Solar Farm Developments: A Proactive Approach

Canadian Association for University Business Officers (CAUBO)
Halifax - June 9, 2019

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ILLINOIS

Agenda

CLEAN ELECTRIC POWER GOALS

ON CAMPUS SOLAR FARM 1.0

ON CAMPUS SOLAR FARM 2.0

OFF CAMPUS SOLAR PURCHASE

CONCLUSION

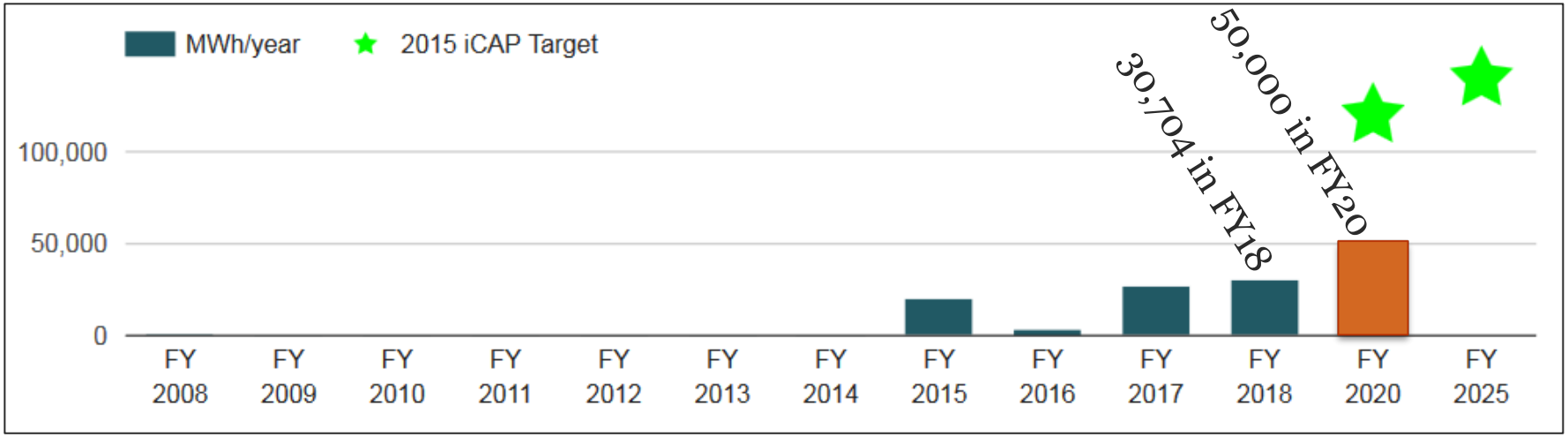
Clean Electric Power Goals

Total campus use = 438,000 MWh

generate **25,000** megawatt hours/year of solar on campus by FY25

obtain **140,000** megawatt hours/year from clean energy by FY25

120,000 MWh/yr goal by FY20



U.S. Environmental Protection Agency (EPA) Green Power Partner

Rail Splitter Wind Farm
- 10-year Wind PPA
- ~25,000 MWh/year
- $38/MWh + Transmission

EPA GREEN POWER PARTNER

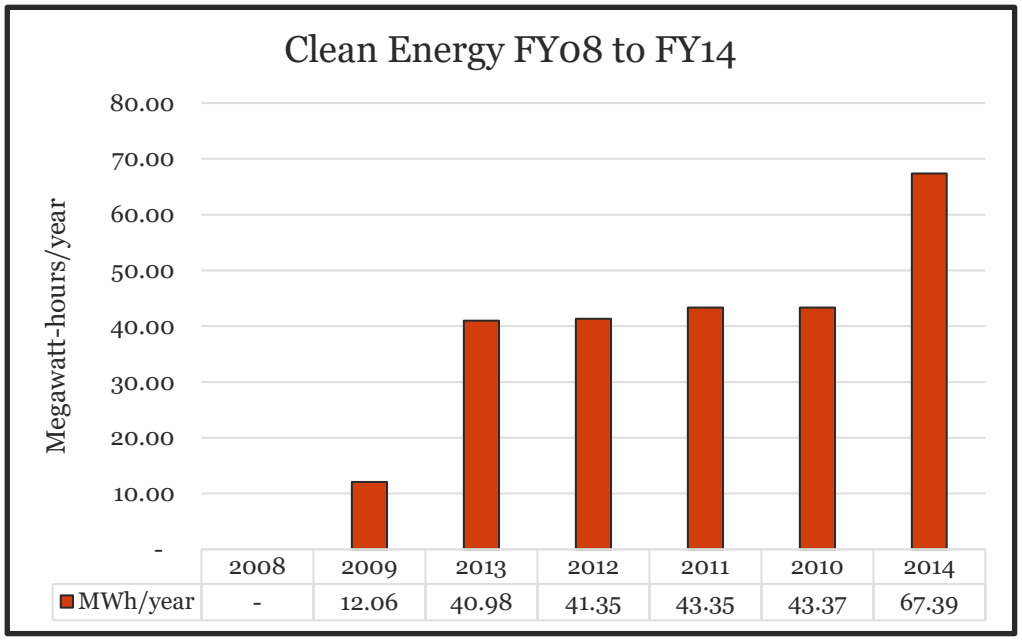
Main Campus
- Rooftop Solar
- Solar Farms
- Geothermal
- Biomass boiler
- Student studies

Allerton Park & Retreat Center
- Solar Power
- Geothermal
- Biomass stove

30,704 MWh
in FY18 from Clean Energy
= 7% of the annual
438,000 MWh consumed

Rooftop & Small Scale Solar

- Business Instructional Facility Roof 0.03 MW
- Building Research Council 0.015 MW
- Uni High Gym Roof
- President's Shed Roof
- Wassaja Hall Roof 0.03 MW
- Electrical & Computer Engineering Roof 0.30 MW– in progress
- TOTAL: 0.375 MW and more to come



On Campus Solar Farm 1.0

SITE SELECTION

REQUEST FOR PROPOSALS

SIMPLE FINANCIAL ANALYSIS

STUDENT SUSTAINABILITY COMMITTEE FUNDING

SIGNED AGREEMENTS

RESULTS AND LESSONS LEARNED

Site Selection

- Justification: iCAP goal for FY15 of 5% renewable electricity
- 30 acres needed, 3 sites considered
- F&S paid the College of ACSE $84,250 for the land
- 27.8 acres approved, but only 20.8 out of the 100-year flood zone

Specifications/ Requirements

Vendor will

- Rent land for $1/year
- Design, build, operate, and maintain the solar farm for the duration of the Power Purchase Agreement (PPA)
- Follow National Electric Code (NEC), National Electric Safety Code (NESC), and IEEE Standard 1547

University will

- Buy all power generated
- Own all Renewable Energy Certificates (RECs) and associated carbon credits
- Own the solar farm at the end of the 10-year PPA

Request for Proposals (RFP) Process

Posted 2/29/12 – Opened 4/05/12

12 Proposals Received and Evaluated

Evaluation Matrix included:

- 35% for the overall program plan
- 10% for land use efficiency
- 10% for the experience and ability of the vendor to perform the services
- 5% for the vendor's financial stability
- 5% for the compliance with the RFP
- 5% for references
- 30% for pricing, based on cost per kilowatt-hour

Simple Financial Analysis

$196/MWh for 10 years

$0/MWh years 11-20

$15.5M total payments

$10.2M avoided costs

→ $5.3M subsidy needed

- Preferred Vendor: Phoenix Solar, Inc.
- $196/megawatt-hour (MWh)

Simple Financial Analysis

- Estimated annual production per year (7,800 MWh)
- 10 year Power Purchase Agreement
- 20 year warranty on solar panels and inverters

= $15,525,926.48 anticipated 20 year cost

- Avoided grid-purchased electricity cost of $51/MWh for 20 year life + 3% escalation

= $10,228,708.88 anticipated avoided cost

➔ $5,297,217.60 subsidy needed

Student Sustainability Committee Funding

UIUC green fees

Contributed $350,000 per year for three years in support of the $5.3M subsidy

- Requirements / Hypothesis
- Total contribution $1.05 million
- The historic timber-frame barn must be preserved, which was moved
- Solar Farm 1.0 is predicted to be self-sustained by year 39
- Funding is designated as a loan, to be paid back after year 39

Board of Trustees Q&A and Approval

- What is the true payback: There is no payback, which is why a subsidy is required.
- Why do we want to install a solar farm if the electricity is more expensive than commercially available: The Illinois Climate Action Plan calls for 5% of the campus electricity from renewable resources by 2015. This interim goal is in keeping with the Illinois State Goal of 20% by 2020.
- Why use fertile farm land for solar: Ground-mounted solar is the most cost-effective.

Approved by the Board of Trustees
November 8, 2012

Signed Agreements

$196/MWh for 10 years

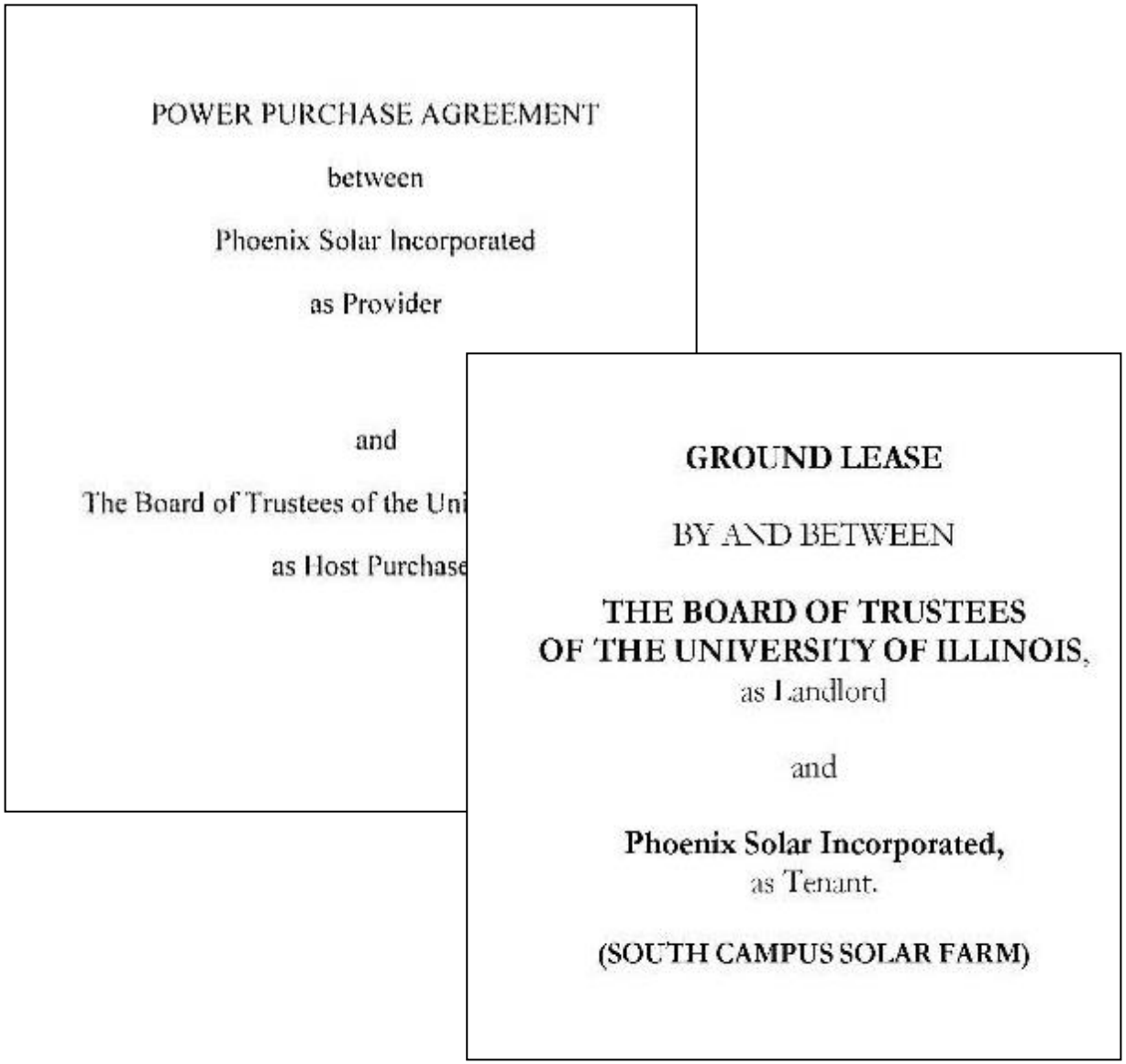
$1/year Lease Agreement

20 year warrantied life

$5.3M subsidy

UIUC will be able to purchase at Fair Market Value at end of 10 year PPA

Lease duration tied to PPA duration, in case of early termination



POWER PURCHASE AGREEMENT

between

Phoenix Solar Incorporated

as Provider

and

The Board of Trustees of the Uni

as Host Purchase

GROUND LEASE

BY AND BETWEEN

THE BOARD OF TRUSTEES
OF THE UNIVERSITY OF ILLINOIS,
as Landlord

and

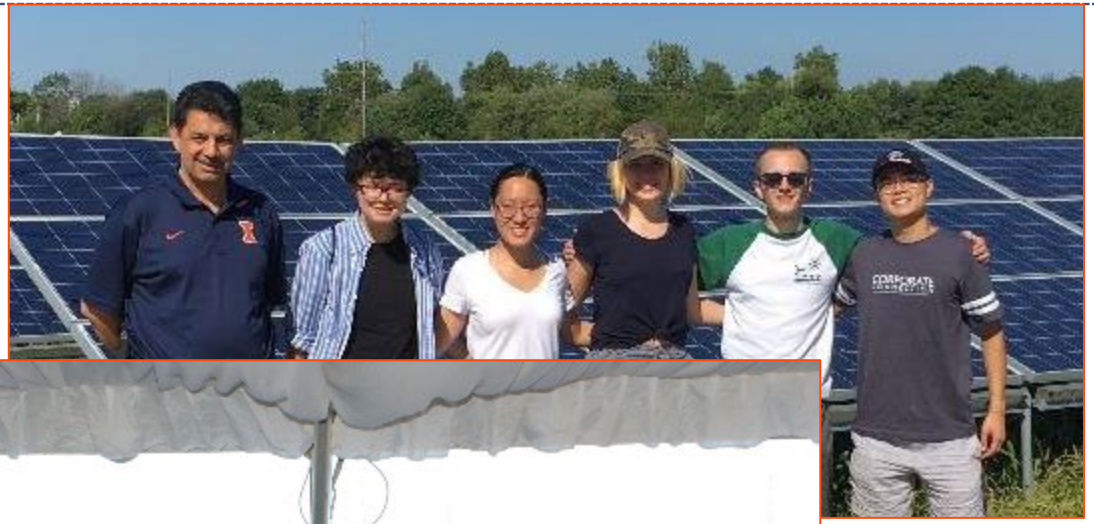
Phoenix Solar Incorporated,
as Tenant.

(SOUTH CAMPUS SOLAR FARM)

Solar Farm 1.0 Results

- Name Plate Capacity: 5.9 MW(dc)
- Production peak: 4.7 MW(ac)
- 7,200 MWh/year production
- 20.8 acres
- 6% of peak campus demand

Less than expected subsidy, to date



Solar Farm 1.0 Lessons Learned

- Specify the ground cover
- Weeds shading the panels
- Define Fair Market Value calculation in PPA
- Tie Lease Agreement to duration of PPA
- Beauty is in the eye of the beholder

On Campus Solar Farm 2.0

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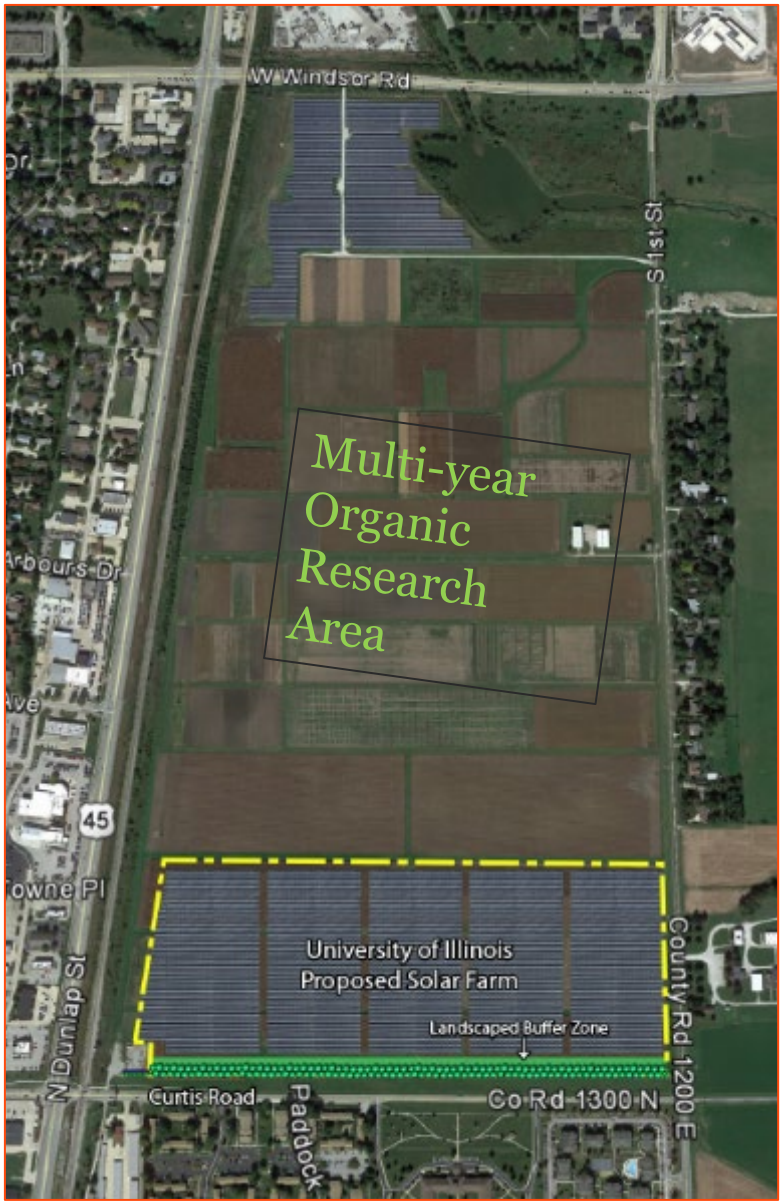
REQUEST FOR PROPOSALS

EVALUATION PROCESS

Solar Farm 2.0 Requirements

- 18,000+ MWh/year production
- Power Purchase Agreement to Design, Build, Operate, & Maintain
- 54 acres - Pollinator Friendly



Financial Requirements

- Lease agreement for $1.00 per year
- Pricing for both a 10-year or 20-year PPA
- Bid 1, Power alone
- Bid 2, Power plus RECs
- Bid 3, Power plus replacement RECs
- Early Termination Values
- Potential for donation (Vendor donates the Farm to the University – tax advantage)
- Buy-out options at Fair Market Value

"Fair Market Value" determined by the mutual agreement of the two entities.

- If no agreement on value, then both entities jointly select
  - nationally recognized independent appraiser with solar expertise
  - value will be binding on the Parties
  - costs of appraisal will be shared equally
- If unable to agree on an appraiser, such appraiser shall be jointly selected by the two appraiser firms proposed by the two entities.

Financial Requirements, continued

- Vendor provides annual report, audited financial statements, Balance Sheet, and Income Statement

<u>Company MUST have:</u>

- Market capitalization of $500M (to reduce campus' risk if the vendor goes bankrupt), and
- Minimum credit rating of
  - BBB- (Standard & Poor's)

    OR
  - Baa3 (Moody's)

OR

- Parental Company Guaranty from a parent that meets those requirements

Evaluation Process

- Received 19 proposals on April 10, 2019
- Focused on 20-year, Bid 2 = purchasing power and keeping the Renewable Energy Certificates (RECs)
- Price will be around $50/MWh, including the end of term costs
- Anticipated to save over $200K per year
- Fall 2019: Anticipated Construction Start
- Summer 2020: Anticipated Commercial Operation Date
- Achieving the Goal

Off Campus Solar
Power Purchase Agreement (PPA)

iCAP CLEAN ENERGY GOALS

IMPACT OF OFF CAMPUS SOLAR

Clean Electric Power Goals

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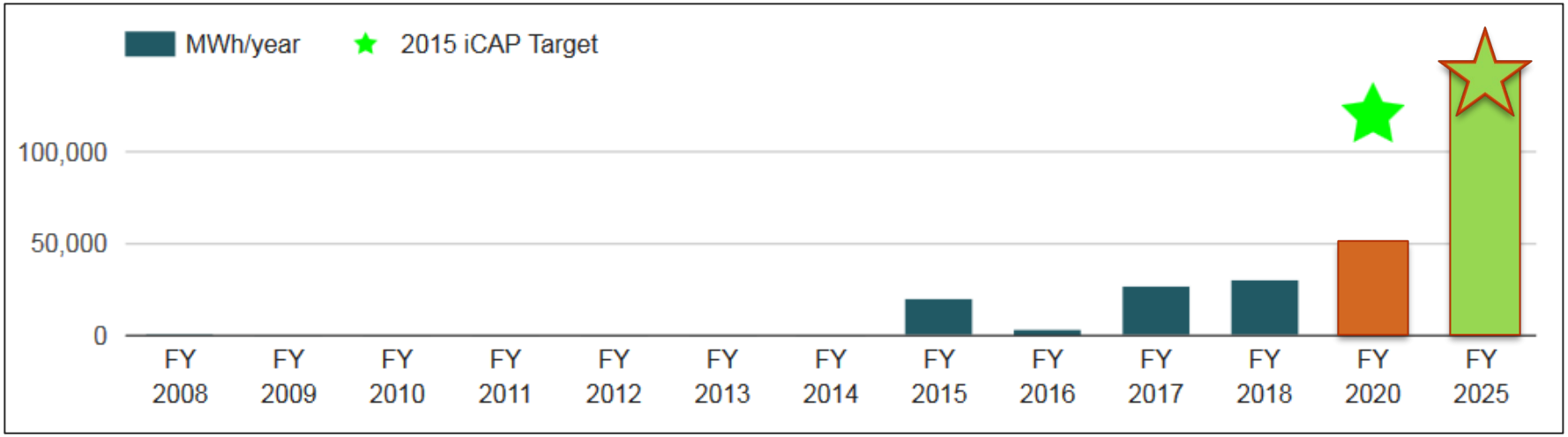

Prediction Initiative

Performed Financial Analysis

Analysis assumed:

- Sunshine hours of future years will match FY17, hour by hour
- Wind power production will remain the same as FY17, hour by hour
- Electrical demand will remain the same as in FY17, hour by hour

Option A: Importing Power

- Analysis is for 60 MW Off Campus Solar PPA; 91,850 MWh/year.
- If Off Campus Solar PPA costs $33/MWh, then
  → add $32/MWh for transmission costs
  → next year would cost ~ $2.4 M/year more
- If Off Campus Solar PPA costs $38/MWh (with RECs), then
  → add $32/MWh for transmission costs
  → next year would cost ~ $2.9 M/year more
- FY17 average price on campus for purchased electricity was $32.68/MWh plus $32/MWh for transmission costs
- Off Campus Solar PPA would reduce the carbon footprint by about 30,700 tons/year

Option B: Financial Transaction

The analysis is for buying and selling solar power from an off-campus private developer, for 90,000 MWh/year clean electrical power.

Pros

- Lowers carbon intensity of regional grid
- Developer needs commitments from large buyers to proceed
- No transmission and distribution fees
- No operational implications for on campus production
- If we keep the RECs, campus can claim the use of an additional 90,000 MWh/year of clean energy.
- If we do not keep the RECs, campus can claim "The University of Illinois has a long-term Power Purchase Agreement with an Illinois Solar Farm. The RECS are sold to the Illinois Power Agency to help satisfy the Illinois Renewable Portfolio Standard."

Option B: Financial Transaction

Pros - continued

- Provides a hedge against future electricity price inflation.
  - Per US Energy Information Agency (EIA), average rate of inflation for commercial electricity prices over the past 58 years is 2.60%/year.
  - From 2012 to 2018, campus purchased electricity prices have an average rate of inflation of 2.2%/year.

Option B: Financial Transaction

Cons

- Financial savings are not guaranteed
  - Electricity prices are difficult to predict.
  - Solar Farm 1.0 cost $196/MWh, but Solar Farm 2.0 is only $50/MWh.
  - There are additional transaction costs in addition to transmission and distribution.
  - The calculated average avoided cost could be different, depending on location of off-campus site
- Lack of liquidity in Electricity Futures market.
- Statutory and Regulatory restrictions/limitations may exist.

Conclusion

- **Higher Education Institutions should think outside the box and consider solar farms on available land, or contribute to PPAs via financial transactions.**
- **Think about the neighbors, to build support from all levels – students, faculty, administration, AND the local community**
- **Include pollinator plantings under solar panels**

Thank you

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University of Illinois Facilities & Services

http://fs.Illinois.edu