10 S. Brentwood: City of Clayton Police and Municipal Building

Tenth Annual LEED Showcase Presentation

U.S. Green Building Council – Missouri Gateway Chapter

May 14, 2013
OVERVIEW

Introduction

1. City of Clayton
   Commitment to Green Building

2. Orientation to Project

3. Sustainable Strategies

4. Solar Case Study
WELCOME TO THE HERITAGE BUILD INC.

10 OUTH BRENTWOOD
City of Clayton
Commitment to Green Building
City of Clayton

On Being a Sustainable City

Clayton has always been a leader in the environmental movement:

A green and sustainable city is a community of residents, neighbors, workers and visitors who strive together to balance ecological, economic and social needs to ensure a clean, healthy and safe environment for all members of society and for generations to come.

Excerpted from www.claytonmo.gov
City of Clayton
On Being a Sustainable City

Environmental Leadership:

- EPA Green Power Community
- Incorporate Green Building
- Ecologically Sound Development
- Educate, Inform and Involve Citizens
- Reduce Traffic Congestion
- Hybrid, Electric and Biodiesel Fleet
- Smoke Free City
City of Clayton
Commitment to Green Building

Clayton Development Initiatives:

- LEED Silver Certification Required
- Commercial Recycling Program
- Green Cleaning Program
- Energy Auditing
- Greenhouse Gas Inventory
- Resource Conservation
City of Clayton

Efforts at 10 S. Brentwood

Clayton Project Initiatives:

- Re-Use of Existing Landmark
- LEED Certification
- MoDNR (Community Block) Grants
- East/West Gateway + MoDOT Grants
- Brownfield Clean-Up
- On-Site Renewable Energy
Orientation to Project
SOUTH ELEVATION
Carondelet Avenue
WEST ELEVATION
Brentwood Boulevard
ORIENTATION TO PROJECT

Dense, Urban Site
Adaptive Re-Use of Existing Structure

Police and Municipal Facility:

- Public Safety Headquarters
- Municipal Court and Records
- Forensic Computer Crimes Lab
- Information Technology Offices
- City-Wide Data Center
- Solar Photovoltaic Array
ORIENTATION TO PROJECT

VIEW TO NORTHEAST
Perspective Showing Sally Port Addition – Before Work
ORIENTATION TO PROJECT

VIEW TO NORTHWEST
Sally Port Addition
SALLY PORT
Floor 1
ORIENTATION TO PROJECT

DETENTION AND PROCESSING
Floor 1
ORIENTATION TO PROJECT

EXTENT OF HISTORIC FINISHES
Floor 1
ORIENTATION TO PROJECT

HISTORIC LOBBY
Floor 1
MUNICIPAL COURT ROOM
Floor 1
ORIENTATION TO PROJECT

EVIDENCE LABORATORY
Basement Floor
FITNESS ROOM
Basement Floor
ORIENTATION TO PROJECT

TYPICAL OPEN OFFICE
Floor 2
ORIENTATION TO PROJECT

TYPICAL TECHNICIAN OFFICE
Floor 3
Sustainable Strategies
High-Lights of LEED Design:

- **SSc2**: Development Density
- **SSc4**: Alternative Transportation
- **EAc1**: Optimize Energy Performance
- **EAc2**: On-Site Renewable Energy
- **MRc1**: Building Reuse
- **MRc2**: Construction Waste Management
SUSTAINABLE STRATEGIES – **SSc2: Development Density**

**ZONING MAP**
10 S. Brentwood Boulevard
SUSTAINABLE STRATEGIES – SSc4: Alternative Transportation

RESERVED PARKING FOR FUEL-EFFICIENT VEHICLES
Custom Signage
SUSTAINABLE STRATEGIES – EAc1: Optimize Energy Performance

IMPROVED THERMAL ENVLOPE
Calculation and Installation
SUSTAINABLE STRATEGIES – EAc1: Optimize Energy Performance

IMPROVED THERMAL ENVLEOPE
Calculation and Installation
**SUSTAINABLE STRATEGIES – EAc1: Optimize Energy Performance**

**IMPROVED THERMAL ENVLEOPE**
Calculation and Installation
SUSTAINABLE STRATEGIES – EAc1: Optimize Energy Performance

IMPROVED THERMAL ENVLOPE
Variable Refrigerant Volume (VRV) Condensing Units
SOLAR PHOTOVOLTAIC ARRAY
During Construction
TYPICAL UPPER FLOOR PLATE
During Demolition

SUSTAINABLE STRATEGIES – MRc1: Building Reuse

>97% RE-USED
WASTE MATERIAL MINIMIZED AND DIVERTED FROM WASTE STREAM
During Demolition and Construction

>94% DIVERTED
# SUSTAINABLE STRATEGIES – LEED Certification Scorecard

<table>
<thead>
<tr>
<th>Prerequisite / Credit:</th>
<th>Qty.</th>
<th>Poss.</th>
<th>Yes</th>
<th>No</th>
<th>Remarks</th>
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<tbody>
<tr>
<td><strong>Prerequisites:</strong> All prerequisites must be achieved for LEED certification.</td>
<td></td>
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<tr>
<td><strong>Total - Required</strong></td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>All prerequisites fulfilled</td>
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</table>

**Credits:** The following is a brief synopsis of LEED credits with estimated points achieved and notes describing the design team’s rationale in an effort to achieve clients LEED program requirements.

### Sustainable sites:
| Total - Credit | 26 | 22 | 4 | Existing urban site, public transportation nearby |

### Water Efficiency:
| Total - Credit | 10 | 0 | 10 | Limited site landscaping or water use strategies |

### Energy and Atmosphere:
| Total - Credit | 35 | 29 | 6 | VRV mechanical system basis for high efficiency |

### Materials and Resources:
| Total - Credit | 14 | 10 | 4 | Resource conservation throughout and after build |

### Indoor Environmental Quality:
| Total - Credit | 15 | 11 | 4 | Effective architectural and mechanical coordination |

### Innovation and Design Process:
| Total - Credit | 6 | 6 | 0 | LEED AP, 3 E.P.s, green cleaning, and comm. outreach |

### Regional Priority Credits:
| Total - Credit | 4 | 4 | 0 | Solar PV Array factored into this |

## Project Summary

<table>
<thead>
<tr>
<th>Total</th>
<th>Potential Pts</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>Totals</td>
<td>110</td>
<td>82</td>
<td>28</td>
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</tbody>
</table>

### LEED Certification Levels
- Certified: 40-49
- Silver: 50-59
- Gold: 60-79
- Platinum: 80+
Solar Case Study
SOLAR CASE STUDY

SOLAR PHOTOVOLTAIC ARRAY
Design Concept
SOLAR CASE STUDY

STRUCTURAL STEEL TRELLIS
Design Concept
SOLAR CASE STUDY

STRUCTURAL STEEL TRELLIS
During Construction
STRUCTURAL STEEL TRELLIS
During Construction
SOLAR MODULE LAY-OUT
Design Concept

720 / 650 such 235w SHARP NU-U235F1 - 3'-8" gap to clean
OPTION A = 169.2kw / 152.8kw order of magnitude production maximum
**SOLAR CASE STUDY**

---

### AC Energy & Cost Savings

(Type comments here to appear on printout; maximum 1 row of 80 characters.)

---

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<tr>
<th>Station Identification</th>
<th>Results</th>
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<td><strong>City:</strong></td>
<td>St. Louis</td>
</tr>
<tr>
<td><strong>State:</strong></td>
<td>Missouri</td>
</tr>
<tr>
<td><strong>Latitude:</strong></td>
<td>38.75° N</td>
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<td><strong>Longitude:</strong></td>
<td>90.38° W</td>
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<tr>
<td><strong>Elevation:</strong></td>
<td>172 m</td>
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<tr>
<td><strong>PV System Specifications:</strong></td>
<td><strong>Results</strong></td>
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<tr>
<td><strong>DC Rating:</strong></td>
<td>98.4 kW</td>
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<td><strong>DC to AC Derate Factor:</strong></td>
<td>0.850</td>
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<tr>
<td><strong>AC Rating:</strong></td>
<td>83.7 kW</td>
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<tr>
<td><strong>Array Type:</strong></td>
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<td><strong>Array Tilt:</strong></td>
<td>6.0°</td>
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<tr>
<td><strong>Array Azimuth:</strong></td>
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<tr>
<td><strong>Energy Specifications:</strong></td>
<td><strong>Results</strong></td>
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<tr>
<td><strong>Cost of Electricity:</strong></td>
<td>7.0 ¢/kWh</td>
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<table>
<thead>
<tr>
<th>Month</th>
<th>Solar Radiation (kWh/m²/day)</th>
<th>AC Energy (kWh)</th>
<th>Energy Value ($)</th>
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<tr>
<td>1</td>
<td>2.46</td>
<td>6364</td>
<td>445.48</td>
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<td>2</td>
<td>3.25</td>
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<td>5</td>
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<td>1010.59</td>
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<td>5.56</td>
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<td>897.05</td>
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<tr>
<td>12</td>
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<td>364.49</td>
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<td><strong>Year</strong></td>
<td><strong>4.48</strong></td>
<td><strong>125699</strong></td>
<td><strong>8798.93</strong></td>
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SOLAR MODULE LAY-OUT
Final Details for Construction
SOLAR PHOTOVOLTAIC ARRAY
During Construction
SOLAR PHOTOVOLTAIC ARRAY
During Construction
SOLAR CASE STUDY

SOLAR PHOTOVOLTAIC ARRAY
During Construction
VIEW TO EAST
Perspective Showing Top of Garage Structure and Solar Photovoltaic Array
VIEW TO EAST
Perspective Showing Top of Garage Structure and Solar Photovoltaic Array
SOLAR CASE STUDY

SOLAR PHOTOVOLTAIC ARRAY
Dedication Ceremony
SOLAR PHOTOVOLTAIC ARRAY
After Construction
**SOLAR CASE STUDY**

**SUNPOWER Monitoring System**
Clayton Police Department, 10 S Brentwood Blvd, Clayton, MO 63105, US

<table>
<thead>
<tr>
<th>Inverter SN</th>
<th>Installation Date</th>
<th>Nameplate Cap</th>
<th>Peak Power Generation</th>
<th>Energy Production</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Today</td>
<td>This Month</td>
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<tr>
<td>307449A-001</td>
<td>Feb 1, 2013</td>
<td>61.803 kW</td>
<td>47.280 kW</td>
<td>49.450 kW</td>
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<tr>
<td>305809A-001</td>
<td>Feb 1, 2013</td>
<td>98.427 kW</td>
<td>80.180 kW</td>
<td>89.230 kW</td>
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**Graphical Data:**
- **Type:** Cumulative Energy Produced (kWh)
- **Time:** 12:40 PM, May 7, 2013
- **Value:** 382.00 kWh
Cost of Solar in Brief:

$1,094,517 – Solar Array Gross Cost
- $ 661,500 – Initial ARRA Award
- $ 100,000 – Ameren Rebate
- $ 88,000 – Later ARRA Award

$ 245,017 – Net City Cost

Projected Yearly Savings $19.25K+

Return on Investment ~1.35 Years (solar array only)

Return on Investment <13 Years (includes steel trellis)
Acknowledgements
ACKNOWLEDGEMENTS

With Gratitude:

- City of Clayton
- KJWW Engineering Consultants
- KPFF Consulting Engineers
- Civil Design, Inc.
- Paric Corporation
- Pinnacle Contracting
- icon Mechanical
- Kaemmerlen Electric Company
- Brightergy Solar
- DeLuca Plumbing
- Thornburgh Companies
- Firetech
END