

Solar and Electric Metering Project



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Introduction

Current Context:

- Inefficient metering system in College Apartments
- No source of solar electricity production in College Apartments
- Not enough solar production in Sustainability House to meet electrification projects or even current consumption

What the project can achieve:

- Lower carbon emissions by electrifying buildings and decreasing indirect emissions
- Cost-savings from:
 - On-site solar electricity production
 - Combined metering system
 - Less service charges

Project Outline

01

College
Apartments
Metering System

02

College
Apartments Solar
Array

03

Sustainability
House Solar
Array - Partial
Electrification

04

Sustainability
House Solar
Array - Full
Electrification

College Apartments Metering System

- Each college apartment has a separate electric meter (35 meters)
 - Connection Fees: ~\$15 (last year avg.)
 - Last 12 months: \$6960
- Combining meters
 - Luther already pays every meter
 - One meter for each building
 - New service charge: \$795/year
 - Commercial grade electricity cost (\$0.12/kWh)
- Savings
 - \$6164/year
 - \$10300/year (with commercial electricity rate)



College Apartments Metering System

Cost and Payback Period

- Cost estimates vary wildly online (\$1400 - \$15,000)
 - If \$5000/building
 - \$20000 project for all four
- \$6164/year savings
- Payback Period: ~3.2 years
- \$10300
- Payback Period: ~1.9 years



College Apartments Metering System

Why Keep Separate Meters?

- Policy and Regulations
 - Iowa Code often requires separate metering for multi-tenant buildings
 - Flat housing fee loophole would allow Luther to join metering
- If Luther ever sells the college apartments
 - Landlords need to individually meter their tenants
 - With joint meters Luther would have a hard time selling the building



College Apartments Solar Array

Position 1:

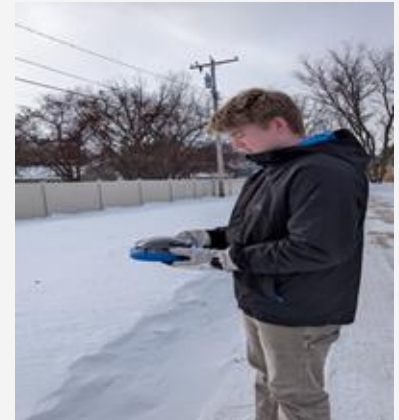
- Total Produced kWh per kW installed
 - 1100.49 kWh/year
- Average Percent Lost
 - 21.42%

Position 2:

- Total Produced kWh per kW installed
 - 1110.23 kWh/year
- Average Percent Lost
 - 20.42%

Position 3: Roof

- ~ Solar Area - 1356.6
- Array size - 27 kW
- Possible Array Production
 - 36099 kWh/year



Costs of the Solar Array

Current Usage and Costs:

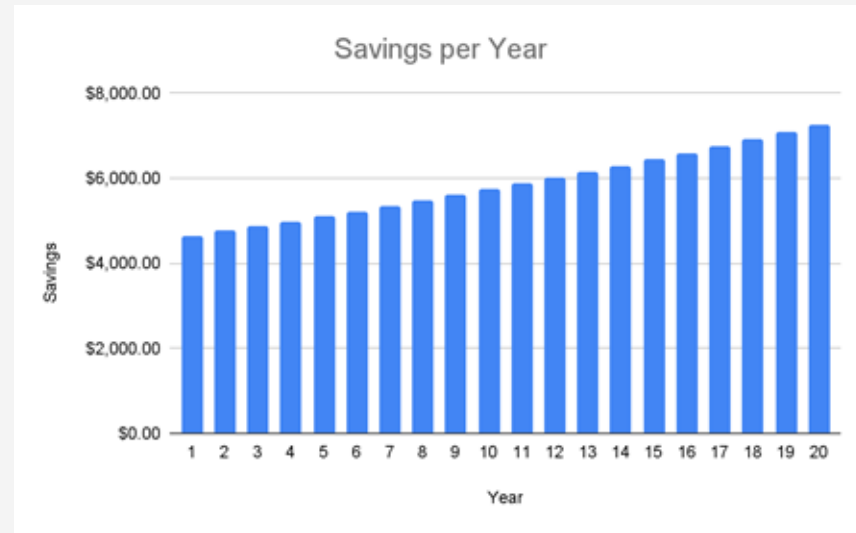
- Electricity use - 80,470 kWh/year
- Cost of Electricity - \$0.128 per kWh
- Yearly Electricity Cost - \$10,300.16/year

Costs of Added Solar:

- Size of the Array (27) x Cost per Installed Watt (2.25) = \$60,750
- Estimated Annual Production ~ 36,349 kWh/year

Savings:

- Annual Savings per Year - \$4,652.67
- Cumulative Savings Over a 20 Year Period ~ \$117,190.22
- Savings to Investment Ratio - 0.1



Sustainability House Solar - Partial Electrification Plan

System



- Estimated electricity use for partial electrification is 10,018 kWh/year
- 7.3 kW array designed for 10,068 kWh/yr production.
- South facing and 30° tilt to maximize solar exposure

Costs



- Total Capital Expenditure: \$ 16,425
 - Priced on a \$2.25 cost per installed watt

Investment Returns



- Total yearly savings: \$1,610
- Cumulative savings over 20 years: **\$40,574**
→ 2.36% increase in electricity prices
- Payback: 10.2 years



<http://www.bloombergenvironment.com/articles/2016-04-06/7-ways-to-know-if-a-solar-panel-system-is-worth-it/>



Sustainability House Solar - Full Electrification Plan

Solar Production:

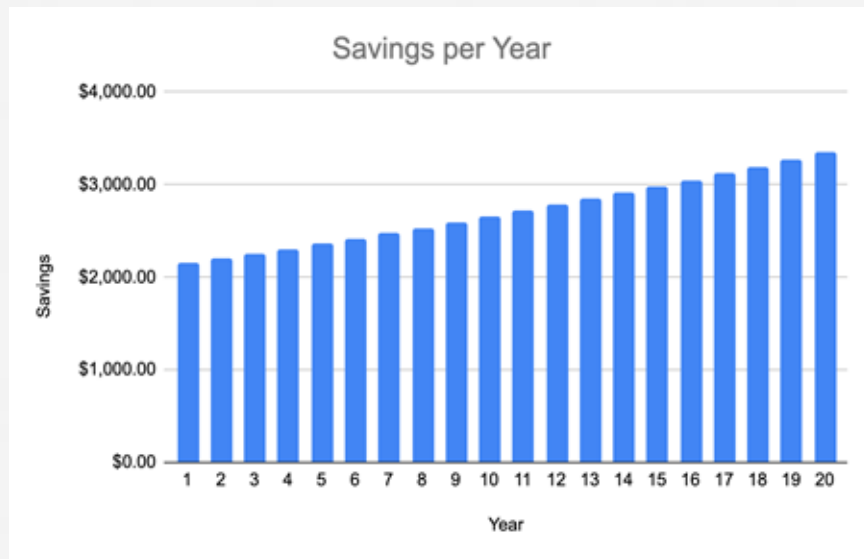
- Estimated electricity consumption: 13248 kWh/year
- Array size: 10kW
- Estimated production: 13443 kWh/year

Cost:

- Electricity: 0.16\$/kWh
- Installation: \$22500
- Initial electricity cost: ~\$2120/year

Savings:

- First year: ~\$2150
- Over 20 years: ~\$54175
- Payback period: 10.5 years



Conclusion

- With these possible upgrades Luther College can:
 - save on costs
 - \$10300/year (Joint metering project)
 - \$40000+ (Sus House solar array, over 20 years)
 - \$100000+ (College Apartments solar array, over 20 years)
 - create more clean energy
 - decreasing their indirect emissions
- Luther can use savings for more sustainability projects

Thank you

