# Reducing Rocky Mountain Emissions

***Genevieve London, Anne Joiner, and Chad Gilless, Stillwater Energy***
***Wil Mannes, Colorado Energy Office***

## ABSTRACT

After a challenging 2020, 2021 appears to be a year of opportunity for organizations interested in reducing their GHG emissions. Many agreements and frameworks exist in the market, political changes appear to point towards increased adoption, and populations have been socialized with the need for greenhouse gas reductions, and these combine to hold a promise for real impacts. In the US, the Centennial State, Colorado, is poised to both lead and benefit from these positive changes.

The US state of Colorado has generally been a success story in terms of economic growth, both across the board and in the industrial sector. Alongside this, organizations are working with each other to capitalize on GHG-related policies and frameworks and to be leaders in the US and in their competitive markets. This paper brings together perspectives from three levels. The Colorado GHG Pollution Reduction Roadmap is a pathway to meet climate targets. The Clean Energy Plan is the climate plan from Colorado's largest investor-owned utility. And two local manufacturers are taking practical actions, one of which is aligning to the Paris Agreement and the other which is aligning to the UN Sustainable Development Goals (SDGs). This paper shares how these different perspectives can align to both push GHG reduction as well as to support economic growth in the industrial sector.

## Building Blocks for Climate Action

Climate change has been a global topic since 1992 when it first appeared on the international stage in Rio de Janeiro at the United Nations Conference on Environment and Development (also known as the Earth Summit). At the Earth Summit, countries adopted the UN Framework Convention on Climate Change (UNFCCC) and opened it for signatures. The UNFCCC established an agreement to stabilize "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interface with the climate system" (*Timeline of Major UN Climate Negotiations*, n.d.). This was not a legally binding treaty and set no mandatory limits on Greenhouse Gas (GHG) emissions. The UNFCCC Treaty entered into force in 1994 after receiving 50 ratifications. The initial group who signed the UNFCCC began to meet annually, starting at the first Conference of the Parties (COP1) in Berlin, Germany in 1995. Each subsequent year, COP delegates met in international destinations across the globe to assess progress and make strides towards a legally binding climate commitment. In 1997 at the COP3 in in Japan, the nations agreed to legally mandate country specific emissions reduction targets; the resulting treaty is known as the Kyoto Protocol. The protocol went into effect in 2005 when it set binding emissions targets for developed countries. The United States signed the protocol. but it was never ratified, arguing the Kyoto Protocol would negatively impact the US economy (Denchak, 2021); Canada withdrew from Protocol in 2012. With limited participation and relatively modest commitments, the protocol has been seen as minimally effective.

At the COP21 in Paris, nations committed to supporting a multilateral negotiations process across all stakeholders to reach an agreement that is: universal and includes a hybrid of legally binding and nonbinding provisions; fair and differentiated; and sustainable and dynamic. The result is the Paris Agreement (*The Paris Agreement*, n.d.), seen as the successor to the Kyoto Protocol. The Paris Agreement requires that all countries do their part to slash greenhouse gas emissions, but it does not penalize countries for missing their targets. The Agreement has greater flexibility and national ownership, meaning developing and developed nations play an active role. The Paris Agreement does outline a system of monitoring, reporting, and assessing targets over time.

The graphic below illustrates the relation between the Paris Agreement and the United Nations (UN) Sustainable Development Goals (SDGs). Implementation of the Paris Agreement is essential to attaining the climate-related SDGs. Since the Paris Agreement is the cornerstone to local, regional, and international goals, it is described in more detail below.

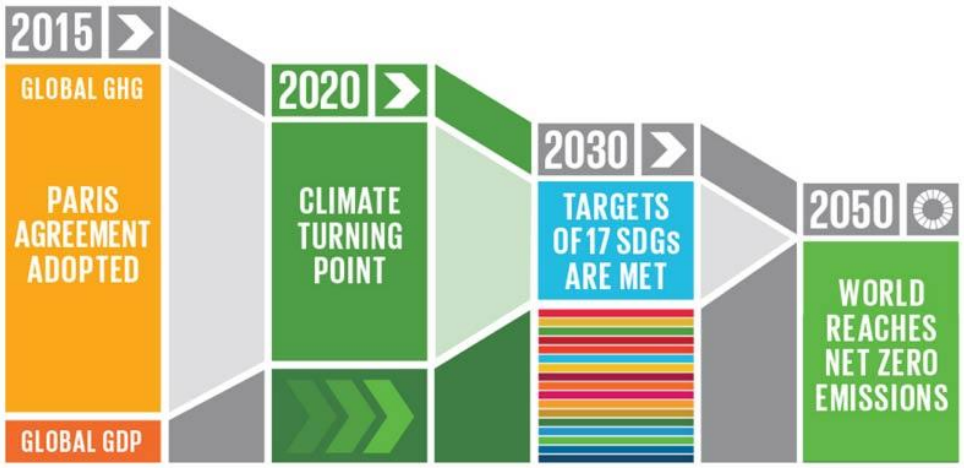


Figure 1: Succession of Climate Change Policy over time. *Source:* UN SDGs 2015.

**Paris Agreement**

The Paris Agreement provides an international and ambitious pathway forward to limit temperature rise to well below 2 degrees, maybe even 1.5. 196 Parties adopted the treaty at the COP21 in Paris on December 12, 2015. The Paris Agreement signifies a multilateral climate change approach that unifies all nations to undertake ambitious efforts to combat global climate change. To do this, the Paris Agreement created a clear framework for all countries to make emissions reduction commitments and strengthen those actions over time. There are three major goals outlined in the Paris Agreement:

1. Limit temperature rise to 1.5C
2. Review individual country commitments to cutting emissions every five years
3. Provide climate finance to developing nations

Implementation of the Paris Agreement requires economic and social transformation based on the best available scientific information. According to the Paris Agreement each

country must develop and submit a five-year plan with steadily increasing climate action goals. These mandatory plans are known as nationally determined contributions (NDCs). In addition to submitting five-year plans, the Paris Agreement provides a framework for financial, technical, and capacity building support for developing nations. Developed nations are urged to take the lead to provide financial assistance for climate mitigation, adaption, and resiliency to adapt to adverse effects of climate change. To support this goal of providing financial assistance to developing countries, four special funds were created: Special Climate Change Fund, Least Developed Countries Fund, Green Climate Fund and Adaptation Fund under the Kyoto Protocol (*Climate Finance in the Negotiations*, 2018). The Paris Agreement signifies a substantial step in unified climate action.

## International Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) were developed in 2015 as an urgent call to action by all countries – developed and developing – to form a global partnership to combat the world's most challenging issues. The SDGs are a collection of 17 goals to achieve a better and more sustainable future for all. They address global challenges from poverty; inequality; climate change; environmental degradation; and peace and justice.

Similar to the Paris Agreement, the United Nations Sustainable Development Goals (SDGs) are global goals focused on building healthier and more resilient communities. The Paris Agreement and SDGs are inextricably linked. The United Nations shares "A strong climate agreement backed by action on the ground will help to achieve the SDGs to end poverty, build stronger economies and safer, healthier and more livable societies everywhere (2015)." This is made even more evident by the 12 out of 17 SDGs that are hinged on climate action, and two SDGs that are closely linked to GHG emissions. SDG 7 ensures access to affordable, reliable, sustainable and modern energy. SDG 13 urges action to combat climate change and its impacts.

## Understanding Emissions, Accounting and Reporting

There are five greenhouse gases (GHGs) that trap heat in the atmosphere causing the planet to warm. Those five GHGs are carbon dioxide, methane, nitrous oxide, fluorinated gases and water vapor. The two most impactful GHGs are carbon dioxide and methane. Carbon dioxide accounts for 76% of global anthropogenic emissions and stays present in the atmosphere longer than other GHGs (Denchak, 2016). Different GHGs have different global warming potentials (GWP). For example, although methane is less abundant than carbon dioxide it is much more potent in terms of its greenhouse gas effect.

To ensure entities are accounting for GHGs the same way, accounting for GHG emissions requires its own specific framework. The Greenhouse Gas Protocol Initiative is a multi-stakeholder partnership convened by the World Resources Institute (WRI) and World Business Council for Sustainable Development. The GHG Protocol Initiative launched in 1998

to develop an internationally recognized and accepted methodology to account and report on Greenhouse Gas emissions (World Resources Institute & World Business Council for Sustainable Development, 2004). As described in the GHG Protocol, to properly inventory emissions it is imperative to set operational boundaries to delineate from direct and indirect emission sources. The GHG Protocol boundaries are described in Scope 1, Scope 2 and Scope 3 emissions. Scope definitions are below:

- Scope 1 emission are direct GHG emissions that occur from sources that are controlled or owned by an organization
- Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat or cooling
- Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organization but that the organization indirectly impacts in its value chain (EPA, 2020).

The graphic below illustrates the differences between scope 1, 2 and 3 emissions along the value chain.

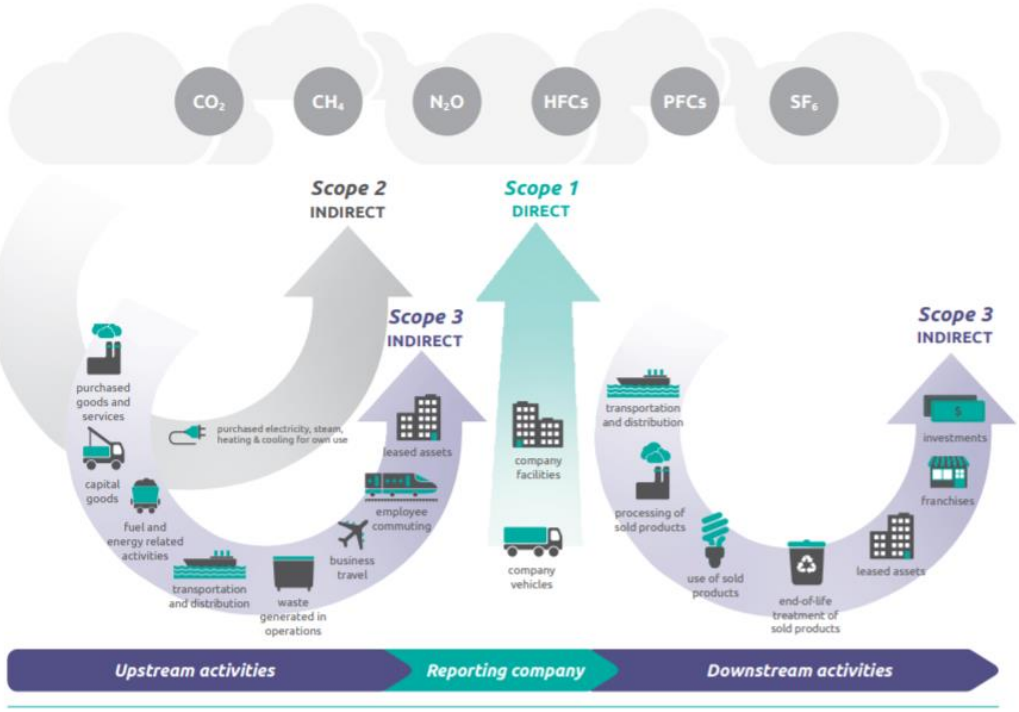


Figure 2: Overview of GHG Protocol scopes and emissions across the value chain. *Source: GHG Protocol Initiative 2004*

## Colorado is Leading the Way

### Colorado Greenhouse Gas Pollution Reduction Roadmap

At local levels both the Paris Agreement and the UN SDGs have found their way into state-wide decarbonization strategies and greenhouse gas reduction goals for local Colorado manufacturers. In the State of Colorado, since taking office in 2019, the Administration of Governor Jared Polis has supported the environment and clean energy adoption. In 2019, the state adopted HB 19-1261 “Climate Action Plan to Reduce Pollution”. This legislation outlined

targets to reduce statewide greenhouse gas pollution by 26% by 2025, 50% by 2030 and 90% by 2050 (Colorado Energy Office, 2021). To prioritize near term actions to meet the 2025 and 2030 goals, the State developed and finalized the Greenhouse Gas Roadmap "Roadmap" in 2021. The Roadmap outlines a multipronged approach with discrete actions to reduce emissions state-wide with the support of regional utilities and action from the industrial sector, and supports economic diversity and progress while improving the health and wellbeing of Colorado communities. The Roadmap is a collaboration of five different state agencies including Colorado Energy Office (CEO). The Roadmap outlines three different scenarios based on climate change action:

1. Reference Case – modeled emission reduction based on all existing state policy prior to 2019.
2. 2019 Action Scenario – modeled emission reduction based on prior state policy and legislative, administrative, and voluntary actions adopted in 2019.
3. 1261 Action Scenario – modeled an illustrative path Colorado could take to meet GHG reduction targets HB19-1261.

The chart below is from the Roadmap, and it illustrates pollution reduction targets needed to achieve the 1261 Action Scenario. Specific, high impact categories are "Clean Electricity", "Transportation Electrification", "Energy Efficiency" and "Oil & Gas Measures".

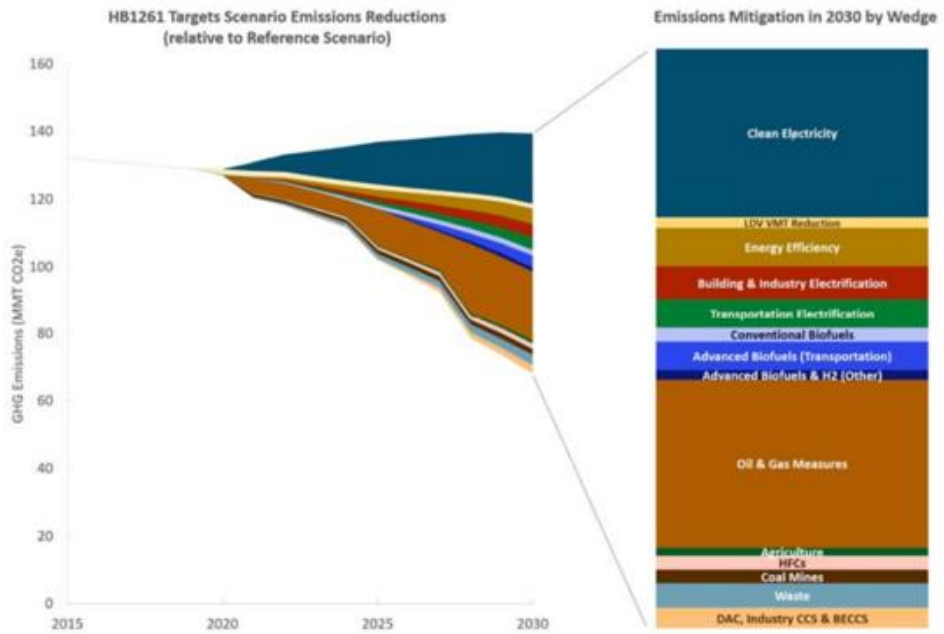


Figure 3: Representative Pollution Reductions in 1261 Target Scenario to Meet 2030 Climate Goals.
*Source: GHG Reduction Roadmap 2021*

To achieve the targets necessary for pollution reduction goals outlined in the chart above, there are several necessary key actions:

- Continue swift transition away from coal to renewable electricity (retiring many coal generation plants)
- Make deep reduction in methane pollution from oil and gas development

- Accelerate shift to electric cars, trucks and buses
- Make changes to transportation planning and investment and land use planning to encourage alternatives to driving
- Increase building efficiency and electrification
- Reduce methane and waste from landfills, wastewater and other sources.

As outlined in the chart and primary actions above, a large portion of the plan relies on electricity from clean generation. The Roadmap estimates that that an 80% reduction in emission by 2030 (from 2005 levels is necessary for the electric utility sector. The largest investor owned utility, Public Service Company of Colorado (Xcel Energy) is required to adopt a Clean Energy Plan as outlined in Senate Bill 236, while other state utilities may submit their plan voluntarily. In addition to Clean Energy Plan adoption, the Roadmap recommends that gas utilities are to expand their energy efficiency investments to support building shell improvements; support beneficial forms of electrification and provide greater financial support for energy projects. To better understand how Xcel Energy is supporting the Colorado Roadmap, Xcel Energy's Clean Energy Plan is described below.

**Public Service Company of Colorado (Xcel Energy's Colorado branch) 2030 Clean Energy Plan**

Xcel Energy is the largest Investor-Owned Utility in the state of Colorado. Xcel Energy provides 53% of Colorado's electricity (SWEEP, 2018). Xcel Energy's carbon goals specific to their electric generation (not including natural gas) are grounded in the research completed through the COP21 Paris Agreement. Xcel Energy is aligned to the Paris Agreement through limiting global temperature increase to 2C. In 2018, Xcel Energy became the first utility nationwide to announce a vision for a carbon-free electricity system by 2050. This plan continues to be refined as Xcel Energy shares their plan to deliver 80% renewable energy while assuring an affordable, reliable energy system (Xcel Energy, 2021). Highlights from this plan include:

- Adding about 5,500MW of new wind, solar generation and battery storage;
- Significantly reducing coal plant operations by 2030 and retiring or repowering all remaining coal units by 2040;
- Building upon successful customer focused energy-efficiency programs, distributed generation opportunities, and demand response options to manage energy load;
- Ensuring grid stability and reliability with flexible resources capable of operating around renewable resources as well as during times of extreme heat or cold;
- Creating a workforce and community transition plan, building upon the utility's experience leading clean energy transitions across its service area; and
- Evaluating transmission infrastructure in the state to improve the reliability and flexibility of the system and reduce the cost of the renewable energy additions contemplated by this plan.

As Colorado's largest utility, Xcel Energy's efforts can be seen as strongly influencing the other 51 utilities in the state. Unifying Colorado's energy efforts across utility jurisdictions is one role of the CEO.

### Colorado Energy Office Energy Initiatives

The mission of CEO is to "reduce greenhouse gas emissions and consumer energy costs by advancing clean energy, energy efficiency and zero emission vehicles to benefit all Coloradans". To help attain this vision, CEO has goals in four areas:

1. Greenhouse Gas Emissions and Renewable Energy.
2. Electrifying Transportation.
3. Energy Project Implementation in the Residential, Commercial and Industrial Sectors.
4. Address Energy Burdens through Weatherization Assistance.

To help achieve the third goal about energy project implementation, CEO is in its third year of administering the Industrial Strategic Energy Management Program (I-SEM). This program targets energy performance improvements through low to no-cost operations, maintenance and behavioral opportunities. This program builds organizational resiliency and business continuity through organizational structures like energy teams, energy policies and employee engagement (Colorado Energy Office, 2019). The CEO I-SEM program targets regions of the state that have fewer energy efficiency resources available to them. As of Spring 2021, the I-SEM program has been implemented in the Northern and Southern Front Range of Colorado, with plans to implement in other parts of the state in coming years. Through the implementation of the I-SEM program, it has become apparent that program participants are focused on achieving goals to develop and support corporate energy and GHG goals.

## SEM's Role in Climate Action

The effort to combat climate change is the largest global change management effort to date. To create a lasting impact, change starts at the individual level. Through the analysis and review of the Paris Agreement, UN SDGs, Colorado's GHG Roadmap and core goals of the CEO I-SEM program, this change is filtering down to individual organizations, facilities, and leaders. The stage appears to be set for a global uptick in decarbonization and now local and regional program administrators are able to support the implementation of reducing greenhouse gas emissions through energy program design, incentives and legislation.

### SEM's Role in Decarbonization

SEM is a proven framework to manage energy effectively and strategically with minimal cost. This same methodology can be applied to manage GHG emissions. Several tactics to incorporate GHGs into SEM include:

1. Executive Engagement – Include GHGs in plans and policies, and then support approval and implementation of more GHG projects. Executive support of financial analysis utilizing present value rather than simple payback can also be a means of supporting GHG reductions.

2. Culture Change – Increase awareness of deep energy retrofits and electrification for buildings and facilities. This change starts at the individual level, to bring urgency to GHG action.
3. Employee Engagement – Use appropriate "why GHG" messaging for the specific audience. Operate systems more efficiently to reduce upfront emissions. Support GHG project persistence through ongoing training for maintenance and operations staff. Provide education and awareness around GHG emissions to general employees.
4. GHG related metrics – Account for GHGs in tracking tools and goals, including tracking grid-based emissions versus onsite energy emissions. Account for time of use from offsite electricity generation to better integrate the variability of renewable energy sources such as wind or solar.
5. Champions and Teams – Support organizational energy management resiliency through targeted energy management activities such as team cross training.

These above tactics can be applied across SEM programs. Although CEO's I-SEM program is similar to most utility SEM programs, CEO being a non-regulatory department of the Governor's office and not a utility program administrator enables greater incorporation and increased adoption of GHG reduction goals and alignment to the SDGs.

It is important to point out that multiple I-SEM program participants had already aligned to and/or subscribed to SDGs and other international protocols prior to their participation in the I-SEM program, driven by individual organizational needs.

**Industrial Strategic Energy Management (I-SEM) Trends**

CEO's (I-SEM) program is built to deploy SEM principles, but unlike traditional resource acquisition SEM programs, there are no mandatory energy savings (kWh or therm) goals or requirements within the program, nor measurement and verification (M&V) expectations appropriate for utility demand side management (DSM) programs. With that, a greater percent of the program is dedicated to SEM implementation.

The I-SEM program focuses on measuring each participant organization's progress in energy management practices via the Energy Management Assessment (EMA). The program conducts two EMAs within the program year, one at the outset as an initial organizational baseline, and the second at the program year end to demonstrate progress and support ongoing prioritization and action. The EMA emphasizes many of the organizational tenets of SEM, including policies, teams, employee engagement, and metrics. It also encourages participants to incorporate additional key metrics like GHGs into their goals, employee engagement efforts, energy data and modeling, etc. In the current cohort, individual organizations are subscribing to UN SDGs and the Paris Agreement. These international protocols are being shared from participants' corporate headquarters and are then implemented at the plant level.

Individual cohort members have requested that GHGs be incorporated into their SEM program energy performance tracking tools, illustrating the market push for relevant reporting mechanisms for GHG-related scopes:

- Scope 1: to reduce emissions related to onsite energy consumption

- Scope 2: to encourage energy purchased from renewable sources, and to support integration of these renewable energy sources through local energy management practices

GHG tracking and reporting has the potential to be complex or overwhelming, but simple and streamlined tracking of scope 1 and 2 emissions based on publicly available data such as the Emissions and Generation Resource Integrated Database (eGrid) serves as an entry point to GHG tracking. eGrid collects data on regional the make-up of power generation and provides regional conversion factors for carbon dioxide, sulfur dioxide, and nitrous oxides. This data can easily be integrated. Similar to the empowerment that SEM provides through tracking and reporting of energy data and energy performance, the integration of simple GHG tracking into the SEM performance tracking tool acts as a starting point for cohort members just becoming familiar with GHG principles and can catalyze GHG tracking and engagement though the organization. A sample of how basic GHG tracking is integrated into the I-SEM performance tracking tool is shown in Figure 4.

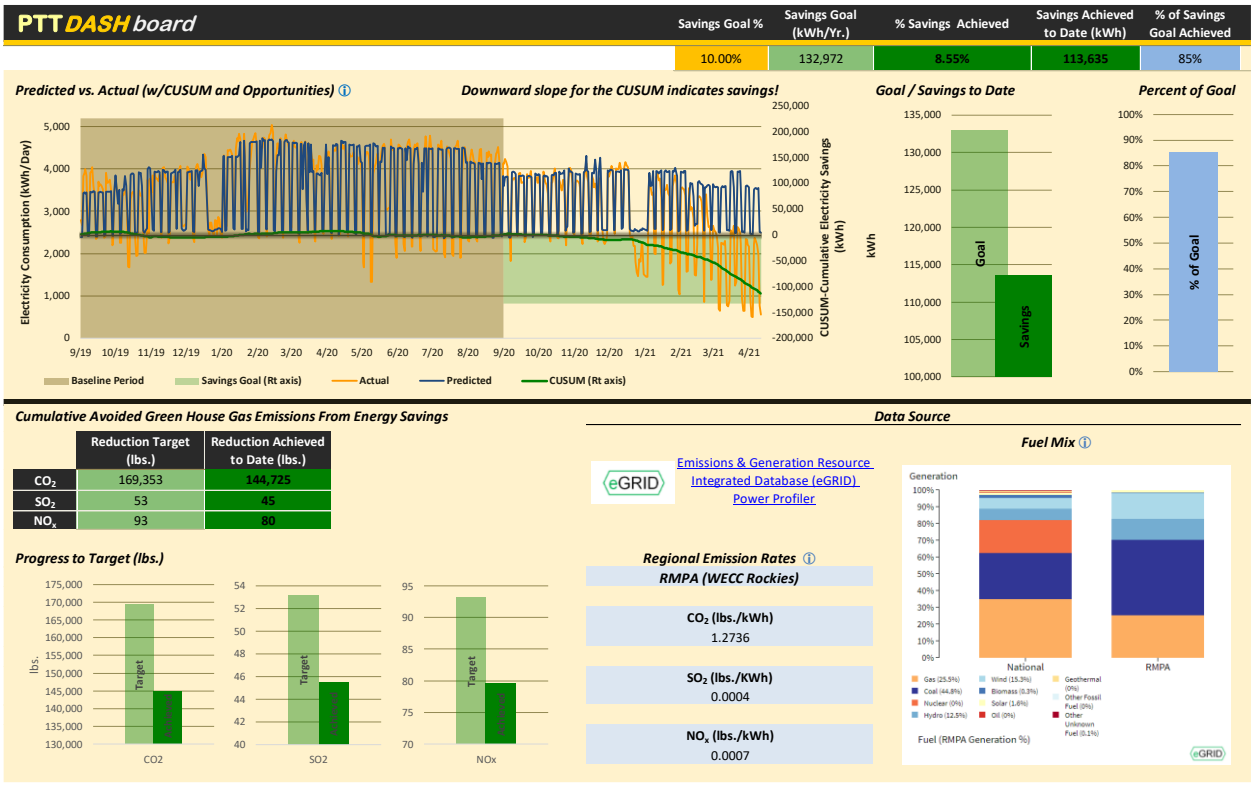


*Figure 4: Integration of GHG metrics into I-SEM performance tracking tool (eGrid, 2021)*

## Comparing Across Programs

As local facilities receive GHG directives from their corporate headquarters, utility programs have often had to reactively deploy GHG-related solutions to these customers. Based on a recent informal survey conducted by the North American SEM Collaborative, program administrators have deployed many types of GHG-related solutions as parts of their SEM programs, as illustrated in the following diagram.

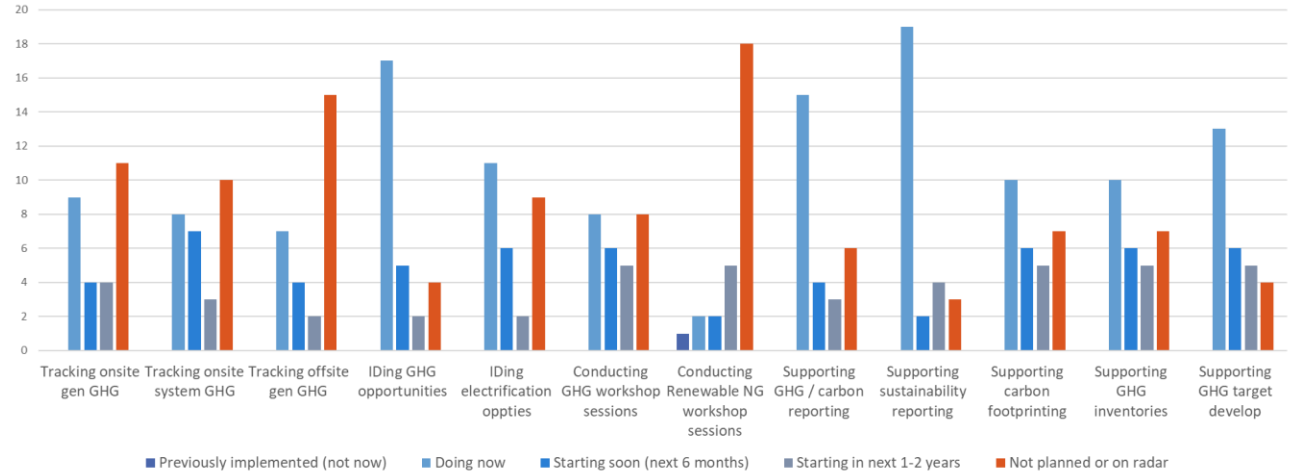


Figure 5: Current GHG/Decarbonization Activity within SEM Programs. *Source North American SEM Survey 2021*

The chart highlights several points, including:

- Most Program Administrators are supportive of GHG and sustainability reporting, yet few Program Administrators have the ability to put GHG reporting into action.
- There are significant opportunities to track onsite generation GHGs, identify electrification opportunities and conduct informational GHG and renewable workshops.

With participants pushing the envelope on the development, tracking, and reporting of GHG reduction goals, traditional SEM and energy efficiency programs must innovate to successfully support end users in attaining larger decarbonization goals and mandates.

In addition to understanding opportunities within an SEM program, survey respondents also shared their largest barriers to address GHGs in SEM programs, shown in the following diagram.

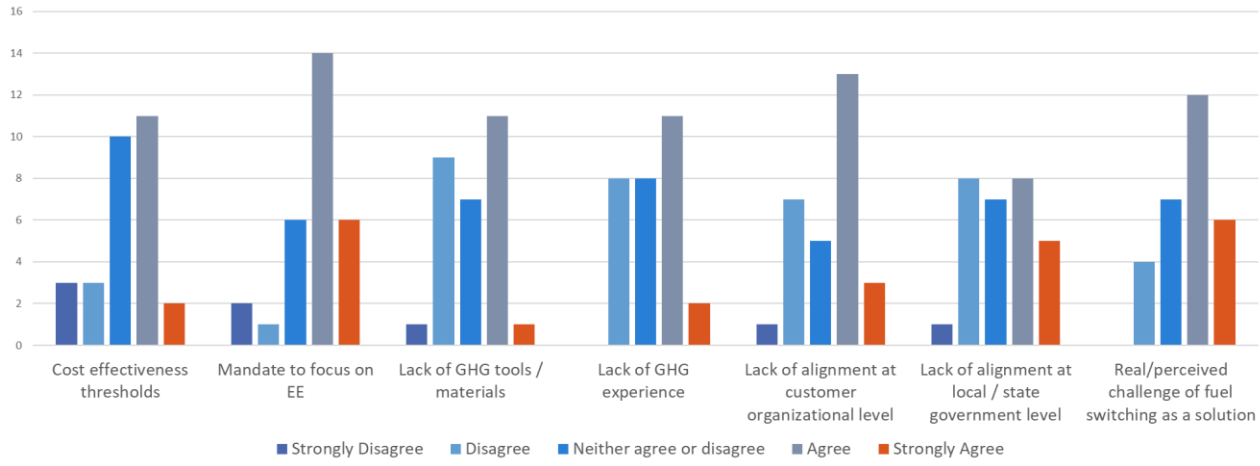


Figure 6: Current Challenges to Address GHG within SEM Programs. *Source: North American SEM Survey 2021*

Most notably respondents to this North American survey frequently shared common challenges:

- Their organization's mandate to focus solely on Energy Efficiency, as opposed to the incorporation of energy efficiency goals into larger GHG reduction goals,
- A lack of alignment at customer organization, local and state government level, and
- The real versus perceived challenge of fuel switching as a solution.

In comparison to North American respondents, in Colorado there is alignment at the state, utility and organization level to address GHGs. This is imperative to drive support for SEM program participants which will lead to meaningful emission reductions.

**Conclusion**

There appear to be positive signs for manufacturers and other private sector organizations to increasingly adopt sustainability frameworks like the UN SDGs based around accepted climate plans like the Paris Agreement. At the same time, there appears to be growing support from US and Canadian governments around the importance and urgency to address climate change. The prognosis is promising for meaningful climate-related action.

The state of Colorado is leading in their efforts to support a unified approach for reducing GHG emissions through decarbonization. A key lesson from Colorado is alignment. Program administrators should look to partners within their local state agencies to support established frameworks like the UN SDGs, whose climate components are based on the Paris Agreement; this framework will have the greatest meaning in the markets of end use organizations. This will align the utility, state, and organization around GHGs, supporting meaningful actions and meaningful results.

## References


*Climate Finance in the negotiations*. (2018). UNFCCC.Int. https://unfccc.int/topics/climate-finance/the-big-picture/climate-finance-in-the-negotiations#:~:text=Climate%20Finance%20in%20the%20Paris,existing%20obligations%20under%20the%20Convention.

Colorado Energy Office. (2019). *Industrial Strategic Energy Management | Colorado Energy Office*. Https://Energyoffice.Colorado.Gov/Clean-Energy-Programs/. https://energyoffice.colorado.gov/clean-energy-programs/industrial-strategic-energy-management

Colorado Energy Office. (2021, January). *Greenhouse Gas Pollution Roadmap Final Report*. https://drive.google.com/file/d/1jzLvFcrDryhhs9ZkT_UXkQM_0LiiYZfq/view

Denchak, M. (2016). *Greenhouse Effect 101*. NRDC. https://www.nrdc.org/stories/greenhouse-effect-101

Denchak, M. (2021, February 19). *Paris Climate Agreement: Everything You Need to Know*. NRDC. https://www.nrdc.org/stories/paris-climate-agreement-everything-you-need-know#sec-important

EPA. (2020, December 31). *Scope 3 Inventory Guidance*. US EPA. https://www.epa.gov/climateleadership/scope-3-inventory-guidance

M., D., D., D., M., M., & M. (2015). *Climate Action*. United Nations Sustainable Development. https://www.un.org/sustainabledevelopment/climate-action/#ParisAgreement

SWEEP. (2018, December). *Colorado || SWEEP Colorado Utility Energy Efficiency Program*. Https://Www.Swenergy.Org. https://www.swenergy.org/utilities/states/colorado#:%7E:text=Colorado%20is%20served%20by%20two,53%20percent%20of%20Colorado's%20electricity.

*The Paris Agreement*. (n.d.). [Press release]. https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

*Timeline of Major UN Climate Negociations*. (n.d.). Environmental and Energy Study Institute. Retrieved April 28, 2021, from https://www.eesi.org/policy/international

World Resources Institute & World Business Council for Sustainable Development. (2004). *GHG Protocol A corporate accounting and reporting standard*. https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

Xcel Energy. (2021, February 24). *Xcel Energy announces 2030 Clean Energy Plan to reduce carbon emissions 85%* [Press release].

https://www.xcelenergy.com/company/media_room/news_releases/xcel_energy_announces_2030_clean_energy_plan_to_reduce_carbon_emissions_85%25

Kohler, J. (2021, February 25). “Xcel Energy ups ante on cutting greenhouse-gas emissions, pledges 85% reduction by 2030.” The Denver Post. https://www.denverpost.com/2021/02/25/xcel-energy-colorado-renewable-energy-plan/