DRAFT NOT FOR DISTRIBUTION

MONTANA CLIMATE SOLUTIONS PLAN

AUGUST 2020

A REPORT BY THE MONTANA CLIMATE SOLUTIONS COUNCIL

MONTANA CLIMATE SOLUTIONS PLAN
AUGUST 2020

A REPORT BY THE MONTANA CLIMATE SOLUTIONS COUNCIL

CONTENTS

Steve Bullock
Governor
STATE OF MONTANA

Suggested Citation: State of Montana. (2020). Montana Climate Solutions Plan. Helena, MT.

Acknowledgements: We wish to acknowledge and appreciate the significant contributions of the members of Montana Climate Solutions Council for their time and dedication toward the creation of this plan. In addition, we are grateful to the many partners who contributed to the Council's work including the U.S. Climate Alliance, the Center for the New Energy Economy, the Clean Energy Transition Institute and Evolved Energy Research. We also wish to express our thanks to the state agency staff who provided invaluable support and the many members of the public who attended meetings, offered comments on draft products, and shared their expertise to inform the Council's deliberations.

Letter from Governor Bullock

Dear Friends and Colleagues:

Icillab int volupta tionesc iatiorpos autet voluptasita dolore nosae maximol uptatest, optaect orest, occus quiatiur, nienduc ipiciae vendaes secus doloreptur? Hariam es res ex eatest od magni odis aperum, quamus rest quatiat assumqu aspernat.

Obis net mi, susae voluptio. Nequo erum ipsam quiatem eost, quo quunda iliam fugitat invelendae. Henis quibus et pa ium ventis voles is evendisime aspero quibus quam illuptum qui voluptation non plignitame rem rerciment volupta core re veni re sequae es nis eostium fugianda de voluptat enia sit alissi desequam am fugitibus diant parupta tquasped eaquas nienditia volorporum quo vendipis dolorep eriores equiassi dem quam, excea dolut imilis inullame sitat asimin evelesequi totatem quuntotat earum et ma que peristio. Mil int minturion rem harum nimenditat et late esciis eum quatemolorum ventur, sit eum rest, consequae prem sequame paribustio eatio dem autectaeri ommolup tatet, sit fugitiist a commit, tem doluptas molest, sunt volupta sperro escille simperor aut officte iti is eossi aut abo. Nam am quis voluptatem endita quosaped milluptas evelibus et autem et qui dus utaspit libusdandam ipsape int et es siti te endendio. Ciis saperum id ex eum sunt, acilique veliquae doleceruptur sum dolorporro eos abo. Neque volorbus plicit exero test et, iuntis nullorerat mintia evella volum imporibus, consequam qui con re dolupti beatio voluptas evelibus volum vent, tem adi ...t ... ... quis ... quia vellabore quam quiditaest, odit vellacestior sus autas dolo cuptae natectium diorio. Uciunt.

Letter to be included in final plan release

Mus, senis aut excea volendundi dolorem re odiciatem harchil eatem eum, auda sit dessimenihit volupit vollatiis magnatibus nonsect atemquatquis mi, eaturep tatenditia nusam fugit, omnia invenimetur, solorum acipit molupiendit et omnit eos sitibus aperum quam et officabo. Tianimo luptas volupta simusant untemol uptationsed qui nobit rem. Lenieniet qui ute ea sinum consenem invendi quod que eium eium quia velest qui blaut volupicid molendelibus etusda voluptur mosa niet et event eos rernate pro te ma sae voluptatus, ide peditas pelicipient est fuga. Da pre, omnisquam que dit aborem ratur? Abo. Agni dolestrum qui ne custe doloritat.

Hitam eic torerit quam, esti ipsaped quaecust officab int lat plaut providelis et ullaut quiatem porero consectat.Uptaspist, aborent ex et volum istis asimpor eiciet landignatur, sum ra dolupturi a pratio estiate consequia vid ut qui beaturibus. Xerum et et fugitibus molente mporeru ptium, veles qui doles conse magnat.

Otam, nonecese renectiust faceat quiam quo temquaectem voluptat quam ex esti dolecullent quae corrovid quat. Exerum facerit fuga. Rum, essi cullaborendi dolorpos num non num utem iditatibus aut lacipsunt veliqua tiorit, sunt utem atiustia cus sam earumque nimus pratquid quam sim hiliam ni ium, omnitis eic tem volescit quossitiore ipis ipictin re ne maximod eatur suntet pelist resequas eserecte doluptat.

Letter to be included in final plan release

Em ipsapicime ni cus, occupicabo. Ero mi, sequis que estoreperum volorernatem autature es sit ditia pa que occus, suntiam, sam alis sunt aut il elendae rovitatur re vollabo. Hentotatus, verunte ssintem. Fuga. Moluptae. Ut que sit dus ute dere doluptatatur reptatiae que pa dolupta ium reptaes tinistotaque quianditam ad ullatia cum quam, cori tem et reniae peribus doloritat autecta sequidu cienimus, quia denihicta pliquo qui sinctateni auta quiam ent am quat ut desequo dolupta por audit aliquo exerori beaturiae plique eum iusaes vel et eos acimagn atecerum imus, is in peruptatqui istibus experiorum quiandam, ut faceatem laut is soluptium ratur, si sum audae dolupti iscidus vel mi, quam et quatusae rest, se simus estis volorem conesequae. Cuptibus iligentis et es molecuptatum eos et atemodi amusdaerum dolor molenim isiminulpa que nimpore prae. Nem dolorrovid ut ex es enda quuntem debis delessitiae nem quasinc totatia etiam volum evene porum rae odis aborem fugiae est voloritat.Sum reptaquiat. Sam ra consed quo maximus eaque nciendis acestibusa at.

Rum fugiae es denis corum labore optio. Nequiam audi quo dolupta santore demollorum sunt rerum ipid quatur, occusae voluptatum rehenis secatur senihit im alique seque vent quos veniminctur magnam consequ iatemped moloriosam adia volut qui dolumquia vollabo. Nequunt officiis que cum fuga. Et estio te veniendam id exerum que debiti atem facia qui ipsam fugit utatur? Escia dolor ad maio dolut pel minvenis es moluptas magnis que aut veligen tincil iust as porum, suntur? Quiatur, omnia imus volupic iendia quiatia erferibus voluptate lab in conseque ea nos nonest etur? Nostrum aute nosanis saperum quiantem inulluptam sit aut vent.

Rum fugiae es denis corum labore optio. Nequiam audi quo dolupta santore demollorum sunt rerum ipid quatur, occusae voluptatum rehenis secatur senihit im alique seque vent quos veniminctur magnam consequ iatemped moloriosam adia volut qui dolumquia vollabo.

Occus non eveles ipiendam quiati voluptatur, sa imillam qui ne vollace rfererferum fugit explabo. Et offic tenditas et, sequiae eatio bea aspienda cuscid qui ut autaqui aut platur renesti oreprae. Ped quo test quo dolor accabor suntiis doluptius a veratia veliantis molor soluptae nimoluptatem reiciam facilit, optatincia veles excerciatem repratis quam, sunt officiene dolupta speruptas velitaquatis

Sincerely,

Steve Bullock
Governor

BACKGROUND

On July 1, 2019, Governor Bullock issued Executive Order 8-2019, creating the Montana Climate Solutions Council and joining the State of Montana to the U.S. Climate Alliance. The Council was tasked with developing a Climate Solutions Plan (this document) that provides recommendations and strategies aimed at preparing Montanans for climate impacts; reducing greenhouse gas (GHG) emissions – including achieving an interim goal of net GHG neutrality for average annual electric loads in the state by no later than 2035 and a goal of net GHG neutrality economy-wide at a date to be determined by the Council; advancing the research, development, and commercialization of new technologies necessary to meet these goals; and addressing the needs of communities and workers in transitions through economic and workforce development efforts.

Montana's climate is already changing. Our temperatures are 2–3° F warmer on average than in 1950. Historical observations demonstrate a shift to earlier snowmelt and earlier peak spring runoff, impacting flooding, water availability, and stream temperatures. Increased temperatures, insect and disease mortality, and fuel loads together are driving increases in the size and possibly the frequency and severity of wildfires. According to the *2017 Montana Climate Assessment* (MCA),[1] the state could experience an additional 3–7° F increase in average temperatures by mid-century, including more days of extreme heat that would dramatically increase many of these impacts moving forward.

Within our state borders, we have also begun to experience transitions in our economy and our energy sector that reflect changes that are happening across our nation and around the world. How the state responds to the shifting demands and needs of the global economy can help ensure our sustained economic growth and position us to continue to provide the food, energy, products, technology, tourism opportunities, and other goods and services to the nation and the world that drive our economy.

Planning for climate change can help the state prepare for anticipated risks amid these uncertainties. Not only does the state face a series of physical risks tied to a changing climate, the state also faces fiscal risks impacting state budgets and services, and economic risks implicating employment and income trends. The state's businesses must also confront financial risks as investors react to market transitions and anticipated policy changes. Planning for climate change not only helps us manage the costs tied to these risks

1 http://montanaclimate.org

through proactive efforts to manage uncertainty, it also offers opportunities for the state to capture and localize the market for innovation happening in response to climate challenges, offering a chance for the state to simultaneously take advantage of and safeguard our traditional strengths while also diversifying and growing new opportunities for the future. While there are many benefits to climate planning and action, many members of the Council are cognizant that care must be taken to evaluate individual policies to determine the implications for issues such as direct and indirect costs, equity across communities, and reliability of our energy system. Implementation of this plan requires action by the state legislature, the public service commission, the executive branch, and numerous business and nonprofit partners – each of which must consider the capacity, costs, and benefits of the recommendations appropriately. Nonetheless, the urgency for action is great and the opportunities for benefits are commensurately large. Montana cannot afford *not* to act.

The Montana Climate Solutions Council

The purpose of the Montana Climate Solutions Council was to provide recommendations to the governor, legislature, and citizens of Montana on strategies to reduce GHG emissions, prepare the state for climate impacts, foster innovation across Montana's economy, and address the needs of communities in transition through appropriate economic development and workforce strategies. The Council developed three committees to further its objectives between full meetings of the Council:

1. The Climate Adaptation, Information, and Decision Support Committee;

2. Greenhouse Gas Mitigation Strategies Committee; and

3. The Technology Innovation for Climate Solutions and Community Transitions Committee.

The Council and committees convened via in-person meetings, webinars, and conference calls to advance their deliberations. Meetings and calls were noticed to the public and – along with a draft report issued in February 2020 – offered members of the public substantial opportunity to track progress, provide input, and share information relevant to the Council's work.

Through a charter, the Council established a commitment to mutual respect, shared learning, and consensus decisions whenever possible. Consensus was defined as achieved when all Council members could live with or were in support of a proposal. The Council recognized that to meet the goals and objectives outlined in Executive Order 8-2019, it would need to advance some recommendations that did not achieve consensus. As such, the Council agreed to adopt recommendations that received support or neutral positions from at least a two-thirds majority of its members with two caveats: in the final report 1) those recommendations had to be clearly distinguished from consensus recommendations and 2) dissenting viewpoints and concerns had to be articulated.

Additional information on the Council's charter, meeting archives, and public comments received can be found at https://deq.mt.gov/Climate/.

LIST OF RECOMMENDATIONS

1. PREPARING MONTANANS FOR CLIMATE IMPACTS

Climate change-driven severe events (e.g., wildfires, drought, flooding) threaten people, communities, and businesses across Montana. The state must prioritize efforts that will prepare our communities, infrastructure, and economies for anticipated climate impacts. Such preparations include ensuring that our natural resources (e.g., farms, forests, rangelands, wildlife, water supplies) continue to sustain our livelihoods and quality of life. Building resilience will require addressing current climate variability and recent extreme events as well as preparing for future change and emergent threats. Given recent climate projections, there is an urgency to strengthen efforts across Montana.

The Council established the Climate Adaptation, Information, and Decision Support Committee to develop strategies to prepare the state for climate impacts. Adaptation knits together a range of activities from translating science into usable information to building the partnerships required to implement strategies that reduce risk. The practice of adaptation commonly includes five general stages: 1) awareness, 2) assessment, 3) planning, 4) implementation, and 5) monitoring.

A foundation of the best available science and locally relevant knowledge, experience, and information is critical to inform decision-making. However, sound science and information alone are insufficient to effectively manage climate-related risks. *Translation* of that science-based information into a form readily accessible to the public is required to best build capacity, outreach, and delivery mechanisms in response to the needs of government agencies, tribal nations, land managers, business owners, non-profits, and individuals. Planning exercises can help decision-makers assess vulnerabilities and identify appropriate strategies to minimize or eliminate risks. In the end, effective adaptation is an iterative process that requires a) taking action to reduce risks, b) a commitment to monitoring results and learning from successes and failures, and c) a willingness to try a different approach, if necessary, based on monitoring outcomes.

Montanans have diverse experiences planning for climate impacts, including efforts at municipal, county, watershed, and tribal nation scales. Committee members discussed their past experiences involving Climate Smart Missoula, the Blackfeet Nation, Montana Disaster and Emergency Services, the Montana Climate Office's work with state agencies to develop early warning systems for drought and flooding, research and community engagement from the Montana University System, and the Department of Natural Resources and Conservation's work with federal partners in the Upper Missouri River Headwaters through the

National Drought Resilience Partnership. Council members also reflected on the findings and process used to develop the *National Climate Assessment* and the *2017 Montana Climate Assessment*,[2] including the state-based workshops, questionnaires, and listening sessions used to guide the MCA's development. Based on these experiences and best practices, Council members identified the following guiding principles for effective adaptation.

2 https://montanaclimate.org/

GUIDING PRINCIPLES FOR EFFECTIVE CLIMATE ADAPTATION

1. Montana agencies, communities, and stakeholders should approach climate change and its impacts with an understanding of the state's geography, culture, history, economy, and resources.

2. Addressing climate change impacts requires robust, community-driven, and bottom-up planning based on an understanding of recent climate trends and future climate projections and the specific vulnerabilities and risks that different sectors and communities will experience, including a focus on explicit goals and effective actions to build resilience.

3. A common framework using the best available science to develop adaptation plans can help highlight commonalities and differences across the approaches used by different jurisdictions and sectors, facilitating comparison and learning among users and identification of best practices.

4. Recommendations should build on and be integrated into existing programs wherever possible.

5. Adaptation efforts should be coordinated with related efforts – including outside of Montana – especially strategies to reduce emissions and foster innovation to achieve multiple benefits and synergies.

6. Communities cannot do adaptation planning individually and without support. The state needs to provide coordinated assistance to gather and share information; build and support networks and partnerships among communities, universities, non-profit, and philanthropic organizations; provide sustained funding for planning; and leverage federal dollars and capacity.

CASE STUDY

The Montana Climate Assessment:

Stakeholder Driven, Science Informed

The 2017 Montana Climate Assessment (MCA)[3] is an effort to synthesize, evaluate, and share credible and relevant scientific information about climate change in Montana with the citizens of the state. The motivation for the MCA arose from Montanans and organizations across the state who expressed interest in receiving timely and pertinent information about climate change, including information about historical variability, past trends, and projections of future impacts.

The MCA was developed by the Montana University System's Institute on Ecosystems, in collaboration with the Montana Climate Office, Montana Water Center and Montana State University Extension. Montana State University scientists Cathy Whitlock and Bruce Maxwell, past and current co-directors of the Montana Institute on Ecosystems, worked on the report with a 30-member team over two years. The Assessment, the first in a planned series, focused on climate trends and their impacts for three key sectors of economic importance for the state: water, forests, and agriculture. The process to develop the MCA was guided by locally relevant science and driven by stakeholder input through questionnaires, conversations, and listening sessions across the state, helping to ensure the research was most relevant and useful to decision makers and end users.

"For years, stakeholders across the state have wondered how much Montana's climate has changed and how much will it change in the future," said Kelsey Jencso, director of the Montana Climate Office at the University of Montana. "The science to address this question has previously been discussed at global or national levels, whereas this assessment provides a first look at these trends and their impacts within Montana."

The report concluded that the number of days when temperatures exceed 90 degrees, and the number of frost-free days, is expected to increase. Montana's snowpack has declined since the 1930s in mountains east and west of the Continental Divide, a trend that has accelerated in the period since the 1980s. Warming temperatures over the next century are likely to reduce snowpack at middle and lower elevations, and earlier runoff will lead to decreased streamflow and less reliable irrigation capacity during the late growing season. The state's growing season is lengthening – now twelve days longer than it was in 1950, but year-to-year variability continues to pose significant threats to production. More frost-free days and longer growing seasons may enable greater crop diversity. However, more 90-degree-plus days will also increase water loss via evaporation and transpiration from plants. Hotter days will also increase water demand for most crops, limit grain development, and increase heat stress on livestock. Forest fires will be bigger, more frequent, and more severe over the coming decades.

The findings offer a common basis to evaluate potential impacts and develop responsive and smart resilience strategies to prepare Montanans for a changing climate. In early 2021, the Montana Institute on Ecosystems will release the next installment of the MCA entitled Climate Change and Human Health in Montana. The effort again draws from the experience of practitioners and the report will include recommendations for the state, communities, and individuals to better prepare for health-related climate impacts in the decades ahead.

Continuing to support sustained, timely and relevant data and assessments of climate trends and projections impacting Montana is a core function of the proposed Montana Climate Solutions Network (see recommendation 1A).

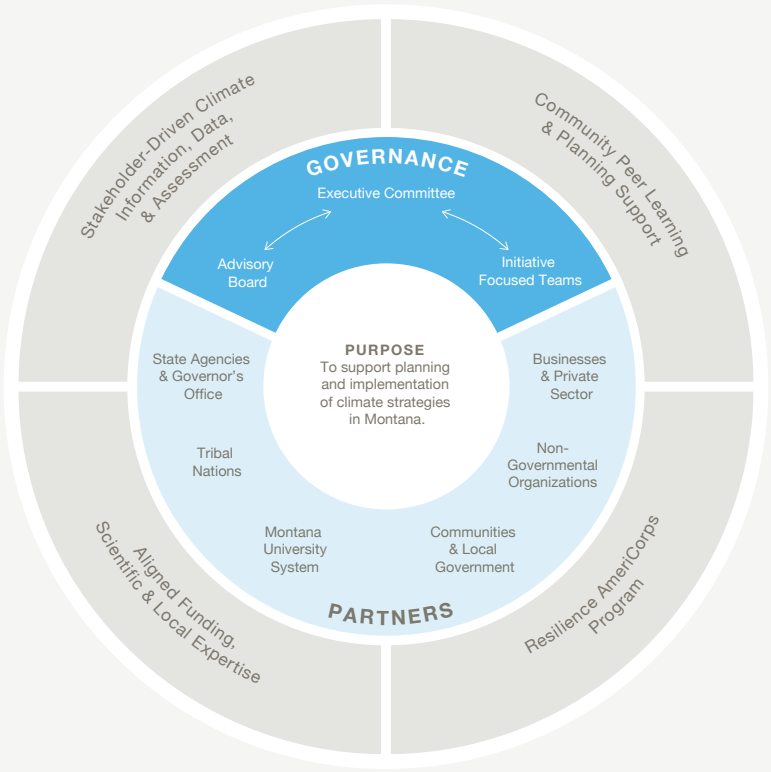
3 http://montanaclimate.org

RECOMMENDATIONS

1A: Establish the Montana Climate Solutions Network to Develop and Share Climate Information and Resources; Build Capacity in Communities; and Connect Climate Solutions at State, Local, Regional, and Tribal Nation Scales

The Montana Climate Solutions Network (MCSN) will bring together state, local, business, tribal nation, and university system partners to provide timely and relevant climate information and coordinate services to meet the needs of Montanans.

Figure 1: Montana Climate Solutions Network



The network will focus on the following core functions:

1. **Supporting community planning initiatives** by providing climate information and decision-support tools, planning resources, best practices guidelines, and peer-to-peer learning opportunities;
2. **Overseeing, coordinating, staffing, and funding a Resilience AmeriCorps program** that provides Montana communities with the expertise and capacity to tackle on-the-ground work for mitigating and adapting to climate change;
3. **Supporting production of regular climate assessment reports** that update existing assessments (e.g., water, agriculture, forests, human health) and tackle new ones. The Montana Institute on Ecosystems leads this effort in partnership with universities, tribal colleges, state and federal agencies, and non-governmental organizations;
4. **Engaging scientists and a broad range of stakeholders** (e.g., communities, agricultural producers, resource managers, businesses) to ensure that climate assessments and services meet the needs of a range of decision-makers and end-users across Montana;
5. **Supporting the Montana Climate Office** to develop stakeholder-informed climate information and tools, early warning systems for extreme events, the Montana Climate Data Layer,[4] and to assist with regular climate assessments; and
6. **Advancing resilience strategies** identified in this *Montana Climate Solutions Plan*.

1A: KEY STRATEGIES

- **Establish an MCSN executive committee consisting of representatives of relevant state agencies, the Montana Climate Office, the Montana Institute on Ecosystems, tribal communities, non-governmental organizations, and businesses.** The executive committee will have rotating co-chairs (from a state agency and from the universities) and will be charged with 1) charting the strategic direction of the MCSN; 2) convening regular advisory board meetings; 3) developing plans for robust stakeholder engagement and communication; 4) overseeing biennial climate assessment production; and 5) seeking and managing diverse sources of funding to support MCSN efforts.
- **Establish an MCSN advisory board to ensure that a range of communities, economic sectors, and decision-makers from across the state to inform the priority activities of the Network.** More specifically, the advisory board will 1) provide strategic guidance to the executive committee; 2) prioritize specific research and information needs; 3) prioritize decision-support needs and investments in capacity building; 4) provide direction regarding how to effectively engage with different groups; and 5) help identify funding opportunities for priority projects.

4 http://geoinfo.msl.mt.gov/home/msdi/climate.aspx

- **Work with State agency officials and University System partners, including the Montana Institute on Ecosystems and the Montana Climate Office, to determine an initial administrative home for the network.** Administrative details will include staffing and funding to support network creation and startup needs. Committee members discussed housing the network in a new or current nonprofit organization, a state agency, or the governor's office, or through Montana's Agriculture Experiment Station and Montana Forest and Conservation Experiment Station.

1B: Build Community Resilience to Climate Change Through Coordinating With Existing Planning Efforts

1B: KEY STRATEGIES

- In connection with the MCSN, **support the Institute on Ecosystem's Climate Smart Montana program**[5] as a platform for communities to share ideas, processes, lessons learned, and resilience plans, so that no community needs to reinvent the wheel.
- Leverage the experiences of practitioners across the state to **develop a roadmap and toolkit for planning** (e.g., building from ongoing efforts of the Department of Commerce's Montana Ready Communities Initiative).
- Develop strategies to **integrate climate adaptation with disaster mitigation plans, wildfire plans, drought and flood plans, and others** that can support resilience planning and facilitate implementation.
- **Incorporate strategies from the forthcoming special report of the MCA, *Climate Change and Human Health in Montana*,** to better monitor and plan for climate-related health concerns (to be released in early fall 2020). Engage local, regional, and tribal health providers in developing a response to extreme climate events that lead to heat exposure, vector-borne diseases, water-related illnesses, food safety and nutrition concerns, smoke-related cardio-respiratory problems, allergies, and mental health issues.
- Build on and **complement the climate adaptation work already happening on tribal lands** throughout the state, while recognizing the leadership that Montana's sovereign tribal nations provide and learning from traditional and indigenous knowledge.
- Explore opportunities to **integrate adaptation planning with planning to reduce GHG emissions**, especially when solutions strengthen local resilience to potential regional energy disruptions and further local economic development goals (*see recommendation 2AF*).

5 http://www.msucommunitydevelopment.org/ClimateSmartMontana.html

- As strategies are developed and implemented, **be attentive to a range of co-benefits and remain cognizant of existing and systemic inequities** that serve to limit access to healthcare, clean water, clean air, and well-being and can exacerbate climate disruptions in those communities most vulnerable to impacts.

1C: Adapt Montana's Built Environment to Climate Change

1C: KEY STRATEGIES

- **Integrate adaptation actions with the hazard mitigation programs of Montana Disaster and Emergency Services (MT DES)** by working with communities to identify their highest-priority risks and vulnerabilities and implement hazard mitigation plans that incorporate climate impacts. Evaluate vulnerabilities for Montana's critical infrastructure (e.g., roads, bridges, power lines, telecommunications) and develop coordinated federal, state, local, and tribal nation resilience strategies.
- **Ensure local governments have access to updated information concerning current and future high-risk floodplain and wildfire-prone wildland-urban interface zones.** Support state and local code updates to further reduce risks and impacts.
- **Implement active management across ownership boundaries to reduce wildfire risks and sustain watershed functions** as identified in the updated *Montana Forest Action Plan*.[6] Implement an engagement process to educate and inform stakeholders on the Montana Department of Environmental Quality (MT DEQ) Smoke Management Program and the ability to use prescribed fire for forest fuel reduction on a year-round basis and support funding to improve smoke management forecasting.
- **Support local governments to integrate flood, disaster, and wildfire protection planning with community land use planning and decisions** when requested by local officials.
- **Ensure local infrastructure such as schools, hospitals, community centers, and shelters incorporate adaptation strategies to address the needs of the young, sick, aging, and other vulnerable populations** related to climate impacts such as smoke and air quality, extreme heat, flooding, winter emergencies, and distributed energy needs.

6 https://www.montanaforestactionplan.org/

- **Expand the use of nature-based solutions that use natural systems, mimic natural processes, or work in tandem with traditional approaches to address natural hazards such as flooding, erosion, drought, and heat.** Incorporating these nature-based solutions in local planning, zoning, regulations, and built projects can help communities reduce their exposure to these climate impacts, resulting in reduced costs, economic enhancement, and safer, more-resilient communities. Examples include urban park development, beaver mimicry, and wetland and riparian restoration.
- **Increase urban forest cover** in communities large and small to provide cooling shade, sustain public health, and reduce energy consumption. Select native tree species that maximize water use efficiency, carbon sequestration, and shade quality.

1D: Protect Outdoor Recreation and Tourism Resources to Maintain a Diverse and Healthy Economy, Positive Mental and Physical Health Outcomes, and a Resilient, High Quality of Life for Residents As Well as Visitors

1D: KEY STRATEGIES

- **Develop and strengthen networks of outdoor recreation and tourism professionals** across agencies, jurisdictions, and the private sector to improve collaborative approaches to identifying risks and vulnerabilities and to facilitate adaptation planning.
- **Develop climate information and tools specific to the outdoor recreation and tourism sectors** and include climate adaptation strategies related to outdoor recreation and tourism in local plans and policies (e.g., parks and recreation plans, hazard mitigation plans).
- **Identify and support funding strategies to address local business recovery needs –** particularly in the travel and tourism sectors – associated with unplanned disasters associated with climate-related weather events.

1E Build the Resilience of Montana's Private Working Lands (Farms, Forests, and Rangelands) and Support Voluntary and Incentive-Driven Efforts for Climate-Smart Management That Reduces Risks, Improves Bottom Lines, and Enhances Carbon Storage in Soils, Forests, and Wood Products

Climate model projections show a warmer Montana in the future, with mixed changes in precipitation and more days of extreme temperature and unexpected weather events. Montana's farmers, ranchers, and forest landowners remain highly vulnerable to extreme weather events, such as flooding, wildfire, blizzards, hailstorms, and drought. Understanding climate impacts and solutions for working landowners and agriculture in particular is complex

because of uncertainties inherent in the timing and manifestation of climate change. It is also complex given the interactions of natural systems and human interventions that operate in agriculture (e.g., crop selection and rotation, livestock costs, pesticide and herbicide use, market revenues and costs, government policies, insurance markets). Agricultural decision support must focus on reducing uncertainty by building tools that explicitly consider the complex interactions between climate, market processes, and policy.

- Producers need to incorporate local monitoring of climate; real-time weather; short- and long-term weather forecasts; weekly drought conditions including soil moisture, snow pack levels, and stream flows; crop and livestock production; input costs; and price variability to create a local understanding of variability and risk in management decisions.
- Climate services need to supply decision-support tools that allow assessment of local management alternatives based on economic sustainability and resilience to drought, heat, floods, snowstorms, etc.
- Increased irrigation efficiency for crop and forage production must be incentivized and establishment of ground water-dependent systems disincentivized.
- Agricultural research must supply plant and livestock breeding programs that will sustain production in higher projected temperatures and subsequent extreme water shortage.
- Research must assess tradeoffs between input-intensive and low-input approaches to crop and livestock production under hotter and more-variable climate.
- Economists need to assess the tradeoffs between insurance-based versus management-system approaches for creating resilience to climate change.

1E: KEY STRATEGIES

- **Recognize Montana producers** for their high adoption rates of soil health practices including no/conservation tillage and cover crops, improved grazing systems, and efforts to maintain and restore native rangelands.
- **Explore partnerships with producers and their associations** to research conservation practice adoption factors, cost savings, and climate-related co-benefits, such as carbon storage, increased water-holding capacity in soils, and reductions in pest and disease risks.
- **Partner with United States Department of Agriculture (USDA) resources** such as the Climate Hubs,[7] Natural Resources Conservation Service (NRCS),[8] and Rural Development[9] to explore farm-scale and regional on-farm conservation and energy planning strategies and align state and federal funding programs to support producer-identified implementation priorities.

7 https://www.climatehubs.usda.gov/
8 https://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/
9 https://www.rd.usda.gov/

- **Explore opportunities for Montana farmers, ranchers, and forest landowners to diversify income streams through emerging GHG markets** by developing pilot projects or programs that aggregate and quantify enhanced GHG management. Consider other creative efforts that reward producers for climate resilience and GHG management, such as cost-share or insurance premium reduction payments, marketing and labeling tools, and others.
- **Target Farm Bill programs to private working lands** that support drought, watershed, and wildfire resilience needs.
- **Expand operator and manufacturing capacity and diversification of uses of long-lived wood products** (*see Chapter 3 for additional wood products innovation discussion*).

1F: Enhance Wildfire Resilience Across Ownership Boundaries in Response to Accelerating Climate Impacts

Over the past several decades, climate change has made summer conditions much more conducive to burning. Warmer springs and warmer, drier summers have dried fuels and led to longer fire seasons and an increased frequency of large wildfires across the western U.S. These changes have come with commensurate increases in acres burned, damages, and intensity. These trends are expected to worsen in the decades ahead. Climate change is estimated to have doubled the area of forest burned in the western United States during the period 1984–2015, above the effects of weather events, ignition, and fire management. For Montana (and the West), projected climatic changes consistently point to an increase in fire danger, and years of widespread wildfire activity in Montana are consistently associated with unusually warm, dry summer conditions (e.g., drought, sometimes starting in spring).

Montana's forests have evolved with wildfire, and many species have adaptations to survive and regenerate after fire. Our ability to make forests resilient to future climate-driven wildfires will be highly variable, given that our forests range from high-elevation wet forests to low-elevation dry forests. No single fire management strategy will be effective for all forest types, and fire-fighting efforts must target protecting communities and safety. As regional impacts become more prevalent, persistent wildfire smoke may pose increasing threats to human health and wildland firefighter safety.

1F: KEY STRATEGIES

- **Recognize that the occurrence, frequency, and severity of wildfires will increase in most parts of the state in response to climate change.** Research priorities include efforts to: better characterize fire vulnerability in the context of climate change; identify and evaluate cascading consequences of wildfire across broad spatiotemporal scales, using natural, physical, and social sciences; and evaluate bottom-up and top-down approaches to predict fire trajectories and potential impacts on ecosystem goods and services.

- **Continue to address wildland fire risks** through coordinating interagency planning and response, supporting wildfire-adapted communities, and building resilient landscapes through active forest management to improve safety and protect communities across ownership boundaries.
- **Maintain fire-adapted landscapes in priority regions** using the updated *Montana Forest Action Plan*[10] for guidance. Enhance forest management and restoration across ownership boundaries, including the use of prescribed fire to maintain structure and composition to increase resilience to insects, disease, and uncharacteristic stand-replacing wildfires; protect municipal watersheds; and maintain the long-term capacity of forests to continue to buffer emissions as natural carbon sinks.
- **Facilitate fire-resilient communities** through planning efforts that include consideration of new fire-adapted landscape and building materials, active community participation, fire education, and reduced development in fire-prone areas.
- Collaborate with wildland firefighting agencies, MT DEQ, local public health agencies, and others to **enhance local air quality monitoring and support indoor air quality needs** for vulnerable communities during intense periods of wildfire smoke.

1G: Support Climate-Resilient Rangelands and Wildlife Using an All-Lands, All-Hands Approach Across Ownership Boundaries

1G: KEY STRATEGIES

- **Maintain a diverse rangeland ecosystem** that supports agriculture, recreation, wildlife, and native pollinators across all ownerships through coordination, flexible tools, and conservation incentives.
- **Promote best management practices for building resilience in rangelands** by increasing soil carbon and soil water-holding capacity
- **Support establishment or enhancement of infrastructure that improves grazing management on rangeland,** including technologies for monitoring range and stock water conditions, livestock behavior changes with climate changes, and livestock health.
- **Strengthen existing partnerships and build new collaborations across landowners and jurisdictions** to share knowledge and ensure that needs for landscape-scale conservation and adaptation are incorporated into relevant planning and management.

10 https://www.montanaforestactionplan.org/

- **Prioritize and conduct additional research and vulnerability assessments** for species, habitats, and ecosystems as part of periodic statewide climate assessments.
- **Provide end users and decision-makers with information about climate change effects** on fish, wildlife, habitats, and ecosystems; adaptation and mitigation options; training opportunities; case studies; recommended peer-reviewed research; and critical contacts in a user-friendly format. Encourage use of this information in adaptation planning and project environmental reviews. Monitor integration of wildlife adaptation efforts into state agency projects, environmental reviews, plans, and relevant communications and training.
- **Conserve, enhance, and restore rivers, streams, lakes, reservoirs, wetlands, and riparian areas** that are critical to fish, wildlife, and plant populations. Provide for aquatic organism passage, where appropriate.
- **Continue to prevent and minimize the spread of invasive species and insect and disease infestations** that can be exacerbated by climate change, including policies developing or continuing support of programs for monitoring, early detection, and rapid response.

1H: Safeguard Montana's Water Quality and Quantity from Climate Change

1H: KEY STRATEGIES

- **Promote wetland and stream function** through a) restoring and conserving river corridors, floodplains, and wetlands and b) supporting related education efforts.
- **Integrate local drought and water quality planning** into other climate and land-use planning efforts.
- **Invest in tools to improve statewide monitoring** and assessment of water resources.
- **Incorporate green infrastructure and adaptive water management** that combine flooding mitigation, water storage, and water quality improvement into stormwater infrastructure and natural storage utilizing ditches, floodplains, and irrigated lands.

2. Strategies to Reduce Greenhouse Gas Emissions

Executive Order 8-2019 requires the Council to develop a *Montana Climate Solutions Plan* that includes recommendations to achieve an interim goal of net GHG neutrality for average annual electric loads in the state by no later than 2035 and a goal of net GHG neutrality economy-wide at a date to be determined by the Council.

The Council formed the Greenhouse Gas Mitigation Strategies Committee to begin to formulate strategies that can achieve the goals outlined by the governor. According to the Federal Government's *Fourth National Climate Assessment*[11] released in 2018, "In the absence of more significant global mitigation efforts, climate change is projected to impose substantial damages on the U.S. economy, human health, and the environment. Under scenarios with high emissions and limited or no adaptation, annual losses in some sectors are estimated to grow to hundreds of billions of dollars by the end of the century. It is very likely that some physical and ecological impacts will be irreversible for thousands of years, while others will be permanent." The urgency to respond to these threats is significant, and Montana has an opportunity to provide leadership and both prepare for and inform future federal policies in response to climate change.

Fossil fuel combustion is the largest contributor of greenhouse gas emissions in Montana. In 2020, fossil fuel combustion was equal to approximately 27.6 million metric tons of carbon dioxide (CO_2).[12] Economy-wide CO_2 emissions from fossil fuel combustion decreased approximately 21 percent between 2005 and 2020, driven largely by a 35 percent reduction in emissions from the electric power sector (Figure 2).[13] Montana's renewable portfolio standard, which requires 15 percent renewables[14], has helped shift power generation away from fossil fuels such as coal. Over the same time period, CO_2 emissions from industrial energy use fell approximately 15 percent, while CO_2 emissions from residential and commercial buildings increased by 15 percent. Transportation emissions dipped in 2009, likely due to the economic downturn, but have otherwise held constant since 2005 (-3 percent). This is likely due to increasing national fuel economy standards which have improved vehicle efficiency.

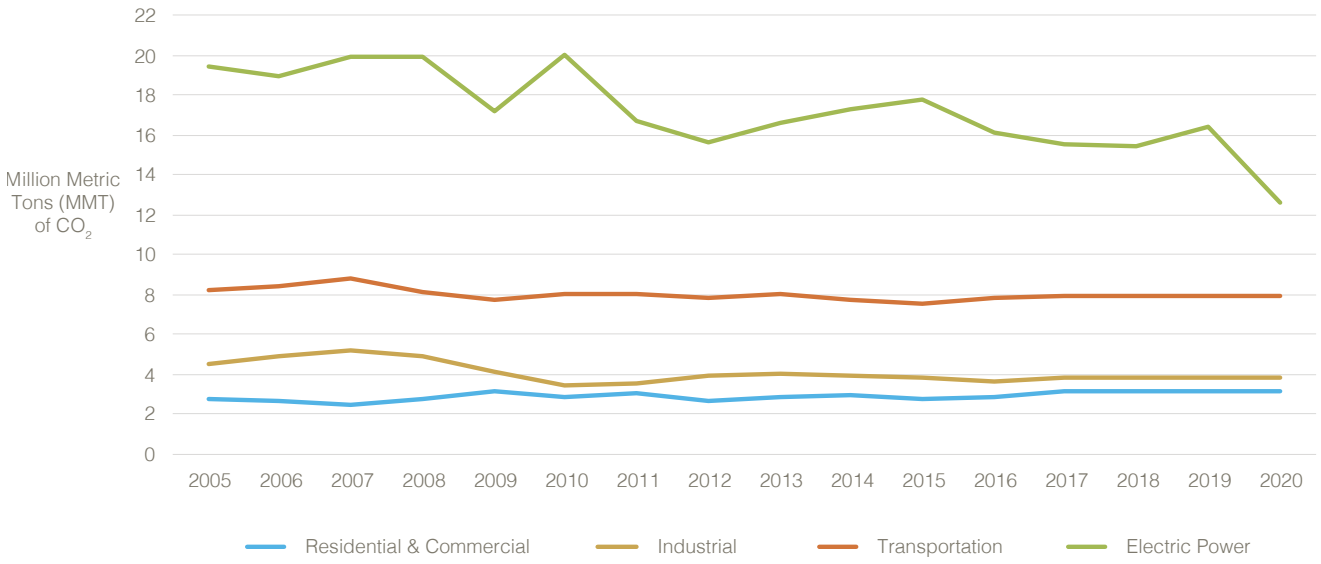
11 https://nca2018.globalchange.gov/

12 Energy-related CO_2 emissions estimates were based on data from the U.S. Energy Information Administration for 2005 through 2017, U.S. Environmental Protection Agency's (EPA) Emissions & Generation Resource Integrated Database (eGRID) for 2018, EPA's Air Markets Program Data for 2019, and knowledge of significant power plant closures to develop current estimates for the Power Sector.

13 Preliminary estimates for 2020 CO_2 emissions reflect the closure of Colstrip coal-fired units 1 & 2. All other sectoral emissions estimates were assumed to remain at 2019 levels, meaning that 2020 estimates do not account for any additional reductions that are likely to occur as a result of the economic downturn caused by the COVID-19 pandemic.

14 DSIRE database, https://programs.dsireusa.org/system/program/detail/384

Figure 2: Montana CO_2 Emissions from Fossil Fuel Consumption (2005-2020)



Source: EIA & EPA (million metric tons). Additional detail on data sourcing can be found in footnotes 11 and 12 on page 21.

The remaining coal-fired power plant units at Colstrip (Units 3 & 4) account for 38 percent of total emissions in 2020 (Figure 3), while transportation sources account for 29 percent. Residential and commercial buildings (11 percent), industrial sources (14 percent), and other fossil-fueled power generation (8 percent) comprise the remainder.

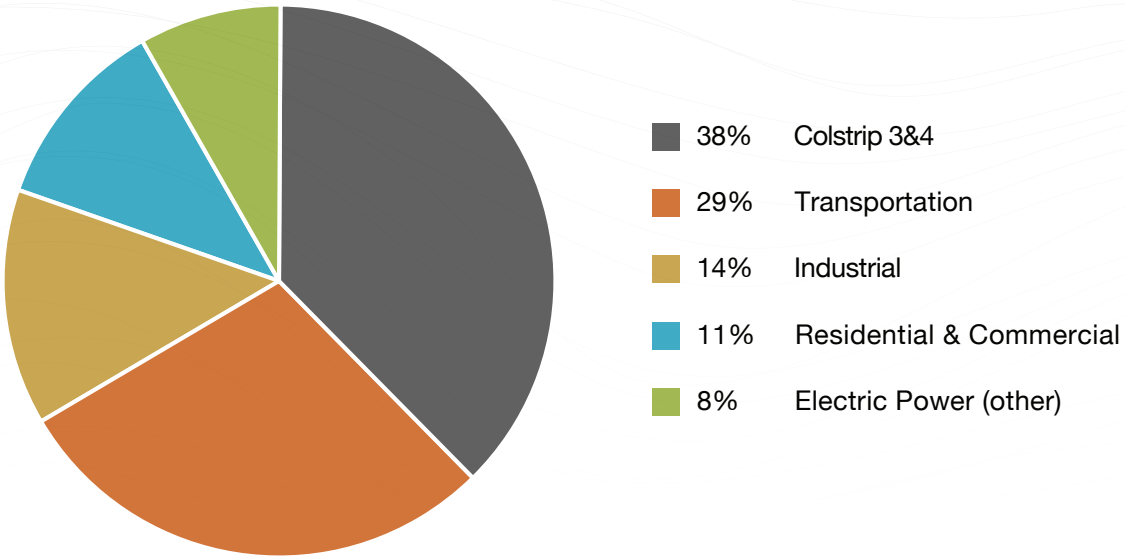
For the purpose of this report, emissions associated with the power sector were estimated using a generation-based approach, meaning emissions associated with generation of electricity by power plants operating within state boundaries. Because Montana is a large net exporter of electricity,[15] the power sector's contribution to total CO_2 emissions would decrease if a consumption-based approach was used, meaning emissions associated with electricity retail sales.

It is important to note that this preliminary inventory does not include emissions from methane, nitrous oxide, and fluorinated gas emissions. A comprehensive inventory analysis requires gathering accurate GHG emissions data from the agriculture, mining, oil and gas, industry sectors and landfills, as well as net CO_2 sequestration data from the forestry, agriculture, and land use sectors.

Using available data and studies, the Greenhouse Gas Mitigation Strategies Committee began to wrestle with what at first appears to be a simple math problem derived from the executive order's goals, but upon closer inspection requires a dynamic understanding of the electric supply system, its regional context, and the role different sectors of the economy play in producing GHG emissions. To understand possible scenarios to achieve the governor's goals there are a number of variables at play, ranging from the known (e.g., future generation facility retirements, planned resource acquisitions) to the uncertain (e.g., future population growth, rate of electric vehicle adoption, the corresponding demand for more electricity) to the fully unknown (e.g., the emergence of novel technologies or widespread economic disruptions). To address common needs of policy and decision-makers, often these variables must be coupled with additional assumptions regarding cost and system integration, allowing for

15 U.S. Energy Information Administration, "Table 10. Supply and disposition of electricity, 1990 through 2018," https://www.eia.gov/electricity/state/montana/

Figure 3: Current Montana CO_2 Emissions by Sector



Source: EIA & EPA (million metric tons). Additional detail on data sourcing can be found in footnotes 11 and 12 on page 21.

evaluations of whether the mix of resources and infrastructure ultimately meets widely-held goals such as maintaining electric system reliability and affordability.

Several studies and models have been developed to help states, regions, and utilities understand least-cost alternatives and pathways toward achieving emissions-reduction goals or targets. These modeling efforts of future scenarios can help structure stakeholder conversations, better inform decision-makers regarding tradeoffs, and provide the context needed to design and implement policy packages that are consistent with long-term goals.

The Council believes the state would ultimately benefit from engaging a consultant to assist with modeling that can help define Montana-specific scenarios to reduce emissions. For the purposes of this report, given the limitations of time and funding, the Committee and Council members reviewed several regionally relevant studies and modeling efforts, including *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest*[16] completed by the Clean Energy Transition Institute (CETI) and Evolved Energy Research (EER). That study was presented at the December 1, 2019 full meeting of the Council in Helena.[17]

Following is the set of recommendations the Greenhouse Gas Mitigation Strategies Committee presented to the full Council for consideration. They span key building blocks for decarbonization, including energy efficiency; beneficial electrification; renewable energy adoption and electric system integration; transportation; strategies for waste, methane, and industrial emissions; and a set of priority state, regional, and federal proposals. The Council ultimately adopted most of the recommendations through consensus. A limited number of recommendations received the two-thirds vote needed per the Council's charter to be adopted, but did not garner unanimous votes. In those cases, dissenting viewpoints are reflected in this report.

16 https://www.cleanenergytransition.org/meeting-the-challenge
17 A copy of the presentation and meeting notes are available at: https://deq.mt.gov/DEQAdmin/dir/Climate

CASE STUDY

Modeling Deep Carbonization Pathways

Decarbonization modeling can help develop a blueprint that outlines strategies to reduce carbon emissions in the energy sector efficiently and at least cost for the electricity grid, the built environment, the transportation sector, and industrial energy use.

George Box famously said that "All models are wrong, but some models are useful." The goal of a GHG-reduction modeling exercise is not to correctly determine a single solution or accurately predict the future – it is to inform decisions made under uncertainty, to offer a set of measuring sticks to evaluate the compatibility of policy options, and to test those options in terms of their feasibility, costs, and emissions-reduction potential.

Given the current level of dependence of the economy on carbon-based energy sources and the interactions among sectors, a modeling effort can help scope the timing of infrastructure changes, technology options, investment requirements, research, development, and commercialization needs, as well as other areas that help align public, private, and academic sector goals and expectations.

Numerous studies have been conducted at state, regional, and national scales to evaluate pathways to achieve GHG emissions-reduction goals. A review of more than 30 of these studies showed that despite their variation in scope and methodology, a set of clear and consistent insights can inform policy makers:

- Achieving mid-century climate goals to reduce or eliminate GHG emissions is lower-cost when the power sector cuts emissions nearly to zero, while expanding to electrify (and consequently decarbonize) portions of the transportation, heating, and industrial sectors.

- Achieving deep decarbonization primarily (or entirely) with renewable energy may be theoretically possible, but it would be significantly more challenging and costly than pathways employing a diverse portfolio of low-carbon resources.

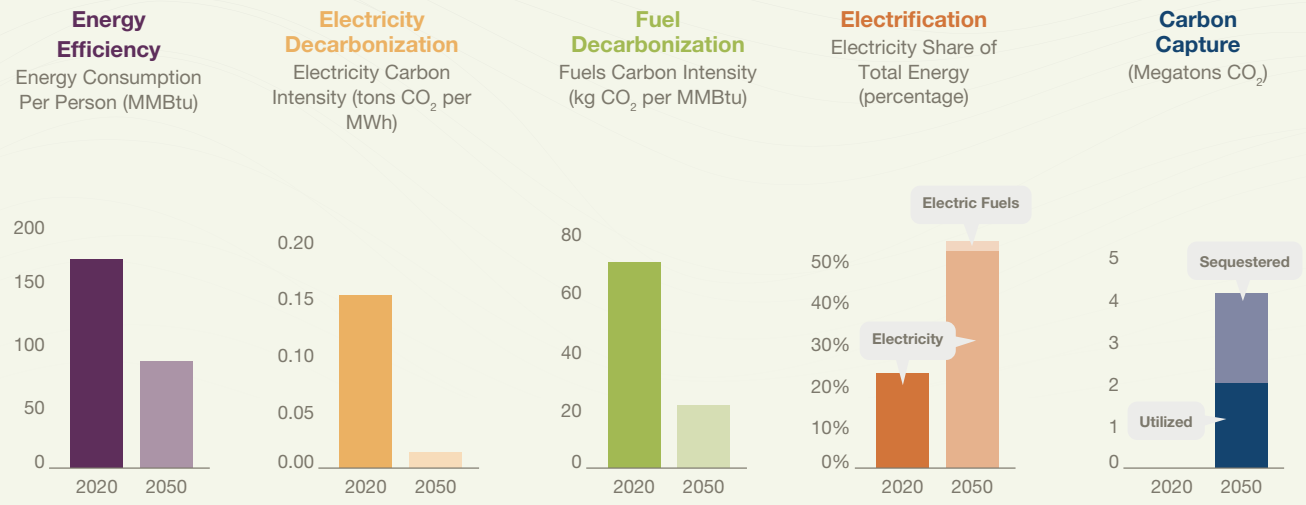
- Deep decarbonization of the power sector is significantly more difficult than more-modest emissions reductions. Taking the first steps to reduce emissions from electricity can be achieved by conventional means, such as fuel switching from coal to gas. The final emissions reductions to decarbonization require more-expensive and harder-to-achieve solutions.

- Absent long-term planning to consider these unique needs, many capital investments made in the near-term could lock in a suboptimal resource mix for the future.[18]

Notable studies for Montana and the Northwest region confirm similar findings. The four Northwest states (Idaho, Montana, Oregon, and Washington) have unique natural resources, power systems, energy consumption, and political conditions that must be represented in modeling decarbonization pathways.

18 J.D. Jenkins, S. Thernstrom, Deep decarbonization of the electric power sector insights from recent literature, Energy Innovation Reform Project, March 2017

Figure 4: Five Decarbonization Strategies



Source: *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future in the Northwest*. June 2019. Eileen V. Quigley. Clean Energy Transition Institute. p. 54. Technical Citation https://github.com/cleanenergytransition/mtc-report-EER-technical-report/raw/gh-pages/EER_Northwest_Deep_Decarbonization_Pathways_Study_Final_May_2019.pdf?raw=true

E3 produced *Resource Adequacy in the Northwest*[19] in March 2019 for sponsors Puget Sound Energy, Avista, NorthWestern Energy, and the Public Generating Pool. The study finds that deep decarbonization of the Northwest electricity grid is feasible without sacrificing reliable electric load service, but that absent technology breakthroughs, achieving a 100 percent GHG reduction using only wind, solar, hydro, and energy storage is "both impractical and prohibitively expensive" due to the very large quantities of these resources that are required during periods of low renewable production once storage is depleted.

Sufficient firm capacity is required during periods of low wind, solar, and hydro production and the study finds that natural gas generation is the most economic source of firm capacity today. The study maintains that adding new gas does not conflict with deep decarbonization goals because the gas will only be used for reliability, and notes that new nuclear generation, fossil generation with carbon capture and sequestration, long-duration electricity storage, and replacing natural gas with carbon-neutral hydrogen or biogas are also firm capacity solutions. The study recommends investigating a formal mechanism to share planning reserves on a regional basis to ensure the region's resource adequacy needs are met in the coming decades as the Northwest transitions off of coal and aims to achieve deep decarbonization.

CETI and EER released *Meeting the Challenge of Our Time: Pathways to a Clean Energy Future for the Northwest* in June 2019. It was the first study to examine the technical and economic feasibility of achieving economy-wide deep decarbonization in Idaho, Montana, Oregon, and Washington. The study identified region-specific strategies that include the five strategies of energy efficiency, decarbonized electricity, decarbonized fuels, electrification, and carbon capture.

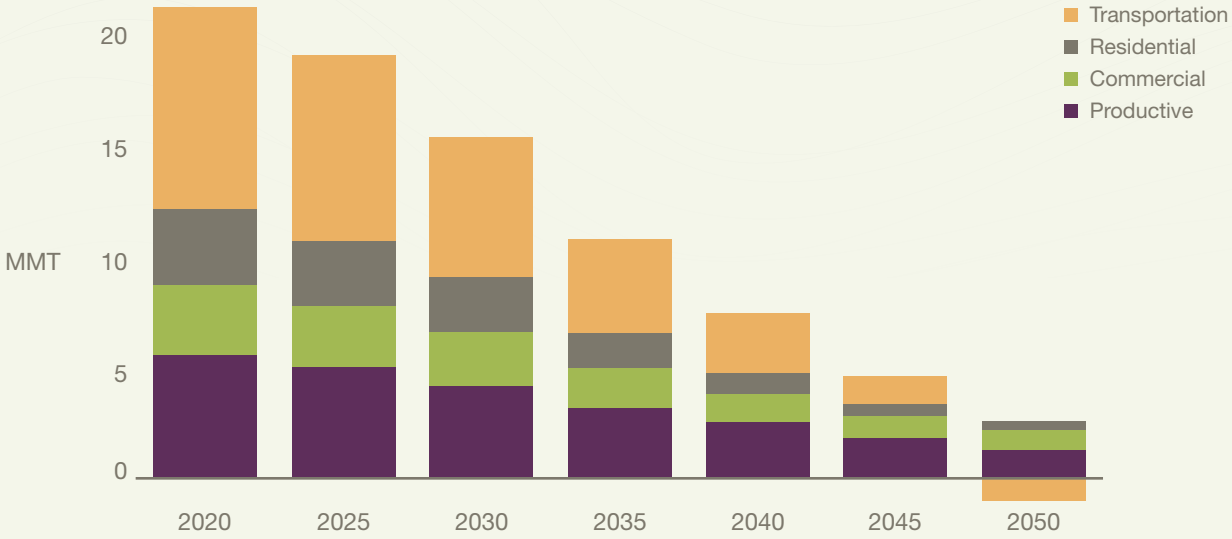
CETI and EER provided results from the June 2019 analysis specific to Montana. Those results can be explored at https://deq.mt.gov/Climate/. The study forecasts final energy demand to fall by 35 percent through greater efficiency, much of which comes from a transition to electrified transportation. As a result, electricity demand rises 71 percent.

In the study, Montana utilizes its geographic strengths on the supply side serving regional needs. A large wind sector is established, supplying clean energy to Montana

19 https://www.ethree.com/wp-content/uploads/2019/03/E3_Resource_Adequacy_in_the_Pacific-Northwest_March_2019.pdf

Figure 5: Energy CO_2 Emissions by Sector

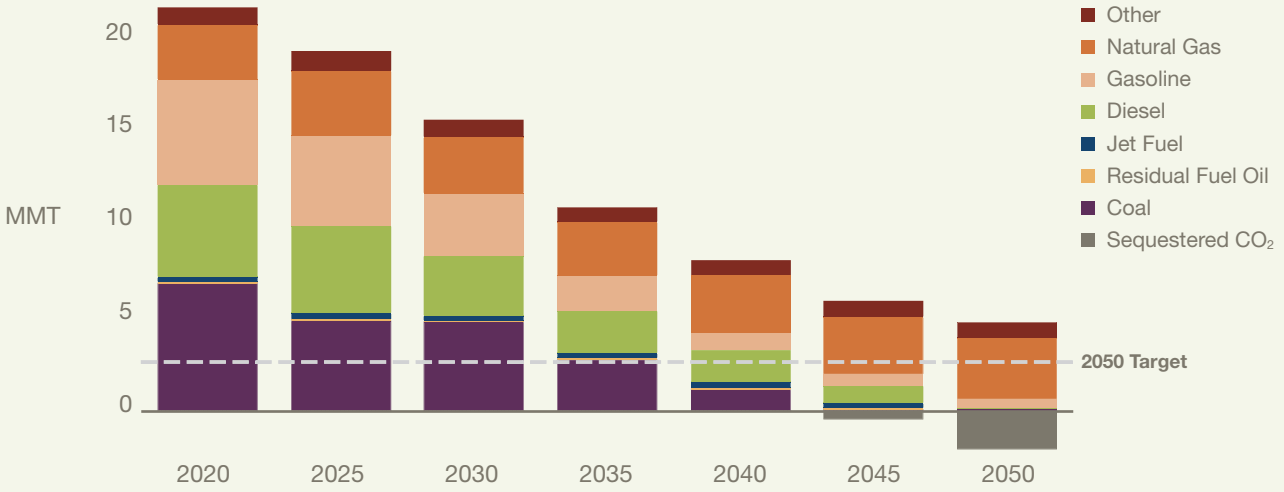
Overall emissions decrease across all sectors of the state's economy. Transportation emissions decline significantly with on-road (LDV, MDV, and HDV) signficantly reduced. In 2050, biofuels with CCS are the dominant source of diesel and jet fuel, resulting in negative emissions. Building emissions are reduced to ~1MMT by 2050 as heating services are electrified.



Source: *Supporting Montana July 15th Climate Solutions Council Report.* June 2020. Jeremy Hargreaves. Evolved Energy Research. p. 29. Technical Citation.

Figure 6: Montana Energy CO_2 Emissions by Fossil Fuel Type 2020-2050

The five decarbonization strategies reduce Montana'a emissions over the next three decades. The largest remaining source of emissions is natural gas. Natural gas is the cheapest fossil fuel, therefore it is the last to be decarbonized. Montana offsets remaining emissions with carbon sequestration in saline aquifers to reach the 2050 target.



Source: *Supporting Montana July 15th Climate Solutions Council Report.* June 2020. Jeremy Hargreaves. Evolved Energy Research. p. 28. Technical Citation.

and surrounding regions. Carbon is sequestered in saline aquifers in the production of liquid fuels from biomass, offsetting emissions from other sources.

Policy actions taken in the rest of the West could impact Montana's investments in significant ways, with opportunities to play a major export role in a decarbonized Western electricity system. Key opportunities for Montana include:

- **A low-cost and complementary wind resource:** Coastal states have less potential for high-quality wind resources and import significant quantities of wind from Montana and Wyoming as emissions caps tighten. Montana has the opportunity to build a valuable energy export market.

- **Decarbonized fuels:** Decarbonized fuels from biomass and hydrogen play a major role in Montana's transportation sector by 2050 in the study. Other Western states also rely on decarbonized fuels to reach their own targets. Montana has low-cost resources to produce fuels and could export fuels to other states.

- **Sequestration potential:** Montana has geological CO_2 sequestration potential, which allows for the capture of CO_2 and storage in saline aquifers.

The results offer a preliminary assessment of least-cost pathways to achieve decarbonization goals for Montana. They also highlight the need for a stakeholder process to support future study and investigation. Future studies will need to tailor assumptions to Montana's specific state objectives, and may wish to consider the implications of proposed projects and the timing of resource retirements.

Since the study was conducted, Western states including Washington, Colorado, and Nevada have set more-stringent emissions and clean energy standards that will drive more clean energy investment, and potentially greater demand for Montana resources. Forecasted prices have been lowered for many clean energy technologies, in some cases substantially, including for electric vehicles – one of the largest drivers of decarbonization cost reductions.

Potentially transformative energy projects, such as the Mitsubishi Hitachi Power Systems renewable hydrogen project discussed for Butte, could provide seasonal energy storage needs across the Northwest through generation that aims to operate on 25 percent hydrogen and 75 percent natural gas by 2025 and 100 percent hydrogen by 2045. Through a stakeholder-driven and iterative planning process, Montana can better understand its regional competitive advantage and align policies that reduce emissions and foster economic opportunities.

RECOMMENDATIONS

SECTION I. Energy Efficiency - Utility Practices, Standards, and Buildings

2A: Establish a Graduated Energy Efficiency Standard, a Demand Response Standard, and an Energy Storage Standard for the State's Investor-Owned Utilities (IOUs)

The rate of energy savings in Montana is quite low, around 0.5 percent annually. States that are high-performing acquire energy efficiency at over 2.0 percent annually. Investments in energy efficiency will reduce the need for electricity generation, thereby reducing GHG emissions. A graduated energy efficiency standard establishes specific targets for energy savings that utilities or non-utility program administrators must meet through customer energy efficiency programs. Demand response involves timing energy conservation measures at industrial sites, commercial buildings, homes, and other locations to save energy and meet utility peak demands. Energy storage can provide power that can be dispatched to better integrate variable resources like renewable energy, but it can also provide management of variable demand – helping to flatten demand requirements of the utility and allow the utility to implement voltage regulation and other efforts to improve system efficiency.

2A: KEY STRATEGIES

- **Adopt a statutory, or through administrative rule by the PSC, energy efficiency standard** at 1 percent energy savings annually within 3 years after program implementation, then increase the standard to 1.5 percent annually for the next 4 years, and to 2 percent annually thereafter for IOUs.
    - To ensure that the utilities are not disincentivized from adopting policies that promote beneficial electrification (e.g., converting from natural gas or propane to electric heat) load growth attributable to these activities would be excluded from total sale volumes and thus would not have any effect in the calculation of energy savings that must be acquired to meet the efficiency standard.

- The proposal could consider specifying some amount of energy efficiency investments targeted at low-income Montanans. Energy efficiency significantly benefits low-income households, given those customers spend a disproportionately large amount of their income on meeting energy needs.

- **Adopt a statutory, or through administrative rule by the PSC, demand response standard** that would require the state's IOUs to acquire, within 5 years after implementation, a total of 35 megawatts (MW) of demand response resources, calculated based on each utility's overall system contribution to Montana load.
    - Efforts could focus on 1) Load control for residential and commercial customers (water heaters, air conditioning), where equipment is cycled for short periods of time; 2) Curtailable load for larger commercial/industrial operations, where operators nominate an amount of load to be curtailed when an event is called; and 3) Interruptible rate for commercial/industrial operations that can curtail most or all of their load.
- **Adopt a statutory, or through administrative rule by the PSC, energy storage standard** that would require the state's IOUs to acquire, within 2 years after implementation, a total of 35 MW of energy storage, calculated based on each utility's overall system contribution to Montana load.

2B: Promote Energy Efficiency Through Tools Like On-Bill Financing

One of the largest barriers to energy efficiency acquisition is the upfront cost to individuals, households, and businesses. To help alleviate this issue, utilities should provide the opportunity for customers to apply for loans that are paid back in installments included in their monthly energy bills. On-bill financing is an energy efficiency uptake tool that utilities have used for decades, yet has failed to gain traction in Montana. Flathead Electric Cooperative is believed to be the only utility in the state providing an on-bill financing option, having alleviated the upfront cost burden for over 500 customers in just 8 years. Financing through the USDA's Energy Efficiency and Conservation Loan Program can assist cooperatives in developing/financing programs.

2B: KEY STRATEGY

- **Utilities and co-ops should provide an opportunity for customers throughout Montana to access energy efficiency measures by taking advantage of utility-administered on-bill financing programs.** Utilities and electric cooperatives should utilize lessons learned from experiences around the country and explore voluntary partnerships and legislative options to leverage funding and further incentivize adoption of energy efficiency financing opportunities. In addition to traditional on-bill financing, which utilizes a third-party intermediary such as a bank, utilities should also pursue on-bill repayment and tariffed on-bill financing in order to ensure renters and low-income customers are able to fully take advantage of these programs.

2C: Adopt Rate Strategies Like Decoupling, Time-of-Use Rates, Inclining Block Rates, and/or Performance Measures to Facilitate Energy Efficiency

Decoupling is an approach to better align utility profit incentives with customers' energy service needs. In simple terms, under a decoupling mechanism a utility is assured of being able to recover the revenue that the Commission has authorized it to recover, no more and no less. Should the utility recover less than the authorized amount, rates would increase in order to recover those revenues. On the other hand, should a utility sell more energy than was projected when rates were set and recover more than the authorized revenue, rates would decrease in order to refund the over collection. The mechanism removes the incentive to maximize energy sales in order to achieve recovery, and thus makes energy efficiency and distributed generation options more attractive to utilities.

Currently, most utility customers in Montana pay the same energy charge no matter when they use the energy (electricity or gas). Under this flat-rate design, the per-kilowatt-hour or per-therm charge is stagnant, meaning there is no price signal to use energy during non-peak times. In Montana, peak times usually mean that a utility's generation is fully operational, meaning GHG-emitting thermal units are emitting. Furthermore, increases in peak load prompt utilities to build additional natural gas "peaker" units, increasing emissions. Time-of-use (TOU) rates, on the other hand, send price signals to customers to shift load to non-peak times, such as at night or during the middle of the day.

Most Montana utility customers pay the same amount per unit (kWh or therm) regardless of the amount they use. For example, a customer that uses 600 kWh/month pays the same for each kWh as does a customer that uses 2,500 kWh per month. As such, there is no price signal to conserve energy or use the energy more efficiently. To address this issue and encourage energy efficiency and conservation, utilities and co-ops should consider adopting inclining block rates (IBR). Utilities with this rate structure encourage large users to reduce their energy usage through higher prices for energy consumed within the higher blocks.

Performance-based measures change the business model for investor-owned utilities (IOUs) operating in Montana, such that rate of return for the utility is calculated based on performance against certain pre-defined metrics rather than only spending or costs. For example, metrics could include environmental impact, mitigation of climate and environmental risks and investment risk, reliability and availability, safety, conditions for connection, social obligation, and ratepayer satisfaction. In the United Kingdom, regulated utilities receive a profit based on the RIIO Model, where Revenue = Incentives + Innovation + Outputs.

2C: KEY STRATEGIES

- Work with the PSC, IOUs, rural electric cooperatives, and other stakeholders to **advance proposals for decoupling, TOU rates, inclining block rates, and/or performance measures**.

- **Consider implementing a three-tiered TOU pricing rate design,** being sensitive to the specific needs and circumstances of low-income customers. The first and cheapest tier (i.e., the low-usage times) should be priced below the "flat rate" charge (e.g., $0.06/kWh) to encourage customers to shift load to these times. The second tier (i.e., average-usage times) should be priced somewhere near the "flat rate" charge (e.g., $0.11/kWh). Finally, the third tier (i.e., peak times) should be appropriately priced to send a proper signal that customers should only use energy essential to home/business operation (e.g., $0.16/kWh). Committee members wish to emphasize that TOU rates will not be applicable to large industrial, agriculture, or large irrigators who already operate under demand charges.

2D: Support Programs to Advance Commercial Energy Audits

In-depth energy audits are necessary for businesses, schools, government agencies, and communities to discern the appropriate energy conservation and renewable energy measures available to them. Previous Montana programs of this scope include the Montana Resource Efficiency Program[20] and the Energy Efficiency Program. The Montana Resource Efficiency Program has a proven track record of success assisting 188 businesses and governments and authoring 48 in-depth audit reports. Customers saved more than $10 million on their energy bills, thanks to more than 131 million kWh and more than 6 billion Btu in energy savings.

2D: KEY STRATEGY

- **Explore budget resources through the legislature to support commercial energy audits.**

2E: The Legislature Should Evaluate the Universal System Benefits Program Funding Mechanism for Electric Customers

In 1997, Montana's energy utilities were restructured, which deregulated the supply of electricity and natural gas. At the time, it was acknowledged that deregulation could negatively affect several activities of the state's utilities that provided societal benefits. To ensure these activities continued in the future, the legislature established a universal system benefits (USB) program and approved a USB charge to be added to natural gas and electric utility bills of all utility customers. These spending activities are annually reported and many utilities consistently exceed minimum USB spending requirements.

There are differences between natural gas and electric USB programs, but both programs provide funding support for three common activities: 1) cost-effective local energy conservation, 2) low-income energy bill discounts, and 3) weatherization activities. Electric USB charges

20 https://www.mtefficiency.org/

also fund energy research and development, renewable energy development, and market transformation programs. Natural gas USB funding is based on 1.12 percent of the utility's annual natural gas revenues from the previous year. Electric USB collections are based on 2.4 percent of the utilities' 1995 revenues. Over the past 20 years, there has been a decline in the effective value of electric USB funds. This is a narrowly focused recommendation pertaining to the electric USB funding formula and not the allocation of funding among programs, particularly the low- income energy programs that are so critical for low-income electric customers.

2E: KEY STRATEGY

- **The Council recommends the Legislature evaluate the electric USB funding mechanism** that determines overall annual contributions to the USB program.

2F: Develop Mobile-Home Replacement Program

Many Montanans still occupy pre-1976 mobile homes, considered to be among the least-energy-efficient housing stocks in the country. Low-income Montanans who are least able to afford energy services reside in these units. Accordingly, replacing pre-1976 mobile homes with newer mobile homes would not only reduce GHG emissions but would reduce low-income Montanans' energy bills and improve their lives.

2F: KEY STRATEGY

- The executive branch of state government should convene a stakeholder group charged with taking an inventory of older, energy-inefficient, and unhealthy mobile homes and **developing a mobile-home replacement program** to meet both energy efficiency and environmental justice goals.

2G: Address the Non-Energy Benefits of Energy Efficiency When Assessing Cost-Effectiveness

Congress recognized non-energy benefits, which are often difficult to quantify, in the Northwest Power Act of 1980, requiring the Northwest Power and Conservation Council and Bonneville Power Administration (BPA) to include a 10 percent adder in cost-effectiveness calculations. As a result, western Montana co-ops, as customers of BPA, benefit from the adder. The law applies to all utilities in the Pacific Northwest. Montana-Dakota Utilities Company has a 15 percent adder included in PSC administrative rule. NorthWestern Energy utilized a 10 percent adder, citing the Northwest Power Act, but abruptly stopped several years ago, at the same time that the utility slashed its energy efficiency acquisition goals.

Cost-effectiveness calculations are a crucial part of procuring energy efficiency as a resource. Utilities must demonstrate that efficiency is cheaper than the cheapest alternative resource in order to receive cost-recovery and/or a rate of return on their investments. Theoretically, both costs and benefits are included in the cost-effectiveness calculation; however, many benefits are not included, leading to skewed outcomes that limit energy-efficiency acquisition. The missing benefits include those related to good health, clean water, environmental protection, compounded economic benefits, etc.

2G: KEY STRATEGY

- In an effort to more-accurately calculate the full benefits of energy efficiency, **all utilities and co-ops should include a non-energy benefit adder in cost-effectiveness calculations**. The specific number should be left up to individual utilities, but should be no less than 10 percent as described in the Northwest Power Act. The result would mean that any measure or program achieving a 0.9 or above (for 10 percent adder) cost-effectiveness ratio would be deemed to be cost effective.

2H: Identify Energy Efficiency Solutions for Rental Units

Installing energy efficiency at rental units is challenging because of the split in incentives that exists between the owner and occupant of the rental unit. Specifically, the owner incurs the cost of capital improvements that yield energy savings but benefits in the form of lower costs of energy and unit comfort and livability advantage the occupant. Consequently, owners have no incentive to invest in energy efficiency, meaning that the benefits are not realized – to the owner, in terms of marketing the unit; to the tenant, in terms of reduced cost of living in the unit and comfort; and to society, in terms of reduced emissions.

2H: KEY STRATEGY

- The governor shall **establish a task force examining existing energy efficiency efforts specific to rental units** and ways to improve energy efficiency acquisition at rental units. The task force shall comprise stakeholders, including investor-owned electric and natural gas utilities, electric cooperatives, local government, energy efficiency providers, and owners of rental units and tenants.

2I: Adopt State Appliance Efficiency Standards

Many states have adopted appliance efficiency standards. Standards require products, such as refrigerators or air conditioners, to meet specific minimum efficiency requirements thereby

reducing energy use, which reduces emissions and also saves consumers money. Equally important, the existence of standards drives manufacturers to focus on incorporating energy-efficient technologies into their products at the least cost and hastening the development of innovations that bring improved performance. While Montana's relatively low population will not drive the market, Montana consumers should not be deprived of the advantages that will be produced as a result of ensuring their appliances meet a minimum level of efficiency performance.

2I: KEY STRATEGY

- The State should **enact legislation that adopts minimum energy and water efficiency standards for a variety of products sold in the state.** The legislation should use as a template the "Model Act for Establishing State Appliance and Equipment Energy and Water Efficiency Standards" issued by the Appliance Standards Awareness Project and the American Council for an Energy-Efficient Economy.[21]

2J: The Montana Department of Labor and Industry (DLI) Should Modernize Montana Building Energy Codes and Administrative Processes to Promote Energy Efficiency and Other Climate Benefits in New Buildings *[ADVANCED WITH DISSENT]*

Building energy codes are an effective way to save energy over the long term. The value of energy efficiency in properly implemented construction standards is universally recognized as the easiest and most cost-effective way to help consumers and businesses save energy and money, make housing and businesses more affordable, and reduce GHG emissions.

2J: KEY STRATEGIES

- **Support regular adoption of updated International Energy Conservation Code codes every three years, with amendments appropriate to Montana.** The adoption process must be accelerated to occur within 12 months of a new code being issued by the International Code Council. Consider capacity building support to meet accelerated adoption objectives.
- **Require that the energy code be considered at the same time as the other codes** to avoid the current situation where the energy code lags adoption of other codes.
- **Require that all builders operating in the self-certification areas of the state be required to submit, to the Building Codes Bureau, a written statement that a house complies with the state energy code** and/or have the appropriate state agency enforce building codes outside of local jurisdictions.

21 https://appliance-standards.org/sites/default/files/2019_Model_Bill_ASAP_Jan_24_2018.pdf

- Modify language regarding energy stretch codes to **allow a jurisdiction to require compliance with that local stretch code** in their jurisdiction. Explore the possibility of developing a stretch code for the entire state that would be optional for local jurisdiction adoption.
- **Investigate the feasibility of requiring energy rating labeling for new home sales and new commercial buildings.**

DISSENTING VIEW: One Council member opposed this recommendation citing concerns over the potential for a local governing body to apply rules and regulations to people or companies outside of their jurisdiction. DISSENTING VOTE: Olson.

2K: Allow for Local Governments to Establish Building Performance Standards

Building performance standards are utilized by local governmental bodies to, over time, improve the energy performance of commercial buildings. In Montana, as is the case nationally, the building sector is responsible for over one-third of GHG emissions. By setting an overall target along with interim targets that ramp up gradually, a building performance standard allows owners of commercial buildings the ability to choose a package of technologies and actions that improve the performance of their buildings best suited to their circumstances. A combination of short- and long-term goals enables building performance to gradually improve and will discourage building improvements that lock in place economically and environmentally inefficient investment.

2K: KEY STRATEGY

- **The State, through legislation, should explicitly allow Montana local governments to adopt building performance standards and Montana cities should adopt such standards tailored for their individual circumstances.**

2L: Implement Net-Zero-Energy Building Strategies

Net-zero-energy (NZE) buildings tackle climate change mitigation and adaption simultaneously. NZE strategies and goals overlap with those of other committees of this Council. In Montana, heating and cooling account for most of the energy used in most buildings. NZE buildings are designed to significantly reduce a building's energy use and produce enough on-site renewable energy to fully address GHG emissions associated with annual energy consumption. Many above-code building programs provide best practices, strategies, and require third-party certification. The State of Montana can adopt one of the existing programs for all state-owned new construction or existing building retrofits.

NZE adoption has several barriers. There is a lack of awareness of the concept and its benefits. Further, there is a lack of educated customers and trained professionals. There exists a chicken-and-egg issue: customers building new buildings need to know that NZE and NZE-ready is an option and ask for it. And, Montana's architects and builders need to know how to design and build NZE so they can be hired. There are numerous architects and builders across the U.S. with the knowledge, expertise, and experience required, but Montana will need to assess knowledge gaps and educate and train most of its building-related professionals. A third issue is the emphasis on capital/first costs versus equal consideration of the "second price tag" of continuous operation and maintenance costs paid over a building's lifetime. Lastly, there is a persistence of outdated myths about off-the-shelf and proven technologies used in NZE buildings. For example, companies that install traditional HVAC systems may say that air-source heat pumps do not work well in cold climates like Montana's.

2L: KEY STRATEGIES

- The Montana Energy Office[22] should **conduct an audit of existing state-owned and -leased buildings to rank them by which are most energy- and water-efficient and retrofit to achieve NZE.**
- The State of Montana should seek to **ensure all new construction for state-owned buildings has a NZE or NZE-ready goal**.
- The Montana legislature should **provide tax incentives for developers designing and building to NZE standards**.
- The Montana Energy Office should **work with national experts and professionals to develop educational materials, guidelines, and learning opportunities** (e.g., seminars, trainings) on NZE design for various stakeholder audiences, including developers, building owners/operators, local code officials, and the general public.

SECTION II. Beneficial Electrification

22 https://deq.mt.gov/Energy

2M: Support an Electric Cooperative Beneficial Electrification Initiative

Beneficial electrification means to substitute electricity as an energy source in place of applications that traditionally rely on fossil fuels, such as switching to electric vehicles instead of internal combustion engine vehicles that utilize petroleum products or utilizing electric space heat instead of natural gas or propane. This approach limits uncontrolled GHG emissions from many sources. Instead, by using electricity from clean energy sources, beneficial electrification allows for these various applications to lower and potentially to zero-out their associated GHG emissions. The electric cooperatives serve a significant number of customers in Montana and thus will be critical if Montana is to achieve emission reductions. In order for electrification initiatives to qualify as 'beneficial,' typically the efforts should contribute toward the goals of saving consumers money over the long run, enabling better grid management, and reducing negative environmental impacts.

2M: KEY STRATEGY

- The Montana's Electric Cooperatives Association and its member cooperatives should **consider establishing a beneficial electrification initiative** in order to save customers money and improve their and their communities' way of life, enhance grid stability and reliability, and reduce environmental impacts.

2N: Study the Challenges and Opportunities of Heat Pump Technology Adoption in Montana

Heat pump technology is used widely across various parts of the country for both heating and cooling needs (air and water). Powered by electricity, heat pumps take energy in the form of heat and by a mechanical process move it from one place to another. Cold-climate heat pump technology for residential and commercial heating is relatively new, but as the technology advances the cost of the technology continues to decline. As such, deploying heat pumps is another way to reduce reliance on fossil fuels for heating, such as natural gas. Additional analysis on the performance of cold-climate heat pump technology is needed to assess the efficacy of the technology in Montana, the emissions reduction potential, and consumer costs and benefits.

2N: KEY STRATEGY

- **The State should commission a study, to be prepared by an entity familiar with the subject, examining the efficacy of air-source and ground-source (i.e., geothermal) heat pumps in Montana.** Working with electric utilities, the study should field-test applications of heat pump technology in a variety of climatic regimes and undertake an economic analysis. The study should also make recommendations as to deployment of the technology and funding – including, for example, state financial grant, loan, or tax incentives for purchase and/or installation – if the report determines the technology has potential value in the state.

2O: Encourage Expanded Community Solar Development and Enact Policy to Enable Community Solar for Investor-Owned Utilities

Community solar programs allow households, businesses, and other energy customers the opportunity to subscribe to one or multiple small portions of a large solar array, typically owned by an energy provider. Community solar can benefit many Montanans by making it possible for them to afford investments in renewable energy without having to pay the high up-front cost of owning a renewable energy generator. Maintenance costs are also reduced because these costs are shared by participating individual consumers. Under current property tax law, after expiration of the five-year tax holiday, these community solar arrays are treated as utility property for tax purposes.

Community solar provides access for individuals, households, and businesses that may not otherwise be able to install an on-site distributed generation system (e.g., renters, buildings with shaded roofs, multi-story apartment buildings and condos). Community solar allows the utility to control the siting of the array, which can provide more-efficient solar production and more-efficient grid interconnection. Community solar subscribers can help finance projects, lessening burden on the developer.

2O: KEY STRATEGIES

- The legislature should **enact policy to extend or make permanent the current five-year property tax holiday for community solar energy development by electric utilities** (MCA 15-6-225 "Small Electrical Generation Equipment Exemption").[23]
- The legislature should **enact policy to enable community solar for investor-owned utilities**.

23 https://leg.mt.gov/bills/mca/15/6/15-6-225.htm

2P: Provide Incentives for Solar-Ready and Solar-Integrated Design and Building

In its report *Solar Ready: An Overview of Implementation Practices,*[24] the National Renewable Energy Laboratory defines a solar-ready building as one that is engineered and designed for solar installation, even if the solar installation does not happen at the time of construction. The report states that creating a solar-ready structure improves the cost effectiveness of solar when pursued later, which eliminates barriers to future solar applications and facilitates market growth.

Examples provided in the report demonstrate significant savings if solar-ready measures are implemented during design and construction versus if those measures must be taken during solar installation. In Montana, solar-ready design incentives should focus on two types of buildings: 1) residential (single- or multi-family structures) and 2) small buildings designed for multi-family housing, commercial use, or mixed-use applications. This second group of buildings typically have flat roofs and are excellent candidates for solar.

2P: KEY STRATEGIES

- The legislature should **enact legislation that provides incentives to encourage solar-ready design for new buildings** in Montana.
- The Montana Energy Office and the Montana Department of Labor & Industry should collaborate to **provide solar-ready design guidance for residential and commercial building developers**.
- The Montana Department of Labor & Industry's Building Codes Program[25] should **adopt the most-recent IECC energy code and specifically include Appendix RB, "Solar-Ready Provisions – Detached One- and Two-family Dwellings, Multiple Single-family Dwellings (Townhouses)."**[26]

2Q: Study the Feasibility of Encouraging Greater Utility-Scale Renewable Energy Development by Reducing Property Taxes on New Renewable Energy in Montana

Montana currently has by far the highest taxes on renewable energy in the region compared to North Dakota, South Dakota, and Minnesota. North Dakota's taxes on a 150 MW generator, for example, are only one-quarter the amount of taxes on the same-sized generator developed in Montana. Taxes in South Dakota and Minnesota are only slightly higher than those in North Dakota (and therefore also much lower than in Montana).

24 https://www.nrel.gov/docs/fy12osti/51296.pdf
25 http://bsd.dli.mt.gov/building-codes-permits
26 https://codes.iccsafe.org/content/IECC2015/appendix-rb-solar-ready-provisions-detached-one-and-two-family-dwellings-multiple-single-family-dwellings- townhouses-

2Q: KEY STRATEGY

- The legislature's Revenue Interim Committee[27] should **conduct independent research to compare taxation across states and renewable energy projects** to determine if rates should be adjusted for new projects. Committee members emphasize that any proposed adjustments must fully consider revenue impacts.

2R: Advance the Deployment of Energy Storage Projects in Montana

Nationally, energy storage is increasingly being utilized by utilities, other energy suppliers, and customers. Energy storage has many applications and roles, including addressing utility peak needs requirements, enhancing system reliability, and renewable resource integration. Presently, however, energy storage development in Montana is hampered by, among other things, a lack of acceptance and awareness of its potential uses and value.

2R: KEY STRATEGY

- MT DEQ should, together with other executive branch agencies, the Montana Public Service Commission, and electric utilities, **host a symposium on energy storage** to explore new storage technologies and their potential application in Montana and identify possible recommendations and next steps.

2S: Deploy and Test Grid-Integrated Water Heaters

Grid-interactive electric water heaters can assist with load control. By shifting water heating load from morning and evening to mid-day and overnight, water heat energy requirements can be served more economically while still meeting customer needs during peak use times. Water heaters can also be controlled on a minute-to-minute basis to provide voltage support and frequency regulation service to the grid at a much lower cost than generating units or batteries.

2S: KEY STRATEGY

- MT DEQ, working with regional entities, such as the national laboratories, the Bonneville Power Administration, and the Northwest Energy Efficiency Alliance,[28] should **develop pilot programs in the service territories of Montana utilities to deploy and test grid-interactive water heaters to evaluate performance, energy savings, and their role in system stability and reliability**.

27 https://leg.mt.gov/committees/interim/2019rvic/
28 https://neea.org/

2T: Increase the Allowable Size for Distributed Generation Systems

[ADVANCED WITH DISSENT]

The current system size cap for small-scale generation interconnecting to the grid is restrictive for entities like commercial buildings, schools, libraries, and private businesses. The cap involves what is known as net metering – a billing mechanism that credits solar energy system owners for the electricity they add to the grid. The current cap of 50 kilowatts (kW) was passed in 1999 and has not been updated since. Meanwhile, solar technology has become more efficient and less costly. Increasing the allowable system size will allow users to meet more of their energy needs with solar, wind, micro-hydro, and other eligible technologies.

2T: KEY STRATEGY

- The legislature should **evaluate and institute a new cap for distributed energy systems.**

DISSENTING VIEWS: Four members did not support the advancement of this recommendation citing concerns over potential increased costs for utility customers who do not take part in net metering and the need to consider the potential for stranded transmission/distribution costs. Members also cited concerns over cost and complexity of ratemaking for a potential new class of generators. DISSENTING VOTES: Hoffman, Wiens, Olson, and O'Hair.

2U: Investigate the Use of Microgrids in Montana

The U.S. Department of Energy (DOE) defines microgrids as "localized grids that can disconnect from the traditional grid to operate autonomously." DOE goes on to note that "because they are able to operate while the main grid is down, microgrids can strengthen grid resilience and help mitigate grid disturbances as well as function as a grid resource for faster system response and recovery." These resilience benefits may be particularly valuable in Montana, where uncharacteristic wildfire and other severe weather can disrupt service and potentially pose liability risks in circumstances where transmission infrastructure is the source of ignitions. Microgrids can also provide an opportunity to deploy more distributed generation, especially with storage technology, and can more efficiently use those technologies. The development of microgrids is still relatively new. As of January 2020, Wood Mackenzie was tracking just over 2,400 operational microgrid projects across the United States. However, Montana itself is home to NorthWestern Energy's Beck Hill Rural Microgrid Project. A group of energy stakeholders should be convened in order to further investigate the increased use of microgrids in Montana.

2U: KEY STRATEGY

- The Montana Energy Office should **establish a microgrid stakeholder advisory group** to investigate the increased use of microgrids in Montana in order to identify impacts to energy consumers and energy providers, as well as technical barriers impacting development, and report its findings to the Energy and Telecommunications Interim Committee.[29]

SECTION IV: Transportation

2V: Adopt Low-Emission Vehicle (LEV) and Zero-Emission Vehicle (ZEV) Standards *[ADVANCED WITH DISSENT]*

Fourteen states have adopted LEV standards and twelve states have adopted ZEV standards. Three other states – Minnesota, Nevada, and New Mexico – are in the process of adopting these standards, which the auto industry broadly supports. California adopted the first LEV regulations in 1990, requiring automobile manufacturers to introduce progressively cleaner light- and medium-duty vehicles with more-durable emission controls. The ZEV regulation requires automakers to invest in clean vehicle technologies such as plug-in hybrid, battery electric, and hydrogen fuel cell by maintaining zero-emission credits equal to a set percentage of non-electric sales. The credit requirement increases over time, much like a renewable portfolio standard.

2V: KEY STRATEGY

- MT DEQ should **undertake a rule-making process (or pursue legislation as appropriate) to adopt low-emission vehicle and zero-emission vehicle standards** by the fall of 2020.

29 https://leg.mt.gov/committees/interim/etic/

DISSENTING VIEWS: Four Council members did not support the advancement of this recommendation. Concerns were raised regarding pending litigation of clean vehicle standards, and the necessity for standards to drive market adoption as opposed to market and consumer preferences. Some members questioned whether Montana should serve as a leader in the development of this marketplace in light of adoption and cost challenges associated with a low population and low population density across the state. Others raised concern that the standards might lead to additional regulations and taxes on existing vehicles. DISSENTING VOTES: Hoffman, Wiens, Olson, and O'Hair.

2W: Advance Comprehensive Strategies to Develop and Expand Electric Vehicle Use and Infrastructure *[ADVANCED WITH DISSENT]*

The states of Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming have entered into a memorandum of understanding (MOU) to establish a Regional Electric Vehicle Plan for the West (REV West Plan).[30] The MOU acknowledges the value of taking coordinated action to deploy EV charging stations across the region. The buildout of an "Intermountain West EV Corridor" will increase access to each state's highways, promote tourism and recreation in rural communities, and support economic development. While private-sector roles for advancing infrastructure will be critical, partnerships will also be needed to overcome initial hurdles to EV adoption attributed to a lack of infrastructure.

2W: KEY STRATEGIES

- The State should **provide tax incentives for the purchase of low- and zero-emission vehicles** at a level sufficient to evoke a robust consumer response.
- The governor should **issue an executive order establishing a goal for the deployment of EV charging infrastructure in the state** and establish a task force charged with creating a plan and action items leading to the implementation of that goal.
- To ensure that transportation electrification occurs as expeditiously as possible, based on sound utility regulatory principles the State should **enact legislation requiring investor-owned electric utilities to file plans every two years with the Montana Public Service Commission**. Likewise, every two years the Montana Electric Cooperatives Association, on behalf of its member cooperatives, would be required to file a report with MT DEQ. The regulated utilities' plans should include such things as: an analysis of existing market opportunities, existing policies, barriers to EV growth, and the impact of rates and rate design on EV adoption. These plans, through an open, public process, would be subject to Commission approval, disapproval, or modification. The electric cooperative report should include a discussion of EV charging in the service territories of member cooperatives.

30 https://afdc.energy.gov/laws/11875

- The Montana Department of Transportation (MDT),[31] working with stakeholders (including the Federal Highway Administration[32]), should **evaluate the feasibility and advisability of installing fast-charging (direct current) EV charging stations at rest areas administered by the Department**. The process should endeavor to identify the specific rest areas suitable for the development of EV infrastructure, establish target dates, and determine funding requirements and sources. MDT should, within existing authority, deploy uniform signage on routes under its jurisdiction indicating the location of public charging stations.
- **The imposition of taxes on low- and zero-emission vehicles should be equitable and should not create disincentives for the ownership of LEVs and ZEVs.**
- Consider enacting **legislation exempting electric vehicle charging stations from property taxes**, installed for use by employees, patrons, and visitors by the owners of commercial property.
- **The Montana Department of Labor should by rule exclude the cost of installing electric vehicle charging infrastructure when calculating the cost. of an electrical inspection for new construction.**

DISSENTING VIEW: One Council member did not support the advancement of this recommendation. That member voiced concern over mandatory reporting requirements for electric cooperatives, which were viewed as unnecessary. The member offered that electric cooperatives would be willing to provide this reporting on a voluntary basis if requested by the legislature. DISSENTING VOTE: Wiens.

2X: Improve Statewide Transportation Management to Foster Alternatives and Support the Needs of Communities

Transportation-related GHG emissions occur not just because our fleet uses fossil fuels, but also because of the nature of our overall transportation system. Montanans have the tenth-highest reliance on personal vehicles of any state in the nation, partly reflecting our geographic range and low population density, but also limited integrated transportation and growth planning and transportation alternatives.

2X: KEY STRATEGIES

- MDT should assemble a broad-based stakeholder group, including transportation consultants and experts from outside of Montana, to **consider and evaluate the Department's transportation planning and operational practices.** This evaluation should include a focus on the state's need and commitment to reduce GHG emissions and the importance of and benefits from developing transportation-efficient communities.

31 https://www.mdt.mt.gov/
32 https://cms8.fhwa.dot.gov/

- MDT should build, or arrange to have built, and **host a ride-sharing mobile app.** The app will enable drivers and riders to connect with each other to reduce vehicle miles travelled and costs for Montanans, while also lessening the burden on existing transportation infrastructure.
- MDT, working with local governments, should **direct additional resources towards planning for and the development of expanded bike infrastructure both within and between communities**. Such development will help decrease miles driven, while helping increase tourism revenue (including, potentially, to more rural Montana communities).
- The Department of Labor should **prepare and make available a manual on remote working practices** and should assist employers that wish to institute remote work opportunities for their employees.

2Y: Explore Opportunities for Passenger Rail

Public transportation across Montana is limited, with few affordable options for intercity travel throughout the state. During the 20th century, southern Montana saw passenger rail service by way of Northern Pacific's North Coast Limited and the Chicago, Milwaukee, St. Paul and Pacific's Hiawatha trains. With the cessation of private rail service in 1971 and the creation of Amtrak, the North Coast Hiawatha was established and ran until 1979 when, during a period of retrenchment, Montana lost the southern route and only retained the Empire Builder along the Hi-Line. Unfortunately, the majority of the state, and the major population centers of the state, are not connected by rail or even by regular bus routes. Transportation accounts for a significant percentage of harmful air pollutants in urban areas, and there is tremendous opportunity to reduce those emissions by reducing single-occupant vehicle trips. A cohesive intercity public transportation system would both reduce air pollution by decreasing the necessity of car travel across the state and would increase equitable access to travel options for those not able to afford car ownership or with other barriers to driving. More regional rail connectivity can help reduce the need for air travel as well (more about GHG reduction benefits https://theconversation.com/rail-travel-is-cleaner-than-driving-or-flying-but-will-americans-buy-in-112128 and https://www.amtrak.com/about-amtrak/sustainability/travel-green.html). Passenger rail cars could further reduce Montana's GHG emissions if electrified or powered by hydrogen.

The last study on the feasibility of reinstating passenger rail in Montana was conducted in 2010. It is likely that many of the estimates of cost and even the state of the current infrastructure need to be reevaluated. Additionally, the previous study did not account for the social cost of emitting carbon and the need to reduce GHG emissions. Another barrier to reinstating passenger rail is the lack of a governance structure, like a rail authority, to lobby for and actively pursue restoration/expansion of passenger rail service. Rail authorities provide the governance structure and institutional framework for engaging state, federal, and private-sector partners to plan and implement restored passenger rail service throughout the region.

2Y: KEY STRATEGIES

- The State should **develop a passenger rail authority modeled after passenger rail authorities in other states.** To start, the governor could direct MDT to coordinate with and support the county officials developing a multi-county Big Sky Passenger Rail Authority.[33]
- The governor and Montana's Congressional delegation should **advocate for the creation of a regional, multi-state passenger rail commission** (like the Southern Rail Commission) that allows Montana to create connectivity with other states and tap into federal resources.
- MDT should **conduct an updated feasibility study of restored passenger rail service through southern Montana** and conduct an impact analysis that accounts for anticipated reductions in GHG emissions.
- The governor should **establish a committee to examine the issue and investigate how Montana can prioritize passenger rail and expanded public bus service** as a part of the state's multi-modal approach to mitigating climate change.

SECTION V. Quantifying and Reducing Industrial, Agricultural and Methane Emissions and Including Carbon Sequestration

2Z: Improve Greenhouse Gas Emissions and Carbon Sequestration Inventory and Accounting Spanning Non-Electric and Transportation Sectors Across Montana's Economy

Presently, the state lacks a comprehensive inventory or estimates of GHG sources and sinks spanning other critical sectors of the economy, including industrial sources, methane emissions, and agriculture, forestry, and wood products. These estimates and inventories are critical to understanding economy-wide strategies to reduce emissions and boost the capacity of carbon storage in healthy soils, forests, and in wood products.

33 https://montanapassengerrailsummit.org/big-sky-passenger-rail-authority

2Z: KEY STRATEGIES

- MT DEQ, in consultation with other appropriate agencies, should **develop GHG emissions and sink estimates for key sectors of Montana's economy and land use.**
- The GHG emissions reporting program should be developed through DEQ rulemaking to **encourage facilities and other industrial, institutional, and commercial operations that produce more than 25,000 metric tons of CO_2e to annually report GHG emissions.** This recommendation would allow for developing a summary report of existing facilities currently reporting to the U.S. EPA's Greenhouse Gas Reporting Program (GHGRP)[34] and also incorporate other facilities subject to 40 CFR 63 Part 98 who are not reporting.
- **In forestry and agriculture, integrate strategies with voluntary and incentive-driven approaches, including potential carbon markets,** as outlined in Chapter 1. Consider use of widely available tools from the USDA for estimating GHG emissions and sinks, including tools like COMET-FARM[35] and COMET PLANNER[36] that allow for farm-scale and regional estimations of the benefits of conservation practices for carbon management and reduced emissions.

2AA: Assess and Reduce Sources of Methane Emissions

Reducing methane emissions is an important component of strategies to address GHG emissions. Key sources include landfills, agricultural emissions from livestock production, and oil and gas operations.

2AA: KEY STRATEGIES

- MT DEQ, working with industry and other appropriate agencies, should develop a study plan and then **conduct a study to identify and quantify sources of methane emissions in Montana**.
- The Montana Board of Oil and Gas Conservation (MBOGC),[37] working with MT DEQ, should **institute a program, directed at well and pipeline operators, that has as its objective the promotion of best management practices** such as leak detection and repair, the use of no-bleed or low-bleed control devices and pneumatic controllers, and to discourage the use of manual liquids unloading processes.

34 https://www.epa.gov/ghgreporting
35 http://comet-farm.com/
36 http://comet-planner.com/
37 http://dnrc.mt.gov/divisions/board-of-oil-and-gas-conservation

- The governor should propose and the legislature should **adopt a budget that provides sufficient funding to address orphan well remediation and closure** in accordance with a plan, developed by MBOGC, taking into account a well's potential to emit methane, that enables the existing orphan well inventory to be remediated and closed by the end of 2023.
- **If the next round of Covid-19 disaster relief and economic stimulus funding directs monies to orphan well remediation and closure, the state should advocate to ensure that Montana receives its fair share of those funds** –through its Congressional delegation, the governor, and the legislature.
- MT DEQ should **assess the extent to which methane emissions are occurring as a result of the use of continuous or intermittent control devices on oil and gas pipeline infrastructure** and shall, if appropriate and working with industry, develop a program to replace continuous or high-bleed control devices with no-bleed or low-bleed control devices on oil and gas infrastructure.
- To the extent not already regulated by MT DEQ's facility registration program, MBOGC – using existing authorities – should **require operators to submit a plan, providing information to be required by the Board, minimizing or eliminating methane emissions,** to be submitted no later than three months after the commencement of production.
- MT DEQ should **review its standards and requirements related to methane production and releases at the municipal solid waste landfills it regulates** and revise those standards and requirements, if necessary, to ensure that methane produced by the facility is captured and diverted for beneficial use.
- The Montana Department of Agriculture (MT Ag.)[38] should undertake a comprehensive review and inventory of methane emissions as a result of livestock production and agricultural practices and, should, working with Montana producers, create a program to reduce or eliminate those emissions.

2AB: Address Food Waste and Food Systems Emissions

Local food systems can reduce "food miles" and transportation costs, offering significant energy savings by reducing fossil fuel energy use and GHG emissions. Although local food systems can reduce transportation distances for food, studies of food transportation energy use and GHG emissions do not always agree on whether local food systems are more energy-efficient, primarily because of the great variability among local foods markets. In some cases, local and regional food systems are more efficient and distance food travels to the consumer is an important factor in determining environmental impacts. Others have found that distance is not an adequate measure of impact because transportation accounts for a relatively small share of energy use and emissions in the food system. The vast majority of energy used in the U.S. food system goes above and beyond transportation, including processing, packaging, storing, and preparing food.

38 https://agr.mt.gov/

Local food systems bring other benefits supporting community nutrition and rural economic development goals and complementary market revenues for producers. Spending money in the local community rather than sending it far away can be economically valuable, and having a vibrant local-food system creates community resilience in the event of unexpected occurrences such as what we are experiencing with the COVID-19 pandemic. For example, many meat-packing facilities across the country are currently shut down because of the pandemic leaving some producers with few options for processing their beef, hogs, and lamb. If Montana had more regional meat processing plants, producers would have more options and Montana would have more jobs. However, although bringing in more feeding and processing capacity could reduce transportation emissions and have some economic or social benefits, doing so could increase GHG emissions as well.

Food waste is a serious problem in the United States. An estimated 30–40 percent of the nation's food supply is wasted.[39] When food is wasted, resources like the energy and water it takes to grow, harvest, transport, and package it is also wasted. Breakdown of food in landfills also produces methane, a potent GHG. About an 11 percent reduction of all the GHG emissions that come from the food system could be achieved if food waste was mitigated. Reducing the impacts of food waste could be achieved through composting programs and programs that funnel unused food to people in need.

2AB: KEY STRATEGIES

- MT Ag. should **establish a food policy council that will establish goals, strategies, and policy recommendations to address opportunities and barriers to reducing GHG emissions related to our food systems and to address food waste generated within the state**. The food policy council should include stakeholder representatives from Montana producers, farmers market managers, farm-to-school programs, food hubs, retail grocers, food banks, and on-the-ground experts in the areas of energy efficiencies, composting, and solid waste disposal.
- MT Ag. should set a goal of beginning to implement recommendations from the food policy council within 12 months of receiving the food policy council's report, including pilot projects as appropriate.

2AC: Manage Solid Waste Emissions And Support Recycling and Composting

There are direct and substantial links between GHG emissions and solid waste management, recycling, and composting. Waste reduction, recycling, and composting are a critical part of reducing emissions in several ways:

- **Energy consumption:** Recycling saves energy. Producing goods from recycled materials typically requires far less energy than making goods from virgin materials. Waste prevention is even more effective. Less energy is needed to extract, transport, and

39 https://www.usda.gov/foodwaste/faqs#:~:text=In%20the%20United%20States%2C%20food,worth%20of%20food%20in%202010.

process raw materials and to manufacture products when a product's life is extended, people reuse things, or when less material is used to make and package the product.

- **Incinerators:** Diverting certain materials from incinerators through waste prevention and recycling reduces GHG emissions in addition to other pollutants. Using certain agricultural, forestry, and yard waste products to instead produce biochar, a natural form of charcoal sometimes used as a soil amendment, would further reduce emissions that would otherwise result from incinerating waste streams or allowing natural decomposition.

- **Methane emissions from landfills:** Waste prevention and recycling, including composting to divert organic waste from landfills, reduces the methane released when these materials decompose. (Note: Depending on the sophistication and funding of a given landfill, methane emissions can also be captured and used as an alternative power source with the net output, as with aerobic composting, of CO_2 emission.)

- **Increased carbon storage in trees and long-lived wood products:** Forests take large amounts of CO_2 out of the atmosphere and store it in wood, in a process called carbon sequestration. Waste prevention and recycling of paper products and building materials can leave more trees standing in the forest, continuing to absorb carbon dioxide from the atmosphere and can prevent methane emissions by maintaining carbon stored in long-lived wood products.

The U.S. EPA estimates that increasing our national recycling rate from its current level of 27 percent to 35 percent would reduce GHG emissions by 11.4 million metric tons of carbon equivalent (MTCE, the basic unit of measure for GHGs) over landfilling the same material. Waste prevention also makes an important difference. By cutting the amount of waste we generate by just 5 percent, we could reduce GHG emissions by another 10.2 million MTCE. Together, these levels of recycling and waste prevention slash emissions by more than 20 million MTCE – an amount equal to the average annual emissions from the electricity consumption of roughly 12 million households.

In addition, landfilling food waste rather than composting it results in the loss of nutrients, a critical aspect for Montana's agriculture. Burying food waste and other organics, such as wood and paper waste, contributes to the production of leachate that must be treated for methane, one of the most-potent GHGs. Food waste is a significant portion of the waste stream nationally and was shown to constitute 20 percent of our state's waste stream in Montana's *2017 Solid Waste Diversion Survey*. Composting represents tangible, local action to reduce GHGs. Substantial reductions in GHGs can be further gained by diverting methane-emitting feedstocks derived from municipal treatment centers, lagoons, and agriculture from landfills to composting operations.

2AC: KEY STRATEGIES

- MT DEQ should **establish an advisory group that will make recommendations for setting goals and establishing strategies to address GHG emissions related to municipal solid waste generated within the state, through increased recycling and composting, and by diverting the amount of solid waste going to landfills.** The advisory group should include representative from the Montana League of Cities & Towns,[40] the Montana Association of Counties,[41] Montana Chamber of Commerce,[42] and on-the-ground experts in the areas of solid waste, recycling, and composting.
- MT DEQ should **set a goal of beginning to implement recommendations from the advisory group within 12 months of receiving the advisory group's report,** including pilot projects as appropriate.

2AD: Advance Efforts to Develop and Deploy Carbon Capture and Storage Technologies (CCS) *[ADVANCED WITH DISSENT]*

Even as Montana diversifies its energy portfolio, fossil fuels are expected to meet a portion of energy demand. The deployment of carbon capture and storage (CCS) technology can accelerate efforts to reduce emissions from power plants and industrial processes, and support other needs such as renewable fuel production central to meeting the net-neutral goal. As the Center for Climate and Energy Solutions notes, more than half of the models cited in the Intergovernmental Panel on Climate Change's *Fifth Assessment Report*[43] required carbon capture for a goal of staying within 2° C of warming from the pre-industrial period. For models without carbon capture, emissions-reduction costs rose 138 percent.[44]

Governor Bullock co-founded multiple regional and national initiatives supporting carbon capture, including the State Carbon Capture Work Group, the Governors' Partnership for Carbon Capture, and the Regional Carbon Capture Deployment Initiative. Governor Bullock also entered a carbon capture memorandum of understanding (MOU) in 2018 along with North Dakota, Wyoming, and Canadian province Saskatchewan.[45]

2AD: KEY STRATEGIES

- MT DEQ should **consider seeking primacy for Class VI deep injection wells**. Class VI wells are used to inject CO_2 into deep rock formations. This long-term underground storage is called geologic sequestration (GS). Geologic sequestration

40 https://mtleague.org/
41 https://www.mtcounties.org/
42 https://www.montanachamber.com/
43 https://www.ipcc.ch/report/ar5/syr/
44 https://www.c2es.org/content/carbon-capture/
45 https://www.saskatchewan.ca/government/news-and-media/2017/december/01/mou-with-montana

refers to technologies to reduce CO_2 emissions to the atmosphere and mitigate climate change. The U.S. EPA has finalized requirements for GS, including the development of a new class of wells, Class VI, under the authority of the *Safe Drinking Water Act's* Underground Injection Control provisions. These requirements, also known as the Class VI rule, are designed to protect underground sources of drinking water. North Dakota is the only state with primary enforcement authority for UIC Class VI wells. EPA directly implements the Class VI program in all other states, territories, and tribes. State management of the program could expedite permitting while maintaining appropriate safeguards to water supplies. MTBOGC already has statutory authority to regulate class VI disposal wells. No application for primacy currently exists.

- **Identify federal and private-sector partners and funding to advance carbon capture and storage in Montana.**

DISSENTING VIEWS: Four Council members did not support the advancement of this recommendation. While most Council members agreed that carbon capture and storage technology may play a role in meeting long-term climate targets and objectives, particularly with regard to industrial activities that often have hard-to-eliminate emissions footprints, Council members expressed concern that relying on the development of expensive, unproven CCS technologies in lieu of strong commitments to reduce emissions could inappropriately prolong the transition from fossil fuel technologies to renewable energy sources. Several members also raised concern over unknown water quality impacts associated with sequestration. DISSENTING VOTES: Piserchia, Rivas, McGraw, and Jencso.

SECTION VI: Tribal Nation and Community Efforts

2AE: Support and Learn From Tribal Nations *[ADVANCED WITH DISSENT]*

Tribal nations in Montana face severe challenges from climate change impacts that threaten their diverse ecosystems, communities, health, livelihoods, and cultural resources. Energy affordability issues are also a significant concern for members of Montana's tribal nations.

The scale of climate impacts facing tribal nations far outweighs the funding and support that the federal and state governments devote to addressing these impacts. In addition to new challenges, climate impacts also have the potential to magnify unaddressed long-standing systemic inequities and discrimination affecting tribal nations.

A number of tribal nations, including the Confederated Salish and Kootenai Tribes (CSKT) and the Blackfeet Nation, are currently leading on the state and national levels, with exemplary climate planning efforts. Initiatives to address GHG emissions reductions and climate resilience and adaptation – developed with and in support of tribal nations – would ensure that the unique circumstances and needs of all the tribes are recognized and addressed and that tribal needs are prioritized and not overlooked, especially given the numerous and competing demands for climate efforts in all Montana communities. The State of Montana should help resource this work, in addition to working closely with and incorporating the input of tribal nations in ongoing reassessment of the state's climate targets and mitigation efforts, as well as the state's policy efforts to meet adaptation needs and concerns.

2AE: KEY STRATEGIES

- The State of Montana should **collaborate with tribal nations in full recognition of tribal sovereignty to devise programs and structures that are specifically designed to support tribal nations as they develop climate change mitigation and resilience plans.**
- Specifically, the State of Montana (i.e., the Governor's office and appropriate agencies) and Montana's tribal governments should **convene a process working with other entities (e.g., federal agencies, energy suppliers, community action agencies) to support tribal nations** to 1) assess GHG emissions-reduction opportunities and develop plans to achieve emissions reductions on reservations where appropriate, 2) develop adaptation and resilience plans, and 3) work in partnership to address emerging climate adaptation and mitigation concerns and challenges.

DISSENTING VIEW: One Council member did not support the advancement of this recommendation. The member felt this recommendation should either be incorporated into the state's broader support for community-based initiatives or left out of this report in recognition of tribal sovereignty over planning and implementation. DISSENTING VOTE: Olson.

2AF: Support Community Mitigation Planning *[ADVANCED WITH DISSENT]*

Local governments should develop GHG mitigation plans and processes that tackle community-wide emissions where possible. Different communities in Montana will proceed and prioritize in ways that respond to local strengths and needs, recognizing their unique opportunities and challenges. Local climate action planning processes will vary depending on the size of the

community and jurisdiction. Effective mitigation planning requires meaningful involvement and buy-in from a diverse group of relevant decision-makers, stakeholders, and community members.

Planning efforts should start by bringing community leaders, including local government staff or elected officials, and interested parties together to determine the scope and basic path forward. Efforts should focus on actions that fit with local needs and opportunities and can either be implemented locally or by working with other communities and the State. In turn, communities can inform state policies that reduce GHG emissions. The State of Montana should support these efforts.

2AF: KEY STRATEGIES

- **Outline and support a process for community mitigation planning and to engage and connect communities.** Every community in Montana is unique and will need to address climate mitigation in ways that recognize its own opportunities and limitations. While there are some similarities, community climate action processes and plans will vary depending on community size and resources, whether they are municipalities, tribal nations, or counties and whether they are primarily served by rural electric cooperatives or an investor-owned utility. Mitigation processes should secure buy-in from key community members, build on existing programs, and be data-driven wherever possible. Recommendations should follow best practices for effective GHG emissions-reduction strategies, with strong consideration for equity and co-benefits, including strategies that also build resilience and help prepare for future climate impacts
- **Communities and tribes engaged in local mitigation processes should set quantitative goals and timelines** for GHG reductions and develop mitigation strategies within a local climate action plan, determine mitigation targets with goals and clear timelines informed by climate science, conduct a community-wide GHG inventory, and determine actionable goals and prioritized strategies to reduce emissions.
- **Connect mitigation strategies and actions across Montana.** Montana State University hosts an online map of existing community and tribal nation mitigation and adaptation plans.[46] As more communities assess mitigation strategies, limitations, and challenges, the State of Montana should reassess statewide strategies in support of locally identified goals.

DISSENTING VIEW: One Council member did not support the advancement of this recommendation. The member cited concern with the potential for an unelected or self-appointed group to inappropriately assert leadership in planning on behalf of a community. DISSENTING VOTE: O'Hair.

46 http://www.msucommunitydevelopment.org/plans.html

2AG: Advocate for Greenhouse Gas Mitigation in Upcoming Federal Stimulus Packages

The COVID-19 pandemic has created economic disruption across the United States. Congress has addressed the near-term effects of the pandemic but is also discussing measures to help ensure long-term recovery and economic vitality for the country. The recovery effort presents an opportunity to invest in rebuilding our infrastructure, social, and economic systems to reduce emissions with intention.

2AG: KEY STRATEGIES

- **Governor Bullock and Montana's Congressional delegation should advocate for stimulus measures to include programs that are called upon throughout this report, especially those supportive of needs facing low-income groups, disadvantaged communities, and tribal nations.** Examples include:
- Clean physical infrastructure investment: renewable energy, energy storage (including hydrogen), and grid modernization.
- Building efficiency spending for retrofits, including improved insulation, heating, and domestic energy storage systems.
- Revitalizing coal country through the cleanup and restoration of abandoned coal mines on federal, state, tribal, and private lands.
- Reclaiming and plugging orphaned oil and gas wells, prioritizing those that emit methane.
- Support for sustainable agriculture and ecosystem regeneration and resilience.
- R&D spending on clean energy technology and sequestration technologies.

2AH: Engage in National and Regional Dialogues Regarding Carbon Pricing
[ADVANCED WITH DISSENT]

The Council acknowledges that a carbon pricing mechanism – if structured thoughtfully and with appropriate stakeholder input – has the ability to both lower emissions (through either a cap on emissions or through a price on carbon) as well as generate revenues that can be invested back into the economy to expand Montana business and/or further reduce Montana GHG emissions. The most effective and equitable approach on carbon pricing would be for Congress to enact national legislation with input from impacted groups. To that end, Montana should track and influence the development of federal legislation through its Congressional delegation and through its membership in the U.S. Climate Alliance (and other association memberships, such as the National Governors Association,[47] the Western Governors' Association,[48] and Environmental Council of the States[49]). The Council further acknowledges that a federal carbon pricing mechanism should consider potential fiscal impacts to states (both positive and negative), workforce transition needs, and any disproportionate impacts to low-income and vulnerable communities.

2AH: KEY STRATEGIES

- In the absence of a federal approach to pricing carbon, the Council encourages the Governor to **direct the appropriate state agencies – including MT DEQ, Department of Revenue, DNRC, MDT, Department of Commerce, Department of Labor, and the Department of Agriculture – to explore the options, costs and benefits, and feasibility for Montana to join other states in an existing or future regional carbon market**. As a starting point, Montana should conduct research and analysis of existing regional markets and should also identify which other states may be interested in working together on some form of a carbon pricing policy. This will inform the decision of whether, and with whom, Montana should collaborate on the development of such policies.
- With either a federal or regional approach, Montana should **consider both the mechanism for pricing carbon (e.g., fee vs. cap), the efficacy of reducing carbon emissions, *and* how revenues generated from carbon pricing will be invested back into the economy** (e.g., through investments such as innovative energy technology, energy efficiency, job training, and building community climate resilience) and used to mitigate the economic impacts on low-income residents.

47 https://www.nga.org/
48 https://westgov.org/
49 https://www.ecos.org/

DISSENTING VIEWS: Four Council members did not support the advancement of this recommendation. Concerns were raised regarding the implementation of carbon pricing, its potential disproportionate impacts on Montana businesses and low-income communities, and potential for carbon pricing to compound known challenges facing the state's fiscal health. Concerns were also expressed regarding impacts to the price of energy in all sectors by setting an artificial price floor. One member also noted that increased prices on energy and other goods would cause impacts to low-income populations and that use of revenues to offset costs to low-income individuals has proven challenging in other states. DISSENTING VOTES: Wiens, Hoffman, Olson, and O'Hair.

2AI: Advance Efforts to Take Advantage of a Coordinated Western Electricity Market

The western United States electric grid comprises 38 balancing areas resulting in a level of jurisdictional fragmentation and complexity that contributes to economic, contractual, and practical obstacles to buying and selling electricity – creating extensive market inefficiencies. A more-integrated electricity market in the West would allow load-serving entities to better manage their loads and optimize production, delivery, and use of the low-cost renewable energy that the western U.S. has in abundance, resulting in cost savings for consumers. Development of a regional electricity market has special salience in Montana, which has significant renewable resource potential, the development of which is presently hampered as a result of the present Balkanized system.

2AI: KEY STRATEGY

- **The governor and legislature, along with the state's electric utilities, should express their support for a western regional electricity market** designed, among other things, to provide transparency and equitable treatment and opportunities for cost savings for all market participants, and should actively work with other states and regional utilities to develop such a market.

2AJ: Adopt a Clean Energy Standard (CES) *[ADVANCED WITH DISSENT]*

A clean energy standard is a technology-neutral mechanism that requires that a certain percentage of utility sales be met through "clean" zero- or low-carbon resources, such as renewables including existing hydroelectric generation, nuclear energy, coal or natural gas generation with carbon capture technology, and other forms of generation.

2AJ: KEY STRATEGY

- The State should adopt a clean energy standard, taking into account customer affordability concerns. Specifically, by 2025, 60 percent of a utility's total sales would come from "clean energy;" by 2035, 80 percent; and by 2050, 100 percent. Compliance with the standard by electric cooperatives would not apply on an individual cooperative basis but rather by aggregating total sales and generation of all the state's electric cooperatives. NorthWestern Energy and the state's electric co-ops already meet the 60 percent clean energy by 2025 standard.

Note: There are many design features of a clean energy standard. Design features frequently considered in the development of clean energy standards include more-precisely defining what constitutes "clean" generation (for example, Washington limits biomass fuel to certain kinds); and if certain clean energy approaches should be favored or disfavored based on type and timing (for example, Nevada affords a ten percent credit for energy efficiency measures achieved by 2024). In order to maximize economic efficiency and compliance flexibility, some clean energy standards establish a credit system based on emission rates. Another design element considered is to provide for cost-containment provisions, either in the form of an alternative compliance payment or cost off-ramps. Both of which keep the cost of compliance within a certain range and, thus, seek to balance concern over impacts to customers with the goals of the standard.

DISSENTING VIEWS: Five Council members did not support the advancement of this recommendation with four members citing the need to address cost considerations and availability of technology in the development of such a standard and questions regarding the achievability of the timelines for adoption. One council member expressed concern over the inclusion of certain technologies including large new hydropower, nuclear, and carbon capture and storage technologies and felt any standard should be set to incentivize early actions. DISSENTING VOTES: Hoffman, Wiens, Olson, O'Hair, and Piserchia.

2AK: Recommendation on Achieving Economy-Wide Greenhouse Gas Neutrality

[ADVANCED WITH DISSENT]

In accordance with Executive Order 8-2019, the Council is charged with adopting a target date by which the Council believes the state should adopt GHG neutrality across the economy. The Council considered IPCC guidance and the objectives identified by a number of states. In accordance with those objectives and guidance, the Council identified an option of a goal of 2050 or a range targeting 2045–2050. Upon vote of the Council, this range was adopted with the intent to address the need for flexibility in achieving a specific goal, while also acknowledging the urgent action that is needed to address the increasing threats and impacts of climate change. Ultimately the goal provides a benchmark to evaluate policy options and pathways and align near-term programs and policies with potential emissions trajectories as part of ongoing climate planning.

DISSENTING VIEWS: Four Council members did not support the advancement of this recommendation citing uncertainty associated with mitigation pathways, costs, and technology advancement. Members voiced concern that the establishment of such a goal could foster uncertainty rather than lead to additional planning efforts. DISSENTING VOTES: Hoffman, Wiens, Olson, and O'Hair.

3. Accelerating Decarbonization and Innovation in Montana's Economy, and Addressing the Needs of Workers and Communities in Transitions

Section I. Moving Montana's Economy to Net Greenhouse Gas Neutrality Through Innovation and Advanced Manufacturing

A goal of the Council is to move Montana's economy to net GHG neutrality for average annual electric loads in the state by 2035 and economy-wide by 2050. To achieve these goals, Montana must accelerate the development and deployment of innovative technologies and practices in the energy, industrial, manufacturing, and agricultural sectors. The Council thus recommends establishing an innovation cluster initiative to assess, define, and support the needed environment, culture, workforce, and resource allocation to sustain statewide efforts to achieve these goals. An innovation cluster initiative will help enable new, or nurture and grow existing, low- and zero-GHG industries across Montana.

Montanans live by an inherently innovative culture. According to the Kauffman Index of Entrepreneurship,[50] Montana consistently ranks at or near the top for entrepreneurship and startup activity per capita. Building on a mindset that is inherent to who we are, an innovation cluster initiative will work to identify regional and statewide capacity strengths, leverage lessons-learned and best practices from successes in sectors where Montana exhibits comparative and competitive advantages, and *grow* what works.

Regional innovation clusters (discussed below) succeed when industry efforts align with existing capacity and focus among state agencies, the education system, industry associations, labor unions, economic development associations, and community leaders. The Council's recommendations on regional innovation clusters focus on the role the state can play in forging new partnerships, sharing information, and prioritizing strategic public investments in research and business formation.

Finally, efforts to understand innovation potential and cluster formation around net-zero emissions technologies and industries should be networked across Montana and supported by the broader intention of fueling Montana's "innovation landscape" and fostering culture, leadership, and environment that motivates and incentivizes public- and private-sector innovation.

Regional Innovation Clusters and Cluster Initiatives Defined

To define clusters, the Council drew on the work of the Brookings Institution and the writings of Harvard

50 https://indicators.kauffman.org/

economist Michael E. Porter.[51] Regional innovation clusters are "concentrations of interconnected businesses, supply chains, and service providers located in the same geographic area with coordinating intermediaries, and public institutions like universities or community colleges in a particular field." Clusters create synergies and drive growth by leveraging advantages of a specialized labor pool, suppliers that can serve special needs of multiple businesses, and "knowledge spillovers" among companies, business associations, and university faculty. The synergies associated with clusters often result in faster commercialization and growth of innovative technologies and services, driving growth in employment, wages, and revenue for the region.

To support industry clusters, several states have launched cluster initiatives. Cluster initiatives are coordinated efforts – motivated by state leadership, policy, and funding – to accelerate and sustain growth of industry clusters. Cluster initiatives seek to build networks and dialogue among industry partners, universities, labor, philanthropy, and other stakeholders to identify areas where strategic investments or shared information and resources will support private-sector growth that achieves public goals, including economic development and climate goals. Cluster initiatives may sponsor education and training activities, encourage relationship building, or facilitate market development through joint market assessment and marketing, among many others.

Net-Zero Greenhouse Gas Innovation Clusters

The Council recommends that Montana launch cluster initiatives to decarbonize the state's economy built around existing industries in the state and capacity among the state's universities, community colleges, tribal colleges, and state agencies. Declaring decarbonization as a state goal provides a competitive advantage for Montana's workers, businesses, and communities. Net-zero GHG innovation clusters will protect Montana's economy, revenue, and jobs against future climate regulations. Decarbonization as an organizing goal will attract and retain business in our state, including entrepreneurs, investors, and industries that see innovation and decarbonization as a market, investment, and regulatory benefit. Montana also stands to benefit from a continuing national trend of advanced manufacturing and knowledge-based innovation sectors locating in smaller cities that have access to global markets, an educated and skilled labor force, and the quality of life and amenities business leaders and workers are seeking.

The Council's proposed Montana innovation initiative will draw on lessons learned among states and in Montana. The photonics cluster in Bozeman[52] is an example of an industry cluster focused around technology developed jointly between Montana State University and local entrepreneurs. From small beginnings, this innovation cluster supported the creation of many private photonics businesses, collectively having substantial economic presence on our state and positive outlook for continued success and growth. The cluster arose organically because of synergies among basic research at the university and businesses. Strategic partnerships, shared material resources, a skilled locally trained workforce, and sustained research funding facilitated rapid growth.

Montana's proposed innovation initiative would first explore how the state can apply lessons from established industry clusters and assess opportunities to nurture, expand, and grow emerging innovation clusters and secure the associated economic and climate benefits. An innovation cluster initiative would a) convene key partnerships and networks, b) make strategic public investments in basic research and early commercialization efforts that are often too risky or diffuse for the private sector, and c) support the institutions that can sustain efforts over the years and decades sometimes required to achieve success.

Properties that should be present before public investments are committed include a critical mass of companies in a defined geographic region that interact synergistically. The synergies may be based on product and supply chains, occupations

51 https://www.brookings.edu/wp-content/uploads/2016/06/0921_clusters_muro_katz.pdf
52 https://www.montanaphotonics.org/

and skills, technology and specialized knowledge, or other traits. The Brookings report *Rethinking Cluster Initiatives*[53] identifies five common traits of successful cluster initiatives: 1) They focus on a robust ecosystem to produce talent, innovation, and economic opportunities, not just quick job gains; 2) They are typically industry-driven, but with university involvement and government funding; 3) The initiative is willing to target resources at specific opportunities based on unique and legitimate strengths; 4) They have dedicated leadership; and 5) They have a physical center allowing significant interaction.

Montana's cluster initiative must be designed to overcome the limits of distance. Clusters benefit from proximity: industries, capital, and research institutions are most-often located in the same city or region. Bozeman's photonics cluster is an example of how synergies develop from proximity and the easy flow of information, resources, and people between public and private sectors. Montana's precision agriculture, basic and applied research, and commercialization are occurring across wide distances and require new approaches to networking and leveraging shared assets. Montana's innovation initiative can build capacity in unique ways that could become the standard for uniting the state with growing research and technology innovation centers with rural areas where natural resources, skilled labor, and business innovation are located.

Montana's competitiveness will stem from continued assessment and assembly of a statewide "innovation landscape" that engenders a culture among community and state leaders that motivates and incentivizes innovation. A robust innovation landscape provides the institutional framework that would coordinate the partnerships and relationships, funding and investment capital, and place-based roundtables identifying and driving forward industry clusters when they get started.

The Council recommends learning from the success of existing innovation clusters and applying these lessons to accelerate growth and deployment of nascent clusters that will help achieve the state's climate goals. Further, the Council recommends six possible regional industry technology development efforts that could be nurtured to form innovation clusters. These efforts build on existing strengths in our state's energy, academic, industry, technology, and agricultural sectors.

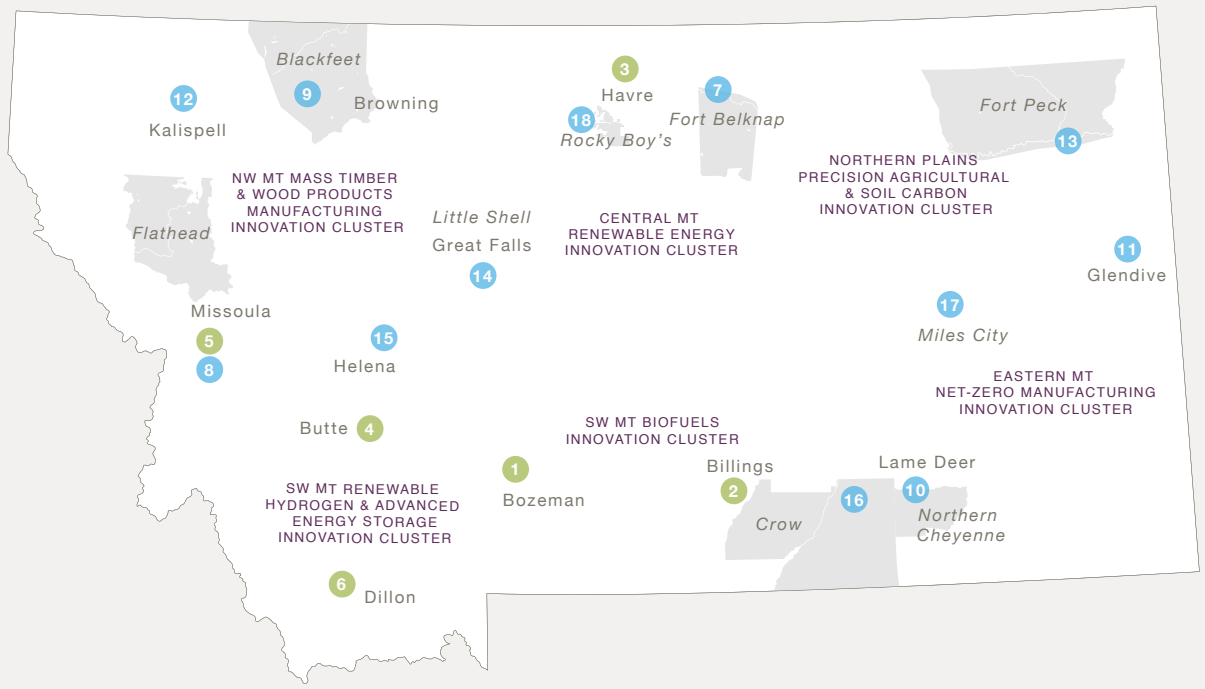
1. **Northwest Montana Mass Timber and Wood Products Manufacturing Innovation.** This region has an existing industrial cluster that includes SmartLam North America, FH Stoltze Land & Lumber Co., and Idaho Forest Group. The University of Montana has research capacity to support innovation in mass timber construction, wood fiber insulation, and other low- and negative-carbon technologies. State and tribal community colleges – including Western, Bitterroot College, Blackfeet Community College, and Salish Kootenai College – add capacity in workforce, skills training, and apprenticeship as well as institutional capacity to convene college, community, tribal, and industry leaders.

   Advanced wood products manufacturing aligns with adaptation efforts to thin small-diameter trees to manage wildfire risk around communities in Montana. Wood building materials also sequester carbon in buildings, reducing emissions from concrete construction. These efforts would grow the state's industrial capacity and workforce in the timber and manufacturing sectors and generate income and revenue in rural communities.

2. **Southwest Montana Renewable Hydrogen and Advanced Energy Storage Innovation.** A significant proposal from Mitsubishi Hitachi Power Systems to establish an electrolysis plant in Butte creates opportunities to establish research capacity to deploy a new, world-leading method for energy storage and electricity generation. The electrolysis process planned would use excess renewable electricity capacity

53 https://www.brookings.edu/research/rethinking-cluster-initiatives/

Figure 7: Montana's Regional Innovation Clusters Initiative



INNOVATION CLUSTERS
Cities
Native American Reservations

UNIVERSITIES
1 - MT State University (MSU)
2 - MSU Billings
3 - MSU Northern
4 - Montana Tech
5 - University of Montana

COLLEGES
6 - University of Montana Western
7 - Aaniiih Nakoda College
8 - Bitteroot College - U of MT
9 - Blackfeet Community College
10 - Chief Dull Knife College
11 - Dawson Community College
12 - Flathead Valley Community College
13 - Fort Peck Community College
14 - Great Falls College - MT State U
15 - Helena College - U of MT
16 - Little Big Horn College
17 - Miles City Community College
18 - Stone Child College

seasonally to split water into hydrogen and oxygen. The hydrogen could be stored seasonally and used to generate electricity when demand exceeds renewable energy capacity. Montana already has a nascent cluster around REC Silicon Inc., the nation's sole supplier of silane gas critical in the manufacture of next-generation lithium-ion batteries and anodes, and research capacity located in Butte. Aligning research capacity at Montana Tech and Montana State University with the industry-led novel technology innovation could help advance and accelerate growth in battery technology and expand industrial applications of hydrogen – including heavy-duty vehicles, rail and equipment, home heating, and manufacturing processes.

Electrifying Montana's economy and eliminating emissions from the electricity sector requires continual advancement in short-term and seasonal energy storage at both distributed and utility scales. By some estimates, the global market for energy storage systems is expected to grow 13-fold from current levels by 2024.[54] Designing and deploying these technologies in Montana will help meet the state's climate goals and offers significant opportunity to grow and establish new businesses. The large industrial proposal from Mitsubishi Hitachi

54 https://www.woodmac.com/reports/power-markets-global-energy-storage-outlook-2019-295618

also represents a significant opportunity to develop new skills and job markets for Montana labor.

3. **Eastern Montana Net-Zero Manufacturing Innovation.** The long-standing industrial cluster in Billings provides an opportunity to decarbonize existing industries through innovation and a networked approach to industrial processes, carbon capture and storage, and renewable energy innovation and deployment. Large-scale industrial processes will continue to need utility-scale power generation, but innovation in industrial and manufacturing processes to decarbonize the regional industrial cluster could expand capacity to attract new, low-carbon industrial development.

   Co-locating industrial processes can utilize waste heat and make carbon capture and storage economic, reducing or eliminating GHG emissions from large-scale industrial processes. Decarbonizing Montana's industrial cluster in Billings will reduce GHG emissions, protect the state's economy from potential carbon regulations, and attract new investment and industry that see decarbonization as a market, financial, and regulatory benefit.

4. **Northern Plains Precision Agricultural and Soil Carbon Innovation.** A Northern Plains precision agriculture and soil carbon innovation cluster would build on and expand research capacity at MSU Northern and MSU Bozeman. Agriculture remains an important sector in Montana's economy and culture and is a key sector with opportunities to reduce emissions from operations, sequester carbon in soils, and meet regional and global market demands

   Building on successful research and technology integration efforts at Montana State University, new technology innovation can be developed that focuses on decarbonizing agricultural processes and sequestering carbon in soils. By working with industry, technology providers, and agricultural producers, MSU can better understand technology improvements and opportunities for research demonstrations that highlight economic and carbon-reduction opportunities. Those demonstrations will then serve as the springboard for the new innovation cluster, centered at least in part on the Hi-Line.

5. **Central Montana Renewable Energy Innovation.** Montana has substantial renewable energy generation and storage potential of wind, solar, pumped-storage, and renewable hydrogen. Locating an innovation cluster around existing institutional and industry capacity in Great Falls, Havre, and Harlowton can accelerate the technology, infrastructure, and projects that will be needed to decarbonize Montana's electricity system and maintain and expand the state's position as an energy exporter.

6. **Southwest Montana Biofuels Innovation.** This cluster will target creating the technologies and scale-up capabilities required for large-scale biofuels manufacture. A key goal is to minimize or eliminate the use of diesel fuel derived from non-renewable sources, a major source of carbon emissions for our state. Diesel is used to fuel large vehicles (e.g., for trucking, agriculture, and construction) and, most importantly, to fuel jet travel. Electrifying such vehicles, an especially positive move if it could be done with solar- or wind-derived energy, is hindered by energy needs and current battery capacity. Thus, development of biodiesel and biojet fuel manufacturing will be a key focus of the biofuels innovation cluster. The cluster will include existing capacity at UM Missoula, MSU Bozeman and MSU Northern (e.g., Energy Research Institute, Chemical Engineering, Plant

Sciences, Forestry, others), the Northwest Advanced Renewables Alliance,[55] private industry, agricultural producers, and labor. The emphasis will be on the creation of diesel and biojet fuel from Montana-sourced feedstocks, including wood products waste, ag production waste, and crops grown specifically as biofuels sources such as safflower, camelina, and algae.

The Council acknowledges that these recommended innovation initiatives will not all lead to successful, sustained industry clusters. On the other hand, several steps can be taken to support the growth, development, and success of nascent clusters, whether existing or formative. Any new policy direction related to innovation clusters must also be flexible and responsive to identify and support new clusters not identified by the Council's work to date.

The following recommendations include steps the state can take to assess the viability of regional innovation clusters and to build capacity to coordinate innovation initiatives across Montana. The recommendations draw on lessons learned from existing industry clusters in Montana and from existing work and capacity in state agencies and the university system to coordinate and advance research and business development in innovation sectors. Additionally, some aspects of the innovation landscape are influenced by policy, particularly the *innovation environment* and the *culture*. The state should investigate best practices in jurisdictions with strong innovation landscapes to develop policies that: a) create competitive business and regulatory environments; b) foster effective fiscal incentives; and c) provide financial and infrastructure incentives to promote business growth. The design of the policy environment can support innovation in market formation (for example, energy balancing markets). Strategies should focus on actions the state can take to create, coordinate, and support innovation initiatives, including roundtables organized around new partnerships, collecting and sharing information, and prioritizing research and public investments.

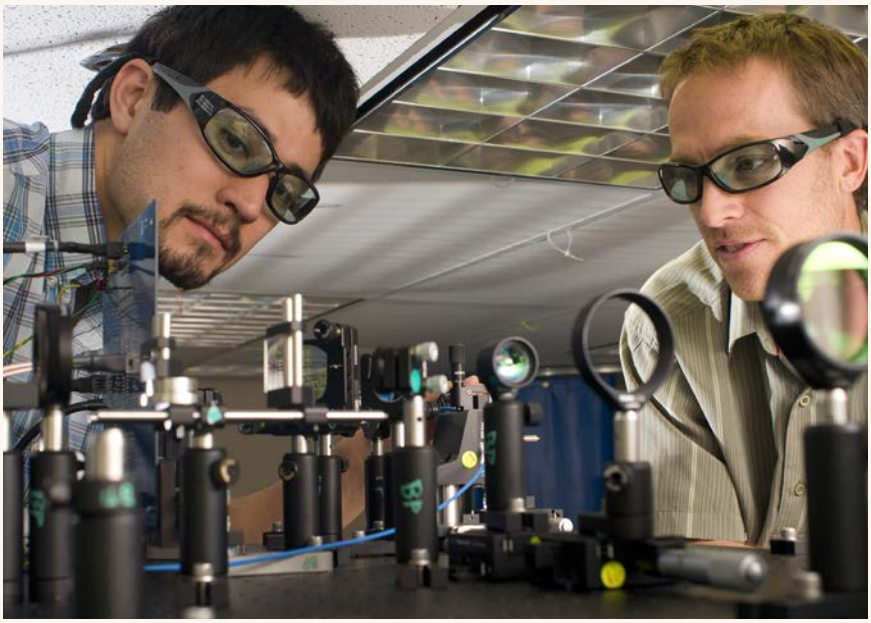
55 https://nararenewables.org/

CASE STUDY

What's in a Cluster?

Montana's Photonics Inudstry

Early in the Montana Climate Solutions Council's deliberations, the Council had the opportunity to hear from Trent Berg, president of the Montana Photonics Industry Alliance, co-founder of Blackmore Sensors and Analytics (now Aurora Innovations), and program director of Photonics and Laser Technology at Gallatin College. Berg was active from the beginning during the emergence and ultimate success of the photonics industry cluster in the Gallatin Valley. Photonics is the science and technology of generating, detecting, and controlling light. Photonics technology is key to many of the things we rely on every day including smartphones, DVD players, cameras, medical instruments, and lighting products. Photonics will power many of the most important innovations of the 21st century, including applications in energy, precision agriculture, manufacturing, and transportation that will drive the transformation required to achieve climate solutions.



From modest beginnings in the 1980s, Montana's photonics cluster is now comprised of over 30 organizations, one of the highest per capita concentration of optics and photonics companies and research institutions in the United States. The cluster supports high-wage jobs in private and university research, development, and commercialization. What fueled that success and how can be it be replicated?

Berg credits much of the success to Montana's strong fundamentals: world-class outdoor amenities, an academic infrastructure that fosters original applied research, and a focus on attracting and developing a skilled and innovative workforce. Once started, the companies and university partners nurtured and grew the material capacity (labs, equipment, etc.), workforce, specialized suppliers, revenue and research funding, and a cluster's leadership characteristic that reinforces and accelerates development of ideas, products, and profits.

Around the world, countries like the United Kingdom are beginning to study and apply the logic and power of cluster economic development strategies to the challenges of confronting global climate change. With backing from the UK Industrial Strategy Challenge Fund, the effort aims to recruit global investment and demand for low-carbon products and technologies by harnessing the power of markets, the public sector, universities, and local communities. The Fund aims to have at least one cluster with the low-carbon infrastructure needed to support industrial decarbonization in place by 2030, and at least one cluster that has achieved net-zero GHG emissions by 2040.

The Montana Climate Solutions Council recommends launching a Montana regional innovation cluster initiative. The initiative would support applied research and business innovation partnerships to create hubs for economic growth in support of the transition to a net-zero economy. The Council recognizes the importance of sparking innovation through collaboration and creating intersections where companies and university partners can share ideas and research developments. Additionally, the initiative would leverage existing research and business innovation with attention and focus on leadership and workforce development efforts that train Montana's workers for emerging job opportunities tied to new growth.

RECOMMENDATIONS

3A: Montana, Led by the Montana Science and Technology Committee and the Office of the Commissioner of Higher Education, Should Identify Key Opportunities for Technology-Led Economic Development, Prioritizing Areas That Assist With Climate Change Transitions and Mitigation

3A: KEY STRATEGIES

- **Revise and update *Montana's Science & Technology Plan*[56]** with a focus on industry linkage opportunities and opportunities to foster and sustain competitive industry/university collaborations in basic and applied research.
- Within identified areas of strength, **charge and fund key networking organizations** (e.g., industry organizations, university research centers, state agencies) with regularly convening key university/industry/society players.
- Within the Montana University System, **institute seed-granting opportunities and research capacity building** efforts to grow the state's university expertise and competitiveness in each identified area of strength

3B: The Montana Legislature Should Invest in Initiatives that Build University/Industry/Society Innovation Linkages to Address Key Montana Challenges, Including Climate Change

56 https://www.mus.edu/research/MUS_STPlan_2015.pdf

3B: KEY STRATEGIES

- **Institute a state-funded grant program to further develop research capabilities and user facilities at Montana's public universities,** with a goal of leveraging these facilities to grow innovative Montana-based technology development companies and clusters.
- **Develop a recruitment and retention funding pool for strategic growth in research capabilities** in key areas of state need.
- **Appropriate further rounds of funding for the Montana Research and Economic Development Initiative[57] to encourage applied research** addressing Montana needs.
- **Set aside a match-funding pool to increase Montana researcher's competitiveness** when pursuing federal grant dollars and capitalize on existing federal and state tax incentives and work to create new incentives where deemed appropriate.
- Develop, identify, and appropriately **fund a research center or institute charged with networking and organizing university research and university/industry linkages statewide in the area of energy innovation**. Key areas of focus based on Montana's industry and existing research expertise may include biofuels, energy storage, transportation, grid electrification, and energy-related agricultural practices.
- **Utilize and bolster existing apprenticeship programs at state agencies in Montana to transition and prepare Montana's workforce for innovation sectors.**

3C: Work to Establish Multiple Regional Innovation Clusters in Montana Focused on Decarbonization of Montana's Industries by 2035

3C: KEY STRATEGIES

- **Resource and convene statewide innovation initiatives with university, state agency, private industry, labor, finance, and non-profit sector leaders to assess the viability of innovation clusters.** These initiatives should begin with regional roundtables focused on assessing the viability of six emerging regional innovation clusters listed below. Other regional clusters may well emerge as the roundtables convene. However, the six listed have been identified through the work of this Council as areas where, to some extent, private and public research, development, and commercialization of innovations that will help decarbonize Montana's industries is already occurring or has good potential for success:

57 https://www.mus.edu/research/research_initiative.html

- Northwest Montana Mass Timber and Wood Products Manufacturing Innovation Cluster
- Southwest Montana Renewable Hydrogen and Advanced Energy Storage Innovation Cluster
- Eastern Montana Net-Zero Manufacturing Innovation Cluster
- Northern Plains Precision Agricultural and Soil Carbon Innovation Cluster
- Central Montana Renewable Energy Innovation Cluster
- Southwest Montana Biofuels Innovation Cluster

- **Over time, identify a cross-sector team, emerging either directly from government or as a public/private partnership or non-profit, charged with and resourced to support nascent cluster initiatives.**

Section II. Building Resilience to Prepare Montana's Communities, Economy, and Workers for Transitions

Economic transitions often occur without consistent or coherent policy to address displaced workers and community impacts. Unions secured wages, benefits, workplace safety, and jobs security that transformed employment in the manufacturing sector into respected and desired jobs. As these jobs have declined, no significant replacement for similar skills has emerged and other sectors have lacked the same wages, benefits, or security.

An industrial transition required to meet ambitious decarbonization goals will require innovation and investment in technology and infrastructure. These investments must be matched with clear and consistent support for the role of unions, fossil fuel communities, disadvantaged communities, tribal communities, and displaced workers in shaping industrial policy and spending. That includes discussions around workforce training and apprenticeship, wages and benefits, and community impacts related to the closure and replacement of energy infrastructure.

The Council calls for engagement with labor, the fossil fuel industry, state agencies, and the university system to ensure a just transition for communities and workers. The workforce recommendations here are aligned with recommendations related to innovation, commercialization, and deployment of technologies that are required to meet decarbonization goals, recommendations to network and build capacity to prepare Montana's communities for climate and economic transitions, and recommendations to align fiscal policy with economic development and transition strategies.

3D: Prepare Montana's Workforce for Opportunities in a Changing Economy and in Sectors Important to Climate Mitigation and Adaptation

Montana's climate, transition, and industrial policies should benefit the state's workforce and ensure justice for displaced workers, including through:

3D: KEY STRATEGIES

- **Focus on apprenticeship.** Apprenticeship ensures that training is targeted to actual needs and opportunities. It reduces risk by keeping existing workers in the workforce instead of removing them for months or years of education and re-training. Montana should expand existing, approved apprenticeship programs registered with the Montana Department of Labor and Industry and develop and provide new registered apprenticeship programs, if required, specifically to transition fossil fuel extraction, transmission, and power generation workers to renewable energy infrastructure and generation sectors.
- **Establish career training centers in public school systems** that deliver basic and advanced skills-based training to middle and high school students throughout the state. These can be coordinated with proposed innovation initiatives and networked with community and tribal colleges. (For example, Billings Career Center in the Eastern Montana Net-Zero Manufacturing Innovation Cluster).
- **Secure prevailing wages in industrial, energy, transportation, and building sectors,** including renewable energy, efficiency, and infrastructure required to meet decarbonization goals.
- **Allow for neutrality agreements** for the purpose of collective bargaining for any new major generation facility or site.
- The state should **develop funding and regulatory proposals to advance these efforts**.

3E: Reform Montana Fiscal Policy to Address Economic Transitions

Montana's economy is transitioning away from natural resource extraction sectors and toward services. The economic transition will have fiscal implications because of the state's existing tax structure that taxes natural resource sectors more highly than other economic activities (such as health care, the fastest-growing employment sector in the state).[58] The state also faces rising costs associated with extreme flood, drought, and wildfire events as well as healthcare impacts on an aging population, particularly in rural areas.

Recommendations to accelerate decarbonization of Montana's electric power sector and the state's economy will have fiscal implications. The exact revenue impact is unknown, but the Council discussed the economic, workforce, and fiscal implications of proposed recommendations. The Council acknowledges the broader structural transition in revenues already under way in response to changing market, economic, and policy conditions affecting our region and further recognizes the key challenges that energy transitions pose for Montana and neighboring states in light of current tax structures.

3E: KEY STRATEGIES

Currently, two legislative interim committees in the Montana legislature are studying and making recommendations for possible reforms to the state's tax structure. These reforms should include revenue and budget policies that ensure local governments have fiscal tools and revenue to continue to provide services and infrastructure as the economy transitions. For example, reforms should consider greater autonomy for local governments to manage volatile revenue and save for transition and adaptation needs; dedicated state and local resources to bolster and sustain adaptation and transition planning over time; and new revenue policies that broaden the tax base, address inequities among communities and economic sectors, and generate more sustainable and predictable revenue as the economy continues to restructure and grow.

The Council makes no specific fiscal policy recommendations. The Council recognizes the need to address revenue impacts and spending needs associated with decarbonization. Better alignment between Council recommendations and the interim committees could help the state understand the types of revenue impacts that may occur and to develop evidence-based solutions using actual revenue and budget data.

58 https://leg.mt.gov/content/Committees/Interim/2017-2018/Revenue-and-Transportation/Taxes-Changing-Economy/Meetings/Mar-2018/Exhibits/MontanaEconomyandTaxRevenue.pdf

LIST OF COUNCIL MEMBERS

Montana Climate Solutions Council

Tom Armstrong, Bozeman. Armstrong is president of the Madison River Group.

Scott Bischke, Bozeman. Bischke is a consulting chemical and environmental engineer and co-principal for MountainWorks Software, Inc.

Bill Bryan, Bozeman. Bryan is the co-founder of One Montana.

Amy Cilimburg, Missoula. Cilimburg is the executive director of Climate Smart Missoula.

Al Ekblad, Helena. Ekblad is the executive secretary of the Montana AFL-CIO.

Sally Ericsson, Whitefish. Ericsson is a strategic consultant for non-profit organizations and foundations.

Kathy Hadley, Deer Lodge. Hadley is the former executive director of the National Center for Appropriate Technology.

Mark Haggerty, Bozeman. Haggerty is a research director at Headwaters Economics.

David Hoffman, Helena. Hoffman is the director of government affairs for NorthWestern Energy.

Kelsey Jensco, Missoula. Jensco is the state climatologist for the Montana Climate Office at the University of Montana.

Chuck Magraw, Helena. Magraw is with the Natural Resources Defense Council.

Jayne Morrow, Chinook. Marrow is the assistant vice president of research and economic development at Montana State University.

Bruce Maxwell, Bozeman. Maxwell is the co-director of the Montana Institute on Ecosystems and professor of agroecology and applied plant ecology at Montana State University.

Todd O'Hair, Helena. O'Hair is the president and CEO of the Montana Chamber of Commerce.

Alan Olson, Helena. Olson is the executive director of the Montana Petroleum Association.

Caitlin Piserchia, Missoula. Piserchia is a climate organizer who works for the Montana chapter of the Sierra Club.

Diego Rivas, Helena. Rivas is the senior policy associate for the Northwest Energy Coalition.

Eric Somerfeld, Power. Somerfeld is a family farmer.

Lee Spangler, Bozeman. Spangler is the director of the Big Sky Carbon Sequestration Partnership at the Montana State University.

Tracy Stone-Manning, Missoula. Stone-Manning is associate vice president of public lands at the National Wildlife Federation.

Joe Thiel, Helena. Thiel is the director of academic policy and research for the Montana University System.

Steve Thompson, Butte. Thompson is the executive director of the National Center for Appropriate Technology.

Paul Tuss, Havre. Tuss is the executive director of the Bear Paw Development Corporation.

Andrew Valainis, Missoula. Valainis is the executive director of Montana Renewable Energy Association.

Gerald Wagner, Browning. Wagner is the director of the Blackfeet Environmental Office for the Blackfeet Nation.

Charlene Waters Alden, Lame Deer. Alden is the director of the Environmental Protection Department for the Northern Cheyenne Nation.

Cathy Whitlock, Bozeman. Whitlock is a regents professor in earth sciences and fellow of the Montana Institute on Ecosystems at Montana State University.

Gary Wiens, Great Falls. Wiens is the CEO of the Montana Electric Cooperatives' Association.

Laura Wood-Peterson, Billings. Wood-Peterson is the senior director of government affairs for Indio Agriculture.

ExOfficio Members

* denotes voting members

Jennifer Anders, Anaconda. Qualification: Northwest Power Planning Council representative and ex-officio member.

Commissioner Galen Hollenbaugh, Helena. Qualification: Director of the Department of Labor and Industry or designee and ex-officio member.

Patrick Holmes*, Helena. Qualification: Governor's Office representative and ex-officio.

Director John Lewis, Helena. Qualification: Director of the Department of Administration or designee and ex-officio member.

Director Shaun McGrath*, Helena. Qualification: Director of the Department of Environmental Quality or designee and ex-officio member.

General Matthew Quinn, Fort Harrison. Qualification: Director of the Department of Military Affairs or designee and ex-officio member.

Amy Barnes*, Helena. Qualification: Representative of the director of the Department of Commerce and ex-officio member.

Director Ben Thomas, Helena. Qualification: Director of the Department of Agriculture or designee and ex-officio member.

Director Mike Tooley, Helena. Qualification: Director of the Department of Transportation or designee and ex-officio member and is an addition to this new Council.

Director John Tubbs*, Helena. Qualification: Director of the Department of Natural Resources and Conservation or designee and ex-officio member.

Director Martha Williams, Helena. Qualification: Director of the Department of Fish, Wildlife and Parks or designee and ex-officio member.

Cover	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit
p.	Photo Credit

Montana Climate Solutions Council

A REPORT BY THE MONTANA CLIMATE SOLUTIONS COUNCIL

https://deq.mt.gov/climate/