

National Grid- A Path toward Sustainability

nationalgrid

The power of action.

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National Grid Overview

National Grid is the second largest electric and gas utility in North America, serving approximately 3.4 million natural gas customers in New York, Massachusetts, New Hampshire and Rhode Island and delivers electricity to approximately 3.3 million customers Massachusetts, New Hampshire, New York and Rhode Island. National Grid also manages the electricity network on Long Island under an agreement with the Long Island Power Authority Serving 1.1 million LIPA customers.

National Grid has requested that these areas be addressed in the Sustainability Plan for New England:

- Energy use in corporate facilities in New England
- Research alternative fuels for fleet vehicles

This paper will provide a path for National Grid to reduce energy usage in corporate facilities through either LEED Gold Certification or Advanced Buildings Certification. In addition alternative fuel usage for fleet vehicles will be presented.

LEED Certification Overview

The US Green Building Council LEED Certification for New Commercial Construction is a voluntary, consensus-based, market driven building rating system based on existing proven technology. LEED Certification evaluates the environmental performance of the whole building over the buildings expected lifespan and provides definitive standards for what constitutes a “green building”.

The LEED rating system is divided into five main environmental categories and one design category. The five environmental categories include Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, and Indoor Environmental Quality. The design category, Innovation & Design Process, evaluates sustainability building expertise and other design measures that are not covered in the five environmental categories.

Newly constructed buildings evaluated under the LEED rating system are awarded points based on the number of “green” features of the building as outlined and approved by the US Green Building Council. The LEED for New Construction ratings can be awarded the following ratings: LEED Certified, Silver, Gold or Platinum.

National Grid, in the future construction of new office buildings, can incorporate LEED Certification in the design and construction of their buildings in order to show the communities they serve their commitment to conservation of nature and natural resources as well as to set a path toward sustainability with all of their new facilities.

The following is a summary of the LEED Certification rating system categories, a brief description of the requirements and a potential strategy that National Grid could use to achieve Certification for their new building.

Sustainable Sites:

Construction Activity Pollution Prevention (LEED Credit SS P1) REQUIRED: It is a requirement for LEED Certification that all construction sites reduce construction activity pollution to abutting properties, including roadways, and sensitive environmental areas. This would be accomplished during the design and construction phases of the project by completing and implementing Storm water Pollution Prevention Plan (NPDES EPS SWPPP) and Erosion and Sedimentation Control Plan. The proper implementation of these plans would minimize if not eliminate storm water runoff carrying sediment and construction debris from leaving the construction site or entering environmentally sensitive areas and to minimize air pollution from dust.

Site Selection(LEED Credit SS c1) 1 point available: National Grid could avoid the development of inappropriate sites and reduce the environmental impact by fitting the building into the topography and locating the building as far as possible away from environmental sensitive areas. Examples of inappropriate sites include farmland, previously undeveloped land within 5 feet of the 100-year flood plain of a river as defined by FEMA, land within 100-feet of a wetland, habitat for threatened or endangered species, land within 50-feet of a lake, sea, river or stream, and land from a public park. In order to assess the site fully a complete site boundary, topographic, and environmental survey would be needed.

Density Development and Community Connectivity(LEED Credit SS c2) 1 point available: The location for new National Grid buildings should be within existing urban areas allowing for connection to established infrastructure as well as for the protection of greenfields and preservation of natural resources.

Brownfield Redevelopment (LEED Credit SS c3) 1 point available: During the site selection process National Grid should give preference to brown field sites. Many brown field sites offer tax incentives for redevelopment and offer property cost savings as long as the development plan for the site is coordinated with the remediation plan.

Alternative / Public Transportation (LEED Credit SS c4.1) 1 point available: National Grid should investigate and ensure that the proposed building site is within ½ mile of the commuter rail or located within ¼ mile of stops for two (2) bus lines. This will encourage employees to take public transit, which would result in the reduction of pollution and land development impacts for automobile use.

Bike Storage and Changing Rooms (LEED Credit SS c4.2) 1 point available: National Grid should incorporate bike racks and incorporate changing rooms with showers into the proposed design of the building to encourage bike use.

Alternative Transportation Low-Emission & Fuel-Efficient Vehicles (LEED Credit SS c4.3) 1 point available: National Grid is currently considering the implementation of a rebate and/or incentives for employees to purchase alternative fuel vehicles. Should these rebates or incentives be offered the incorporation of an alternative fueling station in the site design for the new building would be a valuable asset for National Grid and its employees and is a relatively easy LEED credit to obtain given that National Grid is already promoting alternative transportation.

Parking Capacity (LEED Credit SS c4.4) 1 point available: National Grid should consider limiting the parking lot/ garage size by sharing parking with adjacent buildings and review alternatives to reduce the impervious areas on the property and limit the use of single use occupancy vehicles.

Protect or Restore Habitat (LEED Credit SS c5.1) 1 point available (+ 1 for exemplary performance): In the development of new National Grid building sites existing natural areas should be conserved and natural areas that provide habitat and promote biodiversity should be protected or restored post construction. National Grid should conduct a site survey to identify significant natural areas and the placement of the building and parking areas should be adjusted to protect these areas, if possible, and proposed native plantings and landscaping should be proposed to restore natural areas that were disturbed during construction.

Maximize Open Space (LEED Credit SS c5.2) 1 point available (+ 1 for exemplary performance): The proposed site development plan should maximize open space by reducing building / parking footprints. If possible building tall and parking garages should be used in place of parking lots.

Storm water Quantity Control (LEED Credit SS c6.1) 1 point available: National Grid can reduce the amount of stormwater runoff from their sites by reducing building footprint size (taller buildings), incorporation of green roofs, re-use of stormwater for irrigation or toilet flushing, use of stormwater detention areas, clustered site development and reduction in paved areas.

Stormwater Quality Control (LEED Credit SS c6.2) 1 point available: The stormwater that is generated from proposed impervious surfaces on-site can be treated prior to discharge to eliminate contaminants such as oils, grease, and fertilizers. A stormwater management plan should be established to remove the stormwater contaminants via structural treatment measures and infiltration as well as a reduction in impervious areas on-site.

Heat Island Effect (non-roof) (LEED Credit SS c7.1) 1 point available (+1 for exemplary performance): The proposed National Grid site design should incorporate light colored pavement, numerous shade trees and landscaped areas to shade pavement, and potentially utilize parking garages or decks to limit pavement.

Heat Island Effect (Roof) (LEED Credit SS c7.2) 1 point available: National Grid should consider the use of a green or vegetated roof to reduce heat absorption in the summer and maximize heat retention in the winter.

Light Pollution Reduction (LEED Credit SS c8) 1 point available: The proposed National Grid building and parking area can reduce light pollution by reducing the number of lighting fixtures on-site while still providing enough light for public safety by utilizing full cut off light fixtures, utilizing computer lighting model software, use of occupancy sensors, automatic sweep timers, and employing a lighting professional to design and implement the light reduction plan.

Water Efficiency

Reduction in Landscape by 50% (LEED Credit WE c1.1) 1 point available: The proposed site design should reduce the amount of landscape areas as much as possible and utilize native grasses and plantings. The reduction in the amount of landscape area coupled with a high efficiency irrigation system, grouping plantings according to water usage / need (high-med-low) and a reduction in turf /hydroseed areas to the extent possible will reduce water consumption and save money.

No Potable Water Use or No Irrigation (LEED Credit WE c1.2) 1 point available: In addition to a reduction in landscape area National Grid should consider using only captured rainwater, recycled graywater, or non-potable water for irrigation or potentially consider the installation of landscape plants that do not require irrigation. All of these features would save water and over time money.

Innovative Wastewater Technologies (LEED Credit WE c2) 1 point available (+ 1 for exemplary performance): The majority of National Grid office buildings are located in highly urbanized areas where public sewer is available and it is unlikely that future construction would take place in areas where an on-site wastewater treatment plant would be required. It would

be cost prohibitive to treat and dispose of wastewater on-site where sewer is available. However, a reduction in water use and wastewater generation can be achieved through the use of low-flow fixtures or recycling of grey water for toilet flushing should be considered.

Water Use Reduction by 20 or 30%(LEED Credit WE c3.1 & c3.2) 2 point available (+ 1 for exemplary performance): Water use within newly constructed buildings can be reduced by the use of high-efficiency fixtures, dual flush toilets, occupancy sensors and reuse of stormwater or graywater for toilet flushing.

Energy and Atmosphere

Fundamental commissioning of the Building Energy Systems (LEED Credit EA p1) REQUIRED: There are six requirements that all new buildings must meet to acquire LEED Certification. The intent of the six requirements are to verify that the buildings energy related systems are installed, calibrated and perform according to National Grid's project requirements, basis of design, and construction documents.

Minimum Energy Performance (LEED Credit EA p2) REQUIRED: Documentation of the proposed buildings minimum level of energy efficiency must be provided for LEED Certification. The proposed building envelope, HVAC, lighting, and other systems must maximize energy performance. The design of the building should reduce energy consumption and save operational costs.

Fundamentals of Refrigerant Management (LEED Credit EA p3) REQUIRED: National Grid must use zero CFC based refrigerants in their HVAC systems. New systems must be specified with non CFC based refrigerants.

Optimize Energy Performance (LEED Credit EA c1) 10 points available (1 point given for each 10% reduction in energy usage compared to code minimum): The proposed office building should be modeled in a "Whole Building Energy Simulation" to demonstrate the improvement in the proposed building performance rating compared with the baseline performance (ASHRAE 90.1) of a typical non-LEED Certified building. The Building Model and comparison will show that the energy usage of the building is 40% more efficient than a typical building and will reduce the environmental impacts associated with the excessive energy usage of a standard building.

On-site Renewable Energy (LEED Credit EA c2) 3 points available: National Grids should incorporate on-site renewable energy system to offset building energy cost. On-site renewable energy could take many forms, such as PV panels, solar thermal, geothermal heating / cooling, geothermal electric or bio-fuel based. The use of on-site renewable energy would set a standard for the office park community and could be used as a tool to teach others of real

world benefits as well as aid in the assessment of these features for rebates on other similar projects. Points are given for the amount of total renewable energy usage in the building (2.5% = 1 pt, 7.5% = 2 pts, 12.5% = 3 pts)

Enhanced Commissioning (LEED Credit EA c3) 1 point available: National Grid could incorporate a comprehensive commissioning plan during construction of their facilities, following LEED reference guide for commissioning design review.

Materials and Resources

Storage and Collection of Recyclables: In order to receive LEED Certification the proposed building and facilities management must reduce the waste generated by the building occupants that is hauled to and disposed of in landfills. The majority of National Grid Buildings have a recycling program that should be implemented in the new office building.

Construction Waste Management – Divert better than 50% from Disposal: During the construction process it will be important to divert construction and demolition debris from disposal in landfills and incinerators by re-directing recyclable materials and recovered resources back to the manufacturing process as well as redirecting reusable materials to other appropriate site for use or sale. National Grid could require the contractor and all sub-contractors to keep records during construction to assess this goal and ensure that this goal is highlighted in construction documents and contracts.

Materials Reuse – 5 % or better: National Grid could specify building products and materials be reused / salvaged in order to reduce the demand for virgin materials and to reduce waste. Research by architects, engineers, and contractors would be required to see what materials could be reused and the sources of these materials at the time of construction. Again the contractor and sub-contractor should be responsible for record keeping and documentation of all reused materials.

Recycled Content – better than 10%: National Grid should establish project goals for recycled content materials and the building architects and engineers should identify material suppliers that can achieve the recycled content goals. During construction it would be the contractors' responsibility to keep records and specifications for all materials with recycled content installed within the building.

Regional Materials – 10% or better extracted processed and manufactured regionally: National Grid can encourage the building architects to run preliminary calculations during design to set target goals for regional materials. The building architects and engineers should identify material suppliers that can achieve the regional materials goals. During construction it would be the contractors' responsibility to keep records of the origin of materials installed

within the building. Increasing demand for building materials and products that are extracted and manufactured within the region supports the use of local products and reduces the environmental impacts from transportation.

Rapidly Renewable Materials: The use of rapidly renewable materials reduces the use and depletion of finite raw materials and long-line renewable materials. National Grid should establish goals for the use of rapidly renewable materials. The building architects and engineers should identify material suppliers that can achieve the rapidly renewable material goals. In order to receive LEED credit for these materials and products they must be made from plants that are typically harvested within a 10-year cycle or shorter and 2.5% of the total value of all building materials and products used in the project, based on cost. During construction it would be the contractors' responsibility to keep records of all rapidly renewable material and products installed within the building.

Certified Wood: The use of certified wood in the proposed National Grid building encourages environmentally responsible forest management. A minimum of 50 % of wood-based materials and products that are certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria for wood building components (framing, flooring, sub-flooring, wood doors, trim, etc.) Again, the building architects and engineers should identify material suppliers and costs. Also, during construction it would be the contractors' responsibility to keep records of all FSC material installed within the building.

Indoor Environmental Quality

Minimum Indoor Air Quality Performance: This is a requirement for LEED Certification. National Grid should ensure that the proposed building ventilation systems are designed to meet or exceed rates established by current codes and standards for ventilation. Architects and building engineers can ensure that this requirement is met within the design phase of the building.

Environmental Tobacco Smoke (ETS) Control: In Massachusetts smoking within buildings is prohibited. Also, National Grid does not permit smoking within any of its buildings in the State. It is a requirement for LEED Certification that the building be smoke free and designated smoking areas outside the building be away from building vent systems. Architects and building engineers can designate exterior smoking areas in the building design phase that comply with this requirement.

Outdoor Air Delivery Monitoring: The proposed office building should be designed to provide ventilation system monitoring to help sustain occupant comfort and well being by providing CO2 and airflow measuring equipment that will automatically adjust the HVAC

system. Again, the building architects and engineers can ensure that this equipment is incorporated into the design of the building and can be accommodated in the utility spaces. Installation contractor should document that this type of system and controls were installed within the building.

Construction Indoor Air Quality Management Plan – During Construction: National Grid could reduce indoor air quality problems resulting from the construction process in order to help sustain the comfort and well being of construction workers and building occupants.

Construction IAQ management plan before occupancy – Same requirements as the “During Construction Plan” as detailed above

Use low emitting Adhesives, sealants, paints, carpets, and Composites – National Grid can reduce the quantity of indoor air contaminants that are odorous, irritating and harmful to the comfort and well being of the installers and occupants.

Indoor Chemical Pollutant Source Control – Minimize exposure of building occupants to potentially hazardous particulates and chemical pollutants

Controllability of Lighting and Thermal Systems, and Thermal comfort design and verification – National Grid can provide a high level of comfort for thermal and lighting systems by individual occupants or by specific groups in multi-occupant spaces to promote the productivity comfort and well being of occupants. In addition, providing verification to the thermal comfort and ensuring proper design will be paramount in order to maintain a quality space.

Provide daylighting for 75% or 90% of spaces – National Grid can provide building occupants a connection between outdoor and indoor spaces through the introduction of daylighting and views into the regularly occupied areas of the building.

LEED Accredited Professional – National Grid can obtain an additional LEED credit by having a LEED AP on staff during the accreditation process

Alternative Fuel Usage for Fleet Vehicles

National Grid has a large fleet of company owned vehicles. These include sedans used by the sales force, account representatives, and other officials in the company. Currently, the company cars run on gasoline. Gasoline has seen price spikes as high as five dollars a gallon. Combustion of gasoline also releases green house gases into the atmosphere. Alternatives to the gasoline burning sedans being currently used shall reduce operating costs as well as

reducing green house gas emissions. The other vehicle that makes up a large portion of National Grid's fleet is the large diesel powered work trucks. These trucks burn diesel, which can be expensive like gasoline while releasing the same green house gases. The most cost effective way of upgrading the work trucks would be to convert them to run on biodiesel.

Fleet Vehicles

The Honda Civic GX would be the ideal choice to replace gasoline burning sedans. The Civic GX has the appearance of a normal Civic. The only difference is the Civic 1.8 liter engine has been converted to run on compressed natural gas. The Civic has 113 hp and produces 119 pound feet of torque. This would be plenty of power for National Grid employees to travel about the New England States. Honda states the cars range is about 200 miles, which is enough to go from Boston to Portland, Maine and back on one tank. The Civic GX is also California Air Resources Board certified as an AT-PZEV. This stands for Advanced Technology Partial Zero Emissions Vehicle, which means the Civic GX has zero green house gas emissions in some categories. This is one of the strictest standards to try to meet. The most appealing aspect of the Civic GX for National Grid is the fact that it runs on compressed natural gas. This is beneficial because one of the utilities that National Grid supplies to the New England region is natural gas. Since National Grid would be supplying itself with Natural Gas, they would pay a lower price than anyone else they supplied. National Grid would be buying vehicles with higher fuel efficiency and less green house gas emissions while paying a lower price for fuel.

Diesel Alternatives

National Grid should convert all work trucks to run on biodiesel. Biodiesel is a non-petroleum based diesel fuel made from vegetable oil or animal fat. The oil or fat must be put through some chemical processes to be converted in to biodiesel. First the oil must be purified. This is done to remove water and dirt from the source. The oil must then be neutralized of free fatty acids. This allows the amount of base needed to neutralize the acid to be calculated. The oil then undergoes Transesterification. This is when sodium hydroxide and alcohol is added to the oil to create a combustible fuel. The top layer and bottom layer are then removed and the remnants can then be used as fuel. This process is fairly easy to do with the right vessels and a chemist watching the procedure. National Grid could offer rebates to customers who could consistently supply them with used vegetable oil. This would come from large restaurants, hotels, and kitchens with fryolators in them. This oil must be changed multiple times in a week and is usually disposed of by an oil recovery company. Once the biodiesel is complete, it can be directly poured in to the tanks of the work trucks. No modifications are necessary to run biodiesel in regular diesel motors.

Another source of fuel for the work trucks could be algal fuel or oilgae. This is a cutting edge technology which has high yields of biodiesel from specific types of algae. The best way to produce the algae necessary for the fuel is in a wastewater plant. The wastewater comes in to the plant and is anaerobically digested. The waster then continues on to the algae growing area. The alga feeds off the nutrients present in industrial and domestic wastewater. It is then harvested and converted in to biodiesel.

Advanced Building Certification Overview

The Advanced Building Certification is a great alternative to the LEED Certification. The Certification is more flexible and would work with National Grid to make a custom Plan to become certified. The program utilizes what they call “state of shelf technology”. They design Environmental initiatives around easily attainable equipment that has proven it to be cost effective, efficient, and environmentally friendly. National Grid will gain great success with minimum pay out with this program.

The advanced Building certificate has parallel strategies with the LEED certification. LEED is currently working on a way to directly correlate the core performance strategies of the Advanced Building program into the Point system. This Opportunity would be great for National Grid if they decide to go with the LEED certification in the future. The Advanced Building Certification is becoming more and more popular and it would provide National Grid similar environmental impacts while gaining an industry recognized certification.

The Advanced Building Certificate is strong in the small to midsized commercial building initiatives. The buildings they target fall right in line with a lot of National Grids buildings. The optimum buildings are between 10,000 to 70,000 square feet. Although there are the optimum buildings the strategies can be carried onto larger buildings with the same effect.

The Advanced Building Certificates vehicle is the Core Performance program. The Core Performance is broken up into four strategies.

- Design Process Strategies
- Core Performance Requirements
- Enhanced Performance Strategies
- Energy Modeling

All of these strategies would be easily suited for National grid. If the Program is properly followed it should yield National Grid a 20% to 30% energy reduction at each facility that it is rolled out to. The Advanced Building Certification will prove itself worth while both economically and environmentally by the National Grid.

Design Process Strategies:

Overview,

The Design Process Strategies are developed to make the building operating process more effective, leading to a building that is very integrated in its operation. Requirements include defining design with respect to energy performance, part-load evaluation of mechanical loads, acceptance testing, and long-term performance monitoring.

Energy Star

National grid will need to join Energy Star for the part of the goal setting process. A complete survey will need to be done to facilities using the Target Finder forms from Energy Star. The initial Target reading will set the base line. National Grid needs to document a score over 90 to qualify for the certificate. The Target reading form, Statement of energy design intent must be sent to Energy Star and the EPA to receive the membership.

Five Necessary Criteria

1. Design Intent meeting summary: Develop written summary of meeting, Include building modification options, preferred building configurations, and Item to send to Schematic design. These documents will be referred to for subsequent decisions.
2. Operational performance requirements: Document on how building should operate, Include performance goals, how team minimized energy consumption, Sequence of operation for building systems, and Target Finder report.
3. Acceptance testing requirements: Testing plan coordinated with specifics that meet owner's project requirements, List of key equipment to be tested, List of specifications for passing, and Test outcome documents.
4. Construction documents: information on the building envelope, All major equipment listed and specified, Building loads calculated,
5. Requirements for bid submittals: Performance Specifications presented, Or equal to equipment presented, Change request settlement, Specific requirements presented.

Core Performance Requirements:

Overview,

Core Performance Requirements are all the improvements that the buildings will need. The improvements are to HVAC, Structure, Lighting and many more aspects of the envelope.

Criteria

- National Grids facilities will all be tested for local and federal energy code compliance in all of their respected locations.
- Facilities will endure an Air Barrier Performance test that will determine the leakage into or out of the conditioned space. The necessary measures will be taken to rectify all leakage to achieve the minimum amount of leakage.
- Indoor Air Quality will be tested and must meet requirements of ASHRE standard 62. IAQ will be rectified and plan will be set to maintain good IAQ.
- Below Grade insulation will be installed in any facility that does not have it. A minimum of R-5 must be used.
- The Thermal conductance through the buildings envelope will be tested. The appropriate insulation will need to be installed for the climate zone. The building will need to meet Energy Modeling standards set by AB.
- Fenestration Performance will be assessed. The windows u-value, solar heat gain coefficient, visible light, transmittance, and air leakage should all pass the National Fenestration Rating Council standards.
- Lighting controls should be adjusted or installed if not already. Controls should include but not limited to, Bi-level switching, separate switching for day lit areas, automatic controls, occupancy sensors, automatic daylight controls, and time clock controls.
- The over lighting power density of the sites will be looked at. Reduction of lighting and upgraded fixtures will be used to reduce environmental impacts and increased operational cost associated with energy consumption of lighting systems.
- Mechanical equipment efficiency requirements set previously will be looked at. All major HVAC equipment will need to be upgraded to new standards. VFD's, Controls, Schedules, and programming will be used along with energy star rated equipment to achieve optimum performance.
- Dedicated Mechanical systems will be installed in any area of the facilities that need special requirements. This way meeting these loads will not require the operation of the main building system to be changed.

- Demand control ventilation will be initiated in all areas that are not occupied full time. Carbon dioxide detectors will be placed in conference rooms, storage rooms, and rooms that are seldom used so HVAC will only be provided when needed.
- Domestic hot water system efficiencies will be taken into consideration. All water heaters will be replaced that are not high efficient, have no R-14 insulation, and have no heat traps. Water consumption will also be minimized by installing water saving fixtures and installing water saving aerators.

Enhanced Performance Strategies:

Overview,

The criteria listed in this section are not part of the core performance but they do have a significant impact on energy savings. This section is where National Grid will be able to maximize its opportunities. We will be able to pick and chose which criteria we want to work on to maximize the use of the budget. These criteria will also be there for later upgrades.

Criteria

- Cool Roofs could be utilized to reduce HVAC loads. Roofing material that is reflective can be used to reflect the sun away reducing cooling loads. Use roofs that have an emissivity of at least 0.9.
- Utilize daylighting and controls in the required facilities. Install skylights and use daylight harvesting controls to maximize natural light. Install lighting controls to run a schedule so only the necessary lights are on at night, on weekends, and holidays. Take advantage of the many lighting efficiency improvement techniques and products out in industry.
- Additional lighting power reductions will be implemented where possible. Use newer fluorescent fixtures or led fixtures to lower load.
- Assess plug load and appliance efficiency to determine what improvements can be made. Institute office equipment control strategies to reduce equipment run time. Look into more efficient computers using LCD monitors and high efficient workstations. Look into replacing old appliances with new energy star ones.
- Utilize the supply air temperature reset where the HVAC uses minimum reheat to adjust the temperature. The system uses the outdoor temperature to heat and cool spaces when parameters are suitable.
- Install heat recovery units where possible. These units will use heat exchangers that are heated by the exhaust air. In turn the heat exchangers will heat the incoming air into the AHU's causing reductions of heat load.

- Use Night Venting when the parameters are right. Night venting will cool the building structures and mass associated with it. This will greatly reduce the cooling load in the daytime during the summer. The pre-cooled building will stay a lot cooler than a building that just maintains temp all night.
- Use Variable Speed Controls where larger motors and systems will benefit from them. VFD's will drastically reduce energy consumption in flow systems over using the bypass method of control.
- Incorporate Demand-Responsive Building in all retrofits that are done to the buildings. The buildings will be able to shed 10% of its electrical load. The load will be shed from HVAC and lighting. Lowering demand during peak times will reduce energy bills and save the utilities from starting new plants.
- Look into on-site supply of renewable energy. Look into things like geo-thermal heat, Wind turbines, and thermo-solar.
- Use fault detection diagnostics to aid in the right amount of pm's completed. Set up predictive maintenance programs using vibration analysis, infrared, ultrasonic leak detection, and ultrasonic steam trap surveys.

Energy Modeling:

Overview,

Energy modeling is used to target certain aspects of National Grid's facilities to increase the entire buildings energy performance levels. The targeted areas are beyond the requirements of the Core Performance program but they are an excellent way to start targeting more aggressive energy saving criteria. This is where National Grid will be able to use customized initiatives.

Criteria

Energy modeling must utilize advanced software to measure and track the initiatives. National Grid must use software like eQuest, PowerDOE, Energy Plus, etc. to prove that the initiatives have exceeded the core performance programs requirements. National Grid could use initiatives like alternative fuels, advanced burner controls for the boilers and so on to reduce their footprint. Energy modeling will help measure and track the good work National Grid is doing to reduce energy usage.

Certification Recommendation

After extensive review of both the LEED Gold certification and the Advanced Buildings certification potential benefits to National Grid, we recommend that National Grid incorporate LEED into their sustainability initiative. Although both LEED and Advanced Buildings both allow for National Grid to reduce their energy usage in their buildings and provide a more healthy

work environment for employees via better control over space conditions, LEED provides the most comprehensive and well recognized certification program available. LEED provides better input to site conditions and recognizes the benefit of the public transportation, site selection and protection, proper materials selection and site environmental quality conditions that AB does not. We believe the most important factor into choosing LEED as a certification is that it is the most well recognized symbol of sustainability and energy efficiency available. National Grid can attain instant recognition from their customers by incorporating LEED into their designs. This recognition can go a long way to demonstrate National Grid's commitment to sustainability and a positive influence in the communities that they operate in.

Change Management Plan

National Grid can implement these sustainability changes but must recognize the importance of incorporating a change management. A structure and path to implement these changes are detailed below.

Senior executives must clearly state to employees their vision of sustainability, how it fits into the business plan and why it is beneficial for National Grid to incorporate these changes. We recommend at the senior vice president level or above that a "change champion" be identified (see below). In addition, we recommend identifying personnel in each department that can act as "change agents" (see below) for the sustainability initiative and support the direction that the change champion is advocating.

Change Champion – This person (identified as senior vice president or above) will be the main communicator for the sustainability initiative. They will clearly state to all employees the direction of the company and how sustainability fits into this. They must clearly state the long term benefits of this and ensure that employees recognize that this is not a "flash in the pan" initiative. They will work with the change agents to identify and answer questions from all employees. It is imperative that this person is passionate about sustainability as we believe that this passion will translate to positive employee feedback and interaction with the initiative.

Change Agent - Change Agents are mid-level employees who understand all the changes happening with regards to sustainability, and who support and help communicate those changes, both up and down, and throughout the company. They serve as trusted advisors. They listen to fellow employees' concerns and can get those concerns addressed at higher levels. These agents will communicate the benefits of sustainability and help employees incorporate sustainability into their day to day jobs.

We recommend that change agents meet monthly with each other to discuss their successes and challenges as well as the different questions that employees are having.

We recommend quarterly meetings with the change champion and change agents to discuss any changes in strategy for the sustainability initiative and to communicate to the change champion any challenges that need to be addressed by senior management

In addition to this, we recommend incorporating a measurement and verification (M&V) survey to ensure that the message is getting out to all employees and that the change agents are properly communicating and addressing any questions or concerns that may come up during the process.

Work Cited

Web Sites

<http://www1.eere.energy.gov/buildings/commercial/>

<http://www.buildinggreen.com/>

<http://www.usgbc.org/DisplayPage.aspx?CategoryID=19>

<http://www.nationalgridus.com/>

Change management with Keyspan merger

<http://automobiles.honda.com/>

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<http://www.advancedbuildings.net/>

<http://www.wikipedia.org/>

<http://www.civicgx.com>

<http://www.ezbiodiesel.com>

Books

Advanced Buildings, Core Performance Guide 2007

Making Sustainability Work, Marc J. Epstein

LEED New Construction V2.2 reference guide 2nd edition

Implementing Change Management Plans & Evaluating Success – Craig Borysowich

Do It Yourself Guide to Biodiesel, Guy Purcella

Other

Tac-Energy Solutions, Mark Luckes.Power Point Presentation