

GROUP 14 ENGINEERING

**SUSTAINABILITY REPORT
2010**

GROUP 14 BACKGROUND

Incorporated in 1993 under the name Enermodal Engineering Inc., Group14 Engineering consults on energy and environmental solutions for buildings and communities across the United States. They take their name from the periodic table — Group 14 is the Carbon Group. The name represents the firm's focus on design guidance, field work and engineering research to reduce carbon and greenhouse gas emissions.

Group14 Engineering includes building energy and sustainability professionals from across the United States. They are recognized authorities in sustainable design, the evaluation of environmentally-appropriate technologies, and building inspections & audits. Their staff accreditations include:

- Professional Engineers (PE)
- Building Energy Modeling Professionals (BEMP)
- LEED AP+s
- Associate International Association of Lighting Designers (IALD)
- Commissioning Agents (CxA)
- Certified Energy Managers (CEM)
- High-Performance Building Design Professionals (HBDP)

Statement of Purpose

Group14 Engineering is an energetic consulting firm committed to inspiring innovative and resourceful building solutions.

Connection to the World

Group14 Engineering continually strives to be a part of innovative projects that are improving the interconnections between humanity, the built environment, and our ecological surroundings.

Our Outlook

We are excited about the future that the sustainable built environment holds and how we can use the richness of resources and expertise within our office to assist clients in reaching their goals of a beautiful building that provides for both the occupants and the environment alike.

GROUP 14's PATH TO SUSTAINABLE DEVELOPMENT

Sustainable development requires a holistic approach to “growth”; and a deep understanding that true success depends on a dynamic interconnectedness of economic, ecological, and social viability.

Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

-Brundtland Commission

Economic Viability:

- Financial growth and economic stability
- Maintaining quality of work while growing client base
- Commitment to non-profits, schools, and low-income housing
- Ensuring employee well-being with livable wages and incentives

Ecological Commitment:

- 2030 Challenge of Carbon Neutrality (Energy)
- Maximizing energy efficiency (maintain Energy star rating of 98+)
- Explore opportunities for increased Renewable Energy
- Reducing GHG footprint (scopes 1-3)
- Sustainable Purchasing Policy
- Zero Waste (reuse, reduce, advanced recycling & composting)
- Reduce water consumption (internal fixtures and irrigation)
- Maximize transportation efficiency (work related and commuter)
- Maintain urban wildlife habitat and eco-friendly landscaping practices
- Assist clients in achieving all of the above goals

Social Responsibility:

- Participation in educational opportunities
- Support local businesses
- Build connections to community through partnerships
- Volunteer time, knowledge, & resources to those in need
- Engage in life-long learning



G14 OFFICE & ECOLOGICAL COMMITMENT

Inspiring resource and energy efficient buildings starts with our own workplace. The office itself is a living laboratory for the technologies and building practices we recommend to clients; and we take pride in the design and operation of our office.

THE OFFICE:

The Group14 office is located in the historic district of Uptown, a thriving, hip neighborhood located near downtown Denver. The Group14 office is the first LEED Platinum certified building in the world under the newest version (v3.0 BD&C), and it has received an Energy Star rating of 100.

As an office, they are interested in more than just reducing energy consumption; they take a holistic approach to reducing their entire ecological footprint. This includes a yearly waste audit, an advanced recycling and food composting program, limiting office supplies and product consumption, extreme indoor water savings, commuter incentives for alternative transportation, and a promotion of their connection to the outdoors – with abundant access to daylight and views, and time off to enjoy the mountains.



GROUP 14's GREENHOUSE GAS FOOTPRINT

Group 14 began tracking their Greenhouse gas (GHG) emissions in 2008 in order to better understand their ecological impact. The assessment provided a baseline against which the office could measure its progress in achieving its goal towards optimal operations and in achieving the 2030 Challenge of Carbon Neutrality.

The process brings forth the environmental consequences of the business' decisions by identifying one means of environmental impact in a quantifiable, universal metric. This tool has and will continue to allow G14 to recognize their impact, measure future progress, benchmark their performance against other similar organizations, and take responsibility for their actions.



Every action we make and activity we chose to participate in has massive global impacts. One way these impacts can be measured is through greenhouse gas emissions (as just about every activity impacts emissions in some way or another). By calculating and understanding the sources of our emissions, we can begin to balance the functionality and utility of our choices with their social and ecological impact.

METHODOLOGY

The methodology used for this GHG inventory is based on the demand-centered hybrid life cycle assessment methodology developed by Ramaswami et. al. at the University of Colorado at Denver. In this methodology, a business is treated as a direct producer of greenhouse gases and as a “demand center,” an entity that causes greenhouse gases to be produced elsewhere as a result of its demand for material and energy input. This methodology is consistent with the “Scope 1-2-3” definitions provided by the World Resources Institute. Using the WRI definitions, emissions are divided into three categories:

Scope 1: Direct in-boundary emissions. Includes a building’s natural gas emissions and tailpipe emissions from company fleet.

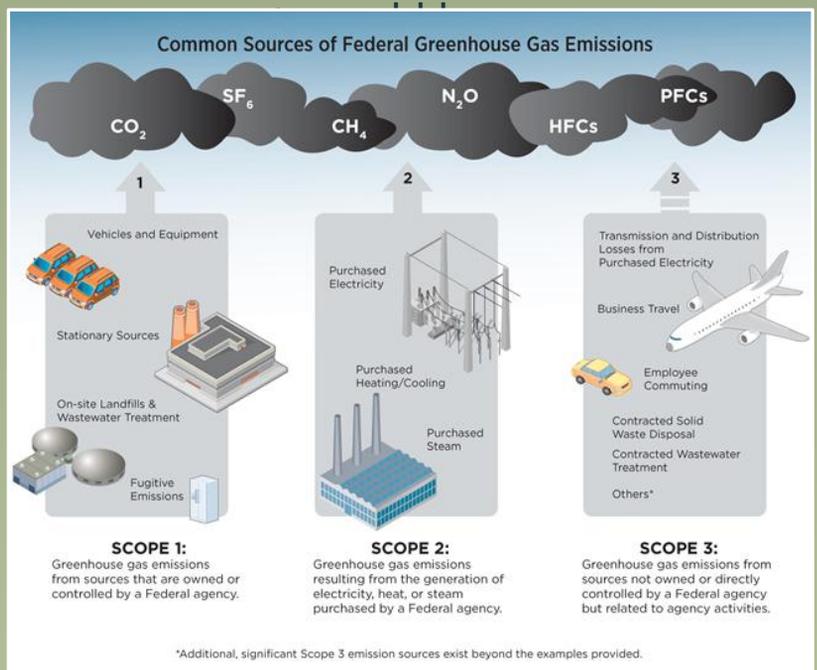
Scope 2: Indirect GHG emissions from consumption of purchased electricity, heat or steam.

Scope 3: Out-of boundary emissions. Includes materials flow and outsourced activities, such as food, fuel, and cement consumption, air travel, municipal solid waste, wastewater treatment, and any other source of GHG emissions taking place outside of the company’s boundary.

Out of boundary activities designated in Scope 3 are optional, but are highly recommended by the EPA as they often make up at least 1/3rd of the total GHG emissions being emitted and provide an opportunity to evaluate more thoroughly one’s operations. If only Scope 1 and Scope 2 emissions are pursued, this would comprise of a GHG Inventory. If Scope 3 emissions are included, the result is a comprehensive GHG Footprint.

In order to calculate the total emissions produced, the methodology makes use of a very simple process of calculating materials (or energy) flow for each sector, multiplied by that sector's emissions factor. The material (or energy) flow is the amount of physical material or energy consumed by the company during the reporting year. The emissions factor is the amount of greenhouse gas released for each unit of material or energy. The footprint considers for all greenhouse gas emissions and not just carbon dioxide (CO₂) by assessing each agent's global warming potential in relation to CO₂ equivalents (CO₂e).

This LCA addresses all the major components of GHG emissions, but has omitted the inclusion of solid waste disposal due to the inability to gather the necessary information from the waste hauler. Nevertheless the emissions created through solid



waste would be negligible, if not negative, due to the company's minimal waste (credited to virtual technologies and their waste reductions and advanced recycling program) and because the city's waste facility practices methane capture. The energy consuming activities that are included in the footprint are: natural gas, electricity, water, waste water, paper production and disposal, airline travel, vehicle travel for business, and commuter travel to and from work. For ease of discussion, the report has been divided into three sections: Buildings, Transportations, and Materials.

2010 GHG FOOTPRINT RESULTS

In calculating the 2010 GHG emissions for Group14's operations, the following scopes were accounted for: buildings, transportation, and materials.

BUILDINGS

This sector quantifies emissions from G14's office building. The energy being consumed by the building is for heating, cooling, lighting, plug loads, etc. The sources of the energy are electricity and natural gas, which are solely provided by Xcel energy, and their on-site photovoltaic (PV) system. Determining building-sector GHG emissions requires multiplying the total energy consumed by the emissions factors supplied by the energy company (or a national standard). In 2010, the total GHG emissions resulting from building energy use was **17,192 kgCO₂e**.

	Energy related (kgCO ₂ e)	Percent Savings over ASHRAE 90.1
G14 baseline	55,444	---
G14 design	27,972	50% savings
G14 2008	21,086	62% savings
G14 2010	17,192	69% savings

	2008	2010
Electricity (kBTU)	12.96	43.68
Natural Gas (kBTU)	25.8	30.7
Per Person (kBTU)	3.23	5.31

G14 has installed an on-site 3kW photovoltaic (PV) system which provides over **13%** of the buildings energy use and they have furthermore reduced their energy related emissions by **69%** from the building's baseline (according to ASHRAE 90.1 energy standard). Though the company also purchases wind power from Renewable Choice Energy to offset over 100% of the remaining electricity consumed, G14 cannot claim this reduction in GHG emissions as it is owned and maintained by Renewable Choice Energy.

2030 CHALLENGE

The 2030 Challenge is a goal set forth by the American Institute of Architects (AIA), which individual organizations can participate in. The ultimate goal of the challenge is to achieve carbon neutrality by 2030, with progressive increments of achievement along the way. The fossil fuel reduction increments for all new buildings & major renovations are:

60% in 2010

70% in 2015

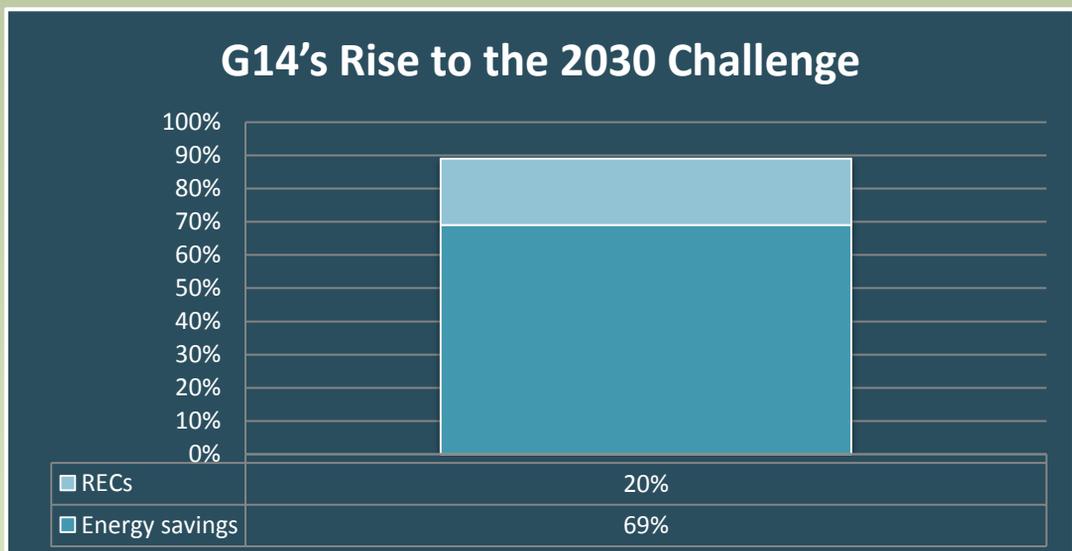
80% in 2020

90% in 2025

Carbon-neutral in 2030



These targets may be accomplished by implementing innovative sustainable design strategies, generating on-site renewable power and/or purchasing (20% maximum) renewable energy and/or certified renewable energy credits.



G14 has reached 89% of their goal towards carbon neutrality. 69% of this was achieved through energy efficiency measures and their on-site PV system. And, 20% is being offset through the purchase of RECs (maximum allowed). They are currently working towards reducing the other 11% by 2030.

TRANSPORTATION

Group14 accounted for the fuel usage of three means of transportation:

1. Commercial Motor Vehicle Transportation: Vehicle miles traveled for the purposes of onsite job visits to and from work or for the purpose of G14's business.
2. Airline Transport: Energy use associated with jet fuel for the purpose of G14's business.
3. Commuter Motor Vehicle Transportation: Vehicle miles traveled by employees between the office and their homes.

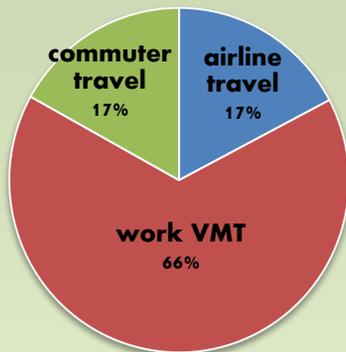
Personal & Commercial Motor Vehicle Transport

Though G14 does not own any vehicles for the companies use, they reimburse mileage to their employees who participate in work-related travel for business. In addition, the company is taking responsibility for the employees' commutes between their homes and the office. Fuel usage for vehicle transportation amounted to 2,705 gallons for work-related travel and 697 gallons for commuter travel.

Airline Transport

In 2010, employees travelled 22,836 airline miles for work. According to the 2006 US Transportation Energy Data (most recent information), the average passenger mpg for a commuter jet plane is 33, this equates to G14 consuming 692 gallons per year of fuel for air transport.

2010 Transportation GHG Emissions



	2008	2010
Airline Travel	156 gallons/yr	692 gallons
Work VMT	428 gallon/yr	2705 gallons
Commuter Travel	1,687 gallon/yr	697 gallons

ALTERNATIVE TRANSPORTATION MANAGEMENT PLAN

Group14 Engineering is committed to reducing pollution and land development impacts associated with automobile and airline use for commuting. They have therefore instituted a comprehensive transportation management plan to reduce the number of vehicle trips &/or reduce emissions associated with travel.

Through the following efforts, and the pure consciousness of its employees, Group14 has been able to reduce commuter travel (employees travelling to and from work) in single-occupant, conventionally-powered vehicles by over 50%.

- Provide reliable, secure bicycle storage and shower/changing facilities for bicycle commuters
- Offer preferred parking that reserves the most desirable parking spaces for carpool and fuel-efficient vehicles.
- Promote and support compressed workweeks
- Instituted a "Work from Home" program, encouraging employees to telecommute whenever appropriate. Each employee has remote access to company server via a secure RFP networking program, and has been supplied with a personal laptop.
- Offer free bus and light rail passes
- Encourage use of tele-conferencing to avoid the need for work-related travel

MATERIALS

The materials sector includes various sources of Scope 3 GHG emissions, which are indirect emitters as a result of company activity. The company has included the following into their analysis: water and wastewater, and paper production and consumption/disposal.

Group 14 attempts to reduce both interior and exterior water usage. They have employed a 1.1gpf pressure-assisted water closet, a 1.6/1.28 dual flush toilet, a .125gpf urinal, .5gpm lav and sink faucets, and 1.5gpm shower.

Their exterior landscape includes drought-tolerant native and adaptive plantings, drip irrigation, and rain sensors.

Paper

The flow of paper was determined based upon financial data from G14's records and compared with records provided by the paper supply company. Though paper consumption is minimal in the office (as are office supplies in general), it makes up a significant portion of products purchased for the office, and thus our emissions. The emissions factors for the production of paper and its eventual disposal were obtained through the EPA.

Water

G14 consumed a total of 114,000 gallons of water in 2010 (info gathered from Denver Water) most of which went to landscaping (over 85%) – this is partly due to the office's high efficiency water fixtures, but also due to their outdated water intensive irrigation system, which was recently updated in the spring of 2011.

Wastewater

Because most of the water being consumed by G14 is used for landscaping, much of the 114,000 gallons consumed is not directly being treated through the municipal waste-water system, but is instead filtered back into the water table or being accounted for in run-off, which is difficult to quantify at this time. Of the water consumed, approximately 12,000 gallons goes back to Denver Water for treatment.



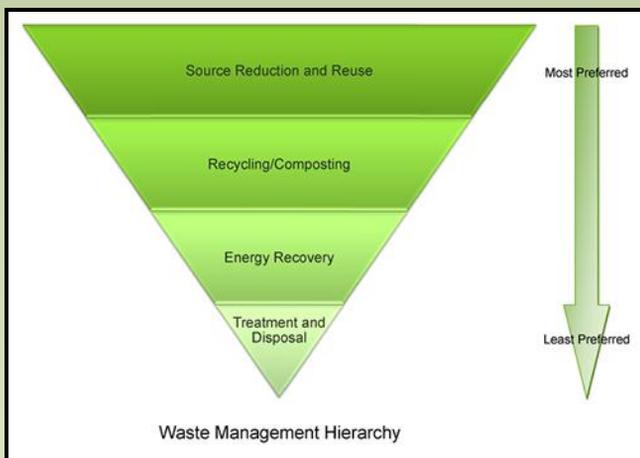
Sustainable Purchasing Policy

Group14 has instituted a Sustainable Purchasing Policy that addresses on-going consumables, durable goods, building materials used in facility alterations and additions, mercury containing lamps, and food & beverages.

When procuring goods and services, Group14 takes into consideration resource reduction, raw material acquisition, manufacturing, worker health and wellbeing, packaging, distribution, reuse, operation, maintenance, disposal, energy efficiency, product performance, durability, safety, the needs of the purchaser, and life cycle cost.

Waste Management Policy

Group14 pursues a waste management plan, attempting to minimize the amount of waste going to the landfill and furthermore reduce toxicity and protect environmental and public health related to waste. In addition to the traditional commingled recycling program, Group14 attempts to reduce waste reductions in operations from purchasing through reuse and disposal. The office utilizes reusable dishware, to-go food containers, towels and napkins. They minimize paper usage through electronic filing and default double-sided printing. Their advanced recycling program accepts electronics, light bulbs, ink cartridges, coffee cups, packing materials, Styrofoam, wine corks, plastic bags, clothing & books. Lastly they have a composting program in which they can divert all organic material including food, cardboard, paperboard, and landscape waste. Through the program, Group14 diverts over 85% of their waste from the landfill.



G14's 2010 GHG FOOTPRINT

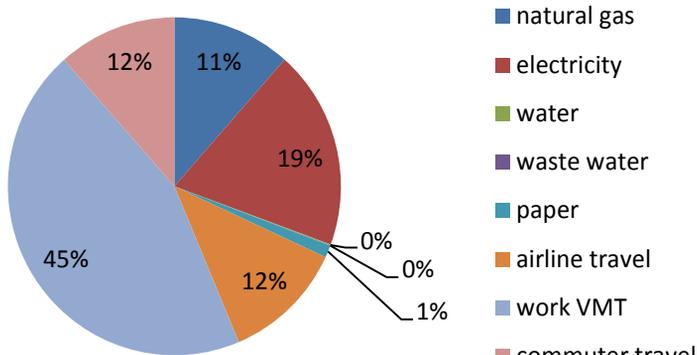
Inventory Items	Sector/Use	Material/Energy flows (MFA)	GHG Emission Factor (EF)	EF data source	Total GHG emitted (kgCO ₂ e)
scope 1	natural gas	1220 therms	5.3kgCO ₂ e/therm	ICLEI	6,466.00
scope 2	electricity	14,960 kWh	.717kgCO ₂ e/kWh	Xcel	10,726.32
scope 3	water	114,000 gallons	.459gCO ₂ e/gallon	Denver Water	52.33
	waste water	12,000 gallons	1.39gCO ₂ e/gallon	Denver Water	16.68
	paper	344.76 kg	1.907kgCO ₂ e/kg	EPA Victoria	657.46
			(-).871kgCO ₂ e/kg	EPA WARM	-300.29
	airline travel	692 gallons	9.57kgCO ₂ e/gallon	EIA	6,622.44
	work VMT	2705.47 gallons	9.3kgCO ₂ e/gallon	GREET	25,160.87
	commuter travel	697.23 gallons	9.3kgCO ₂ e/gallon	GREET	6,484.24
Total GHG emissions					55,886.05

The GHG emissions for the 2010 calendar year totaled 55,886 kgCO₂e. This is up from about 10,000kg from the 2008 calendar year. In this time, overall energy usage actually decreased; but these savings were diminished by the expanded employee base resulting in an increased usage of resources, such as water and gasoline. Nevertheless, overall per capita emissions has lowered.

TOTAL GHG FOOTPRINT (kgCO ₂ e)	
2008	2010
45,332	55,886

GHG EMISSIONS PER PERSON (kgCO ₂ e)	
2008	2010
4,121	3,992

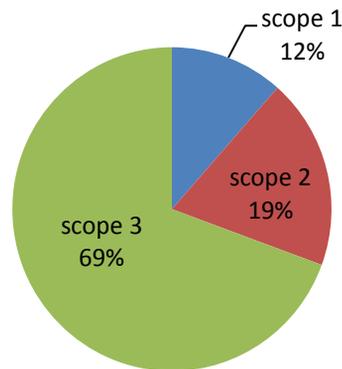
Source as Portion of Total Emissions



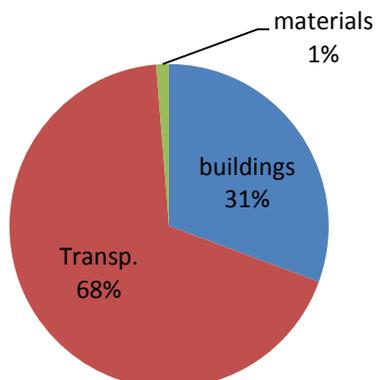
The majority of the 2010 emissions were accumulated through work related vehicle travel followed by whole building electricity use, commuter & airline travel.

Generally, scope 3 makes up only 33% of an organization's emissions, in the case of G14 it makes of 69%; this is in part due to their increased energy efficiency.

Scopes as Portion of Total Emissions



Sector as Portion of Total Emissions



Without much debate, transportation use - in the form of commuter and work-related travel - constitutes the greatest emissions for G14.

BENCHMARKING

Calculating an organization's total emissions is only useful if you can interpret the data and begin to compare this information against one's own baseline or other similar organizations through benchmarking.

Average Energy Uses per Square Footage

	G14 Office (3980sf)	National Avg (5K-10K sf bldgs)	National Avg for Offices	West (commercial bldgs)	Mountain (commercial bldgs)
Electricity (KwH)	12.8	12.4	17.3	13.8	15.4
Natural Gas (kBTU)	30.7	54.8	31.8	39.8	57.9

*based on US Energy Information Administration (eia) - 2003 (most recent data)

RMPA eGRID Subregion (CO-WY)

	G14 Office Building	Typical office building	Energy Star Office Building	50% Lower Carbon Office Building
lbs CO2/sf	4	41	30	20

*based on EPA's Energy Star program (2007)

EPA Region 8 (Denver) Comparison

	kBTU/sf	kBTU/person	Gallons H2O/sf	Gallons H2O/person
G14	43.50	13,317	28.64	8,769
EPA - Denver	77.67	24,941	9.44	3,030

*based on EPA - Region 8 office reporting (2011)

NREL Comparison - kg/CO2e/person

	Electricity	Natural Gas	Commuters	Air Travel	Fleet	Total
G14	825	497	499	500	1,935	4,257
NREL	10,464	20,635	2,888	1,851	135	35,973

*based on NREL 2010 Sustainability Report

MOVING FORWARD

In order to gain benefit from the inventory and benchmarking, and to further assess progress, it is essential that an organization begins to create an Action Plan around their goals. This also requires a regular analysis of one's GHG emissions through similar inventories and an expansion of the analysis into more sectors, such as solid waste, recycling, food consumption, etc...

In the case of Group14, the organization wishes to achieve the 2030 Challenge, optimize operations, and further establish a sense of sustainability in the realm of economic, ecological, and social development.

In order to achieve the 2030 Challenge, Group14 will continue to examine and proactively pursue ways of reducing their building (energy) related emissions through a Measurement & Verification Plan, Recommissioning efforts, continual optimization of HVAC and lighting systems, and renewable energy opportunities.

In order to drastically lower overall emissions related to Group14, the organization will need to address transportation as well; which is where they have the most opportunity for emissions reduction. To address this issues, they will continue to incentivize and promote their transportation management plan. And, for work related travel they will minimize trips through teleconferencing and maximizing meeting productivity; they will encourage the use of alternative transportation for local travel; and investigate the utilization of fuel efficient vehicles in their fleet.

As Group14 works to meet their goals, they will not only note significant savings in costs and emissions, but will also be taking responsibility for their impact and working to live up to their mission of inspiring innovative and resourceful building solutions.