

A large array of solar panels is installed on a rooftop, stretching across the foreground and middle ground. The panels are dark blue with white grid lines. In the background, a city skyline is visible under a clear blue sky, featuring several tall buildings of varying architectural styles, including some with glass facades and others with more traditional brick or concrete. The overall scene is bright and clear, suggesting a sunny day.

Solar Power Purchase Agreements

Brian Millberg | Energy Manager, City of Minneapolis

Direct Ownership

- **Financial:**

Even at \$3/kW installed cost,
simple payback is 18 years

(initial electricity cost of \$0.10/kWh and 3%/year electricity cost inflation)

- **Politics:**

How to justify expense with such a long
payback

- If RECS begin to have some real value, this would be a positive for ownership.

PPA Advantages

- No/low up-front costs
- City can take advantage of Investment Tax Credits (ITCs)
 - This leads to low electricity costs
- Predictable electricity cost for length of contract
- Avoid direct design/rebate/permitting work
- No maintenance/operation headaches

PPA Financial Case (1 MW system)

- **PPA allows a developer to reduce system cost through:**
 - 30% Federal Investment Tax Credit (ITC)
 - 5 year accelerated depreciation with 50% bonus in first year (2013)

Construction Cost:	\$3,000,000
30% FIT Credit:	<u>- \$900,000</u>
Initial Cost	\$2,100,000

- 5 Year MACRS*:

	Depr. Value	Tax Savings
– First year:	\$1,050,000	\$441,000
– Years 2 – 5:	\$262,500	\$110,250

* Modified Accelerated Cost Recovery System

PPA Financial Case for the Developer (1 MW system)

Initial Electricity Cost	Electricity Cost Inflator	7 Year IRR (3%) after Taxes	Simple Payback (Years)	10 Year IRR with 20% Buy Back in Year 10
\$0.10/kWh	0%	-12%	17	N/A
\$0.10/kWh	3%	-11%	13.5	N/A
\$0.15/kWh	0%	-1%	11	2%
\$0.15/kWh	3%	-5%	9.5	4%
\$0.20/kWh	0%	-2%	8	6%
\$0.20/kWh	3%	-1%	7.5	8%

PPA Financial Case for Customer

(1 MW system)

Year	20 Year bond 3% interest	Utility Costs \$0.20/kWh with 3% esc.	PPA Costs \$0.20/kWh with 3% esc.	PPA Costs \$0.20 fixed
1	\$ 150,000.00	\$ 260,000.00	\$ 260,000.00	\$ 260,000.00
2	\$ 90,000.00	\$ 267,800.00	\$ 267,800.00	\$ 260,000.00
3	\$ 90,000.00	\$ 275,834.00	\$ 275,834.00	\$ 260,000.00
4	\$ 90,000.00	\$ 284,109.02	\$ 284,109.02	\$ 260,000.00
5	\$ 90,000.00	\$ 292,632.29	\$ 292,632.29	\$ 260,000.00
6	\$ 90,000.00	\$ 301,411.26	\$ 301,411.26	\$ 260,000.00
7	\$ 90,000.00	\$ 310,453.60	\$ 310,453.60	\$ 260,000.00
8	\$ 90,000.00	\$ 319,767.21	\$ 319,767.21	\$ 260,000.00
9	\$ 90,000.00	\$ 329,360.22	\$ 329,360.22	\$ 260,000.00
10	\$ 90,000.00	\$ 339,241.03	\$ 939,241.03	\$ 260,000.00
11	\$ 90,000.00	\$ 349,418.26	\$0.00	\$ 260,000.00
12	\$ 90,000.00	\$ 359,900.81	\$0.00	\$ 260,000.00
13	\$ 90,000.00	\$ 370,697.83	\$0.00	\$ 260,000.00
14	\$ 90,000.00	\$ 381,818.77	\$0.00	\$ 260,000.00
15	\$ 90,000.00	\$ 393,273.33	\$0.00	\$ 260,000.00
16	\$ 90,000.00	\$ 405,071.53	\$0.00	\$ 260,000.00
17	\$ 90,000.00	\$ 417,223.67	\$0.00	\$ 260,000.00
18	\$ 90,000.00	\$ 429,740.38	\$0.00	\$ 260,000.00
19	\$ 90,000.00	\$ 442,632.60	\$0.00	\$ 260,000.00
20	\$3,090,000.00	\$ 455,911.57	\$0.00	\$ 260,000.00
NPV Values	\$3,058,252.43	\$5,048,543.69	\$2,970,728.19	\$3,868,143.46

Minneapolis Convention Center



601kW Solar Array

Minneapolis Convention Center

- 601 kW DC completed in December 2010
- 2,613 Siliken 230W panels
- Unirac ISYS mounting system
- 6 Solectria 95kW inverters, 480V
- Maximum AC output 567 kW
- 750,000 kWh/year output
- Produces 8% - 10% of daytime electricity consumption at the site
- System owned and operated by MCC Solar, LLC

Convention Center Project Financials

- Installed cost: \$3,100,000 (\$5.15/Kw)
- Renewable Development Fund (RDF) grant from Xcel Energy rate payers: \$2,000,000
- 20 Year Fixed price contract: \$0.10695/kWh
- Buy-out provision:
 - Starting in year 7 at 14% of original cost
 - Yearly reduction in price until 8% of original cost in year 20
- RECS owned by Xcel Energy due to RDF grant

The RFP Team

- **Mandatory team members:**
 - Construction Project Manager
 - Contract Lawyer
 - PPAs can be complicated documents
 - Risk Manager
 - To cover all liability scenarios
 - Financial Consultant
 - To validate developer financial strength
- **Optional team members:**
 - Purchasing Manager
 - To ensure all proper purchasing rules are followed
 - Outside Alternative Energy Consultant or Sustainability Consultant

RFP – Invitation for Proposals

- Project Description
- Regulatory Requirements
- Detailed Site Description/Drawings
- Project Schedule Requirements
- RFP Scoring System Description



Project Description

- System size
 - In kW and kWh/year desired output
- System mounting hardware preference
- System production monitoring requirements
- Sample PPA (minus \$/kWh)

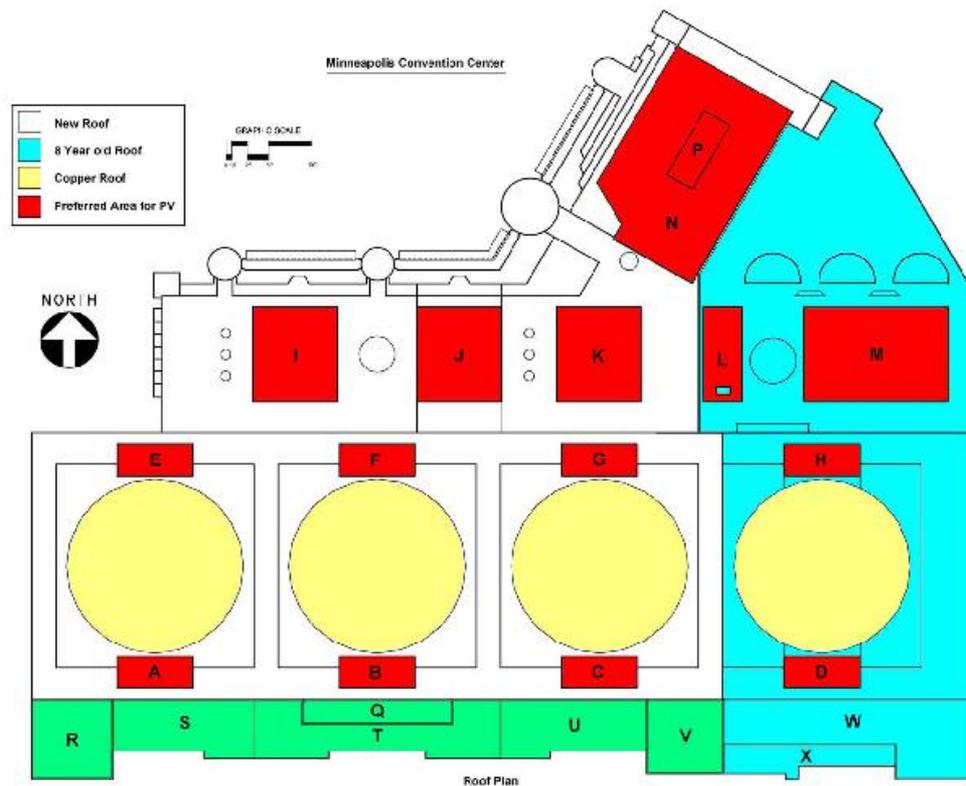
Regulatory Requirements

- Grant money restrictions
 - e.g. Made in USA
- Construction code and inspection requirements
- Labor requirements
 - e.g. labor classification grades or minority/small business goals
- Intangibles
 - e.g. local business involvement, public education, or project visibility

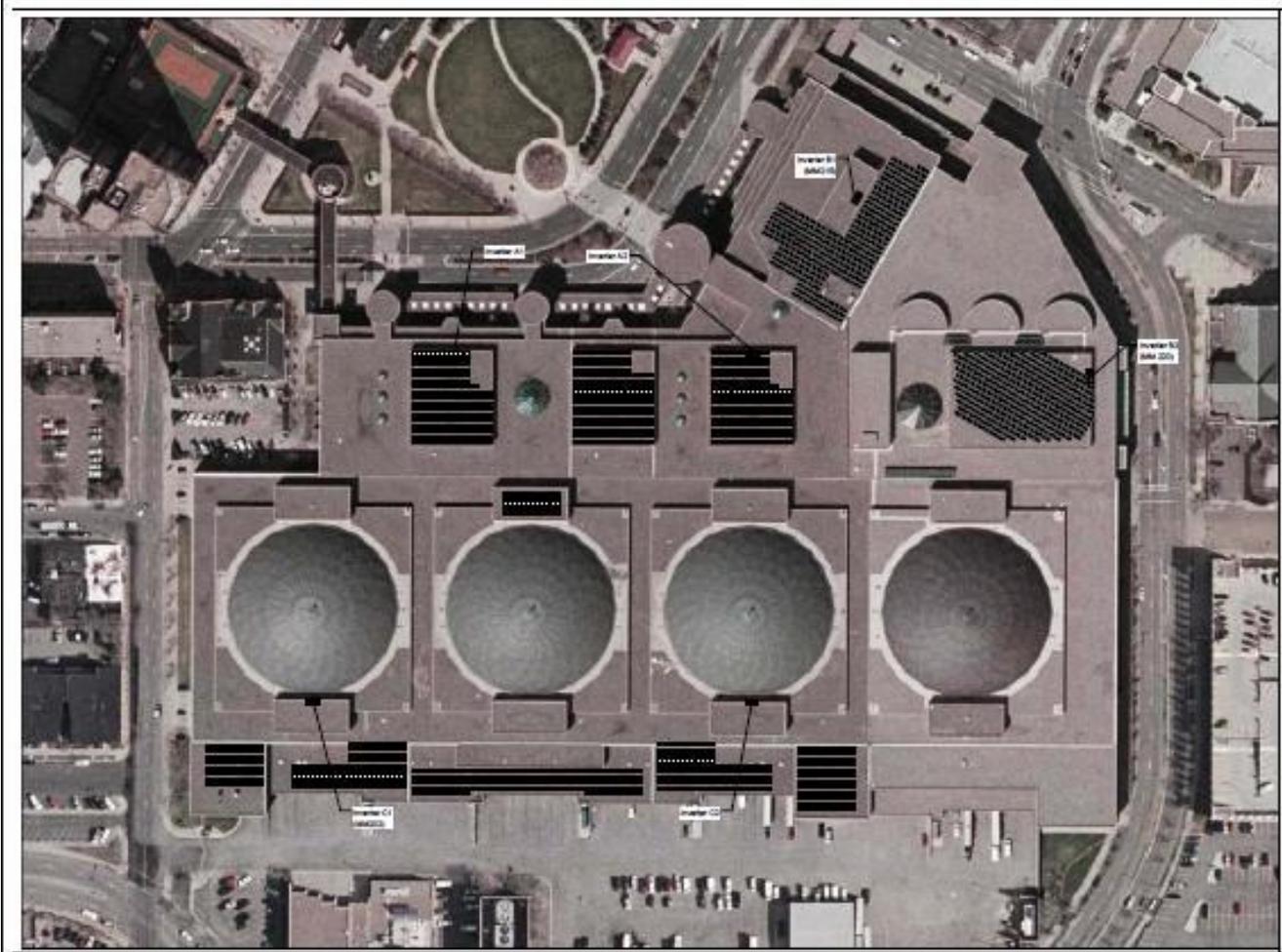
Detailed Site Description/Drawings

- Aerial photos of site
- Legal description of property
- Architectural top view site plan
- Site/Installation requirements:
 - Preferred areas for array
 - Site remediation
 - Staging and access
 - Safety
 - Security

Minneapolis Convention Center Original Site Plan Concept in RFP



Minneapolis Convention Center As Built



Project Schedule Requirements

- Grant requirements, if any
- Weather horizon
- “Substantial completion” vs. actual power production

RFP Scoring Template

- RFP evaluation criteria:
 - Total kWh/year guaranteed
 - \$/kWh pricing
 - Contractor experience level
 - Developer experience level
 - Financing mechanism
 - Project approach
 - Minority/small business/local labor usage

kWh/Year Guarantee

- **Guarantee clause**
 - Avoids outrageous claims of electricity production
 - Requires developer to reimburse customer for extra electricity charges if production falls below guaranteed kWh level

Developer Assessment

- **#1 criteria – financial strength**
 - Beware of first time developers
 - Require signed letter of credit with a reputable bank with the Project Proposal
 - Need your financial consultant to conduct financial due diligence
- **#2 criteria – construction experience**
 - Must be partnered with a general contractor with a history of large complex construction projects. Does not have to be solar experience.
 - More pertinent is complex electrical experience.

Writing the Actual PPA

- Purchase and sale of solar services
- Financing, construction, contracts, design, installation, and testing of systems
- Operation and maintenance of systems
- Purchase of solar services
- Price and payment
- General covenants
- Insurance requirements; irrevocable letter of credit
- Force Majeure events
- Term of agreement; City options
- Events of default
- Remedies following default
- Indemnification
- Miscellaneous provisions
- Lease of property space where array will be placed

The Nitty-Gritty Details

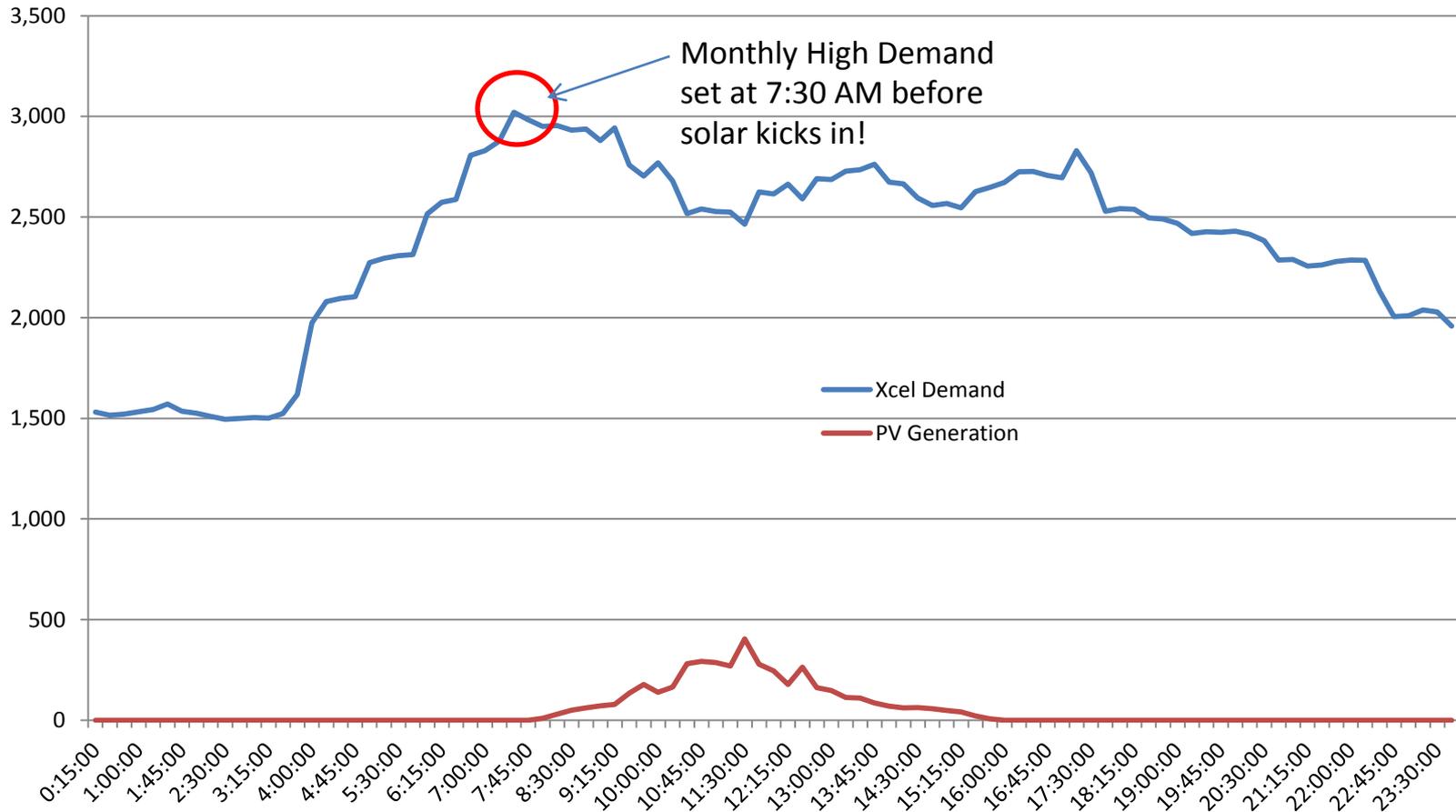
- Project financing
- Construction contract
- System design and installation
- **Utility approvals/interconnection agreement**
- Energy delivery
- Ownership of rebates/RECS
- **Remuneration for loss of solar production**
- PPA could run to 50+ pages

Hot Button Issues

- **Utility approvals/interconnection agreement**
 - Make sure your utility is on board at the beginning
 - Beware of “networked grid” issues
 - All costs paid by the developer
- **Remuneration for loss of solar production**
 - Developer should pay you for difference in electricity costs if they cannot deliver contracted amount of electricity (the guarantee clause)

Beware of Demand Reduction Claims!

Demand Curve for December 2012 Demand Charge Day Minneapolis Convention Center



If You Decide on Direct Ownership

- Bid out a fully designed system created by an experienced solar array design firm. Have them perform contract compliance.
- Require kWh/year guarantee with a 5% retainer for the first 6 – 12 months to ensure system produces correct amount of power.
- Pick a competent General Contractor and Electrical Contractor.

Thank You

Other Resources:

- U.S. EPA: Solar Power Purchase Agreements site
 - [Overview, challenges, opportunities, resources](#)
 - [Webinar](#) (includes presentations, Q&A, and follow-ups)
- National Renewable Energy Laboratory
 - [Power Purchase Agreement Checklist for State and Local Governments](#) (PDF)

Brian.Millberg@MinneapolisMN.gov