Angat-Pampanga River and Manila Bay Ecosystem Renewable Energy and Fuel Cell Research and Development Project

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ABSTRACT

Overview

The main objective of this research and development project is to utilize anything that has kinetic energy or state variance in the ecosystem for the generation of electricity.

We have been largely dependent on fossil fuel for our energy needs in the form of electricity and fuel for our homes and industry. It's utilization for energy generation has resulted in atmospheric emissions which have contributed largely to global warming and climate change.

Bulacan State University (Bustos Campus) is located approximately 100 meters from the banks of the Angat river. Upstream, the river primarily provides water for Metro Manila and hydro electricity through NAPOCOR. Downstream it is used for irrigation at the Bustos dam area. Then it simply drains towards the Manila Bay area. The Angat River and Pampanga River is the second largest river system in the Philippines. It drains to the Manila Bay, without further use for energy generation.

Water that flows downstream or moves by wave movement, have enough kinetic energy to generate electricity to augment community needs and to hydrolize water to create hydrogen fuel cells. An integration system that combines wind. bio mechanical forces or solar energy may be set up to make the river system a mini power grid to serve the needs of nearby communities along the river or coastal communities.

This paper also presents a prototype of the custom built biome reactor, a generator, which is to be deployed to generate electricity from the river systems renewable sources.

Methods of Research and Development

One hundred people representing families living in communities along the river were interviewed. SPSS regression and descriptive statistics were used in the analysis of the data coming from the communities.

Research was also done on the technological aspect of generating electricity and energy from the river, wind, wave, solar and biomechanical sources. The physical and chemical properties of such sources were also studied. Then methods of how that electricity can be utilized for an electrolyzer for the hydrolysis of water to produce hydrogen for possible fuel cell production. Research was also done on how excess electricity not used for hydrolysis may be used to supply power to homes in the communities. Further research is currently on going to find ways of splitting water molecule for power generation.

Utilizing the inputs from the community and technology research, design and fabrication were done to create the system prototypes. Empricial tests were then used to assess the feasibility of the project. This research and development project has seven areas or development phases,

1. **RPG** - renewable energy power generation research and design to generate maximum electricity from all possible sources in the community or ecosystem such hydro, wind, solar and bio-mechanical (human power).
2. **MGD** - mechanical gear design to harness energy from water, wind, wave etc.
3. **PID** - power integration and distribution, a mini power grid.
4. **HFC** - H2 fuel cell
5. **HRD** - human resource development
6. **ITU** - information technology utilization for the project
7. **EEM** - environment and ecology monitoring.

The project is currently based at the university and is at phase 1 where a working prototype of the biome generator was built and demonstrated at the recently concluded in-house review. Currently, there is no formal funding for this project. The research and prototyping materials are provided for by the instructor proponent of this project from his modest salary as a teacher.

Expected Results

- Research in the area of the design and fabrication of indigenous low RPM generators/alternators for harnessing water, wind and bio-mechanical forces in the ecosystem
- Low cost electricity from water, wind and biomechanical sources to augment the power needs of river side communities
- Hydrogen fuel cells for home and industrial applications
- Time bound computer database of physical and chemical properties of water and other natural resources along the water ways.
- Ecological balance in the watershed, riverside and seaside communities through environmental protection policy recommendations
- Human resource development through technology and ecology education among the communities which will participate in the project

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