Calculator Methodology
Revised May 2013

Computations of environmental benefits from renewable energy and carbon offset purchases from NC GreenPower are derived from the following:

One block of renewable energy = 100 kWh
   Annual energy output supported by one block subscribed monthly:
   100 kWh x 12 months = 1200 kWh

   Amount of coal needed to generate one kWh:
   10,500 BTU/kWh / 13,000 BTU/lb. coal = .81 lb coal/kWh

Source: Economic Sciences Corporation, Efficient Heat Rate Benchmarks
   “Clearly, most of the heat rates are concentrated in the range of 9,000 – 12,000 BTU/KWh.” – Average 10,500 BTU/kWh

Source: Kentucky Educational Television, American Coal Foundation Definitions
   “Bituminous coal has a carbon content ranging from 45 to 86 percent carbon and a heat value of 10,500 to 15,500 BTUs-per-pound.” Average 13,000 BTU/lb. coal

Amount of indirect CO₂ offset annually by one block of renewable energy subscribed monthly (12 blocks over one year):
   56.7 lb carbon per 100 kWh x 3.67 lbs. of CO₂ per lb. of carbon x 12 months = 2497 lbs.

Conversion used is 1670.57 Lbs of CO₂ per MWh of electricity produced – provided by eGrid2012 for annual CO₂ non-base load output emission rate for SERC Reliability Corporation – the North American Electric Reliability Corporation (NERC) region which includes North Carolina.

1 Block per month = 1200 kWh = 2004.7 lbs of CO₂

   Shows ultimate analysis of bituminous coal to be 60-80% carbon – 70% average
Formula: (56.7 lb C per 100 kWh block): If coal is 70% carbon, then 81 lb coal/kWh x 0.7 = .567 lb C/kWh or 56.7 lb C/100 kWh.
If one 100 kWh block is subscribed monthly, the annual savings in carbon is 56.7 lb.

Formula: (3.67 lbs. of CO2 per lb. of carbon): Atomic weight of CO$_2$ = 44;
atomic weight of C = 12; 44 lbs of CO$_2$ / 12 lbs of C = 3.67
or 3.67 pounds of CO$_2$ per pound of carbon.

Amount of NOx offset annually by one block of renewable energy subscribed monthly (12 blocks/year): .0026 lbs. NOx per kWh x 100 kWh per block x 12 months = 3.12 lbs NOx.

Source: EPA Power Profiler – eGRID 2002
Pounds of NOx per kWh in North Carolina region: .0026

Amount of SO$_2$ offset annually by one block of renewable energy subscribed monthly (12 blocks/year): .0065 lbs SO$_2$ per kWh x 100 kWh per block x 12 months = 7.8 lbs. SO$_2$.

Source: EPA Power Profiler – eGRID 2002
Pounds of SO$_2$ per kWh in North Carolina region: .0065

Annual reduction of CO$_2$ emissions per block of renewable energy subscribed monthly as environmentally equivalent to trees planted: 2497 lbs / 13 lbs CO$_2$ = 192 trees planted.

Source: 56.7 lb carbon per 100 kWh block x 3.67 lbs. of CO$_2$ per lb. of carbon x 12 months = 2497 lbs. CO$_2$ offset annually per block of renewable energy subscribed monthly (see above methodology)

Source: Urban Forestry Network, Tree Facts
“One acre of new forest will sequester about 2.5 tons of carbon annually.
Trees can absorb CO$_2$ at the rate of 13 lbs./tree/year.”
One block of Carbon Offset = 1,000 pounds (increase from 500 pounds as of 8/1/11)

Annual reduction of CO₂ emissions per block of carbon offset subscribed monthly as environmentally equivalent to days not driven: 3039 miles not driven annually / 15,000 average miles per year driven * 365 days in one year = 73.949 days not driven

10,500 BTU of coal required to make 1 kWh of electricity x 100 kWh per block of carbon offset x 12 months / 4145 BTU per mile driven = 3039 miles not driven annually per block of carbon offset subscribed monthly (see above methodology)

Source: AAA NewsRoom, Cost of Owning and Operating Vehicle in 2013
$9,122 (estimated sedan average automobile operating cost per year) / $0.608 per mile operating cost based on 15,000 miles average annual miles driven

Annual reduction of CO₂ emissions per block of carbon offset subscribed monthly directly equivalent to miles not driven:

CO₂ emissions from a gallon of gasoline = 19.7 pounds/gallon

Source: EPA, Clean Energy Calculations
0.125 mmBtu/gallon x 71.35 kg CO₂/mmBtu x 1 metric ton/1,000 kg = 8.92 x 10⁻³ metric tons CO₂/gallon of gasoline or 19.66523716 pounds/gallon of gasoline

8.92 x 10⁻³ metric tons CO₂/gallon gasoline x 11,493 VMT car/truck average x 1/21.5 miles per gallon car/truck average x 1 CO₂, CH₄, and N₂O/0.985 CO₂ = 4.8 metric tons CO₂E /vehicle/year

NHTSA estimates that the MY 2011 standards will raise the industry-wide combined average to 27.3 MPG Source: NHTSA, CAFE Fuel Economy Standards

15,000 miles (gal/27.5 miles) (.114mmBTU/gal) (154.4lbs/mBTU) (1 block/1,000 lbs)
19.4 lbs/gal x 27.5mi/gal, EIA Environment

Annual reduction of direct CO₂ emissions per block of carbon offset subscribed monthly as environmentally equivalent to trees planted:

6000 lbs / 13 lbs CO₂ = 462 trees planted

Source: Urban Forestry Network, Tree Facts
“One acre of new forest will sequester about 2.5 tons of carbon annually.
Trees can absorb CO₂ at the rate of 13 lbs./tree/year.”