MOTT MACDONALD

Technical Note
Solar Feasibility

Project:	Pensacola – Solar Feasibility		
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1 Introduction

This Technical note is to address feasibility of solar photovoltaic (PV) power at sites designated by the City of Pensacola. This memo encompasses performance estimates, site impact of PV installation, and includes methodology utilized to determine feasibility of the sites.

2 Methodology

The following sections discuss the process followed to develop the feasibility study.

2.1 Mapping Areas on Sites for PV Installation

The team utilized AutoCAD and its Online Map Data to import a to-scale aerial view of the designated sites. Areas where PV panels can be mounted were mapped out in AutoCAD, these areas are indicated as Max Area. We used Google Earth to identify the Sun's path, and roof geometry. As a result, new practical areas were drawn with consideration of the present shadows.

2.2 Estimating the Performance of PV Installation

We used PVWatts® to determine potential power (kW) size for each site by multiplying the practical area, standard module efficiency, and standard module power. PVWatts® is a web application developed by the National Renewable Energy Laboratory (NREL) that estimates the electricity production of a grid-connected roof- or ground-mounted PV system based on location and the system size.

2.3 Determining a Feasible System Size

Based on the Florida Power and Lighting (FPL) energy bill data provided to us by the City, we were able to approximate the average annual kilowatt hours (kWh) used by each site and convert that value into an equivalent PV system size. To determine a feasible system size, we compared the two system sizes and used the lesser amount. This is based on the current limitations of power production under a net metering agreement with FPL. In general, only 110% of the kWh used would be allowed per meter in the FPL net metering agreement. So, while a building or site may be able produce much more than is consumed, there will be limitations to the size.

3 Summary of Findings

The table below summarizes the practical area in ft^2 for each building as well as the associated PV size that could be generated.

Table 3.1: Working Feasibility Data

Site Name	Practical Area (ft^2)	Potential PV System Size (kW)	Avg kWh used system Size (kW)	Site Calculated Size (kW)	Feasible Power Size (kW)	Added Percent Renewable Per Site	Percent towards 30% goal	Budget Installation
Airport	98744.05	13760	TBD	TBD	TBD		TBD	
Blue Wahoos Stadium	9991.81	139.24	698	139.2	139	20%	0.75%	$348,100.92
Fire Administration Building/ Fire Station 1	5938.94	82.73	204	82.8	82	41%	0.44%	$206,904.50
Fire Station 2	10561.83	147.18	91	147.2	91	100%	0.49%	$226,310.95
Fire Station 3	6758.64	94.18	64	94.2	64	100%	0.35%	$161,125.76
Fire Station 4	12362.45	172.27`	87	172.3	87	100%	0.47%	$218,730.55
Fricker Community Center	8921.09	124.31	176	124.3	124	71%	0.67%	$310,798.51
Housing Department	6828.61	95.15	53	95.2	53	100%	0.29%	$133,448.43
Malcolm Youge Center	9607.25	133.88	88	133.9	88	100%	0.47%	$220,124.02
Osceola Golf Course & Club House	16954.16	644.78	201	881.0	201	100%	1.09%	$501,258.52
Pensacola Energy Operations Center	23066.57	321.44	221	321.4	221	100%	1.18%	$552,059.05
Port of Pensacola, Admin Bldg	1603.94	22.35	28	1640.6	22	81%	0.15%	$55,879.06
Port of Pensacola, Warehouse #4	46438.79	647.14	24	1640.6	24	100%	0.13%	$60,551.03
Port of Pensacola, Warehouse #8	69688	971.13	148	1640.6	148	100%	0.80%	$369,970.19
PPD	15160.52	211.26	980	211.3	211	22%	1.14%	$528,171.67
Roger Scott Athletic Complex	1919.44	26.74	64	304.0	27	42%	0.34%	$66,870.65
Roger Scott Tennis Center	1909.14	26.60	466	304.0	27	6%	1.62%	$66,511.81
Vickrey Resource Center	17986.48	250.64	222	304.0	222	100%	1.21%	$554,056.23
Field Service Center	27560.13	384.06	386	1219.2	384	100%	2.09%	$960,157.03
Fleet Garage	17992.85	250.73	72	1219.2	72	100%	0.39%	$181,244.58
Sanitation	5412.36	75.42	111	1219.2	75	68%	0.60%	$188,559.18
Second Garage at FSC	8644.76	120.46	19	1219.2	19	100%	0.10%	$47,542.83
Parks Shed at FSC	10651.81	148.43	22	1219.2	22	100%	0.12%	$54,927.26
Transfer station	12775.67	178.03	2	1219.2	2	100%	0.01%	$7,787.12
Sanders Beach Community Center	9899.04	137.94	164	137.9	138	84%	0.74%	$344,868.94
Theophilis May Community Center	9668.45	134.73	105	168.2	105	100%	0.56%	$263,111.27
Totals:					**3981.3**		**16%%**	**$7,632,089.68**

Practical Area (ft^2)	The area available at a site that could support a solar install.
Potential PV System Size (kW)	The size of PV system that could fit given the area available.
Avg kWh used system Size (kW)	The size of PV system required to meet 100% of the site's energy needs, based on provided data.
Site Calculated Size (kW)	The size of PV system that could fit given the size of the grouped site.
Feasible Power Size (kW)	The size of PV system that could be installed to meet as much of the site's energy needs as possible.
Added Percent Renewable Per Site	The percentage of renewable energy that the feasible PV system could provide to a site.
Percent towards 30% goal	The percentage of renewable energy that the feasible PV system could provide towards the City's 30% renewable energy goal.
Budget Installion	The estimated cost of installation for the feasible PV system.

3.1 System Value

Almost two-thirds of the sites in **Table 3.1** can have PV systems installed to meet average annual kWh usage, with the capability to expand beyond demand and generate credit.

3.2 Single Systems

The following sites could have roof-mounted PV systems installed that would supply the average kWh used per year: Fire Stations 2, 3, & 4, Housing Department building, Malcolm Younge Center, Pensacola Energy Operations Center, and Theophilis May Community Center.

3.3 Campus Systems

Campuses are a group of buildings sub-fed by a shared meter. The Fire Administration building and Fire Station 1 (FS1) currently are sub-fed from the same meter and could have roof-mounted PV systems installed that supply almost half of the average kWh used per year.

Though these building are not campuses, they are located on adjacent properties. The Port of Pensacola has many buildings on separate meters that could be combined in one of two ways to have roof-mounted PV systems installed that can meet demand. One way would be to re-work the head-end electrical equipment and create a single campus-wide meter. Combining these under one meter would lead to higher costs and extend any payback period. The second approach would be to use the largest building on the site as the location for the majority of the solar arrays. Instead of feeding only the one building, feeders from that larger array could be fed to the other buildings on site that have individual meters and tied-in to those systems. Doing so does pose some concerns for meeting the requirements of Article 225 of the National Electric Code. Something that would easily be addressed during a design phase.

Similarly, the following sites could be combined onto one meter to meet demand: Field Service Center, Fleet Garage, Parks Shed at FSC, Sanitation, Second Garage at FSC, and Transfer Station. The Roger Scott Tennis Center and Vickery Resource Center could also be reworked to share one meter and have a PV system that almost meets demand.