**Minnesota 2025 Energy Action Plan Draft Outline**

January 22, 2016

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2. [**Baseline Data and Policy Landscape**](#id.nch2khr5lq3l)
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* 1. **[Electrify buses](#id.im4v7m97smuz)**

* 1. **[Electrify fleets (private fleets and state/municipal fleets)](#id.1zpkyvnutyid)**

* 1. **[Increase adoption of personal EVs](#id.ukcgv2ofr9f3)**
	2. [**Alternative fuel vehicles**](#AlternativeFuelVehicles)

1. **[Energy Supply and Grid Modernization](#id.fvcsz7mqhq4p)**

**Encourage grid modernization**

* 1. **[Deploy advanced metering infrastructure (AMI)](#id.r940lt6mwl10)**

* 1. **[Enable smart inverter functionality](#id.3ovsjo9qk6vq)**

* 1. **[Integrate Energy Storage and Demand Response](#id.4vq70qou6p5m)**

**Evolve tariffs/pricing mechanisms**

* 1. **[Adopt time-based rates](#id.7z14w54b14zi)**

* 1. **[Expand and improve utility green power options](#id.pl6v238amwll)**

1. **[Efficient Buildings and Thermal Energy](#id.yq2mysv20u6v)**

**New Buildings & Major Renovation**

* 1. **[Adopt net-zero energy or low-energy goals for new buildings and major renovations](#kix.fjgmzcyx4oh9)**

**Existing Buildings**

* 1. **[Enhance energy data access through an established standard reporting protocol](#kix.wvxwawe2odt5)**

* 1. **[Increase adoption of building energy benchmarking and disclosure programs](#id.y1j7stzb850s)**

* 1. **[Improve Building Operations](#id.22r1vpoax9ve)**

* 1. **[Promote behavioral energy efficiency strategies](#id.xjx19aajnis1)**

**Thermal Energy**

* 1. **[Identify opportunities for thermal energy](#id.68n08q7ha9mf) grids**

* 1. **[Support combined heat and power (CHP)](#id.676qr667d1ue)**

1. **[Industry and Agriculture](#id.ddf8shaqa7dd)**

* 1. **[Commercialize advanced biofuels and biobased chemicals](#id.jze2n1240uk)**

* 1. **[Capture organic feedstocks through anaerobic digestion (AD)](#id.7fnc7ku079we)**

* 1. **[Promote industrial efficiency practices](#id.pblh32yeyrwr)**
	2. [**Create an Advanced Energy Cluster Organization**](#id.ibyyhb1und14)

1. **[Local Planning and Action](#id.flnrto8iiw4s)**

* 1. **[Incorporate energy into local government policy, planning, and regulatory frameworks](#id.c8e70xx9smk7)**

* 1. **[Increase local government action through voluntary best practices](#id.c57ln7reuime)**
1. **Cross-sector opportunities and synergies**
2. **Taking a Step Back: What’s Possible?**
3. [**A Few Innovative Ideas for Further Consideration**](#id.gapw40hkwb7x)

 **I. Introduction, Purpose, Scope**

1. **Introduction**
2. **Purpose of 2025 Energy Action Plan**
	1. Develop indicators and action plans to significantly advance a number of strategies and technologies for clean, efficient energy in Minnesota between now and 2025. Building on current and recent related efforts, the project will develop recommended next steps to leverage near-term opportunities for a clean, affordable, reliable, and resilient energy system.
3. **Audience**
	1. LEC, Commerce, community and nonprofit leaders, business leaders, and broader Minnesota public
4. **Scope**
	1. Sectors covered: agriculture, industry, energy supply and grid modernization, local planning and action, efficient buildings and thermal energy, and transportation
		1. Not comprehensive, but targeted, strategic areas that add value
	2. Near-term, no-regrets strategies with 10-year timeframe for implementation
	3. Criteria for strategy selection:
		1. Strategy or technology’s potential **impact** toward current MN energy, climate or other air quality and environmental justice goals
		2. The potential for the 2025 Energy Action Plan Project to **move the needle** on a particular strategy in the context of related projects in MN.
		3. Likely **benefits relative to costs**
		4. **Commitment** by stakeholders or other champions to advancing the strategy and ability to leverage additional resources
		5. Has potential to provide benefits **across sectors**
5. **Project team**
	1. Department of Commerce, LEC, RMI, LHB, GPI
	2. Additional project guidance and contributions will come from Energy Systems Consulting, the MN Environmental Quality Board, the MN Pollution Control Agency, and the U.S. Department of Energy.
6. **Stakeholder engagement methods**
	1. Stakeholder Advisory Committee
	2. Three meetings, survey, additional written comments
	3. Additional stakeholder engagement
	4. Metro and Greater MN CERTs, MN SEIA, food processors’ workshop, GPI Collaboratory
	5. Additional interviews with stakeholder advisory committee members
7. **Additional research conducted**
	1. Reviewed relevant literature and Minnesota-specific studies

 **II. Baseline Data and Policy Landscape**

1. **Baseline data**
2. **MN energy system flow chart**
	1. In 2012, Minnesota’s total estimated energy use in was 1700 trillion BTU. 56 percent of the energy inputs in the state are rejected due to inefficiencies, rendering 44 percent of the energy inputs useful.
3. **Energy production by source**
	1. Minnesota does not have native fossil fuel reserves and therefore imports over three-quarters of its energy resources.
	2. Of the energy produced in the state, the majority comes from renewable resources (35 percent biofuels and 38 percent from other renewable resources, mainly wind).
4. **Electricity generation by source**
	1. In 2014, electricity generated in Minnesota came from coal (49 percent), followed by nuclear (22 percent), wind and other renewable resources (21 percent), and natural gas (7 percent).
5. **Energy consumption by source**
	1. Natural gas (26 percent), coal (15 percent), and petroleum, including gasoline, jet fuel, distillate fuel oil, LPG and residual fuel oil (32 percent) made up the bulk of primary energy consumed for electricity generation and end use in 2013.
6. **Energy consumption by sector**
	1. In 2013, the industrial sector accounted for 34 percent of consumption, followed by the transportation sector at 24 percent. The residential and commercial sectors accounted for 23 percent and 19 percent of consumption, respectively.
7. **Greenhouse gas emission by sector**
	1. The energy sector accounted for 87 percent of the state’s emissions from 1970 to 2010. Agriculture accounted for 10 percent and waste for 1 percent.
	2. From 2005 to 2012, Minnesota’s greenhouse gas emissions declined by 10 percent. Notably, the electricity sector’s emissions declined by 17 percent.
8. **Greenhouse gas emissions forecast**
	1. Based on the latest assessment from MPCA, Minnesota’s emissions are anticipated to decrease slightly from 2012 to 2025

**B. National trends**

1. Increasing demand for customer choice and declining costs of distributed energy resources
2. Clean Power Plan and implications for renewable energy and efficiency
3. Increased availability of low-cost natural gas and rise in electricity generation by natural gas
4. Decreasing price for renewable electricity generation and rise in renewable electricity

**C. Policy landscape and trends to date**

1. **Renewable Portfolio Standard (2007)** – 25% of retail electricity sales to be renewable by 2025
	1. Currently, the state is on track to exceed the RPS
	2. Since 2005, electricity generation from renewable resources has increased from just over 5 percent to 20 percent, higher than the national average of around 15 percent renewable electricity generation.
2. **Next Generation Energy Act (2007)** – establishes several noteworthy goals for the state (not requirements), including:
	1. Reduce per capita use of fossil fuels by 15 percent by 2015
		1. 14.7 percent reduction from 2007 to 2013; remains better than national average
	2. Derive 25 percent of the total energy used in the state from renewable power sources by 2025
		1. According to the EIA, in 2013, renewable resources represented 13 percent of the state’s energy production, exceeding the national average of less than 10 percent.
	3. Cut the state’s greenhouse gas emissions to 15 percent below 2005 base levels by 2015, 30 percent by 2025 and 80 percent by 2050
		1. Based on the latest assessment from MPCA, Minnesota will not meet these goals without significant additional reduction efforts.
3. **Petroleum Replacement Promotion**
	1. Biofuel comprises an increasing portion of total gasoline sold or offered for sale in the state, reaching 30% by 2025
4. **The Conservation Improvement statute** (M.S. 216B.241) (1980) - establishes a goal for Minnesota’s electric and natural gas utilities to achieve energy savings equal to 1.5% of sales each year
5. **Sustainable Buildings 2030** (SB 2030) – Energy performance requirement for all state-bonded buildings that receive General Obligation (GO) Bonds
	1. Energy Standards for new buildings to reduce the use of carbon producing fuel an increasing amount, reaching 100% in 2030
		* 1. Targets are halved for renovations of existing buildings
	2. Has saved 327 billion Btus and $5.24 million per year

 **C. Noteworthy related initiatives**

1. CSEO
2. e21 Initiative
3. Community solar gardens

1. **Transportation**
	1. **Electrify buses**

**Why this strategy is included:** Public transit is a logical avenue for electrification. In addition to the benefits of reduced fuel use and greenhouse gas emissions, electric buses in particular would result in less air and noise pollution. Local governments have the authority to act on this opportunity.

* + 1. **Specific actions for strategy implementation**
			1. Validate lifecycle cost studies/estimates for electric buses
			2. Demonstrate electric buses on transit routes in Minnesota (include suburban and urban routes)
			3. Investigate opportunities for electric school buses
				- Identify champion to talk with interested school districts and bus providers
				- Connect with school districts in California and other states that have had success
				- Identify potential pilots, secure funding, and implement.
			4. Convene workshop to guide cities/counties through electric bus procurement.
				- Identify entity that can convene workshop. Contact transit agencies and providers and give pitch. Connect with leaders in electric buses and gather insights while shaping workshop agenda
				- Hold 1-day workshop and develop clear commitments and next steps
		2. **Success Factors**
			1. Demonstrate financial case for electric buses
			2. Show that there are no major operational challenges
			3. Establish commitment from transit agencies for implementation
		3. **Identified Champions/Key Participants** (by action #)
			1.
			2.
			3.
		4. **Metrics**
			1. Number of electric buses (or percentage of fleet)
			2. Number of Minnesota cities/counties with electric bus program
			3. VMT in electric buses compared with conventional buses
			4. Carbon intensity of bus transportation (carbon emissions per passenger mile traveled or per vehicle mile traveled)
			5. Energy saved (in kWh or barrels of oil equivalent) due to higher efficiency
			6. Greenhouse gas emissions reductions (CO2 and other criteria pollutants)
			7. Cost savings due to energy savings or operational savings (in $)
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Green power options – specific rates/programs for electric vehicle charging; EV owners may opt to charge their vehicles with green power
			2. **Ongoing MN initiatives**
				- In February 2015, [Duluth was awarded an FTA grant](http://www.duluthnewstribune.com/news/3670485-duluth-receive-six-electric-buses) of $6.3 million for 6 battery electric buses and 2 fast-charging stations. The FTA grant was supplemented by $1.1 million in local funding. The buses are currently being manufactured by Proterra Manufacturing in Greenville, SC.
				- Metro Transit held [demonstrations](http://www.metrotransit.org/metro-transit-putting-electric-buses-to-the-test) of electric buses in April and May of 2015.
			3. **Other related resources**
			4. **Funding sources identified**

FTA grants through [Low/No Emission Vehicle Deployment Program](https://www.federalregister.gov/articles/2015/09/24/2015-24231/fy15-discretionary-funding-opportunity-low-or-no-emission-vehicle-deployment-program-lono-program#h-11) available for nonattainment and maintenance areas under the Clean Air Act.

* 1. **Electrify fleets (private fleets and state/municipal fleets)**

**Why this strategy is included:** Focusing on fleets for electrification is strategic, since fleet vehicles tend to have higher usage than personal vehicles and are replaced more frequently. Further, a few decision-makers control the procurement of fleet vehicles.

* + 1. **Specific actions for Strategy Implementation**
			1. Increase purchasing in state and local government fleets.
				- Local governments could set up a bulk purchasing arrangement in coordination with the state to help reduce the upfront cost of EVs.
			2. Convene workshop to private and public sector fleet managers, fleet service providers, and leaders in EV fleets across the county to provide insights and guidance into procuring EVs.
				- Identify entity that can convene workshop. Contact fleet managers and service providers and give pitch. Connect with leaders in EV fleets and gather insights while shaping workshop agenda.
				- Hold 1-day workshop and develop clear commitments and next steps.
		2. **Success Factors**
			1. Demonstrate the financial case for EVs
			2. Show that there are no major operational challenges
		3. **Identified Champions/Key Participants** (by action #)
			1. Drive Electric Minnesota could play convening role, Metro CERT has identified local government EV fleets as a 2016 priority

* + 1. **Metrics**
			1. Number of electric vehicles in fleets (or percentage of fleet)
			2. Carbon intensity of EV fleets (carbon emissions per passenger mile traveled or per vehicle mile traveled)
			3. Energy saved (in kWh or barrels of oil equivalent)
			4. Greenhouse gas emissions reductions (CO2 and other criteria pollutants)
			5. Cost savings due to energy savings or operational savings (in $)
		2. **Additional Information**
			1. **Cross-sector opportunities/synergies**
				- Green power options – specific rates/programs for electric vehicle charging; EV owners may opt to charge their vehicles with green power
				- Grid optimization – charging/discharging EVs in sync with renewables; could incent EV owners to charge during off-peak hours
				- Designing buildings to be EV-ready - vehicle charging stations (or 240V service) could be included in updated building codes (including multifamily residential)
				- EVs as Distributed Energy Resources - EVs could be used as a form of energy storage, dispatching energy during emergencies or to reduce peak power demands
			2. **Ongoing MN initiatives**
				- [A number](http://www.driveelectricmn.org/charging_fleets.cfm) of fleets in private companies, local governments, state agencies, and colleges/universities currently use electric vehicles.
				- During the 2015 legislative session, [Minnesota Statute 16C.135, Purchase of Fuel and Vehicles by State Agencies](https://www.revisor.mn.gov/statutes/?id=16C.135#stat.16C.135.2), Subdivision 3 was amended, removing the requirement for fleet vehicles to be “reasonably available at similar costs to other vehicles.”

Subdivision 3 now reads, “[...]when purchasing a motor vehicle for the central motor pool or for use by an agency, the commissioner or the agency shall purchase a motor vehicle that is capable of being powered by cleaner fuels, or a motor vehicle powered by electricity or by a combination of electricity and liquid fuel, *if the total life-cycle cost of ownership is less than or comparable to that of other vehicles* and if the vehicle is capable of carrying out the purpose for which it is purchased.”

* + - 1. **Other related resources**
				* U.S. DOE’s [Plug-In Electric Vehicle Handbook for Fleet Managers](http://www.afdc.energy.gov/pdfs/pev_handbook.pdf) guides users through PEV technology and charging infrastructure, and provides information about PEV procurement.
	1. **Increase adoption of personal EVs**

**Why this strategy is included:** Increasing adoption of personal electric vehicles may have a greater impact than either of the two previous strategies alone, though implementation could be more difficult. Multiple decision-makers would need to be involved and the incentives and public education would have to be right to encourage significant adoption.

* + 1. **Specific actions for Strategy Implementation**
			1. Coordinate a bulk discount program through dealerships & OEMs that could help to reduce the upfront cost of EVs
				- Identify a champion to talk with a number of local governments, fleet purchasers
				- State/local government entities issue RFP to OEMs asking them to come forward with favorable rate on EVs
				- All partners participate in marketing effort and heavily promote the initiative
				- Offer during 8-week period or discrete time period
			2. Create a state rebate for purchasing of new EVs
			3. Increase workplace charging stations
				- Identify a champion to talk with major companies and fleet operators. Investigate funding opportunities.
			4. State/county/city or corporate incentives or non-monetary perks for EVs (preferential parking, reduced fees at state parks, access to HOV lanes, etc.)
				- Identify champion and research best practices
				- Involve key participants, develop plan, and implement.
			5. Consider adoption of [Zero Emission Vehicle (ZEV) program](http://www.c2es.org/us-states-regions/policy-maps/zev-program), which sets a goal that an increasing percentage of vehicles sold in the state over time be zero-emission vehicles (release no emissions during operation; includes plug-in electric and hydrogen fuel cell vehicles). To date, California, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont have [adopted the ZEV program](http://www.arb.ca.gov/newsrel/2013/8s_zev_mou.pdf).
		2. **Success Factors**
			1. Make electric vehicles more accessible by increasing incentives (monetary and nonmonetary) and distributing information via marketing campaign.
			2. Reduce “range anxiety” by increasing workplace charging stations and overcoming information barriers.
		3. **Identified Champions/Key Participants** (by action #)
			1. Local and state government, OEMs, and dealerships, in coordination with utilities
			2. Drive Electric Minnesota
			3. Drive Electric Minnesota
			4. Drive Electric Minnesota
		4. **Metrics**
			1. Number of electric vehicles on the road (or percentage of total)
			2. Growth rate in electric vehicle sales (% increase from 2015 to 2025)
			3. Carbon intensity of EVs (carbon emissions per passenger mile traveled or per vehicle mile traveled)
			4. Energy saved (in kWh or barrels of oil equivalent)
			5. Greenhouse gas emissions reductions (in CO2)
			6. Cost savings due to energy savings or operational savings (in $)
			7. Avoided energy imports in $, kWh, or barrels of oil equivalent
		5. **Additional Information**
			1. **Cross sector opportunities and synergies**
				- Green power options – specific rates/programs for electric vehicle charging; EV owners may opt to charge their vehicles with green power
				- Grid optimization – charging/discharging EVs in sync with renewables; could incent EV owners to charge during off-peak hours
				- Designing buildings to be EV-ready - vehicle charging stations (or 240V service) could be included in updated building codes (including multifamily residential)
				- EVs as DERs - EVs could be used as a form of energy storage, dispatching energy during emergencies or to reduce peak power demands
			2. **Ongoing MN initiatives**
				- **Minnesota does not currently offer rebates or tax incentives for EVs.** During the last legislative session, [a bill](https://www.revisor.mn.gov/data/revisor/sbs/ls89/miscenergy.pdf) was introduced that would offer a $2500 rebate on the purchase of new plug-in electric vehicles.
				- **Electric vehicle charging tariff** - Subd. 2.Required tariff. (a) By February 1, 2015, each public utility selling electricity at retail must file with the commission a tariff that allows a customer to purchase electricity solely for the purpose of recharging an electric vehicle.

The tariff must: (1) contain either a time-of-day or off-peak rate, as elected by the public utility; (2) offer a customer the option to purchase electricity: (i) from the utility's current mix of energy supply sources; or (ii) entirely from renewable energy sources, subject to the conditions established under section [216B.169, subdivision 2](https://www.revisor.mn.gov/statutes/?id=216B.169#stat.216B.169.2), paragraph (b), and subdivision 3, paragraph (a)

* + - * + **Plug-In Electric Vehicle Charging Rate Reduction** - [Dakota Electric](http://www.dakotaelectric.com/residential/programs/electric-vehicles) offers discounted rate for electricity used to charge EVs during off-peak times. [Connexus Energy](https://www.connexusenergy.com/residential/programs-rates/electric-vehicle/) offers a reduced rate and a $270 rebate to install a time-of-day meter.
				+ **Drive Electric Minnesota’s** [**Zero Emission Charging Challenge**](http://www.driveelectricmn.org/zecc/) aims to power all public charging stations with Windsource® or solar generated electricity.
				+ **Minnesota has a well-developed public charging infrastructure,** with 433 public EV charging outlets (including 283 Level-2 charging outlets), according to the U.S. Department of Energy [Alternative Fuels Data Center](http://www.afdc.energy.gov/fuels/electricity_locations.html).
			1. **Other related resources**
				* Recently, Adams, Boulder, and Denver counties in Colorado [coordinated and administered a bulk discount program](http://blog.rmi.org/blog_2015_10_29_what_electric_vehicles_can_learn_from_the_solar_market) on Nissan LEAF (EVs) through Nissan North America and local Nissan dealerships, leading to unprecedented sales. At Boulder Nissan, LEAF sales increased almost 300% during the program. The program did not involve tax credits, subsidies, or additional regulation.
				* A recent Idaho National Laboratory report, “[Plug-in Electric Vehicle and Infrastructure Analysis](http://avt.inel.gov/pdf/arra/ARRAPEVnInfrastructureFinalReportLqltySept2015.pdf),” finds that despite installation of extensive public charging infrastructure, **the vast majority of EV charging is done at home and work**. Further, residential and workplace charging units are less expensive to install than public charging stations.
			2. **Funding sources identified**
				* **There is a federal rebate available for new EVs.** The [Qualified Plug-In Electric Drive Motor Vehicle Tax Credit](http://www.afdc.energy.gov/laws/law/US/409) offers a minimum credit amount of $2,500 and up to $7,500, based on each vehicle's traction battery capacity and the gross vehicle weight rating.
	1. **Alternative fuel vehicles**

**Why this strategy is included:** Strategies for electrification of fleets and passenger vehicles are outlined in strategies a, b, and c. This strategy focuses on action items to target increased adoption of other types of alternative vehicles, specifically for biofuels and natural gas, including renewable natural gas. Industry and agriculture section outlines strategies and actions to increase the supply of advanced biofuels and capturing increased amounts of organic material through anaerobic digestion. Increasing the deployment of alternative fuel vehicles, including fleets and heavy duty vehicles, provide market access for biobased alternatives.

* + 1. **Specific actions for strategy implementation**
		2. **Success factors**
		3. **Identified Champions/Key Participants** (by action #)
		4. **Metrics**
			1. Number of alternative fuel vehicles sales.
			2. Gallons of advanced biofuels used in vehicles.
			3. MMbtus of renewable natural gas used in vehicles.
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
* Deployment and commercialization strategies for advanced biofuels offer an alternative fuel supply for passenger, heavy-duty, and fleet vehicles.
* Increased production of renewable natural gas from organic feedstocks using anaerobic digestion offer a supply for passenger, heavy-duty, and fleet vehicles.
* Implementation of a voluntary pilot program for natural gas green pricing programs can help to facilitate renewable natural gas to market.
* Integrated alternative transportation options with electrification actions.
	+ - 1. **Ongoing MN initiatives**
			2. **Other related resources**
1. **Energy Supply and Grid Modernization**

**Encourage adoption of smart grid technologies -** The grid paradigms of the 20th century are increasingly limited in their ability to integrate 21st century technologies effectively. Grid modernization is an important area of opportunity to maintain reliability, reduce costs for utilities and customers, and better integrate distributed energy resources with the larger grid.

* 1. **Deploy advanced metering infrastructure (AMI)**

**Why this strategy is included:** AMI has been identified in states across the country as a high-value strategy to drive grid modernization, integrate distributed energy resources, and facilitate better customer engagement in their electricity use. Minnesota stakeholders have identified AMI as a near-term opportunity to unlock this value and support state-level policies and goals.

* + 1. **Specific actions for strategy implementation**
			1. Utilities: Calculate the benefits and costs of all AMI values\*. Develop and test use cases for the following:
				- Support for conservation voltage reduction (CVR) and volt-var optimization (VVO) programs
				- Reduced truck rolls
				- Improved system visibility for operations and planning, including worker safety improvement
				- Improved visibility for resiliency and recovery
				- Cost savings for customers and the utility through time-varying rates / pre-pay programs and related reduced consumption
				- Improved customer engagement
				- Customer access to usage data
				- \**Examples of AMI costs and benefit study best practices and results to be highlighted in Action Plan from: Ameren (IL), ComEd (IL), Reforming the Energy Vision (NY), US DOE, and other resources, for both IOU and nonprofit utilities.*
			2. Utilities: Analyze the value of deploying AMI across different feeders, and prioritize any deployment in areas with the highest net benefits.
			3. Utilities: Define whether non-AMI alternatives would be able to perform some or all of the functionalities associated with AMI at lower cost.
				- For example, determine the extent to which already-deployed automated meter reading (AMR) technology can facilitate time-varying retail pricing programs, and what time-varying rate designs might require AMI (e.g. critical peak pricing)
			4. Utilities & other stakeholders: Stay up-to-date on technology advances so that cost-benefit analysis can be refreshed as technology evolution unlocks new value.
		2. **Success factors**
			1. Consumer advocates, utilities, environmental interests, and other stakeholders agree on the appropriate cost-benefit analysis framework to inform AMI investment plan.
				- Broad recognition that there are significant costs, as well as significant potential savings, associated with AMI rollout (e.g. solid-state device lifetime, back end software, etc.)
				- E.g., determine impacts of early replacement of non-depreciated legacy meters with AMI.
				- E.g., danger of excessive spending if software (both utility- and customer-facing) is not standardized
			2. Focus on capturing the full value stack of AMI, and integrate with efforts to do so
				- For example, explicit leverage of AMI investment to support time-varying rates, enable granular customer consumption data access, facilitate least-cost integration of distributed energy resources, spark innovation by allow new businesses to use AMI data and/or functionality in new product offerings, etc.
			3. Back-end support for AMI must be in place to unlock full benefits, including utility meter data management and billing systems.
				- Privacy must be addressed for sensitive customer data - being addressed somewhat by PUC data privacy docket.
		3. **Identified Champions/Key Participants** (by action #)
			1. Xcel; MN Power;Fresh Energy
			2.
		4. **Metrics**
			1. AMI adoption (# meters, % rollout), statewide and per-utility
				- Number of opt-outs
			2. Cost of deployment, statewide and per-utility
			3. Reported benefits from programs that leverage AMI, statewide and per-utility, in following categories
				- maintenance / truck rolls saved ($)
				- peak load reduced (MW)
				- energy saved (MWh)
				- third-party offering benefits ($)
		5. **Additional information**
			1. **Cross-sector opportunities and synergies**
				- AMI can facilitate data access to drive building energy efficiency, including by third-party service providers
				- AMI can allow utilities additional flexibility in demand response program design and implementation
				- AMI can support time-varying rate programs to encourage energy efficiency and peak demand reduction
				- AMI can aid utilities in planning for the increasing introduction of electric vehicles into the grid, and may facilitate scheduling or direct control of EV charging to minimize adverse grid impacts
			2. **Ongoing MN initiatives**
				- MN PUC has ongoing grid modernization proceeding that is considering similar issues.
			3. **Other related resources**
				- Multiple utility- and state-level studies of AMI rollout cost-effectiveness have been performed and made publicly available. Full list to be included in final Energy Action Plan.
				- Mission:Data, [The EmPOWERED Consumer](http://static1.squarespace.com/static/52d5c817e4b062861277ea97/t/56724a8269492e0c126d757b/1450330754632/EmPOWEREDConsumer_CaseStudy.pdf), December 2015 – case studies in three states on energy savings from enhanced energy data access
	1. **Enable smart inverter functionality**

**Why this strategy is included:** Smart inverters have been encouraged and/or required across the United States in utility territories with increasing PV deployment, in order to mitigate issues with high PV adoption and provide grid value. Smart inverter-sourced data from deployment at lower adoption levels can also be used to inform interconnection studies. Minnesota stakeholders have identified near-term value in using smart inverters in the state in order to proactively support increasing PV adoption levels.

* + 1. **Specific actions for strategy implementation**
			1. Convene workgroup to:
				- Review UL and IEEE progress on developing standards for advanced inverter functions, and
				- Consider pathways for implementing advanced inverter functionality in Minnesota.
			2. Utilities: Increase comfort with new inverter capabilities with pilot of grid interactive inverter functionality in combination with other demand and supply-side Distributed Energy Resources.
				- Identify feeders with near-term avoided costs from grid interactive inverters, and prioritize deployment accordingly.
			3. Utilities: Require interconnection contracts to include hardware that supports advanced functionality.
		2. **Success factors**
			1. Lessons learned from other states’ smart inverter rollouts are used to inform Minnesota’s process.
				- Specifically, the California process and IEEE 1547 standards
			2. Standards or requirements provide a consistent signal for utilities and/or installers to choose and install technologies.
			3. Cost-based objections to smart inverters are mitigated by focusing on relatively small upfront costs compared to system-level avoided costs (e.g. utility infrastructure)
		3. **Identified Champions/Key Participants** (by action #)
			1. MN Dept of Commerce, MN PUC, Fresh Energy, Xcel Energy, MnSEIA, Solar Developers
			2.
		4. **Metrics**
			1. Smart inverter adoption (# inverters, % rollout), statewide and per-utility
			2. Cost of deployment, statewide and per-utility
			3. Reported benefits from programs that leverage smart inverters in $ saved, statewide and per-utility
		5. **Additional information**
			1. **Cross-sector opportunities and synergies**
				- Inverters have been integrated into home energy management systems to allow building-level energy monitoring and facilitate energy efficiency and demand response performance.
			2. **Ongoing MN initiatives**
				- MN PUC has ongoing grid modernization proceeding that is considering similar issues.
			3. **Other related resources**
				- Multiple utility- and state-level studies of smart inverter rollout have been performed and made publicly available. Full list to be included in final Energy Action Plan.
	1. **Integrate Energy Storage and Demand Response**

**Why this strategy is included:**

* + 1. **Specific actions for strategy implementation**
			1. Explore opportunities for federal funding and partnerships to integrate energy storage and demand response into grid operations
			2. Investigate energy storage and demand response participation in wholesale markets
		2. **Success factors**
			1. Design and implement projects to capture multiple value streams
			2. Include consideration of electric to thermal storage
		3. **Identified Champions/Key Participants** (by action #)
			1. Energy Storage Collaborative led by University of Minnesota Energy Transition Lab, Sandia/CESA Energy Storage Technology Advancement Partnership (ESTAP), DOE, Xcel Energy, Great River Energy, MN Dept of Commerce, MN PUC
		4. **Metrics**
			1. Number and capacity of energy storage and demand response resources by type (electric, thermal, storage ratio - energy to power MWh:MW)
			2. Number and capacity of energy storage and demand response resources participating in MISO market
		5. **Additional Information**
			1. **Cross-sector opportunities and synergies**
				- Potential for combination with smart inverter functionality to provide similar or complementary services
				- Time based rates
			2. **Ongoing MN initiatives**
				- Xcel Belle Plaine Battery Storage proposal in [Grid Modernization filing](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7b5E76BE76-9C21-45ED-AC0C-B1446EB6DBB6%7d&documentTitle=201511-115454-01) (docket [15-962](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&docketYear=15&docketNumber=962))
				- 2015 Energy Storage Summit hosted by UMN: [Energy Storage 101](http://energytransition.umn.edu/wp-content/uploads/2015/08/Energy-Storage-101.pdf) document, [presentations](http://energytransition.umn.edu/energy-storage-summit-videos-and-presentations/)
				- MN CEE has proposed a project for 2016 LCCMR funding for a Geotargeted Distributed Clean Energy Initiative in partnership with Xcel energy. The project will determine the potential for geographically targeted clean, distributed energy resources to replace planned transmission
				- Strategen Consulting, et al., [White Paper Analysis of UtilityManaged, On-Site Energy Storage in Minnesota](http://mn.gov/commerce-stat/pdfs/utility-managed-storge-study.pdf) (Prepared for Minn. Dep’t of Commerce, Dec. 2013)
				- November 2015 LEC meeting on Energy Storage, [presentations](http://www.lec.leg.mn/meetings201516.html)
				- Microgrid Institute, et al., [Minnesota Microgrids: Barriers, Opportunities, and Pathways Toward Energy Assurance](http://mn.gov/commerce-stat/pdfs/CHP%20pdfs/MN-Microgrid-WP-FINAL-amended.pdf) (Prepared for Minn. Dep’t of Commerce, Nov. 2013)
			3. **Other related resources**
				- January 2016 MISO Energy Storage Workshop: presentation link (copy link into web browser):

https://www.misoenergy.org/Library/Repository/Meeting Material/Stakeholder/MSC/2016/20160105/20160105 MSC Item 06 Energy Storage Workshop.pdf

**Evolving tariffs/pricing mechanisms** **-** Retail pricing for utility customers has remained largely unchanged for decades. Now, with the increasing diversity of distributed energy technologies and evolving customer desires, there is increasing momentum to change how utilities charge for their products. For electric utilities, new pricing schemes can better reflect the costs of service, allow customers more control and engagement in how they use energy, and align incentives for customers to make investments in distributed resources that can lower their bills as well as system costs.

* 1. **Adopt time-based rates**

**Why this strategy is included:** Time-of-use (TOU) and other time-based rates have been used successfully to address grid cost and reliability issues across the nation. Implementing this type of rate for mass-market (i.e. small commercial and residential) in Minnesota has been identified as a near-term opportunity to better engage customers in their energy use and lead to cost reductions in energy supply and grid investment.

* + 1. **Specific actions for Strategy Implementation**
			1. Utilities: Develop and pilot new time-based rates for small commercial and residential customers to achieve cost and reliability objectives, while balancing against customer needs and capabilities (e.g. for low-income customers)
			2. Drive customer adoption of new rates by educating customers about bill savings opportunities and providing customers with enabling technology and/or services to help save money on bills; opportunity for retailers, etc. not just utilities.
			3. Design rates to harness capability of enabling technology and/or behavioral approaches to enable bill and system cost reductions
				- Focus on different capabilities and for different customer classes (large commercial and industrial vs. mass market)
		2. **Success factors**
			1. Utility billing system must have functionality to handle time-based rates
			2. Implementation can be facilitated with AMI, but less-complex time-based rates may be supported by existing infrastructure (e.g. AMR)
			3. Benefits of time-varying rate programs must be analyzed and communicated to customers. Customers must be provided with information on strategies to shift their load to reduce costs.
				- Technologies are available and have been shown to increase customer response to these rates.
			4. Time-varying rates must at least roughly reflect wholesale price signals; undesirable to have mixed signals for consumption.
				- Time periods may thus vary by utility
		3. **Identified Champions/Key Participants** (by action #)
			1. e21 Initiative; PUC
			2.
		4. **Metrics**
			1. Number of customers on time-based rates
			2. Change in customer load profile in response to time-base rates, e.g. % peak reduction
			3. Change in system load factor over time
		5. **Additional Information**
			1. **Cross sector opportunities and synergies**
				- Time-based rates can alter incentives for building efficiency programs, e.g. by incentivizing energy conservation measures that reduce peak-period demand
				- Time-based rates be used to promote charging EVs at low-cost times that would not add to peak demand
				- Time-based rates can unlock additional value from AMI deployment
				- Time-varying rates can be designed to reflect the changing composition of the grid; e.g. reflect the availability or scarcity of variable renewable resources like solar and wind.
			2. **Ongoing MN Initiatives**
				- MN Power has piloted time-varying rates and is in the process of evaluation and reporting.
				- MN Department of Commerce report on “alternative rate designs that result in rates that promote energy conservation, reduce peak demand, and/or send more accurate, useful price signals to customers,” submitted 11/10/2015 in docket [15-662](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&docketYear=15&docketNumber=662)
				- e21 group-sponsored ongoing process around rate design
				- The [e21 Initiative Phase 1 Report](http://www.betterenergy.org/e21-Phase1-Report) recommendations identified the opportunity for Time-Based Rates in Minnesota (December 2014).
				- Ongoing PUC docket on time-varying rates expected to yield design principles, tariffs, and potentially pilots by end of 2016
			3. **Other related resources**
				- Extensive program evaluation, measurement, and verification has been performed for time-based rates across the country; these will be cited and summarized in the final Energy Action Plan.
				- Design principles for effective time-based rate design have been proposed by leading organizations across the industry; these will be synthesized in the Energy Action Plan with specific focus on their applicability to Minnesota.
	1. **Expand and improve utility green energy options**

**Why this strategy is included:** Utility-sponsored green energy programs offer customers a way to voluntarily meet some or all of their own energy use with renewable energy. Minnesota stakeholders have identified the expansion of these programs as a near-term opportunity to continue to drive renewable energy adoption and customer engagement in the state.

* + 1. **Specific actions for Strategy Implementation**
			1. Utilities: develop and pilot green power options to fit customers’ needs
			2. Utilities & clean energy advocates: educate customers about programs that have been developed in other states and consider elements that are appropriate in Minnesota.
				- Also educate about other options for meeting renewable energy demand, including on-site installation
			3. Natural gas utilities: Consider offering a voluntary green pricing pilot program for renewable natural gas
				- A complement to renewable natural integration into the existing natural gas distribution system is a system for tracking and retiring renewable natural gas credits. This type of system would mirror the tracking systems already in place for renewable electricity. Tracking renewable natural gas credits could be an added function of current renewable electricity credit tracking systems.
		2. **Success factors**
			1. Programs offered meet the needs of customer groups, including corporate customers as well as mass-market groups
				- Specifically, many large Minnesota corporate buyers including 3M and Target have signed onto the Corporate Renewable Energy Buyers’ Principles, which emphasizes criteria for successful tariffs including choice, cost-competitiveness, fixed price contracts, and additionality.
			2. Utility programs offer appropriate price signals to consumers to reflect the costs and benefits of procuring renewable resources
			3. CPP compliance does not serve as a ceiling or otherwise limit adoption of green tariffs
		3. **Identified Champions/Key Participants** (by action #)
			1. **e21 Initiative**
			2.
		4. **Metrics**
			1. Number of options offered
			2. Customer participation rate
			3. MWh or mmBTU renewable energy delivered through programs
		5. **Additional Information**
			1. **Cross sector opportunities and synergies**
				- Renewable natural gas offerings have applicability to transportation, industry, and energy/climate action planning.
				- Green power programs used for EV load can ensure low-carbon energy used for transportation
				- Green power programs have proven track record with large corporations in Minnesota that seek to boost their clean energy procurement
			2. **Ongoing MN Initiatives**
				- Xcel submitted a [proposed green tariff](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7bCB545E80-73C0-4342-BD01-96465E189AA0%7d&documentTitle=201511-115703-01) in November 2015 in docket [15-985](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&docketYear=15&docketNumber=985).
				- The [e21 Initiative Phase 1 Report](http://www.betterenergy.org/e21-Phase1-Report) recommendations identified the opportunity for Green Tariffs in Minnesota (December 2014).
			3. **Other related resources**
				- Many state-specific and national programs are in place and several studies have highlighted best practices; full Energy Action Plan will synthesize the successes and lessons learned from these programs.
				- [Emerging Green Tariffs in US Regulated Electricity Markets](http://www.wri.org/publication/emerging-green-tariffs-us-regulated-electricity-markets), WRI, July 2015
				- [Corporate Renewable Buyers Principals](http://www.wri.org/sites/default/files/corporate_renewable_energy_buyers_principles_1.pdf), WWF/WRI, May 2015
				- [Above and Beyond, Green Tariff Design for Traditional Utilities](http://www.wri.org/publication/green-tariff-design), WRI, January 2014

* + - * + [Power Forward 2.0](http:///h), WWF/Ceres/Calvert/DGA, June 2014
1. **Efficient Buildings and Thermal Energy**

Minnesota has a long history of successful utility ratepayer funded energy efficiency and conservation programs, with programs continuously operating since the early 1980s. [Over the past 20 years, these programs have saved 99,000 GWh of electricity, the equivalent of the annual production of 10 large power plants. They have saved Minnesota ratepayers over $6 billion. Minnesota utilities’ programs are ranked in the top five in the country by the American Council for an Energy Efficient Economy.](http://www.mepc-mn.org/Meetings/2015/June15_Summit/Energy%20Efficiency%20Harnessing%20Local%20Power%20Plants_Jennifer%20Edwards.pdf) Utilities and regulators continuously evaluate and improve these programs and they will continue their success in the coming decade as they help building owners understand and install the new technology options best suited to their needs. This report identifies additional opportunities to make buildings more efficient through improved design and operation.

**New Buildings & Major Renovations**

Due to the up-front opportunities to optimize site selection, building design, and material and equipment specifications based on energy efficiency goals, the thoughtful design of new buildings and major renovations is a cost-effective way to reduce energy use in the built environment.

* 1. **Adopt net-zero energy or low-energy goals for new buildings and major renovations**

**Why this strategy is included:** Initial results from the Climate Strategies and Economic Opportunities (CSEO) analysis reveal that implementing a net zero energy requirement for new and renovated buildings is one of the strategies with the greatest impact on reducing state energy use and greenhouse gas emissions. Minnesota SB 2030 - a progressive energy conservation program that targets net-zero energy building design by 2030 - is currently required for all publically bonded, new and substantially renovated buildings. This strategy expands the reach of net-zero energy programs beyond the public sector in order to dramatically increase their impact.

* + 1. **Specific actions for strategy implementation**
			1. Initiate Department of Labor and Industry (DLI) rulemaking to add net-zero or low-energy goals as an Appendix option to the MN State Building Code. This administrative action would allow cities in Minnesota to use this as their required building energy code. This is not currently permitted with existing state code, but can be added as an appendix code without requiring legislative approval.
				- Proposal to include IgCC 2015 as an appendix to the Minnesota State Code with an SB 2030 overlay, such that the SB 2030 Energy Standard Tool replaces IgCC Table 612.1 in determining energy use intensity targets based on building-specific characteristics. This proposal would require the continued expansion of the SB 2030 Energy Standard Tool to handle additional building types and a code compliance workflow. Initial implementation should target all buildings except residential structures with fewer than four units.
			2. Support adoption of the net-zero or low-energy appendix code at the city building official level through education and outreach.
			3. Train architects, engineers, and contractors to design and construct buildings that meet net-zero energy goals.
			4. Train code officials how to determine compliance with net-zero energy goals.
		2. **Success factors**
			1. Cities are able to require net-zero and/or low-energy goals within their building code.
			2. SB 2030 Energy Standard Tool supports the majority of building types.
			3. Design teams have knowledge required to achieve net-zero energy.
			4. Cities have expertise and capacity required to verify compliance with performance-based energy codes.
		3. **Identified Champions/Key Participants** (by action #)
			1. SB 2030 team (especially Department of Commerce, CSBR, The Weidt Group, LHB)
			2.
			3.
			4.
		4. **Metrics**
			1. Number of SB 2030 buildings
			2. Square footage of SB 2030 buildings
			3. Annual energy saved by SB 2030 buildings (as compared to the average building)
			4. Annual CO2e emissions prevented by SB 2030 buildings (as compared to the average building)
			5. Number of cities that have adopted SB 2030 into their building code
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Improved energy data access is required for verifying compliance during building operations.
			2. **Ongoing MN initiatives**
				- [CSEO](http://www.environmental-initiative.org/images/files/CSEO/RCII-2%20SB2030%20Zero%20Energy%20Transition%20Codes.pdf): Taking this action is comparable to a first step in the overall implementation of the proposed “Zero Energy Ready” strategy.
				- In St. Paul, entities that receive tax incentives/abatement are required to participate in the SB 2030 program.
				- Maplewood has adopted a green code for city-owned buildings.
			3. **Other related resources**

**Existing Buildings**

Continuing to address energy use in existing buildings is the second most important building energy strategy. Existing energy efficiency programs will continue to address the building envelope, HVAC systems, and plug load. The recommendations here address the emerging opportunities for building operators and occupants to understand their energy use and control their use through system operations and behavior change.

* 1. **Enhance energy data access through an established standard reporting protocol**

**Why this strategy is included:** Timely access to consistent energy data is essential for identifying potential energy and cost savings. Implementing an industry standard for utilities to use to report energy data will ensure that the data is consistent between utilities and across years. This standardization will enable the effective use of benchmarking and disclosure programs. This strategy does not address data ownership or privacy, instead deferring to the open PUC Energy Data Access/Data Privacy Docket 12-1344 for a ruling on who can access energy usage data.

* + 1. **Specific actions for strategy implementation**
			1. Evaluate the potential of widespread adoption of Green Button as a data standard
				- Implement pilots of Green Button *Connect My Data* with several leading utilities (Xcel Energy, CenterPoint Energy, Minnesota Valley Electric, Minnesota Power). Record the cost to the utilities and test the standard’s usability for natural gas.
				- Once basic functionality has been implemented, pilot test the ability to include demand usage and 15-minute interval data.
			2. Determine a process for making standardized energy data (e.g. through Green Button) available from all Minnesota utilities.
		2. **Success factors**
			1. Utility billing system must have functionality to work with data reporting standard.
			2. AMI would facilitate implementation.
		3. **Identified Champions/Key Participants** (by action #)
			1. MN Dept of Commerce, Fresh Energy, Metropolitan Council, MN PUC, University of MN, Electric and Gas Utilities, Weidt Group
		4. **Metrics**
			1. Number of MN utilities offering Green Button *Download My Data*
			2. Number of MN utilities offering Green Button *Connect My Data*
			3. Reported savings from Green Button-facilitated program offerings
		5. **Additional Information**
			1. **Cross sector opportunities and synergies**
				- AMI would facilitate implementation.
				- Easy access to energy use data facilitates benchmarking and tracking effectiveness of behavioral strategies
			2. **Ongoing MN initiatives**
				- [12-1344](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&docketYear=12&docketNumber=1344) Energy Data Access/Data Privacy docket
				- Xcel currently provides Green Button *Download My Data* for residential and commercial customers. Xcel’s Green Button provides data on kWh and cost in daily intervals for electric customers and therms and cost for natural gas customers. Electric demand use data is not currently provided.
			3. **Other related resources**
				- <http://www.greenbuttondata.org/>
				- <http://energy.gov/data/green-button>
				- Alexandra Klass and Elizabeth Wilson, [Energy Consumption Data: The Key to Improved Energy Efficiency](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2602974), 6 SAN DIEGO J. OF CLIMATE & ENERGY L. 69 (2015)
				- [Integrating Benchmarking into Utility Conservation Improvement Programs to Capture Greater Energy Savings](https://www.cards.commerce.state.mn.us/CARDS/security/search.do?method=showPoup&documentId=%7b20FCCD12-7BD9-4055-B01E-6898CD7C9CD3%7d&documentTitle=148413&documentType=6), prepared by Weidt Group for MN Department of Commerce, August 2014
				- Mission:Data, [The EmPOWERED Consumer](http://static1.squarespace.com/static/52d5c817e4b062861277ea97/t/56724a8269492e0c126d757b/1450330754632/EmPOWEREDConsumer_CaseStudy.pdf), December 2015 – case studies in three states on energy savings from enhanced energy data access

* 1. **Increase adoption of building energy benchmarking and disclosure programs**

**Why this strategy is included:** Tracking building energy use data is essential to ensure that new buildings are operating as predicted, to identify areas for improvement in existing buildings, and to measure the impact and persistence of actions taken, whether energy efficiency retrofits or behavior modification strategies. Disclosure of commercial building energy use has proven to be a valuable tool in other states for current and potential tenants as they evaluate options.

* + 1. **Specific actions for strategy implementation**
			1. Promote adoption of building benchmarking programs
				- Educate cities and commercial building owners on the importance of benchmarking building energy use and the role of cities in facilitating or requiring commercial building benchmarking (e.g., share successful case studies through presentations to the League of Minnesota Cities and GreenStep Cities).
				- Ensure all building owners have access to building benchmarking tools

Extend access to B3 Benchmarking to all building owners.

Provide access to the Minnesota B3 Benchmarking (now available for free to all Minnesota public buildings) to all Minnesota building owners for no or low cost. SB 2030 buildings will be required to track their energy use in B3 Benchmarking; other buildings can use voluntarily.

Increase the number of supported building types in B3 Benchmarking.

* + - * + Train Minnesota cities and tribal communities on benchmarking tools and encourage them to engage local businesses in benchmarking.
				+ Train commercial building owners on benchmarking tools.
				+ Ensure ease of use of benchmarking tools by promoting automated data transfer from utilities
				+ Promote use of benchmarking tools through lease requirements, competitions, and incentivize programs
			1. Promote adoption of energy disclosure programs
				* Encourage commercial building energy disclosure ordinances by Minnesota cities and tribal communities through education (e.g., sharing successful case studies) and technical assistance.
			2. Support taking action based on benchmarked and/or disclosed energy data.
				* Train building owners and funding providers to leverage benchmarking systems to target investment in areas of greatest savings potential.
				* Connect benchmarked building owners with existing resources for operational and behavioral energy efficiency strategies.
		1. **Success factors**
			1. Cities, tribal communities, and building owners understand the importance of tracking their energy use.
			2. Cities and tribal communities champion or mandate benchmarking.
			3. All building owners have access to at least one building benchmarking program and related training materials at low or no cost.
			4. Data entry into benchmarking programs requires minimal time and effort.
			5. Cities and tribal communities understand importance of building energy disclosure programs.
			6. Building operators understand how to use benchmarking data to reduce energy use.
		2. **Identified Champions/Key Participants** (by action #)
			1. Varies
				- USGBC-MN and Great Plains Institute
				- TBD
				- CERTS
			2.
			3.
		3. **Metrics**
			1. Number of Minnesota buildings in B3 Benchmarking and/or ENERGY STAR Portfolio Manager
			2. Square footage of buildings in B3 Benchmarking and/or ENERGY STAR Portfolio Manager
			3. Potential energy savings identified by B3 Benchmarking
			4. Number of cities/tribal communities that have instituted commercial building energy disclosure ordinances
		4. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Advanced metering - automatic tracking of interval data
			2. **Ongoing MN initiatives**
				- [State of Minnesota B3 Benchmarking](https://mn.b3benchmarking.com/): over 8,000 public buildings track their energy use on this site and compare their performance to a code-based benchmark.
				- [City of Minneapolis commercial building rating and disclosure ordinance 47.190](https://www.municode.com/library/mn/minneapolis/codes/code_of_ordinances?nodeId=COOR_TIT3AIPOENPR_CH47ENAIPO_47.190COBURADI): requires commercial buildings above 50,000 sf to report their energy use to the City.
				- [Minnesota ENERGY STAR Challenge](http://mnenergystarchallenge.com/): provides participating building owners with free education and assistance regarding benchmarking, energy reduction strategies, and financing.
				- Resource: [Integrating Benchmarking into Utility Conservation Improvement Programs to Capture Greater Energy Savings](https://www.cards.commerce.state.mn.us/CARDS/security/search.do?method=showPoup&documentId=%7b20FCCD12-7BD9-4055-B01E-6898CD7C9CD3%7d&documentTitle=148413&documentType=6), prepared by Weidt Group for MN Department of Commerce, August 2014
				- [12-1344](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&docketYear=12&docketNumber=1344) Energy Data Access/Data Privacy docket
				- Minneapolis is partnering with Xcel and CenterPoint Energy on the Department of Energy's Better Buildings Initiative [Energy Data Accelerator](http://www1.eere.energy.gov/buildings/betterbuildings/accelerators/energy.html) to facilitate better access to energy usage data. ([ACEEE](http://database.aceee.org/city/energy-data-access))
				- Xcel proposed automatic energy data transfer to Energy Star Portfolio Manager as part of a CIP pilot [Energy Benchmarking Program](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B06E46F50-73D0-4323-BBE4-3444BB4CE133%7D&documentTitle=201510-114859-01).
				- Automatic energy data transfer into B3 for Xcel customers is planned for early 2016 ([B3 newsletter](https://mn.b3benchmarking.com/News)).
			3. **Other related resources**

* 1. **Improve Building Operations**

**Why this Strategy is Included:** Building operators are critically important in ensuring that commercial and industrial buildings are operating efficiently and as designed. This strategy is included here because of the expected retirement of a large percentage of this workforce. This presents both a challenge and an opportunity to ensure that new building operators are well trained and able to take full advantage of the existing and new technology innovation.

* + 1. **Specific actions for strategy implementation**
			1. Identify existing building operator training providers and resources
			2. Partner with them, with unions, and with commercial building owners to ensure that all building operators have updated training certifications
			3. Re-commissioning / On-going Commissioning
				- Improve outreach on available resources for building recommissioning and on-going commissioning for optimal operation of existing building controls.
			4. Enhanced building controls
				- Develop partnerships and pilots to improve understanding of available technologies, applications, and potential savings
				- Identify federal resources and funding opportunities to enhance partnerships, pilots, and implementation
		2. **Success factors**
			1. Availability of building operator training programs
			2. Enrollment in building operator training
		3. **Identified Champions/Key Participants** (by action #)
			1. MnSCU, MEEA, CERTs, unions, commercial building owners and associations
			2. MN Dept. of Commerce (GESP, RevItUp, PACE), commercial building owners and associations, MnTAP
			3. Honeywell, Siemens, Great River Energy, Xcel, MN Power, Energy Design Conference, University of Minnesota, MnTAP, CERTs, DOE
		4. **Metrics**
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Building operator training is an important component for building energy benchmarking
				- Enhanced building controls could be a component of Grid Modernization, integration of demand response, and time-based rates
				- Potential for an Advanced Energy Cluster Organization around enhanced building controls to support MN leadership in this area
			2. **Ongoing MN initiatives**
				- MEEA [Building Operator Certification](http://www.boccentral.org/) training program listings – customers of several MN utilities **may be eligible for a tuition rebate** upon successful completion of course requirements.
				- MN Department of Commerce – Technical assistance and financing
* [Guaranteed Energy Savings Program](https://mn.gov/commerce/industries/energy/technical-assistance/)
* [Local Energy Efficiency Program](https://mn.gov/commerce/industries/energy/technical-assistance/)
* [Energy Savings Partnership](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp)
* [Public Entity Energy Audit and Renewable Energy Feasibility Study Loan Program](https://mn.gov/commerce/industries/energy/financial-assistance/feasibility.jsp)
* [PACE](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp)
* [Rev It Up](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp) Loan Program
	+ - 1. **Other related resources**
	1. **Promote behavioral energy efficiency strategies**

**Why this strategy is included:** Behavior-based energy efficiency strategies include non-financial factors to motivate energy consumption. Use of social science insights in behavioral approaches to energy efficiency can be a cost effective way to reduce energy use and enhance the effectiveness of existing programs.

* + 1. **Specific actions for strategy implementation**
			1. Expand education about energy reduction through behavioral strategies.
			2. Include a citywide energy challenge as a best practice for GreenStep Cities.
			3. Initiate an energy challenge among GreenStep cities with recognition for cities that show significant improvement (similar to Georgetown energy prize).
		2. **Success factors**
			1. Improved energy data access, such as through Green Button and advanced metering, will facilitate improve feedback and facilitate tracking the impact of behavioral strategies.
			2. Encourage local government action to promote an energy challenge.
			3. Use competitions to channel consumers to other energy efficiency programs and resources**.**
			4. Measure long-term persistence of savings to verify impact.
			5. Integrate social science insights into behavioral program design, for example, include additional benefits to frame energy choices in non-monetary terms such as energy rating/benchmarking, social norms, and “similar home” comparisons, include commitment and goal setting, and gamify competitions.
		3. **Identified Champions/Key Participants** (by action #)
			1. MN Dept of Commerce
			2. MN Dept of Commerce, CEE
			3. MN Dept of Commerce, CEE
		4. **Metrics**
			1. Number of GreenStep Cities that have committed to implementing a citywide energy challenge
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Improved energy data access, such as through Green Button, will facilitate tracking the impact of behavioral strategies
				- Behavioral strategies can enhance effectiveness of Local Government Action
			2. **Ongoing MN initiatives**
				- Statewide Commercial Behavioral Segmentation and Potential Study - Illume Advising for MN Department of Commerce, estimated completion in 2017, assessment of technical potential of behavior change among small and medium businesses
				- Resource: [Energy Efficiency Behavioral Programs: Literature Review, Benchmarking Analysis, and Evaluation Guidelines](https://www.cards.commerce.state.mn.us/CARDS/security/search.do?method=showPoup&documentId=%7b971F1044-CF64-41EA-A714-7AEF32F2255B%7d&documentTitle=213328&documentType=6), prepared by Illume Advising for MN Department of Commerce, May 2015
				- Xcel’s [Partners in Energy](http://www.xcelenergy.com/Community/Community_Projects/Partners_In_Energy_Community_Programs) program (2-year program to help city, county, nonprofit, etc develop energy strategies and host energy challenges. Run by CEE)
				- [Schools for Energy Efficiency](https://www.seek.state.mn.us/resource/schools-energy-efficiency-see-program): this program for K-12 schools to save energy through user behavior provides strategies for efficient operations, energy awareness materials for staff and students, training, and utility tracking for immediate and sustainable savings.
				- [Minnesota ENERGY STAR Challenge](http://mnenergystarchallenge.com/): provides participating building owners with free education and assistance regarding benchmarking, energy reduction strategies, and financing.
				- Minnesota Valley Electric Cooperative [Beat the Peak Energy Challenge](http://www.mvec.net/community/challenge/): a reward program for reducing electricity use during peak times
				- [Georgetown University Energy Prize](https://guep.org/): Duluth is participating in this nationwide program where communities compete to raise the bar on energy efficiency.
			3. **Other related resources**

* + - * + [SEE Action – Behavior Based Energy Efficiency](https://www4.eere.energy.gov/seeaction/topic-category/behavior-based-energy-efficiency)
				+ Mission:Data, [The EmPOWERED Consumer](http://static1.squarespace.com/static/52d5c817e4b062861277ea97/t/56724a8269492e0c126d757b/1450330754632/EmPOWEREDConsumer_CaseStudy.pdf), December 2015 – case studies in three states on energy savings from enhanced energy data access

**Thermal Energy**

* 1. **Identify opportunities for thermal energy grids**
		1. **Specific actions for strategy implementation**
			1. Identify locations of existing thermal grids
			2. Analyze and map opportunities for waste heat.
			3. Work with local governments to identify opportunities for district energy when planning for other community systems and infrastructure
		2. **Success factors**
			1. Include consideration of energy opportunities early in infrastructure planning. District energy development is most cost effective in combination with planned road, sewer, or other infrastructure projects.
			2. Use waste heat sources where available, such as from sewer mains and waste water treatment.
			3. In addition to district heat, district cooling and thermal storage improve system efficiency and can be effective load balancing tools to reduce costs from peak energy use).
		3. **Identified Champions/Key Participants** (by action #)
			1. MetCouncil, Evergreen Energy, International District Energy Association, Hospitals, colleges, and universities, GreenStep Cities
		4. **Metrics**
			1. Number of district heating & cooling systems
			2. Square feet of building space served by district heating and cooling
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
* [Incorporate energy into local government policy, planning, and regulatory frameworks](#id.c8e70xx9smk7)
* Support Combined Heat and Power
* Load balancing for Microgrids to improve community resiliency
* Lowers costs for building owners seeking LEED certification
	+ - 1. **Ongoing MN initiatives**
* [Rice Creek Commons](http://ricecreekcommons.com/)
* [University Avenue Innovation District](https://www.minnpost.com/line/2015/07/urbanists-dream-new-msp-innovation-district-would-create-national-standard-city-buildin) (aka Prospect North)
* [St. Paul Ford Plant site redevelopment](https://www.stpaul.gov/departments/planning-economic-development/planning/ford-site-21st-century-community)
	+ - 1. **Other related resources**
* [Midwest DOE CHP Technical Assistance Partnership](http://midwestchptap.org/) provides technical assistance resources on district heating and cooling with CHP.
* Microgrid Institute, et al., [Minnesota Microgrids: Barriers, Opportunities, and Pathways Toward Energy Assurance](http://mn.gov/commerce-stat/pdfs/CHP%20pdfs/MN-Microgrid-WP-FINAL-amended.pdf) (Prepared for Minn. Dep’t of Commerce, Nov. 2013)
* DOE: [CHP: Enabling Resilient Energy Infrastructure for Critical Facilities - Report](http://energy.gov/eere/amo/downloads/chp-enabling-resilient-energy-infrastructure-critical-facilities-report-march), March 2013
* [International Energy Agency - District Heating and Cooling](http://www.iea-dhc.org/home.html)
	1. **Support combined heat and power (CHP)**

**Why this strategy is included:** Over the last two years the MN Department of Commerce has been conducting a robust effort to examine opportunities for increasing the deployment of CHP in MN. As a result of a stakeholder engagement process, technical research studies, and evaluation of resource potential a MN CHP Action Plan was published in October 2015. The Action Plan provides a roadmap for specific actions that will be undertaken in the next several years to improve the policy, regulatory, and technical environment in order to take advantage of CHP implementation opportunities.

* + 1. **Specific actions for strategy implementation**
			1. Analyze and map opportunities for waste heat.
			2. Conduct CHP market analysis for different regions of the state and map assets available in the region.
			3. Six priority actions from [DOC CHP Action Plan](http://mn.gov/commerce-stat/pdfs/abridged-final-chp-action-plan-2015.pdf)
* Establish a CHP evaluation methodology and criteria that would provide a fair, accurate, and comprehensive assessment and valuation of CHP projects.
* Conduct an empirical study and granular analysis that would map opportunities for topping-cycle and bottoming-cycle CHP projects.
* Address knowledge gaps and define options for CHP education and training.
* Address a range of CHP ownership problems and solutions including utility resource planning, ratepayer risks, market power, and behind-the-meter operations.
* Explore CHP supply-side investments as an eligible electric utility infrastructure (EUI) resource under the Conservation Improvement Program (CIP).
* Introduce transparent, unbundled pricing for standby rates.
	+ 1. **Success factors**
			1. Completed region-by-region market analysis to pinpoint project development opportunities.
			2. Access to qualified operation and maintenance technicians to service projects.
			3. Readily available case studies or examples of successful CHP projects at different sectors.
		2. **Identified Champions/Key Participants** (by action #)
			1.
			2.
			3.
		3. **Metrics**
			1. Total fuel savings (Btu)
			2. Total CO2 emissions savings (lbs CO2)
			3. Number of new CHP installations and added capacity
				- Measure against DOC commissioned [CHP potential study](http://mn.gov/commerce-stat/pdfs/CHP%20pdfs/CHPTechnicalandEconomicPotential.pdf), which estimated 984 MW of new economical CHP capacity. Economical CHP was classified as having a payback of less than 10 years.
		4. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Waste heat capture and CHP integration at advanced biofuel and biobased chemical production facilities.
				- Biogas from anaerobic digestion as a prime mover source for CHP projects.
				- CHP as a strategy to increase industrial energy efficiency.
				- Development opportunities in northern MN for harvesting heat for secondary use in mining, pulp/paper, and timber industries.
				- Integrated systems approach may allow enhanced biogas generation.
			2. **Ongoing MN initiatives**
				- MN DOC CHP [Stakeholder Engagemen](http://mn.gov/commerce/industries/energy/distributed-energy/combined-heat-power.jsp)t website tracks and disseminates information on [implementation activities](http://mn.gov/commerce/industries/energy/distributed-energy/chp-action-plan-implementation-.jsp) of the final CHP action plan.
				- [MN Technical Assistance Partnership](http://www.mntap.umn.edu/index.htm) at the University of Minnesota works with MN businesses to develop and implement industry-specific solutions to prevent pollution, maximize efficient use of resources, and reduce energy use and costs.
				- [15-115](https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&userType=public) PUC docket on standby rates.
			3. **Other related resources**
				- DOE [CHP Deployment Group](http://energy.gov/eere/amo/chp-deployment) serves as the center for CHP technical assistance at the DOE. Headquarter operations tracks CHP installs, works on CHP policies, develops targeting material materials, and other central operations.
				- [Midwest DOE CHP Technical Assistance Partnership](http://midwestchptap.org/) provides a wide variety of technical assistance resources and is a second arm of the DOE CHP deployment group.
				- State & Local Energy Efficiency Action Network, [Guide to the Successful Implementation of State Combined Heat and Power Policies](https://www4.eere.energy.gov/seeaction/publication/guide-successful-implementation-state-combined-heat-and-power-policies)
				- [DOE CHP Installation database](https://doe.icfwebservices.com/chpdb/)
				- DOE: [CHP: Enabling Resilient Energy Infrastructure for Critical Facilities - Report](http://energy.gov/eere/amo/downloads/chp-enabling-resilient-energy-infrastructure-critical-facilities-report-march), March 2013
1. **Industry and Agriculture**

Minnesota’s agricultural and manufacturing sectors, both commercial and industrial, are major economic drivers. Minnesota ranks fifth nationally in total agricultural cash receipts and food production is Minnesota’s second largest manufacturing segment. Industry, as a sector, is the largest user of energy and opportunities for increasing energy productivity cuts across different types of manufacturing. The agricultural sector has led the development of value-added opportunities, such as renewable fuel production. Although, industry and agriculture have taken steps to increase energy efficiency and supply renewable alternatives, there is opportunity to expand on the foundation already in place.

* 1. **Commercialize advanced biofuels and biobased chemicals**

**Why this strategy is included:** Minnesota has a strong history of supporting the development biobased industries. The state has 21 corn ethanol plants with 1.1 billion gallons of production capacity and 63 million gallons of biodiesel production capacity. Minnesota has also led the nation in deploying biofuel infrastructure that expands consumer choice at the pump. In October of 2015 the MN Department of Agriculture (MDA) was awarded $8 million from the U.S. Department of Agriculture’s Biofuel Infrastructure Partnership that will be matched with $6.11 million from MDA and in-kind contributions from in-state partners. This new investment is estimated to assist with the installation or retrofit of 620 pumps and related equipment at approximately 165 retail stations. In 2015 the Minnesota legislature put in place a new financing mechanism to assist with the commercial deployment of advanced biofuels and biobased chemicals. Eligible projects have until 2025 to come online and access state financing. Minnesota has the opportunity to expand biobased industry development by taking advantage of new value-added opportunities for our agricultural and forestry sectors to produce advanced biofuels and biobased chemicals.

* + 1. **Specific actions for strategy implementation**
			1. Conduct a supply/value chain mapping study for the variety of biobased chemicals and fuels that can be produced in MN. Map available feedstocks to end products.
			2. Address feedstock supply infrastructure, concerns, and availability.
				- There are different opportunities and barriers to address between agriculture and forestry feedstocks.
				- Forestry: Addressing the forest feedstock supply chain requires developing a more predictable and systematic mechanism for bringing privately owned forest fiber to market.
				- This may require efforts to revise and enhance the Sustainable Forest Incentive Act (SFIA) which exists to incent to private forest landowners to maintain their forest lands as contiguous, non-developed working forest lands.
				- This will also require efforts to support the Private Forest Management (PFM) System Framework that unites the DNR, SWCDs, private forest consultants, BWSR and MN counties and other private forest stakeholders in achieving Minnesota’s Private Forest Management goals, in creating a distribution of responsibilities and in addressing private forest data collection and registration needs.
				- Supporting the newly developed PFM System Framework requires supporting baseline budget requests that fulfill data input needs necessary to predict the availability and location of forest fiber on private lands.
				- Finally, addressing forest feedstock supply logistics will also require working to maintain and potentially enhance MN’s logging base; supporting the Minnesota Logger Education Program (MLEP) in efforts to educate and train loggers as well as helping them succeed in diversifying forest markets will be critically important.
				- Agriculture: addressing feedstock concerns, supply, and infrastructure for agricultural biomass requires a process for bringing relevant stakeholders together to address key concerns on biomass sourcing.
				- Stakeholder process could examine current research on energy and environmental impacts for removing a portion of agricultural residues from existing cropping systems, discuss strategies for increasing cover cropping and perennial vegetation as a potential source of biomass, and develop near-term and long-term strategies for biomass aggregation and supply chain constraints.
			3. Secure funding for and complete a renewable jet fuel/renewable diesel supply chain feasibility study.
			4. Identify and address project permitting barriers to implement strategies for efficient project permitting.
				- [Minnesota Business FirstStop](http://mn.gov/deed/business/help/first-stop/), managed by the MN Department of Employment and Economic Development and includes representatives from key state agencies, offers assistance to business to help streamline licensing, permitting, and regulatory matters.
		2. **Success factors**
			1. Develop adequate refueling infrastructure to meet consumer demand and consume a greater percentage of fuel produced in-state.
			2. Enact policies that address market access for advanced biofuels and biobased chemicals.
			3. Completed supply/value chain studies and identification of promising development pathways.
			4. Encourage efficient and transparent regulatory process for bringing new projects online.
			5. Use public research dollars to develop common intellectual property that can lead to spin-off projects.
			6. Identify research/knowledge gaps for a concerted efforts to understand roadblocks preventing significant investment in biobased development opportunities. This is needed in order to attract additional research funding.
		3. **Identified Champions/Key Participants** (by action #)
			1. Champion: Bioeconomy Coalition of Minnesota. Participants: University of Minnesota, Department of Bioproducts and Biosystems Engineering, Natural Resources Research Institute, Agricultural Utilization Research Institute, Minnesota Department of Agriculture.
			2. Forestry feedstocks: DNR Forestry - Leading the new Private Forest Management Strategy (a collaboration of MN counties, DNR, BWSR, SWCD, private consultants) to maintain momentum and achieve goals outlined within the new strategy. Agricultural feedstocks: Bioeconomy Coalition with participation from the Minnesota Department of Agriculture.
			3. Champions: Wenck Associates and Commercial Aviation Alternative Fuels Initiative (CAAFI).
			4. Champion: MN Business FirstStop
		4. **Metrics**
			1. Gallons produced (liquid advanced biofuels)
			2. MmBTU produced (gaseous advanced biofuel such as Bio Compressed Natural Gas)
			3. Renewable Information Numbers (RINs) generated in MN (liquid and gaseous advanced biofuels under EPA Renewable Fuel Standard)
			4. Pounds produced (biobased chemicals)
			5. Reductions in GHG and criteria pollutants
			6. Economic development - private and public investment dollars (1:1 ratio) for individual projects, jobs produced (seven county metro and greater MN)
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Renewable fuels as a strategy for increasing alternative transportation options for consumers along with electrification (see transportation strategy on alternative fuel vehicles).
				- A more robust advanced biofuel market can help commercialize anaerobic digestion projects that would clean and upgrade produced biogas as a source of transportation fuel.
				- Industrial efficiencies (at existing biofuel or new biofuel or biochemical production facilities) in capturing waste heat (for CHP) more efficiently or in developing integrated systems that provide higher value products that take advantage of waste heat.
				- Advanced Energy Cluster could provide marketing assistance to advertise MN to companies as an ideal location for biobased production and feedstock development.
			2. **Ongoing MN initiatives**
				- [Biofuel and biomass](http://www.clcmn.edu/ag-energy-center/renewable-energy/) energy crop production research at Central Lakes College
				- [Chemical Extractives Laboratory](http://www.nrri.umn.edu/cartd/lce/default.htm) at the Natural Resources Research Institute
				- University of Minnesota energy cropping research and initiatives

 [Forever Green](http://www.cinram.umn.edu/projects/forevergreen/research)

[Green Lands Blue Waters](http://greenlandsbluewaters.net/)

[Green Prairie Alliance](https://www.morris.umn.edu/sustainability/research/)

* + - * + Agricultural Utilization Research Institute, [Agbioscience Leadership](http://www.auri.org/help/research/strategic-initiatives/)
				+ [Bioeconomy Coalition of Minnesota](http://mnbioeconomy.org/)
			1. **Other related resources**
				* Agriculture Research, Education, Extension, and Technology Transfer Grant Program, [MN Statute 41A.14](https://www.revisor.mn.gov/statutes/?id=41A.14).
			2. **Funding sources identified**
				* MN Department of Agriculture, [Agricultural Growth, Research and Innovation (AGRI) Program](http://www.mda.state.mn.us/grants/agri.aspx)

[Minnesota Biofuel Infrastructure Partnership](http://www.mda.state.mn.us/en/grants/grants/mnbiofuel.aspx)

Advanced Biofuel Production Incentive, [MN Statute 41A.16](https://www.revisor.mn.gov/statutes/?id=41A.16)

Renewable Chemical Production Incentive, [MN Statute 41A.17](https://www.revisor.mn.gov/statutes/?id=41A.17)

* + - * + United States Department of Agriculture, Rural Development
				+ Department of Energy, Bioenergy Technology Office
				+ Iron Range Resources and Rehabilitation Board
	1. **Capture organic feedstocks through anaerobic digestion (AD)**

 **Why this strategy is included:** Anaerobic digestion (AD) is not a new technology and in most cases is fully commercial. Although some sectors, like wastewater treatment have successfully utilized the technology for a number of years, AD has not really taken off as an effective waste management tool that can also supply a source renewable energy for local communities or sectors beyond wastewater treatment, such as food and agriculture. Anaerobic digestion captures methane and carbon dioxide (biogas) as organic material decomposes in an oxygen-free, heated environment. Biogas can be collected and burned directly as a source of electricity and/or heat or can be scrubbed of carbon dioxide to produce renewable natural gas, which is chemically equivalent to conventional natural gas. Renewable natural gas can be compressed to provide a source of transportation fuel in vehicles designed or converted to run on natural gas. Anaerobic digestion operates most efficiently when there is a stable and reliable source of organic feedstocks. Anaerobic digestion can be an effective organic waste management tool, also provides a flexible source of renewable energy. There is significant potential for AD with biogas recovery in Minnesota and multiple opportunities for biogas to integrate with alternative vehicle deployment strategies, CHP, green pricing programs, and advanced biofuel and biobased chemical commercialization.

* + 1. **Specific actions for strategy implementation**
			1. Develop a set of success stories/case studies on anaerobic digestion at the municipal, agricultural, and industrial scales. Draw on projects from outside of Minnesota but correlate to MN development opportunities.
				- Identify what types of success stories or case studies would that would help to frame the opportunity in MN.
			2. Revise the MPCA solid waste hierarchy to include anaerobic digestion.
			3. Engage project financiers in a dialogue and solicit one-on-one feedback to identify what needs to be in place to help ensure project investment.
				- Financing dialogue will need to occur among three different common project configurations: food and agriculture, landfills, and wastewater treatment facilities. All three have different financing limitations.
			4. Reset the conversation on anaerobic digestion for state agencies, financiers, and potential and existing project owners.
				- Develop the full value proposition for anaerobic digestion. Project development as an economic and market opportunity.
				- Position anaerobic digestion through greater education of resource potential.
				- Quantify the market premium available for using biogas as a transportation fuel (bioCNG).
			5. Establish a public private partnership to demonstrate a replicable regional AD project with biogas utilization other than electricity generation.
				- Supported by an alternative vehicle strategy for bioCNG.
			6. Support applied research for biogas clean-up as a solution to improve the economic viability for on-farm biogas projects.
			7. Dedicate a pool of money for a study to determine how metro counties will meet recycling goals.
		2. **Success factors**
			1. Publically available information on types and amounts of potential organic feedstocks for AD processing.
			2. Decreased payback period for AD projects at food and agriculture operations.
			3. Reduced capital costs for AD systems.
		3. **Identified Champions/Key Participants** (by action #)
			1. Participants: Minnesota Department of Agriculture
			2. Champion: Wenck Associates
			3. Participants: Minnesota Department of Agriculture
			4. Participants: Minnesota Department of Agriculture
		4. **Metrics**
			1. MMbtus of biogas produced and converted for useful energy.
			2. Wet tons of organic material treated in AD (annually)
			3. Greenhouse gas emission reductions
			4. Economic development - private and public investment dollars for individual projects
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Biogas as a transportation fuel (bioCNG) would be a source for the alternative vehicle strategy (see transportation section)
				- Biogas as a primary mover for CHP projects.
				- A voluntary green pricing pilot for renewable natural gas by natural gas utilities could help scale-up anaerobic digestion projects (see green pricing strategy under Energy Supply and Grid Modernization)
			2. **Ongoing MN initiatives**
				- Assessment on biogas potential for Minnesota - quantify biogas potential from all available feedstocks (municipal and industrial wastewater, landfill, livestock, household and commercial organics etc.)
			3. **Other related resources**
				- CSEO examined establishing a [renewable thermal goal and a renewable thermal incentive fund](http://www.environmental-initiative.org/images/files/CSEO/RCII-5%20Thermal%20Renewable%20Incentives%20and%20Resources.pdf). Biogas would be an eligible source of renewable thermal energy.
				- DOE, USDA, EPA coordination on a [Biogas Opportunities Roadmap](http://www.energy.gov/eere/bioenergy/downloads/biogas-opportunities-roadmap-progress-report) and progress reports on identified implementation actions.
			4. **Funding sources identified**
				- Metropolitan Council, [Industrial Pretreatment Incentive Program](http://www.metrocouncil.org/Wastewater-Water/Funding-Finance/Finance-Pubs/Industrial-Pretreatment-Incentives.aspx)
				- MN Department of Agriculture, [Agricultural Growth, Research and Innovation (AGRI) Program](http://www.mda.state.mn.us/grants/agri.aspx)

* + - * + [Legislative Citizen Commission on Minnesota’s Resources](http://www.lccmr.leg.mn/)

* 1. **Promote industrial efficiency practices**

**Why is this strategy included:** In 2013, the Minnesota industrial sector consumed 636 trillion Btus of energy, the largest of any sector (residential, commercial, transportation) at approximately 34% of total consumption (EIA, 2013). Although strides have been made at some individual facilities or in specific manufacturing sectors to increase energy efficiency, there are additional opportunities for focused actions aimed at improving the energy productivity of industrial operations.

* + 1. **Specific actions for strategy implementation**
			1. Promote Department of Energy programs as a resource for industry to improve energy productivity. Programs include:
				- [Superior Energy Performance](http://www.energy.gov/eere/amo/superior-energy-performance) - a tool for companies to implement energy management systems with third party verified savings;
				- [Better Plants](http://energy.gov/eere/amo/better-plants) - partners join the program and commit to a 25% improvement in energy intensity over 10 years across all facilities; and
				- [Industrial Assessment Centers](http://energy.gov/eere/amo/industrial-assessment-centers-iacs) - engineering universities across the country that provide no cost assessments to small and medium sized manufacturers. MN does not currently have an IAC, but Iowa State serves manufacturers.
			2. Create peer-to-peer networks for different industry sectors to share best practices and information on energy management.
		2. **Success factors**
			1. Identify programs available for different industry sectors to implement new technology and practices to save energy.
			2. Make information resources readily available to connect industry with the technical experts, utility programs, available technology, and data.
		3. **Identified Champions/Key Participants** (by action #)
			1.
		4. **Metrics**
			1. Energy saved (kWh and dekatherms)
			2. Net cost savings
			3. Number of plants participating in Department of Energy’s Better Plants program
			4. Avoided CO2 emissions
		5. **Additional information**
			1. **Cross sector opportunities and synergies**
			2. **Ongoing MN initiatives**
			3. **Other related resources**
				- [MN Technical Assistance Partnership](http://www.mntap.umn.edu/index.htm) at the University of Minnesota works with MN businesses to develop and implement industry-specific solutions to prevent pollution, maximize efficient use of resources, and reduce energy use and costs.

* 1. **Create an Advanced Energy Cluster Organization**

**Why this strategy is included:** A cluster organization would coalesce Minnesota’s energy and business community around the state’s competitive strengths in the clean energy sector. A successful cluster organization would attract funding to the community (such as federal grants); coordinate research across the private, public and nonprofit sectors; and be prepared to take advantage of business opportunities as they arise, in order to develop a cluster of advanced energy businesses in Minnesota whose products are sold around the world.

* + 1. **Specific actions for strategy implementation**
			1. Convene an initial leadership team with the objectives of:
				- Determining Minnesota’s competitive strength in an advanced clean-tech industry
				- Interview local corporations: What is their vision and strategy for the clean energy space?
			2. Identify a few leading potential board members, ask for commitment on initial setup of organization and to help raise seed money
			3. Winning a grant or other initial funding source to advance this vision, and/or asking leadership team to identify initial funding sources (note Colorado established theirs with one full-time director and basic operating budget of about $100k to start).
			4. Building the basic elements of a [business/organizational plan](http:///h) to guide the org and its efforts, with essential staff (see example of [Colorado CleanTech Action Plan](http:///h)).
				- Identify a potential ED to hire
				- Identify initial collaborating organizations and companies and socialize the effort with them as initial potential “sponsors.”
				- Establish clear leadership consensus on cluster mission, goals and strategy
				- Clear competitive differentiator (clearly articulate what the cluster organization is and isn’t)
				- Identify where MN accelerates a current industry or fosters a new one
				- Engage with likely partners (state, universities, labs, businesses, economic development orgs, etc.)
				- Build upon core regional strengths
				- Measure success metrics annually
				- Identify and nurture ongoing funding partners
				- Define the decision-making process
		2. **Success factors**
			1. Involve the right stakeholders.
			2. Engage private sector leadership.
			3. Encourage public sector participation.
			4. Establish sustainable organizational business model:
				- 501c3, 501c6 (allows lobbying), or B Corp?
				- Grant, corporate, state balanced funding mix - with a voice at the table but not captive to any one agency or corporation
				- Revenue generating activities can include networking events, industry education, workforce development, new business funding competitions, award galas, etc.
				- CCIA model below: 1/3 of money comes from sponsors, another 1/3 from members, and another 1/3 from events/programs such as annual gala
			5. Consider role of education and workforce development.
			6. Establish clear cluster goals that capitalize on regional strengths, resources and existing ambition. Examples:
				- Food/agriculture/water process efficiency in MN
				- Biofuels/green chemistry
				- Building efficiency niches (e.g. Honeywell, controls, big data)
				- Sector-specific industry collaborations have been successful for CCIA
			7. SXSW Eco cleantech panel in Austin (2014) identified the following important considerations:
				- Understand the industries collaborating with including regional strengths
				- Building relationships between the public and private sectors
				- Understand the role of big data
				- Role of state policy in efforts
				- Be willing to embrace big bets
		3. **Identified Champions/Key Participants** (by action #)
			1. [2100 Advisors](http:///h) (Justin Kaster): Minnesota firm and local entrepreneur interested in seeing this developed in MN.
			2. Others?
		4. **Metrics**
			1. Clean Energy funding attracted/matched
			2. Clean energy projects created
			3. Number of industry partners
			4. Energy saved by projects created through the cluster organization
			5. GHG and criteria air pollutants reduced by projects created through the cluster organization
		5. **Additional information**
			1. **Cross-sector opportunities and synergies**
				- Food/agriculture/water process efficiency in MN
				- Biofuels/green chemistry
				- Building efficiency niches (e.g. Honeywell, controls, big data)
				- As an economic development opportunity, may align well with state, university or chamber of commerce economic development initiative
				- Organization may foster pilots and public/private partnership opportunities in any one sector or multiple sectors
			2. **Ongoing MN initiatives**
				- Clean Energy Economy Minnesota business group (McKnight Foundation/Gregg Mast)
			3. **Other related resources**
				- **Leading case studies:**

[NECEC](http:///h). The Northeast Clean Energy Council activities include networking, business support, policy leadership, events to support finance, etc.

Strategic Partner Network: working sessions to grow partnerships with startups and growth companies, develop regional markets in electricity system innovation, smart buildings and cities, and advanced materials and manufacturing.

Clean Tech Summit: targeted networking events for entrepreneurs, a business competition, and a startup showcase with awards ceremony celebrating the region’s top cleantech innovators.

[CCIA](http:///h). Colorado Cleantech Industries Association promotes CO clean-tech industry. Industry-led with industry-focus. Provide advocacy, policy leadership (state and federal), business development, education.

[Colorado Clean Tech Action Plan](http:///h). Hired Navigant Consulting to do this.

Convene industry for capacity building, education training, communications on behalf of industry

Research & disseminate reliable data about industry trends and data in CO

Provide a cluster “single point” of contact to negotiate and partner with government, economic development orgs, research institutions, labs, etc.

Unique: [Energy Fellows Institute](http:///h)

Annual clean-tech awards/gala.

[LACI](http:///h): Los Angeles Clean-Tech Incubator.

[NextEnergy](http:///h): 501(c)(3) goal of advancing energy and transportation investment and job creation in Michigan.

* + - 1. **Funding Opportunities Identified**
				* [SBA Cluster Initiative](http:///h). U.S. Small Business Administration is investing in regional clusters throughout the United States.
1. **Local Planning and Action**
	1. **Incorporate energy into local government policy, planning, and regulatory frameworks.**

**Why this strategy is included:** Local governments have the ability to shape any development within their boundaries – including the future energy system. They have a unique set of policy and regulatory tools and incentives through which they can and do influence development and encourage private sector action, and local government operations are themselves large consumers of energy. The explicit integration of energy and climate into policy and planning processes empowers local entities to take action on best practices as well as enables implementation of cross-sector opportunities by non-public entities.

* + 1. **Specific actions for strategy implementation**
			1. Collect and analyze baseline data on energy use and greenhouse gases on a community level.
				- This will help make the case for taking the other actions in this section, e.g. incorporating energy into comp. plans, or creating a community energy action plan
				- Includes showing how money can be saved through “green” practices
			2. Develop a framework for cities to use to incorporate energy, climate, and resilience into current round of Twin Cities Metro comprehensive plan updates.
				- The process should be transparent and truly engage the voices in the community that need to be heard, especially those that are traditionally underrepresented
				- The process should not be overwhelming for a city to take this on
				- Would help cities implement other strategies of this Action Plan
			3. Provide toolkits and models for comprehensive plans to local jurisdictions outside the Twin Cities Metro region.
			4. Engage and support tribal governments in identifying how various tools to address energy, climate, and resilience can be tailored to match their local authority and regulatory processes.
			5. Develop energy and climate goals and action plans at a community level
				- These are living documents
				- This means that it may need to be separate from comprehensive plans, especially for larger cities, as comp plans are legally binding documents
			6. Coordinate with state agencies, local governments, academia and other stakeholders to identify opportunities to integrate energy planning into planning for other community systems and infrastructure
				- For example: If a city is planning on redoing sewer infrastructure, could they install or upgrade district energy infrastructure at the same time, or install pipes that could carry fiber optic cable to handle the data needed for smarter energy systems?
				- For example: Could communities that demonstrate integrated energy planning be scored higher on state grant applications for water or other infrastructure?
			7. Provide state support for local planning
				- Data and analysis
				- Statewide local government energy challenge

Would include grant funding and/or technical support

Raise public consciousness and support, including by showing financial savings

Engage citizens to move local governments towards these actions

* + 1. **Success factors**
			1. Dedicated leadership is a community’s most important asset – time needs to be spent identifying and cultivating strong leaders.
			2. Leadership teams will be more effective if they are representative of their constituency (e.g., inclusive of the business community, neighborhood groups, traditionally underrepresented groups, and others in addition to city or NGO leadership).
			3. Increase community involvement through an environmental or energy commission or ad hoc citizen engagement.
			4. An initial leadership team can engage advisory councils in order to build more community ownership.
			5. A great process is more important than a great product and more likely to lead to impact.
				- Needs to be transparent and collaborative, and lead to a shared vision.
			6. At the end of a planning process, a community should have built local capability (e.g., knowledge, a committed leadership team) in addition to developing a plan.
			7. Outcomes are more likely to be reached if supported by staffed resources (city, a backbone organization, or local business).
			8. A community energy workshop can serve as a catalyst for publicly launching the community energy planning process.
			9. Start with an assessment of the current energy landscape and communicate it well; then consider a higher-level, what’s possible approach in defining the opportunity.
			10. Do more in-depth analysis as is appropriate and with the right partners (such as utilities).
			11. Strategies and tactics should be specific, including responsible stakeholders, enabling actions such as new legislation and policy, and clear initial steps that folks can take to get started.
			12. Seeking private sector partners or grant funding opportunities for demonstration cases or pilot programs is a good way to launch, refine, improve projects/initiatives.
		2. **Identified Champions/Key Participants** (by action #)
			1. Metropolitan Council, GreenStep Cities Partnership
				- City of Oakdale as a local best practice.
				- Local utilities as key participants
			2. Metropolitan Council, GreenStep Cities Partnership
				- Developing this is already in the Met Council’s 2016 work plan.
				- GreenStep Cities is working with the Met Council to connect their program with Thrive 2040 and the Met Council’s local planning handbook
			3. GreenStep CitiesPartnership
			4.
			5. GreenStep Cities Partnership, CEE
				- Utilities are key participants
				- CEE implements Xcel’s Partners in Energy program to help communities make and implement energy plans. Also helps the City of Minneapolis on energy data.
			6. Minnesota Environmental Quality Board
			7. - Department of Commerce, MPCA, Metropolitan Council
				- Department of Commerce
		3. **Metrics**
			1. Number of communities that have conducted/updated baseline energy analyses for their communities
			2. Number of communities that incorporate energy into community planning
			3. Number of communities that have adopted energy and climate goals or action plans
		4. **Additional information**
			1. **Cross sector opportunities and synergies**
				- Building and thermal energy efficiency and increased deployment of distributed energy resources
				- Benchmarking
				- Transportation and land use planning
				- Economic development
			2. **Ongoing MN initiatives**
				- GreenStep Cities Resilience Best Practice #29 (set of practices being added on energy infrastructure resilience, vulnerable population assessments)
				- Metropolitan region’s comprehensive plan updates are beginning now
			3. **Other related resources**
				- Metropolitan Council Local Planning Handbook
				- Grow Solar Local Government Toolkit
				- Xcel’s [Partners in Energy](http://www.xcelenergy.com/Community/Community_Projects/Partners_In_Energy_Community_Programs) program (2-year program to help city, county, nonprofit, etc develop energy strategies. Run by CEE)
				- Minnesota Climate Change Vulnerability Assessment (MDH)
				- [DOE Cities LEAP](http://energy.gov/eere/cities-leading-through-energy-analysis-and-planning) (in beta: offers standardized, localized energy data and analysis to help cities integrate strategic energy analysis into decision making)
				- Regional Indicators Initiative
				- Windlogics Wind Resource Maps
				- University of MN [Solar Suitability App](http://solar.maps.umn.edu/app/)
				- DOE [Guide to Community Energy Strategic Planning](http://energy.gov/eere/slsc/guide-community-energy-strategic-planning)
				- MN Department of Commerce – Technical assistance and financing
* [Guaranteed Energy Savings Program](https://mn.gov/commerce/industries/energy/technical-assistance/)
* [Local Energy Efficiency Program](https://mn.gov/commerce/industries/energy/technical-assistance/)
* [Energy Savings Partnership](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp)
* [Public Entity Energy Audit and Renewable Energy Feasibility Study Loan Program](https://mn.gov/commerce/industries/energy/financial-assistance/feasibility.jsp)
* [PACE](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp)
* [Rev It Up](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp) Loan Program
	1. **Increase local government action through voluntary best practices**
		1. **Specific actions for strategy implementation**
			1. Adopt GreenStep Cities best practices.
			2. Explicitly address renewable energy development in communities’ development regulations.
			3. Create a predictable, transparent, and consistent permitting process for distributed generation.
			4. Spread the word about financing and programs that exist, focusing on people and businesses for whom it’s difficult to access these currently.
				+ Particular focus on mid-size businesses -- relatively large users, so there’s more bang for the buck, but they’re not generally very engaged currently
				+ Need to aggregate resources and make it easy for them
			5. Engage tribal governments to identify opportunities to increase energy efficiency and renewable energy development within their jurisdictions.
		2. **Success factors**
			1. Provide local government staff with the appropriate education and resources to lead on action.
			2. A local energy commission is the champions making sure that actions are being taken and improvements seen
		3. **Identified Champions/Key Participants** (by action #)
			1. GreenStep Cities Partnership
			2. Great Plains Institute
				+ Grow Solar Toolkit
				+ GPI currently rewriting model wind ordinances for Dept. of Commerce
			3. Great Plains Institute, Metropolitan Council
				+ Grow Solar Toolkit includes permitting.
				+ Metropolitan Council can share best practices through their handbook, trainings, and workshops. They’re currently scoping out how they’ll do that and how broad the scope is. They won’t develop ordinances, but a vehicle for sharing information.
			4. Clean Energy Resource Teams
		4. **Metrics**
			1. Number of cities taking actions through the GreenStep Cities program, GreenStep star level of cities in the program, Geographical diversity of cities in GreenStep Cities program
			2. Energy use/energy intensity reduced
			3. Reduced in greenhouse gas and criteria air pollutant emissions
			4. Reduced energy bills for residents, businesses, local government operations; reduced percent of households living in energy poverty
		5. **Additional information**
			1. **Cross-sector opportunities and synergies**
				+ B3 benchmarking and building efficiency
				+ Measuring return on investment makes the case for action
			2. **Ongoing MN initiatives**
				+ ENERGY STAR® Challenge
				+ Regional Indicators Initiative
				+ Minnesota Clean Energy and Economic Opportunities (CSEO) initiative
				+ Utility community solar programs
				+ Clean Energy Resource Teams (CERTs)
				+ Fresh Energy’s Solar for All
			3. **Other related resources**
				+ GreenStep Cities and related technical assistance
				+ Minnesota state agencies provide data, technical assistance and funding (MPCA, Commerce, DNR)
				+ Metropolitan Council Local Planning Handbook
				+ Grow Solar Toolkit
				+ Dept. of Labor and Industry has released Solar PV resources: <http://www.dli.mn.gov/CCLD/ElectricalSolar.asp>
				+ [Optony Solar Road Maps](http://www.solarroadmap.com/about/about-optony/)
				+ Free technical assistance through Grow Solar
				+ For Action 4, aggregating programs that exist:

DSIRE

A MN-specific site is being developed now

Commerce website will have state-based and government-funded programs, broken by sector (e.g. industrial, residential)

* + - * + MN Department of Commerce – Technical assistance, financing, and incentives
* [Residential Energy Resources](https://mn.gov/commerce/consumers/your-home/save-energy-money/)
* Commercial and local gov’t resources:
* [Guaranteed Energy Savings Program](https://mn.gov/commerce/industries/energy/technical-assistance/)
* [Local Energy Efficiency Program](https://mn.gov/commerce/industries/energy/technical-assistance/)
* [Energy Savings Partnership](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp)
* [Public Entity Energy Audit and Renewable Energy Feasibility Study Loan Program](https://mn.gov/commerce/industries/energy/financial-assistance/feasibility.jsp)
* [PACE](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp)
* [Rev It Up](https://mn.gov/commerce/industries/energy/financial-assistance/loans-and-special-assessment-programs.jsp) Loan Program

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1. **Cross-sector opportunities and synergies**
2. **Taking a Step Back: What’s Possible?**
3. **A Few Innovative Ideas for Further Consideration**
	1. Transportation: Autonomous vehicles and energy use
	2. Transportation: Updating Pricing