City of Tipton, Iowa

Meeting:	**Tipton Special City Council Meeting**
Place:	**Tipton Fire Station, 301 Lynn Street, Tipton, Iowa 52772**
Date/Time:	**Monday, August 15, 2022, 5:30 p.m.**
Web Page:	**www.tiptoniowa.org**
Posted:	**Friday, August 12, 2022 (Front door of City Hall & City Website)**

Please join my meeting from your computer, tablet or smartphone.
https://meet.goto.com/681918733

You can also dial in using your phone.
United States (Toll Free): 1 877 309 2073
United States: +1 (571) 317-3129

Access Code: 681-918-733

Mayor: **Bryan Carney**

Council at Large:	Abby Cummins-VanScoy	**Council At Large:**	Jason Paustian
Council Ward #1	Ron Hembry	**Council Ward #2**	Mike Helm
Council Ward #3	Tim McNeill	**City Attorney:**	Lynch Dallas, P.C.
City Manager:	Brian Wagner	**Gas Utilities Supt:**	Adam Fitch
Finance Director:	Melissa Armstrong	**Electric Utilities Supt:**	
City Clerk:	Amy Lenz	**Water & Sewer Supt:**	Brian Brennan
Dir. Of Public Works:	Steve Nash	**Ambulance Svc Dir:**	Brad Ratliff
Police Chief:	Lisa DuFour	**Economic Dev. Dir.**	Linda Beck
Park & Recreation:	Adam Spangler	**Library Director:**	Denise Smith

Call to Order

A. **Roll Call**
B. **Pledge of Allegiance**
C. **Agenda Additions/Agenda Approval**
D. **Communications**
E. **City Business**

1. Discussion and possible action concerning a presentation on the findings of the Solar Feasibility Study. *(Dave Vognsen/LEV Energy Advisors will be making the presentation.)*

F. **Adjournment**

Pursuant to §21.4(2) of the Code of Iowa, the City has the right to amend this agenda up until 24 hours before the posted meeting time.
If anyone with a disability would like to attend the meeting, please call City Hall at 886-6187 to arrange for accommodations/transportation.

Solar Feasibility Study
Tipton, Iowa

August 15, 2022

Latham, Ervin, Vognsen & Associates, Inc.
150 1st Avenue NE, Suite 300, Cedar Rapids, IA 52401

OVERVIEW

- Financial Feasibility of Installing 1 Megawatts of a Ground-Mounted Single-axis Solar Array on City-Owned Property Approximately 11 Acres North of Tipton's Waste-Water Treatment Facility
- Financial Goal of Project is to Help Off-set Tipton's Wholesale Energy Purchases
- The System Would be Directly Connected to Tipton's Electrical Distribution System
- Tipton's Load Profile Would be a Factor in Determining Appropriate Size of System
- Tipton is also Interested in the Financial Feasibility of Installing a Smaller Solar Array to Offset the Usage of the Waste-Water Treatment Facility

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Solar Generation Information

- Solar Typically Has an Annual Capacity Factor of 18-22% Depending On System
- Solar Typically Will Be Operating at at 30-50% Capacity at the Time of Summer System Peak
- Maximum Solar Energy Production Months Are May Through August
- Maximum Daily Production Between the Hours of 11:00 am and 2:00 pm
- Annual Degradation in Solar Production is ½ of 1%
- Annual Life of Solar Panels is 25 – 30 Years
- Annual Life of Inverters is 15-17 Years

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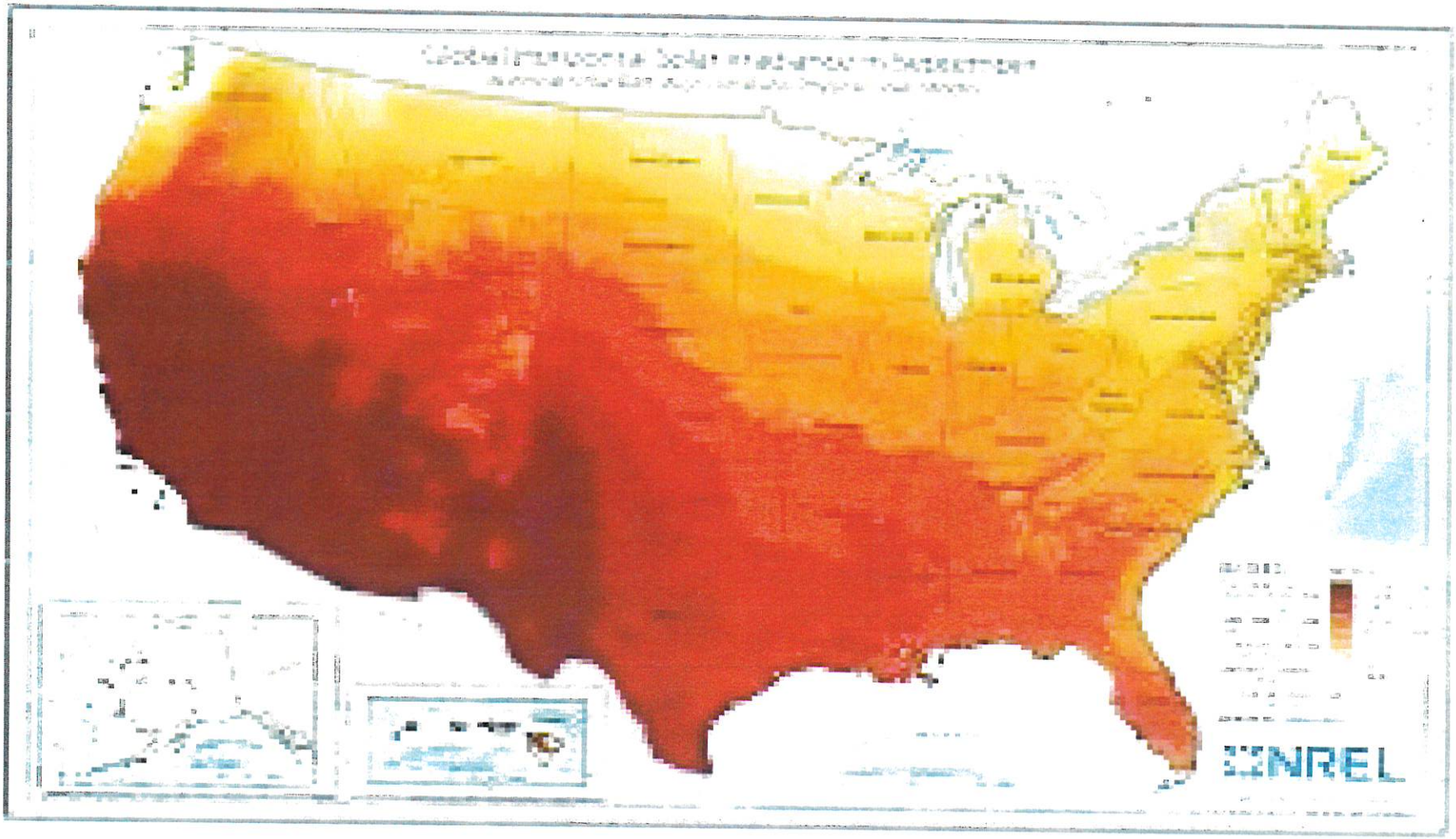
Solar Radiance Map - US



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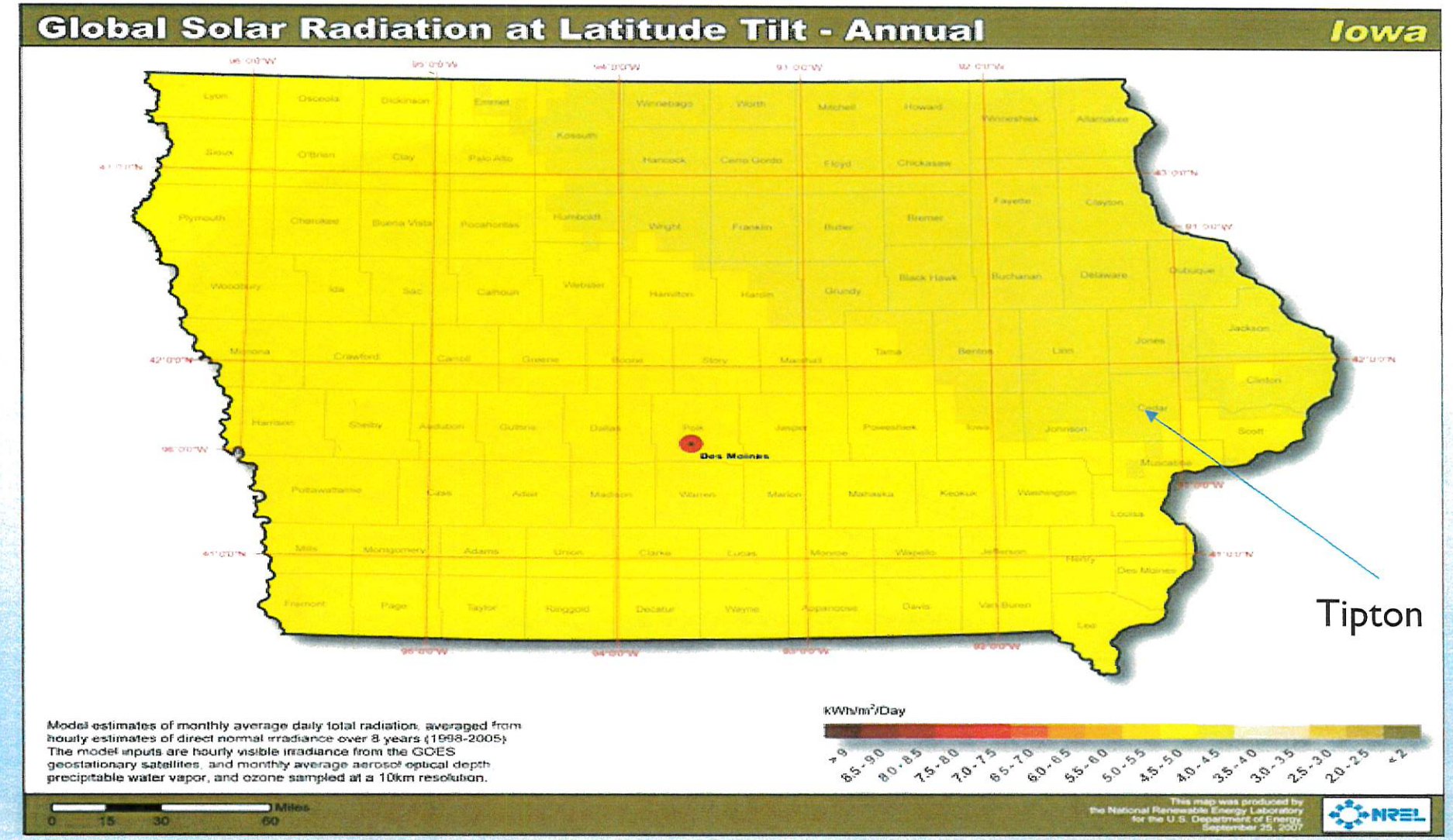
Solar Radiance Map - Iowa



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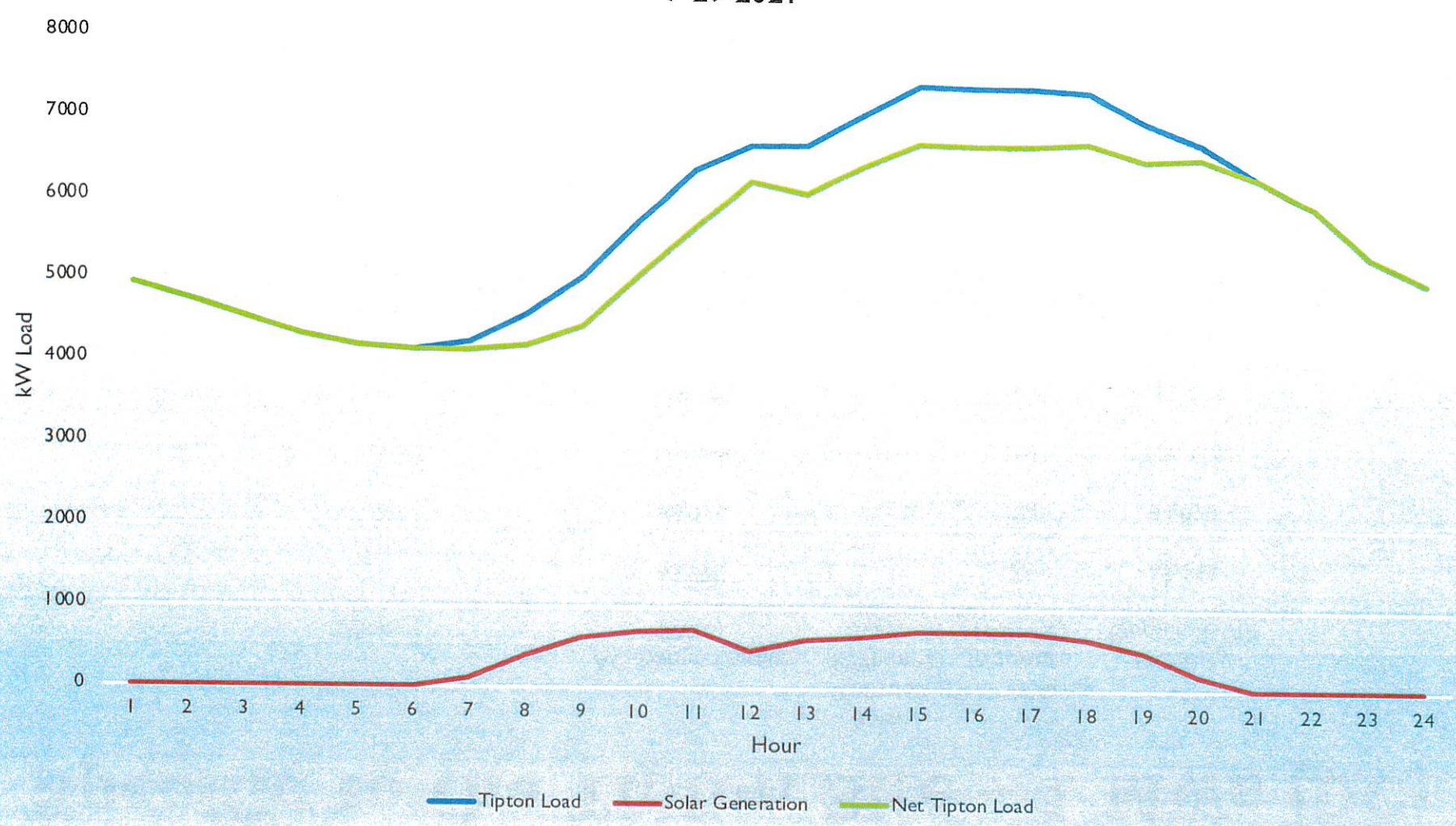
Solar Offset to Tipton Load (1 MW Solar)



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Typical Monthly Solar Generation Specific to the Tipton Site – 1 MWs (DC)

Month	AC System Output (kWh)	Solar Radiation (kWh/m^2 /day)	Plane of Array Irradiance (W/m^2)	DC array Output (kWh)
1	65,975	2	77	69,145
2	90,013	4	104	94,079
3	130,418	5	156	136,115
4	149,105	6	183	155,633
5	183,750	8	236	191,537
6	184,905	8	241	192,754
7	197,401	8	261	205,654
8	177,729	7	231	185,191
9	150,631	6	193	156,927
10	110,914	4	138	115,735
11	69,776	3	84	73,064
12	54,986	2	65	57,682
Total	1,565,603	65	1,969	1,633,516

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Site of Proposed Solar Array

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Current Solar Pricing Issues

- 90% of solar panels come from China and Southeast Asia. Supply chain issues due to COVID shutdowns have impacted imports.
- Global supply chain disruptions due to COVID-19 delays were exacerbated by the February 2022 Biden administration extension of the pre-existing tariffs on Chinese solar modules that led to longer Equipment and Materials lead and delivery timeframes and the unprecedented increases in market prices of commodities (including transformers, trackers solar modules, inverters, cable, batteries, and substation equipment).
- United States Department of Commerce ("DoC") on March 25, 2022, opened an investigation of alleged circumvention of existing DoC antidumping and countervailing duty orders that cover solar modules from China. Specifically the investigation is related to Chinese components, are undergoing only minor processing in Cambodia, Malaysia, Thailand, and Vietnam before being shipped to the United States in circumvention of existing DoC antidumping orders. Biden subsequently waived the tariffs on Southeast Asian nations for 2 years.
- DoC will issue a preliminary ruling at the end of August, however, DoC investigation severely limited solar inports for four months and developers are currently working to get caught up.
- All this has led to a substantial increase in solar pricing (as much as 30%) in the short term.

Financing Alternatives

- Outright Purchase:
  - Federal PTCs or ITC tax credit currently not available,
  - Escrow for inverter replacement
  - Possibly Guaranteed Production
  - May need maintenance agreement
  - May have access to other sources of funding
- Purchase Power Agreement or lease
  - PPA rate incorporates ITC credit & bonus depreciation
  - Ownership options at specific intervals (5, 7, 10, 20 years)
  - Generally defined purchase price (market value)
  - Maintenance reflected in rate. Likely also includes inverter replacement
- Note: Iowa 476C tax credit required solar to be in-service prior to 1/1/2018. SES Tax 422.11L credits required in service by 2022.

Solar Incentives

- Federal Investment Tax Credits (not reflected in current cash flow analysis)
  - Currently in 2023 it is 22% of installed cost of system. Expires in 2024 unless renewed by congress.
  - Non-refundable credit.
  - Based on cost of panels plus labor and installation costs.
  - Inflation Reduction Act proposes to increase back up to 30% if certain conditions are met. Also, non-taxable entities may be able to sell the ITC to an unrelated 3rd party.
  - Inflation Reduction Act also proposes to reinstate PTCs for solar generation. Similar to ITC, non-taxable entities may be able to sell the PTCs to an unrelated 3rd party.
  - Under the Inflation Reduction Act there may be a direct pay option available to governmental agencies and certain other tax-exempt entities.

Solar Incentives

- Energy Infrastructure Revolving Loan Program (EIRLP) (reflected in cash flow analysis
  - Administered by Iowa Energy Center.
  - Available to municipal utilities that purchase and own energy projects.
  - 2% interest rate for 5-10 years, 15 years is max.
  - Energy generation projects with community/public users and benefits eligible.

- Note: Iowa 476C tax credit required solar to be in-service prior to 1/1/2018. SES Tax 422.11L credits required in service by 2022.

Solar Incentives

- Bonus Depreciation
  - Bonus depreciation to 100% for qualified property acquired and placed in service after September 27, 2017 and before January 1, 2023.
- Renewable Energy Certificates (RECs)
  - RECs are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource.
  - Tracked in M-RETS platform
  - RECs can be sold or traded
  - Iowa Utilities have met Iowa's Renewable Portfolio Standard so RECs have minimal value.

Financial Analysis - 1MWs Solar

- Assumptions – Base Inputs
  - 25 year analysis
  - Energy Cost Escalator - 2%
  - Finance Interest Rate – 2% EIRLP loan (15 yr) + 1% internal loan (15 yr)
  - 2021 Hourly Tipton Loads
  - Tipton's Load is offset by other resources, eg. Louisa Generating Station (approximately 4 MWs)
  - RPGI current Demand and Energy Rates

Financial Analysis– 1 MW Solar

- Assumptions – Solar Inputs
  - Single Axis Tracking
  - 1,000 MWs DC
  - DC to AC size ratio= 1.2
  - Max kW Solar Output – 851 kW (AC)
  - 1st year Output – 1,565,000 kWh
  - Annual Degradation in output = 0.5%
  - Capacity Factor = 18%
  - Installed Cost per kW = $2,350 / kW (AC)
  - Total Installed Cost = $2 million

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Cash Flow Analysis –
City Purchases Solar and Finances

Cash Flows Analysis

			Solar Energy Production	RPGI Energy Rate	Solar Reduction in RPGI Energy	Solar Demand Reduction (12 Mos)	Purchase Power Rate	RPGI Demand/Cap Savings	Total Savings	Installed Cost	State Energy Loan	Internal Loan	Operations & Maintenance	Inverter Replacement	Net Cash Flow
Degradation	0.5%														
Purchase Power Escalator	2%	Year	1,565,603	$ 0.0421		4,400	$ 10.72			$ 1,999,850.00			$ 3.30	$5	
		1	1,557,775	$ 0.0430	$66,941.23	4,378	$10.94	$ 47,876.95	$ 114,818.18		$ 117,333.33	$ 37,055.00	$ 2,808.30		$ (42,378.4)
Installed kW	851	2	1,549,986	$ 0.0438	$67,938.65	4,356	$11.16	$ 48,590.32	$ 116,528.97		$ 112,900.00	$ 34,650.00	$ 2,864.47		$ (33,885.5)
		3	1,542,236	$ 0.0447	$68,950.94	4,334	$11.38	$ 49,314.32	$ 118,265.25		$ 116,200.00	$ 34,350.00	$ 2,921.76		$ (35,206.5)
Installed cost		4	1,534,525	$ 0.0456	$69,978.31	4,312	$11.61	$ 50,049.10	$ 120,027.41		$ 114,400.00	$ 34,050.00	$ 2,980.19		$ (31,402.8)
per KW	$ 2,350	5	1,526,852	$ 0.0465	$71,020.98	4,291	$11.84	$ 50,794.83	$ 121,815.81		$ 117,600.00	$ 33,750.00	$ 3,039.79		$ (32,574.0)
		6	1,519,218	$ 0.0474	$72,079.20	4,269	$12.08	$ 51,551.67	$ 123,630.87		$ 115,700.00	$ 33,450.00	$ 3,100.59		$ (28,619.7)
Interest Rate	2.00%	7	1,511,622	$ 0.0484	$73,153.18	4,248	$12.32	$ 52,319.79	$ 125,472.97		$ 113,800.00	$ 38,150.00	$ 3,162.60		$ (29,639.6)
		8	1,504,064	$ 0.0494	$74,243.16	4,227	$12.56	$ 53,099.36	$ 127,342.52		$ 116,900.00	$ 37,800.00	$ 3,225.85		$ (30,583.3)
		9	1,496,543	$ 0.0503	$75,349.38	4,205	$12.81	$ 53,890.54	$ 129,239.92		$ 114,900.00	$ 37,450.00	$ 3,290.37		$ (26,400.5)
		10	1,489,061	$ 0.0514	$76,472.09	4,184	$13.07	$ 54,693.51	$ 131,165.60		$ 112,900.00	$ 37,100.00	$ 3,356.18		$ (22,190.6)
		11	1,481,615	$ 0.0524	$77,611.52	4,164	$13.33	$ 55,508.44	$ 133,119.96		$ 115,900.00	$ 36,750.00	$ 3,423.30		$ (22,953.3)
		12	1,474,207	$ 0.0534	$78,767.93	4,143	$13.60	$ 56,335.52	$ 135,103.45		$ 113,800.00	$ 36,400.00	$ 3,491.77		$ (18,588.3)
		13	1,466,836	$ 0.0545	$79,941.58	4,122	$13.87	$ 57,174.92	$ 137,116.49		$ 116,700.00	$ 36,050.00	$ 3,561.60		$ (19,195.1)
		14	1,459,502	$ 0.0556	$81,132.71	4,101	$14.15	$ 58,026.82	$ 139,159.53		$ 114,500.00	$ 35,700.00	$ 3,632.84		$ (14,673.3)
		15	1,452,204	$ 0.0567	$82,341.58	4,081	$14.43	$ 58,891.42	$ 141,233.00		$ 117,300.00	$ 35,350.00	$ 3,705.49		$ (15,122.5)
		16	1,444,943	$ 0.0578	$83,568.47	4,060	$14.72	$ 59,768.90	$ 143,337.38				$ 3,779.60		$ 139,557.8
		17	1,437,719	$ 0.0590	$84,813.64	4,040	$15.01	$ 60,659.46	$ 145,473.10				$ 3,855.19	$ 72,335.00	$ 69,282.9
		18	1,430,530	$ 0.0602	$86,077.37	4,020	$15.31	$ 61,563.29	$ 147,640.65				$ 3,932.30		$ 143,708.4
		19	1,423,377	$ 0.0614	$87,359.92	4,000	$15.62	$ 62,480.58	$ 149,840.50				$ 4,010.94		$ 145,829.6
		20	1,416,261	$ 0.0626	$88,661.58	3,980	$15.93	$ 63,411.54	$ 152,073.12				$ 4,091.16		$ 147,982.0
		21	1,409,179	$ 0.0639	$89,982.64	3,960	$16.25	$ 64,356.37	$ 154,339.01				$ 4,172.99		$ 150,166.0
		22	1,402,133	$ 0.0651	$91,323.38	3,940	$16.58	$ 65,315.28	$ 156,638.66				$ 4,256.45		$ 152,382.2
		23	1,395,123	$ 0.0664	$92,684.10	3,920	$16.91	$ 66,288.48	$ 158,972.58				$ 4,341.57		$ 154,631.0
		24	1,388,147	$ 0.0678	$94,065.09	3,901	$17.25	$ 67,276.18	$ 161,341.27				$ 4,428.41		$ 156,912.9
		25	1,381,206	$ 0.0691	$95,466.66	3,881	$17.59	$ 68,278.59	$ 163,745.25				$ 4,516.97		$ 159,228.3
			36,694,864						$3,447,441.47		$ 1,730,833.33	$ 538,055.00			$ 1,016,267.4

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Alternatives to Tipton Ownership of Solar

- Purchase Power Agreement Over Life of Solar Array
  - Typically starts out slightly lower than current cost of power and then escalates over time to exceed the cost
- Purchase Power Agreement with Buyout Option
  - PPA Rate for 5 -7 years and then purchase solar panels at fair market value or contract rate
- Lease Agreement with Purchase Option
  - Fixed lease payment each year for a predetermined term
  - Purchase at end of term based upon a percentage of cost of solar panels

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Purchase Power Agreement Example

- Assuming average RPGI bill offset in 1st year at 7 cents/kWh escalates at 2% per year
- Assume purchase power rate at 6 cents in 1st year and escalates at 3.5%
  - PPA saves $20,000 in first and diminishes each year thereafter
  - Total RPGI bill savings over 25 years = $3.4 million
  - Total PPA costs over 25 years = $3.4 million
  - PPA costs exceed RPGI bill savings starting in year 15
- PPA contract provides owner responsible for operation and maintenance costs
- PPA contract may provide a guarantee of annual energy production of solar array
- PPA contract would address inverter replacement responsibility and costs
- PPA contract would address solar array decommissioning responsibilities

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PPA with Buyout Option Example

- Assume purchase power rate at starts out at 6 cents in 1st year and escalates annually at 3.5% through year 7
- Tipton can purchase solar array in year 7 at $1 million
- PPA contract may provide a guarantee of annual energy production of solar array through date of purchase
- Inverter replacement occurs likely in after year 15 and is Tipton's cost
- Tipton responsible for solar array decommissioning costs
- Tipton could either assume responsibilities for operation and maintenance costs or contract for those services.

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Analysis of Results

- Current price of solar does not result in positive cash flow.
- Issuing an RFP in the fall may result in better solar pricing if supply chain issues lessen and DoC does not impose tariff on Southeast Asian solar imports.
- If Congress passes the Inflation Reduction Act, it may improve the economics especially if Tipton can sell the tax credits.

Waste Water Treatment Plant Site

- WWTP uses 384,000 kWh annually
- Peak usage occurs October through March
- WWTP is energy billed on Tipton electric rate Com CE4
- No offset to customer charge, just energy charges and power adjustment charges
- Installed Cost of Solar Array = $2,350/KWWWTP would net solar against usage
- Assumed 195 KW solar array with same monthly production pattern as the 1 MW solar array
- Same financing structure as 1 MW

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Cash Flow Analysis of Waste Water Treatment Plant

Cash Flows Analysis - WWTP

			Solar	Tipton	Solar	RPGI	Solar	Solar Demand	Purchase	RPGI	RPGI									
Degradation	0.5%		Energy	CE4	Reduction in	Energy	Reduction in	Reduction	Power	Demand/Cap	Bill	Net	Installed Cost	State Energy	Internal	Operations &	Inverter	Net		
Purchase Power			Production	Rate	WWTP Energy	Rate	RPGI Energy	(12 Mos)	Rate	Savings	Savings	Savings		Loan	Loan	Maintenance	Replacement	Cash Flow		
Escalator	2%	Year	376,947	$ 0.0751		$ 0.0421		1,008	$ 10.72											
		1	375,062	$ 0.0766	$28,735.02	$ 0.0430	$16,117.30	1,003	$10.94	$ 10,970.63	$ 27,087.93	$ (1,647.09)	$ 458,250.00			$ 3.30	$5			
Installed kW	195	2	373,187	$ 0.0781	$29,163.18	$ 0.0438	$16,357.45	998	$11.16	$ 11,134.09	$ 27,491.54	$ (1,671.63)		$ 26,886.02	$ 8,490.86	$ 643.50		$ (37,667.5)		
		3	371,321	$ 0.0797	$29,597.71	$ 0.0447	$16,601.18	993	$11.38	$ 11,299.99	$ 27,901.17	$ (1,696.54)		$ 25,870.15	$ 7,939.78	$ 656.37		$ (36,137.9)		
Installed cost		4	369,464	$ 0.0813	$30,038.71	$ 0.0456	$16,848.54	988	$11.61	$ 11,468.36	$ 28,316.90	$ (1,721.82)		$ 26,626.32	$ 7,871.03	$ 669.50		$ (36,863.4)		
per KW	$ 2,350	5	367,617	$ 0.0829	$30,486.29	$ 0.0465	$17,099.58	983	$11.84	$ 11,639.24	$ 28,738.82	$ (1,747.47)		$ 26,213.87	$ 7,802.29	$ 682.89		$ (36,420.9)		
		6	365,779	$ 0.0846	$30,940.54	$ 0.0474	$17,354.36	978	$12.08	$ 11,812.66	$ 29,167.03	$ (1,773.51)		$ 26,947.12	$ 7,733.55	$ 696.55		$ (37,124.7)		
Interest Rate	2.00%	7	363,950	$ 0.0863	$31,401.55	$ 0.0484	$17,612.94	973	$12.32	$ 11,988.67	$ 29,601.61	$ (1,799.93)		$ 26,511.75	$ 7,664.81	$ 710.48		$ (36,660.5)		
		8	362,130	$ 0.0880	$31,869.43	$ 0.0494	$17,875.38	968	$12.56	$ 12,167.30	$ 30,042.68	$ (1,826.75)		$ 26,076.38	$ 8,741.77	$ 724.69		$ (37,342.8)		
		9	360,320	$ 0.0898	$32,344.29	$ 0.0503	$18,141.72	964	$12.81	$ 12,348.60	$ 30,490.31	$ (1,853.97)		$ 26,786.72	$ 8,661.57	$ 739.18		$ (38,014.2)		
		10	358,518	$ 0.0916	$32,826.22	$ 0.0514	$18,412.03	959	$13.07	$ 12,532.59	$ 30,944.62	$ (1,881.60)		$ 26,328.44	$ 8,581.37	$ 753.96		$ (37,517.7)		
		11	356,726	$ 0.0934	$33,315.33	$ 0.0524	$18,686.37	954	$13.33	$ 12,719.33	$ 31,405.69	$ (1,909.63)		$ 25,870.15	$ 8,501.18	$ 769.04		$ (37,022.0)		
		12	354,942	$ 0.0953	$33,811.73	$ 0.0534	$18,964.80	949	$13.60	$ 12,908.84	$ 31,873.64	$ (1,938.09)		$ 26,557.58	$ 8,420.98	$ 784.42		$ (37,672.6)		
		13	353,167	$ 0.0972	$34,315.52	$ 0.0545	$19,247.37	945	$13.87	$ 13,101.19	$ 32,348.56	$ (1,966.96)		$ 26,076.38	$ 8,340.78	$ 800.11		$ (37,155.4)		
		14	351,401	$ 0.0991	$34,826.82	$ 0.0556	$19,534.16	940	$14.15	$ 13,296.39	$ 32,830.55	$ (1,996.27)		$ 26,740.89	$ 8,260.58	$ 816.11		$ (37,784.5)		
		15	349,644	$ 0.1011	$35,345.74	$ 0.0567	$19,825.22	935	$14.43	$ 13,494.51	$ 33,319.73	$ (2,026.02)		$ 26,236.78	$ 8,180.38	$ 832.44		$ (37,245.9)		
		16	347,896	$ 0.1031	$35,872.39	$ 0.0578	$20,120.61	930	$14.72	$ 13,695.58	$ 33,816.19	$ (2,056.20)		$ 26,878.38	$ 8,100.18	$ 849.08		$ (37,853.7)		
		17	346,157	$ 0.1052	$36,406.89	$ 0.0590	$20,420.41	926	$15.01	$ 13,899.64	$ 34,320.05	$ (2,086.84)				$ 866.07		$ (2,922.3)		
		18	344,426	$ 0.1073	$36,949.35	$ 0.0602	$20,724.67	921	$15.31	$ 14,106.75	$ 34,831.42	$ (2,117.93)				$ 883.39	$ 16,575.00	$ (19,545.2)		
		19	342,704	$ 0.1094	$37,499.90	$ 0.0614	$21,033.47	917	$15.62	$ 14,316.94	$ 35,350.41	$ (2,149.49)				$ 901.06		$ (3,019.0)		
		20	340,990	$ 0.1116	$38,058.65	$ 0.0626	$21,346.87	912	$15.93	$ 14,530.26	$ 35,877.13	$ (2,181.52)				$ 919.08		$ (3,068.6)		
		21	339,285	$ 0.1138	$38,625.72	$ 0.0639	$21,664.94	907	$16.25	$ 14,746.76	$ 36,411.70	$ (2,214.02)				$ 937.46		$ (3,119.0)		
		22	337,589	$ 0.1161	$39,201.24	$ 0.0651	$21,987.75	903	$16.58	$ 14,966.49	$ 36,954.23	$ (2,247.01)				$ 956.21		$ (3,170.2)		
		23	335,901	$ 0.1184	$39,785.34	$ 0.0664	$22,315.36	898	$16.91	$ 15,189.49	$ 37,504.85	$ (2,280.49)				$ 975.33		$ (3,222.3)		
		24	334,221	$ 0.1208	$40,378.15	$ 0.0678	$22,647.86	894	$17.25	$ 15,415.81	$ 38,063.67	$ (2,314.47)				$ 994.84		$ (3,275.3)		
		25	332,550	$ 0.1232	$40,979.78	$ 0.0691	$22,985.31	889	$17.59	$ 15,645.51	$ 38,630.82	$ (2,348.96)				$ 1,014.73		$ (3,329.2)		
																$ 1,035.03		$ (3,384.0)		
			8,834,948								$813,321.24			$ 396,606.93	$ 123,291.10			$ (606,538.8)		

λ Latham, Ervin, Vognsen & Associates, Inc.
150 1st Avenue NE, Suite 300, Cedar Rapids, IA 52401

Analysis of Waste Water Treatment Plant

- Waste water treatment plant usage higher in non-summer months impacts potential solar savings.
- Bill savings would depend upon if excess monthly kWh generation is carried forward for use in a future month or cashed out at avoided cost.
- RPGI billing savings is less than financing costs of the project resulting in negative cash flows.
- Retail annual retail bill savings exceeds the offsetting RPGI bill savings resulting in the electric utility absorbing the difference.

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