

Massachusetts Electricity Generation

A Proposed New Grid with a Focus on Renewable Energy Resources James Seed, Michael Berlied, Christopher Whipple



Abstract

Dangerous carbon emissions have clearly shown their negative effects in the modern world. This has propelled researchers to develop sustainable technology to reduce these harmful toxins that pollute the earth. These innovative technologies have revealed alternative, renewable ways to produce electricity. Massachusetts however, along with the rest of the world, continues to rely on fossil fuels for power. The reconstruction of the Massachusetts energy infrastructure would be costly and time consuming, but necessary. This proposal is a statistical analysis of the sustainable sources of energy available to Massachusetts and produces an optimal usage of these sources in order to significantly decrease the amount of fossil fuels burned for electrical production.



Current Projections

Current Projections

The graphs on the left illustrate the current energy projections for Massachusetts for the year 2020. If Massachusetts does not take action, nonrenewable resources such as coal and natural gas will continue to emit carbon emissions into the atmosphere. The production of these sources will increase along with the population growth.

Health "Health problems linked to aging coal-fired power plants shorten nearly 24.000 lives a year " -MSNBC



Solar Energy

- Phase 1 : A Large scale Solar Photovoltaic Farm
- •70,000 solar panels
- •Rated at 15,000 Kilowatts
- •Sun Tracking Ability to Maximize Efficiency
- •100 Million dollars to Installed
- •140 Acres of Land

These are the stats from the Solar Farm in Nellis Air Force Base in Colorado(Fig 2). A solar farm with similar stats would be ideal for Massachusetts.



Phase 2 for Solar Energy – Private, small scale solar residential grid tied systems

•Would significant reduce a Homeowners electric bill and their reliance on the electric company •Initial cost would be aided by government tax incentives (NOT included in cost analysis below) •Benefits of A Grid tied system-

•Electricity can be purchased from the electric company during times of low solar production •Excess electricity can be sold to the electric company

Our Proposal

Nuclear energy

1 Proposed AP 1000 Nuclear Plant

• Extremely Efficient (98%) and clean as compared to fossil fuel plants

 Rated power production capacity of 1154MW. •Will produce 9,906 million kilowatt hours per year.

Initial cost of \$2 billion to build with low running costs after.

 Alongside the already standing Pilgrim plant, nuclear could produce a total of 25% of Massachusetts electricity needs in 2020.



Social and Environmental Implications

 Safety of community is always a concern with nuclear plants.

•With careful monitoring and the newest technology, nuclear is safer than ever.

•Storage of nuclear waste has come a very long way and there are now procedures for safe and proper disposal.



Wind Energy

Off Shore Wind Farms

•State is already starting to tap into its offshore wind resource with the Cape Wind project (see below)

•Wind energy production has potential to reach very large percent of MA total with floating farms

- •Proposed 8 wind farms off the east coast of MA •Cape Wind farm (130 turbines rated at
 - 3.4MW) to produce 1500 million kilowatts per year.

•7 Future floating farms (1000 total turbines rated at 5MW) to produce up to 24% of Massachusetts total electricity in 2020 which amounts to 17,500 million kilowatts per year.



Cost Analysis

The proposed plan would cost:

- •\$1.25 Billion per wind farm
- •\$2 Billion for the new nuclear power plant
- •\$100 Million for the solar farm

With 8 wind farms, 1 solar farm and 1 Nuclear Power Plant, this plan would cost an estimated total of

\$12.1 Billion (\$12,100,000,000)



Our Impact

Proposed Projections

illustrate the proposed energy projections for Massachusetts for the year 2020. As a comparison to the graph above, our proposal will reduce the percentage of fossil fuels while significantly increasing the percentage of renewable energy sources.





The graphs on the right





270/

Natural Gas

Renewables

Coal

10 75%

10.75

21.50%

Petroleur

Nuclear

2020 Proposed Electric Production

