Alta, Utah

COMMUNITY GREENHOUSE GAS EMISSIONS INVENTORY

PREPARED FOR
TOWN OF ALTA AND
FRIENDS OF ALTA BY

brendle GROUP

Acknowledgements

The following individuals contributed to the development of this inventory:

Kate Black, Town of Alta
Molly Clark, Friends of Alta
Jennifer Clancy, Friends of Alta
John Guldner, Town of Alta
Claire Runge, Town of Alta
Onno Wieringa, Alta Ski Area

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1.0 Introduction

While climate change is a global challenge, many communities nationwide are realizing the potential benefits of taking local action to reduce climate change and taking on the first step of inventorying community emissions of greenhouse gases (GHGs). This inventory represents that first step for the Town of Alta and could be a tool for the community to identify opportunities to reduce GHG emissions. Many communities are realizing that there are major gains in efficiency and reduction in associated costs for energy and other resources that can be achieved in conjunction with reducing a community's climate change impact. In doing so, Town of Alta could be a leader in adopting practices and technologies that will save consumers and businesses money, creating new business opportunities in clean and renewable energy and attracting the growing number of tourists who factor environmental considerations into their decisions.

2.0 Community Greenhouse Gas Inventory

The following section provides the Town of Alta's community ("Alta") GHG inventory for the 2007 baseline year. It discusses the overall objectives of the inventory and the methodology used to compile the inventory and shares the individual components and overall conclusions of the inventory.

2.1 Objectives

This inventory aims to achieve the following objectives with respect to Alta's community GHG emissions:

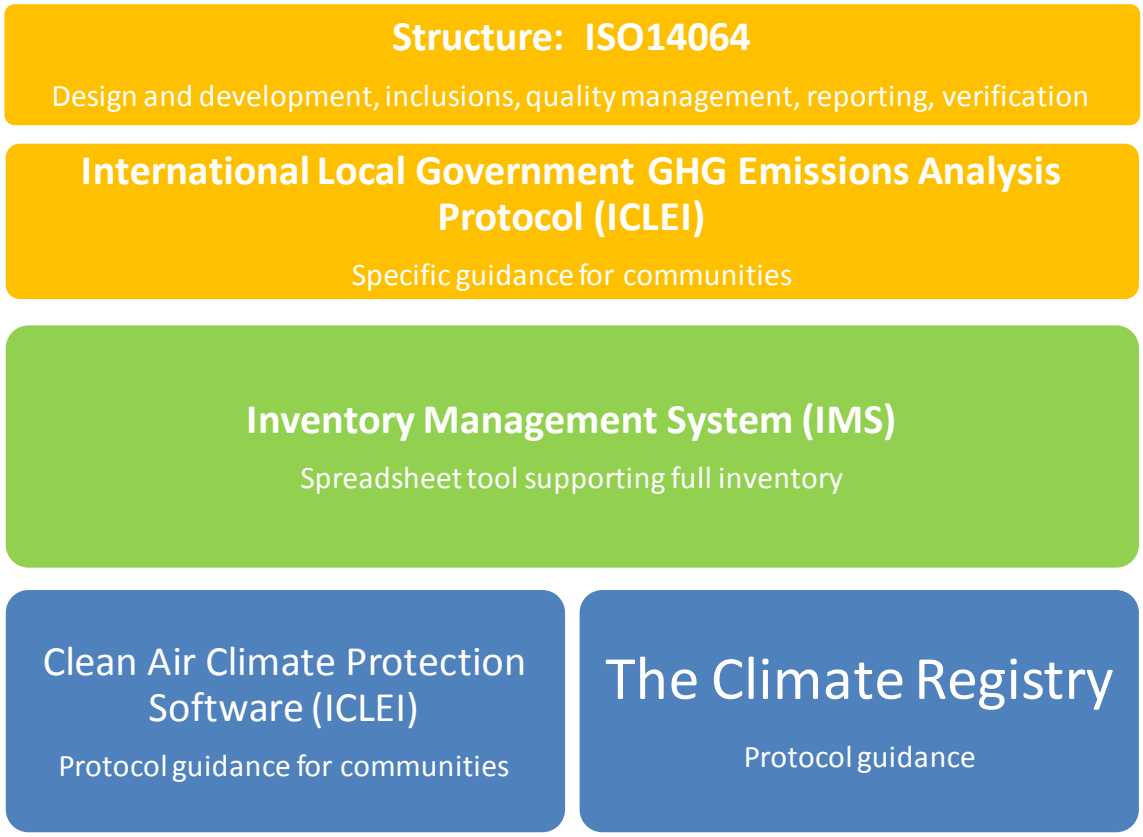
- Completeness – to address all relevant GHG emissions.
- Consistency – to enable meaningful comparison between emissions from the various sources in Alta and to fully document the inventory so that the implications of comparing Alta's GHG emissions to those of other communities can be understood.
- Accuracy – to reduce uncertainties as far as is practical with available data.
- Transparency – to disclose sufficient documentation of the inventory to allow users to make decisions and to enable future inventory users to understand and maintain the inventory.

These objectives are achieved by applying accepted methodologies in designing the inventory and calculating emissions from the best available data.

2.2 Methodology and Tools

GHG emission inventories are rarely, if ever, based on direct measurement of emissions. Instead, emissions are estimated based on accepted models and methodologies. This inventory prioritizes emissions estimates based on data pertaining to actual activities in Alta (e.g., utility bills for electricity consumed) over modeled data. However, in some cases, the results of modeling are the only option upon which to base a calculation (for example, determining emissions from on-road vehicle transportation requires modeling the number of vehicle miles traveled [VMT]).

This inventory draws on well reviewed and accepted methodologies from ISO14064-1, The Climate Registry (TCR), the Intergovernmental Panel on Climate Change (IPCC), the Environmental Protection Agency (EPA), and methodologies implemented in ICLEI - Local Governments for Sustainability's Clean Air and Climate Protection (CACP) software.



The calculations that comprise this inventory were carried out in an Inventory Management System (IMS), a Microsoft Excel-based spreadsheet that collects into one tool the original data, methodology applied, emission factors selected, and a summary of GHG emission results.

The purpose of this report is to convey the approaches used and the results of the inventory. Therefore, it is not burdened with excessive details of methodology. Full documentation of data sources, emission factors, methodologies, and results can be found in the IMS. Appendix A provides additional guidance for the audience that will be maintaining the inventory.

2.3 Included Greenhouse Gases, Units, and Terminology

Included Greenhouse Gases

This inventory includes emissions of the following GHGs which constitute the majority of the Alta's climate change impact:

1. carbon dioxide (CO_2),
2. methane (CH_4),
3. nitrous oxide (N_2O).

The other major GHGs are perfluorocarbons (PFCs), hydroflurocarbons (HFCs), and sulfur hexafluoride (SF_6). PFCs and HFCs are primarily released as the result of normal operation and maintenance of refrigeration, air conditioning, and fire suppression systems and sulfur-hexafluoride is found primarily in large electrical equipment, such as transformers. The impact of these gases on Alta's inventory is negligible because there are very few emission sources for these gases in the community. Furthermore, Alta's ability to influence these emissions is less than for those of the other major GHGs.

Units

All units presented in the body of this report are short tons (1 short ton = 2,000 pounds) unless otherwise noted.

Units of carbon dioxide equivalent (CO_2e) are used to normalize the global warming potential of the various GHGs. As portrayed in Figure 1, the emission of 1 ton of N_2O has a global warming potential (GWP) 310 times larger than that of the emission of 1 ton of CO_2. Similarly, the emission of 1 ton of CH_4 has a GWP 21 times that of CO_2. To avoid confusion between emissions of the different types of gases and their respective GWPs, all emissions are reduced to the common unit of CO_2e, or 'carbon dioxide equivalent'. Thus, the emission of 1 ton of N_2O is expressed as the emission of 310 tons of CO_2e. Tons of CO_2e will be labeled as tCO_2e.

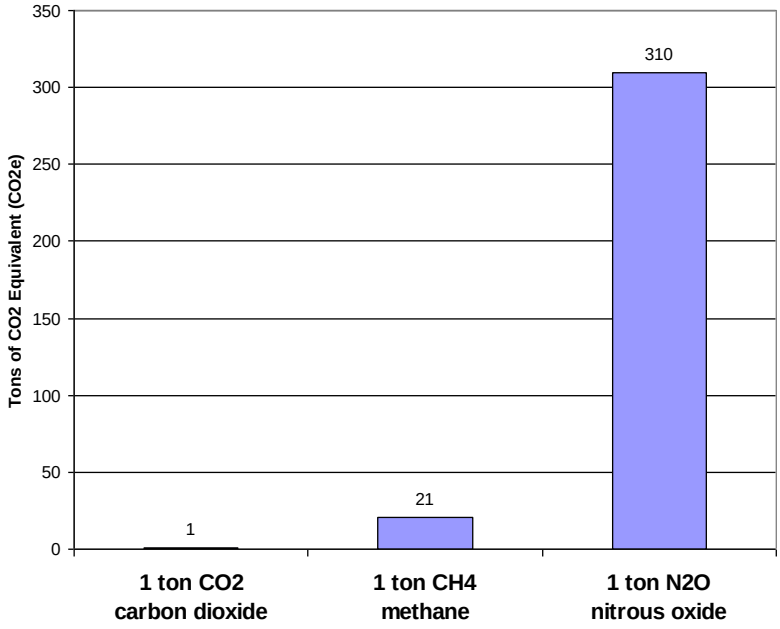


Figure 1. Units of GHG Representation

Terminology

The following terminology is used throughout this report:

- The term inventory refers to an estimate of the GHG emissions from Alta, including all activities within the Town of Alta boundary and in the immediate vicinity, such as vehicle traffic in Little Cottonwood Canyon that is destined to Alta, over which the community might have some influence. This is not the same as a GHG footprint, which is an inventory that may include other emissions that occur outside of Alta but are associated with the products consumed in Alta. Furthermore, this is not an environmental or ecological footprint, which may include impacts outside of those associated with GHG emissions such as water consumption, habitat impacts, etc.
- GHG emission, or just emission, refers to the release of CO_2, CH_4, or any other GHG described in the previous section to the atmosphere.
- IMS refers to the Inventory Management System, the spreadsheet that supports the collection of data, analysis of emissions, and graphical presentations found in this report.

2.4 Geopolitical Organizational Boundary

The Town of Alta limits, as defined by the purple line in Figure 2, were selected as the geopolitical organizational boundary for this GHG inventory. The inventory seeks to quantify the GHG emissions of all activities within this boundary including but not limited to residences and businesses. Some of the data sets used in the inventory may extend beyond the boundary of the Town to include portions of Snowbird, but efforts were made to isolate the inventory to the boundary indicated. The emissions from Town of Alta municipal operations and those of Alta Ski Area are included in this inventory.

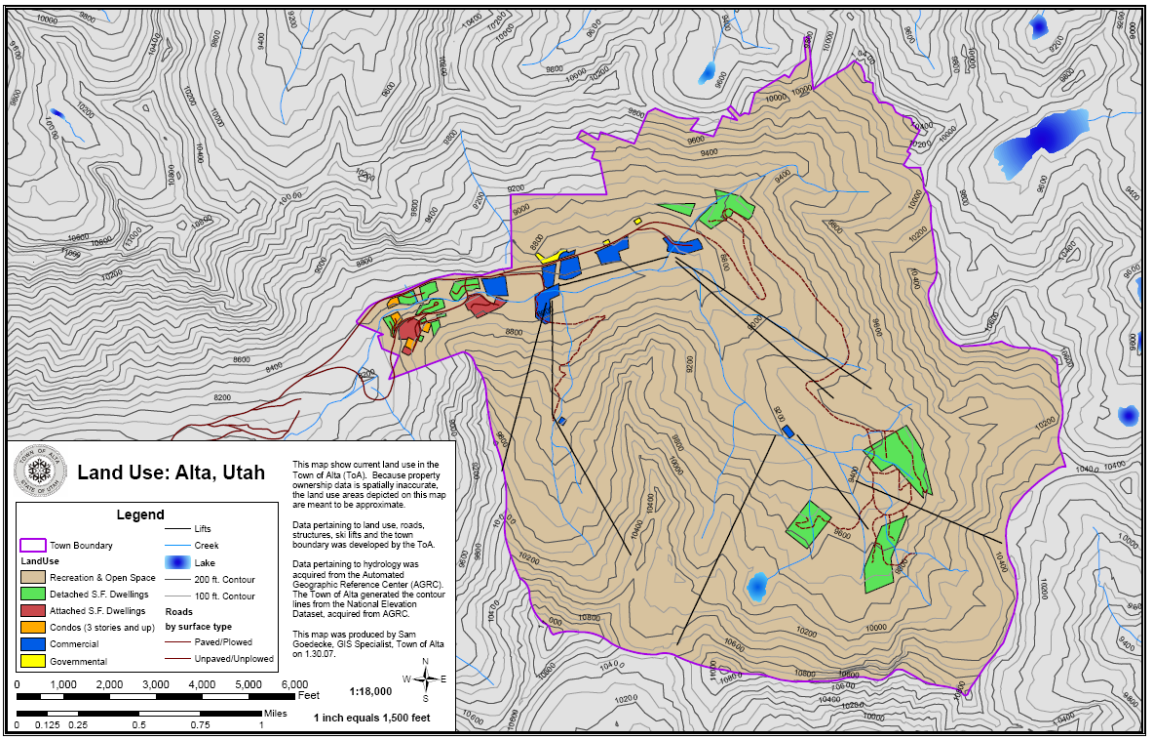


Figure 2. Geographic Boundary of Inventory

2.5 Greenhouse Gas Emission Sources

Most inventory methodologies require the entity to inventory all Direct (Scope 1) and Energy Indirect (Scope 2) GHG emissions. Other Indirect (Scope 3) emissions are reported at the discretion of the entity. As shown in Table 1, Town of Alta and Friends of Alta have elected to include the Scope 3 emissions from solid waste disposal and wastewater treatment.

Table 1. Town of Alta Emission Sources

Direct (Scope 1)	Energy Indirect (Scope 2)	Other Indirect (Scope 3)
• Natural gas consumption • Propane consumption • On-road vehicle transportation • Off-road vehicle and equipment use	• Electricity consumption	• Solid waste disposal • Wastewater treatment

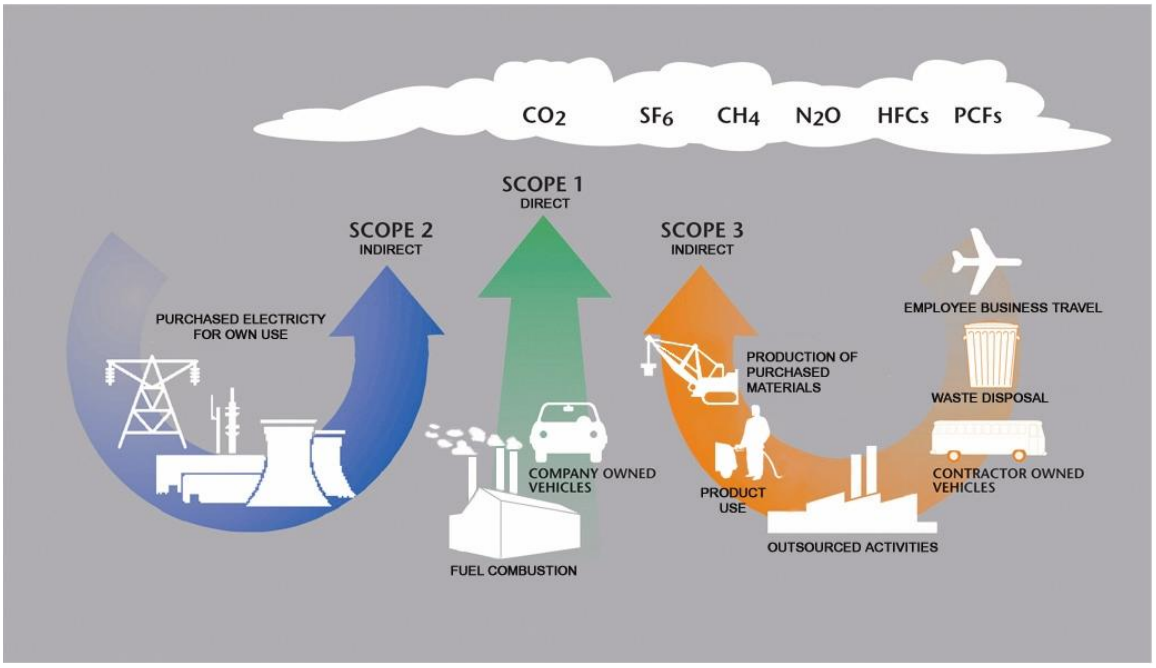


Figure 3. Typical Definition of Corporate Emission Scopes from World Resources Institute

Emission sources not included in this inventory include upstream energy and process emissions embodied in the goods and services that enter Alta from outside of the geopolitical boundary. For example, the emissions generated to produce an aluminum can (extracting raw material, processing, machining, and transporting to the Town of Alta limits) are not included in this inventory.

2.6 Greenhouse Gas Inventory

Aggregate Community Emissions

The total emissions identified in Alta's community inventory in 2007 were 33,334 tCO_2e. Energy consumption, electricity in particular, and on-road transportation are the primary sources of GHG emissions in the community, with small portions contributed by solid waste disposal and off-road vehicles. These sources are presented in Figure 4.

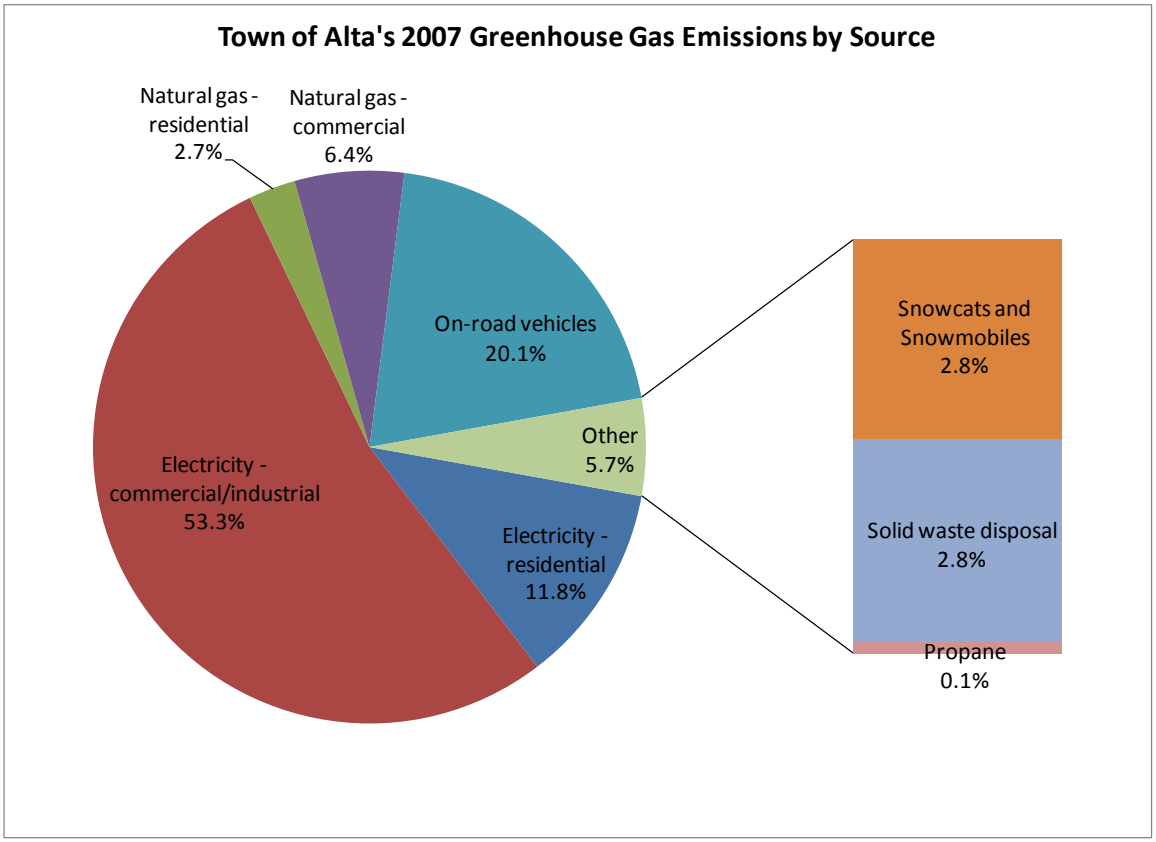


Figure 4. Total Community Emissions by Source

The following sections describe the sources of these GHG emissions and the data and methods used to quantify their impact.

Electricity

GHG emissions from electricity consumption are indirect, occurring at the source of the electricity generation, but are attributed to the consumer of the electricity. Emissions from Alta's electricity consumption were 21,679 tCO_2e in 2007, or 65.0 percent of the total inventory. Residential and commercial/industrial electricity consumption contributed about 18 percent and 82 percent, respectively, of emissions from electricity.

Emissions from electricity generation are calculated using an emissions factor that accounts for the mix of resources used to generate the electricity and the particular GHG emission rates of those resources. For the Alta inventory, a Utah-specific factor from the EPA's eGRID 2007 was applied. Regional factors were considered per the guidance of ICLEI and TCR but were not applied because the region that encompasses Town of Alta boundaries includes the significant hydroelectric resources of the Northwest, thereby greatly reducing the emission factor (Figure 5). Therefore, the Utah factor that more fully represents the impact of coal generation in the intermountain region was selected to accurately represent the impact of Alta's electricity consumption. The calculation of emissions includes factors for CO_2, methane CH_4, and nitrous oxide N_2O.

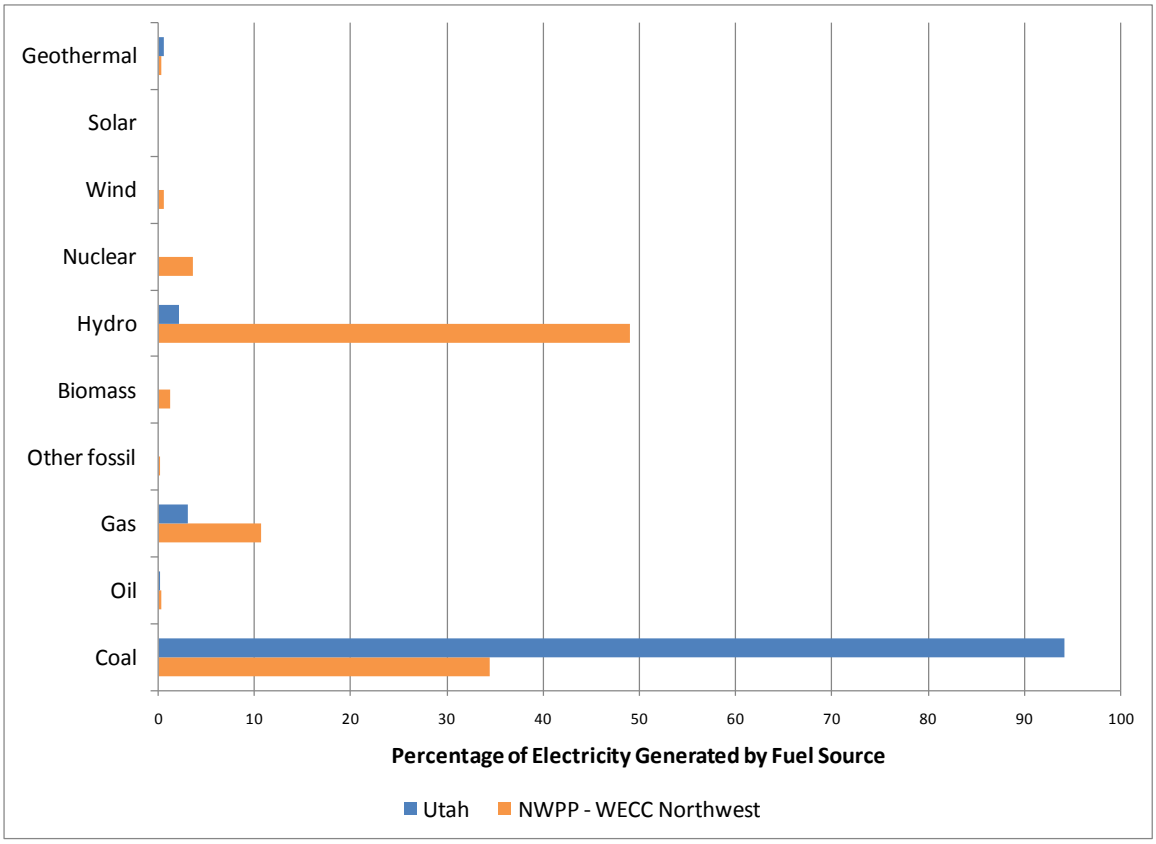


Figure 5. Comparison of State of Utah and Regional Electricity Generation Portfolios

Electricity consumption data for 2007 were provided by Rocky Mountain Power, the sole electricity provider to the community, and included segregation of residential and commercial/industrial uses.

Renewable Energy

In general, GHG reporting protocols such as The Climate Registry do not recognize renewable energy credits such as those purchased from Rocky Mountain Power's Blue Sky program as deductions against an entity's GHG inventory. Due to measurement and accounting challenges, only renewable energy that is used directly by an entity, such as that installed on the site or behind the meter, is deducted from an inventory. As a result, despite the Town of Alta's commitment to renewable energy as an EPA Green Power Community, exceeding the minimum 3 percent required for this designation by purchasing 9 percent of the community's energy as wind power through the Blue Sky program, the emissions from electricity purchases still represent total purchases made from the grid.

Though it is not deducted from the community GHG inventory, purchasing renewable energy and RECs may support the increasing uptake of renewable energy technology and reduce GHG emissions elsewhere on the electrical grid. These purchases can be an important part of a balanced climate protection effort when used in concert with local implementation of energy efficiency and onsite renewable energy generation.

Natural Gas

GHG emissions from natural gas consumption are direct, occurring at the site when the gas is combusted for uses such as heating in homes and businesses. Emissions from Alta's natural gas consumption were 3,047 tCO_2e in 2007, or 9.1 percent of the total inventory. Residential consumption contributed about 30 percent of emissions while commercial/industrial users contributed 70 percent of emissions.

Emissions from natural gas combustion were calculated using an emissions factor from The Climate Registry. The calculation of emissions includes factors for CO_2, CH_4 and N_2O.

Natural gas consumption data for 2007 was provided by Questar, the sole natural gas provider to the community, and included segregation of accounts into residential and commercial/industrial uses.

Propane

Like natural gas, greenhouse gas emissions from propane consumption are direct, occurring at the site when the gas is combusted for uses such as heating. Emissions from Alta's propane consumption were at least 48 tCO_2e in 2007, or 0.1 percent of the total inventory. Use of propane was about 40% residential and 60% commercial.

Propane consumption data were provided by two propane providers for 2007. However, due to the number of potential propane providers serving Alta it is possible that additional propane consumption occurred that is not accounted for by this data.

Emissions from propane combustion were calculated using an emission factor from The Climate Registry. The calculation of emissions includes factors for CO_2, CH_4, and N_2O.

Biomass Combustion

Most protocols, including The Climate Registry, recognize the predominant emission from biomass combustion, CO_2, as a biogenic emission source. Biogenic carbon emissions are the result of carbon that was recently sequestered during the growth of the biomass and will subsequently be subject to uptake by new biomass growth. Therefore, as a matter of protocol, these emissions are not included in an inventory and are typically reported separately. Compared with the magnitude of emissions from other energy sources, such as electricity, natural gas and propane, the emissions from wood burning in Alta are likely to be negligible.

On-road Vehicle Transportation

The GHG emissions resulting from on-road vehicle travel are direct, occurring at the tailpipe of the vehicle as the result of fossil fuel combustion in the vehicle's engine. These vehicles include cars, light trucks, heavy trucks, and transit buses. Emissions from on-road vehicle travel in Town of Alta boundaries and for those vehicles traveling in Little Cottonwood Canyon with Alta as an origin or destination were estimated to be 6,711 tCO_2e in 2007, or 20.1 percent of the total inventory.

Annual vehicle miles traveled were estimated for Little Cottonwood Canyon based on average annual daily traffic (AADT) counts from the Utah Department of Transportation. These VMTs were allocated between entities in the canyon based estimates of trip generation for Alta Ski Area, Snowbird, transit buses and shuttles, Albion Basin and various delivery companies.

Emissions from on-road vehicle travel were calculated using average fleet fuel economies and composition of vehicle types from the Department of Energy's Transportation Energy Data Book. These factors allow the conversion of total VMT to an estimated quantity of fuel consumed, which is converted to GHG emissions using factors from The Climate Registry. The use of a national average fleet composition may underestimate emissions for Alta because of the prevalence of sport utility vehicles and light trucks that tend to be used in the mountain west.

Off-road Vehicles

GHG emissions from off-road vehicles and equipment include fossil fuel combustion in vehicles such as snowmobiles, snow cats, and snow grooming equipment. Emissions from these activities in Alta were estimated to be 919 tCO_2e in 2007, or 2.8 percent of the total inventory.

Emissions were determined for Alta from fuel consumption data provided by Alta Ski Area and counts of privately operated vehicles from the Alta Town Marshal. For privately

operated vehicles, estimates were made for frequency and typical patterns of use. Emission factors from The Climate Registry were applied.

Municipal Solid Waste

GHG emissions from solid waste disposal are considered indirect and occur as a result of material decomposition at the landfill. Municipal solid waste is assumed to be landfilled in a facility with no methane capture. Emissions from municipal solid waste disposal from Alta were 931 tCO_2e in 2007, or 2.8 percent of the total inventory.

Emissions from disposal of solid waste were calculated using emission factors from the EPA's Waste Reduction Model. Waste data were provided by the primary hauler for Alta, Rob Shane.

Recycling

In 2007, an estimated 140 tons of solid waste was recycled in Alta yielding an estimated diversion rate of 18 percent.

Recycling has a two-fold benefit with respect to GHG emissions. Biodegradable materials, such as cardboard and paper, that are diverted by recycling are prevented from decomposing at the landfill and generating GHG emissions. This diversion results in a direct reduction in the community's GHG inventory. Furthermore, diverting recyclables decreases the worldwide market for virgin materials. For almost all materials, the GHG emissions that occur in returning recycled material to market are much less than those that occur bringing virgin material to market. Therefore, recycling has an impact on reducing GHG emissions both in Alta as well as in upstream materials markets.

Wastewater Treatment

GHG emissions from the treatment of wastewater tend to constitute a very small portion of most community inventories. Alta's wastewater is managed by the Central Valley Water Reclamation Facility which employs methane capture. The methane is then combusted in a cogeneration plant that provides for significant portions of the facility's electricity and heating loads. As a result, the primary GHG emission from the treatment of Alta's wastewater is carbon dioxide from combustion in the cogeneration plant. This carbon dioxide is not included in the inventory because it is considered a biogenic emission source. Biogenic carbon emissions are the result of carbon that was recently sequestered during the growth of the biomass and will subsequently be subject to uptake by new biomass growth.

3.0 Conclusion

The Community Greenhouse Gas Inventory provides the Town of Alta, Friends of Alta and Alta's community at large with a baseline off which to prioritize efforts to reduce the

community's GHG emissions and capitalize on the many co-benefits that climate protection planning can offer. While efforts that address all of the above areas will result in a holistic climate protection plan that maximizes co-benefits, efforts to increase efficiency and the use of renewables in electricity generation and to reduce vehicle trips in the Little Cottonwood Canyon are the biggest opportunities for Alta to reduce its GHG inventory. This inventory will ideally serve as a tool for designing programs, setting goals, and measuring progress with respect to GHG emissions reductions over time.

Appendix A: Maintenance of the Inventory

Aside from this written report, the Town of Alta Inventory deliverable includes all the data files and spreadsheets necessary for the ongoing maintenance of the inventory. The purpose of this section is to provide a map to orient the maintainer or reviewer of these resources.

The directory structure includes a directory for each of the source categories identified in the inventory. Within each directory are the following files, as appropriate:

- Original raw data file as provided from the source
- Documentation supporting applied methodologies or emission factors

This original data is compiled into a spreadsheet (Microsoft Excel) based Inventory Management System (IMS). This System captures basic information regarding the definition of the inventory, a list of applicable emission sources, and calculations for the inventory. Charting functions also reside in the IMS.

The following opportunities for improving the quality of activity data and reducing uncertainty in inventory results were identified during the inventory process and should be considered in future inventory updates.

- Confirm the boundaries of electricity consumption data to fully understand potential use at Snowbird (unincorporated Salt Lake County) that may be included in the Town of Alta's boundaries.
- Confirm the boundaries of natural gas consumption data to fully understand potential use at Snowbird (unincorporated Salt Lake County) that may be included inthe Town of Alta's boundaries.
- Maintain awareness of additional traffic studies in Little Cottonwood Canyon that might be used to refine the assumptions used in the current inventory.
- Improve records of solid waste and recycling volumes to better understand the community's diversion rate and provide better data on which to measure the performance of solid waste related programs.

This inventory and associated IMS were prepared by the Brendle Group, Inc. for the exclusive use of the Town of Alta. Please do not distribute the IMS to other parties without the permission of Brendle Group.