BS&G's Green Plan

Energy

May 5, 2011

Overview

- **BS&G is approaching a century of service and getting greener**
- **Business** – construction supply
  - **Ready mix concrete (MA)**
  - **Sand, stone and landscape products (NH)**
- **Customers** – contractors and homeowners
- **Transportation logistics –** truck fleet and railroad.
- **Size** – 250 employees in 18 sites
- **Long history of quality in products and service –** demanding commercial and infrastructure projects
- **Ongoing practice of environmental compliance and sustainability**
- **Developing a positive track record in environment and sustainability**
  - **Green Plan formally began in 2008**
  - **Economic driver with environmental benefit**

Energy Use

- **Electrical power** for concrete production facilities in MA
  - Heavy industry – operate during peak hours
- **Natural Gas and Oil -** boilers and space heat
- **Diesel fuel**
  - Rolling stock – trucks, loaders, RR
  - Mobile equipment – crushers
  - Generators for mining operations in NH
- **Gasoline** - non-commercial fleet

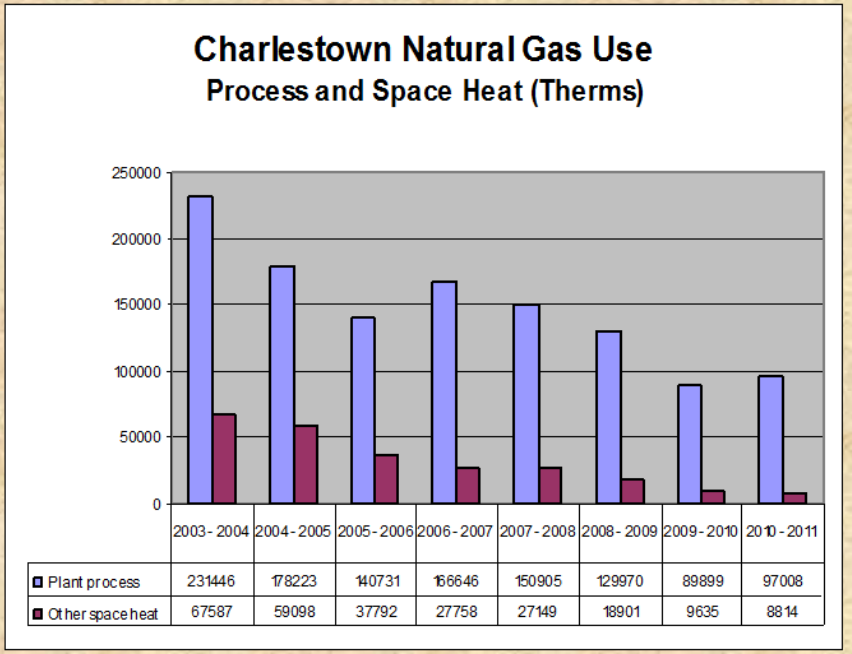
“Greening” BS&G’s Charlestown Plant

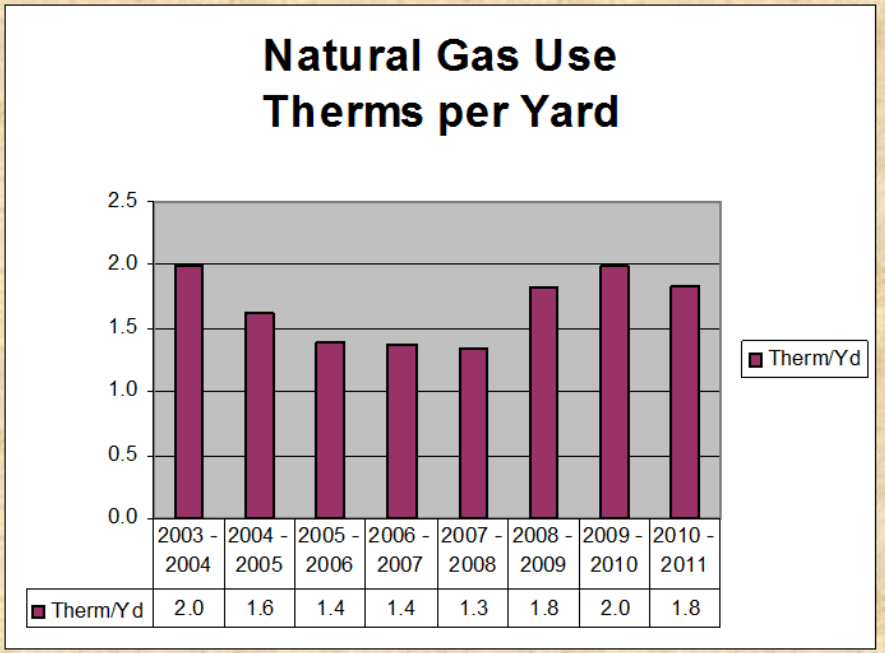
- Largest payback – 60% of company’s energy usage - 3 production plants, full service maintenance garage, ancillary equipment and facilities.
- Energy improvements tried here then implemented in other facilities
  - Energy tracking for electricity and natural gas - where used, how much?
  - Energy Procurement Contracts – a post-deregulation challenge
  - Demand Response – non-critical equipment for energy curtailment
  - Demand Reduction – lighting, motors, pumps, compressors
  - Renewable Energy - PV Solar

Natural Gas

- **Gas used to heat water for production and for space heat.**
- **Objectives – contain cost, reduce demand**
  - Develop supply contracts
  - Track usage trends by meter
  - Look for opportunities
- **Opportunity 1 - Garage**
  - **Gas heating replaced by waste oil burning**
  - Permitted a waste oil burner for waste oil produced by fleet
  - 12% of natural gas replacement
- **Opportunity 2 - Plant**
  - **Hot water control.**
  - Tempering valves on water tower for trucks
  - Modification to boiler water feed control loop
  - 33% improvement in gas consumption 2004 - 2008

Plant Natural Gas Usage and Efficiency

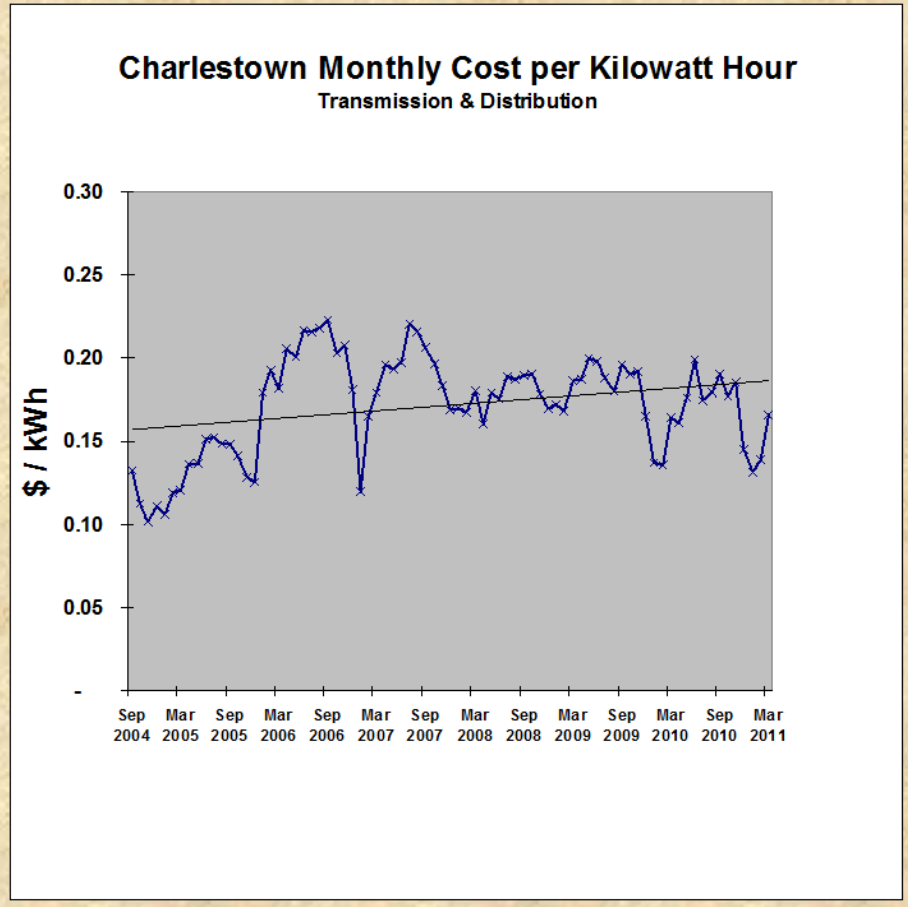




- **Used for space heat and hot water for winter concrete**
- **Efficiency measures**
  - Digital control equipment
  - Piping reconfiguration
  - Tempering valves
- **Challenge: maintaining efficiency at 61% less production volume**

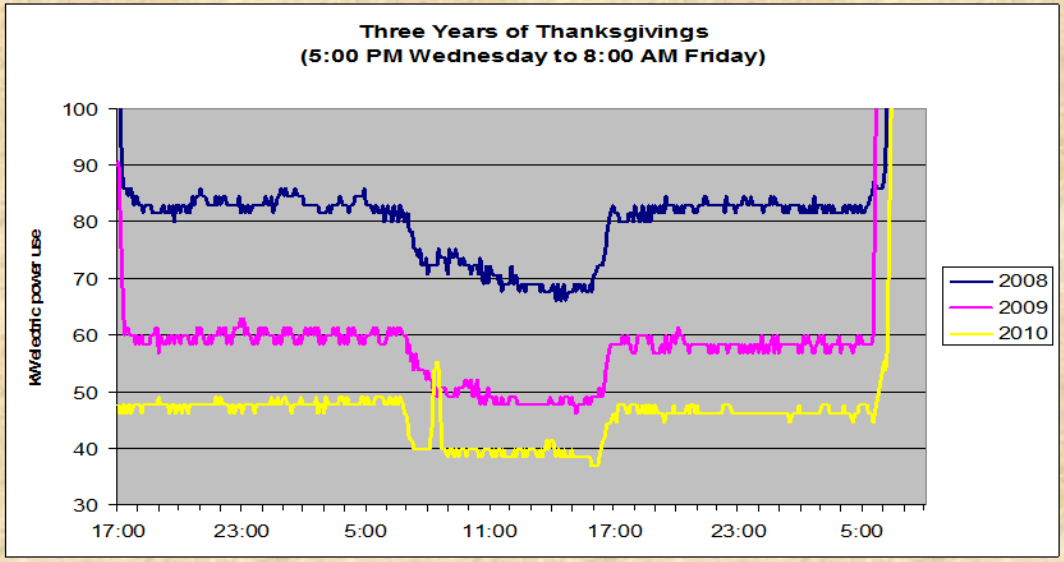
Energy Supply

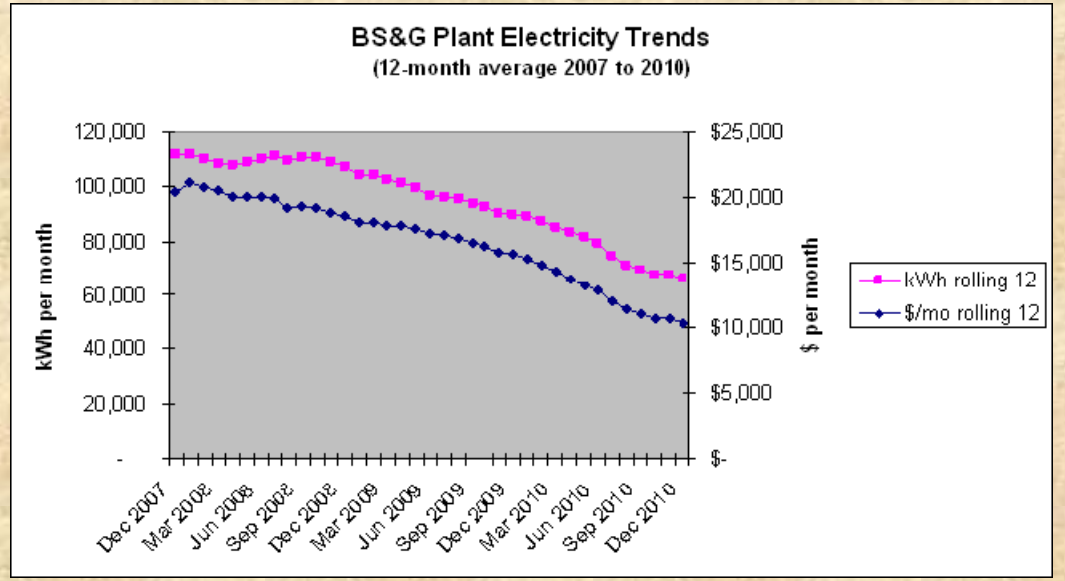
- **SourceOne/Boston**
  - Supply contracts (Oct 04 – Oct 09)
  - Energy tracking for multiple accounts
- **Lessons Learned**
  - Deregulation did not help us.
  - Supply contract does not mean constant delivered cost.
  - Pass thru-costs on supply plus variable delivery costs.
- **Supply contracts**
  - May not work for small seasonal facilities.
  - Contracted supply carries capacity tag even when production volume and usage are low
- **Challenge**
  - Finding energy procurement strategies for large and small facilities operating seasonally and during peak hours.



Plant Energy Usage and Costs

- **Improved supply contracts** – all-in/fixed price (EnerNOC).
- **Energy analysis** with online monitoring equipment
- **Efficiency improvements**





Demand Response

- **Emergency energy curtailment plan to reduce power draw on the grid.**
- **EnerNoc**
  - Assisted BS&G with application/qualification.
  - Provided equipment for real time energy monitoring.
  - Provide quarterly payments for program participation ($/kWh) – pledged KWH reduction
  - Reassess payout based on actual energy reduction in annual drill
- **BS&G**
  - 4 concrete facilities participating.
  - Initially - $17,000/yr for 850 kWh.
  - Now - $3,000/yr for 166 kWh.
  - Less energy curtailment - lower levels of production + energy efficiency improvements.

Demand Reduction – Lighting Upgrade

- **Turn key service – audits, installation, disposal of old equipment, rebate application.**
- **Utility rebates vary depending on the utility and indoor vs. outdoor lighting.**
- **Savings start immediately!**

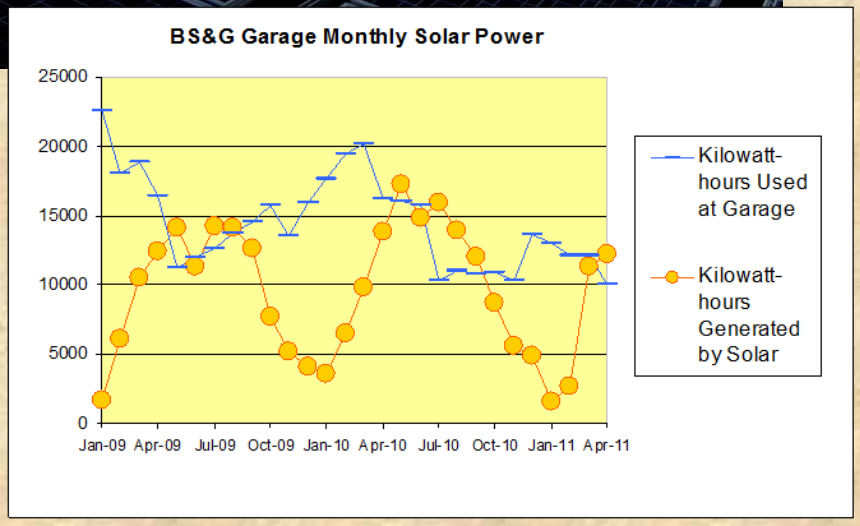
Facility	Proj Cost	Rebate %	Out-of-Pocket Expense	Savings $/yr	Payback (yr)	Savings KWH/yr	Prevented CO2(lb/yr)
BSG-P	$ 16,251	11%	$ 14,483	$ 13,311	1	81,467	126,274
BSG-G	$ 6,450	20%	$ 5,183	$ 2,128	2.2	10,705	16,593
LRM-SD	$ 6,072	88%	$ 724	$ 1,224	0.4	6,948	10,769
LRM-S	$ 2,555	100%	$ -	$ 730	0	3,195	4,953
OA	$ 15,808	47%	$ 8,308	$ 3,389	2.3	20,956	32,484
NHN	$ 17,827	42%	$ 10,327	$ 2,555	3.9	15,803	24,495
Total	**$ 64,962**		**$ 39,025**	**$ 23,337**	**1.7**	**139,074**	**215,568**

Demand Reduction - Equipment

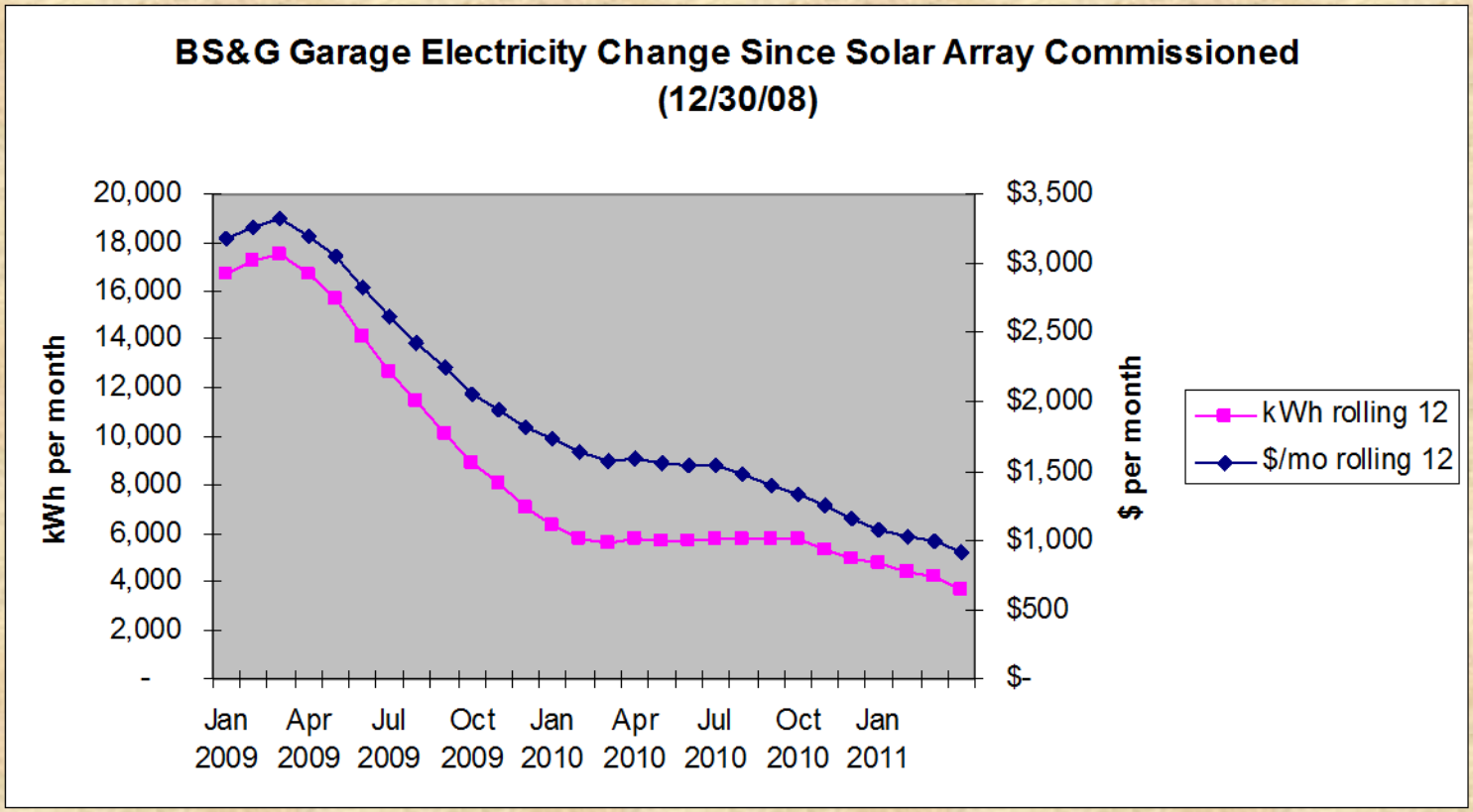
- **Motors and Water Pumps - Variable Frequency Drives**
  - **2 Boiler Room pumps** - 100% runtime, re-circulating or “dead-heading”.
    - Cost to run pumps - $12k/yr – ***> 10%*** of the plant’s annual electric bill.
    - Cost of 2VFD’s - $8,000
    - Savings - $10,200/yr @ 0.78 yr payback
  - **2 Waste Water Treatment pumps**
    - Non-continuous operation
    - $5,000 investment with a 3 to 4 year simple payback.
- **Compressors**
  - **Several compressors replaced with more efficient units**
    - 12,000 KWH/yr saved
    - 30% rebate
  - **Compressor system leak check and maintenance program**

Maintenance Garage - PV Solar

- **109 KW PV Solar Energy System**
  - 552 solar panel array
  - 120,000 kWh/yr
  - 83% of annual garage energy
  - 90 tons/yr CO_2 reduction
- **Investment**
  - 5.5 yr payback
  - 11.4% after-tax rate of return
- **Incentives**
  - Commonwealth Solar Rebate
  - Tax Incentives
  - Renewable Energy Credits
  - Sale of excess energy back to grid
- **Turnkey Design, Installation and Commissioning - Nexamp**
- **MA Produced Components**
  - Solectria Renewables –Inverter
  - Evergreen – Solar Panels
  - Panel claw – Panel Mounting System



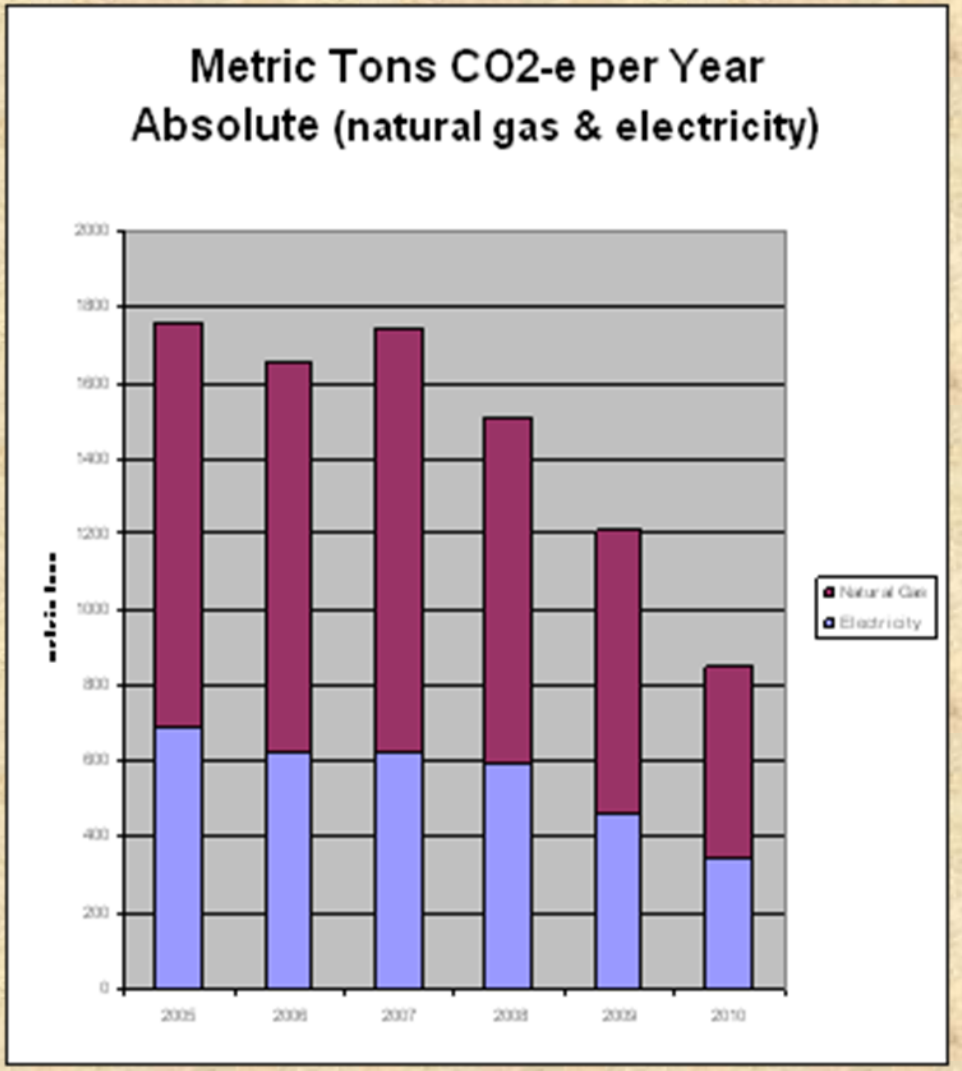
Garage Energy Usage and Costs



- Solar Array
- Compressor upgrade
- Lighting efficiency
- Compressor system leak detection
- Turning off unneeded equipment

Results So Far – Charlestown Facility

- Through 2010, measurable reductions in energy compared to 2007-08 cycle
  - electricity use - 44%
  - natural gas 50%
  - greenhouse gas emissions- 48%.
- On a per unit basis, metrics declined due to lighter production volumes.
- Efficient practices employed during the construction cycle downturn will result in improvement in greenhouse gas emission and profitability on the way to the next building peak.



Recognition

- **Best Energy Reduction Project in New England** (Association of Energy Engineers) - 81% energy reduction in Garage– PV Solar and lighting
- **Solar Boston** – recognition for participation in City's renewable energy program.
- **2009 Green Award** – City of Boston
- **2009 Green Design Award** – Boston Business Journal -unique solar panel mounting system allowing south facing panels on a north facing roof.
- **NRMCA Green Star Certification** – industry recognition for sustainable practice in a ready mix concrete facility – 2nd company in US, 1st east of the Mississippi.
- **Governor's Clean Energy Challenge – Mentor Company and participant –** 10% facility energy reduction by June 2012 relative to 2007 -08 levels . Actual energy reduction: Elec 50%, gas 44%, GHG 48%.
- **EPA Green Power Partner –** achieved 12.4% green energy production from solar in 2010.

GREEN-STAR NRMCA

COMMONWEALTH OF MASSACHUSETTS GOVERNOR'S CLEAN ENERGY CHALLENGE NEW ENGLAND CLEAN ENERGY COUNCIL MENTOR

EPA GREEN POWER PARTNERSHIP

Sustainability Challenges Ahead

- **Energy – RMC Facilities**
  - Continuing improvement through monitoring
  - Updating equipment
    - Compressors
    - Digital controls
    - Flow thru/on-demand boilers – just installed one unit – expecting savings in fuel and electricity
- **Energy – Mining/Crushing Operations**
  - Diesel powered generators for electricity
- **Fuel conservation and GHG emissions**
  - Plants
  - Fleet
  - RR –New Hampshire Northcoast RR
    - Participating in EPA funded program to install auxiliary power units for idle reduction – estimate 4,000 – 8,000 gal/yr diesel savings; 7,000 -12,000 lbs/yr GHG emission reduction.

- **Questions**
- **Contact information**:
  - **Dave Allen**, Sr. Environmental Engineer
    - dallen@bostonsand.com
    - Tel: 617-227-9000, x1032
  - **Linda Charpentier**, Director EHS
    - lcharpentier@bostonsand.com
    - Tel: 617-227-900, x1030
- **Website**: http://www.bostonsand.com