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Memo

To: Beth Fenstermacher
Cc: Tina Waterman
From: Beth Greenblatt
Date: March 30, 2020, Revised June 15, 2020
Re: Solar photovoltaic project update

Beacon Integrated Solutions (“Beacon”) is pleased to provide this revised 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.

Beacon’s original report provided on March 30, 2020 addressed proposals received in connection with the RFP, along with a modelled analysis of an alternative strategy to a behind-the-meter project at the Wastewater Treatment Facility. This revised summary report updates the behind-the-meter analysis and relies on data and pricing proposal provided by ReVision in connection with a request from the City for refreshed pricing based on specific constraints.

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 with evaluating whether the Alternative proposal offered by ReVision Energy 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 financial 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, Beacon provided ReVision with hourly electricity consumption of the Hall Street Wastewater Treatment Facility as provided by Unitil. This allowed ReVision to compare and model hourly usage data to hourly solar generation to ensure that electricity exports were minimized.

Assumptions:

ReVision’s refreshed Alternative proposal for a 720 kilowatts DC/480 kilowatts AC system includes a power purchase option and a PILOT payment for a term of 25-years. Unlike the original Alternative proposal submitted in response to the RFP, which was for a 20-year term, the refreshed Alternative proposal does not include a lease payment. For all generation exported to Unitil as a QF, Beacon used a rate of \$0.035/kWh with a 1.25% annual energy escalator. Finally, we relied on the power purchase rate offered by ReVision in their refreshed Alternative proposal submission, as shown below. We note that the refreshed Alternative proposal also reflects the financial 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 notes that a solar photovoltaic system has a useful life in excess of 25 years, and it is common for power purchase agreements to have extended terms up to 30 years. Tier 1 solar modules offer a standard performance warranty of 25 years. The inverter typically has a 15-year warranty and would be replaced during the term of the agreement by ReVision at their cost, unless the City opted to purchase the system under a provision specified in the power purchase agreement.

Table 1 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.

Table 1: Beacon Assumptions:

BEACON ASSUMPTIONS			
RATE ASSUMPTIONS			
Electricity Supply Rate	\$0.0663	Unitil G-1 Rate	
PILOT Payment-First Year	\$1,800	2.00%	Escalate annually over term
Avoided Cost Rate	\$0.0995	1.50%	Escalate annually over term
QF Credit Rate	\$0.0350	1.25%	Escalate annually over term
PROJECT DETAIL ASSUMPTIONS			
PROJECT TYPE	Behind the Meter Ground Mount		
Capacity kW DC	720.0		
Capacity kW AC	480.0		
First Year Generation (kWh)	900,548		
Annual Consumption (kWh)	3,002,597		
Generation Consumed in Building (kWh)	848,780		
Generation Exported to Grid (kWh)	51,768		

ReVision’s Alternative proposal included a Base power purchase rate plus Adders for specific requirements sought by the City in its original Request for Proposals. Specifically, the City required all Respondents to include in its power purchase rate offer any costs associated with the Respondents obligations for property tax under a PILOT, vegetative management of the leased areas, and full perimeter fencing around the leased area. Table 2 below presents ReVision’s Alternative offer rate detail used in Beacon’s analysis.

Table 2: ReVision Financial Offer

REVISION FINANCIAL OFFER		
	20-Year	25-Year
Base Power Purchase Rate	\$0.0834	\$0.0909
Adder for Vegetation Management	\$0.0012	\$0.0012
Adder for PILOT at \$2.50/kW DC	\$0.0024	\$0.0024
Adder for Perimeter Fencing [1]	\$0.0080	\$0.0080
Total Base Power Purchase Rate Without Perimeter Fencing	\$0.0870	\$0.0945
Total Base Power Purchase Rate With Perimeter Fencing	\$0.0950	\$0.1025
Annual Power Purchase Rate Escalator	2.0%	2.0%

[1] Adder for Perimeter fencing was provided for 25-year term. Beacon carried the same for the 20-year term.

Findings:

Using best available data from Unitil, ReVision proposed an optimized solar photovoltaic system sized at 720 kilowatts DC/480 kilowatts AC and generating about 900,548 kilowatt-hours in the first year. Beacon 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 ReVision.

Finally, given the size of the proposed solar photovoltaic array, ReVision estimated a total export of solar generation to the Grid of 51,768 kilowatt-hours, the equivalent of 5.83% of the total expected annual generation. Such exported generation would be compensated at the QF Rate, a wholesale rate.

The analysis below presents a summary of a comparison of four (4) power purchase rate scenarios relying on pricing provided by ReVision:

- 20-year power purchase offer **without** perimeter fencing
- 25-year power purchase offer **without** perimeter fencing
- 20-year power purchase offer **with** perimeter fencing
- 25-year power purchase offer **with** perimeter fencing

As shown below in Table 3, the twenty-five-year offer **without** perimeter fencing provides economic benefits over the term of the agreement. These benefits are inclusive of energy cost savings (avoided cost), PILOT revenues and revenues from exported generation. The twenty-year offer **without** perimeter fencing is not financially attractive over the term.

Table 3: Summary of Project Economics Without Perimeter Fencing

	BENEFITS TO CITY OF CONCORD	
	20 YEAR OPTION	25 YEAR OPTION
PROJECT COSTS OVER TERM		
Total Payments to Solar Firm under PPA	\$1,966,054	\$2,352,407
PROJECT REVENUES/SAVINGS OVER TERM		
PILOT Revenues	\$43,735	\$57,655
QF Revenues	\$38,916	\$49,580
Avoided Cost Savings [1]	\$1,857,975	\$2,382,701
Total Project Revenues/Savings	\$1,940,626	\$2,489,935
NET SAVINGS OVER TERM		
Net Benefit from Solar PV Over Term	(\$25,427)	\$137,529

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

As shown in Table 4 below, when the Adder for perimeter fencing is included in the power purchase price offer, neither the 20-year nor 25-year term project scenarios provide positive economic benefits over the term.

Table 4: Summary of Project Economics With Perimeter Fencing

	BENEFITS TO CITY OF CONCORD	
	20 YEAR OPTION	25 YEAR OPTION
PROJECT COSTS OVER TERM		
Total Payments to Solar Firm under PPA	\$2,132,482	\$2,568,720
PROJECT REVENUES/SAVINGS OVER TERM		
PILOT Revenues	\$43,735	\$57,655
QF Revenues	\$38,916	\$49,580
Avoided Cost Savings [1]	\$1,857,975	\$2,382,701
Total Project Revenues/Savings	\$1,940,626	\$2,489,935
NET SAVINGS OVER TERM		
Net Benefit from Solar PV Over Term	(\$191,855)	(\$78,784)

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

Beacon notes that in each of the four (4) scenarios above, a key driver in the analysis is the impact of the rate of annual increase of the City’s electricity costs versus the rate of annual increase of the power purchase prices offered by ReVision. Beacon customarily relies on very conservative forecasting estimates for increases in energy costs annually. We have worked with the City for over a decade supporting timely and successful competitive energy supply procurements resulting in attractive supply rates. For this analysis, Beacon applied an annual energy escalator of 1.5% to the annual avoided cost savings. ReVision’s annual energy escalator for the power purchase rate is 2%. Therefore, the cost for the solar generation is escalating at a higher rate than the estimated cost of the savings.

Table 5 below presents an annual view of the overall project savings for the 20-year and 25-year options **without** perimeter fencing and Table 6 below presents an annual view of the overall project savings for the 20-year and 25-year options **with** perimeter fencing. An analysis of expected reduced annual electricity costs resulting from the optimized behind-the-meter solar project is also provided.

Table 5: Summary of Annual Project Savings Without Perimeter Fencing

Year	CITY ANNUAL BENEFITS		NET ELECTRICITY COST AFTER SOLAR	
	Wastewater Treatment Facility		Wastewater Treatment Facility	
	20 YEAR OPTION	25 YEAR OPTION	20 YEAR OPTION	25 YEAR OPTION
1	\$2,947	\$9,706	\$355,680	\$348,921
2	\$2,566	\$9,427	\$361,440	\$354,580
3	\$2,176	\$9,138	\$367,291	\$360,328
4	\$1,776	\$8,842	\$373,233	\$366,167
5	\$1,365	\$8,537	\$379,268	\$372,097
6	\$945	\$8,223	\$385,398	\$378,120
7	\$514	\$7,900	\$391,625	\$384,238
8	\$72	\$7,569	\$397,949	\$390,452
9	(\$381)	\$7,227	\$404,372	\$396,763
10	(\$845)	\$6,877	\$410,896	\$403,174
11	(\$1,320)	\$6,517	\$417,522	\$409,685
12	(\$1,807)	\$6,147	\$424,251	\$416,298
13	(\$2,305)	\$5,767	\$431,087	\$423,014
14	(\$2,816)	\$5,377	\$438,029	\$429,836
15	(\$3,339)	\$4,976	\$445,079	\$436,765
16	(\$3,874)	\$4,565	\$452,241	\$443,802
17	(\$4,421)	\$4,143	\$459,514	\$450,950
18	(\$4,982)	\$3,710	\$466,901	\$458,209
19	(\$5,555)	\$3,266	\$474,403	\$465,582
20	(\$6,142)	\$2,810	\$482,023	\$473,070
TOTAL OVER 20 YEARS	(\$25,427)	\$130,724	\$8,318,200	\$8,162,049
21		\$2,343		\$480,675
22		\$1,864		\$488,400
23		\$1,373		\$496,245
24		\$870		\$504,212
25		\$354		\$512,304
TOTAL		\$137,529		\$10,643,885

Table 5: Summary of Annual Project Savings With Perimeter Fencing

Year	CITY ANNUAL BENEFITS		NET ELECTRICITY COST AFTER SOLAR	
	Wastewater Treatment Facility		Wastewater Treatment Facility	
	20 YEAR OPTION	25 YEAR OPTION	20 YEAR OPTION	25 YEAR OPTION
1	(\$4,258)	\$2,502	\$362,885	\$356,125
2	(\$4,745)	\$2,115	\$368,752	\$361,892
3	(\$5,245)	\$1,718	\$374,711	\$367,749
4	(\$5,755)	\$1,311	\$380,764	\$373,698
5	(\$6,278)	\$893	\$386,912	\$379,740
6	(\$6,813)	\$466	\$393,156	\$385,877
7	(\$7,359)	\$27	\$399,498	\$392,111
8	(\$7,919)	(\$422)	\$405,939	\$398,442
9	(\$8,490)	(\$882)	\$412,481	\$404,873
10	(\$9,075)	(\$1,353)	\$419,126	\$411,404
11	(\$9,673)	(\$1,836)	\$425,874	\$418,037
12	(\$10,284)	(\$2,330)	\$432,729	\$424,775
13	(\$10,909)	(\$2,837)	\$439,690	\$431,618
14	(\$11,548)	(\$3,355)	\$446,760	\$438,568
15	(\$12,200)	(\$3,886)	\$453,941	\$445,627
16	(\$12,867)	(\$4,429)	\$461,234	\$452,796
17	(\$13,549)	(\$4,985)	\$468,642	\$460,077
18	(\$14,246)	(\$5,554)	\$476,165	\$467,473
19	(\$14,957)	(\$6,136)	\$483,805	\$474,984
20	(\$15,684)	(\$6,732)	\$491,565	\$482,612
TOTAL OVER 20 YEARS	(\$191,855)	(\$35,704)	\$8,484,628	\$8,328,477
21		(\$7,341)		\$490,359
22		(\$7,964)		\$498,228
23		(\$8,602)		\$506,219
24		(\$9,253)		\$514,336
25		(\$9,920)		\$522,579
TOTAL		(\$78,784)		\$10,860,198



Beth and Tina, 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.