$2,082,852
			C	1,488 GHG audits (3% implement)	$2,432,393
21	Residential Gas Heat Pump	Gas heat pumps represent an emerging technology category with the potential to replace residential furnaces and water heaters, offering an opportunity to lower GHG emissions and customer costs through higher efficiency. Gas heat pumps have achieved over 1.3 system Coefficient of Performance (COP) in laboratory conditions. While several commercial-sector gas heat pumps are already available, there are four manufacturers aiming to deploy residential systems in 2023-24. An initial pilot phase would include market research and analysis to prioritize which gas heat pump units should be included in the field testing. Outreach would be conducted to recruit CenterPoint customers to participate in the pilot, and contractors would be engaged to train them to install and maintain the heat pumps, with support from equipment manufacturers. The installations would be metered and trial data analyzed to develop reporting metrics that would better inform the opportunity for gas heat pumps to be part of future CIP or NGIA programs. This pilot would cover all the installation costs for participating customers.	A	6 units	$343,319
			B	10 units	$555,308
			C	20 units	$914,123
22	Gas Heat Pump for Commercial Buildings	This pilot involves a demonstration of gas heat pumps offering space and/or water heating for commercial buildings (particularly in cold climates). Natural gas fired heat pumps are an emerging new technology that allows natural gas heating, cooling, and water heating to exceed a COP of 1 and increase efficiency of gas end uses. There are many different types of gas fired heat pump under development, at various stages of readiness, and many different application types of this technology. Some companies have commercially available gas heat pumps in market, and they are typically utilized in commercial buildings with high hot water consumption such as multifamily, small commercial and/or recreational facilities. As the technology is new to market and is not yet considered cost effective for CIP, this pilot involves demonstration site installations with equipment monitoring, energy savings documentation, understanding of costs and benefits and a resulting case study. Some sites could be available for site walk-throughs so that contractors, design firms and other technology specifiers can gain first-hand experience and exposure to the technology. GAHPs are included in the Minnesota Efficient Technology Accelerator's (ETA) starter portfolio. That is a market transformation initiative that will work to accelerate adoption of emerging technologies. This NGIA pilot field demonstration would complement the strategy and planning work that will be completed within the ETA program, and could be completed in coordination with ETA.	A	3 units	$687,149
			B	6 units	$1,148,452
			C	9 units	$1,669,754

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

Energy efficiency pilots – part 2

#	Pilot	Description	Pilot Size	Pilot Scale	Estimated Pilot Budget* (total over pilot period)
23	Neighborhood Weatherization Blitzes	The "Neighborhood weatherization blitzes" proposes an intensive marketing and outreach approach to increase the participation in our existing CIP weatherization offerings. There is uncertainty in the effectiveness of this approach and start-up requires notable time and resource investment, so we will start with a Research & Development project to design and test different outreach campaigns to evaluate their effectiveness for consideration in CIP.			
24	Solar Thermal Heating for C&I	This pilot would offer incentives for customers who install transpired solar air systems, which help facilities that have large make-up air loads reduce their energy consumption. The pilot would offer commercial and industrial customers an incentive to partially offset the cost to install the solar wall. This assumes that the projects in question, which have relatively high upfront costs, would not be cost-effective enough to qualify for any CIP incentives (if any projects did qualify for CIP they would be directed to that program instead of NGIA). Support for initial feasibility study is also included. While incentive approaches/structures to encourage customers to adopt the findings of these studies are still under consideration, CenterPoint is considering leveraging a similar approach to CIP custom programs, with incentives determined based on the minimum of three cost caps (in CIP, this is 1 year payback, 50% of incremental costs, or $5/Dth annual gas savings). CenterPoint expects the $/Dth cap to be the limiting factor for most projects considered under NGIA, and is considering higher incentive levels than the $5/Dth for NGIA incentives. Projects that are eligible for rebates in CIP would not be eligible for these NGIA rebates.	A	10 projects	$335,229
			B	15 projects	$473,703
			C	25 projects	$750,652
25	Industrial GHG Audit Pilot	Expansion of existing CIP Process Efficiency and Commercial Efficiency programs. This would build off the existing CIP programs, enhancing those energy audits to include GHG emissions context/data, as well as emission reduction opportunities. Additional GHG reduction measures might include electric heat pumps or hybrid heating systems, CarbinX carbon capture units, industrial heat pumps or solar thermal walls. Audit participation levels would be consistent with Process Efficiency and Commercial Efficiency. The program would offer specialized incentives to help customers implement audit recommendations. A new 'custom incentive stream' would be established for specific types of technologies that have not traditionally been cost-effective under CIP but could leverage funding from NGIA to help them proceed. Incentive levels expected to take a similar approach to outline in pilot 24 above. There are a number of types of opportunities identified in past CIP audits, where recommendations are not typically implemented. The focus categories would be: 1. Electric heat pumps for certain process hot water needs (including reviewing and applying appropriate new technologies) 2. Heat recovery opportunities for process hot water/ process cooling and winter makeup air heating 3. Process efficiency improvements through improved process heat exchange / integration	A	5 projects	$984,795
			B	10 projects	$1,300,099
			C	15 projects	$1,615,402

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

Appendix – Review of pilot project analysis high-level draft results

-Draft quantitative results
-Qualitative implications

Pilot names

Pilot Key / #	Short-Hand Name	Full Pilot Name
CNP01	Hennepin County RNG	Hennepin County RNG Project - Anaerobic Digestion of Organic Materials
CNP02	Ramsey-Washington RNG	Ramsey-Washington RNG Project - Anaerobic Digestion of East Metro Food Waste
CNP03	RNG Archetype – WRRF	RNG Archetype – WRRF
CNP04	RNG Archetype - Dairy	RNG Archetype - Dairy Manure
CNP05	RNG Archetype - Food Waste	RNG Archetype – Food Waste
CNP06	RNG Archetype - Landfill Gas	RNG Archetype - Landfill Gas
CNP07	Hydrogen Blending	Green Hydrogen Blending into Natural Gas Distribution System
CNP08	Industrial Hydrogen	Green Hydrogen Archetype - Industrial or Large Commercial Facility Electrolyzer Pilot
CNP09	Industrial Methane Leaks	Industrial Methane and Refrigerant Leak Reduction Program
CNP10	Urban Tree Offsets	Urban Tree Carbon Offset Program
CNP11	Industrial Carbon Capture	Archetype Carbon Capture Project for Industrial or Large Commercial Facility
CNP13	Commercial Carbon Capture	Carbon Capture Rebates for Commercial Buildings
CNP14	Networked Geothermal	New Networked Geothermal Systems Pilot
CNP15	Existing District Energy	Decarbonizing Existing District Energy Systems
CNP16	New District Energy	New District Energy System
CNP17	Industrial Electrification	Industrial Electrification Incentive Program
CNP18	Commercial Hybrid Heating	Commercial hybrid heating pilot
CNP19	Res. Deep Energy Retrofits	Residential deep energy retrofit + electric ASHP pilot (with gas backup)
CNP20	Sm./Med C&I GHG Audit	Small/medium business GHG audit pilot
CNP21	Res. Gas Heat Pumps	Residential Gas Heat Pump
CNP22	Com. Gas Heat Pumps	Gas Heat Pump for Commercial Buildings
CNP24	C&I Solar Thermal	Solar Thermal Heating for C&I
CNP25	Large C&I GHG Audit	Industrial and Large Commercial GHG Audit Pilot

Lifetime GHG emission reductions

This metric represents the **net reduction in greenhouse gas emissions over the lifetime of the measures implemented in a pilot.** While the relevant types of emissions vary by pilot, the general components are 1) net emissions reductions from project-related changes in consumption of natural gas and electricity, and 2) reduced emissions from pilot-specific lifecycle emissions calculations (e.g. carbon intensity of RNG, carbon capture savings, etc.). More specifics on the calculations are provided below.

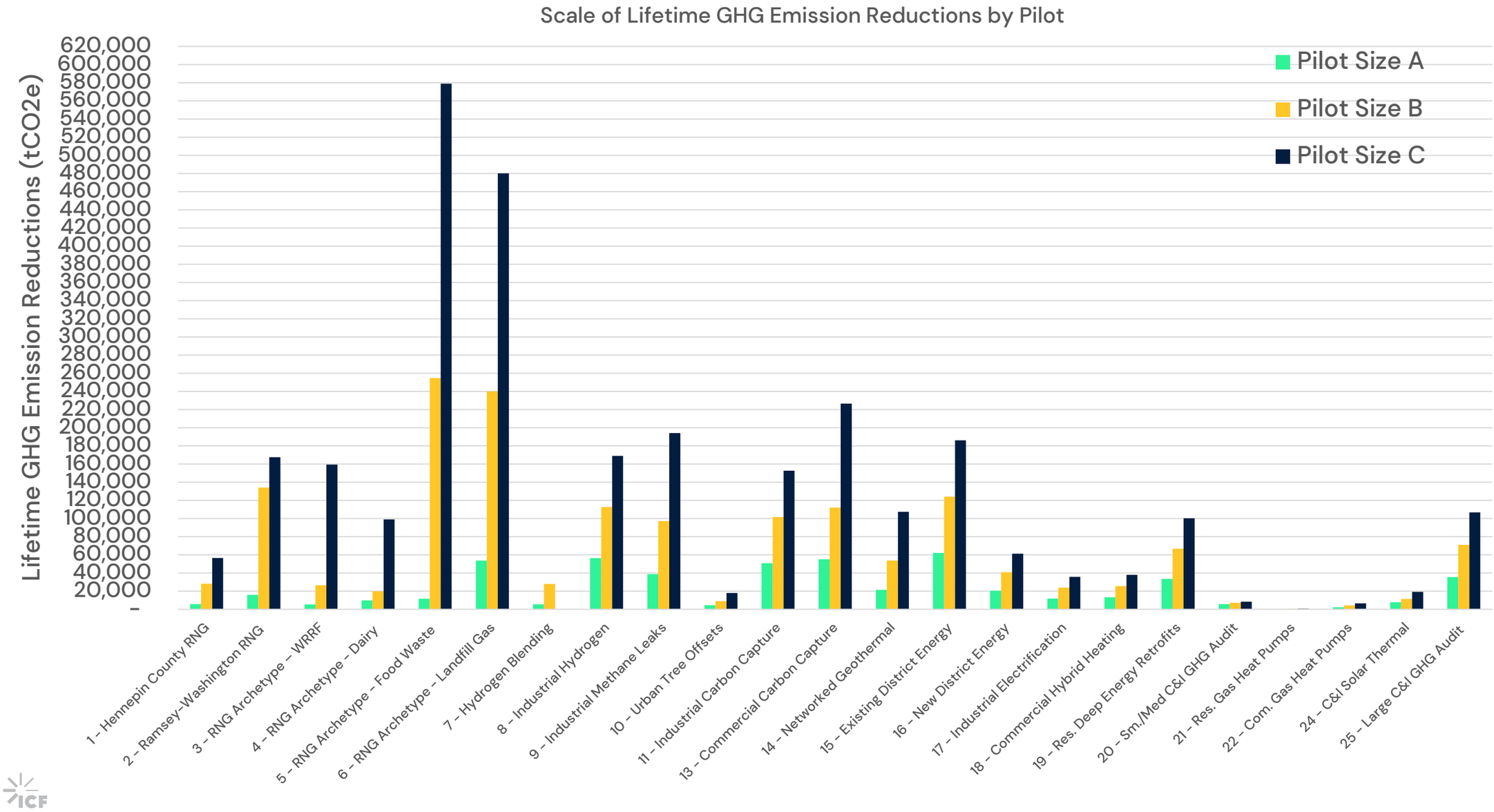
Lifetime GHG Emissions Reduction (tCO2e) = [*(1) Net electricity savings/additions impact* + *(2) Net natural gas lifecycle emissions impact* + *(3) Net lifecycle GHG savings*] x *Measure life* x *Number of participating units*

(1) Net electricity savings/additions impact (tCO2e per participant) = *Annual kWh saved/added per participant* x Electric emissions factor (*tCO2e per kWh)*

(2) Net natural gas lifecycle emissions impact (tCO2e per participant) = *Average annual Dth saved per participant* x *Geologic gas lifecycle emissions factor (tCO2e per Dth)*

(3) Net lifecycle GHG savings (tCO2e per participant) = *other lifecycle GHG savings (annual tCO2e savings per participant)*

Scale of lifetime GHG emission reductions by pilot



5-Year utility costs towards NGIA budget

This metric represents the **cost for different pilots that will count against the statutory cost-caps established for CenterPoint Energy's spending under NGIA**. While the relevant types of costs vary by pilot, the three main cost components are the budget for CenterPoint Energy staff and vendors to deliver the pilots, incentive payments to customers, and any revenue requirements for capital investments made as part of certain pilots. Then, based on the NGIA framework, the pilot costs compared to the cost caps would account for some expected utility savings, such as reduced natural gas commodity costs. More specifics on the calculations are provided below.

5-years utility costs towards NGIA budget ($2024-$2028) = *Net incremental O&M costs ($)*

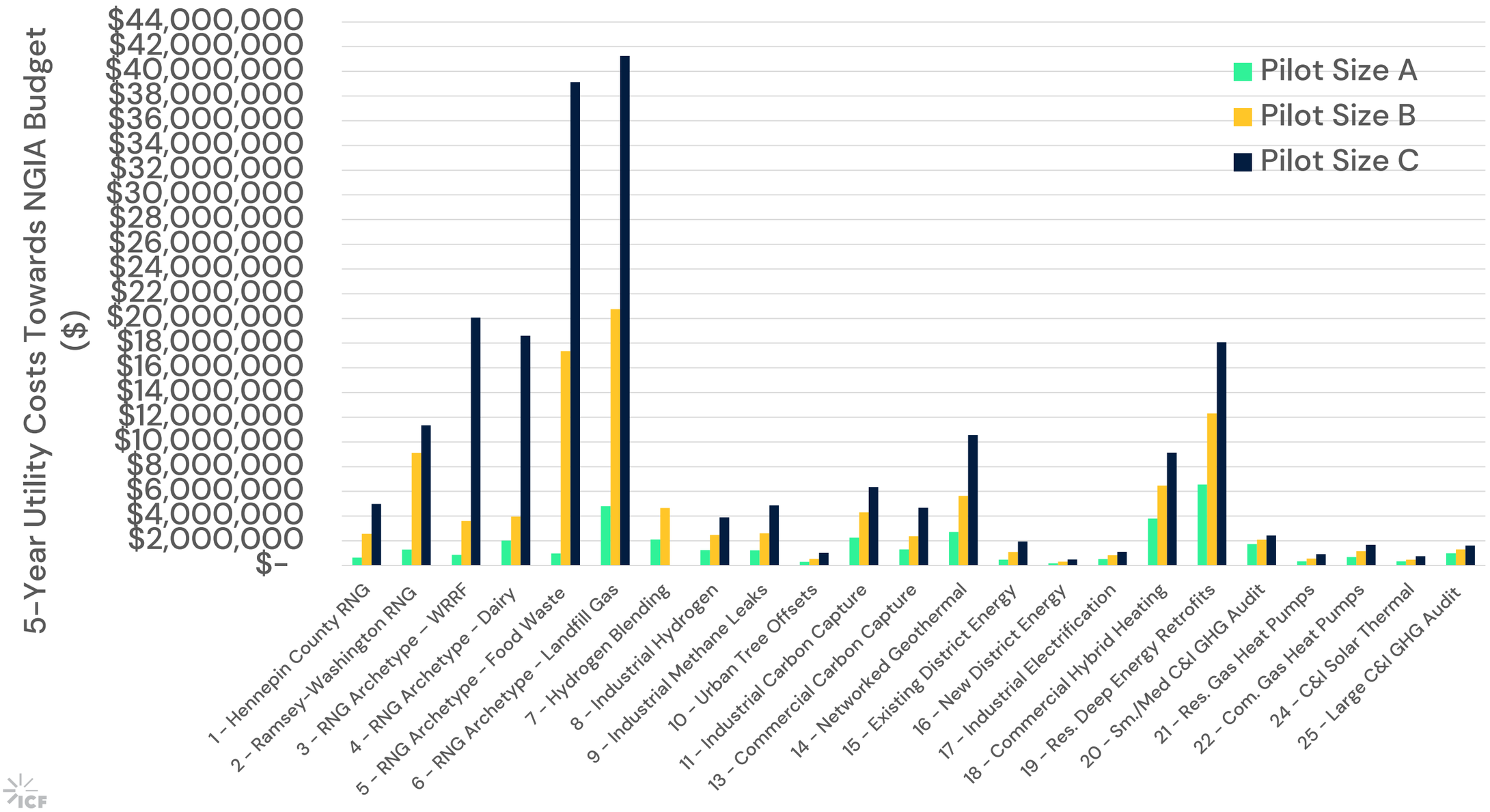
\+ *Annual revenue requirement for capital projects ($)*

\+ *Incentives ($)*

– *Natural gas commodity savings ($)*

Scale of budgets* by pilot and size options

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.



Emission reduction costs

For each of the emission reduction cost metrics showcased here, we take a different cost metric and divide it by the same lifetime GHG emissions.

Utility cost perspective includes only costs the utility will pay and excludes costs paid by participants or others. This perspective is highly sensitive to the level of participant incentive selected. This perspective also does not include benefits of GHG or other pollutant reductions.

The **total (net) pilot impacts** looks to capture 'all the value and cost streams' that have been quantified in this analysis. It includes costs the utility, to the participant, and the value of GHG and other pollutant savings.

The **equipment and installation costs** simply looks at the total upfront cost to purchase and install the relevant technology, stripping out the impacts of different incentive levels and/or supplemental pilot budgets for programmatic support (like program administration, marketing and customer recruitment, etc). This perspective may help better understand the ongoing cost of a technology at scale separately from start-up administrative costs.

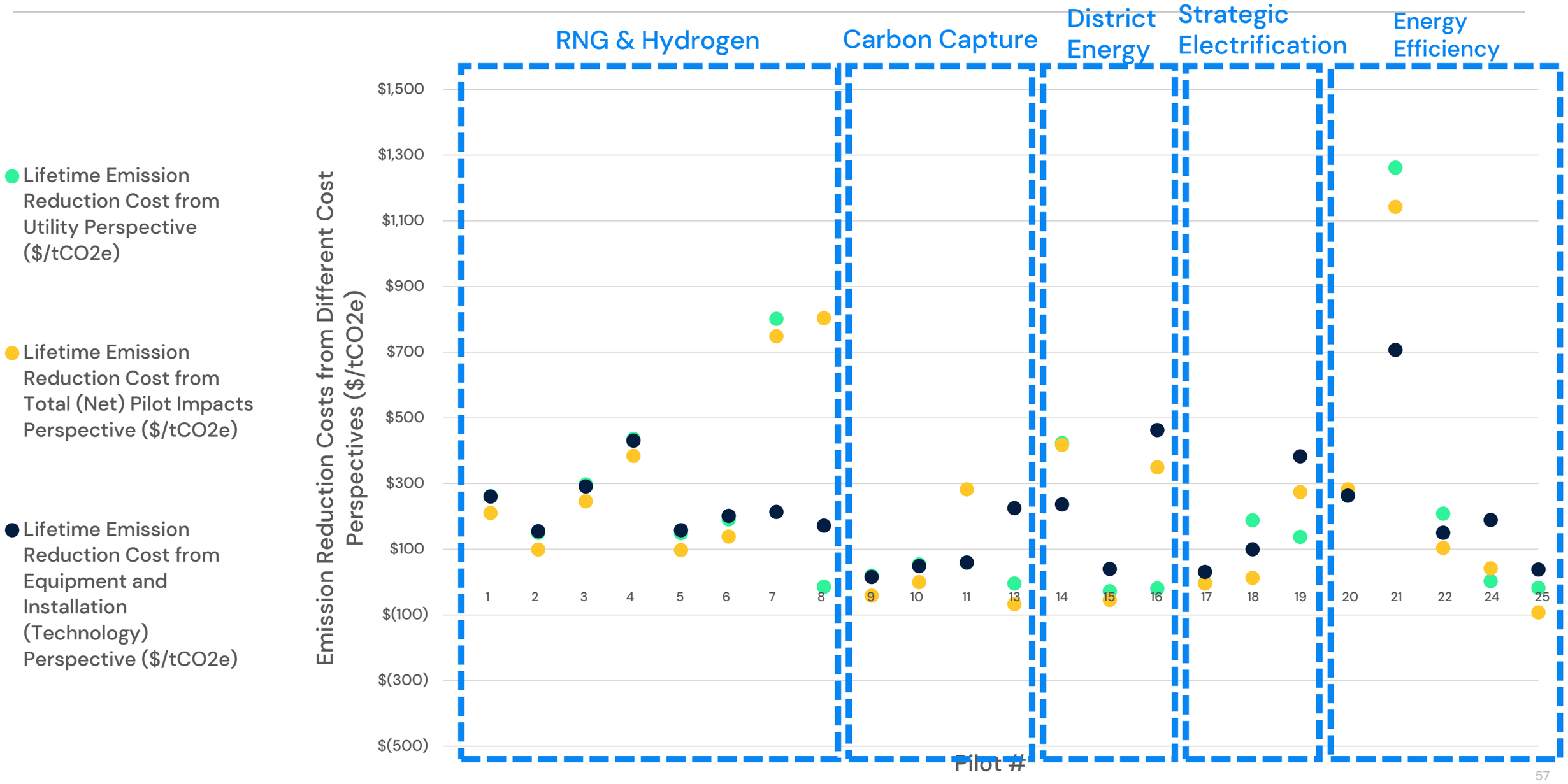
Emission reduction costs (continued)

- **Lifetime emission reduction cost from utility perspective** ($2023/tCO2e) = [*UCT test costs ($2023) – UCT test benefits ($2023)*] / *Lifetime GHG emissions reduction (tCO2e)*

- **Lifetime emission reduction cost from total (net) pilot impacts perspective** ($2023/tCO2e) = [*UCT test costs ($2023) + PCT test costs ($2023) – UCT test benefits ($2023) - PCT test benefits ($2023) + social cost of GHG emission reductions ($2023) + social cost of non-GHG emission reductions ($2023) + third party funding ($2023)*]/ *Lifetime GHG emissions reduction (tCO2e)*

- **Lifetime emission reduction cost from equipment and installation (technology) perspective** ($2023/tCO2e) = *Equipment and installation costs ($2023) / Lifetime GHG emissions reduction (tCO2e)*

Emission Reduction Costs (Pilot Size B)



Snapshot of notable pilot projects from NGIA 'perspectives'

- **NGIA Utility Perspective**
  - Costs from utility perspective vary based on range of factors, including if customers are contributing part of the installation costs (e.g. lower utility contribution) and projects reductions in gas throughput (commodity cost savings lower UCT)

- **NGIA Participants Perspective (including specific impacts on low- and moderate-income participants)**
  - Networked geothermal and res. deep energy retrofit pilots could be targeted towards low- and moderate-income customers/neighborhoods
  - A number of industrial and commercial focused pilots may help participants achieve their own corporate GHG reduction goals making them more competitive with GHG-conscious customers
  - Some pilot projects, such as energy efficiency, will reduce customer costs, while others, such as hydrogen, will increase them

- **NGIA Nonparticipating Customers Perspective (including specific impacts on low- and moderate-income customers)**
  - Rate impacts to be discussed in the third round of stakeholder meetings
  - RNG and hydrogen blending projects will reduce the GHG intensity of gas, reducing the GHG emissions from all CenterPoint Energy customers
  - Hennepin County RNG includes an anaerobic digestion facility proposed in an Environmental Justice 'area of concern'. Hennepin County has initiated community engagement activities to evaluate the potential for disproportionate adverse impacts and consider ways to reduce those impacts from the project. Hennepin County will continue the community engagement process as the project progresses.

- **Effects on Other Energy Systems and Energy Security**
  - Reliance on locally produced RNG and green hydrogen reduces dependence on out-of-state geologic gas which may have benefits for energy security, and is a decarbonization approach built off existing energy infrastructure
  - The two pilots involving hybrid heating systems, and the two pilots involving gas heat pumps, would explore decarbonization opportunities that can help mitigate growth in winter electric peak demand from space heating electrification

Snapshot of notable pilot projects for environmental criteria

- **GHG Emissions**
  - Quantitative results include both lifetime GHG savings (tCO2e) and the social cost (value) of GHG emissions (reductions)
  - RNG projects capture and recover methane (higher global warming potential than CO2) and put that gas to productive use

- **Other Pollution**
  - Quantitative results also include the social cost (value) of non-GHG air pollutants emissions (reductions)
  - Anaerobic digestion of dairy manure can improve agricultural practices that harm water quality, air quality, and local odors
  - The industrial methane leak detection and repair program could also identify refrigerant leaks, to further reduce environmental and GHG impacts

- **Waste reduction and reuse (including reduction of water use)**
  - RNG Pilots 1 and 2 have the potential to be a state model for organics recycling and beneficial use; they, as well as the other 'food waste' RNG projects, can help to demonstrate an effective use of anaerobic digestion in MN to process residential and commercial source-separated organics (as opposed to landfilling)
  - All RNG pilots, digestion of organic materials for energy production is effective way to decarbonize waste

- **Policy (e.g., natural gas throughput, renewable energy goals)**
  - The RNG, hydrogen, networked geothermal, strategic electrification, new district energy, solar thermal, and potentially the C&I GHG audit pilot increase use of renewable energy
  - All pilots except carbon capture pilots and urban tree planting decrease geologic gas throughput

Snapshot of notable pilot projects from socioeconomic criteria

- **Net Job Creation**
  - IMPLAN modelling to quantify the net job creation from pilots is still on-going

- **Economic Development**
  - The hydrogen pilots allow local firms and workers to gain experience in hydrogen, which is a growing industry
  - A number of projects support improved industrial competitiveness in Minnesota, by helping industry become more efficient, while other pilots could entice corporate R&D teams to concentrate their initial decarbonization efforts at Minnesota facilities
  - Pilots seeking higher IRA incentives would follow wage/labor IRA requirements
  - The networked geothermal pilot would represent a large-scale build out of a new type of utility infrastructure
  - CenterPoint Energy is planning to include budget for workforce development to support various projects at the portfolio level

- **Public Co-Benefits**
  - The first two RNG pilots have the additional benefit of supporting local municipalities
  - In the Urban Tree offset pilot, new street trees will shade homes and buildings, reducing cooling and heating costs over time; in addition to sequestering carbon, these trees also increase the stormwater infiltration rate of the urban soils and promote habitat diversity throughout the city

- **Market Development**
  - Many pilots may be located through CenterPoint Energy's service territory; projects may have a significant impact on individual customer's GHG emissions helping them achieve their GHG emissions goals and supporting their competitiveness with GHG-conscious customers

Snapshot of notable pilot projects from innovation criteria

- **Direct Innovation Support**
  - Many of the pilots are small-scale field testing, with most or all of costs covered for CenterPoint Energy customers, in order to better understand an emerging technology and how it could be scaled
  - RNG Pilots 1 and 2 have the potential to be a state model for organics recycling and beneficial use
  - The RNG pilots provide CenterPoint Energy with experience in purchasing low-carbon fuels, and the hydrogen blending and new district energy pilots provide experience with a different way of providing energy
  - Carbon capture and hydrogen pilots explore emerging options to reduce emissions from hard to electrify industrial end-uses
  - The residential deep energy retrofit pilot (including hybrid heating) could help answer questions on balance of energy efficiency retrofits vs. strategic electrification, while also supporting testing of new building retrofit technologies

- **Resource Scalability and Role in a Decarbonized System**
  - Hybrid heating targets the largest residential and commercial sector uses of natural gas and in the 2021 Minnesota G21 study the 'electrification with gas back up' scenario had smallest total cost increase by 2050
  - All deep emission reductions pathways rely on a lot of decarbonized gases to reach emission reduction targets:
    - All scenarios in the 2021 Minnesota G21 study use all available biomethane resources, and hydrogen blending, before tapping into more expensive decarbonized gases.
    - Even in the G21 high electrification case, 2050 RNG demand in Minnesota would be much greater (50-100 times) than the annual volume of decarbonized gas production assumed in the detailed analysis
  - Residential and commercial hybrid heating and gas heat pumps were selected for the Minnesota Efficient Technology Accelerator's (ETA) starter portfolio, and taking a collaborative approach with the Center for Energy and Environment (CEE) on these pilots offers can amplify the effects of both NGIA and ETA.
  - Hydrogen and carbon capture are expected to be important tools in a decarbonized energy system; through IRA and IIJA the federal government has invested heavily in scaling up and reducing the costs of hydrogen production and carbon capture

Lifetime GHG emission reductions by pilot (tCO2e)

#	Pilot	Pilot Size A	Pilot Size B	Pilot Size C
1	RNG Proposal – Organics 1	5,644	28,221	56,442
2	RNG Proposal – Organics 2	15,964	134,097	167,621
3	RNG Archetype – WRRF	5,311	26,556	159,335
4	RNG Archetype - Dairy	9,895	19,790	98,952
5	RNG Archetype - Food Waste	11,579	254,739	578,953
6	RNG Archetype - Landfill Gas	53,621	240,096	480,191
7	Hydrogen Blending	5,599	27,993	-
8	Industrial Hydrogen	56,330	112,661	168,991
9	Industrial Methane Leaks	38,831	97,077	194,154
10	Urban Tree Offsets	4,500	9,000	18,000
11	Industrial Carbon Capture	50,865	101,731	152,596
13	Commercial Carbon Capture	55,150	111,997	226,539
14	Networked Geothermal	21,471	53,677	107,355
15	Existing District Energy	62,015	124,030	186,044
16	New District Energy	20,441	40,882	61,323
17	Industrial Electrification	11,896	23,792	35,688
18	Commercial Hybrid Heating	13,279	25,609	37,940
19	Res. Deep Energy Retrofits	33,380	66,760	100,139
20	Sm./Med C&I GHG Audit	5,642	7,052	8,462
21	Res. Gas Heat Pumps	235	391	783
22	Com. Gas Heat Pumps	2,154	4,307	6,461
24	C&I Solar Thermal	7,687	11,531	19,218
25	Large C&I GHG Audit	35,560	71,120	106,680

5-Year Utility Costs Towards NGIA Budget* ($)

*This represents the pilot budget before portfolio-level costs were split amongst the final selected portfolio of pilots. Those costs are only assigned once the portfolio has been selected from all these options.

#	Pilot	Pilot Size A	Pilot Size B	Pilot Size C
1	RNG Proposal – Organics 1	$ 632,174	$ 2,565,952	$ 4,983,175
2	RNG Proposal – Organics 2	$ 1,283,500	$ 9,125,802	$ 11,351,320
3	RNG Archetype – WRRF	$ 852,930	$ 3,602,364	$ 20,064,460
4	RNG Archetype - Dairy	$ 2,012,930	$ 3,961,297	$ 18,604,100
5	RNG Archetype - Food Waste	$ 972,930	$ 17,355,076	$ 39,124,820
6	RNG Archetype - Landfill Gas	$ 4,806,972	$ 20,749,922	$ 41,245,541
7	Hydrogen Blending	$ 2,100,067	$ 4,656,185	$ -
8	Industrial Hydrogen	$ 1,239,057	$ 2,474,441	$ 3,896,791
9	Industrial Methane Leaks	$ 1,231,708	$ 2,610,763	$ 4,861,378
10	Urban Tree Offsets	$ 295,780	$ 539,530	$ 1,027,030
11	Industrial Carbon Capture	$ 2,257,651	$ 4,300,117	$ 6,341,332
13	Commercial Carbon Capture	$ 1,298,643	$ 2,365,488	$ 4,667,428
14	Networked Geothermal	$ 2,706,777	$ 5,637,833	$ 10,557,712
15	Existing District Energy	$ 475,753	$ 1,094,688	$ 1,945,963
16	New District Energy	$ 175,806	$ 310,412	$ 493,178
17	Industrial Electrification	$ 513,182	$ 832,513	$ 1,107,757
18	Commercial Hybrid Heating	$ 3,799,172	$ 6,465,657	$ 9,132,143
19	Res. Deep Energy Retrofits	$ 6,553,565	$ 12,308,327	$ 18,063,089
20	Sm./Med C&I GHG Audit	$ 1,733,311	$ 2,082,852	$ 2,432,393
21	Res. Gas Heat Pumps	$ 343,319	$ 555,308	$ 914,123
22	Com. Gas Heat Pumps	$ 687,149	$ 1,148,452	$ 1,669,754
24	C&I Solar Thermal	$ 335,229	$ 473,703	$ 750,652
25	Large C&I GHG Audit	$ 984,795	$ 1,300,099	$ 1,615,402

Emission Reduction Costs from Multiple Perspectives ($/tCO2e)

All Values for Pilot Size B

#	Pilot	Lifetime Emission Reduction Cost from Utility Perspective ($/tCO2e)	Lifetime Emission Reduction Cost from Total (Net) Pilot Impacts Perspective ($/tCO2e)	Lifetime Emission Reduction Cost from Equipment and Installation (Technology) Perspective ($/tCO2e)
1	RNG Proposal – Organics 1	$ 262	$ 211	$ 261
2	RNG Proposal – Organics 2	$ 196	$ 145	$ 202
3	RNG Archetype – WRRF	$ 298	$ 246	$ 291
4	RNG Archetype - Dairy	$ 436	$ 384	$ 431
5	RNG Archetype - Food Waste	$ 149	$ 97	$ 158
6	RNG Archetype - Landfill Gas	$ 191	$ 139	$ 202
7	Hydrogen Blending	$ 802	$ 748	$ 214
8	Industrial Hydrogen	$ (14)	$ 804	$ 172
9	Industrial Methane Leaks	$ 19	$ (41)	$ 15
10	Urban Tree Offsets	$ 54	$ (0)	$ 49
11	Industrial Carbon Capture	$ 59	$ 283	$ 60
13	Commercial Carbon Capture	$ (4)	$ (67)	$ 225
14	Networked Geothermal	$ 423	$ 417	$ 236
15	Existing District Energy	$ (28)	$ (54)	$ 40
16	New District Energy	$ (20)	$ 350	$ 463
17	Industrial Electrification	$ (3)	$ (4)	$ 31
18	Commercial Hybrid Heating	$ 188	$ 13	$ 100
19	Res. Deep Energy Retrofits	$ 138	$ 274	$ 383
20	Sm./Med C&I GHG Audit	$ 276	$ 282	$ 263
21	Res. Gas Heat Pumps	$ 1,262	$ 1,143	$ 707
22	Com. Gas Heat Pumps	$ 209	$ 104	$ 150
24	C&I Solar Thermal	$ 3	$ 42	$ 189
25	Large C&I GHG Audit	$ (18)	$ (92)	$ 38

Resources Included in NGIA

- Renewable Natural Gas (RNG) & Biogas
  - Must be from biomass
  - Distinction is pipeline quality or not
- District Energy
  - From solar thermal or ground-source
- Energy efficiency
  - Does not include “investments” that can reasonably be included in the Conservation Improvement Program
- Power-to-hydrogen & power-to-ammonia
  - Produced using a carbon-free power source
- Strategic electrification
  - Cannot add to electric peak
  - Customer must still use gas (partial electrification only)
- Carbon Capture
  - Very broad definition

Special Requirements for the First Plan

- All utilities
  - Costs must be 50%+ for RNG, biogas, power-to-hydrogen or power-to-ammonia (low carbon fuels)
- CenterPoint Only
  - Residential deep energy retrofit + electric ASHP pilot (with gas backup)
  - Industrial hard-to-electrify pilot
  - Small/medium business GHG audit pilot
  - District energy pilot

CenterPoint Energy Innovation Plan

Regulatory Parties Engagement Meeting 3 Summary and Notes

Monday, May 22nd, 8:30AM-12:00 PM CT

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Meeting Context and Summary

Background

On Monday, May 22, 2023, CenterPoint Energy (CenterPoint), with technical support from ICF and facilitative support from the Great Plains Institute (GPI), hosted the third and final regulatory engagement meeting that will inform the development of CenterPoint's first innovation plan. The regulatory engagement meetings were planned to complement a series of three separate public engagement meetings. The meeting was held in an online format via Zoom.

CenterPoint is preparing its voluntary innovation plan in accordance with the Natural Gas Innovation Act (NGIA), which was signed into law by Governor Walz on June 26, 2021. The full text of NGIA is available here. The innovation plan will be evaluated by the Minnesota Public Utilities Commission (Commission) in accordance with the framework approved in Commission Docket No. 21-566.[1]

Prior Regulatory Meetings

The first public and regulatory engagement meetings provided attendees with an overview of the legislative and regulatory context for natural gas utility innovation plans in Minnesota. It also provided an opportunity for participants to provide feedback on the selection of an initial list of 28 pilot project ideas and several research and development initiatives to be evaluated for inclusion in the innovation plan.[2]

The second public and regulatory engagement meetings provided attendees with an opportunity to provide feedback on a shorter list of 23 pilot concepts proposed for innovation plan inclusion, the methodology for analyzing the costs and benefits of those projects, and on a refined list of research and development projects. Agendas, summaries, and slides from Regulatory Engagement Meetings 1 and 2 are available in the resource library hosted via Airtable: https://airtable.com/shrIqHCeYD5SeGwoX/tblCg3frZs5eAhKfz

Third Regulatory Meeting

In advance of the third public and regulatory meetings, CenterPoint and ICF completed their analysis of potential pilots in accordance with the quantitative and qualitative considerations in the Commission-ordered NGIA evaluation framework, as developed under Docket No. 21-566. Informed by this evaluation, CenterPoint developed a draft portfolio of pilots for inclusion in its

[1] Docket No. G-999/CI-21-566. "In the Matter of Establishing Frameworks to Compare Lifecycle Greenhouse Gas Emissions Intensities of Various Resources, and to Measure Cost-Effectiveness of Individual Resources and of Overall Innovation Plans."

[2] Due to the smaller budget for research and development and greater uncertainty about the likely effects of these initiatives on greenhouse gas emissions reductions, research and development initiatives will not be subject to as detailed an analysis as potential full pilot projects.

initial innovation plan and presented that portfolio for feedback at the public and regulatory engagement meetings.

In addition, CenterPoint presented on the estimated rate impacts of innovation plan implementation, the tracking and verification plans for different pilots, and a comparison of alternative portfolios with different greenhouse gas reduction levels as required by statute (50%, 150%, and 200% reductions, as compared to the draft portfolio). CenterPoint also shared a list of the documents and information that would be included in its filing so that interested parties could provide feedback on the filing structure.

Meeting Summary

The goals of the May 22, 2023 regulatory engagement meeting were as follows:

1. Review content from the May 12, 2023 public engagement meeting, including the draft portfolio of projects and results of the cost benefit analysis.
2. Build a shared understanding of and solicit feedback on the following:
    a. Estimated rate impacts from the innovation plan
    b. The structure and content of the innovation plan
    c. Alternative portfolios of pilot projects that could achieve different levels of emissions reductions
    d. The proposed plan for tracking and verifying pilot project results

For each item above, CenterPoint and ICF presented to the group, then GPI facilitated a discussion. Below, we have captured a series of high-level feedback themes, followed by the more detailed meeting notes.

Feedback Themes:

Overall, participants in this meeting had questions to help them better understand the proposed pilots and their estimated impacts but provided somewhat limited feedback on potential changes to the draft portfolio itself. The following list of feedback themes therefore highlights some of the questions and points of discussion posed by attendees.

NGIA statutory requirements: How and if NGIA statutory requirements—such as the requirement that at least 50% of spending in a utility's first innovation plan go towards low-carbon fuels—change over time, including through subsequent plan filings, as well as some other statutory considerations.

Cost modeling: Participants were interested in innovation plan cost modeling considerations including (but not limited to) utility costs, customer costs, emissions reduction costs, and consideration for cost savings resulting from the Inflation Reduction Act (IRA). Below, we have captured some of the suggestions participants raised and feedback participants provided related to costs, and provided clarification as needed:

- IRA impacts: Costs were modeled to include impacts from the IRA where possible but noted that there is some uncertainty for funding opportunities that have not yet been

finalized. CenterPoint will note all relevant IRA incentives of which it is aware in the filing, regardless of whether those dollars have been included in the modeled costs.

- Cost recovery: While the innovation plan budget has a 5-year window, some project lifespans are longer than that. The costs for some pilots will be fully recovered within the 5-year window, while others won't be fully recovered and will need to be included as part of future innovation plans.
- Commodity cost savings: Commodity cost savings (savings as a result of needing to purchase less fuel) play a significant role in enabling the number of pilots in the proposed list. Some projects have relatively high commodity cost savings that allow CenterPoint to include additional pilots with modest budgets.
- Natural gas commodity costs: The assumptions that CenterPoint used to project natural gas prices are dictated by the framework order in Docket 21-566 and involve looking back at historic prices, which were recently updated in the analysis. The baseline price is then forecasted by assuming an annual escalation rate, which is calculated based on the annual changes in EIA's Annual Energy Outlook for gas prices moving forward. Note that though it is currently an unusual time for gas prices, that will likely be corrected over time. Prices can be updated in the annual NGIA reports.
- Cost scenarios: Some participants suggested that CenterPoint should consider conducting (and presenting in the filing) a sensitivity analysis to demonstrate the impact of higher or lower commodity costs.

Plan filing and engagement schedule: Participants noted that there are many proceedings occurring concurrently at the Commission and suggested that, in acknowledgement of this, the procedural schedule should allow sufficient time for parties to submit comments in the docket. Parties suggested that 90 days would be appropriate to review the innovation plan filing and develop initial comments. One participant also suggested that CenterPoint should work with parties to jointly propose a schedule for the comment periods.

Meeting Notes

Notes are in an alphanumeric format for reference purposes only; the numbers and letters do not indicate any prioritization or ranking.

Introductions and Agenda Overview

1. This is the third and final regulatory party engagement meeting in advance of CenterPoint's initial (draft) NGIA innovation plan filing
    a. The process involved three "pairs" of public engagement meetings
        i. Three public engagement meetings
        ii. Each public engagement was followed by regulatory party engagement meeting
        iii. Both the public and regulatory party engagement meetings were open to any interested parties throughout the engagement process, but the regulatory party engagement meetings have served as venues to discuss more technical aspects.

2. Participants were asked to adhere to the following meeting ground rules:
    a. **Respect the time.** Our time together is limited and valuable. Please be mindful of the time and of other's opportunity to participate.
    b. **Respect each other.** Help us to collectively uphold respect for each other's experiences and opinions, even in difficult conversations. We need everyone's wisdom to achieve better understanding and develop robust solutions.
    c. **Please use "raise hand" and chat features.** We have a large group this morning, to help make space to hear from as many stakeholders as possible, please use the "raise hand" or chat features to indicate you would like to participate in the conversation.
    d. **Enable honesty through non-attribution.** Outside of this group, you may share what was said and who was present, but please refrain from sharing who said what without first obtaining permission. All meeting notes and materials will also adhere to this.
3. CenterPoint thanks all parties for their involvement throughout the innovation plan development process and remains open to holding additional ad-hoc meetings (with small groups or individuals) to discuss items in detail, provide clarification, etc.

Meeting Context and Purpose

1. This meeting is an opportunity to:
    a. Provide a high-level preview of CenterPoint's draft innovation plan filing
    b. Discuss draft innovation plan components in advance of the filing, including:
        i. Pilots included in the portfolio
        ii. R&D projects
        iii. Details regarding rate impacts
        iv. Alternative portfolios
        v. Overview of innovation plan filing structure
        vi. Tracking and verification plan
2. Participants' honest thoughts and feedback at this meeting will help CenterPoint file a well-informed plan.

Review of May 12th Public Engagement Meeting

Process Overview

1. The third pair of meetings marks the end of the portfolio development phase in advance of plan filing.
2. Focus of third public engagement meeting was to receive feedback on CenterPoint's draft pilot portfolio
3. Overview of NGIA frameworks order, which established quantitative and qualitative cost effectiveness criteria spanning several topics, allowing cost-effectiveness to be evaluated more holistically.
    a. Utility and non-utility perspectives
    b. Environmental
    c. Socioeconomic

d. Innovation

Overview of NGIA Statutory Requirements

1. General NGIA statutory requirements for any utility filing any innovation plan:
    a. Strategic electrification generally requires gas backup per NGIA definition
    b. $90M cost cap for five-year plan life, with a $15M bonus available for certain renewable natural gas (RNG) types
    c. Up to 10% of the utility's budget can be used for R&D
        i. In CenterPoint's case, this allows for ~$10.6M to be directed towards R&D
2. Special requirements for utilities filing their first innovation plan:
    a. For all utilities:
        i. At least 50% of costs must go towards low-carbon fuel initiatives (RNG, biogas, power-to-hydrogen, power-to-ammonia)
    b. CenterPoint-specific pilot requirements:
        i. Residential deep energy retrofit plus electric air source heat pump (ASHP) with gas backup—must help meet a specific ambitious retrofit standard in at least some homes.
        ii. Pilot targeting a hard-to-electrify industrial sector
        iii. Small/medium business greenhouse gas (GHG) audit pilot
        iv. District energy pilot (cannot be more than 20% of plan costs)
3. Question: Are the special initial plan requirements only required to be filed, or are they required to be included in the final Commission-approved plan?
    a. Answer: It depends on the requirement—for example, the Commission cannot approve a plan that does not meet the low-carbon fuel requirement, but there are some other aspects that must be included in CenterPoint's proposal, but that the Commission could theoretically reject.
4. Question: How do requirements change after the first plan (e.g., does the low-carbon fuel requirement go away)?
    a. Answer: Yes—all utilities must meet the low-carbon fuel requirement in their first plan, but NGIA does not include it as a requirement in subsequent plans.
5. Question: My interpretation of strategic electrification per NGIA is that it is electrification in buildings that had gas prior to the electrification project. Could you clarify how CenterPoint interprets strategic electrification under NGIA and the gas back up requirement?
    a. Answer: CenterPoint reads it as requiring gas back up or some kind of gas use after the project is implemented. The reason for this in the statute is in part a fairness concern about ensuring that customers that have benefited from incentives in NGIA, which is funded by all CenterPoint Energy ratepayers, continue to pay into the natural gas utility system after receiving that benefit.

Pilots Included in Filing

1. Of the 23 shortlisted pilots, 22 have been selected for inclusion in CenterPoint's draft innovation plan portfolio.
    a. Pilot 24 (Solar Thermal Heating for Commercial/Industrial) is the only shortlisted pilot that is not included—note: solar thermal heating technology could still be pursued via Pilot 25 (Industrial and Large Commercial GHG Audit) as one measure eligible for incentives
2. Able to fit most pilots into the portfolio for at least size A

   a. Makes for a balanced portfolio while still meeting statutory requirements
      i. Just slightly over low-carbon fuel requirement (50% of costs), which left as large a budget as possible for non-low-carbon fuel pilots
      ii. A handful of specific pilots (Pilot 12, New Networked Geothermal Systems; Pilot 18: Commercial Hybrid Heating; and Pilot 19: Residential Deep Energy Retrofits) were given large portions of the non-low carbon fuels budget because they were seen as particularly strategic and of interest to interested parties
   b. Opportunity to test many different technologies and drive innovation
3. Emissions reduction costs and lifetime GHG savings for all pilots included in the draft portfolio are provided in the table on Slide 10
4. Question: Can you clarify how the emissions reduction cost from a utility perspective was calculated, in comparison to how the emissions reduction cost from a total (net) pilot impacts perspective (see Slide 10), given that they are so different?
   a. Answer: Slides 55–57 in the appendix provide definitions and additional detail regarding the utility cost perspective and the total (net) pilot impacts perspective. Essentially, the utility perspective compares lifetime GHG savings with the utility's portion of cost (pilot administration costs, incentives, commodity costs, etc.). There can be a large difference between the two perspectives when comparing a highly-incentivized direct install program (e.g., deep energy retrofits) in which utility costs encapsulate most of the total project costs versus an a pilot like industrial green hydrogen, in which the utility might pay an incentive covering only a portion of the cost and where the customer must finance continued electrolyzer operations. In the total (net) pilot impacts perspective, total emissions reduction cost reflects not only the utility's spending, but also the customer's spending and certain other costs and benefits. There is also a separate metric that is focused exclusively on costs and benefits from a customer perspective, including customer costs and some additional costs defined under NGIA.
5. Question: Are IRA provisions captured in these costs? Or do we not yet know what those will look like?
   a. Answer: Yes, these costs were modeled to account for estimated IRA funding where possible, but there is some uncertainty; mostly included IRA in the modeled utility costs, but also included it in customer cost modeling where possible. CenterPoint will include discussion of all potential IRA incentives in the filing of which it is aware, regardless of whether those dollars have been included in the modeled costs.
6. Question: What do utility costs towards NGIA look like compared to revenue requirements? What are the expenses vs. capital?
   a. Answer: We will discuss the cost cap in more detail later on, but in general, the utility cost perspective aims to capture CenterPoint's net budget for these projects over the projects' anticipated lifetimes. Types of costs included vary by pilot (e.g., for RNG, fuel procurement costs are included). The NGIA budget is a five-year window on these utility costs, even though some project lifespans are much longer than that. Costs associated with some pilots will be fully collected within five years, but pilots with longer lifetimes (typically those associated with large capital investments) won't be fully included in the five-year budget window. Revenue requirement costs are included in the utility perspective.
7. Net job impacts are displayed as the number of full-time equivalent jobs (direct, indirect, and induced jobs) aggregated over a project's lifetime
   a. Types of jobs created:

        i. Direct: Jobs created in sectors in which CenterPoint is directly spending NGIA innovation plan money (e.g., pilot management activities, pilot construction/installation, etc.)
        ii. Indirect: Upstream supply-chain related jobs in industries in which CenterPoint is not directly spending money, but that support pilots through materials, equipment, and construction
        iii. Induced: Jobs created downstream in communities in which new workers will spend their money
    b. IMPLAN tool used to conduct job impact modeling
        i. IMPLAN identifies how spending in one sector contributes to economic impacts in other sectors
        ii. Focus on a target geography (in this case, Minnesota)
        iii. Note: NGIA does not require that utilities use IMPLAN to conduct their job analysis—job analysis can be more qualitative in nature.
8. Two additional columns added to the table on Slide 11 since the public engagement meeting to demonstrate net job creation per $1M invested, essentially reflecting jobs created divided by costs:
    a. Direct Jobs Created per each $1M investment (utility and non-utility)
    b. Direct Jobs Created per each $1M of Utility Cost towards NGIA budget
9. Question: What type of analysis is IMPLAN typically used for?
    a. Answer: IMPLAN is used in regional economic impact modeling to understand local economic impacts (including jobs) for any type of infrastructure project—may include more traditional physical infrastructure (bridges, roads, etc.) or energy infrastructure (power plants, wind farms, etc.). “Payback” from a large infrastructure investment can come in many forms, one of which is jobs. IMPLAN can also be used for energy efficiency analyses and modeling the impacts of power plant closures or other energy investments.

R&D Projects

1. The seven R&D projects that CenterPoint will pursue in the first two years of its initial five-year innovation plan are listed on Slide 12.
    a. Setting aside some R&D budget for future initiatives
2. Two key R&D projects:
    a. Weatherization Blitzes—there was substantial discussion in prior engagement meetings about how this came to be an R&D initiative
    b. CenterPoint Minnesota Net Zero Study—some regulatory parties requested this be included in previous meetings

Rate Impacts

Presentation

1. There types of costs included in the innovation plan
    a. Capital costs: long-lived investments to be made by CenterPoint
        i. NGIA examples: hydrogen electrolyzer and solar panels, new networked geothermal system, potential RNG capital investments
        ii. Usually recovered via a rate case over the investment life, with a rate of return
    b. Gas or fuel costs: costs for fuel that supplies energy to customers

        i. NGIA examples: RNG costs, electricity costs to power the CenterPoint-owned hydrogen electrolyzer
        ii. Costs passed through, with a monthly adjustment that lines up cost recovery with actual expenses
    c. Operations and maintenance (O&M) costs: generally "anything else"
        i. NGIA examples: rebates, vendor costs, plan development costs
        ii. Primarily recovered via delivery charges or occasionally via special riders, as is the case for CIP costs.
2. CenterPoint's proposal for recovering NGIA costs:
    a. Statute lays out cost recovery mechanisms
    b. Recover eligible fuel costs (e.g., RNG, electricity used to power a hydrogen electrolyzer) via the Purchased Gas Adjustment (PGA)
        i. Excludes onsite solar generated electricity, which would not be purchased)
        ii. Includes purchased clean electricity for electrolyzer
    c. Capital and O&M costs recovered via a two-part structure similar to what is currently used for cost recovery under CIP
        i. Certain costs to be included in delivery rates like CIP's Conservation Cost Recovery Charge—currently referring to this as the "NGIA Charge" but that is not a formal or finalized name
        ii. Remaining costs to be recovered via a special rider, like CIP's Conservation Cost Recovery Adjustment—currently referring to this as the "NGIA Adjustment" but that is not a formal or finalized name. The rider will include an annual true-up.
    d. Program costs will be matched with the rate classes that may benefit from that program. For example:
        i. Barring some specific exceptions, all classes would pay for resources that serve all customers (RNG, hydrogen electrolyzer, urban tree offsets)
        ii. Commercial/industrial customers would pay for pilots that only serve commercial/Industrial customer classes
        iii. Residential customers would pay for pilots that only serve residential customer classes
3. CenterPoint will communicate with customers regarding rate details—interested in feedback regarding how to best communicate this information to customers and how to best represent these costs on customer bills
4. Estimated cost recovery proposal timeline (with key approximate dates) presented in Slide 16.
    a. As indicated on the timeline, customers will not see the NGIA Charge on their bills until CenterPoint's rate case concludes with Commission approval (estimated in the first half of 2025)
5. Expected bill impacts from CenterPoint's first innovation plan are displayed on Slides 17 and 18
    a. Key rate distinction between Commercial/Industrial Transport/Non-Transport customers:
        i. Transport customers independently purchase gas from other suppliers, to be transported through CenterPoint's natural gas facilities—do not pay the Purchased Gas Adjustment fee and do not (directly) benefit from RNG programs or hydrogen blending
        ii. Non-transport customers purchase gas from CenterPoint
    b. Costs ramp up over time as pilots become better established

   c. Different costs are recovered via different recovery mechanisms
   d. Estimated actual and average Year 1 and Year 5 impacts by customer class, for all customer classes, provided on Slide 18
      i. Note: Some classes have very few customers, but those customers may be large gas users
6. Estimated actual and average Year 1 and Year 5 commodity savings (amount of commodity costs saved due to commodity [gas] usage savings) by customer class, for all customer classes, provided on Slide 18.
   a. In many cases, customers will be reducing the amount of fossil gas they will be purchasing
   b. Transport customers do not receive commodity savings because they would not receive RNG or hydrogen resources from CenterPoint—these customers may be buying RNG independently, but CenterPoint would not have insight into that.
7. Customers who are currently exempt from participating in CIP ("CIP-exempt customers"), and who are excluded from CIP cost recovery are also excluded from NGIA cost recovery by statute, but there is a provision that allows CIP-exempt customers to opt-in to NGIA (no customers have done so yet)
8. Market rate customers that are not CIP-exempt are included in cost recovery
9. Question: Could you clarify the two rightmost columns in the Estimated Commodity Savings by Class table (Slide 19)?
   a. Answer: The two leftmost columns (after the "Class" column) demonstrate gas commodity savings in Year 1 and Year 5, by customer class. The next two columns demonstrate the net (i.e., subtracted) savings by customer class for Year 1 and Year 5. Then the two rightmost columns demonstrate the average annual net impact in Year 1 and Year 5, for an individual customer within the specified customer class. For residential customers, the Year 1 gas savings are small enough to not show up for the Residential customer class, but there are implications for larger customers.
10. Question: How are you dividing costs between the NGIA Charge and the rider (NGIA Adjustment)?
    a. Answer: Currently anticipating including regulatory costs and plan development costs in the NGIA Charge. Intend to set an NGIA Adjustment upon implementation happens, likely starting with a low charge that will have a positive adjustment
11. Question: Does the ability to fit more pilots into the plan relate to commodity costs?
    a. Answer: Yes—the numbers look low when broken down by customer class, but they made enough of a difference to allow CenterPoint to fit more pilots into the plan. Commodity cost savings allow the portfolio to include ~$4.5M more for pilots. Additionally, many smaller (Size A) pilots have modest budgets and some large projects (e.g., Pilot 14, New Networked Geothermal Systems) have huge commodity cost savings.
12. Question: What assumptions did you use for natural gas prices?
    a. Answer: The natural gas price assumptions are dictated by the framework order and involve looking back at historic prices to calculate the base year price. The historic prices were recently updated with the last 24 months of natural gas pricing. The forecast then adjusts the base year price based on the annual changes in EIA's Annual Energy Outlook for gas prices moving forward (currently ~$5/MMbtu and forecasted to drop sharply). Note that though it is currently an unusual time for gas prices, that will likely be

corrected over time. Additionally, prices can be updated annually in the annual NGIA report

13. Question: Has CenterPoint considered doing a sensitivity analysis to demonstrate high-/low-cost scenarios?
    a. Answer: We did do some sensitivity analyses on this, but those can be updated those to identify what higher/lower geologic gas prices would mean for the portfolio.
    b. Follow-up comment: Given that there is disagreement about natural gas cost escalation rates, CenterPoint might not want to assume that gas costs will decline over time.
    c. Answer: Gas prices have been volatile, but the starting prices could be higher. Looking at a flat or increasing escalation rate in a sensitivity analysis would change things. Also, later-year commodity prices matter more, since some pilots will not be deployed until later years of the plan. There was also a shift in how CIP describes commodity price growth rates (shift towards considering a longer forecast range), and that change does not automatically apply to NGIA requirements.
    d. Follow-up comment: This analysis could also show benefits to ratepayers and society
14. Question: It will be impossible to predict many commodity cost aspects—there is a chance that costs could be lower than what are projected. The fact that the innovation plan counts on higher gas costs to remain below the statutory maximum cost per customer presents a risk in the plan because CenterPoint is counting on a gas cost projection that may not be right. If the gas commodity cost savings do not add up as anticipated, how will CenterPoint handle it?
    a. Answer: Would probably address that in annual status reports. Currently we do not know whether costs will go up or down, so that must be monitored over time. Also, pilots have some implementation uncertainties in addition to uncertainties about gas costs, so generally will need to monitor actual costs and savings throughout the life of the plan and adjust as we go.

Alternative Portfolios

Presentation

1. Statutory language from NGIA plan filing states: “The utility’s plan must include… collections of pilot programs that the utility estimates would, if implemented, provide approximately 50 percent, 150 percent, and 200 percent of the greenhouse gas reduction or avoidance benefits of the utility's proposed plan.”
    a. CenterPoint developed alternative portfolios consistent with this requirement by evaluating different pilots or pilots of different sizes
    b. Alternative portfolios assume same fixed overall portfolio-level administrative costs and adhere to statutory funding standards (10% of spending towards R&D, at least 50% towards low-carbon fuels)
    c. Note: Some alternative portfolios exceed NGIA cost cap requirements
2. Details regarding cost differences for each alternative portfolio are included on Slide 25 and are briefly summarized below:
    a. Alternative Portfolio 1: Lifetime GHG savings would be 50% that of core portfolio and utility costs would be 41% lower

   b. Alternative Portfolio 2: Lifetime GHG savings would be 150% that of core portfolio and utility costs would be 49% higher
   c. Alternative Portfolio 3: Lifetime GHG savings would be 200% that of core portfolio and utility costs would be 82% higher
      i. Alternative Portfolio 3 consists entirely of pilots deployed at sizes B or C.
3. Question: Alternative Portfolio 2 has a 50% increase in lifetime GHG savings and 49% of budget (somewhat equivalent GHG saving to cost ratio), but Alternative Portfolio 3 has a very different ratio. Does this pertain to economies of scale, wider distribution of fixed costs, etc.?
   a. Answer: Different pilots have different effects on budget versus GHG savings. CenterPoint has not changed portfolio-level cost assumptions for pilots, but chances are that for Alternative Portfolio 3, actual administrative costs would be larger than listed in the table.
4. The alternative analysis helps the PUC understand GHG reduction opportunities with budgets. 150% and 200% exceed what CenterPoint is even allowed to spend.
   a. Given that CenterPoint plans to spend nearly the whole budget, the alternative portfolios might not be quite as useful. The alternative portfolio development process may be more useful for utilities that do not aim to spend their entire allotted NGIA budget.
5. Question: Why are there such big differences between some scenarios (e.g., RNG Archetype–WRRF) in different alternative portfolios?
   a. Answer: Because RNG archetypes are not specific identified projects, the split between different deployment sizes is somewhat arbitrary. Sizes A, B, and C can also vary significantly in scale in general.
6. Comment: It would be helpful to have the selected portfolio information (e.g., 100% of GHG savings) in the alternatives table as a reference point.
   a. CenterPoint will consider presenting it this way in the filing.
7. Comment: The decision to expand each project seems like it was focused more on meeting the alternative portfolio numbers (50%, 150%, 200%) required by statute, rather than a more quantitative optimization of cost reductions.
   a. Answer: While the analysis conducted to develop the alternative portfolios was less detailed than the analysis conducted to develop the selected portfolio, CenterPoint still wanted to make sure that they included the pilots they can learn from the most while also meeting the defined statutory requirements.
      i. However, none of the portfolios (including the selected portfolio) are truly “optimized,” as there are many competing goals.
      ii. The intent behind the alternative portfolios was not to develop fully optimized alternative portfolios, but rather to gain a general understanding of GHG savings and costs associated with alternative portfolios, while maintaining some similarity to the selected portfolio.
8. Question: The baseline proposal (to which the alternative portfolios are compared) represents 100% lifetime GHG savings. What would X% lifetime GHG savings look like from a business-as-usual case (e.g., we can see what 50% lifetime GHG savings looks like compared to CenterPoint’s proposed portfolio, but what about 50% business-as-usual)?
   a. Answer: CenterPoint will ensure that the context is provided in the filing for its selected portfolio.
9. Question: Why do some utility costs change for some of the pilots in Alternative Portfolio 3 when the pilots would be deployed at the same size and the lifetime GHG reductions are the same?

a. Answer: This is due to the way that overhead administrative costs have been allocated to all pilots—if costs increase for other pilots, splitting that cost across the pilots will result in cost changes even to pilots that are otherwise unchanged.

Walk-through of Filing Components

1. This section is intended to provide a preview of the full filing
2. Overview of filing materials:
    a. Short (~30 pages) main filing
    b. Details included in a series of exhibits (very long, much more detailed)
3. CenterPoint will request that the Commission consider its innovation plan filing by July 2024
4. To be included in filing body:
    a. **Regulatory information**—must be included in a miscellaneous filing
    b. **Overview of proposed innovation plan and filing structure**, including:
        i. Selected pilots
        ii. Key metrics (cost, GHG lifecycle emissions reductions, job creation)
    c. **Plan development process**, including information regarding engagement with interested parties
    d. **R&D**—CenterPoint's proposal for the preliminary two years of R&D spending for the innovation plan (including brief description of R&D initiatives for first two years), with remaining R&D budget earmarked for proposals to be presented in future NGIA status reports
    e. **Cost recovery proposal**—description of calculations for the following:
        i. Cost cap
        ii. Proposed cost recovery mechanisms
        iii. Cost impacts to average residential customer
    f. **Approval criteria**—walk-through of statutory criteria required for Commission to approve an innovation plan
    g. **Proposed cost-effectiveness objectives**—CenterPoint will propose cost-effectiveness objectives for Commission consideration
5. Question: What does CenterPoint envision occurring between the time that they file their draft innovation plan in June 2023 and the time that they will request a Commission decision (July 2024)?
    a. Answer: Anticipating a comment period, reply comments, likely 1-2 rounds of supplemental comments, and many information requests. Additionally, parties could potentially file extension requests that would extend comment periods beyond 30 days. CenterPoint may have conversations with parties throughout process and is open to meetings/conversations.
6. Question: Has CenterPoint considered what the proposed cost-effectiveness objectives would be?
    a. Answer: Yes, but CenterPoint is still working through and refining them. One challenge is that some things are hard to track and measure. CenterPoint is open to feedback that might help inform this.
7. Question: I thought that CenterPoint already had a model of how they will be evaluating cost effectiveness. What is the model for evaluating what that looks like for each pilot?
    a. Answer: This commenter might be remembering the cost-benefit chart, adopted via the NGIA evaluative frameworks order (see Docket 21-566). CenterPoint has used this framework for portfolio development, but the Commission must set specific cost-effectiveness objectives for the plan where it can say whether or not CenterPoint is meeting them.

8. Exhibits to be included in the full filing (note that exhibit letters listed below are not necessarily included in the order in which they will be included in the filing, and that exhibit names and section titles are subject to change). A description of what will be included in each of these exhibits can be found on Slides 28–31.
    a. **Compliance Matrix**
    b. **Full Pilots Detailed Description**—each pilot description will contain the following:
        i. *Project Description:* Narrative overview of pilot concept
        ii. *Eligibility:* Description of customer participation eligibility where applicable (e.g., all residential customers)
        iii. *Budget and Participation:* Participation estimates by year, five-year estimate of utility spending
        iv. *GHG Reduction and Natural Gas Savings:* GHG reductions over five-year plan and pilot timeline, natural gas savings over five-year plan and pilot lifetime where applicable
        v. *Customer Incentive Information* (where applicable, e.g., “40% of costs”)
        vi. *IRA Incentives Considered:* Description of any IRA incentives considered in developing utility and participant costs
        vii. *Equity and Inclusion:* Description of relevant equity and community engagement efforts specific to the pilot (e.g., commitments to vendor diversity)
        viii. *Additional Information* (as-needed for certain pilots, e.g., required hydrogen safety information)
    c. **R&D Pilots Detailed Description**
    d. **Lifecycle GHG Calculation Details**
    e. **Pilot Utility Cost Estimate Details**
    f. **Pilot Assumptions Spreadsheet**
    g. **Pilot Quantitative Calculations**
    h. **Pilot Qualitative Details**
    i. **Commission Cost-Benefit Framework Chart**
    j. **Letter Endorsing GHG Emissions Calculations**
    k. **Tracking and Verification Plan**
    l. **IMPLAN Modeling Details**
    m. **Cost Recovery Proposal Details**
    n. **Alternative Portfolios**
    o. **Draft RFP for RNG**
    p. **Draft Tariff Pages**
    q. **Utility System Report and Forecast**
    r. **Summary of RFI Responses and Other Pilots Considered**
    s. **Interested Party Meeting Materials**
    t. **Service Quality Metrics**
    u. **Non-Technical Summary**
    v. **CIP/NGIA Coordination**

Tracking and Verification Plan

Presentation

1. CenterPoint has proposed tracking/verification plans by resource type to ensure consistency with NGIA statutory requirements and NGIA GHG accounting framework
    a. Tracking helps ensure that environmental attributes, benefits, etc. are not double counted elsewhere
    b. Verification ensures that the amount of those environmental benefits is reasonably accurate and is verified for reporting purposes
2. **RNG/biogas tracking/verification plan:**
    a. Annual verification of GHG intensity, as required in the NGIA GHG accounting framework
    b. Will use M-RETS to track and retire renewable thermal certificates (analogous to RECS used for electric utilities, but for thermal energy)
        i. Each certificate represents one dekatherm of thermal energy
        ii. Registry ensures that dekatherms of thermal energy produced via renewable resources are not double-counted
        iii. CenterPoint will retire each certificate claimed under its innovation plan on behalf of its customers—this helps ensure that nobody else can claim those same GHG reductions
3. **Power-to-hydrogen tracking/verification plan:**
    a. Will engage third party to conduct measurements and verification for projects to determine hydrogen production and system performance
    b. Will obtain records demonstrating carbon-free electricity used based on how it is defined under NGIA
    c. Green hydrogen (hydrogen produced from renewable resources) is considered a renewable resource, so it will be registered under M-RETS when produced by CenterPoint Energy for purposes of hydrogen blending
    d. For customer-owned projects, participation agreements will include a provision prohibiting resale of environmental attributes
4. **Carbon capture tracking/verification plan:**
    a. Will engage a third-party to conduct lifecycle assessments to identify GHG savings
    b. For customer-owned projects, participation agreements will include a provision prohibiting resale of environmental attributes, to ensure that the environmental benefits stay in MN
5. **Energy efficiency, strategic electrification, and district energy tracking/verification plan:**
    a. Will use the MN Technical Reference Manual (TRM) where possible for standardized energy savings projects
        i. When this is not possible, will propose GHG savings calculation methods
    b. When it is necessary to calculate custom energy savings, CenterPoint will engage a third party to measure and verify all projects saving >20,000 dekatherms
        i. CenterPoint may complete verification (to be reviewed by third party) for projects that would save 1,000-20,000 dekatherms
        ii. CenterPoint may internally and independently complete verification for projects that would save <1,000 dekatherms

   c. Will establish a dedicated tracking system to record customer participation and ensure that savings are not being claimed under both NGIA and CIP/ECO
6. Question: How will the monitoring be done? Will it be conducted by people, will there be air quality monitors on buildings, will it be done by billing period, will buildings with carbon capture systems being installed be retrofit in some way, like with insulation?
   a. Answer: CenterPoint is not yet sure what data collection methods would be employed, but it would probably vary by project type. Large projects would have site- or project-specific data collection to verify GHG savings. Insulation won't be a major part of carbon capture projects, but CenterPoint is always open to further ideas. Carbon capture systems would be deployed at large industrial facilities and would keep close track of CO_2 that has been captured and disposed of but that wouldn't happen at the household level.
7. Question: Is CenterPoint going to sell the captured carbon?
   a. Answer: For commercial customers, CenterPoint would give an incentive to install carbon capture. Then there would be an agreement for another entity to receive that carbon; that other entity would use that carbon as part of a process to produce an end product, and they would make money off of that product, not the carbon itself. CenterPoint Energy will not sell the environmental attributes associated with the captured carbon and would prohibit customers receiving incentives from reselling environmental attributes, to ensure that the environmental benefits stay in MN.
8. Question: How often do you plan to track the data?
   a. Answer: For energy efficiency and strategic electrification, there are well established methods and processes for claiming energy savings through CIP. CenterPoint plans to draw from the verification processes that they currently use for CIP, which are tiered by project size. CenterPoint would conduct upfront verification via established methodologies where they exist, and would propose alternative methodologies where they do not exist (e.g., commercial carbon capture with an energy efficiency component)
9. Question: Will tracking involve real data? How often would data be collected?
   a. Answer: In general, the large projects with large impacts would have site-specific data collected to inform GHG emissions reductions, rather than models. But smaller projects will generally involve models or assumptions about average savings.
10. Question: Some people will be electrifying and not using gas—For those people, would the pipeline be cut at a different source? Would fumes still be present? If so, how will that be monitored?
    a. Answer: Under the statute, a customer who electrifies must maintain gas backup, so that customer would not lose their gas connection, but would rely more on electricity and less on gas for their heating needs. The infrastructure would not be eliminated—it would be maintained "just in case," with the general expectation that customers will use electric heating as needed in the shoulder months, but will need gas on very cold winter days. Fumes should not be present in the customer's house, and the customer should have a carbon monoxide detector. Any active parts of the gas distribution would remain under CenterPoint's safety/monitoring protocols; a reduction in gas used would not mean that safety standards would be reduced.

Final Thoughts & Next Steps

1. Any overall questions/feedback after the third and final regulatory parties engagement meeting as CenterPoint is working towards their filing (targeting late June)?
    a. Question: Could CenterPoint circulate a proposed schedule for interested parties to keep us on track? There is a lot to balance between NGIA, future of gas, gas resource planning, ECO triennial filings, etc.
    b. Answer: CenterPoint supports this idea—How long do parties think they'll need to review the first filing?
        i. 60–90 days
        ii. Preference that the proposed schedule be filed with the Commission
        iii. Suggestion that a larger group propose this schedule, so it is not coming just from CenterPoint
2. CenterPoint requests that meeting attendees complete the Innovation Plan Engagement Meeting Survey (survey link available here)—this is the same survey provided following the all-parties public engagement meeting held on Friday, May 12.
    a. Please submit additional feedback via the survey, which will be sent out after the meeting.
    b. Survey responses due **Friday, May 26, 2023.**
3. Participants and other interested parties may reach out with further questions and/or feedback via the email address dedicated to this initiative: InnovationPlan@CenterPointEnergy.com.
4. GPI will prepare a meeting summary which will be provided to participants.