Provider: Conference for Catholic Facility Management

Provider Number: G460

CCFM

CONFERENCE FOR CATHOLIC FACILITY MANAGEMENT

God is in the details.

Tap Into the Sun, Save Money, Reduce Your Environmental Impact

Course Number MIA1705

Richard Anderson

April 25, 2017

CQI ASSOCIATES

Energy & Sustainability Management Consultants

CONTINUING EDUCATION AIA

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with AIA CES The presentation is for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Copyright Materials

This presentation is protected by US and International Copyright laws. Reproduction, distribution, display and use of the presentation without written permission of the speaker is prohibited.

CQI ASSOCIATES
Energy & Sustainability Management Consultants

CCFM
CONFERENCE FOR CATHOLIC FACILITY MANAGEMENT
God is in the details.

© CQI Associated LLC and CCFM 2017

CONTINUING EDUCATION AIA

Course Description

"Renewable energy from solar has increased significantly over the past five years. In 2016, the addition of solar energy has resulted in keeping energy suppliers using fossil fuels from increasing, thus reducing the overall cost of energy. With the extension of the federal investment and accelerated depreciation legislation to 2020, the investment community is continuing to provide attractive financing for projects. Catholic schools, parishes and Religious Institutes have an opportunity to install solar photovoltaic generation systems to lower current operating costs, provide fixed rates for long-term budget stability, and achieve positive environmental benefits. The Archdiocese of Baltimore has a 4 megawatt solar system installed through a net aggregate meter billing process, which is providing solar energy for the Cathedral, the Basilica, three high schools, one school, and the Catholic Center. The first year of operation is complete. Learn how solar can be a part of the long-term solution to provide renewable energy".

CONTINUING EDUCATION AIA

Learning Objectives

At the end of the this course, participants will be able to:

1. Assess the potential benefits of installing a solar system, using examples and case studies.
2. Understand the potential project financing options for the installation of a solar system, using examples and case studies.
3. Identify the steps requires to implement a feasibility study to determine if the installation of a solar system will be beneficial, using examples and case studies.
4. Identify which solar installation option may be applicable to their locations and facilities, using examples and case studies.

CONTINUING EDUCATION AIA

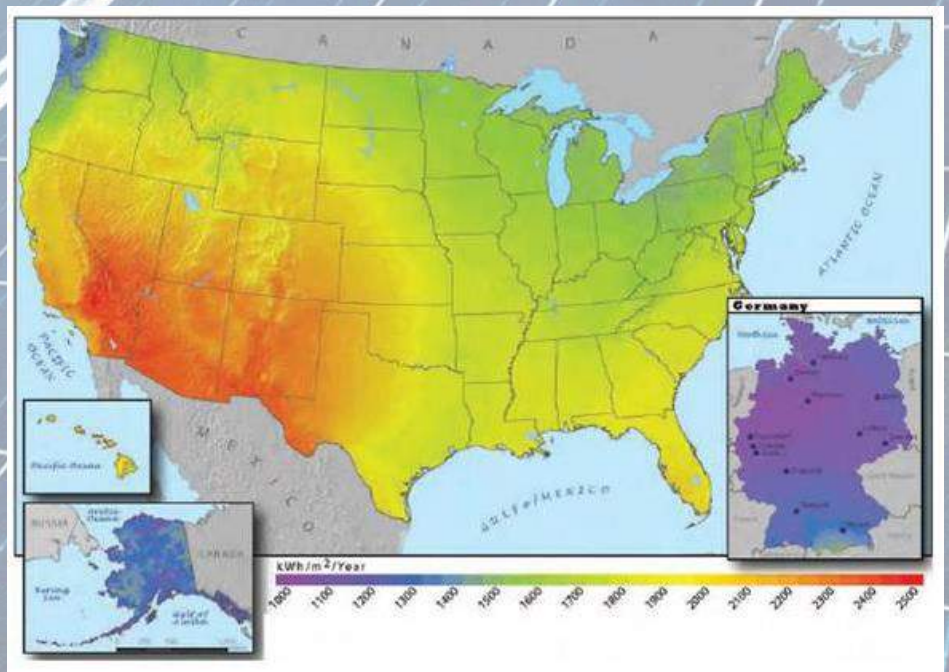
Why Solar?

- Renewable & Sustainable
- Regulatory Financial Incentives Provide Near term Economic Benefits
- Long-Term Budget Stability
- Consistent with Stake Holder Expectations

Solar Energy

- Free and limitless energy source
- Offset energy consumption costs
- Reduce carbon footprint

- **Almost the entire U.S. receives more solar rays than Germany**
- **Current World Leader is Germany (2012, Reuters)**

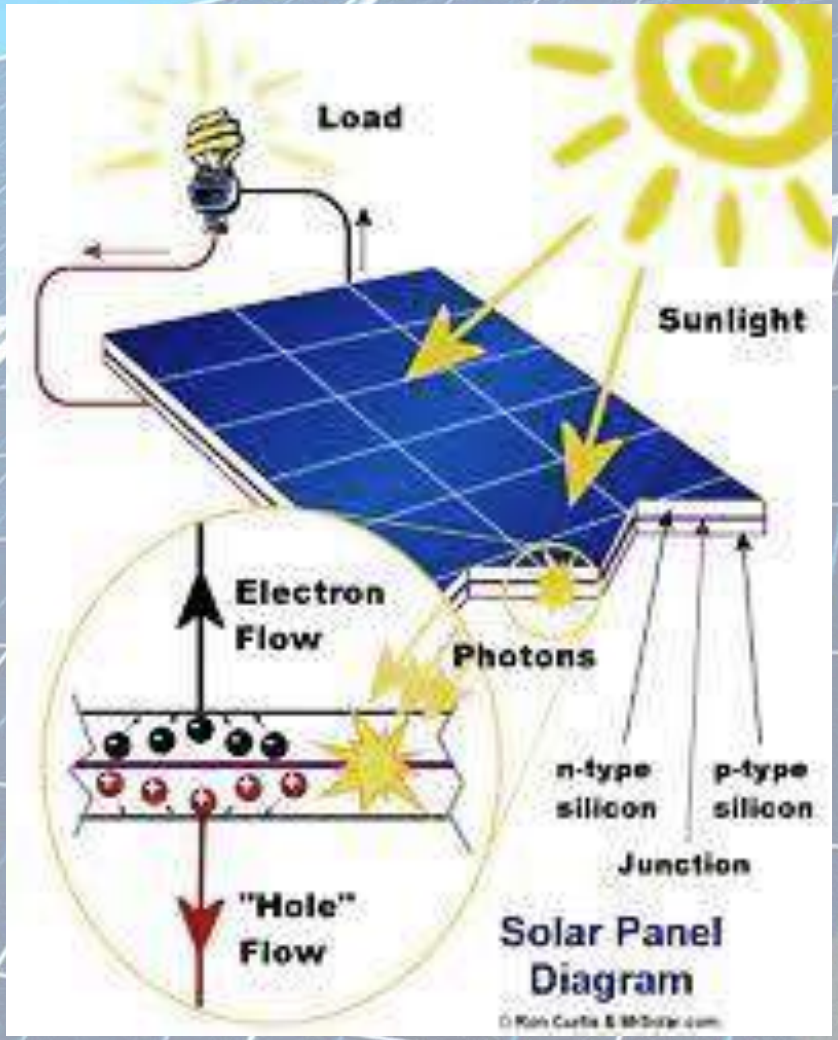


Environmental Benefit

- Solar energy production does not involve the **extraction**, **transport**, **facility construction** and **fuel combustion** of fossil fuels
- 2,890,000 kWh produced by solar per year equates to 1,500 metric tons of carbon reduction-equivalent to the annual greenhouse gas emissions from 300 cars

Photovoltaic Solar Technology

- Converts sunlight directly into electricity
- PV cell is a wafer of silicon sandwiched between two thin contact plates
- The top contact is positively charged and the back contact plate is negatively charged
- When sunlight strikes the solar panel, its energy knocks electrons loose creating energy



Photovoltaic Solar Power

- PV modules power things as small as calculators to providing energy for cities

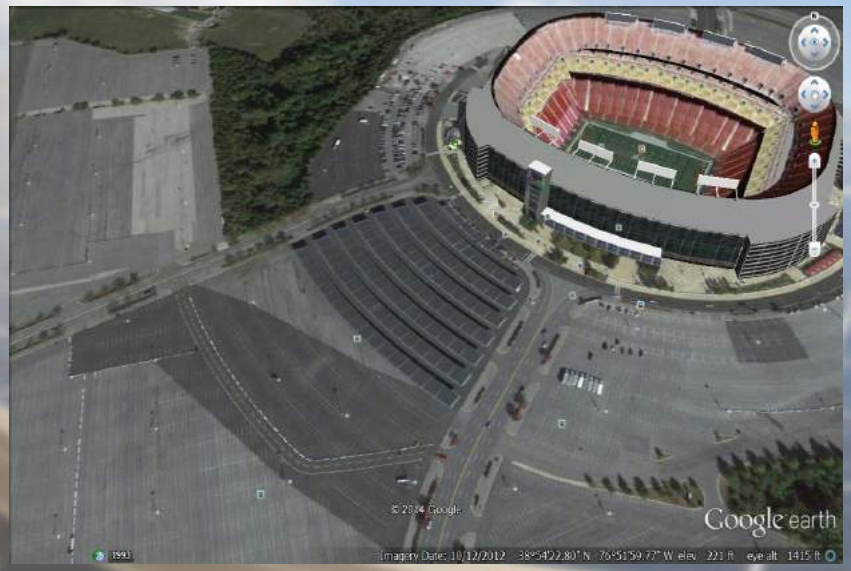
System Configurations

- **On Site Systems - Behind the meter**
- **Off Site Systems – Net Meter Option by Utility**
- **Virtual System Options – By Utility & By Supplier**

Roof Mounted Solar

Ground Mounted Solar

Parking Canopy Mounted Solar



Garage Canopy Mounted System

Off Site Solar

Mt Saint Mary's University

Innovative Solar Arrays

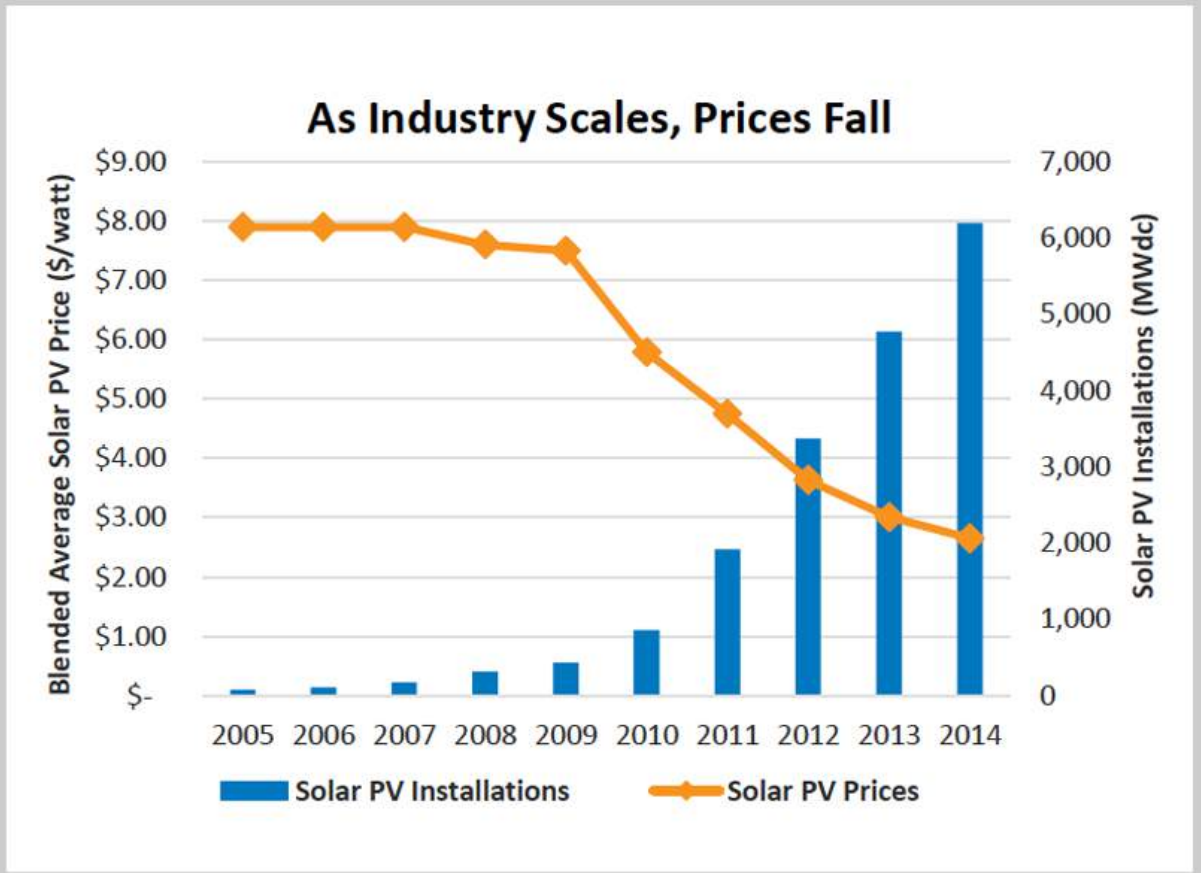
Thermal Hot Water Solar

Battery Back-Up

Solar Growth Since 2010

- 132% Growth since 2010
- 46% Commercial growth
- 64% Increase in system size
- 60% Installation cost reduction
- $2.50/watt Total system cost 2016
- 6 Frequency of product improvements in months

Solar Growth and Cost

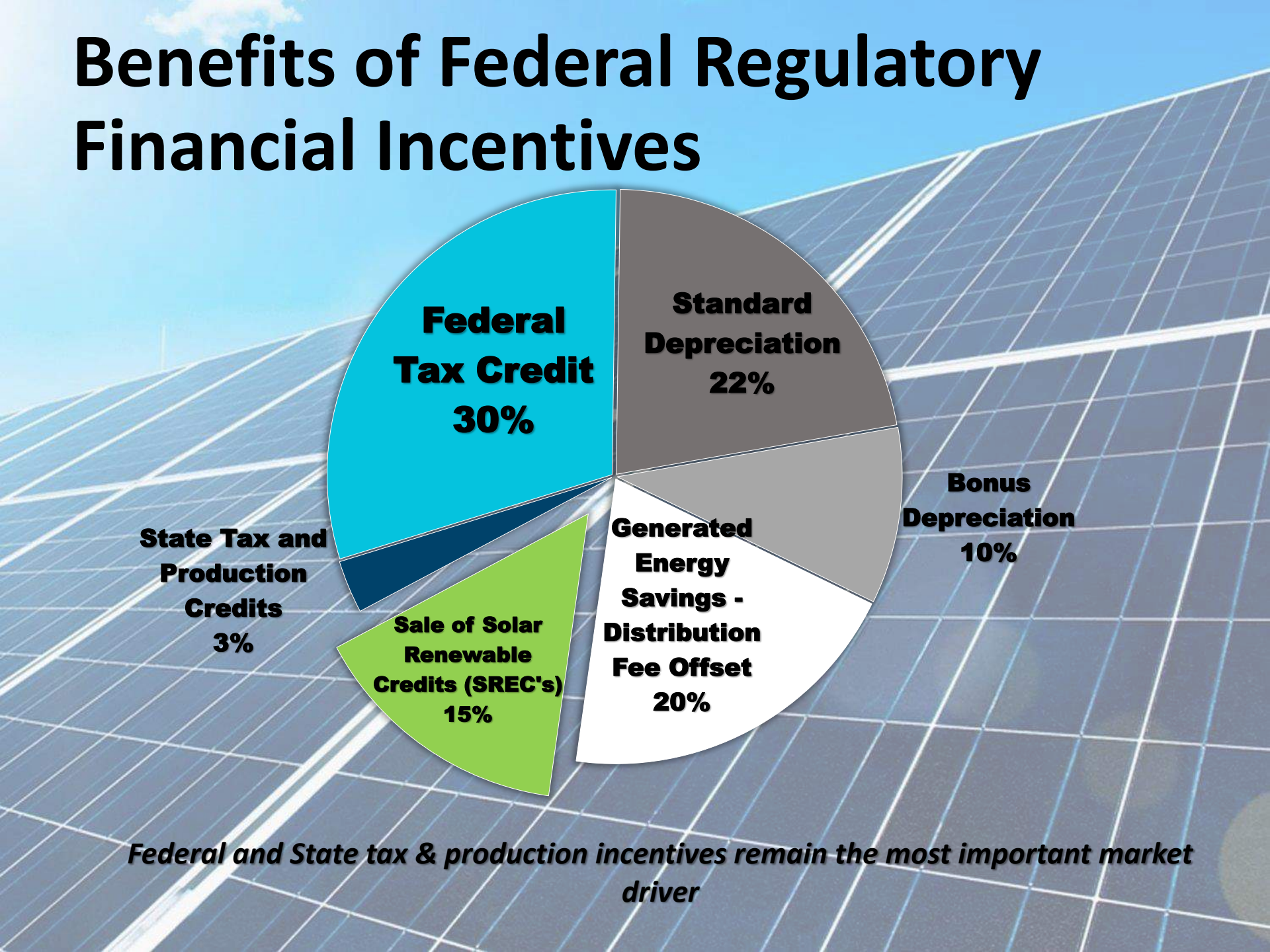


© 2015

GTM RESEARCH

40 YEARS SEIA Solar Energy Industries Association®

Benefits of Federal Regulatory Financial Incentives



Federal and State tax & production incentives remain the most important market driver

Financing Options

- Owner Financed Capital Project
- Power Purchase Agreement
  - Third Party Financing
  - Typically 20 year
  - Fixed price for the generated energy
  - Financing company retains all financial and environmental incentives

Power Purchase Agreement – Price

- Fixed price to be paid to Seller for the generated energy
- Host Utility will provide a “deliver and distribution credit” for the designated accounts

Power Purchase Agreement - Buyer

- The Buyer agrees to provide land for the construction of the solar system
- The Buyer agrees to pay for the generated energy produced from the solar system at a fixed price with annual escalation fees for a period not to exceed 20 years
- Buyer receives the full benefit of the generated energy from the solar system
- Buyer receives the benefit from the allocation of the generated energy to nominated accounts as part of the aggregate net metering program

Power Purchase Agreement - Seller

- The Seller agrees the Buyer has no obligation to proceed with the terms of the PPA if:
  - Utility does not grant an interconnection approval
  - If local, state and federal agency permits are not approved
- Seller shall provide a performance guarantee the system will produce 90% of the baseline design annual solar energy
  - If the production is not achieved the seller shall reimburse Buyer for the difference
- The Seller agrees to design, permit, construct, operate, and maintain the solar system
- Seller pays all cost to design, permit, construct, operate, and maintain the solar system
- Seller retains all financial potential benefits to include tax incentives, production incentives, depreciation
- Seller retains all potential environmental and renewable energy credit benefits
- The seller agrees at the end of the term of the PPA Agreement to remove the solar system and restore the property to it’s original condition

Baseline Cost

Understand what you are currently paying for bundled energy costs.

- Annual consumption kWh)
- Annual total electricity cost
- Divided = Bundled cost per kWh

	$0.1070
Supply Costs Generated Energy	$0.0735
Delivery Cost & Regulatory Fees	$0.0335

Long Term Budget Stability

Benefit – Behind the Meter Option

Bundled Cost	$0.1070
Supply Costs Generated Energy	$0.0735
Delivery Cost & Regulatory Fees	$0.0335

Reduction	$0.0470
Cost of System 10 Years	$0.0600

Long Term Budget Stability

Benefit – Power Purchase Agreement Option

Bundled Cost	$0.1070
Supply Costs Generated Energy	$0.0735
Delivery Cost & Regulatory Fees	$0.0335

Reduction	$0.0316
	$0.07545
Supply Costs Generated Energy	$0.06545
Delivery Cost & Regulatory Fees	$0.01000

Long-Term Budget Stability

			Current Third Party BGE Rates			Solar Power Purchase Rate & BGE Offsets			
	Year	System kWh	Supply Cost	Bundled	Electricity	Supply Cost	Bundled	Electricity	Cost
Site A		Production	per kWh	per kWh	Cost	per kWh	per kWh	Cost	Reduction
1,374 kW	**2017**	**1,968,000**	**0.07350**	**0.1070**	**$210,576**	**0.06545**	**0.0755**	**$148,486**	**$62,090**
	2018	1,958,160	0.07350	0.1070	$209,523	0.06676	0.0768	$150,306	$59,217
	2019	1,948,369	0.07497	0.1085	$211,340	0.06809	0.0781	$152,156	$59,183
20 Years	2020	1,938,627	0.07497	0.1085	$210,283	0.06946	0.0795	$154,036	$56,247
	2021	1,928,934	0.07647	0.1106	$213,416	0.07085	0.0810	$156,331	$57,085
	2036	**1,789,220**	**0.08784**	**0.1241**	**$222,044**	**0.09535**	**0.1062**	**$189,966**	**$32,077**
20 Year Totals		**37,545,315**			**$4,317,053**			**$3,363,686**	**$953,367**

Off Site Solar – Archdiocese of Baltimore

Aggregate Metering

- The solar generation must be intended primarily to offset all or part of the Customer's own electricity requirements
- Regulation permitting a local government agency to build a larger system at one site and allocate the excess solar energy capacity to other location meters
- Each customer will be able to aggregate accounts
- The accounts must be held by the same customer
- A solar electrical generating facility shall not exceed 2,000 kW per site

Net Metering - Regulatory Options

- **Allow owner to aggregate accounts** to receive generation credits from a solar photovoltaic energy generation facility

- The eligible customers qualified to request meter aggregation are:
  - a customer using service for agriculture
  - a customer who is a not-for-profit organization
  - or business, and a customer who is a **municipal government** or its affiliated organizations

- Eligible customers installing a solar electrical generator

Site A - Long-Term Budget Stability

Cathedral of Mary Our Queen		Seton Keough High School		School of the Incarnation		Summary	
kWh	Cost	kWh	Cost	kWh	Cost	kWh	Cost
1,095,374	$ 92,254.	594,990	$ 59,171	932,685	$ 76,462.	2,857,798	$ 250,439.
	$ 0.08422		**$ 0.09945**		**$ 0.08198**		**$ 0.08763**
PRIOR BUNDLED RATE	**0.11742**		**0.1135**		**0.11930**		**$ 89,700**

Site B - Long-Term Budget Stability

Roman Catholic Archbishop		Archbishop Curley High School		Archbishop Spalding High School		Summary	
kWh	Cost	kWh	Cost	kWh	Cost	kWh	Cost
758,562	$ 68,963	773,748	$ 70,782	1,412,396	$ 127,390	2,944,706	$ 267,137
	$ 0.09091		**$ 0.09148**		**$ 0.09019**		**$ 0.09072**
PRIOR BUNDLED RATE	**0.11742**		**0.11663**		**0.11930**		**$ 81,100**

The implementation steps

Pre-Construction

1
Assessment
- Technical
- Financial
- Regulatory Review

2
Contractor Selection
- Request for Proposal
- Price Proposal
- Agreement Review

Construction

3
Design & Phasing Plan
- Occupied campus
- Road closures

3
Permits
- Electrical permit
- Building Permits
- Utility Interconnection Application

3
Construction
- Site Access
- Internal approvals
- Utility Coordination

4
Operation
- Commissioning
- Utility Certification
- Start-up

Key Tasks

- **Agreement Legal Review and Negotiations**
- **Best and Final Pricing**
- **Utility Interconnection Application**
- **Building Permit Application**
- **Commissioning & Final Inspections**
- **Certificate of Commercial Operation from Host Utility**
- **Performance Monitoring**
- **Quarterly Preventative Maintenance and Performance Reviews**

Why Solar?

- Renewable & Sustainable
- Regulatory Financial Incentives Provide Near term Economic Benefits
- Long-Term Budget Stability
- Consistent with Stake Holder Expectations

Questions?

Copy of Presentation - CQI Website

cqiassociates.com

References:

- **Solar Energy Industries Association**
  202-682-0556 | 600 14th Street, NW, Suite 400, Washington, DC 20005
- **Department of Energy.Gov/Solar**
- **Renewable Energy World**
  www.renewableenergyworld.com/solar-energy.htm
- **National Renewable Energy Laboratory**
  www.pvwatts.nrel.gov

This concludes The American Institute of Architects Continuing Education Systems Course

Conference for Catholic Facility Management

CQI ASSOCIATES
Energy & Sustainability Management Consultants

CCFM
CONFERENCE FOR CATHOLIC FACILITY MANAGEMENT
God is in the details.

Richard Anderson — richard@cqiassociates.com

Andy Guljas — 317-525-7176

CONTINUING EDUCATION AIA