Meeting Carbon Goals While Saving Money with Renewable Energy
Utility-Scale Wind

700+ MW developed from 2002 - 2008
Utility-Scale Solar

200+ MW developed since 2010
Net Metered Solar

Clarkson University 2.5 MW
Built in 2014
Options for Meeting Carbon Reduction Goals with Renewable Energy

› Renewable Energy Credits

› On-Site Renewable Energy

› Off-Site Renewable Energy
What is a REC?

- Renewable Energy Certificate (or Credit), Green Tags
- Proof that 1 MWh of renewable electricity was generated
- Environmental benefits of clean, renewable energy, including greenhouse gas emission reductions
Renewable Energy Credits (RECs)

› Pros
  – Inexpensive
  – Easy for high % of renewable energy

› Cons
  – Always an added expense
  – Far away projects
  – Don’t build new renewable projects
On-Site Renewables

› Pros
  – Direct reduction in electric demand from the utility
  – Full retail electric rate offset

› Cons
  – Limited to available roof and land
    • Limited impact on electric demand
    • Long-term commitment on use of space
  – Can be more expensive than off-site options
Behind-the-Meter Solar

Eastern University Solar
55 kW built in 2009
Off-Site Renewables

› Pros
  – Serve multiple sites from one large solar facility
  – Lower cost of power due to economies of scale
  – Don’t need to tie up your roof or land

› Cons
  – Not a direct comparison to retail power prices
  – Doesn’t reduce electric demand from the utility
Off-Site Renewables
How it Works

Solar Project

Facilities

PPA ($)

RECs

Revenue from wholesale market sales of energy ($)

Electric Grid

Money → Energy → RECs
Key Terms

- No up-front cost to customer
- Purchase all the power produced as it is produced
- All maintenance and operations included at no additional cost
- 15-30 year term
- Fixed price of power > 2 Options:
  1. $X/kWh OR
  2. $Y/kWh with a Z% annual escalator (where Y is less than X)
Making It Count for Carbon

› Need to purchase/retain the RECs
› REC purchase/retention can start any time
  – RECs in some compliance markets can be expensive
  – Start purchasing/retaining RECs after year 7 for meeting carbon goals cost effectively
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AU GHG Emissions

American University GHG Emissions

- Commuting, Air Travel, T&D Losses
- Natural Gas
- Brown Power
- Unbundled RECs
- Reduced Consumption
- Bundled Power & RECs
- Renewable Gas
- Offsets
- Carbon Neutral
- Green PPA 1
- Green PPA 2
- Minor sources

MTCO2e

American University GHG Emissions
## Goals Progress Summary

**Strategies & Goals**

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<th>Reduce Consumption</th>
<th>Deadline</th>
<th>Progress</th>
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<th>Produce Renewable Energy on Campus</th>
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<th>Source Renewable Energy</th>
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<th>Offset Unavoidable Emissions</th>
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**Legend**

- Accomplished
- On track
- No longer applicable
- Challenges

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**American University**

**Green Dream**
Goal – On-Campus Renewables

- Installed ~ ½ MW of solar PV
- Installed ~ ½ MW of hot water
  - PPAs were zero CapEx, but smaller cost savings
  - Direct purchase paybacks becoming attractive
Goals - On-Campus Renewables

Onsite small-scale wind. Technically & financially attractive but politically challenging.
Goals – Off-Campus Renewables

Goal: 100% renewables by 2020

Accomplishments:

- FY15 sourcing 100% Wind RECs (~$50k / yr)
- FY16 Solar PPA for ~50% of load

Exploring Next Steps:

- Investigate 2\textsuperscript{nd} PPA for other 50% of power
- Investigate renewable gas w/ Altenex for scope 1
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