Rules of Thumb					
Energy Efficiency in Buildings					
Cost Premiums	**Benefits**				
	Energy Savings	**Cost Savings**	**Increased Productivity**	**Economic Development**	**Other Benefits**
• *Standard lighting retrofits*: $0.90-$1.20 per square foot. • *High-efficiency packaged and split system A/C equipment*: $100- $180 per ton more than standard efficiency models. • *Premium Efficiency Motors* (incremental costs vs. standard replacements): about $16 per horse power (HP) for 1 HP-10 HP motors; $8/HP for 11 HP to 100 HP. • *Variable frequency drives (VFDs):* $150-$200, installed. • *Commissioning new buildings:* $0.50-$3.00 per square foot. • *Retro-commissioning buildings:* $0.05 and $0.40 per square foot.	• *Existing buildings:* overall consumption reductions of 20% to 30%, with reductions as high as 35%-40%, depending on aggressiveness. • *Retro-commissioned commercial building:* average savings of 1.7 kWh/ft^2 and average overall energy savings of 15%. • *Lighting retrofits:* save 10%-20% of *total* electric consumption in gas-heated buildings. • *High efficiency packaged and split-system cooling equipment:* 25% less *cooling* energy than standard equipment and 10%-15% less than ASHRAE standard. • *Building Operator training*: 0.35-1.2 kWh/ft^2 per year.	• *Existing buildings:* reducing consumption by 20% to 30% can produce savings from 6%-9% of *total annual costs*. • *Converting constant volume HVAC systems to variable air volume systems:* can save between $0.10/ft^2 to $0.20/ft^2 or 10%-21% of HVAC energy costs. • *Installing premium efficiency motors and VFDs: Potential energy cost savings are 50-85%.* • *Peak energy-reducing measures:* produce proportionally greater cost savings than those that have mostly off-peak savings. • *Commissioning new buildings:* average savings of $0.05/ft^2. • *Retro-commissioning existing buildings:* save around $0.27/ft^2, resulting in 15% energy savings and a payback period of 0.7 years.	• *Existing buildings:* improved comfort and better air quality can increase productivity. • *Retrofitted buildings:* Increased savings from enhanced productivity can equal up to 10 times the energy cost savings. • *Existing buildings:* 1% productivity improvements can offset entire annual utility costs.	• *Existing buildings*: For every $1 spent in local economy, energy efficiency generates 57¢-84¢ more economic activity than does payment of energy bills.	• *Existing Buildings:* energy efficiency investments can increase asset value by $2.00-$3.00 for each $1.00 spent. • *Existing buildings:* a lighting power reduction of 40% increases an ENERGY STAR rating by 10 points. • *Retro-commissioned buildings:* annual non-energy savings, such as extended equipment life and improved air quality, are approximately $0.26/ft^2.

Rules of Thumb					
Green Buildings					
Cost Premiums	**Benefits**				
	Energy Savings	**Cost Savings**	**Increased Productivity**	**Average Period Payback (years)**	**Other Benefits**
• *Green buildings:* cost premiums average $3/ft^2-$5/ft^2, or less than 2% of initial costs. • *New high-performance green buildings*: cost premium range from 2%-7%, depending on the specific design features integrated. *LEED green buildings:* additional cost of certified projects: 0%-2.5%, Silver 0%-3.5%, Gold 0.5%-5%, Platinum 4.5%+.	• *New green buildings:* mean savings is 27%; mean value for actual consumption is 1% lower than modeled. • *New green buildings:* 50% reduced consumption compared to conventional new buildings.	• *New green buildings:* energy cost savings compared to conventional design as high as $0.47/ft^2. • *Commissioning new buildings:* average savings of $0.05/ft^2.	• *Installing high-performance lighting:* productivity improvements of 0.7%-26% with a median of 3.2%. • *Incorporating daylighting:* productivity improvements of 0.45% -40%, mean of 5.5%. • *Increasing natural ventilation:* productivity improvements of 3%-18%, mean of 8.5%.	• *High-performance buildings:* simple payback period can be as short as 2.0 years for offices, 2.1 years for libraries, and 2.6 years for schools.	• *GHG emissions reductions:* as high as 36%. • *Reduced indoor and outdoor water consumption:* 30% and 50%, respectively. • *Reduced waste consumption:* 50%-75%. • *Value of non-energy benefits:* 25%-50% of the value of annual electricity cost savings.

Energy-Efficient Product Procurement – All Products				
Cost Premiums	**Benefits**			
	Energy Savings	**Energy Cost Savings**	**Average Payback Period (years)**	**Emission Reductions**
• *Energy-efficient as opposed to conventional products:* cost premium varies with each product, but most often the difference is slight.	• *Energy-efficient product procurement*: savings of 3%-12% of total building energy consumption.	• *Energy-efficient product procurement:* energy cost savings of 4%-17% relative to total commercial energy costs.		• *1 MWh of electricity saved: through energy-efficient product procurement equals emissions reductions of*: – 1,364 pounds of CO_2 – 5.6 pounds of SO_2 – 2.2 pounds NO_x

Rules of Thumb			
Energy-Efficient Product Procurement – By Type of Product			
Product Category	**Effective Date of Current Specification**	**Percent Savings Compared to Conventional Product**	**Cost-effectiveness (payback period)**
Appliances			
Dehumidifiers	October 2006	15%	0 years (typically no retail cost premium)
Dishwashers	January 2007	40%	0 years (typically no retail cost premium)
Refrigerators and freezers	April 2008	15%	4 years (refrigerators) 6 years (freezers)
Room air conditioners	November 2005	10%	Not available
Room air cleaners	July 2004	45%	0 years (typically no retail cost premium)
Electronics			
Battery charging systems	January 2006	35%	0 years (typically no retail cost premium)
DVD products	January 2003	60%	0 years (typically no retail cost premium)
External power adapters	January 2005	35%	0 years (typically no retail cost premium)
Televisions	November 2008	25%	0 years (typically no retail cost premium)
Envelope			
Roof products	December 2007	Not available	< 4 years
Lighting			
Compact fluorescent lamps	January 2004	75%	< 1 year
Office Equipment			
Computers	July 2007	25% - 50%	0 years (typically no retail cost premium)
Copiers	April 2007	65%	0 years (typically no retail cost premium)
Monitors	July 2007	25%	0 years (typically no retail cost premium)
Multifunction Devices	April 2007	20%	0 years (typically no retail cost premium)
Printers, fax machines, and mailing machines	April 2007	15%	0 years (typically no retail cost premium)
Scanners	April 2007	50%	0 years (typically no retail cost premium)

Rules of Thumb			
Energy-Efficient Product Procurement – By Type of Product			
Product Category	**Effective Date of Current Specification**	**Percent Savings Compared to Conventional Product**	**Cost-effectiveness (payback period)**
Heating and Cooling			
Air source heat pumps	April 2006	5%	< 5 years
Boilers	April 2002	5%	< 1 year
Ceiling fans	September 2006	45%	0 years (typically no retail cost premium)
Furnaces	October 2006	15%	< 3 years
Geothermal heat pumps	April 2001	30%	< 5 years for new construction
Light commercial HVAC	January 2004	5%	< 1 year
Ventilating fans	October 2003	70%	0 years (typically no retail cost premium)
Commercial Food Service			
Commercial dishwashers	October 2007	30%	2 years
Commercial fryers	August 2003	15%	2 years (for typical unit)
Commercial ice makers	January 2008	25% - 30%	4 years (for typical unit)
Commercial solid door refrigerators and freezers	September 2001	35%	1 year
Other			
Water coolers	May 2004	45 %	0 years (typically no retail cost premium)
Vending machines	April 2004 August 2006 (rebuilt machines)	40 %	< 1 year

Rules of Thumb			
Green Power Purchases			
Cost Premiums	**Benefits**		
	Energy Savings	**Energy Cost Savings**	**Emission Reductions**
• *Green power*: about 2¢/kWh. Premiums vary by utility but range from 0.2¢/kWh-17.6¢/kWh • *Renewable energy certificates (RECs)*: 1¢/kWh (in ME) - about 5¢/kWh (in MA). Solar REC prices in NJ are the highest at 25¢/kWh • *RECs offered by a certificate marketer:* 0.5¢/kWh - 7.5¢/kWh, with an average of 2.3¢/kWh. RECs are also available at \$5.50/ton CO_2 to \$12/ton CO_2, with an average of \$9.80/ton CO_2.	• N/A	• *Utility green power programs:* For some utility green power programs, the premium can be negative, thus reducing energy bills. These premiums have been as low as -0.13¢/kWh	• *Purchasing 1 MWh of green power is equivalent to:*[d] – 0.14 passenger cars not driven for one year; – 0.52 acres of pine or fir forests storing carbon for one year; – 16 tree seedlings grown for 10 years; – 0.21 tons of waste recycled instead of landfilled; and – 71 gallons of gasoline.

Rules of Thumb			
Clean Energy Supply			
Total Costs	**Benefits**		
	Energy Savings or Energy Generated	**Cost Savings**	**Emission Reductions**
• *Small-scale CHP plant:* installed cost of $1.60/W for systems less than 500 kW, and about $1/W for systems between 0.5 MW and 5 MW. Installed costs for on-site CHP systems average around $2.90/W in California. • *Solar photovoltaics:* average shipment price in 2004 was $3.00/W; the average price in 2005 was $3.20/W.[c] Total costs, including the inverter, installation, and balance of system range from $6-$9 per peak Watt. Installed costs for PV modules average around $8.70/W in California and $7.90/W in New Jersey. • *Small wind turbine*: including installation, ranges from $14,700-$20,800 for a low-range model; $28,100-$59,600 for a mid-range model; and $105,000 and $115,000, respectively, for two elite models. Installed costs for on-site wind generation average around $3.60/W in California.	• *CHP systems:* energy savings as high as 40%. • *10 kW solar PV system:* generates 9,700 kWh/year to 16,800 kWh/year, depending on the location of the system. • *Wind turbine with 84-foot tower and 7-foot diameter (rated at 900 W)*: generates 96 kWh/month at an average wind speed of 10 mph and 155 kWh/month at 12 mph. • *Wind turbine with 140-foot tower and 50-foot diameter (rated at 65 kW):* generates 3,674 kWh/month at 10 mph and 5,992 kWh/month at 12 mph.	• *CHP systems:* as high as 40% of the cost of operating separate heat and power systems. • *10 kW solar PV system:* from about $600-$1,400 per year, depending on the geographic location of the system. • *900W wind turbine*: cost savings range from $9/mo.-$14/mo per installed turbine. • *65 kW wind turbine:* range from $330/mo -$540/mo. Per installed turbine.	• *CHP systems:* equivalent to about 2.6 lbs NO_x/MWh, 5.8 lbs SO_x/MWh, and 1,200 lbs CO_2/MWh. • *10 kW solar PV system*: from 12,000 lbs-20,000 lbs of CO_2, 10 lbs-90 lbs of SO_x, and 4 lbs- 90 lbs of NO_x per year. • *Single 10-meter wind turbine with 750 kW capacity with wind speeds ranging between 12.5 and 13.4 mph*: 2.36 million lbs of CO_2, 13,800 lbs of SO_x, and 8,600 lbs of NO_x in one year.