

Renewable Energy Awareness Research Center

Portraying the Transformation of the World System from Fossil Fuels to Renewable Energy.

Chapter 1

RESEARCH

Renewable Energy Awareness and Research Center

Portraying the Transformation of the World System from Fossil Fuels to Renewable Energy.

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PART ONE: PROJECT OVERVIEW

Introduction:

Worldwide, it has become a common practice for engineers, constructors and designers to select renewable sources of energy instead of the non-renewable ones. The renewable types of fuel include sources like wind, solar, biomass, geothermal, hydropower and biofuels which can be produced within a short period of time as an alternative to the traditionally recognized methods that widely depend on natural resources (Bradshaw, 2011). Engineers and designers prefer renewable sources of energy as opposed to others due to the wide range of advantages they bring about. Some of the positive reasons for the selection of renewable sources include: environmental conservation benefits, sustainability since they cannot become used up or depleted, they need less maintenance, and they have very minimal waste products unlike non-renewable ones such as wood which produces ash and smoke that makes it difficult to work with (The advantages and disadvantages of renewable energy sources, n.d). The various sources of renewable fuels, as already outlined, can be termed as modern. They are the end products of a commendable commitment from scientists all over the world who have spent part of their good times in trying to solve the problems arising from the continuous use of renewable energy sources. This is not enough because there is still a lot to be done in order to produce very reliable and efficient alternative sources of energy to meet the ever dynamic needs of the human population in the universe.

Fossil fuels constitute a very large portion of the non-renewable source of fuel in the world although a tremendous progressive change has been witnessed in the recent years. For example, 81% of total fuel consumed in the United States of America is believed to originate from oil, natural gases and coal (National Academics of Science, 2018). Various areas of applications include in the manufacturing industry, in driving automobiles, and for other uses like cooking and heating in homes. However, there is a growing concern about the fate of this source of energy as the world's supply can become fully exploited. This, accompanied with the need to conserve the environment for the future generation has necessitated the world to develop other alternative sources of fuels together with the need to come up with environmentally friendly sources of fuel. The wastes from fossil fuels have negative effects on the environment which has also affected the natural climatic patterns (Ranveer & Latake, 2015). One of the possible solutions is to establish renewable energy research centers that are primarily meant to facilitate advanced research and analysis of alternative sources of fuel to substitute the non-renewable ones so as to eradicate or minimize the burden that is placed on the renewable ones. This paper deals with renewable energy research Center in an attempt to portray how the world energy system is undergoing a transition from fossils fuels to renewable ones.

Project overview:

The paper focuses on the design and establishment of a renewable energy research center which portrays how the energy system in the world is experiencing a shift from the traditional fossil fuels to the available renewable sources of fuel. The museum can simply be viewed as a kind of a building which is constructed using the futuristic style. These styles include a good number of

contrasting areas which shows the importance of renewable sources of fuel, the existing technologies which help in countering various modern challenges efficiently together with a unique action laboratory area that deals with the development of new technologies regarding the renewable sources of fuel. It is also essential for this building to use at least 90% of renewable sources to meet its energy demand. For this reason, the building has to have integrated solar panels and wind generators. The startup challenges for international inventor teams would also be advantageous to this project.

Project Definition:

Upon completion and commissioning, the energy research center should cater for the following services:

- **Research and Development Center** for alternative renewable sources of fuel. Just like other centers in the world, this project deals with activities such as conducting advanced scientific research on the various sources of fuel. These sources include wind energy, solar energy, biomass and wind energy. These sources act as potential and viable substitutes for the widely used fossil fuels. Other areas of interest to the researchers include the total energy efficiency of the alternative sources, sustainability, and the immediate effects posed to the environment. Also, the center is meant to be a source of professional advice to the government, institutions, investors and citizens on different policies and strategic matters independently (ECN, 2018).
- **Incubator-innovation Center.** The project focuses on the invention of reliable and renewable sources of fuel that meets the current demand of the market while reducing the emission of harmful gases like Carbon (IV) Oxide and other greenhouse gases into the atmosphere. The project develops and sustains energy and formulates cleaner methods on the uses of various components of fossil fuels. It should also nurture and facilitate any newly developed energy source, together with advising the government, investors, and citizens on efficient energy use (ECN, 2018). As an incubation center, the project should support upcoming energy systems during their infant stages, offer an access to mentors and industrial experts, as well as act as a source of funds for research and exploiting various opportunities (Bullock, 2014).
- **Business Center.** This project has an outdoor recreation area, a conference zone for various events and children zones which provides a good opportunity for business investments. For example, the children may need some goods and services like swimming costumes and other types of special dresses which creates a business opportunity for the surrounding residents. On the other hand, the recreation facilities include the hotels, pubs, and restaurants. These recreation facilities require the input of businessmen and women who provide the required goods and services with an intention of earning profits. By doing so, these people earn an income that can be used to improve their living standards. Also, some of the in-

come is taxed by the government and the amount collected is used to improve other sectors of the economy through investments in things like roads and social amenities. This leads to economic growth.

- **Conference Center.** Conference zones are part of this project. The process of conducting research involves collective responsibilities of all stakeholders. The researchers, investors, government agencies and the citizens should all express their views before any crucial decision is made and implemented. As highlighted by Blankenship (n.d), any scientific research has to clarify the problem at hand and define the concerned population. These two processes emphasize the need for public participation in the research process, and thus, the center has to be able to fully host the stakeholders at any given moment for the purpose of conducting seminars or conferences. By hosting this congregation, this project serves as a conference centre.
- **Educational Center.** One of the objectives of this project is to create local and global awareness with regards to the use of fossil fuels, create a community of professionals in Saudi Arabia and lure many students into renewable energy professions among others. All of these objectives result in the transfer of knowledge and skills from one person to another, hence, learning by interaction. The facility also has a children zone for educational purposes. Children can visit the project and gain relevant knowledge on the use of fossil fuels and this will create awareness of the disadvantages of fossil fuels.
- **Tourist Center.** The project aims at attracting people from different parts of the world. These people include world-class engineers, researchers, investors, children and tourists. These people come from within and beyond the borders for the purposes of learning and pleasure, hence, can be referred to as tourists. Through tourism, the country earns foreign exchange which can be used to boost other sectors of the economy and infrastructural facilities. The funds collected can also be used in strengthening the research on renewable sources of energy.

Project Goal & Objectives OR (VISION AND MISSION):

Project goal & objectives

Vision

The vision of this project is to become a beacon of quality renewable energy innovation and inventions for the entire world population, providing real-time solutions that are aimed at reducing, if not eradicating, the usage of fossil fuels.

Mission

The mission of this project is to equip researchers with the very best facilities and conducive environment for conducting their daily activities with an objective of developing more reliable, efficient and environmentally friendly sources of fuel.

Goal:

The main goal of this project is to enhance research in the field of renewable sources of fuel in order to curb the undesirable effects resulting from the continuous use of fossil fuels.

Objectives:

The primary objectives of this project include but not limited to the following:

1. To raise both global and local awareness about the usage of fossil fuels and their negative effects on the environment.
2. To build up a community of professionals concerned with the drawbacks of using fossil fuels and the advantages of renewable sources of fuel.
3. To create a center to make Saudi Arabia a global leader in the sector of renewable energy.
4. To act as a tourist attraction site to the country.
5. To attract world-class engineers into the country.
6. To improve the innovation culture of Saudi Arabia.
7. To lure more students to choose renewable energy projects as their lifetime profession.
8. To create an experimental platform for the development and implementation of new technologies dealing with sources of fuel.
9. To attract both local and foreign investors into the country.
10. To make the world greener and better for the current and future generation.

Literature Review

Project Historical Review:

Petroleum is one of the widely used fossil fuel in different parts of the world due to its availability and affordability. The production and usage of these petroleum sources of fuel have been under fierce criticism in the recent years due to their contribution towards the emission of greenhouse gases. This emission has negatively affected the environment and resulted in irresolvable social problems in different parts of the world (Pieprzyk et.al, 2009). Coal-based fuels are the worst when it comes to the emission of greenhouse gases. These gases, that is, shale gas, coal bed methane and tight gas bring about a greenhouse balance fall of approximately 33% when compared to conventional petroleum fuel. On the other hand, GLT fuel manufactured from the conventional natural gases is on top of the list with an estimated value of 13%. The magnitude of influence of these gases is a combination of several factors which include the oil depth, viscosity of the petroleum, the amount of Sulphur in the petroleum, water to oil ratio, flaring of the accompanying gases, ventilation of unburned gases and the application of improved technology in the production phase (Pieprzyk et.al, 2009). For instance, a six thousand meters deep field source will encounter a fourfold increase in its emission with an equal deterioration of the ratio between water and oil. Sulphur is added to petroleum in order to improve its specific properties and by doing so, the weight of the fuel is increased although there has been a need to reduce this content. However, this trend has led to an increased Carbon (IV) Oxide emission by about 50% especially in Europe.

Some strict legal regulations on the production of fossil fuels have also contributed towards increased emission of greenhouse gases. For instance, it is projected that the emission of Carbon (IV) Oxide from Brazilian refineries will rise by 30% as they attempt to maintain a new threshold of Sulphur. In the recent years, the production cost of fossil fuel has been on an upward trend, with specific reference being made to the last decade. The costs for extraction and production of deep-sea oil has also increased seven times while that of producing petroleum from tar sand has grown four times. Although there is no direct relationship between the emission of greenhouse gases and production costs, fuels from oil shale and coal are the most expensive and also have the highest rate of emission. With the ever improving investment cost, the cost of production is expected to reduce in the near future (Pieprzyk et.al, 2009). Reduction of Sulphur content in petroleum will lead to a lower level of emissions and pollutants (Orbital Australia Pty Ltd, 2013). The level of emission of substances like oxides of Sulphur and Carbon has to be kept as low as possible and this can be done through scientific research.

PART TWO: DESIGN OVERVIEW

1. Concept & Philosophy:

The principal purpose of this project is to establish a research center to show how the world energy system has transformed from fossil fuels to renewable energy sources. This is a complete living society with basic facilities for human needs and research like hotels, conference halls, library, restaurants and business centers. The research center is the most important facility in the

entire project and that explains the reasons as to why it is centrally placed. It is designed to be easily accessible than any other existing facility. The library and laboratory are on the same floor with the research center while the conference halls, hotel and restaurant are located on the top-most floor to give visitors and workers an opportunity to have a glance at the amazing surrounding environment while enjoying cool and uninterrupted environmental conditions.

Design Program:

The project contains interactive stands, virtual reality media spots for the transmission of information to visitors, conference zone for hosting various events, lab area for the development of new technologies, an outdoor recreation area and a zone for children education. This is based on the needs of the community, capital availability, religious and cultural beliefs and the available space.

- The recreation facility. The project serves as a recreation facility and the main part of this is the hotel. This part is made up of accommodation unit, public area, hospitality area, domestic area, administrative area, leisure and shops and conference halls. These facilities are mainly used for entertainment and recreation purposes for the whole family. They make life at the research center easier and enjoyable. For example, while the hotel provides foods and drinks to the visitors and workers, the shops offer various types of essential products. The accommodation unit can host visitors for a good number of days without difficulties since the facility is well equipped for this task.
- The business center is composed of facilities like bank branches, conference or exhibition centers and administration department. Numerous financial institutions are free to establish their own bank branches in this building. This is meant to minimize monopolistic activities and privileges that could otherwise be enjoyed when the opportunity is offered to a single bank. The banks are mainly useful when it comes to savings, financial advice, and provision of business loans and the exchange of foreign currency. The administration department also forms part of the recreation center. It takes care of all the managerial roles of the project and any other related investment. It deals with matters like the maintenance of a cleaner environment, provision of security and tickets for various events.
- Research and development center. This part is the backbone of this project. It is composed of a research laboratory, library and an incubator or an innovation center. The research laboratory is whereby nearly all the relevant experiments are conducted in order to verify scientific hypothesis or to turn them down. This laboratory is fully equipped with chemicals, apparatus or equipment and personnel. The personnel include technicians, record keepers, receptionists and security personnel since some of the chemicals and apparatus could pose serious threats to the health of human beings if carelessly handled. The library, on the other hand, contains all the relevant printed and unprinted educational materials specifically about fossil and renewable sources of fuel like magazines, journals and textbooks.

The various facilities at the site are operated and managed according to parameters like age and the mission. The library, for example, should be able to accommodate both children and adults.

The recreation facilities should also be very decent to an extent of accommodating a whole family fun without corroding the cultural, religious and moral values of the society. The conference hall can also be divided based on their intended purposes. This may include discovery halls, lecture halls, presentation halls and entertainment halls in order to avoid any chance of misunderstanding in future days.

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