Why Net Zero Means Business for Owners

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Upcoming Getting to Zero Webinars

All sessions 10-11:30 am Pacific/1-2:30 pm Eastern

October 21, 2015  Teaming with Technology: A Manufacturer’s Panel
November 4, 2015  Getting to Zero Energy Outcomes
January 13, 2016  Both Sides of the Meter
February 17, 2016  From Policy to Practice
March 16, 2016    Strategies for Getting to Zero
April 20, 2016    Beyond a Building
May 18, 2016     ZNE Policies within and Across Borders

Registration now open for the October and November sessions at newbuildings.org/demand-webinars
Zero Net Energy – What is it?

A ZNE building is a highly energy efficient building that produces as much energy as it consumes through clean, renewable resources over the course of a year. Also known as Net Zero Energy.
PV Cost Trend Makes ZNE Accessible

P. Mints, Navigant Solar Services Program, 2011
The largest database on ZNE buildings in North America and the only database searchable by ZNE Status & Energy Performance
http://newbuildings.org/getting-to-zero-buildings-database

Roadmap to 2030

Adopted by:
- US Conference of Mayors
- AIA
- ASHRAE
- Royal Architectural Institute of Canada
- U.S. Green Building Council
- Congress for the New Urbanism

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“Big Bold” Goals for Net Zero in California

1. All new commercial construction will be ZNE by 2030
2. 50% of existing buildings will be retrofit to ZNE by 2030
3. All new residential construction in California will be ZNE by 2020

The California Efficiency Strategic Plan (Sep 2008) californiaenergyefficiency.com/docs/EEStrategicPlan.pdf

Code Cycles to Net Zero in CA

Code Cycles to ZNE, Source: SCE & AEC, 2009
GETTING TO ZNE
Tools for the PCC:
1. Goals and Definitions
2. Market Readiness
3. Public Buildings
4. Case Studies
5. Outreach to Stakeholders
6. Emerging Issues – DG, EV, etc…
7. Engagement w/ Energy Utilities

ASHRAE 2030 MAP

40 States with ZNE Buildings

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**Zero Net Energy Buildings**

![Graph showing zero net energy buildings growth from 2012 to 2015.]

**McGraw Hill Smart Market Report**

*Achieving Net Zero Energy Buildings*

With buildings accounting for 40% of energy use in the U.S., they are key to any strategy to reduce energy consumption. In 2007 the Energy Independence and Security Act charged the U.S. Department of Energy to achieve market-ready solutions for Net Zero Energy (NZE) commercial buildings by 2030 with the goal of converting all existing building stock to NZE by 2050. NZE buildings employ a combination of high energy efficiency measures with renewable energy to allow the building to use no more energy than it generates.

42% of the respondents find that the shift to net zero provides an opportunity for them in the market. Because survey respondents are drawn from a diverse range of business sectors, this result demonstrates that the move toward NZE is perceived as potentially good for business.
CREATE A HEALTHY AND POSITIVE WORK ENVIRONMENT FOR THE OCCUPANTS

- NATURAL LIGHT
- THERMAL COMFORT
- NATURAL VENTILATION
- EXCEPTIONAL ACOUSTICS
- CONSTANT CONNECTION TO NATURE

MINIMIZE THE IMPACT ON THE ENVIRONMENT

- NET ZERO ENERGY OPERATIONALLY
- CARBON NEUTRAL
- MINIMIZE WATER USE
- HIGHLY SUSTAINABLE CONSTRUCTION METHODS AND MATERIALS

ACCOMPLISH THIS AT A PRICE POINT THAT WILL OPERATIONALLY BE MORE PROFITABLE THAN THE STANDARD WAY OF RENOVATING TO CITY CODE.
EXISTING CONDITIONS

- 30,000 SF square one-story office warehouse built in 1973
- Uninsulated concrete walls, wood roof and single pane windows
- DARK, DINGY and UNRENTABLE!

HIGH PERFORMANCE ENVELOPE
PASSIVE THERMAL COMFORT
## INTEGRATED ROOF PLANNING

![Image of solar panels on a roof]

## ECONOMIC ANALYSIS

<table>
<thead>
<tr>
<th>Cost Info</th>
<th>Standard Renovation</th>
<th>Sustainable Renovation</th>
<th>Difference</th>
<th>Per Sq. Ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total A &amp; E Cost</td>
<td>$260,800</td>
<td>$337,700</td>
<td>($76,900)</td>
<td></td>
</tr>
<tr>
<td>Total Hard Cost</td>
<td>$2,865,944</td>
<td>$4,042,458</td>
<td>($1,176,514)</td>
<td></td>
</tr>
<tr>
<td>Total Soft Cost</td>
<td>$426,550</td>
<td>$410,629</td>
<td>$15,921</td>
<td></td>
</tr>
<tr>
<td>PV Cost</td>
<td>$0</td>
<td>$345,228</td>
<td>($345,228)</td>
<td></td>
</tr>
<tr>
<td>Total Cost</td>
<td>$3,553,294</td>
<td>$5,136,015</td>
<td>($1,582,721)</td>
<td>($49.84)</td>
</tr>
</tbody>
</table>

| Income Information / Valuation   |                     |                        |            |            |
| Annual rent net of operating expenses | $847,194    | $1,086,848             | $239,654  |            |
| Value of Rent Differential at 7.5% cap rate | $3,195,387 | $4,042,458             | ($847,071)|            |
| Rent during first 18 mos. after completion | $0          | $724,500               | $724,500  | $22.81     |
| Net Additional Value if sold in 18 mos. | $2,337,166  | $2,337,166             | $0         | $73.59     |
| PG&E and Govt. Rebates           | $0                  | $298,764               | $298,764  | $9.41      |
| Additional Value if include rebates | $2,635,930  | $2,635,930             | $0         | $83.00     |
ECONOMIC ANALYSIS

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>Additional Cost</th>
<th>($1,582,721)</th>
<th>($49.84)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Early Lease-up</td>
<td>$724,500</td>
<td>$22.81</td>
<td></td>
</tr>
<tr>
<td>Net additional Cost</td>
<td>($27.02)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Cash Flow after Debt Service</td>
<td>$585,350</td>
<td>$708,373</td>
<td>$123,023</td>
</tr>
<tr>
<td>Years to amortize with cash flow</td>
<td>5.89</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rental Income Differential</th>
<th>NNN Rent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Expenses</td>
<td>$280,220</td>
</tr>
<tr>
<td>TI Replacement Reserves</td>
<td>$62,866</td>
</tr>
<tr>
<td>Additional 326 SF of space</td>
<td>$0</td>
</tr>
<tr>
<td>Premium over market rent &amp; op. exp.</td>
<td>$0</td>
</tr>
<tr>
<td>Total</td>
<td>$239,654</td>
</tr>
</tbody>
</table>

BUSINESS CASE FOR ZERO ENERGY COST

• ADDITIONAL COST TO RENOVATE SUSTAINABLY VS. LESS EXPENSIVE STANDARD METHOD OF RENOVATING => ($49.84 / SF)

• ADDITIONAL VALUE CREATED DUE TO A REDUCTION IN OPERATING EXPENSES AND RESERVE REQUIREMENTS => $52.94 / SF

• ADDITIONAL VALUE DUE TO ACCELERATED LEASE-UP TIME VS. AVERAGE MARKET DOWNTIME => $22.81 / SF

• ADDITIONAL VALUE DUE TO RECEIVING A PREMIUM IN RENT OVER THE TOP OF THE MARKET RENTS => $34.47 / SF
Why Net Zero Means Business for Owners:
Building Value Through Sustainability

Darlene Pope
Protect and enhance the value of your asset by understanding and mitigating against future risks.

Sustainability and Real Value

<table>
<thead>
<tr>
<th>Corporate Drivers</th>
<th>Financial Drivers</th>
<th>Real Estate Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Corporate social responsibility (CSR)</td>
<td>Escalating cost of energy</td>
<td>Tenant/end user demand</td>
</tr>
<tr>
<td>• Stakeholder and shareholder demand</td>
<td>Productivity improvement</td>
<td>Future-proofing</td>
</tr>
<tr>
<td>• Attracting quality talent</td>
<td>Operational and maintenance costs</td>
<td>Energy rating scores</td>
</tr>
<tr>
<td>• Brand implications</td>
<td>Market differentiation</td>
<td>Impact on asset value</td>
</tr>
<tr>
<td>• Voluntary reporting and disclosure projects</td>
<td>Incentive programs</td>
<td>Building legislation and regulations</td>
</tr>
<tr>
<td>• Operational, financial, legal risks</td>
<td>Demand for socially responsible assets and operations</td>
<td>Energy/greenhouse legislation and regulations</td>
</tr>
<tr>
<td>• Environmental regulation and legislation</td>
<td>Risk of obsolescence</td>
<td>Lease commitments</td>
</tr>
<tr>
<td>• Compliance and governance</td>
<td>Availability of finance and insurance</td>
<td>Optimum design, management, operation</td>
</tr>
<tr>
<td>• Health and employee productivity benefits</td>
<td>Alternative energy opportunities</td>
<td></td>
</tr>
</tbody>
</table>

JLL Energy & Sustainability Services (ESS)
World-class performance… by the numbers

- 334 global sustainability clients, 158 in the Americas
- 129 global full-time energy and sustainability employees, 50 in the Americas
- 35 Full-time energy engineers
- Managed 300+ LEED projects - 75Msf
- Over 1,400 LEED accredited professionals (Most of any organization in the world)
- More than 5,000 properties with ENERGY STAR ratings nationally, representing over 205 million s.f.
Getting to Zero Net Energy

Definition: A zero net energy building is a building with zero net energy consumption – that is, the total amount of energy used by the building on an annual basis is equal to the amount of energy created on site.

- Reduce carbon emissions
- Reduce dependence on fossil fuels
- Reduce overall energy costs

Approach:
1) Maximize use of renewable energy on site, such as solar, wind, geothermal.
2) Reduce demand with highly efficient HVAC, lighting, and plug load technologies and strategies.

Technologically possible?  
Economically feasible?  
Socially acceptable / marketable?

Challenges and Obstacles to Zero Net Energy Buildings

People
“Buildings don’t use energy, people do…”
“It can’t be done…”
No interest – apathy

Physical Restrictions
Space, location, surroundings, natural resources
(no wind, limited sun, building design, etc.)

Financial Constraints
Capital, ROI, payback period, split incentive, investor buy-in, etc.

Technological Challenges
Technologies can help reduce energy consumption, but not eliminate use
The Value to Building Owners (and other stakeholders)

**Investor Owned – Commercial Buildings**
- In most cases, tenants pay the electric bills – need customer support / buy-in
- Lower cost of energy
- Environmentally friendly building operations
- Lower greenhouse gas / carbon emissions

**Corporate Facilities**
- Support for corporate sustainability program
- Lower cost of energy
- Redundant power source adds resiliency and energy security

**Other Building Types**
- Depends on building type and use…
  - Hospitals, schools, hotels/hospitality, industrial, manufacturing, government, public, sports/entertainment, etc…
JLL AES - Matching the Technology to the needs of each site

On a site by site or regional basis

• Evaluate operations/site limitations, determine appropriate onsite technology fits
  - Solar: Rooftop or ground mounted PV
  - “Micro” wind (2 kW to 1 MW)
  - Waste-to-energy applications
  - Cogeneration (internal combustion/fuel cells)
  - Microgrid applications

• Evaluate off-site options where wheeling (virtual net metering) is allowed
  - Solar
  - Biogas driven generation (fuel cells, cogen)
  - Geothermal
  - Wind
  - Hydro, wave
  - Nominated biogas

• Present new/emerging technologies that could be applicable

JLL Case Study: Walgreens Rooftop Solar Program

Starting with more than 1,400 sites in 5 states, JLL facilitated a screening and selection process that lead to an on-site, off-site RFP issued in March

• Screen 1: Top 5 solar states chosen based on incentive and avoided cost/kWh
• Screen 2: Store viability

Anticipated result:

• Secure 15-20 year PPA for 45 million kWh/year
• Savings between $0.02 – $0.03/kWh (over $1M Year 1 savings)
• Replicate process two more times before Q3 ’15 (to avoid 2016 ITC cut off)
JLL has developed a detailed Roadmap to Energy Efficient Buildings®, providing a step-by-step plan for sustainable, energy efficient properties. From initial energy assessments to advanced energy management technologies, this roadmap is a comprehensive action plan for energy savings. JLL offers best-in-class technologies and solutions to guarantee an integrated approach – plus provide all the resources to get the job done.

1. Determine owner goals and performance metrics
2. Conduct initial building energy assessment; include Energy Star® benchmarking
3. Evaluate interest and goals for LEED certification or other rating programs
4. Review rates/sourcing for electricity and natural gas; conduct competitive bid for energy purchasing
5. Evaluate and implement demand response and strategic load management program
6. Implement a real-time energy monitoring and analytics platform with JLL’s Intellicommand™
7. Survey and assess tenant energy usage pattern
   - Develop and implement behavior modification program
   - Develop energy conscious green leasing and tenant build out strategies
8. Perform detailed energy audit to identify specific energy conservation opportunities
9. Evaluate energy conservation measures (ECMs); prioritize based on owner’s business objectives, including:
   a. Lighting retrofits and advanced lighting controls
   b. HVAC upgrades and optimization
   c. Advanced controls and building automation solutions
   d. Temperature set points and operational parameters
   e. Plug load management strategies
   f. Building envelope
   g. Water conservation measures
   h. Other energy efficient technologies / solutions
10. Conduct waste audit; evaluate for waste reduction and recycling program
11. Develop short-term and long-term business plan for energy upgrades. Identify incentives and rebates, calculate life cycle costs and comprehensive ROI. Identify, analyze, and securing financing, if needed
12. Identify opportunities for renewable energy or on-site power generation and storage
13. Solicit proposals for implementation of ECMs; manage integrated implementation of ECMs
14. Measure and report results and savings
15. Implement continuous monitoring, commissioning, and maintenance program for ongoing efficient operations
TODAY... A single building network provides the infrastructure and platform to integrate building systems, with the ability to add web-based access and control.

Advanced Data and Analytics

- The industry is moving towards integrated, end-to-end systems, networking, big data, and real-time event processing, or “analytics.”
- New technologies and innovations in the energy sector that will forever change the way utilities and buildings operate (technology changes, organizational/business process changes, new services)
- Analytics provides unprecedented command and control over building systems and conditions
Client Goals and Performance Metrics

- Energy cost savings
- Reduced carbon footprint
- Marketing differentiation, leadership
- Technology upgrades, reduced obsolescence
- Reduced operations and maintenance costs
- Extended life of systems and equipment
- Improved productivity
- Better experience for end users / students; better workplace
- Safety and security
- Other?

ESS Comprehensive Suite of Services

Our services include:

**Smart Building Integration and Control**
- Master planning, design, and integration of smart building systems and technologies
- Installation of smart building technologies
- IntelliCommand real-time, 24/7 continuous monitoring, reporting, and commissioning
- Smart building education and consulting

**Assessment & Certification Services**
- LEED gap assessments & design charrettes
- LEED certification management
- Green acquisition assessment
- ENERGY STAR certification
- Green+Productive Workplace benchmarking

**Building Energy Services**
- Energy assessments and audits
- Integrated energy retrofit analysis and implementation
- New building commissioning
- Existing building retro-commissioning
- Energy retrofit financing

**Consulting Services**
- Green lease services
- Engagement and educational services
- Green IT services
- Corporate sustainability strategy & reporting
- Educational webcasts and conferences

**Alternative Energy Services**
- Solar, fuel cell, biomass, wind opportunity analysis, RFP management, and deployment
- Feasibility studies, master planning, design, implementation
- Financing strategies

**Waste, Water, and Recycling Services**
- Audits, benchmarking, disclosure compliance
- Strategic sustainability roadmap & processes
- Portfolio management delivering ongoing savings
- Best practices, technology partners, and subject matter experts
Mainstreaming Net Zero

Peter Rumsey, PE
Point Energy Innovations
September 2015
STATE OF CALIFORNIA
“SOLAR OFFICE BUILDINGS”
CIRCA 1978

NET ZERO

Bateson Office Building

NREL

RMI

Berkeley Public Library

North Shore Community College
Don’t get stuck on energy

Energy Savings - 100% Reduction

Increased Occupancy + 2% - 3%
1-10-100 Landbank Central & Wolfe – 770,000 sf

Architects: HOK, KSH

1,800 kW 30%
850 kW
23%

$0.11/kWh
levelized cost of energy

Undisclosed Client

Apple

“100 percent of our data centers run on 100 percent renewable energy”
### Tesla Gigafactory

#### Gigafactory Projected Figures

<table>
<thead>
<tr>
<th>Category</th>
<th>Projection</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 Tesla Vehicle Volume</td>
<td>≈300,000/yr</td>
</tr>
<tr>
<td>2020 Gigafactory Cell Output</td>
<td>35 GWh/yr</td>
</tr>
<tr>
<td>2020 Gigafactory Pack Output</td>
<td>50 GWh/yr</td>
</tr>
<tr>
<td>Space Requirement</td>
<td>Up to 10M ft²</td>
</tr>
<tr>
<td></td>
<td>w/ 1-2 levels</td>
</tr>
<tr>
<td>Total Land Area (acres)</td>
<td>500-1000</td>
</tr>
<tr>
<td>Employees</td>
<td>≈6,500</td>
</tr>
</tbody>
</table>

![Tesla Gigafactory Rendering](image)

**New Local Renewables Solar and Wind**

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**2030**

![2030 Image](image)
Key Points

• Most Net Zero to date has been in public sector
• Financial models for developer cost recovery are still under construction
• Large company sustainability goals are driving private sector investments in solar for buildings
• Stay tuned…
Albert Einstein:
You can’t solve a problem with the same thinking that created it.

Peter Rumsey, PE
peter@pointenergyinnovations.com
LinkedIn and Twitter

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