Sustainable Sun Prairie
Strategic Framework & Guiding Principles
What is Sun Prairie Sustainability?

“What Sustainability means balancing the demands and impacts of economic stability, environmental protection, and social equity across our community now and in the future.”

Vision Statement

“The City of Sun Prairie will collaborate with its citizens to create and expand sustainability practices while always recognizing the interdependence of environmental quality, economic resiliency and growth, and social equity. Our mission is to promote and enable our community to embrace a culture that is inclusive, safe, resilient and sustainable.”
FOCUS AND IMPACT

- THREE FOCUS ELEMENTS
  - ex: Planet
- NINE IMPACT AREAS
  - ex: Natural Resources

CITY-WIDE GOALS

- EIGHT GOALS
  - ex: Create a socially just community with an economically and environmentally sustainable development pattern

TASK FORCE STRATEGIC RECOMMENDATIONS

- 115 RECOMMENDATIONS
  - ex: Develop a tree preservation ordinance and/or maintenance guidelines

Sustainability Web page
Sustainability Taskforce Report
(100+ Recommendations)
- Settled in 1837
- Population 35,460
- 718 Businesses
- 12.23 Square Miles
- 411 acres city-owned parks
- SPU – 14,990 Res. + 1,729 Com. Accounts
- Water supply – 7 wells, 3 towers, 150 miles of main; 11,033 customers
Circle of Control
- City Operations
  - Buildings, vehicles, equipment, staff
  - Purchasing, procurement
  - Measure: Resource Consumption
    - Electricity, NG, fuel, labor

Circle of Influence
- Residents, Businesses
  - Resources & Information
  - Partnerships & Collaboration
  - Measure: Goals, Targets, Ordinances

Circle of Awareness
- State & Federal Action
- Consumer Trends, Regulatory Changes
- Environmental & Systems Impacts
Circle of Control
- Buildings
- Vehicles
- Equipment
- Contracts & Purchasing

Circle of Influence
- Residents & Businesses
- Resources & Information
  - Programs & Incentives
    - Development & Opportunity
  - Partnerships & Collaboration

Circle of Awareness
- State & Federal Action
- Consumer Trends & Business Strategies
- Economic Growth & Environmental Conservation
- Behavioral Science & Best Practices
- Systems Thinking & Interdisciplinary Frameworks
Sustainability Tiers

Transcendent Frameworks (Economy, Government, Society, Environment) long-term sustainability to preserve humanity and a healthy planet

Systems Thinking (Life-Cycle Analysis, DEI, Transparency, Ecosystem Service Valuation) value driven, consensus on trade-offs, interactive effects

Resource Optimization (Electricity, Natural Gas, Transportation Fuels, Water, Food, Materials, Time) quantified by analysis & calculation
Guiding Principle Examples – Quantitative

Community Feedback Required!

- 100% socket saturation of LED lighting throughout the city
- 100% local food procurement, 0% food waste community-wide
- 100% Electrified Buildings/Vehicles/Equipment, 0% fossil fuel use
- 100% renewable energy, local generation (SPU municipal utility leader)
- 100% of buildings tracking resource consumption, setting targets
- 0% Vehicle Miles Traveled (VMT) for single occupancy vehicles
- 100% of targeted greenspace acres conserved
Guiding Principle Examples – Qualitative

Community Feedback Required!

• Sustainability fully integrated in city operations - processes, policies, procedures, and procurement
• System-wide resource optimization (energy, water, food, time)
• Education, Resources/Incentives, Opportunities; known to all
• Impacts and costs are distributed justly; DEI frameworks
• Ambitious, community-wide, science based targets are set and achieved, Sun Prairie as a leadership model for others to follow
• Sun Prairie attracting businesses that are pioneering sustainability in their products & services
Focus Area: LED Lighting, compared to alternative technology -

- **Uses less energy** (lumens per watt)
- **Lasts far longer** (25,000+ hours)
- **Better control** (CCT, CRI, tuning)
- **No hazardous materials** (mercury, glass, filaments)

**Produces Light, not Heat**
Focus Area: Heat Pump Technology 101

• Heating & Cooling (space & water)
• Significant Technology Advances (cold-climate, dual-fuel)
• Ducted/Ductless/Mixed - Configuration
• Air/Water/Ground – Source
• Electrification Enabler
• Control (zoning)
HOW A HEAT PUMP WORKS

Electrical Load:
Heat pumps use freely available heat energy by moving it to where it’s needed. But moving it takes some energy.
The components of the system that require power include the compressor, fans, pumps, and controls.

Compressor:
As the pressure of the gasified refrigerant increases, the temperature increases.

Reversing Valve:
Changes refrigerant direction for heating or cooling cycles

Expansion Valve:
As the pressure of the liquid refrigerant drops, the temperature drops further

Fan:
Draws outside air through heat exchanger

Expansion Valve:
Draws interior air through heat exchanger

Heat Pump Cooling Mode:
The reversing valve allows the whole system to run in reverse, extracting heat from the home’s interior and releasing it to the outside.

Split Systems:
The “interior” heat exchanger can be located outside, using ducting to move hot air to the inside space, or it can be located inside, in a separate “split” unit that uses refrigerant to move heat between the two heat exchangers.

Exterior Heat Exchanger:
Cold liquid refrigerant is warmed by outside air and evaporates as its temperature increases

“Interior” Heat Exchanger:
Hot gasified refrigerant releases heat to the inside air and condenses to a liquid as it cools

Air from Outside:
Warmer than liquid refrigerant

Air from Inside:
Cooler than gas refrigerant

Cold Air to Outside
Hot Air to Inside

The Cost of Comfort: Climate Change and Refrigerants | BuildingGreen – Image Courtesy of Home Power Magazine
Six Principles for Beneficial Electrification

1. Put Efficiency First
To many, the term “energy efficiency” has historically meant using less electricity. But when switching to electric vehicles or heat pumps for space and water heating, electricity use may go up. Today, energy efficiency calculations should incorporate both the efficiency of the equipment and the fuel used.

2. Recognize the Value of Flexible Load for Grid Operations
The cost and emissions of power generation vary greatly depending on the time of day. Because electric vehicles and heat pumps are flexible in when they can be charged, their use of electricity can be shifted to times when low-cost, clean resources are available.

3. Understand the Emissions Effects of Changes in Load
Knowing a system’s marginal emissions—the emissions that will be added with the use of one more kWh, or that will be reduced if a kWh is avoided—is one way of understanding the emissions associated with increase electrification. Marginal emissions vary depending on time and place. Modeling is a useful way to characterize the emissions associated with electrification.

4. Use Emissions Efficiency to Measure the Air Impacts of Beneficial Electrification
Characterization of the pollution associated with a specific electrification investment requires an understanding of emissions efficiency—the emissions per unit of energy output. By driving an electric vehicle or installing an efficient heat pump water heater, consumers can produce less pollution per vehicle mile traveled or gallon of water heated. Moreover, as the grid becomes cleaner, the emissions efficiency of that electric vehicle or heat pump will improve further.

5. Account for the Lives of Investments
Because energy infrastructure is long-lived, opportunities for new investments are limited. Unless utilities and consumers are positioned to make informed investments when infrastructure replacement time arrives, the opportunity to make lower-cost, cleaner investments may be lost.

6. Design Rates to Encourage Beneficial Electrification
Unlike typical electric rates, time-sensitive rates reflect the different cost of providing electricity at different times of the day, and they signal this price difference to consumers. By using well-designed rates to encourage customers to shift their demand to less expensive times, utilities can make more efficient use of grid resources.

For electrification to be considered beneficial, it must meet one or more of the following conditions without adversely affecting the other two:

- Saves consumers money over the long run
- Enables better grid management
- Reduces negative environmental impacts

For more information, visit www.raponline.org/be
Residential Sustainability Guide: Content Outline

• Energy:
  • https://www.energy.gov/energysaver/energy-saver
  • Products Choose a Light (energystar.gov)

• Food/Water: food waste reduction, composting, water efficiency

• Waste: materials selection, reduction

• Materials: embodied carbon, local sourcing

• Land Use: green space, ESV, GHG sinks, productivity

• Built Environment: Equity and resilient design, connectivity
Residential Perception vs. Reality

**Q.** From this list of options, which three do you think would most reduce the greenhouse gas emissions of an individual living in one of the world’s richer countries?

**Global Market Averages**

The difference is clear when ranked by actual order – actions like recycling, hang-drying and using low energy light bulbs are over-estimated compared with not having a car at all or avoiding long-distance flights.

<table>
<thead>
<tr>
<th>Action</th>
<th>Actual rank</th>
<th>CO₂ saved (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having one fewer child</td>
<td>1</td>
<td>58.6*</td>
</tr>
<tr>
<td>Not having a car</td>
<td>2</td>
<td>2.4</td>
</tr>
<tr>
<td>Avoiding one long-distance flight (lasting six hours or more)</td>
<td>3</td>
<td>1.6</td>
</tr>
<tr>
<td>Buying energy only from renewable sources (e.g. wind power, hydro-electric)</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Replacing a typical car with an electric car or hybrid</td>
<td>5</td>
<td>1.1</td>
</tr>
<tr>
<td>Eating a plant-based diet</td>
<td>6</td>
<td>0.8</td>
</tr>
<tr>
<td>Recycling as much as possible</td>
<td>7</td>
<td>0.2</td>
</tr>
<tr>
<td>Hang-drying their clothes, instead of using an electric or gas dryer</td>
<td>8</td>
<td>0.2</td>
</tr>
<tr>
<td>Replacing traditional incandescent light bulbs with low energy</td>
<td>9</td>
<td>0.1</td>
</tr>
</tbody>
</table>

*Base: 21,011 online adults aged 16-74 across 30 markets, 19 Feb – 5 Mar 2021
*Source: Institute of Physics, 2017. The most effective individual steps to tackle climate change aren’t being discussed. Available here: https://iopscience.iop.org/news/2017-07-effective-individual-climate-actions-discussed.html

NB: Emissions saved from having one fewer child is calculated by quantifying future emissions of descendants based on historical rates, based on hereby.
Commercial Sustainability Guide: Content Outline

- **Energy**: Focus/WPPI/efficiency, renewables, operations
- **Food/Water**: input reduction, offer spare resources to community, tax credits
- **Waste**: inventory/audit and reduction/reuse
- **Materials**: products/services, local sourcing
- **Land Use**: green space, ESV, GHG sinks, productivity
- **Built Environment**: Equity and resilient design, connectivity
- **Procurement/Supply Chain**: Scopes 2, 3+ emissions, procurement, policies
- **Downstream/Product + Service Influence**: Education, product differentiation
Alternative Fuel Vehicles
Electric Vehicles (EVs) 101

- **Types** – plug-in hybrid, hybrid, fuel cell, battery (BEV)
- **Conversion Efficiency** (Energy>Motion) – Electric Motors 85%, Gas Combustion 40%
- **Emissions** – Electricity source, EV model, driving habits all contribute; average EV emits 50% CO2 compared to gas-burning vehicle
- **Fueling** – 80% of EV charging occurs at home; depending on charge level can take 30 minutes – 12 hours, lifetime (15 years) fuel cost savings average ~$7,500
- **Maintenance** – EVs require no oil changes, fewer brake changes, no transmission, ICE Vehicle has 400 moving parts, EV has about 20; $3,500 saved over 150,000 miles

Technology advancements, charging station availability, education (Ride & Drives)

Source: Electric Vehicles 101 | NRDC
Electric Vehicles 101: Resources

- Electric Cars 101: What You Need to Know About EVs | Kelley Blue Book (kbb.com)
- Normal Now
- Electric Cars 101 | NRDC
- The Economics of Electric Vehicles | NBER
- The changing economics of electric vehicles | World Economic Forum (weforum.org)
- How Much Do EV Charging Stations Cost? Expect $6,000 On Average (propertymanagerinsider.com)
Ecosystem Services

- Preserve Greenspace
- Quantify Benefits
- Communicate Value of our “Natural Capital”
- Conserve Biodiversity
- Smart Growth & Land Use – ArcGIS & SolVES plug-in.
Ecosystem Services – Nature Worth
$125,000,000,000,000+

• Great Barrier Reef - $5.7 billion/year to Australian economy, supports 69,000 jobs
• Natural Land-based Assets in the Americas - $24 trillion/year
• 20,000 Pollinating Insect Species – increase global value of crop production $235-577 billion/year
• Summary: Healthy Ecosystems + Biodiversity = Functional Economy

How much is nature worth? $125 trillion, according to this report | World Economic Forum (weforum.org)
Solutions – Systems Thinking & Holistic Mathematics

$42/metric ton CO2

Social Cost of Carbon – 2020 with 3% discount rate
5-Year Sustainability Plan

2021 – Asset inventory (buildings, vehicles), establish Sustainability Committee

2022 – Benchmark Asset Targets, provide community education content, embed sustainability into operations

2023 – Monitor Asset Target Progress, Capital Improvements & Development reviewed for Sustainability

2024 – Complete over 75% of Report Recommendations by EOY

2025 – Asset Targets met, electrification underway, Sun Prairie leader in Sustainability
Task Force Synergies: The Triple Bottom Line

The City’s measures for success in its sustainability efforts lies at the nexus of the three focus areas of its vision statement:

- **PLANET** – Environmental sustainability is to live gently and minimize any negative environmental impacts that lifestyles generate.

- **PEOPLE** – Social sustainability means that relations between people are equitable, everyone is treated respectfully, and people in Sun Prairie share strong social bonds.

- **PROFIT** – Economic sustainability means that businesses are profitable, and households are able to afford their basic needs (food, shelter, health, etc.).
Current Status of Sustainability Activities

• City facilities being uploaded into ENERGY STAR Portfolio Manager, to track building data and resource consumption (electricity, NG, water, waste)

• City fleet being reviewed with WI Clean Cities via assessment to explore fuel savings and replacement opportunities

• Updated RFP template has sustainability scoring component (10%, 10/100)

• Grant proposal submitted to WI PSC for Library community resiliency center feasibility study (Solar PV + Battery Storage for critical loads), AWARDED

• City Hall LED RFP drafting in progress

• WWTP enrolled in DOE SWIFt accelerator cohort

• Creation of the Sustainability Committee
Questions, Comments, Next Steps?
Define metrics of success for the following categories:

- City Operations –
- Residents –
- Businesses/Organizations –
- Sustainability Committee –