2008

Massachusetts Electricity Generation

Michael Berlied  
*Worcester Polytechnic Institute*

James Seed  
*Worcester Polytechnic Institute*

Chris Whipple  
*Worcester Polytechnic Institute*

Follow this and additional works at: [http://digitalcommons.wpi.edu/gps-posters](http://digitalcommons.wpi.edu/gps-posters)

Recommended Citation  
Berlied, Michael; Seed, James; and Whipple, Chris, "Massachusetts Electricity Generation" (2008). *Great Problems Seminar Posters*. Book 139.  
[http://digitalcommons.wpi.edu/gps-posters/139](http://digitalcommons.wpi.edu/gps-posters/139)

This Text is brought to you for free and open access by the Great Problems Seminar at DigitalCommons@WPI. It has been accepted for inclusion in Great Problems Seminar Posters by an authorized administrator of DigitalCommons@WPI.
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
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.

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.

**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)

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.

Proposed Projections
The graphs on the right 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.

Our Proposal

Wind Energy
Off Shore Wind Farms
- Comparable 30-40% efficiency as fossil fuel
- Clean, sustainable, and infinitely renewable energy source
- Massachusetts' wind energy hub is offshore (see wind profile figure)
- 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.

Our Impact

Proposed Percentages of Production
- Natural Gas: 2%
- Petroleum: 10.75%
- Coal: 10.75%
- Nuclear: 21.50%
- Renewables: 23.2%
- Hydroelectric: 26%

Our Impact

Fig 1

Fig 2

Fig 3

Fig 4

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.

Health
"Health problems linked to aging coal-fired power plants shorten nearly 24,000 lives a year" - MSNBC