

Transforming, not Replacing the Fossil Fuel Infrastructure

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Abstract— About 80% of the world's total energy is powered by the nonrenewable sources of energy. Which implies that 80% of the world's electricity infrastructure is designed to work on nonrenewable systems. (G, Milena, and Matt L.) Introducing completely new renewable infrastructures for power generation will dump the present nonrenewable based power plants, which will inturn be a huge economic loss and also an environmental loss. But if the present systems are just modified to work on nonrenewable sources rather than complete replacement, then it can be a good benefit to both environment and the economy of the society. This project is an attempt to show such type of modification applied on a pedal boat, that transforms the boat to work on renewable source and it becomes more efficient and convenient system. The idea is further extending to show the innovations done in the present techniques that modifies the existing fossil fuel based systems and converts them into renewable based infrastructure.

Key words: Energy Source, Renewable Energy, Non-Renewable Energy, Infrastructure

I. INTRODUCTION

Numerous new innovative methods for green energy production are developed by several people throughout the world. Mostly, these methods are for the future and include complete new manufacturing plans right from scratch. Such methods might be a good thing for the future society, but it will also discard the entire present infrastructure to waste. The waste generated will result in both economic and environmental loss. It is necessary to develop a technique that can transform the present power infrastructure to produce renewable energies, instead of building the complete new renewable structures from the scratch.

This project is an attempt to demonstrate how renewable energy sources can be used to power the current infrastructure in parallel to the default conventional sources, not by complete replacement of the existing nonrenewable systems, but by modification of present infrastructure. The idea is illustrated with an example of a pedal boat which is modified with an attachment of a simple setup consisting of a generator with the pedals and a solar panel with a motor. The idea can be taken forwarded to the other vehicles, automobiles, etc. that can transform the existing infrastructure into green infrastructure, rather than creating an entirely new foundation. The project also refers a few key techniques that can transforms the present power infrastructure to generate energy from renewable sources or from waste, covering all the different sectors from transportation to nuclear power plants.

II. THEORETICAL BACKGROUND

A. Pedalling Hotels

Crown Plaza Copenhagen Towers in the UK has installed electric exercise bikes in their gyms, where people can exercise on special electric bikes and recharge the batteries that power the supply the power back to the building. Any guest producing 10 watt-hours or more will be rewarded with a free meal. This system offers the guests a chance to get fit and help power the hotel at the same time. The hotel's calculations suggested that one person cycling at 30kmph for one hour can produce around 100 watt-hours of electricity, which means that one can get a free meal only in six minutes. The power generated is less, but the hotel wants to make the target achievable so that many people will be encouraged to participate. The hotel also has installed underground based heating and cooling system and the solar panels, which makes it, even more, Greener. Presently, the hotel is looking to analyze the system by checking the efficiency and other technical details for a year. It's a type of method in which not new systems are installed, but the present infrastructure is modified to work will cleaner and efficient energy sources (Robbins, Tom).

B. On Demand Hydrogen Production for the cars

In the present time, most of the research institutes, companies and organizations are investing and trying to innovate new electric vehicles, which are predicted to be the future of the transportation. If all the gasoline vehicles are made to replace by the electric vehicles, then all those electric vehicles will be wasted and dumped. There will be a huge environmental and also economic loss to the entire world. Apart from that, all the new electric cars will be charged by the line supply, which will again be again charged by the line supply, which is again mostly maintained by the regular fossil fuel based power stations. So ultimately it will all make no significant difference. Hence, instead of making new transportation infrastructure, if the present vehicles can be converted into the renewable based systems, then it can extensively reduce environmental pollution and also it can have a massive positive impact on the economy of the society.

One of the most researched method to do this is with the help of on demand production of Hydrogen and using it in the vehicles as fuel. Many nonprofessional and amateur people are trying to make this possible and a verity of results and

opinions are observed. How2SaveFuel is a company that makes such Electrolysis based systems that can act as an efficient Hydrogen Hybrid conversion structure for any car. It claims to give a horsepower boost of upto 30% and also the mileage increase from 20% to 50%. It also removes excess carbon deposits from the engine of a car and also helps to have a complete burn of the fuel. It releases a significant amount of pure water from the exhaust of the vehicle, which intern helps the environment (Welcome to How2SaveFuel.Com).

The benefits seem obvious based on the technique used. The hydrogen is not stored in any pressurized cylinder in this technique, but a mixture of baking soda and distilled water is utilized for the electrolysis in it. With the help of electricity from the car battery, the water molecule is spliced into Hydrogen and Oxygen which is passed into the engine as a fuel. As there is no storage of any combustible material as a fuel, it is even much safer than any gasoline. The rate of electrolysis results the amount of Hydrogen gained from water molecule. As hydrogen has the highest calorific value among all the fuels, it burns completely in the combustion chamber of the engine and gives out a significant amount of energy on oxidizing, which will give an extra boost to the vehicle. Upon oxidizing, the hydrogen and oxygen molecule will recombine to form water molecule and come out as an exhaust as steam, which does no harm to the environment (Welcome to How2SaveFuel).

The technique is developed by a nonprofessional person who is the owner of the company. If the same concept is further seriously studied by the professionals, then the technique can be more efficient. Also if the concepts of fuel cells producing electricity are added to it, then electricity generated by the combustion of hydrogen can be reused for electrolysis. The idea can be also further extended for the generation of electricity in present coal based power plants, where the coal can be replaced by hydrogen and there will no pollution any more (Welcome to How2SaveFuel).

C. Nuclear

Transatomic power nuclear reactors are the type of power plants that can run entirely on nuclear waste. All the nuclear waste of the world, about 270,000 Metric Tons can be converted into 72 years of power for the entire planet. It also consumes the waste and reduces its radioactive life time. The technique is based on the working principle of molten salt reactor that runs on fresh uranium fuel and has high safety benefits enough to sustain the reactor even in the worst kind of accidents. A conventional nuclear reactor uses only 4% of the total energy of a Solid Uranium Oxide Pallet, and rest of it is all wasted as a nuclear waste stored in the nuclear waste. The Transatomic reactor takes the fuel assemblies, remove the uranium oxide fuel pellets and dissolve them into the molten salt into a liquid (Videos – WORLD.MINDS).

Because it's a liquid, it doesn't have any long range structure to be damaged, and also because it's a liquid, it can be continuously filter out the byproducts, that would normally done by shutting down the reactor. Hence, the used nuclear fuel can be left in the nuclear reactor for the time as long as it takes to consume almost all of its residual energy. Hence, the gain energy can reach the bars of upto 96% and not the 4% like the other designs. The conventional nuclear power plant produces 20000 Kg of nuclear waste, whereas Transatomic power plant produces only 20 Kg. Nuclear waste generated in the Transatomic reactor has to be stored only for a few hundred years, rather than a few thousand years from conventional reactors. The main difference between the molten salt reactor is that it uses the liquid fuel, rather than a solid fuel (TRANSATOMIC POWER).

The molten reactor has a completely different type of cooling requirements, which doesn't builds up any kind of pressure in the reactor core. Due to any reason, even if the temperature builds up in the core, the structure of the reactor is designed in such a way that it will solidify the salt, instead of a meltdown in a traditional reactors. As there is no pressure buildup in the reactor, there is no risk of any explosion. Such nuclear reactors are the perfect replacements for our present nuclear power plants, which uses the nuclear waste as a source of producing the energy and are highly economically and environmentally efficient in all ways (TRANSATOMIC POWER).

D. Home Electric Bike

5-hour energy is a leading Energy Shots Manufacturing company in United States and the owner of the company, Mr. Manoj Bhargava has developed an Energy Generating Electric Hybrid Stationary bicycle (5hourenergy). It can produce a day worth of electricity with just an hour worth of riding. But the energy is only limited to the small homes, where the energy requirement is minimal. It works with a pretty simple mechanism, in which pedaling the bike rotates an attached flywheel that powers the generator and the attached battery is further charged (Free Electric Bike). The system produces about 0.11 kWh of power in an hour, which is not much, but its designed for small houses in the rural areas of poor countries (West, Mick). In an hour, it can power a few low powered light bulbs, a fan, and charge a cell phone which is sufficient for people in poverty. Mr. Bhargava has planned to supply several of such cycles in the rural areas of India at a costs that they can afford. The system is made with the standard bike parts, so any mechanic can fix it if any problem arises with it. This system is both clean and cheap, which doesn't deal with the grid based power supply and every house can get access to electricity, regardless of their location. Also, there are no grid based line transmission losses involved in it as the electricity is independently produced in the individual houses. This technique is not the replacement, its installation of a complete new system from the scratch, but it's also an excellent way to power the rural backward areas where it's not economical enough to install a significant renewable energy source and also not convenient enough to extend the main grid. Such a technique sounds best for the places where there is no infrastructure for energy is built in past. Maybe in the future, a simple addition of a normal low-cost windmill can be done to the system that can pedal the cycle according to the wind flow, constantly throughout the year and provide much more power than usual (ZUKERGOOD, SAMANTHA).

E. Project Idea

The project idea of 'Solar pedal boat,' is an example to demonstrate how a simple traveling vehicle, a pedal boat, in this case, can be converted to work on the power from the pedals operated by its own passengers. Solar Powered Pedal boat is a concept of parallel power distribution on transportation vehicles. In this project, a two-seater pedal boat is designed to be powered by a generator which is mechanically connected to the pedals of the boat. Along with the generator, a battery is connected in parallel to the motor of the boat which satisfies the extra power needs, if there is any. The battery is charged by an onboard solar panel, which makes it almost self-sustaining.

The induction motor used in this project is a Pedelec motor of 24V induction motor, with the power capacity of 1K watt is used along with a Crystalite HT3525 permanent synchronous generator, with an out power capacity of 2K watts and an efficiency of 86%. An H-bridge circuit is used to control the direction of rotation of the induction motor, which controls the forward and backward motion of the boat. STM32F4 Discovery Board is used as a microcontroller to regulate the entire functioning of the boat. Theoretically, the setup should work fine with the existing hardware, but due to some circuit designing problems, the heating problems still prevail in the setup.

III. CONCLUSION

We see that there are several methods for producing energy in different levels ranging from low powered rural scale to the super high powered nuclear scale, which are not a complete replacement of the existing infrastructure but are just a simple innovative modification of existing infrastructure. We also see that most of such methods are readily available and just require some smart modifications to it. These are only a few methods mentioned in the project, but there are several other energy production methods which consist of transformation of present infrastructure to a renewable source and not the complete replacement of it. Hence, its best to modify and transform our existing power plants to work on renewables, rather than making renewable power plants from the scratch. We have seen that everything we need to makes such modifications to the existing system is available in the world, we just need to smartly apply them to make it work.

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