

Environmental Sustainability Board
2022 Goals and Objectives

City of
Bellaire

Proposed Strategy for
Rooftop Solar on City Hall

Dec 1, 2022

ESB Goal Champion: Rajiv Pandya

System Location and Solar Reliability

The following is a summary from an ESB sub-team that has been investigating since 2021 the feasibility of installing solar energy on CoB municipal building rooftops

1. The CoB City Hall Building is a perfect candidate for a Solar Photovoltaic Energy system, and is the best one to start with in the City of Bellaire -
 - Flat Roof allowing for panels to be oriented for optimum tilt and azimuth (180° due South)
 - Limited number of obstructions and external shading
 - White membrane surface allows for bi-facial solar panel utilization (sunlight absorbed from both sides of panel) resulting in electricity production boost
 - Ballasted mounting design requiring no holes to be poked in roof
 - Panels will be hidden and not be visible from street level

2. Solar Energy systems are very reliable and require very little maintenance -
 - Have no moving parts and are designed to withstand 140 mph wind speed
 - Major equipment (solar panels and inverters) has 25-year warranties
 - System life is expected to be 30 to 35 years
 - Annual proactive cleaning recommended
 - Online performance monitoring available with data updated every 1 minute
 - The system to be added to the buildings existing property insurance policy

System Size and Solar Production

3. Draft rooftop solar layout (shown below) shows an estimated system size of 163 Kw DC, comprising of 100 Kw DC on the City Hall roof and 63 Kw DC on the Civic Center roof –
 - 163 Kw DC will yield appx 283 MwHr of electricity annually, using bi-facial solar panel
 - City Hall's annual electricity consumption is appx 561 MwHr
 - The solar energy generated would offset around 51% of City Hall's electricity consumption (283 KwHr / 561 KwHr), with the remaining 49% coming from the Grid
 - The 51% solar offset can be increased if the building's consumption is reduced
 - Project can be staged with solar installed on Civic Center and City Hall at different times



Funding Strategy

4. Funding strategy for the system can be per the following –

- The City of Bellaire issues an RFP (Request for Proposal) to qualified solar EPC company bidders for turnkey project services (ie Design, Permitting, Installation, Startup), leveraging experiences from Evelyn’s Park solar rooftop installations as much as possible
- “All In” System Cost is **estimated at \$244,500**, Targeted funding breakdown:
 - **\$73,350** through 30% Federal Investment Tax Credit (ITC) “**Direct Pay**” option for all Non-Profit and Tax-Exempt entities (part of the Climate Provisions in the recently enacted Federal Inflation Reduction Act), with final IRS guidelines pending
 - IRA allows for cash in lieu of tax credit for municipalities; updated guideline pending
 - Summary Links: [Solar United Neighbors](#) and [Solar Energy Industries Association](#)
 - The Federal ITC has been the “bedrock” incentive for the US solar industry for 20+ years
 - **\$50,000** funded through Shell / MP2 Contract Grant
 - \$10,000 per year for 5 years, with first payment in June 2022
 - Check availability of other potential grants (State Energy Conservation Office, CenterPoint, etc ...)
 - **\$121,150** funded by CoB Capital Budget
 - Payback estimated at 8 years per Cash Flow table
 - Numbers will be heavily impacted by RFP feedback from solar EPC company bidders
 - Bellaire Citizen Donation Program can be considered to reduce CoB cash outlay

Cash Flow Summary

5. Estimated Simple Cash Flow Analysis with very conservative 8-year payback projection

Assumptions		
Solar Project Size =	163.00	Kw
Solar Production Factor =	1,735	KwHr / Kw
Solar Production =	282,805	KwHr / Year
City Hall Consumption =	561,024	KwHr / Year
Solar Offset - Production / Consumption =	50.41%	%
Avoided Utility Rate (excl Inflation) =	\$0.0600	\$ / KwHr
Avoided Utility Payment (excl Degradation) =	\$16,968	\$ / Year
Estimated System Cost =	\$1,500	\$ / Kw
Estimated System Cost =	\$244,500	\$
30% Federal ITC Refund =	\$73,350	\$
Shell / MP2 Grant (over 5 years) =	\$50,000	\$
Bellaire Citizen Donations =	\$0	\$
CoB Net Capital Cost =	\$121,150	\$
CoB ROI (IRR) =	11%	%
CoB ROI (Payback) =	8	Years
CoB Savings over 30 Years =	\$357,899	\$

City of Bellaire - Simple Cash Flows								
Year	Avoided Utility Payment	Estimated System Cost	CoB Citizen Donations	30% Federal ITC Refund	Shell MP2 Grant	O&M, Insur	Annual Savings	Cumulative Savings
Start	\$0	\$244,500	\$0	\$0	\$10,000	\$0	-\$234,500	-\$234,500
1	\$16,968	\$0	\$0	\$73,350	\$10,000	\$1,000	\$99,318	-\$135,182
2	\$16,968	\$0	\$0	\$0	\$10,000	\$1,000	\$25,968	-\$109,213
3	\$16,968	\$0	\$0	\$0	\$10,000	\$1,000	\$25,968	-\$83,245
4	\$16,968	\$0	\$0	\$0	\$10,000	\$1,000	\$25,968	-\$57,277
5	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	-\$41,309
6	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	-\$25,340
7	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	-\$9,372
8	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$6,596
9	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$22,565
10	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$38,533
11	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$54,501
12	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$70,470
13	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$86,438
14	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$102,406
15	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$118,375
16	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$134,343
17	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$150,311
18	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$166,279
19	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$182,248
20	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$198,216
21	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$214,184
22	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$230,153
23	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$246,121
24	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$262,089
25	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$278,058
26	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$294,026
27	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$309,994
28	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$325,962
29	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$341,931
30	\$16,968	\$0	\$0	\$0	\$0	\$1,000	\$15,968	\$357,899

Next Steps

6. Next Steps for rest of 2022, with installation targeted for 2q2023 (before summer) -
 - Review, modify, and gain alignment on this Strategy from the following key personnel before elevating to the CoB Mayor and City Council –
 - ESB – at upcoming monthly meeting
 - David Roylance – CoB Energy Consultant
 - Karl Miller – CoB Facilities Director
 - Sharon Citino – CoB City Manager
 - Terrence Beaman – CoB Chief Financial Officer
 - Review, modify, and gain alignment of this Strategy from the CoB Mayor and City Council, and then begin the following -
 - Confirm details and process for 30% ITC “Direct Pay” refund
 - Confirm grant from Shell / MP2 and others (SECO, CenterPoint, etc ..)
 - Confirm if a Bellaire Citizen Donation program should be implemented
 - Initiate Project RFP
 - After all technical, regulatory, and commercial aspects are approved, formally award and kickoff the project with the successful Solar EPC Company bidder

Backup Slides

Utility Bill Data Review Results

Courthouse & Police Station, Fire Station, City Hall

	Bldg Name	Court & Police			Fire Station			City Hall		
	Address	5110 Jessamine St, Bellaire, TX 77401			5101 Jessamine St, Bellaire, TX 77401			7008 S Rice Ave, Bellaire, TX 77401		
	ESI ID	1008901001901436960118			1008901022900411320110			100890102490141300118		
	Cust ID	5218002029			5213003406			5218001827		
Year	Usage Mo	\$	KwHr	\$ / KwHr	\$	KwHr	\$ / KwHr	\$	KwHr	\$ / KwHr
2019	June	\$6,680	117,888	\$0.0567	\$2,710	46,280	\$0.0586	\$3,852	65,280	\$0.0590
2019	July	\$6,401	112,800	\$0.0568	\$2,606	45,569	\$0.0572	\$3,231	52,992	\$0.0610
2019	Aug (est)	\$6,401	112,800	\$0.0568	\$2,606	45,569	\$0.0572	\$3,231	52,992	\$0.0610
2019	Sept (est)	\$6,401	112,800	\$0.0568	\$2,606	45,569	\$0.0572	\$3,231	52,992	\$0.0610
2019	Oct	\$11,668	93,596	\$0.1247	\$4,498	37,446	\$0.1201	\$5,741	42,816	\$0.1341
2019	Nov	\$4,809	84,096	\$0.0572	\$2,195	39,717	\$0.0553	\$2,787	45,312	\$0.0615
2019	Dec	\$4,740	85,152	\$0.0557	\$2,231	41,221	\$0.0541	\$2,682	45,888	\$0.0584
2020	Jan	\$9,135	76,608	\$0.1192	\$4,154	34,352	\$0.1209	\$5,051	39,744	\$0.1271
2020	Feb	\$4,770	83,040	\$0.0574	\$2,028	37,033	\$0.0548	\$2,437	40,512	\$0.0601
2020	Mar	\$4,756	83,520	\$0.0569	\$2,039	37,063	\$0.0550	\$2,249	34,368	\$0.0654
2020	Apr	\$5,213	87,264	\$0.0597	\$2,087	36,834	\$0.0567	\$2,539	43,584	\$0.0583
2020	May	\$5,338	91,680	\$0.0582	\$2,226	38,769	\$0.0574	\$2,636	44,544	\$0.0592
	Total	\$76,312	1,141,244	\$0.0669	\$31,986	485,422	\$0.0659	\$39,665	561,024	\$0.0707

These 3 buildings initially identified due to newer build and good physical roof characteristics; other CoB properties (Recreation Center, New Library, New MTC) can be considered also for the future

Why Communities Install Solar

Usually, a combination of one of these four reasons:

To Save Money

To Save The Environment

To Have Energy Independence

To Have Technology Diversification



Example View of Online Solar Monitoring

- Monitoring is included as part of the Solar Inverter package
- Main capability is to collect and send real time power level data and diagnostics through an Online Portal

