Hawaiian Telcom

ARCADIS

Climate Action Plan

Net Zero by 2040

July 1, 2023

Hawaiian Telcom

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Executive Summary

Hawaiian Telcom is a technology company that delivers integrated communications solutions over our copper and fiber optic networks, including high-speed Internet, video, voice, and data. It serves the entire state of Hawai'i. Building upon a long legacy of environmental responsibility and stewardship, Hawaiian Telcom made a commitment to be a net-zero carbon emitter by 2040 and embarked on a path to reduce greenhouse gas (GHG) emissions. In 2022 we announced our interim goal of reducing our carbon emissions 40% from our 2021 baseline by 2030. Our targets align with those recommended by the Science Based Targets Initiative's (SBTi) guidance for Information and Communications Technology companies and contribute to the global effort to limit warming to 1.5-degrees Celsius.

This climate action plan details Hawaiian Telcom's actions and milestones spanning our operations across Hawai'i. The purpose of this plan is to provide a roadmap to reach our net zero goals and detail an emission reduction pathway to 2030. The key elements of the plan are as follows:

Element	Summary
Baseline emissions	• 2021 baseline year: 77,000 mt CO_2e for Hawaiian Telcom • Scope 1 made up 93% of emissions in Hawaiian Telcom • Scope 2 emissions made up 7% of emissions for Hawaiian Telcom
Reduction Targets	• Near-term: 40% reduction in Scope 1 and 2 by 2030 • Long-term: Net Zero (90% reduction) by 2040
Abatement measures	• Aggressively implement voice network transformation by migrating customers from copper to fiber, and shutting down energy-intensive elements of the copper network; in particular legacy voice switches and related network such as Optically Remote Modules (ORM) and Digital Loop Carrier (DLC) equipment • Increase the pace of efficiency projects in network, facilities & fleet • Consolidate & divest of network equipment, fleet, and real estate, where feasible • Integrate available electric vehicle (EV) models into our fleet as we replace vehicles at end-of-life • Add on-site solar photovoltaic systems where feasible

Table 1: Key elements of climate action plan.

Specific carbon emission abatement measures are presented in this climate action plan including their relative cost, effort to implement, timeframe, potential carbon reduction, and current status. The abatement measures, or climate actions, for Hawaiian Telcom through 2030 are presented in the table below.

Hawaiian Telcom Carbon Emissions Abatement Measures

Abatement Measure	Project Category	Energy Source Impact	Timing	Amount of mt CO2e Reduction by 2030
Biodiesel	Renewable fuel	Diesel	2023-2026	57
Fleet electrification	Electrification	Gasoline	2023-2030	930
Legacy voice and access	Operational efficiency	Purchased electricity	2023-2030	4,460
HVAC & regulated	Operational efficiency	Purchased electricity	2023-2030	1,319
DLC	Operational efficiency	Purchased electricity	2023-2030	4,970
Alakea annex	Operational efficiency	Purchased electricity	2024	1,290
CO exits	Operational efficiency	Purchased electricity	2024-2040	270
Rectifiers	Operational efficiency	Purchased electricity	2023-2030	1,020
On-site solar	On-site renewables	Purchased electricity	2024-2030	2,650
Total				16,966

Table 2: Hawaiian Telcom Business Case Assessment.

1 Climate Action Plan Introduction

Hawaiian Telcom is a technology company that delivers integrated communications solutions over our fiber optic network, including high-speed Internet, video, voice, and data. Our Environmental Vision is to connect people, free from waste or pollution, enhancing environmental quality and health in our communities.

Hawaiian Telcom is a brand belonging to Cincinnati Bell Inc., which also owns and operates sister companies Agile, BridgeLink, CBTS (including OnX Enterprise Solutions in Canada), and altafiber (the former, Cincinnati Bell).

For this Climate Action Plan (CAP), we focus on the Hawaiian Telcom business which is an incumbent local exchange carrier (ILEC) company[1] operating legacy, copper-wire-based telephone and high-speed internet communications infrastructure. Hawaiian Telcom is steadily over-building the entire state with superior fiber optic broadband infrastructure by the end of 2030. This CAP identifies carbon abatement measures for Hawaiian Telcom, building upon our network transformation from copper- to fiber-based services, and offers a template for other ILECs undergoing similar modernization.

In 2021, Cincinnati Bell Inc. announced the completion of its take-private acquisition by Macquarie Asset Management (MAM), which accelerated the fiber build across its operating footprints in Hawai'i and greater Cincinnati. Macquarie has set ambitious net zero emissions targets and announced plans to operate its portfolio aligned with net zero emissions by 2040, and by the end of 2022 to have net zero business plans in place for assets where it exercises control or significant influence (Addressing climate change and accelerating the low carbon transition | Macquarie Group). MAM's managed companies must track, verify, and report greenhouse gas emissions; set science-based targets for GHG reductions; and create and implement a net zero plan. This Climate Action Plan provides Hawaiian Telcom's science-based targets and our net zero plan. It formulates emission abatement projects, business case, project assumptions, and our net zero roadmap needed to achieve our sustainability goals. The following topics are covered:

- Section 1.1: Hawaiian Telcom's GHG Emissions Inventory Summary
- Section 1.2: Business-As-Usual Emissions
- Section 1.3: Emissions reduction targets aligned with Science-Based Targets initiative (SBTi)
- Section 2: Planned emissions abatement measures
- Section 3: Summary

[1] An ILEC is a local telephone company which held the regional monopoly on landline service before its service area was deregulated and opened to competitive local exchange carriers (CLEC)

1.1 GHG Emissions Inventory Summary

GHG emissions can be categorized as either Scope 1, 2, or 3, as defined by GHG Protocol:

- **Scope 1:** Direct GHG Emissions – emissions that occur from sources owned and controlled by the company; for example, Hawaiian Telcom's owned or controlled vehicles, generators, and any refrigerant releases.
- **Scope 2**: Electricity Indirect GHG Emissions – GHG emissions from the generation of purchased electricity brought into the organizational boundary of the company and consumed. It is based on site electricity use and does not include transmission and distribution losses.
- **Scope 3**: Other Indirect Emissions – an optional reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by the company, such as emissions from the commuting of our employees to work and home; business-related travel whether by vehicle or commercial air; emissions related to the materials (copper and fiber lines, customer premise equipment, paper, ink, etc.) consumed by Hawaiian Telcom; emissions related to our material reuse and recycling, waste disposal and transport; emissions from our extensive supply chain of subcontractors including construction contractors; and emissions from the use of our products and services.

Hawaiian Telcom's GHG inventory, described in this report, covers Scope 1 and 2 only. Hawaiian Telcom's Scope 1 and 2 were first collected in 2021 and independently verified by a third-party auditor, Cameron-Cole, LLC. Cameron-Cole provided a limited level of assurance that our 2021 GHG emissions assertions are free of material errors, omissions, or misstatements.

This inventory covered the period from January 1, 2021, to December 31, 2021, and used the operational control boundary approach. To access the full GHG accounting report, please view the report on our website. Hawaiian Telcom's emissions breakdown consisted of 2,504 mt CO_2e of scope 1 emissions, accounting for 7% of their total emissions, and 33,869 mt CO_2e scope 2 emissions, accounting for 93% of their total emissions.

- Scope 1 emissions sources consisted of:
    - Stationary Combustion – Generators & Equipment (Diesel Fuel) — emissions, resulting from onsite combustion of diesel fuel to operate back-up generators during utility outages or during periodic tests and to operate any ground equipment.
    - Mobile Combustion-Fleet (Gas and Diesel) — emissions resulting from the operation of fleet vehicles.
    - Fugitive Emission (Refrigerants) — refrigerants leak from heating, ventilation, and air conditioning (HVAC) equipment in our facilities.
- Scope 2 emissions consisted of purchased electricity.

Below, is a display of our 2021 Scope 1 and 2 emissions broken down by type measured mt CO_2e:

Hawaiian Telcom Emissions and Energy Footprint in 2021

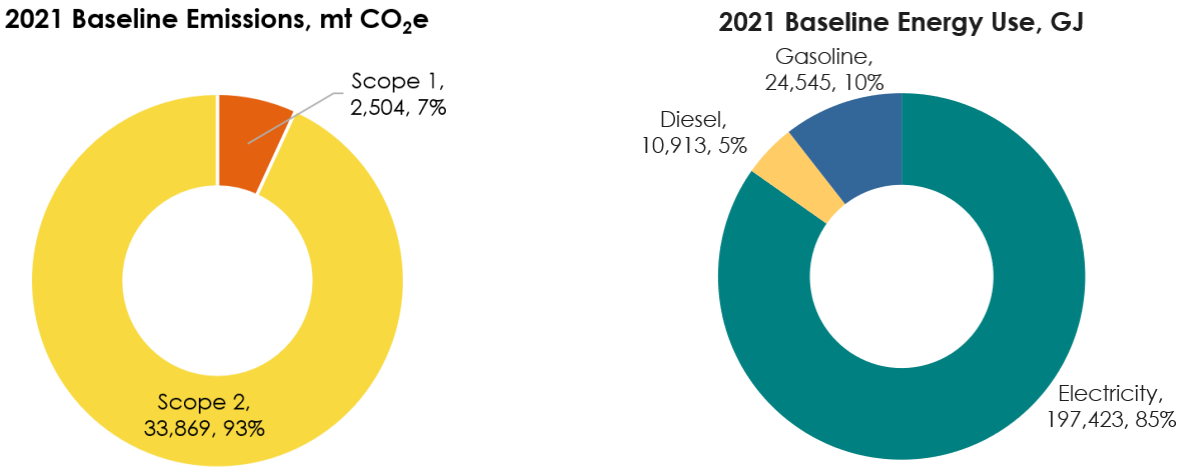

Figure 1: 2021 GHG emissions and energy use for Hawaiian Telcom.

Further understanding the GHG emissions sources within our business, and particularly our electricity use, helped us develop our climate action strategy and prioritize abatement measures. The network equipment that forms the very core of our value proposition – providing network connection in its various forms to residential, business and wholesale customers – uses electricity responsible for approximately 69% of our GHG emissions. Cooling and lighting our central offices (COs), buildings which house and protect our network equipment, is responsible for 21% of our GHGs. All our remaining "non-network" GHGs together account for 10% of our emissions. In this group are emissions from our 600+ fleet vehicles, administrative offices, retail stores, garages, refrigerant losses, and generators.

Below, is a display of our 2021 GHG emissions broken down by network equipment, cooling and lighting our central offices, and our non-network related GHG emissions measured in mt CO_2e:

2021 Hawaiian Telcom GHG Emissions by Source in ILECs

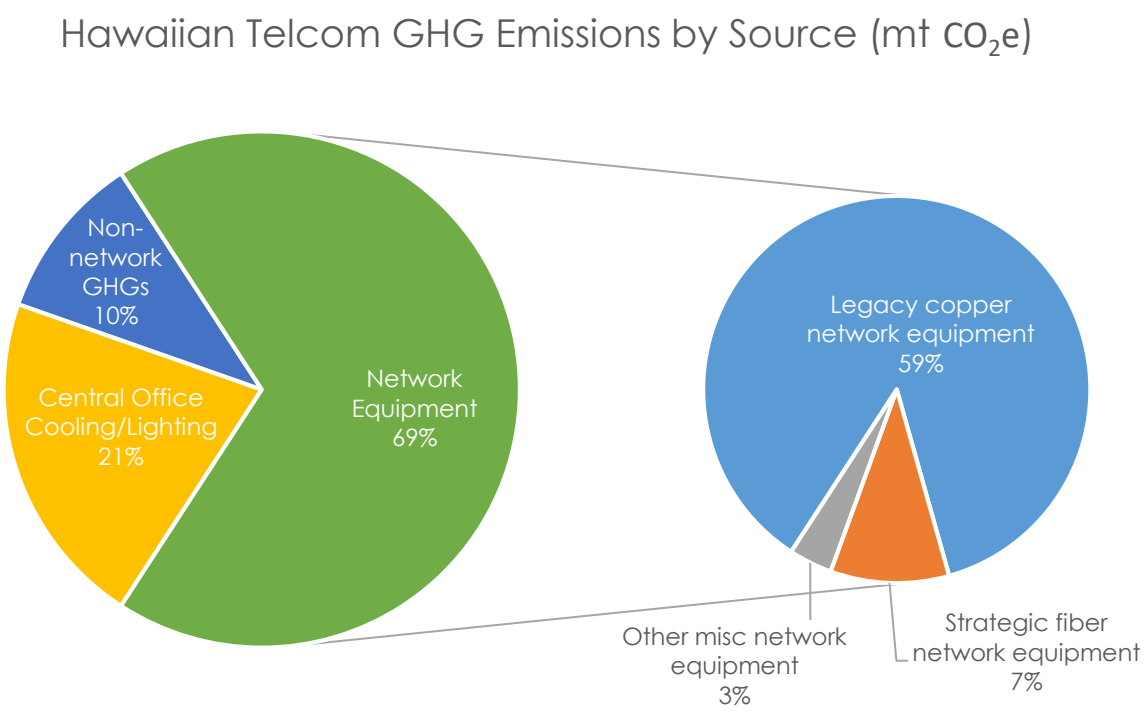

Figure 2: The 2021 GHG emissions by source for Hawaiian Telcom's ILEC business.

At Hawaiian Telcom we use the term "legacy" in reference to our copper network, in contrast to our "strategic" fiber optic network, the network upon which we are building the future of our company. As shown in Figure 2, our network equipment is a mix of legacy copper network equipment, strategic fiber network equipment and other, miscellaneous equipment not fitting in either of those two categories. Powering the legacy network equipment itself causes 59% of our emissions, plus additional emissions from cooling it. By contrast our strategic fiber network equipment (7%) and its cooling are responsible for far less of our carbon footprint because it is so much more efficient. Our action plan includes abatement measures targeting almost every emissions category, but it prioritizes action in the parts of our business most ripe for network transformation, divestment, and efficiency gains.

To provide further context for the actions described in this plan Figure 3 shows the breakdown of our emissions attributed to various parts of our business that are addressed in the abatement measure in section 2 of this plan.

Proportion of Annual GHG Emissions by Sources in Hawaiian Telcom

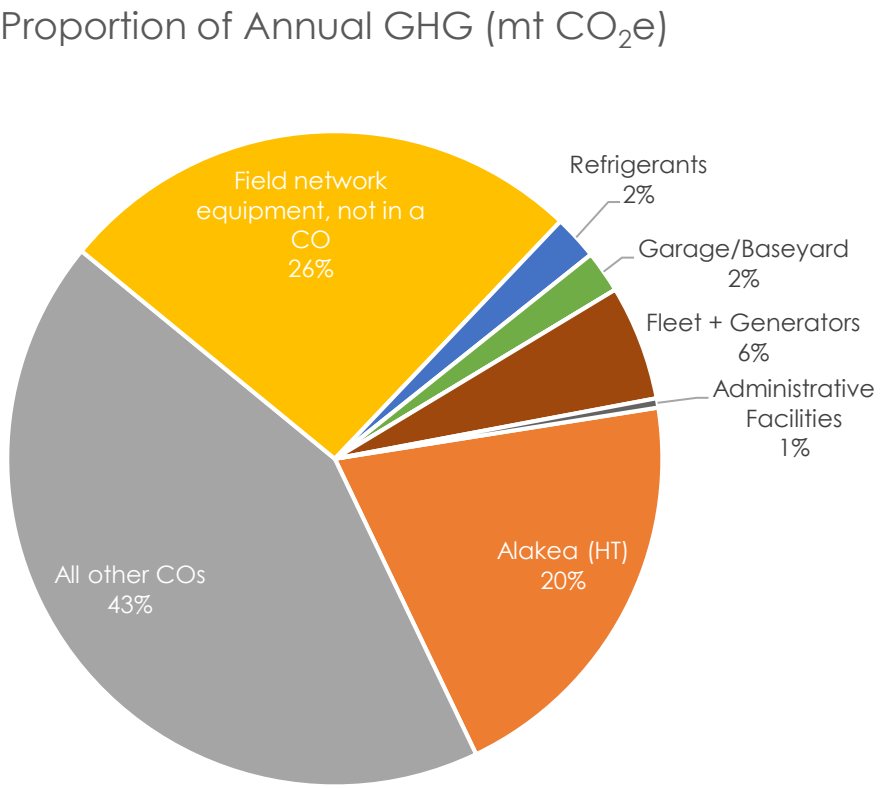

Figure 3: The 2021 GHG emissions by source for Hawaiian Telcom.

1.2 Business-As-Usual Emissions

As part of our climate action plan, we developed a business-as-usual (BAU) scenario to have a clear picture of our current state and to understand what future emission reductions will be necessary to meet our goals. This BAU scenario represents the emissions that would result from Hawaiian Telcom's operations in 2030 and 2040 if no abatement measures were implemented. The BAU considers the effects on our emissions profile of Hawaiian Telcom's planned growth and divestment, as well as the decarbonization of the utility grids that provide energy to our operations.

We estimated our emissions would grow by 8% to power the new fiber communications network the business will install and offer across the state of Hawaii by 2030.

Our current business plan anticipates revenue changes from customers moving from our legacy copper to the newer, faster fiber network over the next decade. However, the BAU case assumes only minimal consolidation and decommissioning of copper network equipment, commensurate with current maintenance activities, even as copper customers atrophy. The legacy copper network has a significantly higher emissions profile than the new fiber network; however, our BAU plans add the fiber networks' power requirements on top of continued operation of the legacy copper network.

1.2.1 Emission Reductions from Grid Greening

The decarbonization of the electricity grid is a core step in building a lower-carbon economy. Many states have commitments called renewable portfolio standards (RPS) which require their Public Utility Commission (PUCs) to supply renewable energy to the electricity grid. Hawaiian Telcom purchases electricity from Hawaii's electricity utilities, and as they become less carbon intensive, our emissions will reduce. In our business-as-usual scenario, we reviewed grid greening reductions from multiple sources to forecast the emissions intensity of power in Hawai'i grid by 2030 and 2040:

- Hawai'i had approximately 40% of their grid supplied by renewable energy in 2021 and is projected to have 53% by 2030 and 70% by 2040, based on input from staff at Hawaiian Electric Inc. (HEI), and HEI's and Kauai Island Utility Cooperative's annual reporting.

The projected BAU emissions from 2021 to 2040 Hawaiian Telcom are shown in Figure 4 below. Note, there is significant uncertainty about the public utilities' ability to achieve the ambitious grid greening projected for Hawaii, with further study expected from the Hawaii Department of Health in 2023 to inform our assumptions. Therefore, we choose not to over-rely on grid greening, which is inherently out of our control, to achieve our carbon reduction goals.

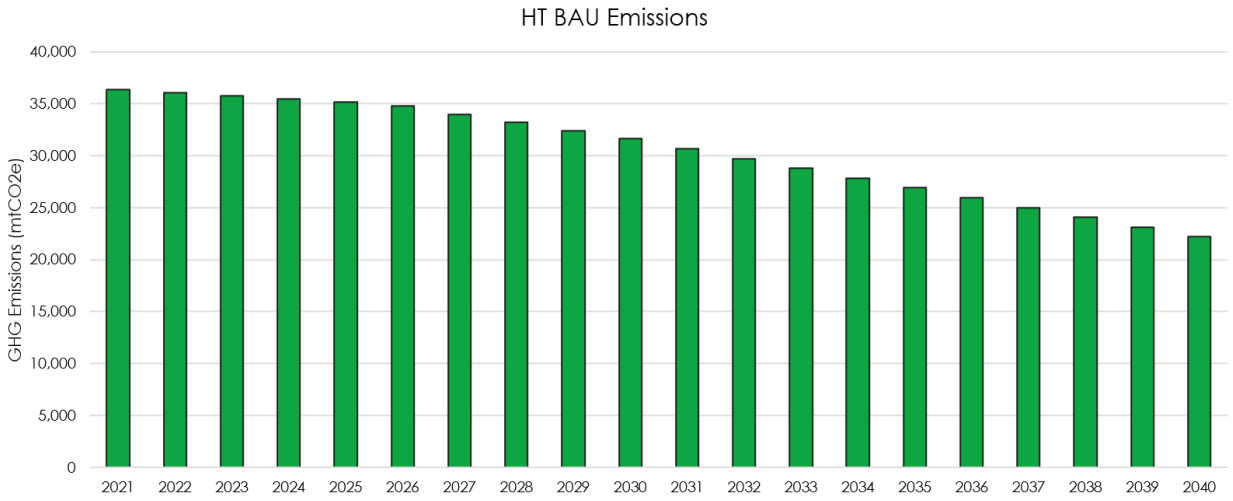

Figure 4. Hawaiian Telcom business-as-usual emissions projections

1.2.2 Emissions Increases from Projected Business Growth

As part of Hawaiian Telcom's strategic fiber network buildout, we will continue to overbuild areas currently served by legacy copper infrastructure with superior fiber optic service and products. The advantages in terms of data transmission capacity, bandwidth and speeds are significant. Fiber optic networks also provide advantages for energy and emissions savings given their enhanced transmission and power efficiencies. This business growth will result in increased emissions from new energy use by the fiber network and associated HVAC loads, albeit smaller compared to our legacy network.

In our business-as-usual scenario, we reviewed the impact of our projected strategic fiber network growth and determined a forecast for the Hawai'i operation region. The increase in power use by the new fiber network matches the projected growth in fiber-to-the-premise (FTTP) sellable market

coverage; in other words, as the percent of FTTP sellable market covered grows, the power to the fiber network grows at the same rate, as follows:

- Hawaiian Telcom energy use from strategic network growth is projected to increase 50% between 2021-2026 and 6% between 2026-2030, and energy use from HVAC and other regulated loads is projected to increase 8% between 2021-2026.

Note, although the BAU emissions scenario extends to 2040, our current business plan only extends to 2030. Therefore, there is no growth in business related emissions currently projected from 2030 to 2040, an assumption that will have to be revised as long-range plans develop to 2040.

1.3 Emissions Reduction Targets

One of the requirements set by MAM for its portfolio companies, including Hawaiian Telcom, is the development of a science-based net zero target. Science-based targets provide companies with information on how much and how quickly they need to reduce their emissions to prevent the worst effects of climate change.

There are several organizations that provide guidance and validation of science-based targets; one of the most prominent is the Science Based Targets initiative (SBTi). SBTi provides scenarios for emissions reductions and net-zero targets in line with climate science.

Hawaiian Telcom set a net zero science-based target that covers Scope 1 and 2 emissions for 2030 (near-term) and 2040 (long-term), aligned with a 1.5C warming scenario. Our targets are listed in the following table:

Base Year	Target Year	Emission Reduction Target	Annual Reduction Target
2021	2030	40% reduction in Scope 1 and 2 between 2021 - 2030	4.4%
2021	2040	90% reduction in Scope 1 and 2 between 2021 - 2040	6.0%

Table 3: Summary of interim and final net zero target.

For companies whose scope 3 emissions represent more than 40% of their combined scope 1, 2 and 3 emissions, targets must address scope 3 emissions reduction. Although Hawaiian Telcom does not yet have a scope 3 inventory, we expect that our scope 3 inventory will exceed that criterion. Where accounting for and reporting scope 3 emissions are relevant, we plan to calculate and track them, and recognize this is an area of improvement for our future GHG inventory.

While these targets are consistent with the SBTi requirements, they have not been submitted to the SBTi. The proposed emission target reductions are shown along with the projected BAU emissions on the graph below.

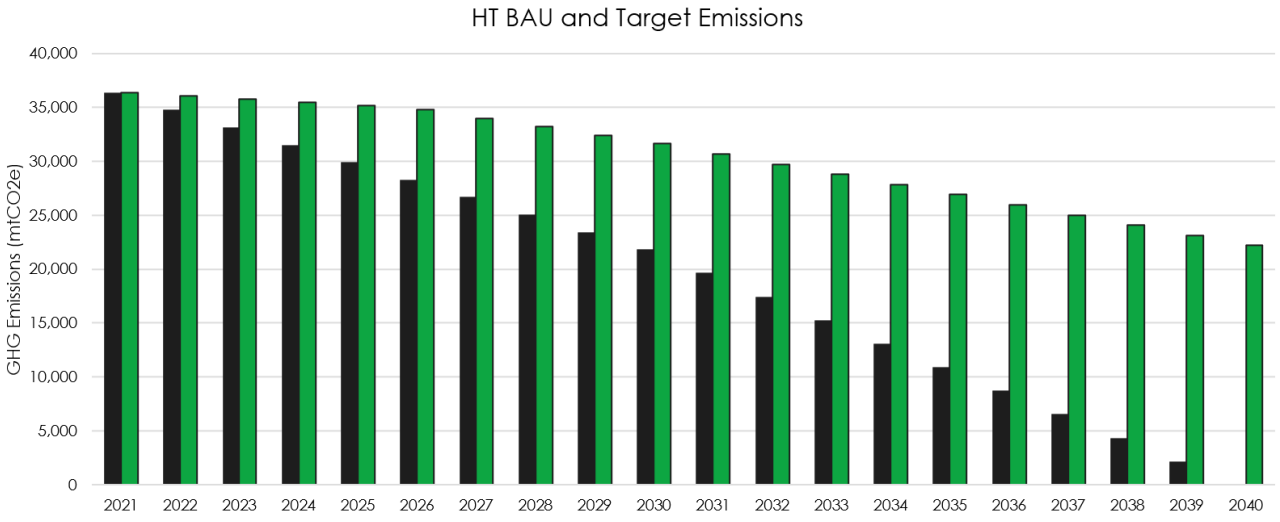

Figure 5. Hawaiian Telcom Business-as-usual and target emissions projections

2 Planned Abatement Measures

In 2022, Hawaiian Telcom convened experts throughout the organization for a multi-day workshop in Honolulu, HI. During the workshop we identified a strategy to achieve our emission reduction goals that was further developed in the following months. Our collective effort resulted in the following strategy:

1) Bring superior fiber optic service to our customers.
2) Aggressively implement voice network transformation by migrating customers from copper to fiber, and shutting down energy-intensive elements of the copper network; in particular:
   a) Class 5 voice switches
   b) Related legacy network equipment, primarily digital loop carrier (DLC) equipment
3) Consolidate & divest of network equipment, fleet, and real estate, where feasible
4) Increase the pace of efficiency projects in network, facilities & fleet
5) Add available electric vehicle (EV) models into our fleet as we replace vehicles at end-of-life
6) Add on-site solar photovoltaic systems where feasible

Specific emissions abatement measures were developed in each of these areas, which are listed below, to help us reach our net-zero goals. Hawaiian Telcom will implement these measures to meet our emissions reduction targets.

Near-to-Long Term Emissions Targets

As indicated in Table 4 below and the waterfall chart which follows, Hawaiian Telcom identified abatement measures available to them in the near-term including voice network transformation, energy efficiency projects, switching to locally sourced biodiesel, fleet electrification, divestment of property, and investments in on-site solar.

Hawaiian Telcom Abatement Measures					
	Abatement Measure	Energy Source	% GHG Emission Reduction, Cumulative	Projected Start Date	Business Function
	Biodiesel	Diesel	0.2%	In Progress	Fleet
	Fleet electrification	Fuel	3%	2023	Fleet
	Legacy voice and access	Electricity	12%	2023	Network
	HVAC & regulated loads	Electricity	4%	2023	All
	Alakea annex sale	Electricity	3%	2023	Real Estate
	Strategic CO exits	Electricity	1%	2024	Real Estate
	On-site solar	Electricity	7%	2024	Real Estate
	Remove DLCs	Electricity	14%	2023	Network
	Replace rectifiers	Electricity	3%	2023	Network

Table 4: Abatement measures 2022-2030 for Hawaiian Telcom.

The Hawaiian Telcom 2021 – 2030 waterfall figure below depicts the 2021 GHG inventory baseline emissions broken down by emission source, shown in the gray bar at the far left labeled, "2021 Baseline Year Emissions". The chart shows the expected growth in emissions associated with completing the fiber over-build of the State and reduction expected between 2021-2030 from grid greening, which provides the BAU condition labeled on the graph. The following bars in the graph are displayed as a "waterfall" chart, with emission increases displayed in red, and decreases in emissions shown in blue. The chart details each abatement measure and its estimated emission reduction from the baseline year to 2030.

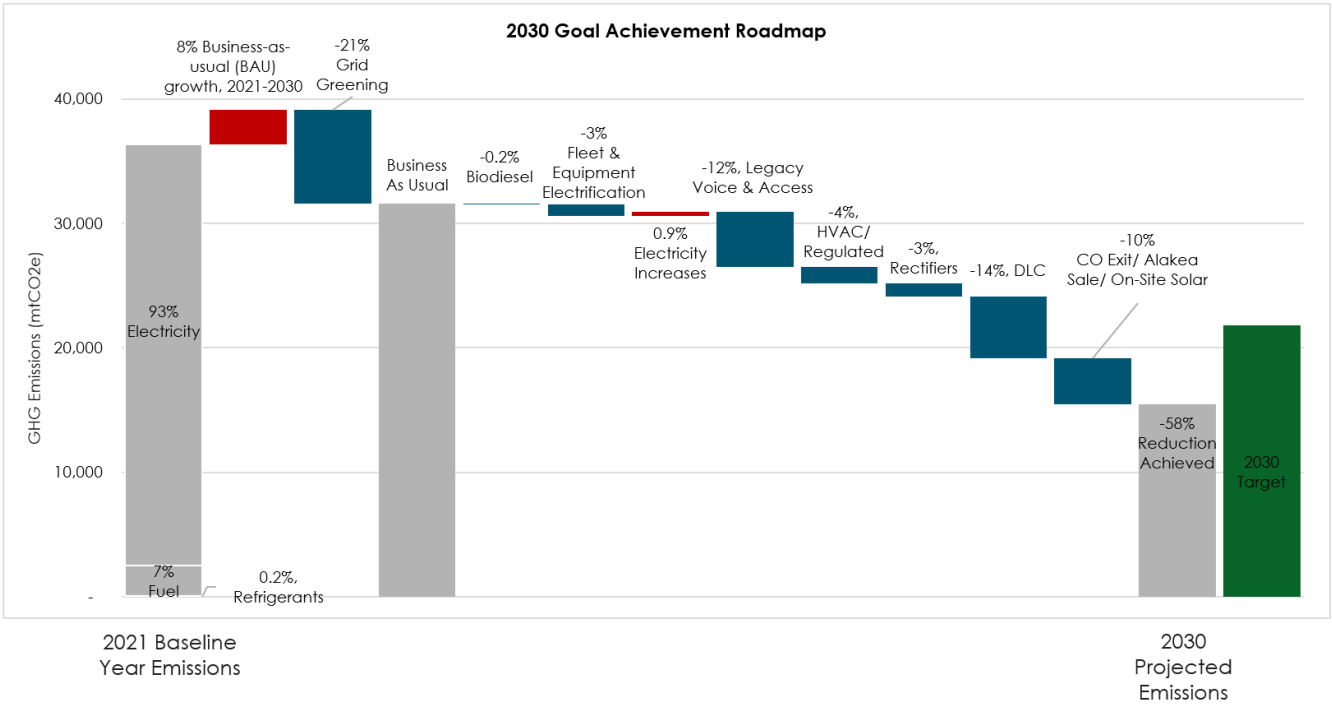

Figure 6: Waterfall chart of the Hawaiian Telcom 2021-2030 decarbonization strategy.

Description of Planned Abatement Measures

The following sections provide a summary of planned abatement measures, including the type of measure, what scope emissions it will reduce, and a net zero scorecard providing a summary view of the measure's cost, ease of implementation, timeframe, potential impact on achieving Hawaiian Telcom's targets, and the status. The qualitative scores on the net zero scorecards correspond to the following general ranges:

	Metric	Low	Moderate	High
	Capital cost	$0 - $5M	$5M - $10M	$10M+
	Net OpEx	$0 – $2M	$2M - $5M	$5M+

	Level of effort	No to limited impact to current operations, or no to limited technical challenges with implementation	Limited to moderate impact to current operations, or limited to moderate technical challenges with implementation	Significant impact to current operations, or significant technical challenges with implementation
	Timeframe	0 – 3 years	3 – 7 years	7+ years
	Potential carbon reduction	<5% emission reduction from baseline	5 – 10% emission reduction from baseline	10+% emission reduction from baseline

Table 5: Net zero scorecard legend

2.1 Fleet Efficiency & Electrification

Fleet Electrification Scorecard

	Metric	Score
	Cost	◑ Moderate
	Net OpEx	◑ Moderate
	Effort	● High effort
	Timeframe	◑ Mid-Term
	Potential carbon reduction	◔ Low
	Status	Some projects are in progress

Hawaiian Telcom fleet will include 616 vehicles including those they plan to purchase by the end of 2023.

These vehicles include a range of makes, models, and years, and are all internal combustion engine (ICE) models that use gasoline or diesel for fuel. The emissions from these vehicles produce the majority of Hawaiian Telcom's scope 1 emissions. Hawaiian Telcom has plans to reduce these Scope 1 emissions via increased efficiency and fleet electrification. The fleet management team is adopting efficiency measures informed by telematics installed in 2021 which will reduce fuel use and related carbon emissions. They are also formulating a fleet modernization plan to reduce the average age of the fleet, which will increase its fuel economy. In addition to these actions, fleet electrification is needed to move towards net-zero as EV models are available and fleet vehicles turn over. Electrifying our vehicle fleet will reduce our scope 1 emissions through 2030, but more importantly posture our company to achieve net-zero emissions by 2040, as newly purchased vehicles will last in our inventory for at least a decade. Note, it is unclear if EV models will last beyond a decade in the fleet without significant investment in battery replacement; therefore, EV models may have a shorter functional life in the fleet than the 12~15 year service life ICE vehicles currently routinely achieve.

Our fleet electrification plan starts in 2023 to allow for proper capital planning, procurement, and availability. We plan to electrify sedans, pickup trucks, and SUVs through retiring or replacing older models at their end-of-service-life.

Electrification of vehicles will reduce our gasoline consumption by approximately 100,000 gallons by 2030, and subsequently reduce our carbon emissions by 930 Metric tons.

Additional Fleet Electrification Evaluation

Hawaiian Telcom will continue studying and planning for the electrification of our fleet and the supporting EV infrastructure. We will research programs available in our markets and take advantage of any grant programs. For instance, Hawaii has financial assistance available through a diesel vehicle replacement program as well as rebates for installing EV Chargers through Hawai'i Energy.

Assumptions:

- Fleet efficiency measures (e.g., driving behavior modification; route planning; eliminating under-utilized vehicles; purchasing more efficient models) will reduce carbon emissions.
- Vehicles are replaced at the end of their functional life.
- Electrification can begin in 2023, supported by federal tax incentives.
- EV installer vans will not be immediately available at the levels needed, so will be gradually increased over time.
- We will procure lighter vehicles first before moving to heavier class vehicles.
- Electric replacements for our heavier vehicle types are not now and will not be commercially available in the short term; therefore, any electrification of those vehicles will happen when/if such replacements enter the market and are price competitive.
- We will develop a methodology to reimburse for home charging based on vehicle telematics
- All installer vans will charge at a garage or base yard
- 40% of the EV sedans, SUVs and pickups will home garage and charge at an employee's home
- 60% of the EV sedans, SUVs and pickups charge at a garage/base yard or CO.

2.2 Biodiesel

Biodiesel is a renewable energy substitute for conventional diesel engines. There are several advantages for switching to biodiesel such as: improved fuel supply protection, better air quality due to the reduction of life cycle emissions and it is less expensive at the pump.

Evaluating our business activities through the lens of sustainability illuminated several areas for potential improvements. Although our GHG emissions from fuel use represent a relatively minor portion of our total GHG inventory, they present an opportunity for both emissions and cost savings.

In Hawaiian we are piloting a biodiesel program that enables our field technicians to refill their vehicles with

Biodiesel Scorecard

	Metric	Score
	**Cost**	Low
	**Net OpEx**	Low
	**Effort**	Low effort
	**Timeframe**	Near-term
	**Potential carbon reduction**	Low
	**Status**	Ongoing

a drop-in diesel alternative, using either 100% biodiesel (B100 or B99) or an 80/20 blend (20% biodiesel, or B20). A drop-in fuel allows for a direct replacement with no vehicle modification. Biodiesel burns cleaner than conventional diesel, resulting in reduced carbon emissions and savings at the pump. The average cost of biodiesel from January 2021 to June 2022 on the island of Maui was $0.62 - $0.73 per gallon, cheaper than conventional diesel. The biodiesel is produced on-island and uses local food waste as input to develop the alternative fuel. When B100 is used and stored in tanks it is not hazardous and already reduces risk and liability from spills and accidents. In 2022, biodiesel blends are commercially available on the islands of Maui, Oahu, and the Big Island. Biodiesel has proven to be a viable and stable alternative fuel for reducing costs and emissions.

The total estimated emissions reduction in 2030 for this abatement measure is less than 1% measured from our 2021 baseline GHG inventory.

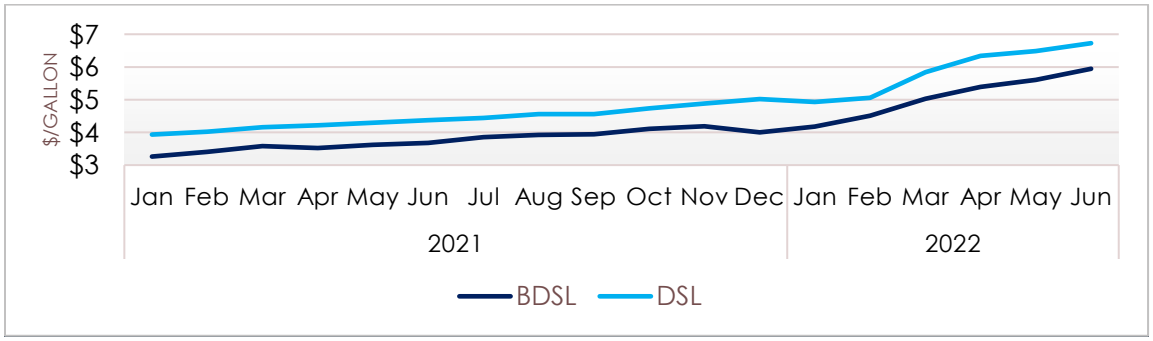

Figure 7: Biodiesel (BDSL) prices compared to diesel (DSL) from 2021 to 2022 (source: internal biodiesel study)

Assumptions

- 100% of current diesel use in fleet and generators gradually transition to B100 biodiesel by 2030.
- Temperature of Hawaii remains at a seasonal average above 40 degrees Fahrenheit.
- Cost of biodiesel remains cheaper than conventional diesel.

2.3 On-site Solar PV

Solar photovoltaic (PV) systems convert sunlight into energy, which is used as electricity. There are many types of solar PV systems including rooftop, canopy, and floating. These systems are built to generate electricity and deliver benefits by reducing scope 2 emissions and stabilize and potentially reduce the cost of power. Hawaiian Telcom benefits from significant cost savings and price stability from its on-site rooftop and canopy PV systems at 64 locations throughout Hawai'i.

For our climate action roadmap, we assume new solar projects would be installed over an 8-year period, starting in 2023.

On-site Solar PV Scorecard

Metric	Score
Cost	● High
Net OpEx	◑ Moderate to high
Effort	◔ Low effort
Timeframe	◑ Mid-Term
Potential carbon reduction	◔ Low
Status	Not started; quotes received

The size and cost of each solar project varies based upon location, size, and installment type. A summary of the projects is broken out by subsidiary.

The plan includes the notional projects for Hawaiian Telcom listed in the table below. In 2024, these projects are expected to generate 2,080 MWh of production/year. As much of our available roof space is already developed with PV, we plan to grow on-site solar energy production via adding parking canopies each year by 25% to represent 5,500 MWh of production/year in 2030. These energy reductions are estimated to result in a cumulative GHG emissions reduction of 2,650 mt CO_2e by 2030. In a business case prepared in 2022 evaluating a PV array for the roof of Moanalua Baseyard (MBY) Building A (Oahu) the unlevered IRR is around 24% and the levered IRR around 34%. The business case for PV in Hawaii is generally positive due to the rapidly rising and volatile cost of utility power.

Hawaiian Telcom on-site solar projects

Location	Size of System	Installation Year
MBY Building A roof	734 kW	2024
MBY Building D roof or other preferred location(s)	734 kW	2026
Parking Canopies - Lihue base yard - New Kona base yard - Other locations TBD	500 kW with additional 25% yearly	2024-2030

Table 6: Key on-site solar projects in Hawaiian Telcom

Image 1 & 2: Hawaiian Telcom Parking Canopy

Image 3: Hawaiian Telcom ground-mounted solar

Assumptions

- Installations occur in the proposed years listed in the table above.
- Systems produce according to their forecasted generation capacity.
- 0.5% system degradation per year
- A strong business case for additional PV in Hawaii.

2.4 Legacy Voice, Access, and Associated Equipment

Hawaiian Telcom's legacy networks are comprised of legacy access, legacy voice, and associated field network equipment. Our emission reduction plan is in accordance with our strategic direction to reduce Hawaiian Telcom's legacy footprint and move towards a fiber optic network. This undertaking will require a coordinated effort across multiple departments and will drastically reduce the emissions associated with the lower-efficiency legacy delivery network.

Network description:

The **legacy voice network** consists of all the necessary infrastructure and equipment to deliver time-division multiplexing (TDM) voice services, such as plain old telephone service (POTS) over copper lines. With the ubiquity of cell phones, subscribers to our legacy POTS product have decreased, and our

business plan anticipates further decline. We expect legacy "average voice units," our POTS subscribers, to decline.

The **legacy access network** represents all the necessary infrastructure, equipment, and testing to transport internet data over last-mile copper to customers.

Legacy Network Scorecard

	Metric	Score
	**Cost**	● High
	**Net OpEx**	● High
	**Effort**	● High
	**Timeframe**	◑ Mid-Term
	**Potential carbon reduction**	● High
	**Status**	Planned Start in 2023

The **field network equipment** is housed outside of a central office in the field. This field network equipment operates in a cabinet, a vault or possibly mounted on a pole. This category represents all the field network equipment not housed in a CO that has its own energy meter.

Legacy Voice

Fundamentally, Hawaiian Telcom expects operational expense savings and a payback in divesting of legacy voice switches. Challenges and benefits include:

- **Institutional knowledge challenges:** The skilled technicians needed to maintain and operate legacy switches are few and at or nearing retirement; OEM support is equally limited, and parts must be salvaged.
- **Consolidation challenges:** It is difficult and costly to consolidate legacy lines to turn down portions of a switch. Experience with consolidation has shown a poor business case; therefore, although paid subscribers decrease the entire switch often remains in operation. In lieu of switch consolidation, our CAP focuses on achieving entire switch shutdown.
- **Cost saving benefits:** Studies of voice network transformation in Hawaiian Telcom from 2011-2013 by Hawaiian Telcom, Alcatel-Lucent, Metaswitch and Genband all showed positive business cases:
    - Hawaiian Telcom estimated voice network transformation could produce $70M in power cost savings over 10 years (2013)
    - Alcatel-Lucent estimated $4.4M net savings with an 18-month payback via 5E switch consolidation (2011)
    - Alcatel-Lucent estimated $1.5M net savings and a 24-month payback via GDT5 switch consolidation (2011)

These existing studies are encouraging, but the climate action plan requires additional detail to understand the effects of our voice network transformation. In concert with the climate action plan the business is developing an updated, unique, and encompassing network transformation plan for the

legacy systems in Hawaiian Telcom. Although network transformation from copper to fiber is on-going concurrent to our climate action planning, an aggressive abatement measure reducing energy use and emissions associated with the legacy voice network and related legacy access and field network equipment is a central part of both efforts.

Hawaiian Telcom's legacy voice, access, and network field equipment represent a significant portion of our emissions due to the high-power demand of operating this kind of network. The legacy network presents an opportunity for Hawaiian Telcom to make significant reductions by shutting down many Class 5 switches, significantly reducing legacy operations by 2030.

We currently lack a Hawaiian Telcom -specific study of the power used by legacy voice switches in its 90+ Central Offices (COs); however, such a study is under contract for 2023. Therefore, the same percentage of CO energy usage, 41%, is assumed for Hawaiian Telcom as its sister company altafiber, based on a 2022 study of three altafiber COs. This figure is also supported by a 2013 analysis by Hawaiian Telcom staff and Metaswitch.

Field network equipment in Hawaiian Telcom is captured in the following section for DLCs. During the Hawaiian Telcom workshops, the network team elected to track this equipment separately for this assessment.

Our plan targets a composite energy reduction of 9,050 MWh by 2030 from eliminating legacy GDT-5 and DMS-10 and some 5ESS voice switches. The cumulative GHG emissions reductions is expected to be 5,407 mt CO_2e by 2030 representing an overall reduction of 12% towards our decarbonization goals.

In support of both efforts, we continue an ongoing project to associate every electric meter with a Common Language Location Identifier (CLLI) code such that we can associate equipment with its electric meter and further analyze field equipment energy use. This project will help, for example, identify the power used by DLCs associated with legacy switches effected by voice network transformation. This on-going work will further refine our planning assumptions and steer where and how we shut down legacy equipment to achieve our carbon reduction goals.

Assumptions:

- Initial focus is on offices with GTD5 switches, due to their higher power consumption, no spares, and lack of in-house and OEM support
- Deploy island-specific tandem switches first, collapsing the class 4 function
- As the fiber build completes, use access gateways (years 1-3) to serve copper-only customers
- As fiber is available dedicate resources to migrate voice service customers (assumes 25% attrition and related revenue loss in the process)
- 62 offices will have switches eliminated; between 8 and 14 CO's switches shut down per year from 2024-2030
    - 41 GTD5 wire centers reduced, with all 20 offices
    - 10 DMS10 switches, including all on Molokai and Lanai, eliminated
    - 11 5ESS wire centers

- This effort would effect over 100k lines (60% of HT's voice lines) and would eliminate these switches, and the associated maintenance burden and outages, on the islands of Maui, Lanai, Molokai, and Kauai

2.5 Digital Loop Carriers

Digital loop carrier (DLC) equipment, typically housed in field cabinets with their own power meter, boosts voice signal transmission to outlying areas of our network. DLC equipment uses electricity and requires a minimum power level to provide adequate volume for the voice signal.

DLC Reduction

During the Hawaiian Telcom workshop, the network team set a target to reduce 75% of the energy use from DLCs by 2030, starting in 2023. There are a total of 138 remote DLCs, and Hawaiian Telcom will decommission 15 DLCs per year from 2023-2030.

DLCs Scorecard

	Metric	Score
	**Cost**	TBD
	**Net OpEx**	● High
	**Effort**	◑ Moderate
	**Timeframe**	◑ Mid-Term
	**Potential carbon reduction**	● High
	**Status**	Planned to start in 2023

The estimated annual energy savings is 1,293 MWh. We project the GHG emissions reduction per year to be 760 mt CO_2e and reduce slightly each year based on estimated emissions factors. In 2030, the estimated cumulative GHG emissions reduction is 4,970 mt CO_2e, representing an overall reduction of 14% towards our decarbonization goals.

Assumptions

- It is unclear what percentage of the field network load is attributed to the DLC. This will become clear via associating CLLI codes with power meters.
- The rate of decommissioning is linear, removing 15 DLCs per year.

2.6 HVAC & Regulated Loads Reduction

HVAC & Regulated Loads Scorecard

	Metric	Score
	**Cost**	◔ Low to Medium
	**Net OpEx**	◔ Low
	**Effort**	◔ Low
	**Timeframe**	● Long-term
	**Potential carbon reduction**	◔ Low to Moderate
	**Status**	Some projects in progress

A building's regulated loads are those governed by the energy code including heating, ventilation, and air conditioning (HVAC); lighting; losses through the building envelope; motors and hot water heating. Our regulated energy uses are the non-network systems in our central offices and are dominated by HVAC for cooling. Hawaiian Telcom's network teams, facilities teams, and consultants estimate CO HVAC and other regulated loads are responsible for 20% of our carbon emissions. Hawaiian Telcom's Real Estate office will continue, and where possible accelerate, efficiency efforts such as chiller and package-unit replacements, LED lighting projects and LEED certifying new facilities and major renovations. In addition, as legacy network equipment shuts down under this plan, we project HVAC cooling loads will reduce at a similar pace.

As the network migration plan progresses, we project that the energy usage associated with HVAC reduction will reduce by 350 MWh from 2023 – 2030. The cumulative GHG emissions reduction is expected to be 1,319 mt CO2 by 2030 representing an overall reduction of 4% towards our decarbonization goals.

As our network teams shutdown legacy equipment throughout our portfolio, there will be a focus on repairing and optimizing HVAC systems, recommissioning HVAC controls and evaluating set points to realize energy savings. In 2023 Hawaiian Telcom will study five COs to refine these assumptions and start HVAC recommissioning work.

Assumptions

- On-going energy efficiency projects continue or accelerate.
- HVAC load reduction project(s) in COs follow legacy network equipment shutdown.

2.7 Rectifier Replacement

Rectifiers are an important part of the power plant supporting redundant and resilient power to our network equipment in our central offices. They contribute to the overall electricity consumption and subsequent scope 2 emissions. Hawaiian Telcom will invest in replacing older, less efficient models to reduce cost and emissions. Hawaiian Telcom will also evaluate inverter replacement as an opportunity for additional energy use reduction.

We plan to replace five rectifiers per year, starting in 2023 and ending in 2030. Replacing older rectifiers with newer models is estimated to save around 53,000 kWh per rectifier annually, based analysis of the equipment in our Kahili central office, but will vary depending on type and energy load.

Rectifier Replacement Scorecard

	Metric	Score
	**Cost**	Low
	**Net OpEx**	Low
	**Effort**	Moderate
	**Timeframe**	Mid-Term
	**Potential carbon reduction**	Low
	**Status**	Planned to start in 2023

The estimated energy savings by replacing five rectifiers per year is 265 MWh. The estimated GHG emissions reduction per year is 160 mt CO_2e and reduces slightly each year based on projected emissions factor. In 2030, the estimated cumulative GHG emissions reduction is 1,020 mt CO_2e.

Assumptions

- Five rectifiers are replaced per year, or an equivalent number of rectifiers to achieve the savings projected/desired, from 2023-2030
- A specific rectifier replacement program and associated business case is under development.

2.8 Central Office Sale and Exit

Hawaiian Telcom's central offices (COs) represent the largest portion of our total emissions due to their power requirements. Strategically exiting and selling COs will not only contribute to our network objectives but will lower our energy use and related emissions. In Hawaiian Telcom we expect to exit several COs once the fiber network is fully built and customers are served by fiber. Hawaiian Telcom's fiber build plan is designed to obviate the need for certain COs in the future.

We plan to sell the portion of our downtown Honolulu headquarters building, called the Alakea Annex, building in 2024, an action that will reduce the power consumption of Hawaiian Telcom's largest building

CO Sale and Exit Scorecard

	Metric	Score
	**Cost**	Low
	**Net OpEx**	Low
	**Effort**	Medium effort
	**Timeframe**	Near-term
	**Potential carbon reduction**	Low
	**Status**	Currently in progress

by 18%. The estimated annual energy savings upon the sale of the Alakea Annex building is 2,250 MWh. The estimated cumulative GHG emissions reduction is 1,290 mt CO_2e in 2030.

Starting in 2024, Hawaiian Telcom plans to exit a small number of additional COs. The estimated annual energy savings by exiting COs is 570 MWh in the year of the divestment. The estimated cumulative GHG emissions reduction is marginal at 270 mt CO_2e in 2030.

Assumptions

- The Alakea annex is sold from the portfolio by 2024.
- When customers are served by new fiber optic infrastructure, Hawaiian Telcom divests of Puunui, Ewa, Kualapuu, Ualapue, and Maunaloa COs, or other COs to achieve a similar power reduction.

2.9 Refrigerants

Refrigerants which leak from HVAC equipment in our facilities become fugitive emissions for Hawaiian Telcom. As part of our GHG inventory, we measured our refrigerant losses in our baseline year which accounted for 79 mt CO_2e, a very small (<1%) part of our emissions inventory. However, due to the accounting rules in the GHG protocol[2] exclude emissions associated with R-22 (Freon), an ozone depleting substance, from being tallied in our inventory. Nonetheless, we estimate R-22 losses were responsible for an additional 929 mt CO_2e in emissions, adding 2% to Hawaiian Telcom's GHG emissions inventory.

Hawaiian Telcom will accelerate its current plans to eliminate its remaining R-22 HVAC equipment with more efficient models. Stemming R-22 losses is a high priority as R-22 has almost 2,000 times the global warming potency of CO_2 if released to the atmosphere. Our goal is to promptly replace the HVAC systems requiring these refrigerants, to eliminate the potential for further leakage and also eliminate the high cost of replacing lost R-22, which is no longer in production.

Assumptions

- Accelerate replacement of R-22 HVAC equipment

3 Summary

The climate action plan for Hawaiian Telcom through 2030 is presented in the table below, which includes the following information:

- Project name
- Project category type (electrification, operational efficiency, on-site renewable energy, or renewable fuel)

[2] Under the GHG Protocol, certain refrigerants which are also ozone depleting substance (ODS) are excluded from GHG inventories because they are regulated and reported in other ways and are being phased out of production. The GHG Protocol allows for reporting of these ODSs, including R-22 (Freon), as separately in an organization's GHG inventory, but they do not contribute to total emissions.

- The energy source impacted by the abatement measure (natural gas, gasoline, diesel, or purchased electricity)
- The approximate timing for the implementation of the measure

Abatement Measure	Project Category	Energy Source Impact	Timing	Cost	Net OpEx	Effort	Timeframe	Potential Carbon Reduction
Biodiesel	Renewable fuel	Diesel	2023-2026	Low	Low	Low	Near-Term	Low
Fleet electrification	Electrification	Gasoline	2023-2030	Moderate	Moderate	High	Mid-Term	Low
Legacy voice and access	Operational efficiency	Purchased electricity	2023-2030	High	High	High	Mid-Term	High
HVAC & regulated	Operational efficiency	Purchased electricity	2023-2030	Low to Medium	Low	Low	Long-Term	Low to Moderate
DLC	Operational efficiency	Purchased electricity	2023-2030	TBD	High	Moderate	Mid-Term	High
Alakea annex	Operational efficiency	Purchased electricity	2024	Low	Low	Medium	Near-Term	Low
CO exits	Operational efficiency	Purchased electricity	2024-2040	Low	Low	Medium	Near-Term	Low
Rectifiers	Operational efficiency	Purchased electricity	2023-2030	Low	Low	Moderate	Mid-Term	Low
On-site solar	On-site renewables	Purchased electricity	2024-2030	High	Moderate to High	Low	Mid-Term	Low

Table 7: Hawaiian Telcom Business Case Assessment.

Climate Action Plan Update and Conclusions

To ensure continued action, this plan and associated contents will require iterative updates. The CAP should be reviewed annually and updated at least every three years, or more often if warranted by changes in operations or business structure. Additionally, as abatement measures are implemented or evaluated, the plan should be updated to reflect the actual carbon impact of the measure.

Next Steps

This Climate Action Plan has detailed abatement measures for Hawaiian Telcom that are required to meet our emissions reduction goals. This plan signifies a critical step in the process to meet our goals, but Hawaiian Telcom now must implement the activities detailed in this plan.

Implementation is a large, interdepartmental effort that will require significant collaboration and addition of resources. To ensure that Hawaiian Telcom meets its stated goals, the Sustainability Department will develop tools such as an implementation matrix and progress tracker against emissions reduction targets for each abatement measure in the plan.

Disseminating this plan both internally and to our interested stakeholder, including the public, is an important next step. We have buy-in from corporate leadership, at the executive team (C-suite) level to implement these abatement measures. In 2023 critical next steps include:

- Disseminate the plan to responsible parties. Provide awareness-level training to all employees, and abatement-measure specific training to all involved parties
- Gather support from stakeholders to help make implementation a priority.
- Meet regularly with stakeholder group(s) to discuss the required actions associated with their departments and brainstorm ideas around any barriers that will need to be overcome in implementing the initiatives and potential partners.
- Create financial business cases for each abatement measure for which none exists today. Vet each business case against our standard financial criteria for investments to determine if, how and when each will be incorporated into our long-term financial plan and short term budgets
- Build upon our current Plan's assumptions and incorporate data from ongoing studies. As new information and details become available, it is important to refine our estimates to enhance the accuracy of our Plan.
- Track year-over-year performance against our science-based targets

Acronyms and Abbreviations

BAU	Business as usual
CBT	Cincinnati Bell Telephone Company LLC
CLLI	Common Language Location Identifier
CO	Central Office
DLC	Digital Loop Carrier
DSLAM	Digital subscriber line access multiplexers
ESG	Environmental, social, and governance
FTTP	Fiber-to-the-premise
GHG	Greenhouse gas
GJ	Gigajoule
HT	Hawaiian Telcom Holding Inc.
kW	Kilowatt
kW	Kilowatt hour
LED	Light-emitting diode
MBY	Moanalua Base Yard
mt CO_2e	Metric ton of carbon dioxide equivalent
MWh	Megawatt hour
ORM	Optically Remote Module
POTS	Plain old telephone service
PPA	Power purchase agreement
PUC	Public Utility Commission
PV	Photovoltaic
REC	Renewable energy certificate
RPS	Renewable portfolio standard
SBTi	Science Based Targets Initiative
TDM	Time-division multiplexing
vPPA	Virtual power purchase agreement

Business Case Abatement Measures Assumptions

- Discount rate was set at 8% for calculating net present costs.
- Network transformation was modeled through 2030, while solar used a lifetime of 30 years, and HVAC which used a lifetime of 25 years.
- Electricity costs for Hawaiian Telcom were set to increase based on the average commercial projection over 5 years for Hawaii/Alaska (Source: EIA Retail Price of Electricity by Sector and Geography – 2019-2023)
- For fleet electrification, diesel engine, EV engine, and gasoline engine efficiency was incorporated.
- A typical fleet vehicle drives 50 miles/day. 40% of cars, trucks, and SUVs will be charged at employee homes and 60% at fleet garage/baseyard. 100% of installer vans will be charged at the fleet garage/baseyard.
- For the capital cost of fleet charging infrastructure, home charging was assumed to cost $1,500 per home; charging at a garage/baseyard was assumed to cost $30,000 per level 2, dual port charger. Level 2 chargers are provided for 50% of EVs in fleet, assuming vehicles charge every other day. Maintenance cost of EV charging infrastructures is included.
- Solar cost range is based on solar costs ranges from $4-5/watt for Hawaiian Telcom.
- Future gasoline cost increases were set to the EIA, Fuel Prices by Sector and Fuel - 2019-2023 Projected Average Annual % Change for the high-end estimate; the low-end cost increases were set to 50% of the high-end value.
- Future biodiesel costs increases were based on the Clean Cities Alternative Fuel Price Reports.
- Fleet costs represent the incremental cost above purchasing an ICE model. Fleet OpEx costs include maintenance savings of EVs over ICE.
- Estimated fleet emission reductions were based on a 50-mile range and average mileage rates.
- HVAC & regulated load savings in CBT assume a cost of $30K to modify and recommission HVAC equipment at a CO after a legacy voice switch is decommissioned, with 10 such switches shut down per year.
- HVAC & regulated load savings in CBT assume a cost of $50K to modify and recommission HVAC equipment at a CO after a legacy voice switch is decommissioned.
- Alakea Annex sale already had an approved business case.
- Values in table 7 are estimates based on the available data at the time of the CAP, are approximate and rounded, and are indicative costs that require verification through procurement and/or subcontractor quotations.