BEACON
INTEGRATED SOLUTIONS

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Memo

To: Beth Fenstermacher

Cc: Tina Waterman

From: Beth Greenblatt

Date: March 30, 2020

Re: Solar photovoltaic project update

Beacon Integrated Solutions ("Beacon") is pleased to provide this summary update and analysis in connection with the Request for Proposals ("RFP") issued for solar photovoltaic systems at the City's capped Landfill, Hall Street Wastewater Treatment Facility and Water Treatment Plant.

Background:

The RFP required Respondents to provide pricing proposals for fully net metered stand-alone systems at each or any of the City's three locations. The City received comprehensive proposals from four (4) qualified firms each providing proposals for systems as required in the RFP.

Of the four firms, only two firms offered proposals that provided favorable economic benefits to the City. Given the State's statutory limit on the total size of the facilities to be no greater than 1 megawatt AC, the combination of the lease, PILOT and energy benefits for two of the four firms resulted in the payments for solar generation exceeding the benefits received from Unitil over the life of the systems.

Two of the firms, ReVision Energy and PS Renewables provided Alternative proposals addressing a different strategy relating to either the approach to interconnection to Unitil or the capacity delivered to Unitil, both compliant with State law. These Alternative proposals offered financial benefits to the City from a combination of lease and PILOT payments, and financial credits from net metering.

As the City is aware, while legislative initiatives expanding the Net Metering Program have not yet resulted in a change of law or regulation, current activity from both the legislature and the Governor's office support a possible improvement in the Net Metering Program and in Group Net Metering. Given the potential for such improvement, the Committee has taken a position that the City should realize improved financial and environmental options by postponing an award for large-scale solar development at the Landfill and the Hall Street Wastewater Treatment Facility. Accordingly, the Committee recommends that the City re-issue the RFP when legislation is signed into law increasing the net metering cap beyond 1 megawatt AC.

Notwithstanding, the Committee tasked Beacon to evaluate whether the Alternative proposal offered by ReVision Enegy to construct a small behind-the-meter solar photovoltaic array in the front part of the parcel at the Hall Street Wastewater Treatment Facility provided favorable long-term economic benefits to the City. The balance of this summary addresses that analysis.

Behind-the-Meter Configuration:

A behind-the-meter configuration serves to reduce the actual electricity needed to be purchased and delivered by the Grid to the building. In essence, a behind-the-meter installation "spins the meter backwards" and allows the generation from the solar array to be utilized in the building.

Under the Net Metering Program statute and regulations, a utility billing meter that supports generation from renewable sources, and which seeks compensation under the Net Metering Program, must be served under the utility's Default Service Energy supply. Since the Hall Street Wastewater Treatment Facility is served by Unitil on their G-1 rate tariff, the Default Service energy rate for that tariff is a monthly variable rate that is generally market reflective. Therefore, all electricity delivered by Unitil and not offset by the solar array would be charged at the Unitil monthly variable Default Service energy rate for the entire period the City receives benefits under the Net Metering Program.

As the City is aware, solar photovoltaic systems are intermittent electricity resources and operate when the sun is available. Therefore, the City would be required to purchase variably priced electricity from Unitil during non-sunny days, during the evening and when the solar array is covered by snow. Because New England is so dependent on natural gas supply for electric generation, pricing for electricity supply in the winter is more expensive than pricing in the summer months since natural gas is more expensive in the winter months. And, since solar photovoltaic systems in New England generate the least amount of electricity during the winter months, the City will be exposed to more pricing volatility and uncertainty at one of the largest electricity consumers in the City's portfolio.

Further, for safety, protection and control reasons, Unitil requires that any renewable generating system sized at 500 kilowatts AC (0.5 megawatts AC) or greater must include a Recloser on the utility side of the meter. A Reclosure is a protection device that allows Unitil to in effect de-energize the solar array in the event of an emergency or planned outage. If a renewable system is interconnected behind-the-meter and a Recloser is opened by the utility, both the solar array and the building will be taken offline. This presents a huge operational risk to the Hall Street Wastewater Treatment Facility.

The Committee has identified two strategies to minimize the above risks to the City, while simultaneously consider integrating solar photovoltaic systems into the "supply mix" for the Hall Street Wastewater Treatment Facility.

Such strategies include:

- Optimize the size of the solar array to avoid the requirement of the Recloser.
- Optimize the size of the solar array and limit the amount of excess generation exported to Unitil.
    - Under this strategy, the solar array would not participate in the Net Metering Program and would instead be considered a Qualified Facility ("QF"), or wholesale generator.
    - As a QF, the Hall Street Wastewater Treatment Facility would not need to return to Unitil Default Service and instead can remain on competitive electricity supply which on average currently offers a financially advantage to the City. Moreover,

procurement of competitive supply allows the City to hedge the market and limit market volatility exposure as the City customarily does for all of its energy commodities.

- While the net metering credit rate is equal to the Default Service supply retail rate, the QF rate is a wholesale rate and therefore much lower. By limiting the amount of export, there are fewer kilowatt-hours credited at a lower rate than the price paid to the third-party solar firm to generate those kilowatt-hours.

To more accurately determine the financial benefits of an optimized behind-the-meter solar photovoltaic installation at the Hall Street Wastewater Treatment Facility, it will be critical to evaluate the hourly electricity consumption of the Hall Street Wastewater Treatment Facility and model it against hourly solar generation from varying sized systems. Beacon conducted a higher-level analysis which should serve as a conservative proxy for the City's consideration.

Assumptions:

The table below presents assumptions Beacon used in the analysis. As noted, the electricity supply rate reflects an average of contracted supply rates for future periods with a third-party supplier. Specifically, the supply rate is the average of six months of the current supply rate of $0.0712/kWh and six months of the recently contracted rate of $0.0614/kWh. Beacon notes that both the current and future supply contracts are for 100% Green-e energy supply.

Further, Beacon calculated the Lease and PILOT payment amounts offered by ReVision Energy in their Alternative proposal using the per kilowatt rate offered and used a conservative average QF rate of $0.03/kWh. Finally, we relied on the Power Purchase Rate offered by ReVision Energy in their Alternative proposal submission. We note that the ReVision Energy Power Purchase Rate will likely change to reflect impacts associated with a reduction in project size (lost economies of scale) and reduction in the Federal Investment Tax Rate from 30% (2019 rate) to 26% (2020 rate).

BEACON ASSUMPTIONS			
RATE ASSUMPTIONS			
Electricity Supply Rate	$0.0663	0.00%	G-1
Lease Payment-First Year	$750	2.00%	20
PILOT Payment-First Year	$750	2.00%	20
Avoided Cost Rate	$0.0999	1.00%	20
QF Credit Rate	$0.0300	1.00%	20
Solar Firm Power Purchase Rate	$0.0790	2.00%	20
PROJECT DETAIL ASSUMPTIONS			
PROJECT TYPE			Behind the Meter Ground Mount
Capacity kW DC			300.0
Capacity kW AC			250.0
First Year Generation (kWh)			386,534
Annual Consumption (kWh)			3,002,597

Findings:

Using best available data from Unitil, Beacon evaluated an optimized solar photovoltaic system sized at 300 kilowatts DC/250 kilowatts AC and generating about 386,500 kilowatt-hours in the first year. We profiled total electricity costs before and after the solar photovoltaic installation taking into consideration a reduction in the volume of kilowatt-hours the City would purchase from the Grid. An avoided cost analysis was undertaken to account for the value of the electricity not purchased from the Grid in comparison to the cost to purchase the solar-generated electricity from a third-party.

Finally, given the small size of the modeled solar photovoltaic array, Beacon does not anticipate that the City would export any solar generation to Unitil. Notwithstanding, we conducted a scenario analysis assuming a total of five percent of the monthly generation was exported to Unitil and compensated at a wholesale rate.

The analysis below presents a summary of the twenty-year financial opportunity inclusive of Lease revenues, PILOT revenues, energy benefits and Avoided Cost savings. It is our expectation that if the project proceeds, the overall economics could be improved through more detailed project optimization and modeling which ReVision Energy would undertake.

	BENEFITS TO CITY OF CONCORD	
	BTM-NO EXPORT	BTM-5% EXPORT
PROJECT COSTS OVER 20 YEARS		
Total Payments to Solar Firm under PPA	$705,414	$705,414
PROJECT REVENUES/SAVINGS OVER 20 YEARS		
Lease Revenues	$18,223	$18,223
PILOT Revenues	$18,223	$18,223
QF Revenues	$0	$13,394
Avoided Cost Savings [1]	$809,941	$769,444
Total Project Revenues/Savings	$846,387	$819,284
NET SAVINGS OVER 20 YEARS		
20 Year Net Benefit from Solar PV	$140,972	$113,869
20 Year Net Present Value (4% Discount Rate)	$100,765	$82,351

The following table presents an analysis of the first-year electricity cost savings to the City accounting for all of the revenue streams, plus the avoided costs, less payments for the generation of the solar energy.

ESTIMATED FIRST YEAR BUDGET COST IMPACTS [1]		
	BTM-NO EXPORT	BTM-5% EXPORT
Estimated Payment to Unitil Before Solar	$358,627	$358,627
Estimated Avoided Cost Savings from Solar	($38,626)	($36,694)
Estimated Lease Revenue from Solar	($750)	($750)
Estimated PILOT Revenue from Solar	($750)	($750)
Estimated QF Credit Payments from Solar	$0	($580)
Estimated Net Payment to Unitil After Solar	$318,501	$319,853
Estimated Power Purchase Payments for Solar	$30,536	$30,536
Estimated Net Electricity Cost After Solar	$349,038	$350,389
Estimated First Year Savings After Solar	$9,589	$8,238

[1]. Avoided cost savings does not account for any demand savings.

The following table presents an annual view of the overall project savings under both export scenarios. An analysis of expected reduced annual electricity costs resulting from the optimized behind-the-meter solar project is also provided.

	CITY ANNUAL BENEFITS		NET ELECTRICITY COST AFTER SOLAR	
	Wastewater Treatment Facility		Wastewater Treatment Facility	
Year	BTM-NO EXPORT	BTM-5% EXPORT	BTM-NO EXPORT	BTM-5% EXPORT
1	$9,589	$8,238	$349,038	$350,389
2	$9,356	$8,003	$352,858	$354,210
3	$9,117	$7,763	$356,719	$358,072
4	$8,872	$7,518	$360,622	$361,976
5	$8,622	$7,268	$364,566	$365,921
6	$8,367	$7,012	$368,553	$369,909
7	$8,106	$6,751	$372,583	$373,939
8	$7,840	$6,484	$376,657	$378,013
9	$7,568	$6,211	$380,774	$382,130
10	$7,290	$5,933	$384,936	$386,292
11	$7,006	$5,649	$389,142	$390,499
12	$6,715	$5,359	$393,393	$394,750
13	$6,419	$5,063	$397,691	$399,047
14	$6,117	$4,760	$402,034	$403,391
15	$5,808	$4,452	$406,424	$407,781
16	$5,493	$4,137	$410,862	$412,218
17	$5,171	$3,816	$415,347	$416,703
18	$4,843	$3,488	$419,881	$421,236
19	$4,508	$3,154	$424,463	$425,817
20	$4,166	$2,812	$429,095	$430,448
TOTAL	**$140,972**	**$113,869**	**$7,755,638**	**$7,782,741**

Beth, please let me know if you require additional information, analysis or explanation. Thank you again for the opportunity to support the City on this important project.