Climate Action Plan 2.0

Appendix 3

Eugene Community Climate Action Plan 2.0 Fossil Fuel and Greenhouse Gas Reduction Forecast, 2018 – 2030 for Existing Plans, Policies, Programs and Opportunities for Additional Actions Towards CRO Goals

PLEASE NOTE: This appendix was edited July 23, 2020 to reflect a numeric error found in Figure 1, which edits Eugene's 2017 Fossil Fuel use from 9 million MMBTU to the correct figure, 13.5 million MMBTU found in Figure 3.

Appendix 3: Eugene Climate Action Plan 2.0
Fossil Fuel and Greenhouse Gas Reduction Forecast, 2018 – 2030 for Existing Plans, Policies, Programs and Opportunities for Additional Actions Towards CRO Goals

Date: October 22, 2019

Note: *During the data collection and analysis portion of preparing this document, the entities that make up the group currently known as "Eugene Climate Collaborative (ECC)" are referred to as "Large Lever Shareholders (LLS)" throughout this document.*

INTRODUCTION

The intent of this memo is to show how close the community gets to accomplishing the Climate Recovery Ordinance (CRO) fossil fuel targets and greenhouse gas (GHG) goals through existing and planned actions of the Large Lever Shareholders (LLS). Our team reviewed LLS plans, policies, and programs, and collected additional data to calculate fossil fuel and GHG emissions reductions. These are used to forecast emissions between 2018 and 2030 and compare that forecast to CRO targets. In addition, this memo also provides suggestions for additional community climate actions towards meeting the goals and targets defined in the CRO.

EUGENE CLIMATE RECOVERY ORDINANCE TARGETS AND GOALS

Updated in 2016, Eugene's Climate Recovery Ordinance includes the following goals and targets:

Section 6.675 Climate Recovery – ***Climate Action Goals***

> *(3) By the year 2030, all businesses, individuals, and others living or working in the city collectively shall* ***reduce the total (not per capita) use of fossil fuels by 50%*** *compared to 2010 usage.*
>
> *(4) By the year 2100, total community greenhouse gas emissions shall be average share of a global atmospheric greenhouse gas level of 350ppm, which is estimated in 2016 to require an* ***annual average emission reduction level of 7.6%.***

Section 6.685 Climate Recovery – ***Targets & Benchmarks***

To reach the climate action goals, the city council adopts the targets and benchmarks contained in subsection (1) of this section, and the city will take other actions that the council determines are necessary, for achieving the targets, benchmarks and other climate action goals.

> ***(1) Targets and benchmarks:***
> ***Reduce fossil fuels 50% (from 2010 levels by 2030)***
> - ***2020: 25% reduction from 2010***
> - ***2025: 38% reduction from 2010***
> - ***2030: 50% reduction from 2010***
> - ***Annual Average, 2010 - 2030: 2.5% reduction***

The CRO does not clearly define the inventory boundaries that align with CRO goals and targets (i.e. what geographic boundaries and type of emissions sources are included in the goal). Therefore, Good Company made a preliminary interpretation for the fossil fuel use targets and report based on both the Eugene Community's Sector-

based and Consumption-based GHG Inventories. *Note: Good Company's interpretation of the CRO GHG Goal should be considered preliminary and subject to change.*

For the purpose of the analysis conducted and presented in this memo the following was assumed:

- CRO fossil fuel targets are based on the fossil fuels combusted within the City's geographic boundary plus fossil fuels used to generate electricity that serves retail load within the City's Urban Growth Boundary.
- Fossil fuel use for electricity is calculated based on EWEB's current and planned (2017 IERP update) supply contracts (market-based electricity accounting). EWEB's utility-specific GHG emissions factor (GHGs / MWh) is provided by Oregon Department of Environmental Quality (ODEQ). ODEQ does not provide a corresponding fossil fuel use factor (MMBTU / MWh) for EWEB, so one was calculated using ODEQ's GHG factor and using natural gas electricity generation as a proxy.
- CRO GHG emissions reduction goals are calculated using 2017 as the baseline year with annual reductions of 7.6% applied to the prior year, not the baseline year; out to 2100. This rate of reduction is applied to sector-based and consumption-based emissions. Note: The fossil fuel use targets and GHG goals have different reduction rates therefore there are slight differences between fossil fuel use and Sector-based GHG graphics in this memo.

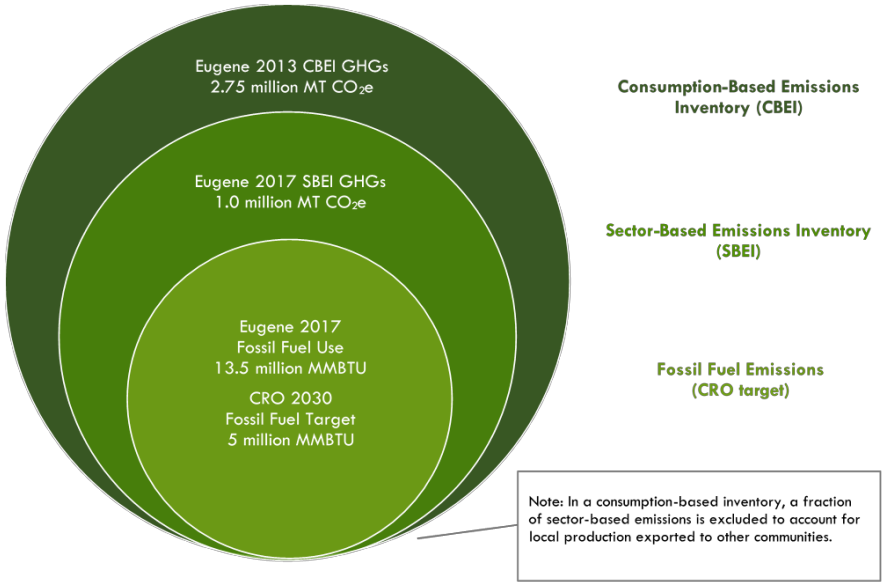
Relationship Between GHG Inventories and CRO Fossil Fuel Target

Figure 1 shows the relationship between the two types of GHG inventories conducted for the Eugene community (Sector-based and Consumption-based) and Eugene's CRO Fossil Fuel Target. As can be seen, the CRO Fossil Fuel Target (CRO Target) is a subset of the Sector-based emissions inventory (SBEI), which is a subset of the Consumption-based emissions inventory (CBEI). The two types of inventories conducted for Eugene is consistent with the State of Oregon's reporting approach. The two inventory types include:

- **Sector-based GHG Inventory** (or local GHG emissions) include GHGs from local fossil fuel combustion (homes and cars) in addition to other local sources of community GHG emissions (e.g. refrigerant gas leaks, landfill methane, etc.). Sector-based emissions are a subset of the largest boundary, Consumption-based emissions.
    - **Local fossil fuel use** is the biggest contributor to the communities Sector-based GHGs (~90%). This boundary is accounted for separately to align with the CRO's fossil fuel targets.
- **Consumption-based GHG Inventory** (or local + imported GHG emissions) include local, Sector-based emissions in addition to "imported" GHG emissions. The imported fraction accounts for GHGs generated elsewhere to produce and transport the goods and food consumed locally in Eugene. Consumption-based GHG inventories are more comprehensive view of the Eugene community's GHG emissions compared to a Sector-based GHG inventory but are also more difficult to accurately account for over time (to track progress towards goals) and the sources of emissions are outside of the Eugene community's direct control which makes taking action to reduce these actions more challenging.

As can be seen in Figure 1, imported, consumption-based emissions are more than 2x local emissions.

Figure 1: Relationship between GHG inventory types and local fossil fuel use.



Note: Circles in figure not to scale - see right-hand text for scale comparison.

EXISTING POLICY FORECAST FOR LOCAL EMISSIONS (SECTOR-BASED)

Figure 2 compares actual 2010 and 2017 community fossil fuel use and the 2030 forecast fossil fuel use after currently adopted plans are implemented to the 2030 CRO fossil fuel target. Existing plans are projected to achieve 40% of the CRO 2030 Target reductions compared to 2010 levels.

Figure 2: Comparison of actual and forecast fossil fuel use to CRO targets.

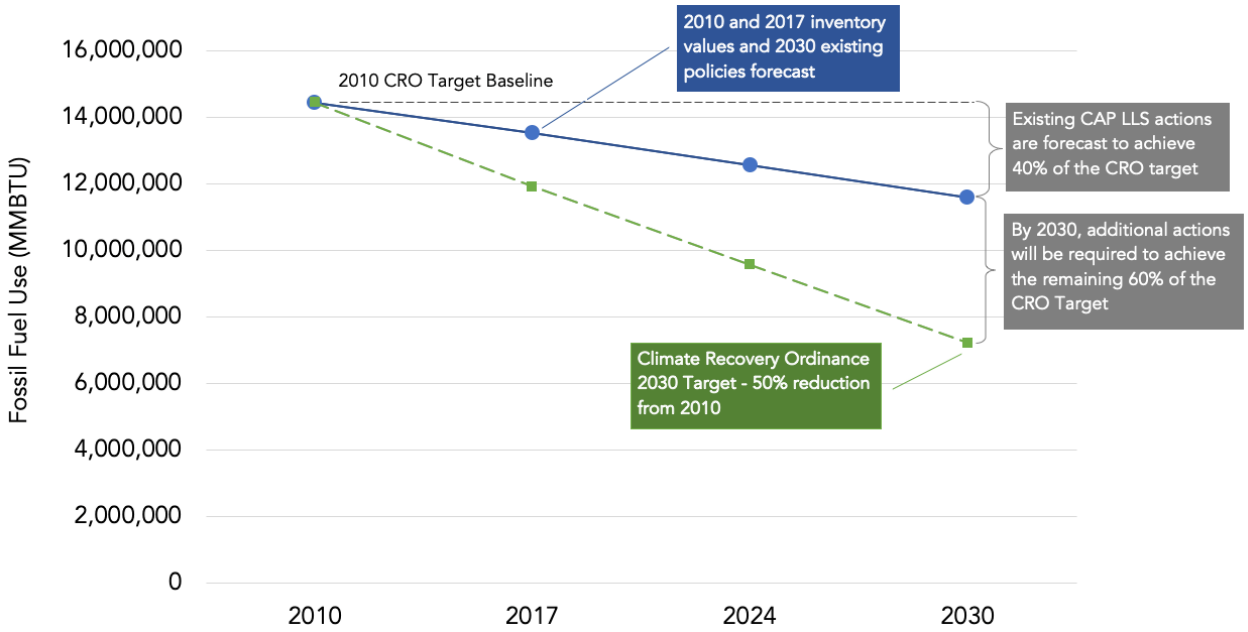


Figure 3 shows Eugene's Fossil Fuel Reduction Forecast for 2030 in greater detail than Figure 2. The y-axis minimum is set equal the CRO GHG 2030 Goal (green dashed line).

The first bar (grey) shows 2017 Fossil Fuel use (in millions of British thermal units, MMBTU). The second bar (blue) shows the increase of fossil fuel use based on a 'Business as Usual' (BAU) forecast of GHGs between 2018 and 2030, which represents the fossil fuel use effect of community population growth. In Eugene population is expected in increase by about 1% annually between 2018 and 2030. The third bar (grey) shows 2030 forecast emissions

assuming 2017 GHG rates and additional population. The fourth bar (orange) shows the expected GHG reductions from actions identified through the CAP2.0 process. For details of included actions see Appendix A, Figure 12. The fifth bar (grey) shows the forecast of GHGs in 2030 post CAP2.0 implementation of existing policies.

As can be seen, existing CAP2.0 policies are not forecast to achieve CRO fossil fuel use targets. A "gap" remains equal to about 4.4 million MMBTU of fossil fuel energy use.

Figure 3: Comparison of actual and forecast fossil fuel use to CRO targets.

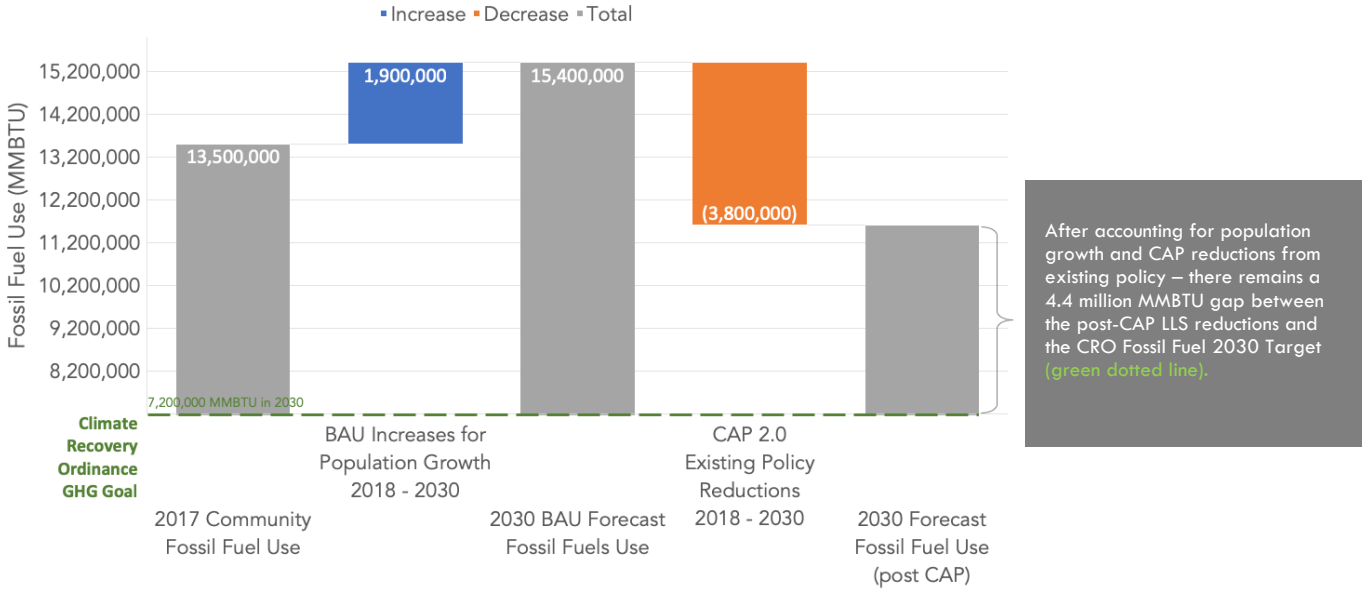


Figure 4 (next page) shows Eugene's GHG Reduction Forecast for local, Sector-based GHGs[1]. The y-axis minimum is set equal to the CRO GHG 2030 Goal. The bars in Figure 4 are the same as Figure 3, except that they represent community GHG emissions instead of fossil fuel use (in metric tons of carbon dioxide equivalent, MT CO_2e).

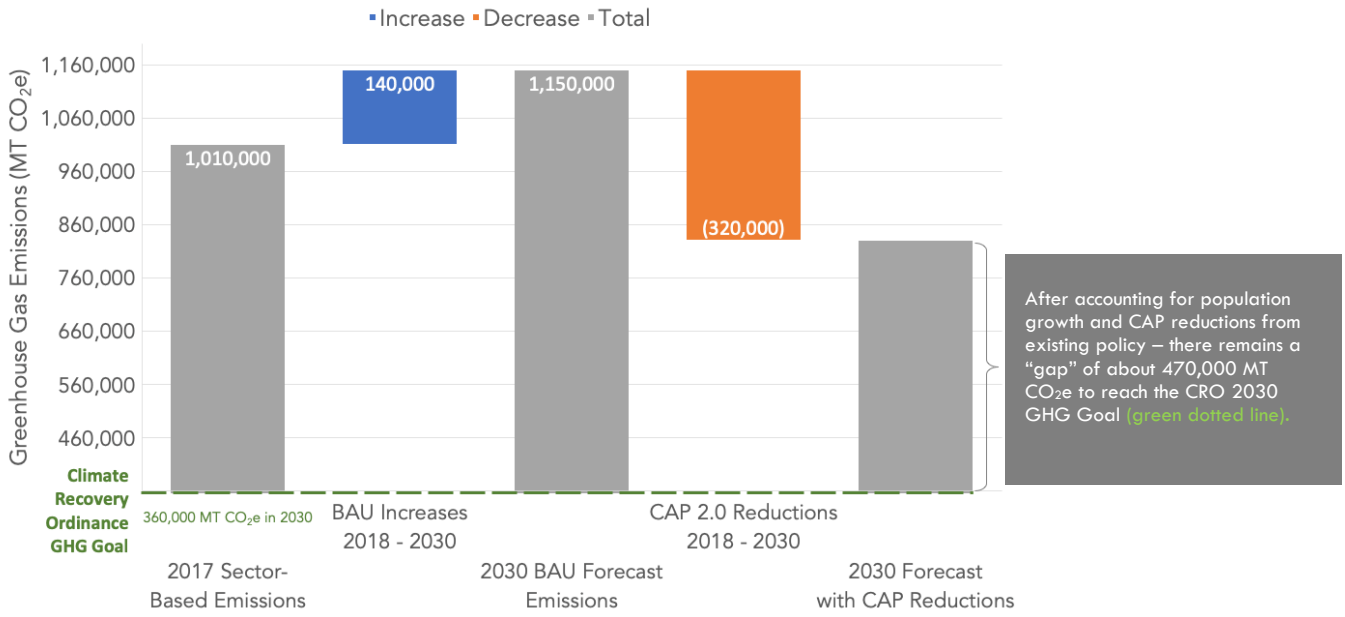
The rates of reduction are different between the Targets (2.5% annually from a 2010 baseline) and the GHG goals (7.6% annually from a 2016 baseline). It's important to note that because the GHG goals are more aggressive than the fossil fuel targets, and that local sources of GHGs are greater than just fossil fuel use (e.g. methane from waste disposal, fugitive refrigerant loss, etc.), progress towards the GHG goal is less than the CRO fossil fuel targets.

As can be seen, existing CAP2.0 policies are not forecast to achieve CRO GHG goals. A "gap" remains equal to about 470,000 MT CO_2e of local GHG emissions.

Figure 4: Sector-based emissions and existing policy forecast.

Note: GHG Goal value in figure based on Good Company CRO interpretation and is subject to change.

[1] For details see Eugene's 2017 Community GHG Inventory. Eugene's 2015 Community inventory may be downloaded at https://www.eugene-or.gov/2170/Climate-Recovery-Resources



Note: GHG Goal value in figure based on Good Company CRO interpretation and is subject to change.

To address the gap, City of Eugene asked Good Company to recommend additional actions to achieve CRO goals and targets by 2030. See GC memo titled *Recommendations for Additional Eugene Climate Actions to Meet Eugene's Climate Recovery Ordinance Targets and Goals* for a full list of recommended actions. City staff selected a group of Good Company's recommended actions.

Figure 5 and Figure 6 show the "gap" actions and scenarios considered.

The top row of Figure 5 lists the local, Sector-based GHG and Fossil Fuel Use gaps (470,000 MT CO_2e and 4.4 million MMBTU respectively). These values correspond to the far right-hand grey bars on Figures 3 and 4. The lower rows in Figure 5 describe the action and scenario; corresponding GHG / fossil fuel reduction; and the percentage of the gap addressed by the action/scenario.

Figure 6 graphically presents the same information as Figure 5 for a select group of actions. The left-hand grey bar is equal to the local, Sector-based CRO gap. The other bars compare the scale of reduction potential for actions / scenarios to the gap. As can be seen, some of the larger actions include State of Oregon adoption of a Cap-and-Invest program[2]; community adoption of electric vehicles; and community participation in Northwest Natural's Smart Energy program.

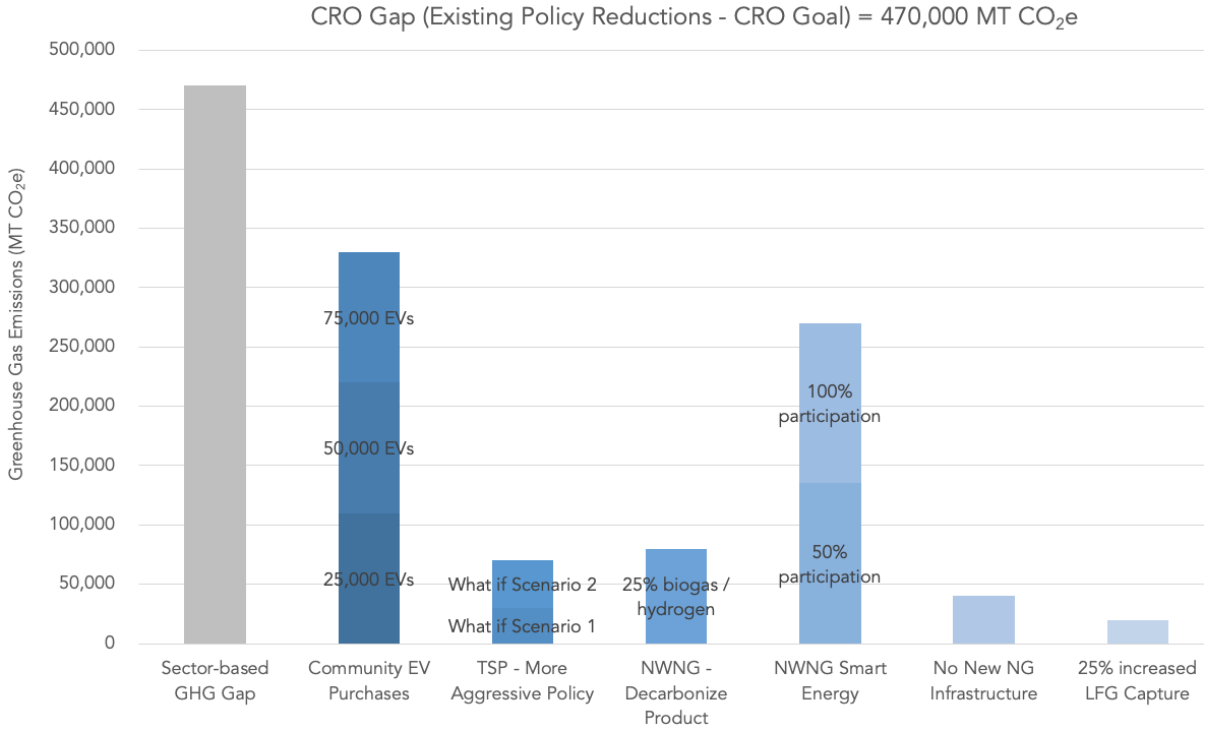
It's important to note that, as of this writing, passage of an Oregon Cap-and-Invest bill (or similar legislation) is highly uncertain. Inclusion of this strategy in this document should not be interpreted as an assumption about the potential of legislation being implemented. It is presented here as an information item to address broad community interest.

Figure 5: Sector-based GHG and Fossil Fuel Use Gap compared to additional actions / scenarios.

[2] HB2020 introduced in 2019 as this analysis was being prepared, but did not pass into Oregon law. Inclusion of this strategy in this document should not be interpreted as an assumption about the potential of similar legislation becoming Oregon law. It is presented here as an information item to address community interest and questions.

Annual Gap - Sector-based GHGs and Fossil Fuel Use	470,000 MT CO2e		4,400,000 MMBTU	
	MT CO2e	% of Gap	MMBTU	% of Gap
Building Actions				
Scenario 1: NWNG - 50% Reduced NG infrastructure investment	(20,000)	-4%	(300,000)	-7%
Scenario 2: NWNG - 100% Reduced NG infrastructure investment	(40,000)	-9%	(700,000)	-16%
Scenario 1: NWNG SmartEnergy - 50% participation	(140,000)	-30%	*Action does not reduce FF use	
Scenario 2: NWNG SmartEnergy - 100% participation	(270,000)	-57%	*Action does not reduce FF use	
Scenario 1: NG Appliance Fee, 2020 - 2030	(130,000)	-28%	(2,400,000)	-55%
Scenario 1: Reduce Carbon Intensity of NWNG Product (25% biomethane)	(80,000)	-17%	(1,500,000)	-34%
Scenario 2: Reduce Carbon Intensity of NWNG Product (50% biomethane)	(160,000)	-34%	(2,900,000)	-66%
Scenario 1: Prohibit Financial Incentives for New NG Equipment	*More information required*			
Scenario 1: Increase franchise fee to fuel switch away from NG	*Not modeled per staff guidance*			
Scenario 1: Home Energy Score	(10,000)	-2%	80,000	2%
Transportation Actions				
Scenario 1: TSP What if 1 (in addition to Adopted)	(30,000)	-6%	(400,000)	-9%
Scenario 2: TSP What if 2 (in addition to Adopted)	(70,000)	-15%	(1,000,000)	-23%
Scenario 1: 25,000 additional EVs beyond TSP	(110,000)	-23%	(1,300,000)	-30%
Scenario 2: 50,000 additional EVs beyond TSP	(220,000)	-47%	(2,500,000)	-57%
Scenario 3: 75,000 additional EVs beyond TSP	(330,000)	-70%	(3,800,000)	-86%
Produce Use Actions				
Scenario 1: Refrigerant recharge fee to purchase carbon offsets for 100% of GHGs	(80,000)	-17%	*Action does not reduce FF use	
Waste Actions				
Scenario 1: Landfill gas capture efficiency increases by 10%	(10,000)	-2%	*Action does not reduce FF use	
Scenario 2: Landfill gas capture efficiency increases by 25%	(20,000)	-4%		
Overarching Action				
Scenario 1: Oregon Cap-and-Invest (Draft SB 557, Section 4 goals) *Note: An Oregon Cap-and-Invest program would reduce climate impacts in Eugene using many of the same LLS actions already considered and counted in the LLS forecast. Therefore GHG reductions a Cap-and-Invest policy should not be viewed as wholly independent and additive to existing LLS actions. The Cap-and-Invest program will be complimentary - providing regulatory and financial support towards climate action, but the reductions presented in this row are not 100% additive to reductions previously presented for existing LLS actions.*	*(430,000)*	*Indeterminate. Cap-and-Invest reductions overlap with other LLS and gap filling actions*	*(7,200,000)*	*Indeterminate. Cap-and-Invest reductions overlap with other LLS and gap filling actions*
	*This column shows max cumulative potential in 2030		*This column shows max cumulative potential in 2030	

Figure 6: Sector-based GHG and Fossil Fuel Use Gap compared to additional actions / scenarios.



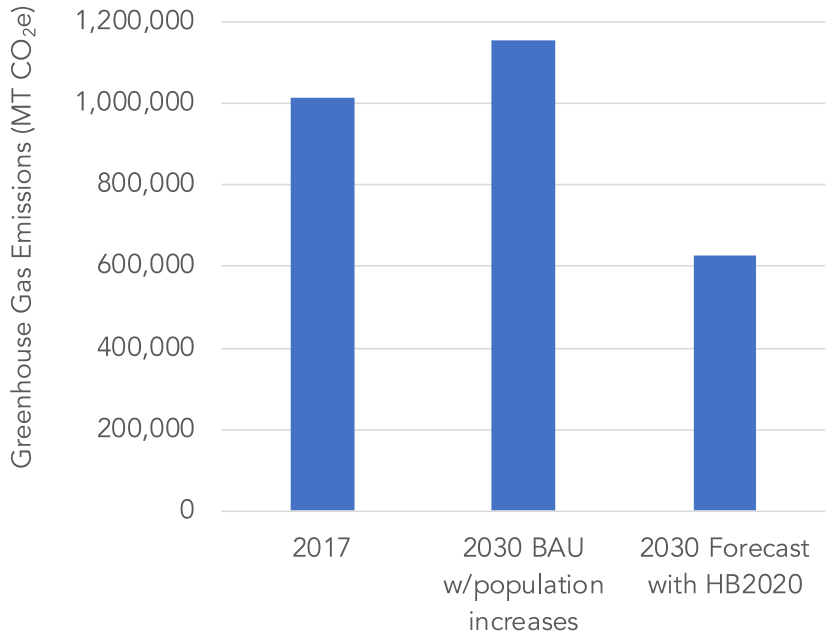
Note: NWNG's Smart Energy program reductions are only applicable to NWNG direct customers and does not include "transport" gas. NWNG "transports" through its pipelines for Eugene natural gas customers who contract with gas suppliers other than NWNG.

Figure 7 presents projected 2030 Eugene GHGs, post-implementation of HB2020. HB2020 was actively in the legislative process as early drafts of this report were being prepared, but ultimately HB2020 di not pass. The introduced text[3], and specifically the goals in Section 1, are used to estimate GHG reductions. To estimate reduction for Eugene it is assumed that citizens of Eugene (on a per capita) basis will be required to reduce emissions at the same rate and in the same amount as all other Oregonians towards the goals stated in Section 1 of HB2020.

The scaling below *may* overestimate the mitigation reductions due to assumed electricity emissions reduction potential based on higher statewide electricity emissions than EWEB's very-low emissions electricity. Alternatively, the Cap and Trade program, *could* recognize Eugene's unique lower carbon electricity sector and finance deeper mitigations for transportation than in other communities to ensure the overall reductions per capita are roughly even around the state.

[3] Downloaded 4/2019 from https://olis.leg.state.or.us/liz/2019R1/Measures/Overview/HB2020.

Figure 7: Eugene's 2017 sector-based GHGs and estimated effects in 2030 post-HB2020 implementation. Note: The following figure is meant to provide a sense of scale comparison to show how emissions reductions from HB2020 would have impacted Eugene's community emissions. This bill did not pass and therefore this information should not be used for community planning purposes other than to illustrate how similar, future bills might change community emissions.



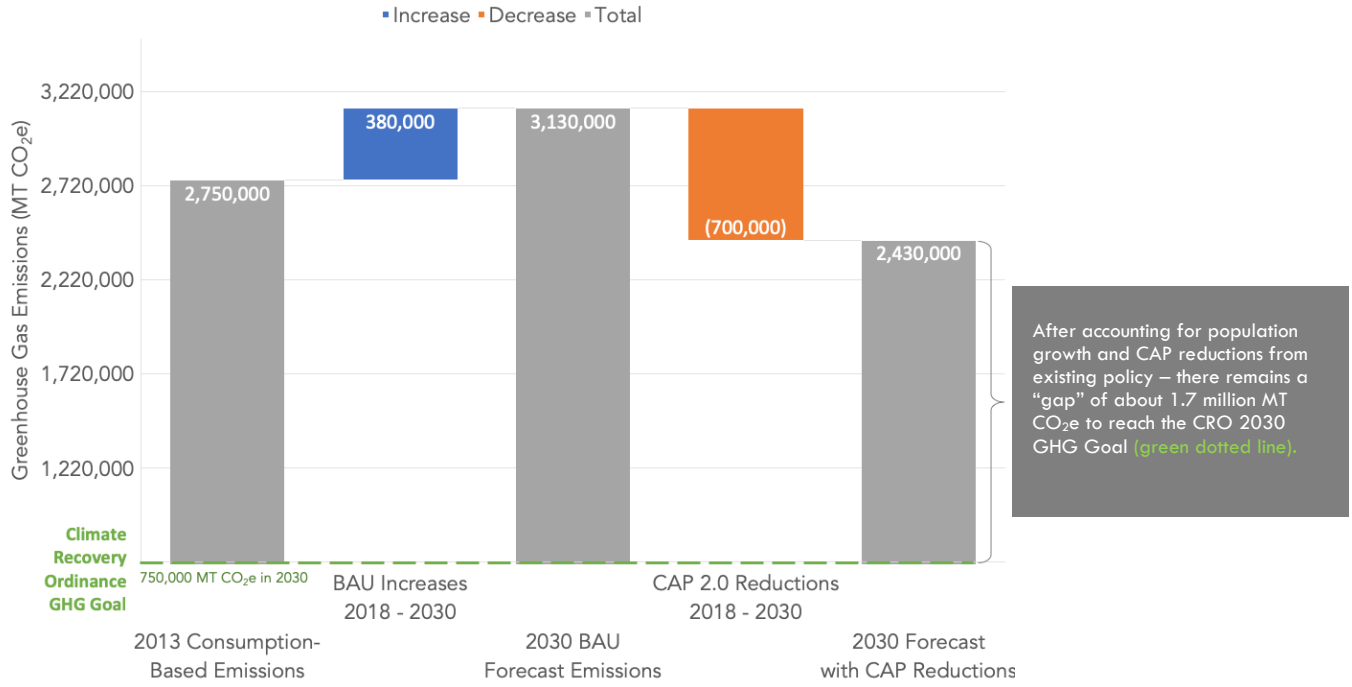
EXISTING POLICY FORECAST FOR LOCAL+IMPORTED EMISSIONS (CONSUMPTION-BASED)

Figure 8 shows Eugene's 2013 consumption-based emissions of goods and food; projected growth based on 2017 emissions rates and population increases; and forecast reductions from existing, already adopted policy. Note that Figures 3 and 4 (Sector-based) are subsets and included in the consumption-based emissions presented in Figure 7 (Consumption-based).

As can be seen, existing CAP2.0 policies are not forecast to achieve CRO GHG goals. A "gap" remains equal to about 1.7 million MT CO_2e of local + imported GHG emissions. As the City and community consider the consumption-based GHG gap, it's important to reiterate that the "imported" fraction of consumption-based GHGs are produced largely outside of the Eugene community's control.

While there are point of purchase decisions and actions that members of the Eugene community can make to reduce the community's consumption-based emissions (such as buying used products instead of new or choosing lower-carbon foods) – there is no currently known way to reduce Eugene consumption-based emissions to zero outside of domestic and international climate policies. If the City / community were to select consumption-based GHGs as the basis for CRO goals it will require the community devising a means to influence or control the energy systems in other states and counties to reduce the GHGs generated in those places as they produce goods for consumption here. It's important to recognize that there isn't any precedent for consumption-based emissions being used as the basis for community goal setting or action planning.

Figure 8: Consumption-based emissions and existing policy forecast.



Note: GHG Goal value in figure based on Good Company CRO interpretation and is subject to change.

Figure 9 and Figure 10 show the "gap" actions and scenarios considered for consumption-based emissions. Since Sector-based GHGs are a subset of Consumption-based emissions, previously discussed Sector-based actions are also a means to reduce Consumption-based emissions.

The top row of Figure 9 lists the Consumption-based GHG gap (1.7 million MT CO_2e). This value corresponds to the far right-hand grey bar on Figure 7. The lower rows describe the action and scenario; corresponding GHG reduction; and the percentage of the gap addressed by the action/scenario.

Figure 9: Sector-based GHG and Fossil Fuel Use Gap compared to additional actions / scenarios.

Annual Gap - Consumption-based GHG Gap	1,700,000	MT CO2e
	MT CO2e	% of Gap
Consumption and Materials Management Actions		
Reduce the average size of new single-family homes (from 2,300 to 1,600 sqft.)	(50,000)	-3%
Eugene optimizes the solid waste system to minimize GHGs	(90,000)	-5%
Scenario 1: 25% of community reduces meat and dairy by 25%	(10,000)	-1%
Scenario 2: 50% of community reduces meat and dairy by 50%	(40,000)	-2%
Scenario 3: 100% of community reduces meat and dairy by 100%	(170,000)	-10%
Community reduces 100% of edible food waste	(50,000)	-3%
Community reduces the carbon intensity of concrete products	*Data not readily available*	
U.S. Remains in Paris Accord	*(550,000)*	*-32%*

*This column shows max cumulative potential in 2030

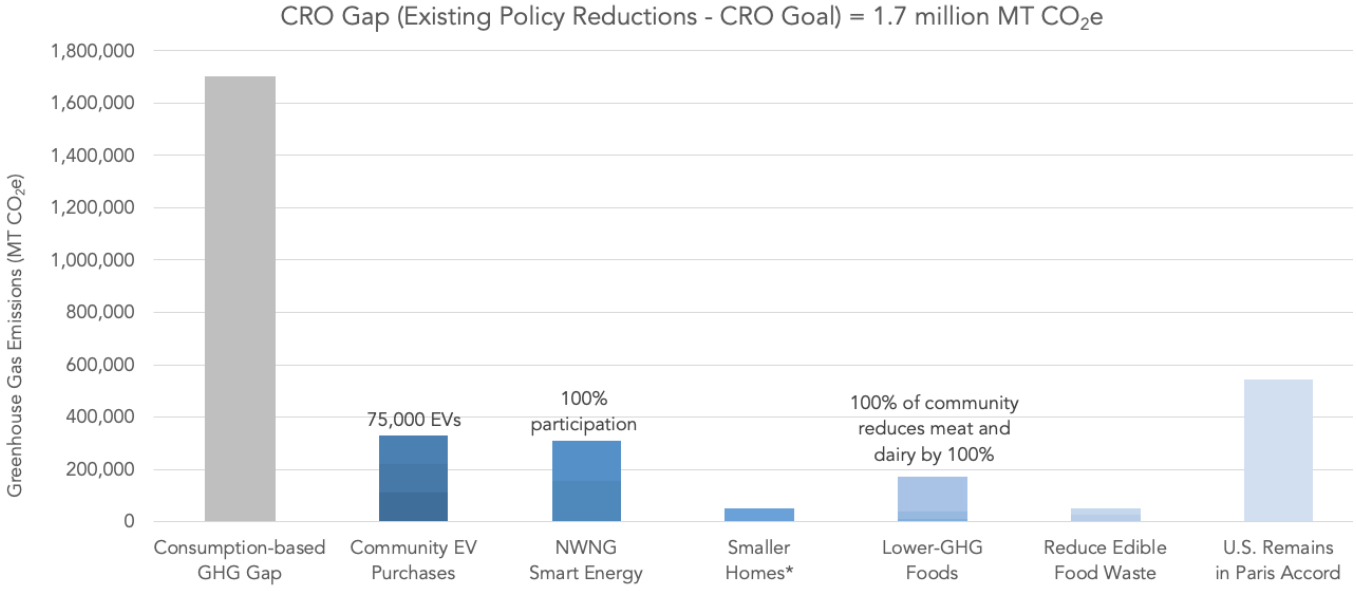
Figure 10 graphically presents the same information as Figure 9 (for a select group of actions). The left-hand grey bar is equal to the local, Sector-based CRO gap. The other bars compare the scale of reduction potential for actions / scenarios to the gap. As can be seen, some of the larger actions include U.S. remaining in the Paris Climate Accord;

community adoption of electric vehicles; community participation in Northwest Natural's Smart Energy program; lower-GHG food choices; and reduction in the amount of edible food waste.

One action of note on Figure 10, is U.S. participation in the Paris Climate Accord and the significance of domestic and international climate policy in general. The U.S. is currently in the process of withdrawing from the Paris Climate Accord. Oregon imports about 44% of its goods from U.S. states outside of Oregon.[4] If the U.S. were to remain in the Accord, the reductions required by the Accord would have had the effect of reducing GHGs from U.S. energy systems thereby lowering the amount of GHGs emitted during the production of the goods imported from other U.S. states into Eugene.

Eugene's consumption-based emissions are primarily a function of the fuels used to generate the energy used to produce goods imported to Eugene for local consumption. Because Eugene has limited control over other states' Energy systems – Federal climate policy, or state level policy in other states is required if Eugene is to reach CRO goals for consumption-based emissions.

Figure 10: Consumption-based GHG and Fossil Fuel Gap compared to additional actions / scenarios.

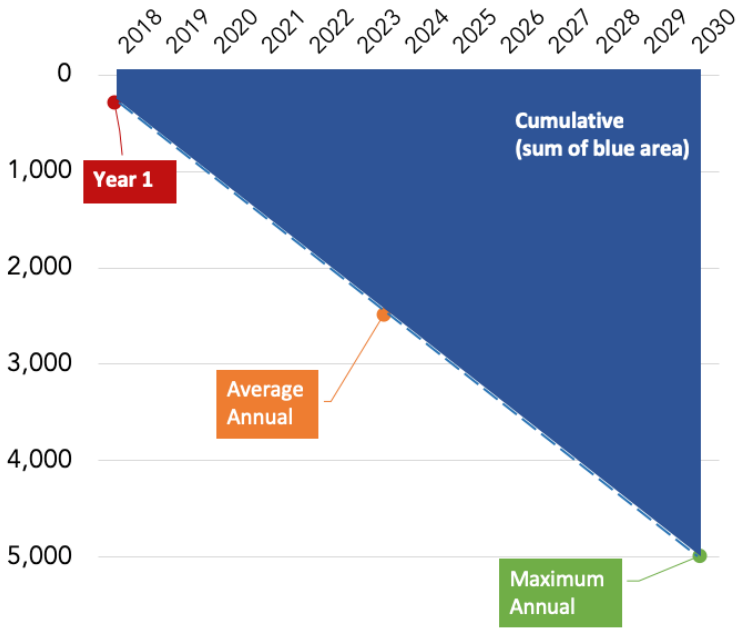


[4] Oregon's Greenhouse Gas Emissions through 2015. Available for download at https://www.oregon.gov/deq/FilterDocs/OregonGHGreport.pdf.

APPENDIX A – EXISTING POLICY FORECAST DETAILS

Fossil fuel and GHG reductions are calculated in four ways for this memo, which are illustrated in Figure 11 and presented in Figure 12. "Year 1" represents reductions expected during the first year of project implementation. "Average Annual" is the annual average of reductions over the life of the action. "Maximum Annual" is the maximum annual reduction in 2030. For some projects, like wastewater biomethane to the natural gas pipeline, Year 1, Average, and Maximum values will all be very similar because almost all of the benefit is realized the moment the system is turned on and every year after for the action. Other actions accumulate over time, such as annual work done to improve the energy efficiency of our community's buildings. These will have different Year 1 and Maximum values because budgets require that the actions are implemented over time.

Figure 11: Illustration of GHG reduction over time.



The following documents and tools were used to calculate reductions. Additional details in Appendix B.

- City of Eugene's 2010 and 2017 Sector-based Community Greenhouse Gas Inventories
- City of Eugene's 2013 Consumption-based Community Greenhouse Gas Inventory
- Portland State University – Population estimates and Lane County Population Forecast
- EWEB Integrated Energy Resource Plan – 2017 update
- NWN's 2018 Integrated Resource Plan
- Eugene 2035 Transportation System Plan (specifically a memo titled "*Eugene Transportation System Plan as it Relates to Climate Recovery Ordinance Goals*")
- City of Eugene, Fleet Internal Climate Action Plan
- City of Eugene, Facilities GHG Reduction Analysis
- Oregon Senate Bill 263 (2015) – Updates to Opportunity to Recycle Act
- City of Eugene / Good Company GHG inventory and analysis for road materials
- Lane County data related to landfill diversion rates and plans for 2025 goal
- Environmental Protection Agency, Waste Reduction Model (v14)
- Interviews with City's staff related to urban forestry
- Oregon's Waste Composition Study for Lane County
- Good Company GHG analysis of wastewater biomethane utilization pathways for MWMC
- City of Eugene Love Food Not Waste program data
- Lane Community College, DRAFT 2018 Climate Action Plan
- Envision Eugene, Residential housing projections
- Oregon Department of Environmental Quality, Oregon's 2018 Greenhouse Gas Inventory
- Oregon Department of Environmental Quality, EWEB emissions coefficients
- Environmental Protection Agency, eGRID 2016
- Energy Information Administration's 2017 Annual Energy Outlook
- Many other organizational documents were reviewed but were not used for reduction calculations. Thank you to everyone who provided information.

Figure 12: Detailed summary of existing plans, by lead organization. For some of the line items, like the Eugene TSP, implementation will be delivered by multiple agencies.

Large Lever Shareholders Plans and Strategy Bundles	Greenhouse Gas (MT CO_2e)				Fossil Fuel Use (MMBTU)			
	Year 1 Potential	Average Annual 2018 - 2030	Maximum Potential, 2030	Cumulative Potential 2018 - 2030	Year 1 Potential	Average Annual 2018 - 2030	Maximum Potential, 2030	Cumulative Potential 2018 - 2030
Eugene Water and Electric Board (EWEB)								
Future Energy Conservation (market-based)	(200)	(1,000)	(2,500)	(17,000)	(3,700)	(14,000)	(27,000)	(190,000)
Future Energy Conservation (location-based)	*(4,000)*	*(22,000)*	*(44,000)*	*(290,000)*	*Not applicable to CRO target*			
Operational Fleet / Facilities Climate Action	(1,000)	(1,000)	(2,000)	(8,000)	(7,000)	(8,000)	(20,000)	(290,000)
Northwest Natural (NWN)								
Future Conservation (cost effective resources only)	(1,100)	(8,000)	(15,000)	(100,000)	(21,000)	(150,000)	(280,000)	(1,960,000)
Cost Effective	*(1,100)*	*(8,000)*	*(15,000)*	*(100,000)*	*(21,000)*	*(150,000)*	*(280,000)*	*(1,960,000)*
Achievable (85% of total)	*(1,500)*	*(16,000)*	*(19,000)*	*(140,000)*	*(28,000)*	*(200,000)*	*(360,000)*	*(2,540,000)*
Technical Total	*(1,700)*	*(5,201)*	*(23,000)*	*(160,000)*	*(33,000)*	*(230,000)*	*(430,000)*	*(2,990,000)*
Smart Energy Program (5% participation rate)	(3,000)	(12,000)	(15,000)	(155,000)	*Not applicable to CRO target*			
Operational Reduction of Local Distribution Loss	(30)	(200)	(400)	(2,500)	(50)	(300)	(2,500)	(17,000)
City of Eugene								
Eugene 2035 Transportation System Plan*	(10,000)	(90,000)	(240,000)	(1,200,000)	(160,000)	(1,100,000)	(2,800,000)	(26,600,000)
Envision Eugene	Included in Eugene TSP modeling and Future Conservation							
Food Materials Management	(5,300)	(5,900)	(6,000)	(74,200)	Not applicable to CRO target			
Food Waste Composting	*(2,900)*	*(3,200)*	*(3,300)*	*(40,500)*				
Food Waste Avoidance	*(2,400)*	*(2,700)*	*(2,700)*	*(33,700)*				
City Operational Reductions	(1,200)	(2,000)	(4,000)	(34,000)	(23,400)	(40,000)	(57,000)	(520,000)
City Operational - Facilities	*(1,000)*	*(1,000)*	*(1,000)*	*(15,000)*	*(21,000)*	*(22,000)*	*(23,000)*	*(281,000)*
City Operational - Fleet	*(200)*	*(1,000)*	*(3,000)*	*(19,000)*	*(3,000)*	*(18,000)*	*(34,000)*	*(239,000)*
Roads - Materials Management	(1,300)	(1,300)	(1,300)	(16,700)	(5,100)	(5,100)	(5,100)	(66,000)
Urban Forest	(340)	(2,100)	(3,700)	(27,500)	Not applicable to CRO target			
30% Tree Canopy Goal	*(300)*	*(2,000)*	*(3,000)*	*(26,000)*				
World Track and Field - Tree Planting Offsets	*(40)*	*(200)*	*(300)*	*(2,000)*				
Lane County								
Material Management - 63% Recovery by 2035	(87,000)	(88,000)	(90,000)	(440,000)	Not applicable to CRO target			
Electric Vehicles in County Fleet	Not calculated. See Eugene > Fleet for sense of scale							
Roads - Materials Management	Not calculated. See Eugene > Roads for sense of scale							
INFO ONLY: Anaerobic Digestion of Food Waste	(2,900)	(3,000)	(3,100)	(18,000)	(40,000)	(41,000)	(42,000)	(246,000)
4J and Bethel School Districts								
Food Waste Composting	Supports and included with City of Eugene > Food				0	0	0	0
Bus Fleet & Fuels	Included in Eugene TSP modeling				Included in Eugene TSP modeling			
Lane Community College								
INFO ONLY: DRAFT Climate Action Plan Goals	(610)	(6,400)	(7,900)	(55,000)	(9,900)	(104,000)	(129,000)	(900,000)
Facilities	*(100)*	*(600)*	*(700)*	*(5,200)*	*(1,100)*	*(11,200)*	*(13,900)*	*(97,300)*
Owned Fleet	*(10)*	*(70)*	*(80)*	*(590)*	*(120)*	*(1,290)*	*(1,590)*	*(11,160)*
Student Commute	*(500)*	*(4,800)*	*(6,000)*	*(42,000)*	*(8,700)*	*(91,300)*	*(113,100)*	*(791,500)*
University of Oregon								
Climate Change Research and Teacking	Not calculated. See Appendix C for details							
Oregon Model for Sustainable Development and Campus Energy Efficiency	(200)	(1,000)	(2,000)	(10,000)	(3,000)	(20,000)	(40,000)	(250,000)
Metropolitan Wastewater Management								
Biogas to NG pipeline (project with NWN)	(6,000)	(5,000)	(7,000)	(69,000)	(82,000)	(86,000)	(90,000)	(944,000)
Lane Transit District								
Fleet & Fuels (electric bus substitution)	(100)	(400)	(900)	(4,700)	(11,700)	(49,600)	(49,600)	(645,300)
Route Efficiency	LTD to analyze in 2019							
State of Oregon								
Net-Zero Residential Building Code	(1,300)	(1,500)	(6,400)	(19,300)	(27,400)	(31,600)	(136,800)	(410,400)
Net-Zero Commercial Building Code	(2,500)	(2,800)	(12,300)	(36,800)	(40,900)	(47,200)	(204,700)	(614,000)
Clean Fuels Program	Included in Eugene TSP modeling				Not applicable to CRO target			
International Agreements								
Paris Climate Accord (reductions by trading partners)	(20,000)	(150,000)	(270,000)	(1,890,000)	Not applicable to CRO target			

*Note – Eugene TSP incorporates aspects of other LLS plans and policies (e.g. LTD planning, Envision Eugene, etc.)

PLEASE NOTE: This appendix was edited July 23, 2020 to reflect a numeric error found in Figure 1, which edits Eugene's 2017 Fossil Fuel use from 9 million MMBTU to the correct figure, 13.5 million MMBTU found in Figure 3.

APPENDIX B: METHODOLOGY AND ASSUMPTIONS

Large Lever Shareholder Existing Policy / Strategy / Action	Methodology Description	Assumptions
Eugene Water and Electric Board (EWEB)		
Future Conservation (Energy Efficiency)	Energy reduction calculated based on 2017 Annual IERP Update - Figure 1. The Figure shows that EWEB's future conservation will maintain electricity use at current levels through 2035. Roughly a 7% reduction from EWEB's 2017 BAU forecast. GHGs were calculated using both market-based and location-based emissions factors. Market-based factors are provided by Oregon Department of Environmental Quality based on EWEB supply contracts that serve local load for calendar years 2010 - 2016. The average of EWEB's 2010 - 2016 factors are used to project reductions from 2018 - 2030. Location-based factors are taken from U.S. Energy Information Administration's 2017 Annual Energy Outlook - 2050 projections for the Northwest Power Pool regional electricity grid.	- The average of EWEB's 2010 - 2016 market-based emissions factors is used to calculate GHG / fossil fuel reductions from future conservation for the years 2018 - 2030. - Fossil fuel factor for EWEB is calculated using the market-based factor (from ODEQ) and an assumption that the electricity is generated 100% from natural gas. ODEQ does not currently provide fossil fuel factors for specific utilitiies, only GHG factors.
Operational Climate Action (EWEB-owned buildings and vehicles)	EWEB's operational climate goals (50% fossil fuel reduction by 2030, and carbon neutral by 2050) are used in combination with EWEB's 2017 inventory to calculate future emissions reductions. EWEB's most recent GHG inventory shows they are ahead of schedule towards meeting their goals (http://www.eweb.org/Documents/Community/2017-ghg-inventory.PDF)	- EWEB achieves goals as written assuming average annual percentage progress towards the goals. - Future reductions exclude those from EWEB's decommissioning of the steam plant as those reductions are already accounted for in the 2017 Eugene Community Inventory. - Future reductions assume EWEB will continue purchaseing low-carbon vehicle fuels at current rates as well as take on additional actions in order to reach EWEB's state fossil fuel and GHG related goals.
Northwest Natural Gas (NWNG)		
Future Conservation (Energy Efficiency)	NWNG provided Energy Trust of Oregon reporting on conservation in Eugene for the period 2011 - 2017. Average annual conservation over that period is 214,000 therms per year. This average is applied to the 2018 - 2030 period to estimate additional future conservation. The range over this period was between 100,000 - 380,000 therms. On average ETO efficiency projects serve about 550 residential households, 35 commercial businesses, and 2 large-scale industrial / agricultural customers. ETO savings are assumed to be "cost effective" measures (i.e. those that pay for themselves and save money over the life of the equipment). There are also additional types of future conservation potential assessed by ETO called "achievable" and "technical". ETO's 2014 Resource Assessment is used to estimate additional local conservation resources that are more expensive that the "cost effective" category, but still represent an opportunity to reduce emissions and fossil fuel use.	- Assumes future conservation is implemented at a similar rate as the 2011 - 2017 period. - See NWNG's 2018 Integrated Resource Plan for additional details https://www.nwnatural.com/uploadedFiles/NW%20Natural%202018%20IRP.pdf
Smart Energy Program (5% participation)	2030 maximum reduction GHG / fossil fuel potential is calculated as 5% of annual emissions as projected for 2030. 2030 projected natural gas use is estimated with 2017 community natural gas use data scaled up 1% annually for the period 2018 - 2030 to account for projected population growth. Eugene community natural gas-related GHGs / fossil fuel use are taken from Eugene's 2017 Community Greenhouse Gas Inventory. Population growth projections are taken from Portland State University's Lane County Coordinated Population Forecast, 2015-2065.	- Community participation rate is 5% in 2030. This assumption was discussed and agreed upon with NWNG staff for the purpose of the existing policy forecast.
Operational Climate Action (5% upstream GHG reduction)	NWNG Climate Action Plan / Goal includes actions to plans to reduce upstream leakage of natural gas by 5%. This goal is applied to GHGs/fossil fuel use for the local distribution system as well as for the entire supply chain. Local distribution system loss estimated is reported by NWNG as 0.0061%. As a benchmark EDF User Guide for Natural Gas Leakage Rate Modeling Tool suggests an average value of 0.3% (https://www.edf.org/sites/default/files/US-Natural-Gas-Leakage-Model-User-Guide.pdf). So NWNG's local distribution system has far less leakage than the average. Total natural gas supply chain loss emissions are estimated using factors from ICLEI's U.S. Community GHG Inventory Protocol (i.e. upstream NG emissions are equal to about 12% of tailpipe emissions. 2030 projected natural gas use is estimated with 2017 community natural gas use data scaled up 1% annually for the period 2018 - 2030 to account for projected population growth. Eugene community natural gas-related GHGs / fossil fuel use are taken from Eugene's 2017 Community Greenhouse Gas Inventory. Population growth projections are taken from Portland State University's Lane County Coordinated Population Forecast, 2015-2065.	- Upstream emissions are calculated using the rates and sources previously described in methodology. - NWNG 5% planned reduction is assumed to be implemented in equal shares over the period of 17 years, 2019 - 2035.

Large Lever Shareholder Existing Policy / Strategy / Action	Methodology Description	Assumptions
City of Eugene		
Envision Eugene / Transportation System Plan	The CAP forecast uses the results from a previous modeling effort for Eugene's 2035 Transportation System Plan conducted by Lane Council of Governments, City of Eugene, and Oregon Department of Transportation staff. These results were presented in a 2/8/2018 memo titled *Eugene Transportation System Plan as it Relates to Climate Recovery Ordinance Goals.* The TSP modeling work considered three scenarios; 1) Adopted plans, 2) What if 1, and 3) What if #2. The "What if" scenarios consider similar actions as the adopted plans at a larger-scale and faster rate. Modeling results provided projected reductions for both GHGs and Fossil Fuel use.	- Assumptions are identical to those documented in the ODOT modeling analysis
Food Waste - Avoiding Edible Waste and Composting	Oregon Department of Environmental Quality's Waste Composition Study provides food waste quantities including the edible fraction of food waste (https://www.oregon.gov/deq/mm/Pages/Waste-Composition-Study.aspx). EPA's WARM v14 (waste reduction model) is used to calculate GHG reductions (https://www.epa.gov/warm/versions-waste-reduction-model-warm#WARM%20Tool%20V14).	- 25% of food waste will be recovered from the waste stream by 2030 to comply with the requirements of Oregon SB263. - 5% of edible food waste is avoided by the community at large as a result of City / County public outreach and education along with other related programming.
Operational Climate Action - Fleet	Good Company worked with City of Eugene to develop the *2018 Fleet Division and Fire Department Internal Climate Action Plan*. The plan focuses first use of telematics to drive operational efficiency and substitution of electricity for gasoline and renewable diesel for fossil fuel diesel. As of 2017 the City is about 60% towards the CRO's 2020 GHG goals and 90% towards the 2030 fossil fuel goals. The Fleet ICAP details the projected GHG and fossil fuel savings for various actions considered for the plan as well as the final scenario and actions selected to reach CRO goals and targets.	- See Fleet ICAP report for findings and details of modeling methodologies and assumptions (https://www.eugene-or.gov/DocumentCenter/View/38211).
Operational Climate Action - Facilities	Solarc worked with City of Eugene to develop the *2017 Facilities Greenhouse Gas Reduction Analysis*. Opportunities considered in the Analysis include energy efficiency, solar energy, as well as substitution of heat pumps for existing natural gas boilers. The Analysis includes projections for GHG and fossil fuel reductions as well as first costs and operational costs associated with a variety of actions to achieve CRO goals and targets.	- See Facilities ICAP report for findings and details of modeling methodologies and assumptions (https://www.eugene-or.gov/DocumentCenter/View/37360). - Scenario 3 from the Facilities GHG Analysis is used to represent City Facilities reductions in the CAP Forecast.
Road Construction - Low-GHG Material Use	Good Company worked with City of Eugene Public Works staff to collect materials-related data used in City construction projects and develop a simple Excel-based tool to calculate GHG reductions associated with substitution of lower-GHG materials for conventional cement and asphalt binder. The Excel-based tool utilizes factors from environmental product disclosures from National Ready Mixed Concrete Association (https://www.nrmca.org/sustainability/EPDProgram/) as well as Circular Ecology's *Inventory of Climate and Energy* (http://www.circularecology.com/embodied-energy-and-carbon-footprint-database.html).	- The analysis uses average, past GHG reductions and assumes similar results going forward.
30% Tree Canopy Goal	The amount of carbon currently stored in Eugene urban forest is provided by City of Eugene via a report using the i-Tree Landscape tool (https://landscape.itreetools.org/report/ef5518cd-7698-47a3-a372-16e29d228a77/sample/). Currently stored carbon is representative of 23% canopy coverage. A carbon to canopy ratio is used to estimate the additional carbon that will be stored by increasing the urban canopy to 30%. Note that these calculations only include carbon storage in the trees and do not include estimates of energy savings associated with shading from the additional canopy coverage.	- Eugene's urban tree canopy increases from 23% to 30% coverage by 2030 - Carbon storage in additional trees is at similar rates to existing
World Track and Field - Tree Planting	This action is aligned with the City's commitment to plan 2021 trees to offset emissions and commemorate the 2021 World Track event to be held in Eugene. The method and factors for calculating carbon storage in the additional trees is provided by U.S. Dept. of Energy's *Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings*.	- Tree type is assumes to be a fast growing conifer for all 2,021 trees - Carbon storage for these trees is limited to the growth period 2021 - 2030.

Large Lever Shareholder Existing Policy / Strategy / Action	Methodology Description	Assumptions
City of Eugene		
Envision Eugene / Transportation System Plan	The CAP forecast uses the results from a previous modeling effort for Eugene's 2035 Transportation System Plan conducted by Lane Council of Governments, City of Eugene, and Oregon Department of Transportation staff. These results were presented in a 2/8/2018 memo titled *Eugene Transportation System Plan as it Relates to Climate Recovery Ordinance Goals.* The TSP modeling work considered three scenarios; 1) Adopted plans, 2) What if 1, and 3) What if #2. The "What if" scenarios consider similar actions as the adopted plans at a larger-scale and faster rate. Modeling results provided projected reductions for both GHGs and Fossil Fuel use.	- Assumptions are identical to those documented in the ODOT modeling analysis
Food Waste - Avoiding Edible Waste and Composting	Oregon Department of Environmental Quality's Waste Composition Study provides food waste quantities including the edible fraction of food waste (https://www.oregon.gov/deq/mm/Pages/Waste-Composition-Study.aspx). EPA's WARM v14 (waste reduction model) is used to calculate GHG reductions (https://www.epa.gov/warm/versions-waste-reduction-model-warm#WARM%20Tool%20V14).	- 25% of food waste will be recovered from the waste stream by 2030 to comply with the requirements of Oregon SB263. - 5% of edible food waste is avoided by the community at large as a result of City / County public outreach and education along with other related programming.
Operational Climate Action - Fleet	Good Company worked with City of Eugene to develop the *2018 Fleet Division and Fire Department Internal Climate Action Plan*. The plan focuses first use of telematics to drive operational efficiency and substitution of electricity for gasoline and renewable diesel for fossil fuel diesel. As of 2017 the City is about 60% towards the CRO's 2020 GHG goals and 90% towards the 2030 fossil fuel goals. The Fleet ICAP details the projected GHG and fossil fuel savings for various actions considered for the plan as well as the final scenario and actions selected to reach CRO goals and targets.	- See Fleet ICAP report for findings and details of modeling methodologies and assumptions (https://www.eugene-or.gov/DocumentCenter/View/38211).
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Road Construction - Low-GHG Material Use	Good Company worked with City of Eugene Public Works staff to collect materials-related data used in City construction projects and develop a simple Excel-based tool to calculate GHG reductions associated with substitution of lower-GHG materials for conventional cement and asphalt binder. The Excel-based tool utilizes factors from environmental product disclosures from National Ready Mixed Concrete Association (https://www.nrmca.org/sustainability/EPDProgram/) as well as Circular Ecology's *Inventory of Climate and Energy* (http://www.circularecology.com/embodied-energy-and-carbon-footprint-database.html).	- The analysis uses average, past GHG reductions and assumes similar results going forward.
30% Tree Canopy Goal	The amount of carbon currently stored in Eugene urban forest is provided by City of Eugene via a report using the i-Tree Landscape tool (https://landscape.itreetools.org/report/ef5518cd-7698-47a3-a372-16e29d228a77/sample/). Currently stored carbon is representative of 23% canopy coverage. A carbon to canopy ratio is used to estimate the additional carbon that will be stored by increasing the urban canopy to 30%. Note that these calculations only include carbon storage in the trees and do not include estimates of energy savings associated with shading from the additional canopy coverage.	- Eugene's urban tree canopy increases from 23% to 30% coverage by 2030 - Carbon storage in additional trees is at similar rates to existing
World Track and Field - Tree Planting	This action is aligned with the City's commitment to plan 2021 trees to offset emissions and commemorate the 2021 World Track event to be held in Eugene. The method and factors for calculating carbon storage in the additional trees is provided by U.S. Dept. of Energy's *Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings*.	- Tree type is assumes to be a fast growing conifer for all 2,021 trees - Carbon storage for these trees is limited to the growth period 2021 - 2030.

Large Lever Shareholder Existing Policy / Strategy / Action	Methodology Description	Assumptions
Lane Community College		
DRAFT Climate Action Plan	Lane Community College's DRAFT Climate Action Plan has set a goal of carbon neutral operations by 2050. LCC's goal combined with LCC's most recent GHG inventory is used to estimate reductions in 2050 versus GHGs reporting in the baseline inventory.	- Assumes LCC will meet climate goals as written - Assumes an equal, average rate of reduction between 2017 to 2050. CAP Forecast only includes reductions for time period 2019 - 2030.
University of Oregon		
Oregon Model for Sustainable Development and Campus Energy Efficiency	UO staff provided data on building energy and GHGs for inventory years 2012 and 2018. These results show a significant decrease in campus use of natural gas over the time period. These decreases are largely attributed to UO's use of the Oregon Model for Sustainable Development and related campus energy efficiency projects. Campus capital improvements documents were reviewed for the historic square footage of new construction and rennovation projects as well as square footage for planned new construction and rennovation project through 2030. It was found that historic and planned projects are very similar. Therefore the rate of reductions achieved during the period 2012 - 2018 are used to project reductions for the 2019 - 2030 time period.	- Building and project types between histroic capital projects and future projects are largely similar.
Metropolitan Wastewater Management		
Biogas to NG pipeline (project with NWN)	Good Company worked with MWMC staff to perform a detailed GHG analysis and scenario comparison for a variety of potential uses for the community's wastewater treatment generated biogas supply. The analysis results are for the MWMC selected scenario, which is to inject the biogas into NWNG's pipeline to be used as a vehicle fuel. The GHG analysis considered all energy and process emissions sources required to produce the biogas, refine to biomethane quality, and credits the fuel for displacing conventional fossil diesel fuel.	- 100% of MWMC biogas is cleaned and injected into NWNG's pipeline - End-use for 100% of the biogas is to displace vehicle diesel fuel use
Lane Transit District		
Fleet & Fuels	LTD 2013 fuel use data - from the Eugene's 2013 Community Inventory - for buses is used in conjunction with ODEQ fuel carbon intensity scores to estimate reductions associated with shifting 50% of LTD's diesel use (B5) to Springfield Utility Board (SUB) electricity. Carbon intensity scores are provided by Oregon Department of Environmental Quality to support accounting for Oregon's Clean Fuels Program. NOTE: ODEQ's CI score for SUB electricity uses market-based accounting.	- By 2030 11 of LTD's 90 buses are fueled with electricity (or a comparable low-GHG fuel type). This subsitution is estimated to reduce LTD bus fuel use by about 10% from current levels.
State of Oregon		
Net-Zero Residential Building Code	Planned net-zero building codes will apply to future, yet-to-be constructed properties. Mitigation potential is calculated based on Eugene's average 2017 household emissions for energy. Average household emissions are calculated using Eugene's 2017 Community GHG Inventory and U.S. Census Bureau data. The number of new housing starts predicted for 2025 - 2032 is provided in a report titled Eugene Housing Needs Analysis prepared to support Envision Eugene. The study finds that roughly 15,000 new housing units are required in Eugene between 2012 - 2032. To estimate GHG / fossil fuel reductions for this actions, new housing starts projected for the 2025 - 2030 time period are assumed to have zero-net energy and GHGs. These reductions are only calculated for the period 2025 - 2030, but the reductions associated with this code will span the 70 year life of these new structures.	- Net-zero energy is equal to net-zero GHGs - New codes are implemented in 2025 - Assumed to not be included in existing EWEB load projections - Eugene housing needs, as defined in the analysis, are developed at a consistent rate over the study time period (i.e. 15,000 / 20 years = 750 units / year) - Composition of housing types are consistent with Table 28 in the Eugene Housing Needs Analysis
Net-Zero Commercial Building Code	Planned net-zero building codes will apply to future, yet-to-be constructed properties. Development projections for future, additional commercial space needs are not readily available. Future commercial building energy use are estimated for the period, 2019 - 2030 using 2017 commercial building emissions rates scaled up using a 1% annual compounding growth rate to account for new community population. Population growth projections are taken from Portland State University's Lane County Coordinated Population Forecast, 2015-2065. To estimate GHG / fossil fuel reductions for this actions, new housing starts projected for the 2025 - 2030 time period are assumed to have zero-net energy and GHGs. These reductions are only calculated for the period 2025 - 2030, but the reductions associated with this code will span the 70 year life of these new structures.	- Net-zero energy is equal to net-zero GHGs - New codes are implemented in 2025 - Assumed to not be included in existing EWEB load projections - Commercial building development and related energy needs are assumed to be equal to projected population growth