FIGHTING CLIMATE CHANGE AS A 2000-WATT SOCIETY.

ONE TARGET. OUR COMMUNITY. STEPPING UP NOW.

Minneapolis, Minnesota | Carbon Framework Plan, 2018

ONE TARGET FOR ALL.

The 2000-Watt Society fights climate change by focusing on the issue of energy waste and inefficient energy use. That focus has helped hundreds of cities around the world use the 2000-Watt Society model to substantially lower their carbon footprint. Here's what they targeted with their carbon-reduction, action plans:

THE RELATIONSHIP BETWEEN CO_2 AND WATTS.

Since the burning of fossil fuels is a major cause of climate change, it's best to measure and benchmark CO_2 based on non-renewable source energy. That's why the 2000-Watt Society uses "watts" as the measuring unit. Given this perspective, one ton of CO_2 per person per year equals a demand of about 500 watts of non-renewable source energy.

THE 2000-WATT SOCIETY VISION.

While the ultimate target is one ton of CO_2 per person per year, or about 500 watts of non-renewable source energy, the vision of the 2000-Watt Society is to reduce energy demand for global sustainable development and provide sufficient energy for all. To achieve that goal, the aim is to lower yearly global source energy demand to 2000 watts per person with 75% renewable-energy consumption. At this level and type of energy use, greenhouse gas emissions will be limited to one ton of CO_2 per person per year. Limiting non-renewable energy consumption at this level also maintains global warming at the levels agreed to in the 2016 Paris Climate Accord.

To put those goals in perspective, Americans on average currently use 12,000 watts per person and 20 tons of CO_2 per person each year.

HUMAN ENVIRONMENTAL IMPACT.

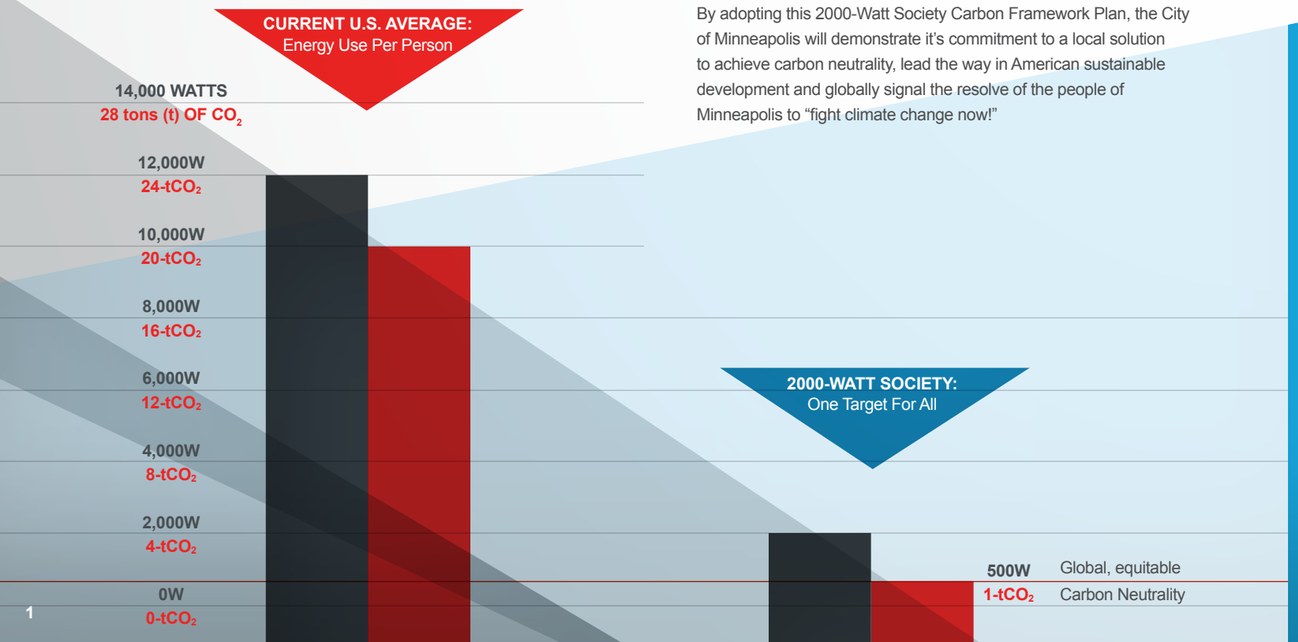
We're living in an innovative and modern world with seemingly unlimited technical possibilities. On the pathway of social and economic development, however, we've ignored the world's capacity to serve our needs and compensate for our impacts. Deforestation, intensive agricultural and non-renewable fossil energy consumption has led to environmental destruction and global warming. Higher frequencies of extreme-weather events has resulted in lives lost, large-scale health crises, ongoing poverty in undeveloped countries, risk of mass migration, massive economic losses and many other critical issues.

No one country, city, or person alone can solve these global environmental problems and the inequities of resource distribution in a globalized economy. Only by working together through a global sustainable development strategy based on equality and solidarity will we ensure the future well being for humanity and for the environment.

FACING GLOBAL CHALLENGES WITH LOCALLY IMPLEMENTED SOLUTIONS.

Prosperous, developed countries such as the U.S. can take the lead in sustainable development. Such a transformation requires step-by-step action at a local level to provide choices and alter behaviors aimed at efficiency, sufficiency, and renewable energy sources. These changes can be implemented at any time with the shared global climate-neutrality target of 1 ton of CO_2 per person per year or 500 watts of non-renewable, source-energy per person.

By adopting this 2000-Watt Society Carbon Framework Plan, the City of Minneapolis will demonstrate it's commitment to a local solution to achieve carbon neutrality, lead the way in American sustainable development and globally signal the resolve of the people of Minneapolis to "fight climate change now!"



ONE TARGET FOR ALL.

ONE CARBON-NEUTRALITY TARGET FOR ALL:

1-ton CO_2 per person per year or 500 watts of non-renewable source energy

SUSTAINABLE ENERGY-FOOTPRINT TARGET FOR ALL:

2000 watts of source energy = 500 watts of non-renewable source energy + 1500 watts of renewable source energy

ONE STRATEGIC TARGET FOR ALL:

Efficiency, Sufficiency, Renewable Energy

EFFICIENCY: THERE ARE NO ENERGY RESOURCES TO WASTE.

When we have any need that requires energy, the question to ask ourselves is: "What is the most energy-efficient way to meet my need?" Simple examples include:

- When we need light, change from incandescent lighting technology (60-watt light bulb) to LED lighting technology (10-watt light bulb)
- When we need warmth and comfort in January in the upper Midwest, change from a jacket to a super-insulated parka with a hand-warmer

It's this personal mind shift, getting into the habit of thinking about our energy-consumption needs in new ways, that helps our community make big strides toward reducing its collective carbon footprint.

SUFFICIENCY: THE RIGHT AMOUNT OF ENERGY FOR EACH OF US.

In 1985, Brazilian scientist José Goldenberg posed the question: "How much energy is necessary for a good life?" Goldenberg determined that below a threshold of 1000 watts per person, people are indeed better off if they can increase their energy consumption, however, consumption above 1000 watts per person does not improve quality of life. Therefore, the core concept of the 2000-Watt Society is sufficient energy consumption because consuming more would be undesirable, even if the energy could be provided in a completely "clean" way. This is the concept of sufficiency, also balancing higher-energy demand for heating in cold climates with the comparatively lower-energy demands in warm climate zones of developing countries to establish an equitable single target for all.

RENEWABLE ENERGY: ENERGY SOURCES THAT DO NOT GENERATE CARBON.

When an energy source is "renewable," it does not mean it should be used in excess. That's why use of renewable forms of energy is the last of the three steps, activated only after efficiency and sufficiency efforts are made. The focus then becomes achieving a primary energy-use balance of 1,500 watts of renewable energy and 500 watts of non-renewable energy on the path toward becoming an actual 2000-Watt Society.

IT'S A LIFESTYLE: DOING WELL. DOING MORE.

Most of us do our best to reduce energy use. Making positive energy choices and having a "personal climate-action plan" is good. And remember our goals to achieve Paris Agreement levels by 2050:

DEMOCRACY WILL DRIVE OUR SUCCESS.

The key to a successful 2000-Watt Society lies in the core principle of democracy, that is, everyone having a right to "life, liberty and the pursuit of happiness" while also fulfilling the responsibilities to such privileges. When it comes to our climate issue, each of us has a responsibility to build a new "privilege" to understand how one's energy-use choices impact global climate change and future generations. On the platform of global equality and solidarity, the 2000-Watt Society offers the opportunity to unite all of us to fight and win the challenge of climate change: we have a problem, we face it by understanding it, agreeing on a common goal, making a plan, acting on it and staying accountable to it.

A PROBLEM TACKLED TOGETHER IS A PROBLEM ENDED SOONER.

This section of the Minneapolis Carbon Framework Plan outlines what individuals can do to reduce energy use and our community carbon footprint. One of the most difficult questions each of us faces is the question of Sufficiency: "What is the adequate amount of something?" Consumption drives daily choices which should be framed by answering this question as we choose from all goods and services that make life easier and more comfortable: "What are the direct and indirect impacts of my choices to energy use and climate change?"

For example, consider that the average size of a home in the U.S. was 600-800 square feet in the early 20th century. In the 1970s, it grew to 1500 square feet and today, it is over 2000 square feet while the number of people living in a household has decreased. Yes, energy efficiency has increased substantially, but some of those increases have been made void by the increase demand on home size.

Also, the total energy use per person is substantially higher than the same energy as measured on the community level because the "system boundary" is different. For more information on this topic, read the section on page 7 to learn more.

The following five lifestyle considerations illustrate how each individual can reduce our current average U.S. energy use of 14,200 watts and carbon footprint of 22.4 tons of carbon per person per year:

1. HOMES

Choosing where we live and how we live significantly impacts energy use. Often housing choices are based on school availability, neighborhood quality and work location.

When you rent or own consider the following when choosing housing:

- What housing type should I invest in; single family, townhouse or apartment?
- How large should it be?
- What is the energy rating? (All buildings should have such a label: ask for it.)
- Is it a Passive House, a carbon-neutral house?
- What infrastructure is it connected to: public utilities, cooperatives or does it have its own?
- What is the energy rating of the appliances and lights?

When operating your home:

- Set the thermostat with energy conservation in mind: a couple degrees lower in the winter and higher in the summer make a difference.
- Buy and use state-of-the-art, energy-efficient electrical devices: household equipment, electronics, lights, etc.
- Turn electrical devices off when not needed.
- When you remodel your home, meet or exceed energy standards.
- Buy renewable energy from your provider or invest in your own, but only after Efficiency and Sufficiency measures are taken.

When at work, try to influence your employers by discussing:

- Use of energy within the workplace: turning electrical devices off when not in use.
- The purchase energy-efficient equipment.
- Improvement of the design and operation of manufacturing or service processes.
- Improvement of the design and operation of buildings.
- The commitment to research and use other strategic, tactical decision-making or implementation of energy efficiency and carbon impacting measures.

2. FOOD AND GOODS

Near-unlimited access to food and consumer goods today allows us to enjoy our favorites at any time of the year. However, the extensive selections and convenience come at a high cost of energy and carbon due to the refrigeration, air freight, greenhouse gas emissions, etc. For example, one pound of beef contains as much energy as driving 80 miles. Animal-derived foods and seafood require significant energy to produce and result in high-carbon output due to the machinery, sophisticated processing facilities, industrially-produced feed and refrigerated transportation required to bring these foods to our tables.

As you shop, consider how to reduce carbon impacts by:

- Buying local and in season.
- Buying less / appropriate animal-based foods; meats, eggs, etc.
- Wasting less food.
- Reducing need for packaging.

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3. TRANSPORTATION

Our ability to move from any place to another at any time may be thought of as personal freedom. However, this instantaneous level of mobility comes at a price and often requires significant investments in a car, a place to park and ongoing maintenance. We live in one place only to have to drive to schools, work and shopping. When we organize our lives around this lifestyle the question becomes, "At what price?" When we compare Minneapolis to the "most livable" cities around the world (Vancouver, Munich and Zurich, for example) it is notable that these cities have 50% lower levels of individual car ownership and an array of mobility options including significant modes of public transportation, car-sharing programs and biking and walking trail networks that together optimize mobility within a community.

Consider how to reduce carbon impacts in your mobility choices by:

- Making informed energy choices as to where you live, work, shop and play.
- Are there low energy mobility alternatives in place?
- Can you walk, ride a bike or use public transportation?
- Is there an option to take the train in lieu of car or air travel? A simple rule of thumb is that traveling by train is the least energy-intensive means to travel: cars require two times the amount of energy and airplanes require three times the amount of energy to travel the same distance.
- Think about offsetting your carbon output through various carbon offset programs such as tree-planting initiatives.

4. GOODS, LEISURE AND HEALTH

There is an old adage often recited by people who lived through the Great Depression in the 1920s and 1930s: "Use it up, wear it out, make it do or do without." No doubt this was a reflection of the economic crisis. And it still stands as wise advice to all of us as we consider the negative impacts of global warming.

To shift the focus from consumption that merely seeks to get the greatest use out of everything, consider:

- Buying durable goods that last longer.
- Look for goods that are more easily repaired.
- Borrow, share or rent.
- Re-cycle, re-use.
- Think about the cost of operation and maintenance when purchasing.
- Think about local choices, such as how and where you travel for leisure, vacations you take and how often you travel locally to theater events, sporting events, etc.

The need for collective action beyond positive, personal lifestyle choices.

A healthy lifestyle is essential and enjoyable, of course. For example, in a modern society such as the U.S., studies have shown that healthcare costs of $2000 to $3000 a year reflect about 1000 watts of source-energy per person. So yes, inform yourself about healthy living and lifestyles. And yes, read on to learn how the collective, scalable action of a 2000-Watt Society scales and accelerates the use of less energy and reduces our carbon footprint. Examples include choices we make in our community's built environment and infrastructure. Joining together is the way to reach our global critical goals.

A PROVEN PROCESS TO GET US THERE.

Reducing our carbon footprint means increasing our quality of life.

While Minneapolis can become the first 2000-Watt Society in the U.S., the concept is not new. In fact, it's a proven process successfully used in more than 500 cities throughout the world including cities such as Zurich, Munich and Vancouver… each on Mercer's global list of 2017 "Quality of Living" cities.

LOCAL ACTION LEVERAGING A PROVEN, GLOBAL FRAMEWORK.

Climate change is expected to have significant economic impacts and is generating the short-term need for sizeable investments in infrastructure, mitigation and preparedness projects. At the same time, the prioritization of such large investment needs is very complex and fraught with a number of implementation challenges. In addition, recent financial crises and political uncertainty has left federal, state and particularly municipal governments in fiscal limbo. They have very little room to tackle the necessary investments to achieve de-carbonization in the real estate, transportation and public infrastructure sectors.

WHY SHOULD WE USE ENERGY AND RESOURCES EFFICIENTLY?

A clear plan is needed so that a focused investment can be made that will dramatically lower local and personal dependency on energy, leading to improved local resiliency.

When local communities leverage the proven, measurable and actionable 2000-Watt Society model to develop and implement a customized Carbon Framework Plan, it results in strengthened competitiveness and provides opportunities for local job growth through innovation and local investment.

At a global level, such communities become part of an international network for holistic thinking and action to achieve a livable and enjoyable carbon-neutral future for all.

ECOLOGICAL SUSTAINABILITY	2000 WATT SOCIETY ECONOMIC SUSTAINABILITY	SOCIAL SUSTAINABILITY
• Halt global warming at 2 degree Kelvin (3.6ºF) • Conserve Resources	PROVIDE COST SAVINGS ENHANCE COMPETITIVENESS THROUGH COST SAVINGS PROVIDE OPPORTUNITIES THROUGH INNOVATION	• Secure level of comfort and standard of living • Ensure access to resources • Support development

Sources: Bieri, Kumminoff and Pope (2012) and Glaeser and Kahn (2010)

ROI: BENEFITS ABOUND.

Return on Independence: the greatest value of energy self-sufficiency.

Continued global population growth makes reductions in greenhouse gas emissions an absolute necessity requiring radical reductions of per capita energy. However, the 2000-Watt Society, One-Target-For-All of 2000 watts per person and greenhouse gas emissions limited to 1 ton of CO_2 per person per year will deliver:

Freedom
Facing the future by taking a positive stance to reduce dependency on non-renewable energy sources while simultaneously enriching local economies.

Resiliency
Overcoming the challenge of climate change by reducing the need for energy resource to develop the skills and innovation needed for new and better economic, social and environmental systems that will be the foundation for more powerful and enriched local communities.

Social Justice
Reducing disparities between the "have and have-nots" on the local level or between the industrial and developing countries, allowing poorer countries to attain higher living standards by providing the energy they need at the same time off-setting these increases with reductions in energy use of industrial nations.

Money in Our Pockets
Enjoying big dividends in one's community based on today's investment in a carbon-neutral future. The profits and benefits from the reduction of energy resources flow to local residents, meeting and often exceeding their current standard of living.

The 2000-Watt-Society is a comprehensive global sustainable development strategy encompassing technology and personal lifestyle choices of how we live, play, work, eat, move about and the goods we consume. Several studies have demonstrated that reducing energy demand is the most cost-effective first step we can take. Once efficiency measures are implemented, the next step is to substitute carbon-based energy sources with renewable energy sources.

WHAT GETS MEASURED GETS DONE.

Our ability to take effective climate action depends on defining the current status of energy use and its related greenhouse gas emissions.

Answering the questions of “Where are we now?” and the ultimate target of climate neutrality, “Where do we need to be?” relies on parsing the available data and making it understood by all: key objectives of this Carbon Framework Plan. Breaking it all down to the actual energy user allows us to manage change and create unified Action Plans. First, we need to establish clear “system boundaries” to account for energy use and the related greenhouse gas (GHG) emissions.

SYSTEM BOUNDARY AND 2000-WATT SOCIETY MEASUREMENT APPROACH

Since GHG emissions are mostly measured in the atmosphere, allocation to their source of emitter is typically measured, monitored and calculated from the source energy it was emitted such as natural gas (heating, power production, etc.), coal (power production), Photovoltaics + Wind (power production) and gasoline + diesel (transportation) to name a few.

System boundaries are defined geographic areas at world, country, state, city and individual levels. Only the energy used within the respective system boundary is included in the energy balance and GHG emissions, which are the parameters for this Carbon Framework Plan.

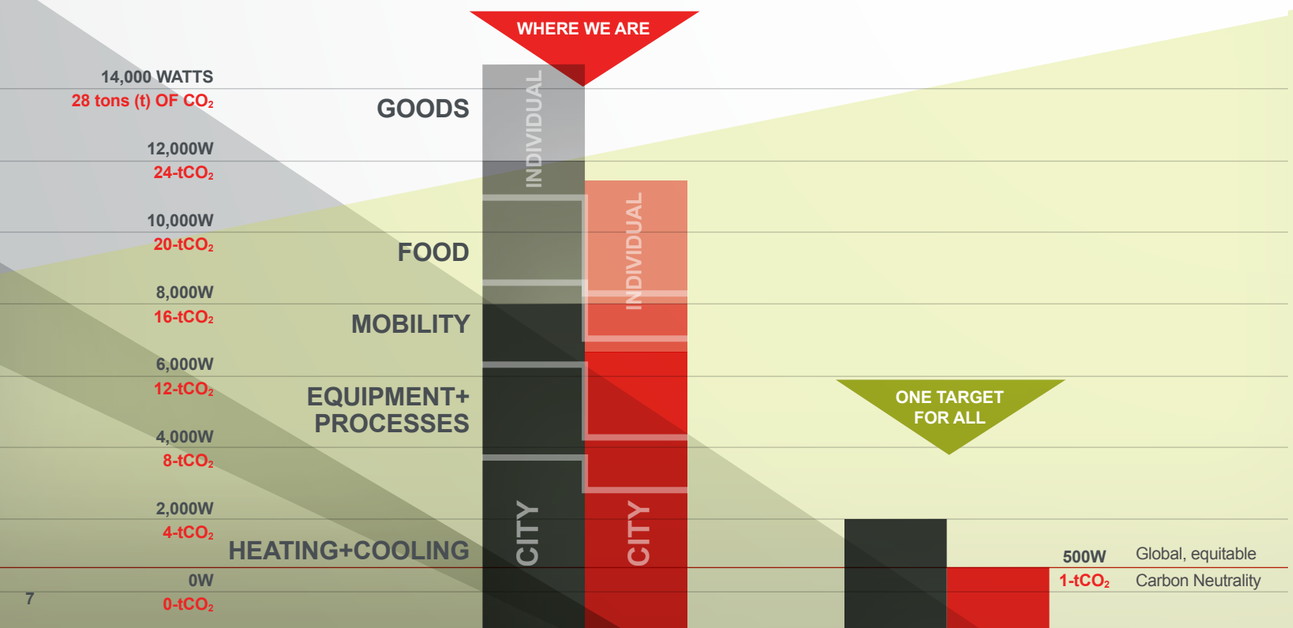
This means we have two sets of numbers for Minneapolis to answer the question “Where are we now?”:

1) Individual Data: Here the complete energy / carbon footprint comes together. In this Carbon Framework Plan, it is based on different lifestyle inputs fed into the EcoSpeed personal calculator and is estimated to be 14,200 watts per person and 22.4 tons of CO_2 per person per year.
2) Minneapolis Data: This is only the energy used in the city of Minneapolis and is based on the detailed Minneapolis GHG Emissions Inventory that was gathered by the City of Minneapolis 2012 Climate Action Plan (also see sidebar). The result is 7,900 watts per person and 12.4 tons of CO_2 per person per year.

For example referring to this diagram as reference, the Minneapolis Data includes the natural gas we use to heat and cool our homes, the electricity used to move light-rail transportation, the gas we use in our cars, etc. But it does not include things such as air travel, food / clothing / electronic use and all other goods and services that are not manufactured in Minneapolis. This means they are not the same, an important distinction to keep in mind and a topic to discuss openly to fully understand. Clarity with this structure provides the opportunity for transparency, target precision, allocation of responsibility and credit of implementation.

Minneapolis on the move: Current status and environmental efforts.

Minneapolis has already put effort into reducing human environmental impacts, beginning with the definition of profound GHG-reduction targets by the Minneapolis-Saint-Paul Urban CO_2 Plan adopted in 1993. Currently, Minneapolis efforts have resulted in a reduction of 10-15% on the path to a goal of 80% reduction by 2050. Based on the current status, this would be a reduction to about 3-4 tons of CO_2 per person per year. This Carbon Framework Plan is intended to accelerate Minneapolis’ progress and align it with a true equitable global goal, thus opening the dialog to optimize the City’s current Action Plan.



Minneapolis Energy and Calculation Data

This Minneapolis Carbon Framework Plan is based on official data provided by state governmental agencies, international and national standards and scientific assumptions based on empirical values. Some may argue that these baselines have a political slant and therefore can be challenged, but that is not the case for this Carbon Framework Plan. It objectively seeks to demonstrate the magnitude of energy-resource consumption in Minneapolis, thus the data measured and collected for that purpose is sound.

Energy Data

The four major current energy sources in Minneapolis are electricity, natural gas, gasoline and diesel. Minor energy sources include liquid propane (LP) and biomass. Minneapolis the data of 2010 was used:

- Electrical grid: 4,202,230,000 Kilowatt hours (kWh)
- Natural gas grid: 7,399,164,000 kWh
- Gasoline: 107,800,000 gallons (cars: 64,800,000/ light trucks: 43,000,000)
- Diesel: 25,000,000 gallons (cars: 320,000/ light trucks: 1,730,000/ heavy duty trucks: 22,950,000)

Electrical Data

In the upper Midwest of Minneapolis the power grid is based on Xcel Energy (2017) information and are listed as: nuclear (30%), coal (29%), natural gas (16%), wind (15%), hydro (7%), biomass (3%), and solar (<1%) (Xcel Energy 2017).

Transportation Data

The gasoline and diesel consumption is based on the “2012 Minneapolis GHG Emissions Inventory.”

Minneapolis Population Data

- The population of Minneapolis, based on the U.S. Census Bureau as of 2010, is 382,578
- The estimate for the population of Minneapolis by 2050 is based on forecast by the Metropolitan Council and is 479,000

Site-to-Source Energy Factor Data

The reported site energy values were transformed to source energy by utilizing the average source-site ratios for the electricity of a factor of 3.14 and natural gas of a factor of 1.05 based on Energy Star 2013 data.

Carbon Emissions Data

Carbon emissions ($CO_{2\ equ.}$) are calculated by multiplying the energy consumption with the CO_2 emission factors of the different energy sources based on EPA Emission Factors for GHG Inventories 2015:

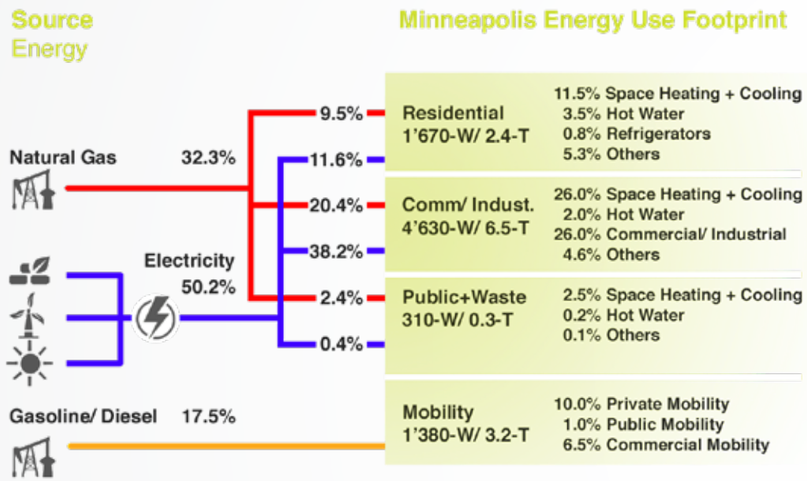
- Coal (Mixed; Electric Power Sector): 95,52 kg CO_2 per mmBtu
- Natural gas: 53,06 kg CO_2 per one million British Thermal Units (mmBtu)
- Biomass: 52,07 kg CO_2 per mmBtu
- Nuclear, wind hydro and solar energy, a CO_2 emission factor of zero is assumed, as grey energy is not considered in the calculations
- Unleaded gasoline: 8.78 kg CO_2/gallon
- Diesel fuel: 10.21 kg CO_2/gallon

BASELINE:
MINNEAPOLIS, MN, USA.

Where are we in Minneapolis?

The total source energy demand of the City of Minneapolis can be allocated to the private sector, industry & service sector, public sector and the transport sector.

This graphic provides a snapshot of that demand. Detailed explanations of the data follow below.



RESIDENTIAL SECTOR

The private sector is responsible for 21.1% of the total city energy demand or 1,670 watts per person per year (W/P) (9.5% natural gas, 11.6% electricity), from which the majority is used for space heating and cooling with 910-W/P (11.5%), hot water 280-WO (3.5%), refrigerator 60-W/P (0.8%) and other uses/ plug loads of 420-W/P (5.3%). As such, the private sector accounts for 19.4% of greenhouse gas emissions of the City of Minneapolis corresponding to 2.4 tons of CO_2-eq./P.

COMMERCIAL + INDUSTRIAL SECTOR

The industry and service sector clearly holds the highest energy consumption with 58.6% of the total city energy demand or 4,630 W/P (20.4% natural gas, 38.2% electricity) from which the majority is used for space heating and cooling with 2,060 W/P (26.0%), followed by commercial and industrial processes with 2,060 W/P (26.0%). Other uses in this sector, such as lighting and plug loads account for 360 W/P (4.6%) and warm water generation accounts for 150 W/P (2.0%) As such, the industry and service sector accounts for 52.4% greenhouse gas emissions, accounting for 45% of the total greenhouse gas emissions or 6.5 tons of the CO_2-eq./P of the City of Minneapolis.

PUBLIC SECTOR

The public sector is responsible for 2.8% of the total city energy demand or 220 W/P (2.4% natural gas, less then 0.4% electricity) corresponding 2.5% are almost exclusively attributed to space heating and cooling with hot water, plug loads and lighting account for 0.3%. As such, the public sector contributes to 2.4%% of total greenhouse gas emissions of the City of Minneapolis, corresponding to 0.3 tons CO_2-eq./P. Emissions resulting from waste treatment are also incorporated in the greenhouse gas emission calculations of this sector.

TRANSPORT SECTOR

The transport sector responsible for 17.5% of the total energy demand or 1,390 W/P from which private transportation (mostly cars and small trucks) contribute 10% or 800 W/P (1.8 tons CO_2-eq.), the industry and service sector (mostly heavy trucks) contribute 6.5% or 520 W/P (1.2 tons CO_2-eq.) and public transportation for 1% of the total energy demand or 80 W/P (0.2 tons CO_2-eq.) As such, the transportation sector contributes to 25.8% of total greenhouse gas emissions of the City of Minneapolis, corresponding to 3.2 tons CO_2-eq./P.

GRID ENERGY DEMAND

In 2010, the per capita source grid energy demand for the City of Minneapolis accounted for 6,530 W/P. This corresponds to greenhouse gas emissions of 9.2 tons CO_2-eq./P. 84% (5'510 W/P) of this electrical energy comes from fossil and nuclear energy sources, only 16% (1,020 W/P) of the energy demand is delivered from renewable energies. Natural gas represents the highest part of the grid energy demand with about 49% and 3,190 W/P, this is followed by nuclear energy (1,180 W/P) and coal (1,140 W/P), both representing 10% of the total grid energy consumption. The renewable energies wind and hydro power account for 9% (590 W/P) and 4% (280 W/P), respectively. Biomass (120 W/P) and solar energy (40 W/P) both hold about 1% or less of the grid energy demand.

GREY ENERGY

Grey energy is the energy hidden in a product, for example, the amount of energy required to extract that product from nature and to cultivate, manufacture, package, transport and finally to dispose it. Grey energy therefore incorporates the energy of imported goods and services. According to assumptions in the City of Basel, Switzerland, a net-import city, the grey energy amounts to almost the same amount as the source-energy demand (Department for Environment and Energy, 2016). If we then include an assumed grey energy share of 80% for Minneapolis (net-import of about $22 billion dollars per year; Sources: United States Census Bureau 2016, Minnesota employment and economic development 2016), the city would then consume about 14,200 watts per person (instead of about 7,900 watts per person) and emit approximately 22.4 tons CO_2-eq. (instead of 12.4 tons CO_2-eq.).

PROPOSALS FOR PROSPERITY: A CLEAR PATH TO 2050.

MINNEAPOLIS OPTIONS FOR PURSUING CARBON NEUTRALITY?

Agreeing on the global, equitable goal of 1 ton of CO_2 per person per year and 500 watts per person per year is a given for non-renewable source energy. Next there is only the choice of what the Minneapolis energy footprint will be and how it will be supplied by renewable, clean source energy = 1500 watts per person per year. (The target set by the Minneapolis WorldHolders is 2000 watts per capita of source-energy demand.)

How does that specifically break down for Minneapolis? Let's look at the data.

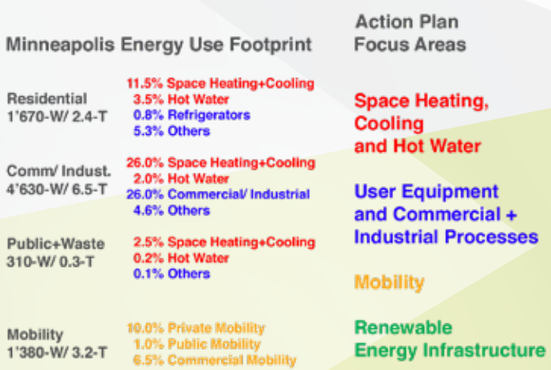
With the ultimate goal of leading the City of Minneapolis to become the first 2000-Watt Society in the United States and thereby setting a milestone in American climate-change history, the following requirements need to be achieved by 2050:

FOUR WAYS TO SCALE CARBON REDUCTION.

Individual actions are essential. And we should all continue to do our personal parts in the fight against climate change. When individual measures are then combined with community-level measures, real impacts are made to reduce our collective carbon footprint. Modeled in Minneapolis, this approach can be replicated in other American cities and around the world.

Based on the current energy and carbon footprint baselines established in previous sections, this Carbon Framework Plan defines the areas we should target in the Minneapolis Carbon Action Plan. Each can become specific action areas to be developed based on this Carbon Framework Plan:

1) Building Heating, Cooling and Hot Water
2) User Equipment and Commercial + Industrial Processes
3) Transportation
4) Renewable Energy Infrastructure



1) BUILDING HEATING + COOLING AND HOT WATER

Heating and cooling of buildings combined with hot-water energy demand in homes (residential buildings), offices/ factories (commercial and industrial buildings) and schools, churches, libraries (public buildings) accounts for approximately 45% of Minneapolis' energy consumption and almost for all the natural gas use or 3,610 watts per person or 5.1 tons of CO_2 per year. Such significant use makes energy efficiency and energy sufficiency in buildings the primary focus of this Carbon Framework Plan.

Since this is such a high percentage of energy use in Minneapolis, innovative options are proposed based on best-practice building models from around the world.

Efficiency Actions

Buildings constructed in the past 12 years to the German Passive-House standard – for example, "das BioHaus" was the first certified Passive House built in the U.S. in 2006 near Bemidji, MN - have proven that heating energy-efficiency in new buildings and even in refurbished buildings can be reduced by up to 90% while improving comfort. They also deliver remarkable resiliency, for example during a frigid mid-winter vortex, the interior temperature of a Passive-House under construction without heating did not drop below 50°F. Passive-House design and construction techniques provide a viable solution to efficiency and sufficiency in buildings. Example Passive-House design strategies include:

- Super-insulated thermal bridge free envelope
- Installing the appropriate heat-recovery ventilation to provide fresh air without wasting energy
- Installing a renewable energy-based heating and cooling system

Proposed city-wide action:

- Use currently planned buildings as pilot projects (especially for typical structures such as housing and office buildings) to establish a clear understanding for the current market, code, financial and other challenges as baselines for replicable action plans.
- Set the appropriate policies to encourage replicable action plans.
- Explore and establish funding mechanisms.
- Continuously increase refurbishment-rate from about 1% today to 4.5% in 2050, together with increasing the change of heating and cooling efficiency from 12% to 90%.

Experience from around the world and local multi-family, housing-pilot work has demonstrated that long-term, lifecycle-ownership costs are less for these super-efficient buildings compared to current-code based buildings. Given that initial investment costs are higher, a gap-funding need currently exists.

Sufficiency Actions

City planning and design for new construction or refurbishment is the time to ask key questions including:

- What is the appropriate form and size of housing?
- What is the right density?
- What uses and function should or should not be intermixed (living, working, manufacturing, leisure, etc.)?
- What infrastructure in what form is required in the future (energy, water, sewer, etc.)?

2) USER EQUIPMENT AND COMMERCIAL + INDUSTRIAL PROCESSES

The second-largest category of energy use relates to our personal, day-to-day activities and the tools we use to conduct them. This includes everything that uses energy in our homes such as kitchen appliances, lighting, laptops, etc. to everything that uses power outside our homes from lighting, computers and printers to the heavy industrial tools or large imaging machines at hospitals, for example. Technology innovation and investment in state-of-the-art-technology are key elements of this Carbon Framework Plan. It should be: equipment and commercial manufacturing energy use in Minneapolis account for 2,900 watts or 4.1 tons of carbon per year.

EFFICIENCY ACTIONS

Private households.

Household appliances and consumer electronics continue to deliver energy efficiency improvements and controls. Choosing efficient, state-of-the-art devices, using appropriate devices, using devices only if necessary, using manual or automated controls to turn appliances off when not in use, all are sound best practices to reduce household energy use.

Public-sector neighborhoods and city-wide opportunities.

Public sector organizations serve a lighthouse function by demonstrating to their communities their commitment and feasibility of purchasing efficient, state-of-the-art devices and using them appropriately through efficient means of control. Minneapolis neighborhoods feature many of these organizations. We should definitely stay in conversation about encouraging even more such organizations do the same.

Commercial and industrial.

Commercial and industrial equipment have improved when it comes to energy efficiency, automation and control. Businesses should also choose efficient, state-of-the-art devices, use appropriate devices, use devices only if necessary with manual or automated controls to turn appliances off when not in use to reduce energy use. These are good examples of such efforts going straight to the bottom line of each business. It also leads to local, regional and global differentiation and increased competitiveness when more businesses get in on the act.

3) MOBILITY

Transportation or mobility is the third-largest energy-use category in Minneapolis. The key driver of the transformation to a 2000-Watt Society will not be in less personal freedom to mobility, but rather in the form it takes. Here the biggest challenge is the perception that one's quality of life will be changed. Let's compare two cities listed on Mercer's 2017 List of Most Livable Cities, Zurich, Switzerland and Munich, Germany. (Both are 2000-Watt Society cities currently tracking at half of Minneapolis' energy footprint.) They also both have half the car-ownership level of Minneapolis, but a substantially better "multi-modal" mobility plan, based on car sharing, car / bike renting / hiring, robust public transportation, bike networks (here Minneapolis has one of the best in the world but there's always room for improvement!) and pedestrian systems. These options all emerge from a clear vision of city density, mix-use, neighborhood live / work / play centers, all which are designed to support the active lifestyle of their communities.

Transportation or mobility energy-use in Minneapolis accounts for 1,400 watts or 3.2 tons of carbon per person per year.

4) RENEWABLE ENERGY INFRASTRUCTURE.

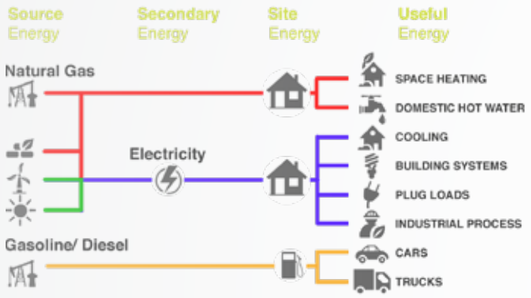
There's a lot to discuss here, so this community-measure level continues on the next page…

NEW ENERGY INFRASTRUCTURE FOR A RENEWABLE FUTURE.

Renewable Energy Resources and Energy Infrastructure:

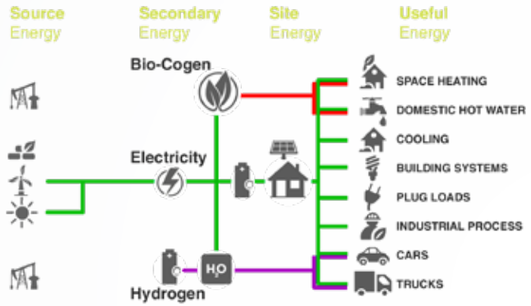
Minneapolis today reflects any other industrial nation where the energy infrastructure for heating energy demand is provided by natural gas or similar, transportation is based on petroleum, the rest of the energy demand is provided by electricity. This graphic displays it visually.

ENERGY SUPPLY INFRASTRUCTURE TODAY



Transition to a carbon-neutral future will mean the transition to an energy infrastructure that will be interconnected and as such, be more electricity based. This interconnectivity will allow users as well as producers to interact on an individual, micro- and macro-grid level and will require some smart-grid functionality. Here's a graphic of how that system will look soon.

ENERGY SUPPLY INFRASTRUCTURE TOMORROW

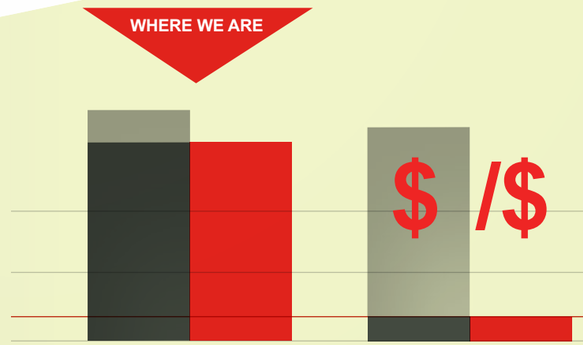


The key driver of the transformation to a 2000-Watt Society will be, along with a substantially reduced demand and ability to supply a lot of the required residual energy need by the community of Minneapolis itself, the lifestyle benefits of more freedom and resiliency unseen and experienced ever before.

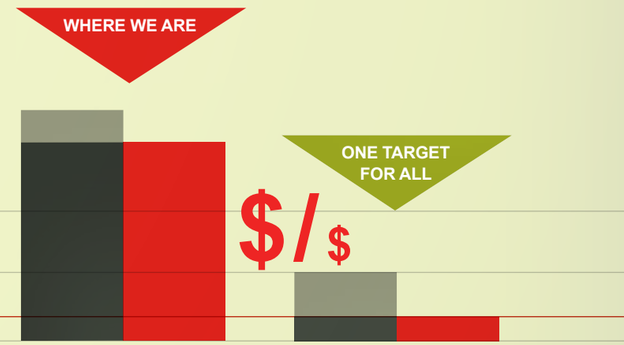
Real-world examples include building-based renewable energy systems such as photovoltaic systems (electrical energy) or thermal solar system (domestic hot water) along with energy storage capacity that can become the backbone of a building. Alternate fuel and storage systems such as Biofuel-based cogeneration or renewable-generated hydrogen are potential solutions for storage and thermal and power generation. Think of it as a neighborhood-based energy supply system.

Communities ultimately need to choose between these two options to reduce their carbon footprints and improve quality of life:

1) Invest significant dollars to replace non-renewable energy sources with clean energy infrastructure and keep paying a large monthly energy bill?



2) Invest significant dollars to dramatically reduce the energy demand with a substantially smaller clean energy infrastructure and reap the reward of a smaller monthly energy bill?



The only limitations will be the will of the community to adopt and implement the infrastructure strategies, building approaches and technologies already in use by 2000-Watt Societies throughout the world. But given the progressive and passionate mindset of Minneapolis residents, limitations will give way to innovative action plans that accelerate the reduction of its carbon footprint.

It's time to make Minneapolis the first 2000-Watt Society in the U.S.

LET'S CREATE THE MOST LIVABLE CITIES IN THE WORLD.

A NEW FRAMEWORK FOR ENERGY FLOW.

It all comes down to understanding, comparing and making informed choices about how energy flows today compared to how it will need to flow tomorrow. With coordinated community education and action, personal decisions take root that deliver a bright and prosperous lifestyle today and for future generations for a long time to come.

ENERGY INTELLIGENCE = IMPROVED QUALITY OF LIFE.

It's actually already happening throughout the world. In a referendum held in 2008, for example, three-quarters of the Zurich population voted in favor of learning about and achieving a 2000-Watt Society by 2050, making it the first city in the world to give these ambitious goals a democratic legitimacy and enshrine them in their constitution. Other cities such as Vancouver and Munich, as well as the Swiss cantons of Basel and Geneva, have also made the 2000-Watt Society a goal or benchmark in their respective climate-change efforts.

And by no coincidence, Zurich, Vancouver and Munich were named some of the most livable cities in the world by Mercer's Annual "Quality of Living Survey." They're proving that dramatic reduction in energy consumption does not negatively affect quality of life, but in fact, reducing their carbon footprints are making their cities more competitive, resilient and innovative.

Here's an overview of these three cities and their journeys toward carbon neutrality, just a few inspiring examples of the more than 500 cities throughout the world working toward becoming a 2000-Watt Society.

ZURICH, SWITZERLAND: ENJOYING A "LIGHTER" LIFE.

ZURICH IS THE BIRTHPLACE OF THE 2000-WATT SOCIETY, going from a research focus area of the Swiss Federal Institutes of Technology to a goal for climate change that its concerned citizens adopted through a historic public referendum.

The idea behind Zurich becoming a 2000-Watt Society was to pursue a "lighter" life, one that requires less energy instead of always consuming more. While this an ecological necessity, it can also lead to a better life.

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Three quarters of the people on Zurich's electoral roll voted to:

- Commit to sustainable development
- Reduce its energy consumption to 2000 watts per person per year
- Reduce its annual CO_2 emissions to one-ton per person by 2050
- Promote renewable energy and energy efficiency
- Not renew its investments in nuclear power plants

So far, they have achieved these results:

- Reduction of primary energy consumption by 1300 watts per person per year since 1990
- With currently 3900 watts per person, Zurich already reached the 2020 interim goal of 4000 watts per person on the pathway to becoming a 2000-Watt Society
- Since 2015, all households and private customers that cannot choose their electric energy supplier on their own are delivered with electricity from 100% renewable energies, exclusively
- In the transport sector, the energy demand decreased by 13% since 1990
- Reduction of the annual greenhouse gas emissions by 1.5 tons per person since 1990
- Distinct reduction of energy consumption and greenhouse gas emissions in the building sector through thermo technical restoration, that is, the construction of new state-of-the-art buildings and the transformation to renewable energy sources
- Since 1990, the share of renewable energy sources more than doubled from 11% to now 25%

What else the City wants to achieve:

- Cover 80% of the heat supply using renewable energy sources by 2020
- Create further 2000-Watts Society neighborhoods on a regular basis
- Implement more stringent guidelines for new buildings and building restorations in the private sector that correspond to the climate-neutral public policy

As impressive are the progress and results of these world-class cities, so too can they be for the City of Minneapolis. This Carbon Framework Plan has established the opportunities with clear targets for an Action Plan. It's time to create and begin executing that Action Plan as individuals, neighbors and passionate residents of the City determined to fight climate change.

The footprints we leave behind will impact the lives of those who walk in our path tomorrow. Everything we love about our neighborhood and our planet depends on the actions we take today.

2000 watt SOCIETY

One target. Our community. Stepping up now.

Struggling to quantify their carbon neutrality goal of reducing energy consumption by 50% and supplying that amount by renewable energy only, the City of Vancouver, in collaboration with the University of British Columbia and the Provincial Government of BC, used the 2000-Watt Society target to establish a clear energy-framework for the city's mid- and high-rise housing projects. The City of Vancouver is only one of the cities in North America with the jurisdiction to establish its own energy code for buildings.

So far, as a result of leveraging the 2000-Watt Society framework, Vancouver is now using the German Passive-House standard as their carbon-neutral standard for operating energy and incentivizing projects, for example, fast tracking building permits that reduce its carbon footprint.

VANCOUVER, BRITISH COLUMBIA: OWNING ITS ENERGY CODE.

Canberra makes an end to the often below-average energy efficiency in Australia compared to European standards. In 2016, the Australian government and the administration of the Australian Capital Territory (Canberra) expressed their will to take leadership in sustainable urban development by creating a new landmark neighborhood based on the 2000-Watt Society for more than 5000 inhabitants plus workplaces. In a joint venture with the City of Zurich, the Federal Office for Energy and other institutions, a platform for Swiss knowledge-transfer was created in order to construct a leading-edge efficient and sustainable building-block in Australia.

CANBERRA, AUSTRALIA: SMART CITY FOR SMARTER LIVING.

On the pathway to becoming a 2000-Watt Society, Munich has established these goals for 2050:

- Reduce per capita greenhouse gas emissions to 1 ton CO_2 per capita or less per year
- Most buildings conform to low-energy standards and new buildings have to be built as Passive Houses (100% on-site energy coverage through renewable energy sources) or plus-energy houses (more than 100% on-site energy coverage)
- 100% of the demand for electricity and heating covered by renewable energy
- Intelligent transport concepts whereby public transport is emission-free with moderate prices
- Citizens have learned to consume sustainably: "using in place" instead of owning!
- Munich as an attractive location for green economy: 100% recyclable products
- Establishment of a "Think Tank": politically independent adviser panel with scientific support

So far, they have achieved these results:

- The city is currently (2014) at 3500 watts per person per year
- Reduction of greenhouse gas emissions to 7 tons CO_2 per person in 2014 from 12 tons CO_2 in 1990
- Reduction of per capita end energy consumption by 28% since 1990, 5% reduction since 2012
- Reduction of the energy demand in the building sector by 32% since 1990
- The greenhouse gas reduction course, which intends to reduce emissions by 10% every 5 years, is currently accomplished
- Slight per capita end energy reduction in the transport sector by 5% since 1990
- Thermal energy generation by geothermal energy increased by 17% compared to 2012

MUNICH, GERMANY: USING ENERGY IN PLACE.

STEP UP TO JOIN WORLDHOLDERS AT WORK.

Put Minneapolis and your city on a proven path to reaching carbon neutrality.
Visit 2000-watt-society.org/become-a-worldholder.html to:

1. Become a WorldHolder today. Invest in a better world right now.
2. Start a WorldHolder community in your city.
3. 3. Work your Framework Plan. Adjust your city's Climate Action Plan to make your community more independent, resilient, just plain put more money back into the pockets of your residents.

COMMON LANGUAGE FOR A COMMON FIGHT.

Fighting climate change to reduce our carbon footprint can be as easy as simple, individual energy-consumption things we change. It can get more complex when more people are involved, such as neighbors, community organizations and government. That's why a common language is essential: to have a fundamental agreement on agreed-upon concepts so that when discussing the collective Action Plan, everyone's working from a similar level of understanding. Use these common concepts discussed in this Carbon Framework Plan to keep the conversation, and action, going strong in your community.

Energy: "The ability to do work", whereby producing heat or light is also considered to be "doing work". Motion, heat, light and electricity are different forms of energy. Energy is measured in many units – we at the 2000-Watt Society combine it in Watt-Hours or Kilowatt-hours (kWh = 2kW Society)

Energy efficiency: Whenever energy is used, part of the consumed primary energy is lost. An energy service, like heating, lighting or transport, is efficient if the largest possible share of the energy used is converted into effective energy.

Greenhouse gases (GHG) / carbon dioxide (CO_2): Part of the solar radiation which reaches the Earth heats it up and part is reflected back. The so-called "greenhouse gases" (GHG) retain the reflected radiation, thus causing additional warming. Human activities are increasing the concentration of greenhouse gases in the atmosphere. Carbon dioxide (CO_2) is the most significant of these. CO_2 is intrinsically harmless – we breathe it out ourselves. What is dangerous, is that the concentration of CO_2 in the atmosphere is rising because of the combustion of petroleum, coal and gas, as well as the destruction of forests, thus causing the Earth to become warmer and warmer. In order to enable other climate-relevant gases to be taken into account alongside CO_2, these are converted into so-called "CO_2 equivalents" according to their greenhouse effect. The 2000-Watt Society's goal of reducing annual greenhouse gas emissions to 1 ton per person refers to the sum of all greenhouse gases, measured in CO_2 equivalents. In this Carbon Framework Plan, we have only written CO_2 in each instance, so as to improve legibility.

Grey energy / grey emissions: The energy required for the manufacture, transport, storage, sale and disposal of a product is called grey energy. The term "grey emissions" is used analogously. Taking grey energy into account gives a more realistic picture of the consumption caused worldwide by one's own consumption.

Power: The conversion (production or consumption) of energy per unit of time, measured in watts (W). One watt is equal to the conversion of one joule of energy per second. Horsepower (HP) is also a unit of power: 1 HP equals 735 watts.

Renewable energy: Petroleum is only available to us until the deposits are exhausted. On the other hand, solar energy never runs out and firewood grows back: these are referred to as forms of renewable energy. However, there is no clear defining line. In some cases, if forests are over-exploited, the tree population can no longer recover over the centuries, therefore, the use of renewable energy is not necessarily sustainable.

Source (primary) energy, site energy and effective (use) energy = Energy Flow: The 2000-Watt Society methodology defines primary energy as the total energy present in the original energy source (like a piece of coal) plus its grey energy. The energy that reaches the customer (by means of electricity), after all conversion and transmission losses, is called site energy (meter at the house). Energy use is called effective energy (e.g., the energy used to create light via a light-bulb). Any remaining energy is lost as waste heat.

Sustainable development: Any form of balancing which does not have a negative impact on future generations is referred to as sustainable. The main goals of sustainable development are social solidarity, ecological responsibility and economic performance.

Making Minneapolis the First 2000-Watt Society in the U.S.

Thank you to Minneapolis WorldHolders!

Individual investments from local WorldHolders have funded this official Carbon Framework Plan for the City of Minneapolis. Without that courageous support, this critical first step toward carbon-neutrality for the City would not be possible.

Visit worldholderfootprints.earth to learn about WorldHolders at work in Minneapolis.

INVESTING IN AND COMMITTING TO FIGHTING CLIMATE CHANGE.

Each WorldHolder invested $100 and made a commitment to:

1. Pledge to support their community in implementing "One Target for All."
2. Reach 500 WorldHolders to form a local WorldHolder Community, joining together to receive a customized Carbon Framework Plan that documents current conditions to set a framework to benchmarks local energy and climate-change actions.
3. Share their voice using the 2000-Watt Society framework to launch innovative projects, services and products in their community.
4. Be part of an international network for holistic thinking and action to achieve a livable carbon-neutral future for all.
5. Receive ongoing education about standards, guidelines and tools to measure and implement a 2000-Watt Society lifestyle, one that more than 500 cities throughout the world are using.

With the clear target at hand, WorldHolders will drive the action needed to hit these targets. Residents, businesses and government leaders must collaborate on translating this Carbon Framework Plan into an Action Plan that reflects the local culture, climate and ability to implement each project and commit to the changes agreed to.

LET'S GET INTO THE NUMBERS. LET'S GET TOGETHER TO CREATE OUR ACTION PLAN. WE CAN DO THIS. RIGHT HERE IN MINNEAPOLIS.

ONE TARGET. OUR COMMUNITY. STEPPING UP NOW.

2000-watt-society.org

2000-Watt Society (501(c)3)

2000-Watt Society, 901 23rd Avenue NE, Minneapolis, MN 55418

For more information, contact **info@2000-Watt-Society.org**

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