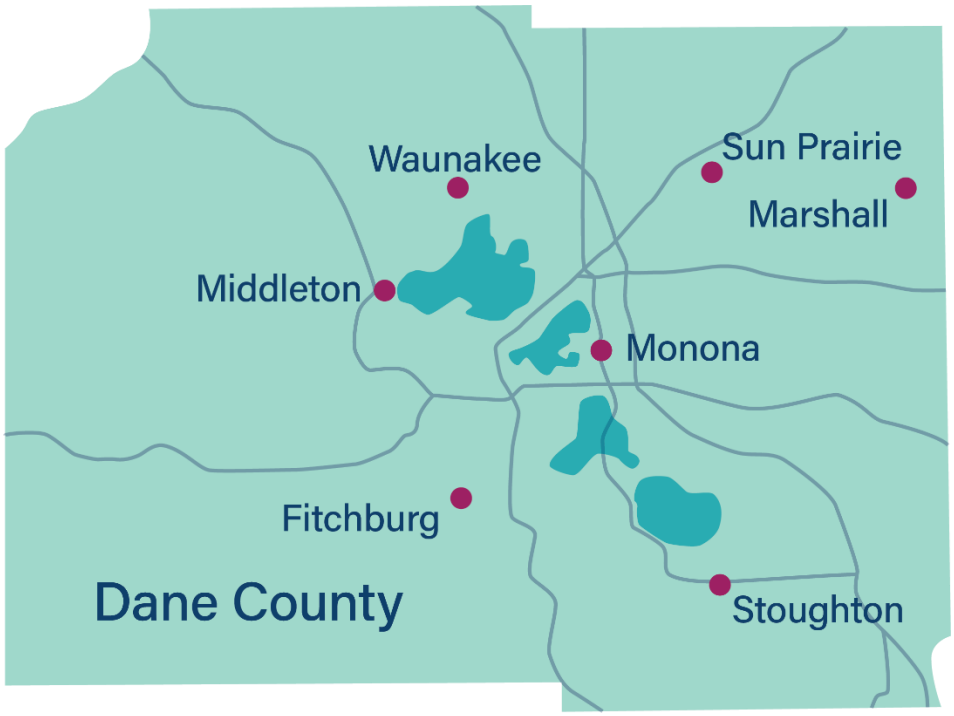
DECEMBER 2019

Municipal Energy Plan - Seven Community Collaboration

Appendices of Assumptions



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APPENDIX A: COST AND EMISSION ASSUMPTIONS

Table 1 provides the standard cost and emissions factor assumptions that we used to calculate the baseline energy cost and emissions as well as the potential energy and CO_2esavings. These numbers are Wisconsin-specific and not city-specific.

Table 1: Cost assumptions and emissions factors

		Value	Data Source
Electricity	Emissions Factor CO_2 equivalent	1679 lb/MWh	eGrid – MORE https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid
	Cost	0.11 $/kWh	EIA data – WI average rate https://www.eia.gov/electricity/state/wisconsin/
Natural Gas	Emissions Factor	0.0053115 metric ton/therm	EPA Emissions Factors https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf
	Cost	0.60 $/therm	EIA data – WI average rate https://www.eia.gov/dnav/ng/ng_pri_sum_dcu_SWI_m.htm
Compressed Natural Gas	Emissions Factor	0.0000544 metric ton/scf	EPA Emissions Factors
	Cost	2.20 $/gallon-equivalent	Clean Cities – US DOE https://afdc.energy.gov/files/u/publication/alternative_fuel_price_report_july_2019.pdf
Gasoline	Emissions Factor	.0085 metric ton/gallon	EPA Emissions Factors
	Cost	2.47 $/gallon	Average of reported prices
Diesel	Emissions Factor	.0102 metric ton/gallon	EPA Emissions Factors
	Cost	3.00 $/gallon	Average of reported prices

APPENDIX B: STREETLIGHT ASSUMPTIONS

This section documents the assumptions used in the calculation of annual LED use as well as in the lifetime cost calculations. To calculate the LED annual electricity use, we assumed 4,000 hours of operation in a year and used product manuals to estimate the wattage of an equivalent LED fixture for each conventional bulb type (Table 1). Using data from each community on type and wattage of current lights, we used these two assumptions to calculate electricity use if all lights were converted to LEDs.

For the lifetime cost analysis, we used similar calculations for annual electricity use and then applied cost assumptions for both upfront and ongoing costs. Table 3 documents the cost assumptions for the replacement of typical bulb wattages. For upfront costs, we applied an incremental labor, $99 for all lights, cost and an incremental equipment cost minus the available Focus on Energy rebate (see Table 3). As LED last longer than HIDs, we applied an avoided labor, $50 for all, and replacement bulb cost (see Table 3) every 4.6 years during the LEDs' lifetime. We discounted future year's energy savings and maintenance savings using a 2 percent discount rate to estimate NPV and a discounted payback period.

Table 2: Standard assumptions - streetlighting lifetime cost analysis

Input	Assumption	Data Source
LED Lifetime	100,000 hours (~22 years)	Manufacturer rating
HID Lifetime	20,000 hours (~4.6 years)	
Fixture Replacement Labor	$99	Focus on Energy TRM
Bulb Replacement Labor	$50	Engineering judgment
Discount Rate	2%	Industry knowledge

Table 3: Wattage based assumption - streetlighting cost analysis

Input	70 - 100W	150-175W	250W	400W	Data Source
LED Replacement Wattage	51	91	134	214	Product manuals
Upfront Cost – Low ($)	150	200	300	400	WI cities' estimates
Upfront Cost – High ($)	214	257	346	461	FOE TRM
FOE Rebate ($)	20	35	50	50	FOE
Bulb Replacement Cost ($)	8.61	10.09	9.62	11.98	FOE TRM

APPENDIX C: FLEET ASSUMPTIONS

BASELINE CALCULATIONS

Estimating the baseline energy use of municipal fleets required use of secondary research. The following section documents these assumptions. Each city had different ways of reporting vehicle fuel usage and varying levels of access to data. Table 4 summarizes the data used to calculate the baseline fuel usage and cost for each of the cities. We used city-specific data as much as possible. Using the emissions factors summarized in Appendix A, the CO_2 equivalent was calculated for each department.

Table 4: Data used for baseline calculations – gallons and cost by community

Community	Gallons	Cost
Fitchburg	Reported gallons by department	Reported by department
Marshall	Reported gallons per vehicle + assumptions for police fleet (no data)	Reported by department + city average $/gallon for police
Middleton	Assumptions for all vehicle types	Average $/gallon from other cities
Monona	Reported gallons by department	Reported by department
Stoughton	City: calculated gallons for each vehicle using reported miles and mpg Utility: Reported gallons	Used reported city average $/gallon
Sun Prairie	City: assumptions for all vehicles; Utility: reported mileage + assumptions for mpg	Used reported city average $/gallon
Waunakee	Assumptions for all vehicle types	Average $/gallon from other cities

Table 5 details the assumptions used to calculate baseline fuel usage for each vehicle or vehicle type if data was missing. Where possible, we used actual data collected for the community. However, not all communities collected the type of data needed to create the community energy profiles or analyze energy opportunities; for those communities, we either used average data from other communities in the collaboration and where that was not available, we relied on secondary published data.

Table 5: Baseline fuel usage assumptions - all vehicle types

Vehicle	Input	Value	Data Source
Police Patrol	Miles traveled	14,000	Monona, Fitchburg, Stoughton
	Miles per gallon	19	Monona data; EPA rating
	Idling Hours	1,750	Clean Cities Idling Report https://cleancities.energy.gov/files/u/news_events/document/document_url/93/2015_strategic_planning_idling_reduction.pdf
	Gallons per hour idled	0.5	AFDC Idling Report https://afdc.energy.gov/files/u/publication/idling_emergency-service_vehicles.pdf
Police Motorcycle	Miles traveled	14,000	Monona, Fitchburg, Stoughton data
	Miles per gallon	38	EPA ratings
	Idling Hours	1,750	Clean Cities Idling Report
	Gallons per hour idled	0.16	Engineering judgment
Police Nonpatrol	Miles traveled	6,500	Monona data
	Miles per gallon	19	EPA rating
Fire trucks	Miles traveled	1,135	SP runs per year + national survey https://www.cityofsunprairie.com/1192/Annual-Reports https://www.washingtonfirechiefs.com/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=1306&Command=Core_Download&PortalId=20&TabId=2384
	Miles per gallon	4	DOE https://www.energy.gov/eere/vehicles/fact-626-june-7-2010-fuel-economy-light-and-heavy-vehicles
	Idling Hours	260	National Survey (see miles traveled)
	Gallons per hour idled	1.25	AFDC Idling Report
Fire pickups	Miles traveled	3,000	Monona/Stoughton data
	Miles per gallon	11	Monona/Stoughton data
Fire SUVs	Miles traveled	3,800	Monona/Stoughton data
	Miles per gallon	14	Monona/Stoughton data
Ambulances	Miles traveled	6,240	SP runs per year https://www.cityofsunprairie.com/281/Statistics
	Miles per gallon	8	DOE Fuel Economy https://www.energy.gov/eere/vehicles/fact-626-june-7-2010-fuel-economy-light-and-heavy-vehicles
	Idling Hours	700	SP runs + one hour per run https://www.cityofsunprairie.com/281/Statistics https://www.collegeems.com/wp-content/uploads/2018/05/JCEMS-NCEMSF-Academic-Poster-Session-Poster-A-Low-Cost-Ambulance-Idle-Reduction-System-Kung-et-al.pdf

	Gallons per hour[1]	1.5	AFDC Idling Report
Light duty: cars, SUVs, vans	Miles traveled	3,500	Monona/Fitchburg/Stoughton data
	Miles per gallon	20	Industry knowledge - average of vehicles
Pickups	Miles traveled	5,250	Monona data
	Miles per gallon	11	Monona/Stoughton data
Heavy duty: plows, dumps, etc.	Miles traveled	1,800	Monona/Fitchburg data
	Miles per gallon	4	DOE Fuel Economy
Light equipment: small construction, lawn care	Hours used	200[2]	Monona/Stoughton/Minneapolis data
	Gallons per hour	1.2	City of Minneapolis data https://lims.minneapolismn.gov/Download/RCA/2361/10_Municipal%20Fleet%20Electric%20Vehicle%20Study.pdf
Heavy equipment: large construction	Hours used	90	Monona data
	Gallons per hour	8	City of Minneapolis data
ATV	Miles traveled	1,500	City of Minneapolis + engineering judgment
	Miles per gallon	31	City of Minneapolis data https://lims.minneapolismn.gov/Download/RCA/2361/10_Municipal Fleet Electric Vehicle Study.pdf

ALTERNATIVES: AVAILABILITY AND ASSUMPTIONS

To identify opportunities to reduce energy use from municipal fleets, we explored what cost-effective alternative fuel vehicles currently exist. The alternatives we recommend are detailed below in Table 6. The other options we explored included hybrid pickups and CNG heavy duty vehicles. As documented in the Lifetime Fleet Analysis Appendix, these two options were not cost-effective at this time. The other equipment did not have widespread alternatives.

Table 6: Recommended alternatives - type and example of vehicle by type

Type	Vehicle	Alternative	Example
Police	SUV	Hybrid Gasoline	Ford Police Interceptor Hybrid Utility
	Sedan	Hybrid Gasoline	Ford Police Responder Hybrid Sedan
	Motorcycle	All-electric	Zero Motorcycle
Light duty	Car	All-electric	Chevy Bolt Nissan Leaf
	SUV	Plug-in hybrid electric	Subaru Crossktrek Hybrid Volvo S60 AWD

[1] Stoughton reported hours used per ambulance rather than miles traveled. We used this number as gallons per hour overall to calculate the baseline fuel usage.

[2] Waunakee had a substantial amount of handheld pieces of equipment, so this value was decreased to 150 hours to account for the difference in equipment reported.

	Van	Plug-in hybrid electric	Chrysler Pacific Hybrid

To estimate the impact of adopting these alternative vehicles, we used EPA ratings to estimate the efficiency of the vehicles and then used the same miles driven or hours used assumptions from the baseline calculations to estimate fuel consumed. Table 7summarizes the assumptions for police vehicles and light-duty vehicles. Using this, we calculated the annual impact.

Table 7: Alternative vehicle efficiency assumptions - police and light-duty vehicles

Vehicle	Input	Assumption	Source
Hybrid Police SUV	Miles per gallon	24	EPA estimated rating
	Gallons per hour idled	0.204	Ford testing
Hybrid Police Sedan	Miles per gallon	38	EPA estimated rating
	Gallons per hour idled	.20	Ford testing
Electric Police Motorcycle	Electric: kWh/100 miles	17	Estimated rating http://media.zeromotorcycles.com/resources/fleet/zero-fleet-police-brochure.pdf
	Gallons per hour idled	2.7	Engineering judgment
Electric Sedan	kWh/100 miles	32	AFDC Vehicle Search https://afdc.energy.gov/vehicles/search/
Plug-in hybrid SUV	Percent electric	55	AFDC Assumptions https://afdc.energy.gov/vehicles/electric_emissions_sources.html
	Electric: kWh/100 miles	38	AFDC Vehicle Search
	Conventional: mpg	32	AFDC Vehicle Search
Plug-in hybrid van	Percent electric	55	AFDC Assumptions
	Electric: kWh/100 miles	42	AFDC Vehicle Search
	Conventional: mpg	25	AFDC Vehicle Search

LIFETIME COST ANALYSIS: ASSUMPTIONS

The following section summarizes the assumptions used in the lifetime cost analysis for vehicles with a widely available alternative fuel option.

Table 8: Lifetime cost analysis - lifetime and incremental cost assumptions

Vehicle	Input	Value	Source
	Lifetime	8	Industry knowledge (100,000 miles)

Police	Incremental Cost – Ford Hybrids	3,500	Ford quote
	Incremental Cost - Motorcycle	390	Comparison of online quotes
Light-duty	Lifetime	15	Industry knowledge
	Maintenance savings – electric	$0.0128/mile	AFDC Assumptions https://afdc.energy.gov/vehicles/electric_emissions_sources.html
	Incremental Cost – Passenger	8,600	AFDC Cost Calculator https://afdc.energy.gov/calc/
	Incremental Cost – PHEV SUV	10,000	AFDC Cost Calculator
	Incremental Cost – PHEV Van	9,000	AFDC Cost Calculator
Pickups	Lifetime	15	Industry knowledge
	Incremental Cost – F150 eq	20,000	Online quotes https://news.pickuptrucks.com/2018/08/whats-it-like-to-drive-a-hybrid-plug-in-ford-f-150.html
	Incremental Cost – F250 eq	9,000	Online quotes https://news.pickuptrucks.com/2018/08/whats-it-like-to-drive-a-hybrid-plug-in-ford-f-150.html
Heavy-duty	Lifetime	15	Industry knowledge
	Incremental Cost	10,000 – 50,000	AFDC, NYSERDA + sensitivity https://afdc.energy.gov/files/u/publication/ng_regional_transport_trucks.pdf Guidebook – Natural Gas for Refuse Fleets in New York

To calculate the annual fuel savings, we used the same assumptions for police and light-duty vehicles' efficiency as documented in the alternative assumption section. For heavy duty and pickups, we used the below efficiency assumptions and the miles driven from the baseline section.

Table 9: Efficiency inputs - lifetime cost analysis of pickups and heavy-duty vehicles

Vehicle	Input	Value	Source
Plug-in hybrid F150	Percent electric	55	AFDC Assumptions https://afdc.energy.gov/vehicles/electric_emissions_sources.html
	Electric: kWh/100 miles	96	XL Hybrid Estimation; Testing https://www.xlfleet.com/content/vehicles/#xlh-section https://news.pickuptrucks.com/2018/08/whats-it-like-to-drive-a-hybrid-plug-in-ford-f-150.html
	Conventional: mpg	19	XL Hybrid Estimation; Testing
Hybrid F250	Miles per gallon	14	XL Hybrid Estimation
CNG	Miles per gallon-eq	3.8	Argonne National Lab https://afleet-web.es.anl.gov/afleet/

APPENDIX D: ROCHESTER TIF POLICY

REVISED 11/19//2018

CITY OF ROCHESTER POLICY ON DEVELOPMENT INCENTIVES FOR TAX INCREMENT FINANCING AND TAX ABATEMENT

1. GENERAL POLICY

The purpose of this policy is to establish guidelines and procedures for the provision of development incentives to private businesses. The fundamental purpose of providing development incentives are to encourage the redevelopment of the city's older residential, commercial, and industrial areas; to preserve and expand the city's economic and employment base, and to provide affordable housing.

Development incentives may be provided when the city believes that the desired development would not occur without municipal involvement. The city reserves the sole right to accept or reject proposals for development assistance, taking into account the degree to which they adhere to the intent of this policy and any other factors the City Council may wish to consider

2. OBJECTIVES

Within these stated priorities, the City will consider providing development incentives to private projects to achieve one or more of the following objectives:

a. Encourage development or redevelopment consistent with the goals and objectives of the City of Rochester.

b. To encourage the redevelopment of developed areas through the removal of blight and blighting conditions.

c. To retain jobs and/ or increase the number and diversity of quality jobs.

d. To provide a balanced and sustainable housing stock and to promote neighborhood stabilization and revitalization.

e. To increase the city's tax base.

f. To encourage additional unsubsidized private development, either directly, or through secondary "spin-off" development.

g. To meet other public objectives as determined by the Council.

3. PRIORITIES FOR USE OF DEVELOPMENT INCENTIVES

(Projects that meet 1, 2 or 3 below are considered to be of equal priority and are a higher priority for the use of development incentives than other projects).

1. Development or redevelopment projects that are included in the Destination Medical Center Development Boundary Area that further the goals and objectives of the plans and research outlined below:
    a. DMC Development Plan
    b. Rochester Downtown Master Plan
    c. DMC District Design Guidelines
    d. Public Realm Plans
    e. DMC Transportation Plan
    f. City of Rochester Comprehensive Plan
    g. DMC District Market Demand Studies

2. Economic development projects of an industrial or manufacturing nature, that are consistent with the Minnesota Statutes and that create or retain living wage jobs or increase the tax base in the City.

3. Housing TIF District projects must provide for at least 40% of the units to be affordable to persons at 60% area median income or 20% of the units to be affordable to persons at 50% area median income, as required by statute. For Housing TIF District proposed development projects seeking development incentives, priority will be given to those projects that

    a. Secure other funding sources, such as Housing Tax Credits or Housing Revenue Bonds
    b. Take advantage of an infill site.
    c. Are within 1/4mile of bus stop.
    d. Are located within 1/2 mile of essential services that serve the property.
    e. Are within the 4 minute EMS response time.
    f. Have no tenant relocation issues associated with the project.
    g. Single family dwelling owner occupied housing as permitted by Statute.
    h. Provide rents affordable to persons at or below 50% AMI

4. Other Redevelopment projects. Determination of project approval should consider the following:

    a. The project site is deemed to be blighted or distressed and in significant need of renovation or redevelopment, as evidenced by declining property value, several years of high vacancy rates or negative impacts on the surrounding neighborhood; or
    b. The site's proximity to the downtown core and transit availability; or
    c. The site is deemed to have a concentration of households to support the proposed use of the site; or

d. If the project includes a housing component, a goal of 20 % of the units must be affordable to persons at 60% of the area median income or 10% of the units must be affordable to persons at 50% of the area median income; or if a project consists of only market rate units, that a percentage (to be determined by the Council) of the available tax increments is to be used for affordable housing purposes within the City.
e. For projects that do not propose a housing component as part of the project, that 5% of the available tax increments will be utilized for affordable housing purposes within the City.

5. Other projects deemed critical to the long-range economic development of the City, or as identified for transit-oriented redevelopment in the Comprehensive Plan, as determined by the Mayor and City Council.

4. RELOCATION ASSISTANCE

1. Prior to submittal of an application for City TIF assistance, it is the developer's obligation to ensure that appropriate relocation benefits are provided to displaced rental unit tenants whose incomes are at or below the 60% area median income (AMI)

and that have been displaced within the previous 6 months to an application submittal.

2. In order to qualify for the relocation assistance, a tenant must have resided in the unit for a period of 90 days prior to the displacement.

3. For those displaced tenants who do not utilize Housing Choice Vouchers, the relocation assistance amount shall be based upon the monthly difference between the tenant's current monthly rent amount and the maximum monthly gross rents identified by HUD for income levels at or below 50% AMI and number of bedrooms, for a period of 42 months.

4. For those displaced tenants that do utilize Housing Choice vouchers for part of the monthly rent payment, the amount of relocation assistance provided to the tenant would be the difference between the tenant's portion of the current monthly rent payment and any increase in monthly rent that would be the tenant's responsibility, for a period of 42 months.

5. In cases of displaced tenants with special needs, the developer will be obligated to provide additional relocation assistance in an amount to cover the costs of renovating a comparable dwelling unit to accommodate the tenant's needs, with a maximum cap of

$20,000 for renovation costs and no more than $25,000 in aggregate, including rental assistance and moving related costs.

6. The developer will be obligated to pay a fixed cost fee per displaced tenant, based upon the schedule listed below, which is the MnDOT standard.

Residential Moving Expense and Dislocation Allowance Payment Schedule The occupant owns furniture

Rooms	1	2	3	4	5	6	7	8	Each Add'l Room
Amount	$575	$725	$925	$1125	$1325	$1525	$1725	$1925	$275

Residential Moving Expense and Dislocation Allowance Payment Schedule The occupant does not own furniture

Rooms	1	Each Add'l Room
Amount	$450	$100

5. POLICIES

1. To directly link the level of assistance provided to a project to the attainment of the objectives defined above.

2. The level of public assistance provided to a project shall be commensurate with the extent to which the project addresses specific redevelopment, DMC Plan, economic development or housing goals and objectives. Assistance shall be limited to the minimum amount necessary for the successful construction of the project and to address an identified funding gap.

3. To keep the payback period for bonds, loans, abatements, or other forms of assistance to the shortest te1m possible.

4. To structure any assistance in such a manner as to minimize financial risk to the city. Up front bonding will primarily be directed to City owned public infrastructure. All other assistance will be typically done on a "PAYGO" reimbursement basis.

5. To require proposers to provide full disclosure of project information so that the city can assess the need for incentives.

6. To require guarantees and other forms of financial security commensurate with risk incurred by the city.

7. Projects seeking City assistance will be more strongly considered if they meet one of the Sustainable Building Certification Standards as follows :
    a. For commercial projects:
        i. LEED for New Construction and Renovation; Certified Silver, Gold or Platinum.
        ii. State of Minnesota B3 Guidelines; Certified Compliant.
    b. For residential projects:
        i. LEED for New Construction and Renovation; Certified Silver, Gold or Platinum.
        ii. State of Minnesota B3 Guidelines; Certified Compliant.
        iii. Green Star; Certified Silver, Gold or Platinum
        iv. [V. Green Communities; Certified

8. Redevelopment and Economic Development Projects must also meet the standards set forth below:
    a. Predicted and actual energy use and greenhouse gas emissions - meet SB 2030
    b. Energy Standard through design and operation
    c. Predicted and actual use of potable water: 30% below Energy Policy Act of 1992 levels
    d. Predicted and actual use of water for landscaping: 50% reduction from consumption of traditionally irrigated site
    e. Utilization of renewable energy: Evaluation of 2% of on-site renewables; installation if cost-effective using SB 2030 guidance
    f. Electric vehicle charging capability: install conduit that allows charging stations to be installed at a future date
    g. Diversion of construction waste from landfills and incinerators: 75% diversion rate
    h. Indoor Environmental Quality: Low VOC materials includes paints, adhesives, sealants, flooring, carpet as well as ASHRAE thermal and ventilation minimums
    i. Stormwater Management: Quantity and quality requirements, including infiltration rate, suspended solid and phosphorous reductions
    j. Resilient Design: Document a design response to several identified potential shocks such as utility interruption, extreme rainfall and transportation interruption. Design Team shall integrate the identified strategies into the design of the project.
    k. Participate in the City of Rochester's Voluntary Benchmarking Program for a period of three years after construction is completed to report energy and water consumption of the project
    l. Performance standards outlined above must be verified by a third party proposed by the Developer and acceptable to the City of Rochester

6. PERMISSIBLE COSTS

The city may provide financial incentives to cover any cost permitted by regulation or statute. While the city will consider any eligible cost, it reserves the right to participate in only those costs it deems appropriate.

7. PROVISIONS

A. Prior to application submittal for any required City land use / zoning approvals, the Proposers will be required to provide the City with a written notice of intent to seek City assistance and submit project and financial data in sufficient detail to document their need for assistance. Such information may include, but not be limited to, financial statements, project pro-formas, source and use of funds statements, market and feasibility studies and similar documents.

B. Projects must be consistent with the city's comprehensive plan, zoning ordinance and other land use policies. Projects not consistent with such plans, ordinances and policies must obtain land use approvals prior to provision of any financial assistance.

C. Redevelopment Projects should leverage the maximum private investment possible. Each project will be reviewed to determine funding gap and the level of assistance will be based upon that and the public benefits provided by the project. Desired goals of the City are a maximum city funding of no more than ten (10) years of present value tax increments be provided to the project, except that additional tax increments may be provided for eligible expenses that provide public amenities or benefit, as determined by the City. Projects that are provided more than 10 years of TIF will be required to meet one of the Sustainable Building Certification Standards indicated. Not more than 75% of the estimated project tax increments being provided to the developer on an annual reimbursement basis

D. If incentives are to be provided, proposers must submit evidence of private financing satisfactory to the city, or secure the city's costs before the city makes any significant financial commitment to a project

E. In the case of tax increment financing projects, prior to the execution of any assistance agreements, the proposer must complete project plans and provide project financial data in sufficient detail to allow the Olmsted County Assessor to estimate the market value of the project upon completion, and provide evidence satisfactory to the City that private financing is secured

F. The city may require collateralized guarantees, assessment agreements, and other forms of security to protect the public's investment in the project. The amount of security required will be based on the City's assessment of the risk of the project.

G. In evaluating a project, the City may utilize outside legal, financial, real estate, marketing, design and other consultants. Unless waived by the Council, proposers will be required to pay the costs of such consultants.

H. In the case of tax increment projects, proposers must agree to provide documentation of actual allowable costs no less than quarterly during project construction. These costs must be categorized as required by the State of Minnesota "Tax Increment Financing Authority Report".

8. LIMITATIONS

a. Development incentives will not be used to support projects that place extraordinary demands on city services and infrastructure, unless such demand is mitigated as part of the project.

b. Because tax abatement requires an offsetting levy increase, it will be used in very limited instances, primarily used to encourage development or redevelopment of the central business district or DMC Plan boundary area. Tax abatement will not be used for retail or office projects located outside of the central business district. In limited circumstances, the Council may consider the use of tax abatements to assist manufacturing and technology, housing, historic preservation and public infrastructure projects. For manufacturing and technology projects, tax abatements will be considered only if it is not feasible to provide assistance through tax increment financing and then, only when there is an imminent threat of significant job loss, or when there will be a significant increase in new jobs.

c. Where new job creation provides the primary rationale for the granting of development incentives, the city will consider providing assistance to employers paying a living wage, shall consider the number of jobs generated and the wage and benefit levels provided by the Company as factors in determining the amount of assistance for the project. Assistance agreements may include provision for repayment of all or a portion of the assistance granted if, the business fails to either create or maintain the targeted number of jobs at the stated pay level thresholds.

d. For Statutory Housing TIF District projects that typically include housing revenue bonds or other state or federal housing assistance, the following guidelines will be considered:

i. A threshold of no more than $12,000 / dwelling unit or a maximum of 15 years of available tax increments, whichever is less.

ii. Priority for TIF assistance will be given to those housing projects that have been successful in leveraging other sources of funding such as housing tax credits, housing bond funding or other sources,

iii. The City reserves the right to limit the number of housing units assisted annually.

9. PROCESS

a. Prior to submission of a formal application requesting development incentives and land use / zoning approval, the proposer shall meet with staff to discuss the nature of the proposal and its relationship to the City's and or DMC Plan development goals, objectives, and priorities. Procedures and submission requirements will also be reviewed. For projects located within the DMC Development Plan boundary area, the City/ DMC EDA joint staff application submittal and review process will be followed.

b. The proposer shall submit sufficient copies of his / her proposal to the City Administrator for distribution to appropriate officials and staff.

c. Staff will review the proposal and submit a written report to the Council and/or City Economic Development Authority (EDA) outlining its findings. The Council and City EDA may accept the proposal, reject it, or indicate to the proposer those modifications to the proposal necessary for continued consideration.

d. A recommendation to accept the proposal shall include the basic terms and conditions of an agreement to be entered into by the city and the proposer.

e. The terms of the agreement and staff report and recommendation will be presented to the Common Council and/or the City EDA for final action.

10. SUBMISSION OF PROPOSALS

Proposals for development incentives shall include the following information:

a. A completed application form and application fee.

b. Qualifications of the proposer including prior experience with similar projects. Qualifications, where applicable, of principal members of development team, including the architect, construction company, and financial advisor.

c. Financial capability of the proposer to unde1iake the project.

d. Site plans, schematics, and narrative describing the location, type, scope, and size of the project.

e. Identification of all public assistance being sought.

f. Preliminary analysis showing existing taxes, estimated future taxes, and for economic development projects, the number of new jobs created, by wage level.

g. The proposers source and use of funds including any public assistance being requested.

h. A preliminary listing of any approvals, pe1mits, licenses or other authorizations required for the project.

i. A statement identifying the specific public objectives the project will address.

j. A preliminary schedule identifying significant milestone dates leading to the completion of the project.

k. Any other pe11inent data the city may require.

11. APPLICATION INFORMATION

Applicants shall include the information listed in the City or DMCC application form that will be provided. Not all of the information will be needed for every proposal. The applicant will work with city staff to assure all appropriate information is provided.

a. A $5,000 application fee must be attached to the application. This fee is designed to cover a portion of the city's costs associated with evaluating the proposal. If warranted by the complexity of the proposal, additional deposits may be required to cover City out of pocket expenses related to the application process. If the project is determined to be a DMC Plan project, the application filing fee shall be $10,000.

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APPENDIX E: BUILDING ENERGY EFFICIENCY ASSUMPTIONS

This section documents the assumptions used in the calculation of annual energy savings for general buildings as well as simple payback analysis. To calculate measures that were applicable to most buildings, 10 energy saving measures were developed to be applied across six different building types. Buildings surveyed in each community were categorized into different building types. If one building had multiple uses, it was assigned a percentage to each building type (e.g. 50 percent police station and 50 percent city hall). Below are the 6 use types:

- City Hall
- Community / Senior Center
- Fire Department and EMS
- Police Department
- Library
- Public Works Garage

General measures listed below calculated savings as a function of building square footage and use type. Measures were then applied to each building based on an estimate of how much the measure applied to the building. An example is Stoughton Senior Center LED retrofit, which was observed to be about 33 percent complete, so the measure was applied to 67 percent of the building. General engineering judgement was used for how much each measure applied to the building based on use type, square footage, survey, age of building, and other factors. These assumptions

General measures were also applied to buildings not visited. A short survey was sent to communities asking for basic information on the building. Engineering judgement was applied on how much each measure would apply to each building. Below are the questions in the survey sent to each community:

- What percent of rooms have occupancy or vacancy controls?
- Are there CO_2 sensors in conference or meeting rooms to control ventilation rates?
- What is your current lighting mix for this building (LED, CFL/Fluorescent, HID, Incandescent)?
- What's your building primary heating system?
- What's your building primary cooling system?
- How man boilers are there building heat?
- How many air handling units (including rooftop units) does the building have? Do not include furnaces?

Based on the site walkthroughs, several custom energy saving measures were developed to provide more insight on building specific energy measures. The assumptions for those calculations are listed in **Error! Reference source not found.**.

Table 10. Application of general measures to each building

CITY	NAME	LED retrofit % of gsf	Task tuning % of gsf	Occ/vac % of gsf	Daylight % of gsf	Garage % of gsf	Office DCV % of gsf	Assembly DCV % of gsf	Boiler count	AHU count
Fitchburg	City Hall	90%	35%	25%	10%	10%	50%	25%	2	3
Fitchburg	Community Center	66%	35%	25%	10%		10%	40%	2	2
Fitchburg	Library	90%								1
Fitchburg	Maintenance	100%	60%		10%	50%				
Fitchburg	New Fire Station									2
Fitchburg	Police Processing	100%								
Fitchburg	Safety Building / Firehouse 1	100%	10%	10%		50%				
Marshall	Community Library	100%	55%	10%	45%		20%	60%		1
Marshall	Municipal Building	100%	30%	30%			5%	5%		
Marshall	Municipal Garage					100%				
Marshall	Public Safety Building							10%	1	1
Middleton	City Garage	50%				50%			2	3
Middleton	City Hall								2	3
Middleton	EMS Department		50%	25%	25%	30%	20%	20%	1	1
Middleton	Fire Department	100%	50%	25%	25%	20%	20%	20%	2	2
Middleton	Library							30%	3	2
Middleton	Police Department	100%	50%	40%	10%			40%	2	3
Middleton	Senior Center		10%	10%						
Monona	City Hall		20%	10%	10%		10%	10%	2	3
Monona	Community Center	40%	20%	10%	10%				1	
Monona	Library	100%	40%	10%	30%			20%	1	5
Monona	Public Works Garage	100%				10%				
Stoughton	City Hall / Opera House							14%		2
Stoughton	Fire Department	40%	50%	50%		20%		20%		1
Stoughton	Library		20%	10%	10%				2	2
Stoughton	Public Safety	50%	50%	25%	25%	5%	5%	5%	2	5

CITY	NAME	LED retrofit % of gsf	Task tuning % of gsf	Occ/vac % of gsf	Daylight % of gsf	Garage % of gsf	Office DCV % of gsf	Assembly DCV % of gsf	Boiler count	AHU count
Stoughton	Public Works									
Stoughton	Stoughton Chamber Of Commerce	100%	50%	25%	25%					5
Stoughton	Stoughton EMS	50%	20%	10%	10%		10%	10%		
Stoughton	Stoughton Senior Center	67%	25%	25%		10%		20%	2	1
Stoughton	Youth Center	50%	50%	25%	25%					
Sun Prairie	City Hall	100%	35%	25%	10%			10%		
Sun Prairie	EMS East	100%	50%	25%	25%	10%	5%	5%		2
Sun Prairie	Fire Department	50%	20%	10%	10%	10%	10%	10%		5
Sun Prairie	Library	80%	20%	10%	10%			10%	3	14
Sun Prairie	Museum									
Sun Prairie	Public Works	100%	20%	20%		50%				3
Sun Prairie	Westside Community Building	100%						20%	2	3
Waunakee	Liftstation									
Waunakee	Police Department	100%	50%	40%	10%			20%		5
Waunakee	Public Works	100%	10%	10%						0.2

Table 11: Building efficiency assumptions

Measure Name	Input	Assumption	Source
LED Lighting Retrofit - Interior	Building Lighting Power Density (LPD)	Assuming a pre-measure LPD that matches 2009 energy code baselines for each building type. Assumed Public Works buildings' LPD is the average value of Parking Garage and Warehouse categories.	IECC 2009 Table 505.5.2
	Community/Senior Center Lighting Power Density (LPD)	Assuming an LPD that is based on a 2018 energy code baseline for a school with an uprate to make corridors suitable for the visually impaired. This 2018 LPD was converted to a 2009 equivalent using the average 2009 and 2018 LPDs.	IECC 2018 Table C405.3.2(1), IECC 2009 Table 505.5.2
	Hours of Use	Assuming "Town Hall" hours of use for our City Hall calculations, "Library" hours of use for Community/Senior Center and Library, "Auto Related" for Public Works, an average of "Police/Fire Stations (24 hr)" and "Fire Station (unmanned)" for Fire Station and EMS, an average of "Police/Fire Stations (24 hr)" and "Office (General Office Types)" for Police Department.	New York Standard Approach for Estimating Energy Savings from Energy Efficiency Programs, Version 7, p437, "Operating Hours"
	Wattage reduction potential	A percent reduction in lighting power was found based on the Wisconsin Focus on Energy 2019 TRM weighted average 4-foot T8 fluorescents wattage and DLC listed 4-foot LEDs wattage.	Wisconsin Focus on Energy 2019 TRM, p521, "Annual Energy-Savings Algorithm"
	Natural gas negative savings	A natural gas therms negative savings per kWh of lighting energy savings was found using an average ratio from DOE-2	

Measure Name	Input	Assumption	Source
		energy models for libraries and offices.	
	Cost per lamp	Assumed $14.11 per lamp replacement with an LED.	Wisconsin Focus on Energy 2019 TRM, p520, "Measure Details," "Incremental Cost"
LED Lighting Retrofit – Exit Signs	Energy savings per sign	Assumed electricity savings according to a baseline “default” exit sign wattage (a weighted average of CFL and incandescent exit signs) and an Energy Star v2.0 rated LED exit sign.	Wisconsin Focus on Energy 2019 TRM, p617, "Annual and Lifecycle Savings for LED Exit Signs," "Default"
	Cost per sign	Assumed $16.24 per replacement with LED exit sign.	Wisconsin Focus on Energy 2019 TRM, p616, "Measure Details," "Incremental Cost"
LED Lighting Retrofit – Task Tuning	Energy savings per square foot	Assumed energy savings associated with 100% dimmable fixtures with 3,500 hours of use per year. Used a lowered LPD resulting from Measure 1.	MN CARD Final Report. "Adjusting lighting levels in commercial buildings: Energy savings from institutional tuning." 2015. p2.
	Cost per square foot	Assumed an incremental cost associated with a dimmable system, with no equipment costs but time and labor costs.	MN CARD Final Report. "Adjusting lighting levels in commercial buildings: Energy savings from institutional tuning." 2015. p3.
Lighting Controls – occupancy/vacancy	Energy savings per watt	Used the savings factor from the Wisconsin TRM.	Wisconsin Focus on Energy 2019 TRM, p366, "Annual Energy-Savings Algorithm"
	Hours of operation	Used the hours of operation from the Wisconsin TRM for School & Government.	Wisconsin Focus on Energy 2019 TRM, p366, "Hours of Use by Sector," "Schools & Government"
	Cost per square foot	Assumed a weighted average LED fixture wattage and calculated cost per square foot	Wisconsin Focus on Energy 2019 TRM, p616, "Measure Details," "Incremental Cost,"

Measure Name	Input	Assumption	Source
		using the Wisconsin TRM incremental cost per fixture and lowered LPD resulting from Measure 1.	Wisconsin Focus on Energy 2019 TRM, p521, "Annual Energy-Savings Algorithm"
Lighting Controls – Daylighting	Energy savings per watt of lighting	Used an annual savings from the Wisconsin TRM for schools & Government that assumes hours of operation of 3239 and a savings factor of 0.64.	Wisconsin Focus on Energy 2019 TRM, p352, "Annual Savings per Watt of Lighting Controlled by Daylighting Controls," "Schools & Gov"
	Cost per square foot	Assumed a weighted average LED fixture wattage and calculated cost per square foot using the Wisconsin TRM incremental cost per fixture and lowered LPD resulting from Measure 1.	Wisconsin Focus on Energy 2019 TRM, p350, "Measure Details," "Incremental cost," Wisconsin Focus on Energy 2019 TRM, p521, "Annual Energy-Savings Algorithm"
Lighting Controls – Garage	Garage Lighting Power Density (LPD)	Assumed a garage LPD that matches 2000 energy code baseline.	IECC 2000 Table 805.4.2
	Energy savings percentage (recommendation)	Used a suggested energy savings of 30% which can be achieved by a 50% reduction in 5 minutes or 90% reduction in 15 minutes.	The Brewery Parking Structure: Performance of an LED Lighting System in a Parking Application, Page 23, 30-32. Energy Center of Wisconsin.
	Cost per square foot	Assumed a weighted average LED fixture wattage and calculated cost per square foot using the Wisconsin TRM incremental cost per fixture and Garage LPD from 2000 energy code.	Wisconsin Focus on Energy 2019 TRM, p616, "Measure Details," "Incremental Cost," Wisconsin Focus on Energy 2019 TRM, p521, "Annual Energy-Savings Algorithm"
DCV – office space	Outside airflow per square foot	Used DOE-2 energy models to determine a typical CFM/person and sf/person for a small office. These values were divided to arrive at a CFM/sf value.	
	Equipment EER	Assumed a code baseline EER of 11.	IECC 2009 Table 503.2.3(1) “Standard AC Unit > 65 and < 135 kBtu/h”

Measure Name	Input	Assumption	Source
	Heating equipment efficiency	Assumed a heating efficiency of 83%.	IECC 2009 Table 503.2.3(4) “Warm air furnaces, gas fired”
	Daily operating hours	Assumed 12 hours for city halls, community/senior centers, and libraries. Assumed 10 hours for public works buildings. Assumed 24 hours for fire department and EMS and police department.	Based on typical hours from building site visits.
	Electricity savings per square foot	Assumed an enthalpy difference between outside and return air, equivalent full-load cooling hours, savings factor, and daily cooling hours based on the WI TRM values for an office.	Wisconsin Focus on Energy 2019 TRM, p184, "Annual Energy-Savings Algorithm", Wisconsin Focus on Energy 2019 TRM, p185, "Cooling and Heating Savings Factors and Equivalent Full-Load Hours by Building Type", "Office;" "Enthalpies, HDD, and Incremental Costs"
	Natural gas savings per square foot	Used a weighted Wisconsin average heating degree days and savings factor from the Wisconsin TRM for an office.	Wisconsin Focus on Energy 2019 TRM, p184, "Annual Energy-Savings Algorithm" Wisconsin Focus on Energy 2019 TRM, p185, "Enthalpies, HDD, and Incremental Costs" And "Cooling and Heating Savings Factors and Equivalent Full-Load Hours by Building Type", "Office"
	Cost per square foot	Used the Wisconsin TRM cost per CFM and outside airflow per square foot to calculate a cost per square foot.	Wisconsin Focus on Energy 2019 TRM, p183, "Demand Control Ventilation for Air Handling Units", "Incremental Cost"
DCV – assembly space	Outside airflow per square foot	Used DOE-2 energy models to determine a typical CFM/person and sf/person for a small office.	Based on typical hours from building site visits.

Measure Name	Input	Assumption	Source
		These values were divided to arrive at a CFM/sf value.	
	Equipment EER	Assumed a code baseline EER of 11.	IECC 2009 Table 503.2.3(1) “Standard AC Unit > 65 and < 135 kBtu/h”
	Heating equipment efficiency	Assumed a heating efficiency of 83%.	IECC 2009 Table 503.2.3(4) “Warm air furnaces, gas fired”
	Daily operating hours	Assumed 12 hours for city halls, community/senior centers, and libraries. Assumed 10 hours for public works buildings. Assumed 24 hours for fire department and EMS and police department.	Based on typical hours from building site visits.
	Electricity savings per square foot	Assumed an enthalpy difference between outside and return air, equivalent full-load cooling hours, savings factor, and daily cooling hours based on the WI TRM values for an office.	Wisconsin Focus on Energy 2019 TRM, p184, "Annual Energy-Savings Algorithm", Wisconsin Focus on Energy 2019 TRM, p185, "Cooling and Heating Savings Factors and Equivalent Full-Load Hours by Building Type", "Public Assembly;" "Enthalpies, HDD, and Incremental Costs"
	Natural gas savings per square foot	Used a weighted Wisconsin average heating degree days and savings factor from the Wisconsin TRM for an office.	Wisconsin Focus on Energy 2019 TRM, p184, "Annual Energy-Savings Algorithm" Wisconsin Focus on Energy 2019 TRM, p185, "Enthalpies, HDD, and Incremental Costs" And "Cooling and Heating Savings Factors and Equivalent Full-Load Hours by Building Type", "Public Assembly"
	Cost per square foot	Used the Wisconsin TRM cost per CFM and outside airflow per	Wisconsin Focus on Energy 2019 TRM, p183, "Demand Control

Measure Name	Input	Assumption	Source
		square foot to calculate a cost per square foot.	Ventilation for Air Handling Units", "Incremental Cost"
Boiler reset	Natural gas therm savings	Used the Wisconsin TRM savings factor to calculate a percent natural gas savings.	Wisconsin Focus on Energy 2019 TRM, p55, "Annual Energy-Savings Algorithm"
	Cost per boiler	Used the Wisconsin TRM incremental cost per set of controls.	Wisconsin Focus on Energy 2019 TRM, p54, "Boiler Control, Outside Air Temperature Reset/Cutout Control"
HVAC AHU reset	Electricity savings per square foot	Assumed electricity savings equal to the average kWh savings per square foot found in 6 education and public assembly buildings om Illinois.	
	Natural gas savings per square foot	Assumed natural gas savings equal to the average kWh savings per square foot found in 6 education and public assembly buildings om Illinois.	
	Cost per unit	Used the Wisconsin TRM incremental cost for implementing or optimizing a supply air temperature reset to an existing system.	Wisconsin Focus on Energy 2019 TRM, p319, "Supply Air Temperature Reset."
Custom Measure Marshall Library - Radiant Floor	Electricity and Natural Gas savings	Built a simple energy model based on building square footage, age of building and site walkthrough. Modeled inefficiencies of overheating building in morning warm-up to simulate overheating radiant slab floor and account for additional cooling to bring building back into setpoint.	
Custom Measure – Marshall Municipal Garage	Electricity Savings	Estimated energy use of a 1978 refrigerator as baseline annual energy consumption versus an	American Council for an Energy-Efficient Economy. “How your refrigerator has kept its

Measure Name	Input	Assumption	Source
		energy star rated refrigerator, top freezer, no ice maker.	cool over 40 years of efficiency." https://aceee.org/blog/2014/09/how-your-refrigerator-has-kept-its-co Department of Energy. ENERGY STAR Appliance Calculator. Link
	Cost per Unit	Average of the three similar refrigerators, 7 cu. ft., top freezer, no ice maker, on google shopping.	
Custom Measure – Middleton EMS Department Uninsulated Tank	Gas Energy Savings	Calculation of heat loss through a large 30" diameter pipe versus the same pipe with 1" insulation less heating required to garage through existing garage infrared heaters	
	Cost per Unit	Based on pricing listed by Armacell AP Armaflex Sheet Insulation, 36"x48"x1". Labor cost based on RS Means cost data adjusted to present day value.	Armacell. AP Armaflex Price List 1/2019. http://www.armacell.us/fileadmin/user_upload/Price_Lists/PL_APArmaFlex.EN.US.2019.pdf RS Means Mechanical Cost Data, 2010. Section 23 07 16, HVAC equipment Thermal Insulation.
Custom Measure - Middleton Senior Center RTU Retrofit	Electric and Gas Energy Savings	Custom energy model modeled with baseline individual furnaces and AC System (9.8 EER) with no economizer and no DCV. Proposed model included high efficiency packaged VAV (11 EER) with Hot Water Reheat, air-side economizer, and DCV.	
Custom Measure - Monona	Electric and Gas Energy Savings	Custom model comparing energy impact of changing north	Vitro Architectural Glass. Construct IGU.

Measure Name	Input	Assumption	Source
Community Center – Event Space Window Replacement		windows from single pane to double pane windows. Single pane window performance estimated based on Vitro Glass calculator. Double pane window performance estimated based on DOE window library for low-e double pane window with aluminum metal frames.	http://construct.vitroglazings.com/ DOE-2 Glass Library, eQuest.
	Cost per Unit	Estimated cost for replacing double pane window.	Modernize. "How Much Do Double Paned Windows Cost". https://modernize.com/windows/energy-efficient/double-pane-windows
Custom Measure – Monona Community Center – Event Space Window Replacement	Electric and Gas Energy Savings	Custom energy model based on site survey of existing lighting fixtures. Applied a savings factor for advanced lighting occupancy sensors.	
	Cost	Refer to Measure 1 and Measure 4	
Custom Measure – Stoughton Opera House – Seating Area Lighting	Electric and Gas Energy Savings	Custom energy model based on site survey of existing lighting fixtures and replacing with LED fixtures.	
	Cost	Refer to Measure 1	
Custom Measure – Stoughton Opera House – Stage Lighting	Electric and Gas Energy Savings, and Cost	Email communication with ETC in Middleton. Measure lists savings and costs for replacing 10 incandescent fixtures.	ETC Midwest 3031 Pleasant View Rd PO Box 620979 Middleton, WI 53562-0979 https://www.etcconnect.com/
Custom Measure – Waunakee Library Lighting	Electric and Gas Energy Savings	Custom energy model based on a major renovation LED lighting layout with occupancy lighting controls.	
	Cost	Refer to Measure 1 and Measure 4	

Measure Name	Input	Assumption	Source
Custom Measure Waunakee Library A/C replacement	Electric savings	Custom energy model based on a improving from existing A/C unit to a new 18 SEER A/C unit.	
	Cost	Cost to upgrade to CEE Tier 2 Unit	Northeast Energy Efficiency Partnerships. Incremental Cost Study-Phase 3, Unitary AC Analysis. https://neep.org/incremental-cost-study-phase-3

APPENDIX F: DETAILED SOLAR ANALYSIS BY COMMUNITY

PROCESS OVERVIEW

All communities in the collaboration had invested in at least one solar photovoltaic system, either installed or planned, and all indicated an interest in adding additional on-site solar arrays to generate electricity for municipal operations. To facilitate this process, Slipstream conducted a survey of many of the facilities that were owned by each municipality to identify potential opportunities to site a solar array at that location.

1. Solar panels have estimated useful lifetimes of up to 30 years (though inverters may need to be replaced sooner). While it is possible to relocate existing panels in the future, it is recommended that solar arrays be located at sites where the owner expects they can remain for an extended timeframe. For this reason, facilities that were expected to be replaced or redeveloped in the foreseeable future were not considered.
2. Utility rate structures generally require, or provide better terms for, distributed renewable energy systems (including municipally owned solar arrays) that are located at electricity-consuming facilities and that are sized and configured to serve the energy demand of the host facility. To find opportunities to align solar arrays with municipal energy use, Slipstream reviewed levels of electricity use at each municipally-owned facility and identified which locations currently consume significant amounts of electricity. All municipal buildings were reviewed, as well as sites with water-pumping equipment.
3. Solar arrays generate the most electricity and offer the best return on investment (ROI) when they are oriented toward the south and receive unobstructed sunlight throughout the day. To identify high-potential sites, Slipstream used satellite imagery from Google Maps and Project

Sunroof to review each location.[3,4] The review ruled-out sites at which trees or neighboring buildings would compromise the electricity production of the array. It also ruled-out buildings with roof layouts, including both orientation and roof-mounted equipment, that would unduly limit the solar production at the site.

4. On the remaining locations, Slipstream used Project Sunroof to conduct an initial survey of the available roof, or ground, space at each location for installing a solar array.
5. Based on the available space, Slipstream applied standard assumptions regarding solar array capacity per square foot of available space. Initial estimates assumed that 75 percent of available roof space could be used for an array, as well as that the installation would use optimally-sited, fixed mount panels with dimensions of three feet by five feet. The estimate further assumed that the panels would be oriented due south and, in order to minimize maintenance requirements, would be fixed-mount arrays, rather than tilting or tracking systems. Additional assumptions for array configurations included tile of 20 degrees, a DC:AC ratio of 1.2, inverter efficiency of 96 percent, and a ground coverage ratio of 0.4.
6. Based on potential array capacity, the National Renewable Energy Laboratory's (NREL's) PV Watts tool was used to conduct an initial estimate of the annual solar electricity production potential for the site. [5]
7. Slipstream generated high-level cost estimates for the potential projects by using market data to calculate that the average installed cost of commercial scale PV systems in Dane County is $1.95 per watt.[6] It is important to note that actual costs for each project will depend on the specific characteristics of the project and of the site. Potential project rebate amounts were also estimated based on the rebate program (WPPI vs. Focus on Energy RECIP) that would apply to the project in order to arrive at an estimated net cost and annual production estimate for each site.

Slipstream presented findings from the opportunity identification process to the municipalities, each of which selected up to four sites for further opportunity analysis. The municipalities selected potential sites based on current electricity consumption, renewable energy generation potential, community relations, and future plans for each building. Slipstream used the Site Review Process described below for this step in the review. The findings from the analysis were intended to assist each community in prioritizing sites and allocating funds in future capital budgets. To further develop these projects, the municipalities must obtain proposals from installation contractors, select a contractor, and work with the contractor to define an actual scope of work and project cost.

SITE REVIEW PROCESS

1. Slipstream used satellite imagery from Google Maps to identify a potential layout for each array. Using the measurement tools available, Slipstream mapped and measured the locations for the panels within each array.

[3] Google LLC. (2019). Google Maps. Retrieved from https://www.google.com/maps/
[4] Google LLC. (2019). Google Project Sunroof. Retrieved from https://www.google.com/get/sunroof
[5] National Renewable Energy Laboratory. (2019). NREL PVWatts Calculator. Retrieved from https://pvwatts.nrel.gov/
[6] Average based on reviewed PV project proposals and on email from Sam Dunaiski (RENEW Wisconsin)

2. For each identified space, Slipstream calculated the number of standard PV panels that could be configured within it and the corresponding DC capacity of those panels.
3. NREL's System Advisor Model (SAM) enables users to create a detailed model of solar arrays at a specific geographic location and estimates the electricity production of those arrays. This analysis is considered to be significantly more accurate than the output of the PV Watts tool. Slipstream used SAM to refine production estimates for the selected opportunities.
    a. Revisions to potential array configurations were made for those sites that were found to have the potential to produce more electricity than the facility consumed during the 12-month review period (calendar year 2018, unless otherwise noted). When needed, the revisions also reduced the proposed array sizes to align estimated production with past consumption. By aligning production and consumption, municipalities may avoid over-production, which is either prohibited or disincentivized by each of the electric utilities serving the communities.
4. Slipstream estimated the financial performance of each system by comparing the initial net cost of the system (total cost less estimated rebates) to the value of the electricity to be produced by the system during its first year of operation and throughout its thirty-year lifetime.
    a. To streamline the analysis, Slipstream assumed a value of solar electricity of $0.11/kWh, as well as a discount rate of two percent, with no anticipated increases in the cost of electricity, and annual system degradation of 0.50 percent.

A note on the cost per kWh

The $0.11/kWh value is based on average total costs per kilowatt hour of electricity consumed in Wisconsin per EIA data (see Appendix A: Cost and Emissions Assumptions). Electricity costs for municipalities depend on the terms of the utility rate for a given facility, as well as on the amount of electricity consumed and the pattern of consumption. Commercial electric rates vary between electric providers and generally include certain fixed charges, demand charges (based on maximum electric demand during a 15-minute period), and total consumption. Net metered solar PV systems directly reduce total billed consumption for a building and may have limited impact on demand charges, but will not affect fixed charges. The actual value of electricity produced will depend on the terms of the applicable utility rate, as well as on the amount and pattern of consumption at a building.

FITCHBURG

Fitchburg Community Building -5510 Lacy Road	
Array configuration	Flush-mounted system covering four southeast-facing sections of the building's roof.
Recommended PV capacity (limiting factor)	37.2 KW DC
Total System Cost (est.)	$72,575
RECIP rebate amount (est.)	$10,886
Net system cost (est.)	$61,689
Year 1 electricity production (est.)	46,131 kWh
Value of Year 1 electricity production (est.)	$5,074.41
Electricity production/KW capacity (est.)	1240 kWh
Current electricity consumption	167,400 kWh
Electric reduction (est.)	28 %

Fire Station -5791 Lacy Road	
Array configuration	Racked roof-mounted system, with 20 degree south-facing tilt.
Recommended PV capacity (limiting factor)	65.1 kW DC
Total System Cost (est.)	$127,005
RECIP rebate amount (est.)	$19,051
Net system cost (est.)	$107,954
Year 1 electricity production (est.)	92,315 kWh
Value of Year 1 electricity production (est.)	$10,154.65
Electricity production/KW capacity (est.)	1,418 kWh
Current electricity consumption	139,600 kWh
Electric reduction (est.)	66%

Well #5 - 6042 McKee Road	
Array configuration	Racked roof-mounted system, with 20 degree south-facing tilt.
Recommended PV capacity (limiting factor)	23.26 kW DC
Total System Cost (est.)	$45,359
RECIP rebate amount (est.)	$6,804
Net system cost (est.)	$38,555
Year 1 electricity production (est.)	31,501 kWh
Value of Year 1 electricity production (est.)	$3,465.11
Electricity production/KW capacity (est.)	1,354 kWh
Current electricity consumption	584,164 kWh
Electric reduction (est.)	5%

Well #10 - 2689 Granite Circle	
Array configuration	Racked ground-mounted system, with 20 degree south-facing tilt.
Recommended PV capacity (limiting factor)	66.9 kW DC
Total System Cost (est.)	$130,634

RECIP rebate amount (est.)	$19,595
Net system cost (est.)	$111,039
Year 1 electricity production (est.)	94,532 kWh
Value of Year 1 electricity production (est.)	$10,398.52
Electricity production/KW capacity (est.)	1,413 kWh
Current electricity consumption	249,014 kWh
Electric reduction (est.)	38%

MARSHALL

Marshall Wastewater Treatment Plant - 616 West Karem Drive	
Array configuration	Ground-mounted, racked, fixed-tilt panels
Recommended PV capacity	290.3 kW DC
Total System Cost (est.)	$566,083
RECIP rebate amount (est.)	$84,912
Net system cost (est.)	$481,171
Year 1 electricity production (est.)	403,981 kWh
Value of Year 1 electricity production (est.)	$44,437.91
Electricity production/KW capacity (est.)	1,392 kWh
Current electricity consumption (limiting factor)	409,929 kWh
Electric reduction (est.)	99%

Community Library -605 Waterloo Road.	
Array configuration	Racked, fixed-tilt, roof-mounted array
Recommended PV capacity (limiting factor)	46.5 kW DC
Total System Cost (est.)	$90,718
RECIP rebate amount (est.)	$13,608
Net system cost (est.)	$77,110
Year 1 electricity production (est.)	64,654
Value of Year 1 electricity production (est.)	$7,111.94
Electricity production/KW capacity (est.)	1,390 kWh
Current electricity consumption	69,400 kWh
Electric reduction (est.)	93%

MIDDLETON

Pleasant View Golf Course Clubhouse - 1322 Pleasant View Rd.	
Array configuration	Flush-mounted system covering five sections of the building's roof.
Recommended PV capacity (limiting factor)	31.6 KW DC (viable roof space)
Total System Cost (est.)	$63,200
RECIP rebate amount (est.)	$9,480
Net system cost (est.)	$53,720
Year 1 electricity production (est.)	40,193 kWh
Value of Year 1 electricity production (est.)	$4,421.23
Electricity production/KW capacity (est.)	1,270 kWh
Current electricity consumption	100,752 kWh*
Electric reduction (est.)	40% *

Municipal Well #6 – 8490 Greenway Blvd.	
Array configuration	Ground-mounted or pole-mounted PV array, configured as two rows of two-deep panels.
Recommended PV capacity (limiting factor)	24.8 KW DC (available space)
Total System Cost (est.)	$45,088
RECIP rebate amount (est.)	$6,763
Net system cost (est.)	$38,325
Year 1 electricity production (est.)	31,509 kWh
Value of Year 1 electricity production (est.)	$3,465.99
Electricity production/KW capacity (est.)	1,270 kWh
Current electricity consumption	278,746 kWh
Electric reduction (est.)	14%

Municipal Well #8 – 3222 West Point Rd.	
Array configuration	Four ground-mounted or pole-mounted PV sub-arrays, configured as rows of two-deep panels.
Recommended PV capacity (limiting factor)	80.6 KW DC (available space)
Total System Cost (est.)	$146,500
RECIP rebate amount (est.)	$21,975
Net system cost (est.)	$124,525
Year 1 electricity production (est.)	110,649 kWh
Value of Year 1 electricity production (est.)	$12,171.39
Electricity production/KW capacity (est.)	1,372 kWh
Current electricity consumption	218,916 kWh
Electric reduction (est.)	51%

STOUGHTON

Stoughton Fire Station -401 E Main St.	
Array configuration	Roof-mounted array with two sections of racked, fixed-tilt panels and two sections of flush-mounted panels.
Recommended PV capacity	98.6 kW DC
Total System Cost (est.)	$192,323
RECIP rebate amount (est.)	$76,929
Net system cost (est.)	$115,394
Year 1 electricity production (est.)	119,704 kWh
Value of Year 1 electricity production (est.)	$13,167.44
Electricity production/KW capacity (est.)	1,214 kWh
Current electricity consumption (limiting factor)	126,517 kWh
Electric reduction (est.)	95%

Stoughton WWTP - 700 Mandt Parkway	
Array configuration	Roof-mounted array with four sections of racked, fixed-tilt panels oriented to accommodate existing roof penetrations.
Recommended PV capacity	24.5 kW DC
Total System Cost (est.)	$47,779
RECIP rebate amount (est.)	$19,112
Net system cost (est.)	$28,667
Year 1 electricity production (est.)	33,942 kWh
Value of Year 1 electricity production (est.)	$3,733.62
Electricity production/KW capacity (est.)	1,385 kWh
Current electricity consumption (limiting factor)	735,329 kWh
Electric reduction (est.)	5%

Stoughton Library - 304 S 4th Street	
Array configuration	Roof-mounted array with two sections of racked, fixed-tilt panels oriented to accommodate existing roof penetrations.
Recommended PV capacity	19.5 kW DC
Total System Cost (est.)	$38,101
RECIP rebate amount (est.)	$15,240
Net system cost (est.)	$22,861
Year 1 electricity production (est.)	27,338 kWh
Value of Year 1 electricity production (est.)	$3,007.18
Electricity production/KW capacity (est.)	1,402 kWh
Current electricity consumption (limiting factor)	171,240 kWh
Electric reduction (est.)	16%

SUN PRAIRIE

Sun Prairie Library -1350 Linnerud Drive	
Array configuration	Ground-mounted, fixed-tilt, racked solar array in two sections.
Recommended PV capacity	338.7 kW DC
Total System Cost (est.)	$660,432
WPPI rebate amount (est.)	$125,000
Net system cost (est.)	$535,432
Year 1 electricity production (est.)	469,394 kWh
Value of Year 1 electricity production (est.)	$51,633.34
Electricity production/KW capacity (est.)	1,386 kWh
Current electricity consumption (limiting factor)	479,680 kWh
Electric reduction (est.)	98%

Sun Prairie WWTP - 3040 Bailey Road	
Array configuration	Roof-mounted arrays on the east-west faces of two buildings and a racked, ground-mounted array, divided into three segments in order to accommodate existing roads and walkways.
Recommended PV capacity (limiting factor)	937.9 kW DC
Total System Cost (est.)	$1,828,887
WPPI rebate amount (est.)	$125,000
Net system cost (est.)	$1,703,887
Year 1 electricity production (est.)	1,230,117 kWh
Value of Year 1 electricity production (est.)	$135,312.87
Electricity production/KW capacity (est.)	1,312 kWh
Current electricity consumption	2,648,344 kWh
Electric reduction (est.)	46%[7]

[7] The WWTP is undergoing renovations which may increase energy efficiency and decrease consumption. If so, the system may be able to supply a higher percentage of the building's electricity.

WAUNAKEE

Waunakee Village Center - 333 S Madison St	
Array configuration	Roof-mounted array with eight sections of flush-mounted panels on the east and west portions of the building's roof.
Recommended PV capacity	74.4 kW DC
Total System Cost (est.)	$145,150
RECIP rebate amount (est.)	$58,060
Net system cost (est.)	$87,090
Year 1 electricity production (est.)	85,533 kWh
Value of Year 1 electricity production (est.)	$9,408.63
Electricity production/KW capacity (est.)	1,150 kWh
Current electricity consumption (limiting factor)	524,160 kWh
Electric reduction (est.)	16%

Waunakee Public Works building - 504 Moravian Valley Road	
Array configuration	Roof-mounted, fixed-tilt, racked array.
Recommended PV capacity	43.4 kW DC
Total System Cost (est.)	$84,671
RECIP rebate amount (est.)	$33,868
Net system cost (est.)	$50,803
Year 1 electricity production (est.)	60,610 kWh
Value of Year 1 electricity production (est.)	$6,667.10
Electricity production/KW capacity (est.)	1,397 kWh
Current electricity consumption (limiting factor)	60,610 kWh
Electric reduction (est.)	99%