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Technological Opportunities and Solar Energy, to Contribute to Sustainable Development of Mexico

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I. Introduction

HOW DOES THE TECHNOLOGICAL DEVELOPMENT IN THE FIELD OF SOLAR TECHNOLOGY CREATES OPPORTUNITIES AND SOCIAL BENEFIT AS WELL AS BEING RESPECTFUL OF THE ENVIRONMENT?

Take advantages of the technological development of solar energy and hybrid systems for identifying strategic opportunities socially beneficial and kind to the environment.

It is vital to incorporate clean energy systems, as there are also very bad international experiences in use of nuclear energy, as in the case of Chernobyl Russia in 1986, one of the factors to keep in mind is that the oil reserves will run out experts say, in fifty years [11].

Renewable energies are consistent with the concept of sustainable development as integral process that requires different society actors commitments and responsibilities in implementing the economic model, political, environmental and social, as well as consumption patterns that determine the quality of life.
With respect to social problems with fossil fuels, the United States imports oil from different countries, so that its influence is global, both in the real economy and financial markets. On the supply side, oil-producing countries are in conflict zones and unstable, so registering a negative impact on the international financial markets. The difficulty of projecting oil prices, uncertainty in the estimation of future prices is one of the main points of the Agenda (international energy) despite the perceived high price insensitivity filing the lawsuit. On the other hand, specifically the United States seeks an increase in research investment in clean energy technologies [11].

Also, the projection, peak oil (Hubbert Peak) where the oil is in decline, that is will end, and that combustion is a cause of environmental degradation [18].

Within the global energy aspect there is a factor that must be considered, as is the issue of the effects of CO2 emissions than producing global warming impacting climate change, on the other hand, the

intensive use of fuels derived oil called fossil fuels contributes significantly to irreversible climate change, here are some reasons why it is necessary to analyze and promote changes on the use of various types of energy, noting its benefits and drawbacks to the socioeconomic environment, but especially considering the environmental implications they bring to our planet, Earth, polluting energy use, currently reliance regarding the use of fossil fuels has created primarily two types of concerns in society: first, the environmental impacts associated their use and their impact on climate change, the country strategies regarding alternative energy and economic kind, should be based on a thorough assessment of these opportunities and costs in the medium and long term.

One factor to consider is that the oil reserves will run out, according to experts, in fifty years, this research is reviewed as using solar energy in conjunction with other energy sources (hybrid systems), to support minimize consumption of fossil fuels. Furthermore, the use of natural resources is of vital importance not only to prevent further contamination, if not for savings in the pockets of the Mexicans, they really need a better economy is one of the steps to becoming a developed country.

Furthermore looking for new ways to create and develop new business clusters aimed at environmental conservation.

We must put aside these proposals in the details of social problems that this will cause, because they do not appear in the first instance to the gas station owners and those who hold interests in oil rather than caring for the environment, that is another subject to be treated separately, this strategy includes proposals for technological innovation and cluster development.

a) Justification

Why solar energy? The sun is available worldwide, only in Mexico the average energy delivered by the sun is 2000 kW/m2 per year., With the passage of time the technologies enable better use of resources, and photovoltaic systems now allow get only 30% of the solar energy for electricity.

The use of solar energy systems in rural areas, and contingency areas have a high impact social benefit, for example, can electrify remote island with a type system, that is using photovoltaic panels, inverters and battery bank virtually anywhere there is sun, and in the case of Mexico, the sun is present all year.

You can have benefits of large scale, in the case of this article, we will discuss two major social problems, such as:

1. The use of fossil fuels for transportation and its replacement with photovoltaic systems.
2. How with the solar energy is possible to produce purified water in contingency zones and helping in rural areas to meet the need of the vital liquid for survive.

Considering the definition of Michael Porter in his article, What Is Strategy?, considers the strategy as the creation of a unique and valuable position, involving different activities, hence we consider that the use of technological opportunities leads to strategic business. Therefore, if a resource such as solar energy, not being maximized, and technological opportunities are available, they can gain a competitive advantage that would position in strategic businesses.

Many strategic business opportunities that can arise from technological opportunities through the use of renewable energies, can be exploited with the blue ocean strategy.

Although long ignored seems that the potential of micropower, new markets and new manufacturing capabilities are helping to make solar PV systems in a global industry. Beyond political and financial interests, provides a sustainable use of technological interest.

This research will consider a solution for harnessing solar energy to be used in cars in Mexico, and propose new business alternatives based on Blue Ocean Strategy be proposed hybrid systems using photovoltaic batteries to recharge electric cars or hybrids 100% in Mexico to minimize the problem of polluting emissions and maximize solar energy using systems based on this combined between current energies, combined with photovoltaic cells.

All of this to determine and propose the use of these systems based on technical and economic feasibility.

II. State of the Art

a) Current situation

The solar photovoltaic systems currently represent a potential source of renewable energy, considering the volatility of international oil prices, and oil-producing countries are in conflict zones and unstable; represent a negative impact on international financial markets

R & D: both developed and developing countries should pay attention to the benefits associated with research and development, adopt new technologies, which results in improved environmental heritage and allows monetize [10]

Let us see how is the current global landscape in solar energy Affordable commercial PV systems current top performers are averaging 7m2 (monocrystalline silicon) for each 1 KW peak, ie peak 0.142KW/m2, per day on average.

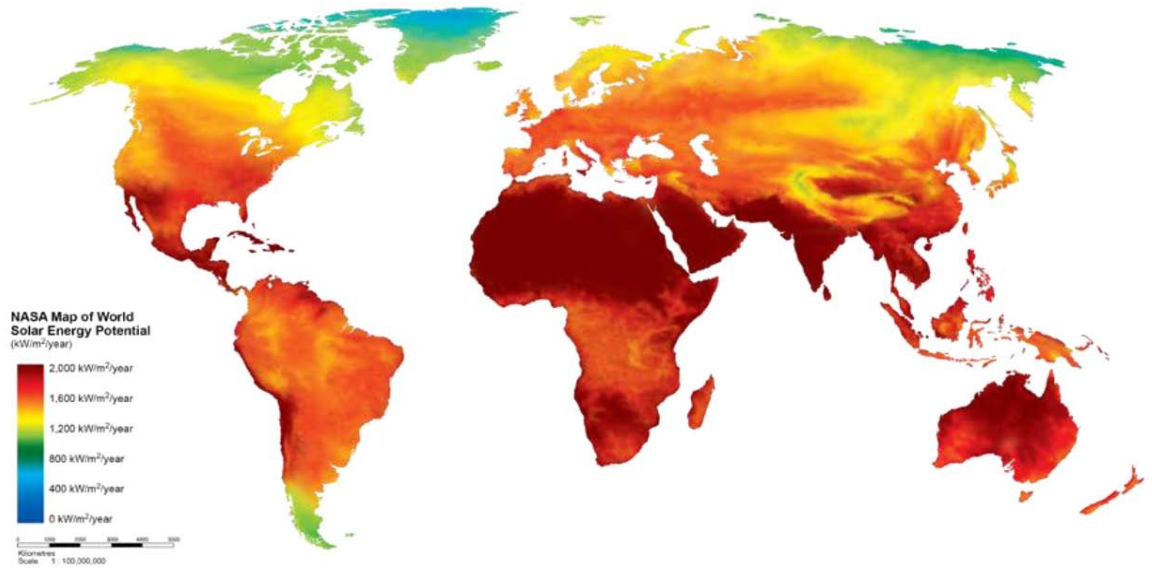


Figure 1 : Average solar radiation calculated on the basis of 24 hours per day, and considering the clouds (NASA Data 2012)

The sun is the source of renewable energy that covers a large part of the planet, so it is a source of great potential today.

One the needs of people in the event of contingencies is to take water to survive, but if this water is contaminated, is dangerous and can cause health problems very strong, so it should consume treated water,in such cases, so in this article a recommendation to use solar energy to purify water, and to support these emergency situations, including the recommendation is also used in rural areas currently without electricity to the national grid , where electric power can also be obtained from the sun.

There are various designs of water purification plants. Among them is the process of reverse osmosis purification process germicidal UV, ion exchange process for silver.

However the pure reverse osmosis process is not recommended because it removes all solids including salts that the body requires, so we recommend a water purification plant consists of traditional sand filters, activated carbon filter 5 microns, ultraviolet lamp, and ozone.
As shown following

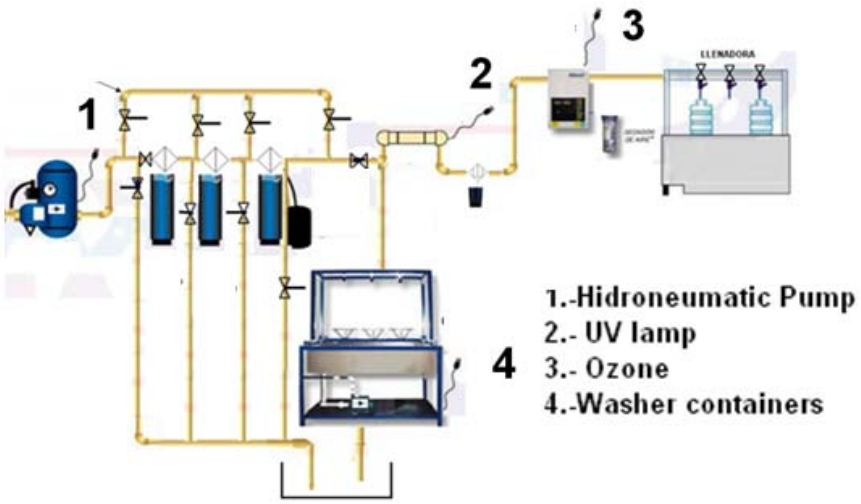


Figure 2 : Standard equipment water purification

In the case of transport, towards replacing fossil energy with renewable energy we have:

The world is facing a huge global campaign, which aims to incorporate the quickest energy solutions based on renewable sources. [2]

Various designers and automakers with energy saving strategies. Among them is its strategy VW Think Blue, developing hybrid cars.

Renault with its strategy called ZE (zero emissions)

Even Nissan USA introduces the 100% electric cars in 2012, with its model 100% electric Nissan Leaf

In Mexico there is now a brand marketed since 2010 Zilent of Mexico

The 100% electric Nissan LEAF will enter the Mexican market in 2013.

b) Current technology electric cars

It is based on cars occupy occupy moved with electric motors and a battery system for mobility [21], see diagram 1

c) Current technology hybrid cars

Are those cars still manage internal combustion engine combined with an electric motor for speeds averaging 50 km / hr. After that internal combustion engine used

Source IAA Frankfurt am Main [20], see diagram 4.

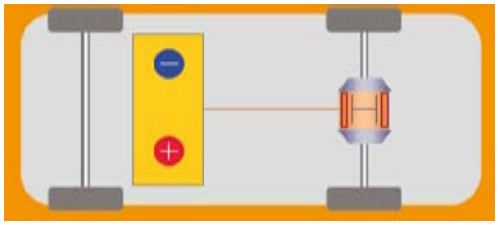


Diagram 3 : Electroauto

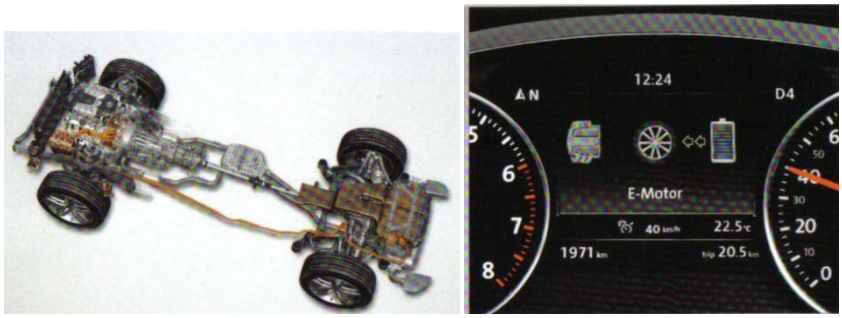


Diagram 4 : Hybrid Cars

Plug in.-System is a system based on connection to an AC outlet, it is designed for electric cars can recharge battery during parking, see diagram 13

They choose to make clean energy research using photovoltaics, since the sun is a renewable resource that is not being exploited Mexico efficiently to meet important needs, especially for the case of basic needs such as water purification, traditional methods currently used power supply and remote contingency zones, such as gasoline plants using such systems for energizing.

Besides the use of solar energy systems in rural areas, and contingency areas have a high impact social benefit

There is a strategic model of the process of developing and exploiting technological opportunities based on evidence of cases where explained as the result from the different activities carried out in the area of the university, such as research results, transfer agreements technology (or combination of both), academic and specialized services, are potential sources of technological opportunities. [15]

The degree of technological opportunity at maturity is reached the desired value correlation and ability to create value in addition to a technological opportunity is not a high risk, and that in turn is obvious in its benefits.

An idea can subsequently using creativity can become a technological opportunity. The exploitation of technological opportunity in perception-ability to create value from a market need from unemployed resources or underemployed, this leads to the opportunity to create a business idea.

III. Methodology

In the case of the photovoltaic system technical basis for the study, to use this system in many applications, in this case it is recommended to water purification and photovoltaic electric mobility.

The methodology used to develop research methods developed in simulation [9]; conducting a process of combining information from the NASA database and calculating between simulation programs of German origin, Homer and Insel respectively, analysis information (variables) and results in order to present an overview of the research topic. (basis is taken from a photovoltaic system of 1 Kilowatt peak (unit is a measure for the study), and an example is simulated in Puebla Mexico, as a case study, however for each

region should be calculated with GPS data of each place to investigate.

The methodology for this research done can be summarized in the following points:

1. Uptake and research of solar resource data, photovoltaic system definition as well as electricity demand parameters to be used according to the size of the water purification system.
2. Simulation software system Insel and Homer (annual solar power complete system behavior and system including batteries)
3. Analysis of information
4. Results and recommendations concludes proposals for implementation in Mexico

IV. Definition of Resources, Energy and Systems to Simulate

a) Resources to simulate solar site as exemplified case (City of Puebla in Mexico)

Data are obtained through NASA database, from global position (GPS)

Site: Mexico	Units	Value	Data Record
Latitude	grad	19° 03` N	7 Norte 3208 Puebla,Pue.
Longitude	grad	98°12' O	7 Norte 3208 Puebla,Pue.
Altitude	m	2147	
Global solar radiation	kWh/m²/d	5.40	Annual average
Maximum global solar radiation	kWh/m²/d	6.21	
Minimum global solar radiation	kWh/m²/d	4.49	
Average Precipitation	Mm/D	2.71	Monthly Averaged Precipitation
Annual average wind speed***	m/s	2.99	Monthly Averaged Wind Speed At 10 m

Table 1 : Solar Resources NASA data obtained

Energy consumption to calculate 1 Kilowatt (case study)

Photovoltaic System Definition to simulate

Component	Units	Value	Comments
PV generator modules	kW	1.34	6 modules @ 230 W Nominal
Battery bank	kWh	7.2	12 pieces Hoppeke 6OPzS 600 @ 600 $Ah_{c\ 10}$,1.80 U_e/cell
Charger for Battery bank			Sunny Charger 50
Inverter	kW	1.2	1 sunny Island 2224
Transformator			Inside 220 Volts, output 120 Volts

Table 2 : System Components PV system to simulate

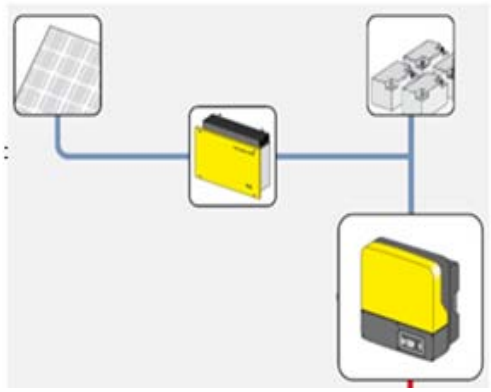


Diagram 5 : Photovoltaic system to simulate peak 1Kilowatt

V. Simulation and Results

a) SIMULATION (Software INSEL and HOMER)

This simulation describes the behavior of the PV system and inverter for a year, the simulation was done in 3 different angle of inclination 20 °, 30 ° and 45 °, in three seasons, January, June and August, to decide the best average angle.

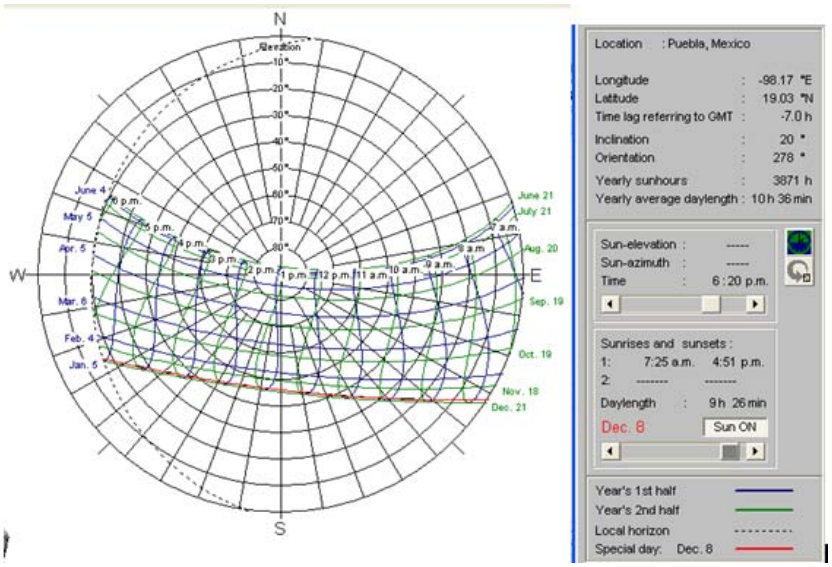


Diagram 6 : Simulation hours sun-year degree tilt PV system

b) Simulation software HOMER) - Best angle of inclination of the photovoltaic system

In this simulation is analyzed which is the best angle of inclination to take into account the different seasons.

Comparison 20 °, 30 ° and 45 ° in January, compared to 20 °, 30 ° and 45 ° in June and compared 20 °, 30 ° and 45 ° in August.

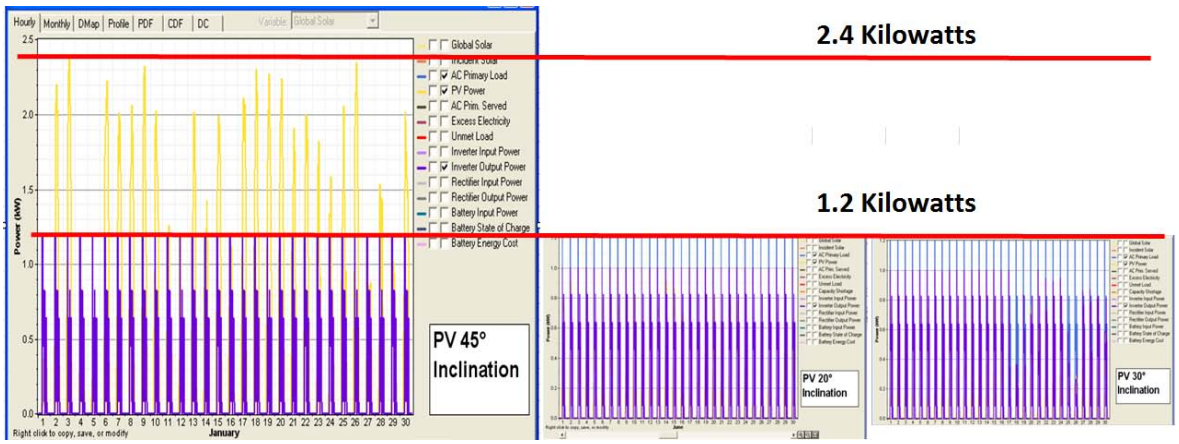


Diagram 7 : The generally results indicated that the best angle is 45 °

c) Simulation with HOMER software (battery charging)

State of Charge (3 types of battery in series arrangement of 6 units to be 12V) nominal voltage of each battery (2V)

i. *Hoppecke 4OpzS200 (below 20%) Not recommended*

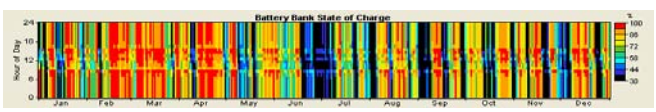


Diagram 8 : Hoppecke battery-simulation 4OpzS200

ii. *Hoppecke 6OpzS600 (30% load, in the months June, July, ag, Sept, Oct, Nov, dec.)*

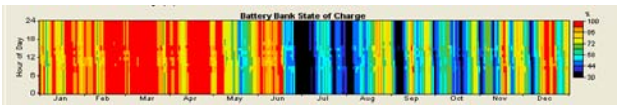


Diagram 9 : Hoppecke battery simulation 6OpzS600

iii. *Hoppecke 6OpzS600 (30% load, in the months June, July, ag, Sept, Oct, Nov, dec.)*

VI. Results and Recommendations

a) Case best angle of the photovoltaic system

Recommendations: In December, January, the best angles ranging from 30 ° to 45 °, but half of the year is recommended to use at least 20 °, recommended a

system with flexible position because it is not possible to collect the same energy with a system static round.

However if you use static angle should be 45 °, which are those that have year-round range of the system.

b) Case battery arrangement

I. Hoppecke 4OpzS200 not recommended load below 20% is not recommended
II. Hoppecke 6OpzS600 (30% load, in the months June, July, ag, Sept, Oct, Nov, dec.)

(Recommended, with an emergency backup generator see diagram 3)
See diagram 10 (emergency)

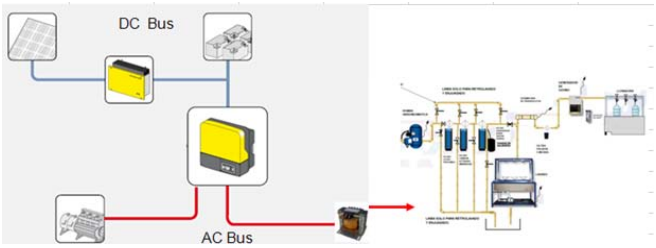


Diagram 10 : (Emergency case)

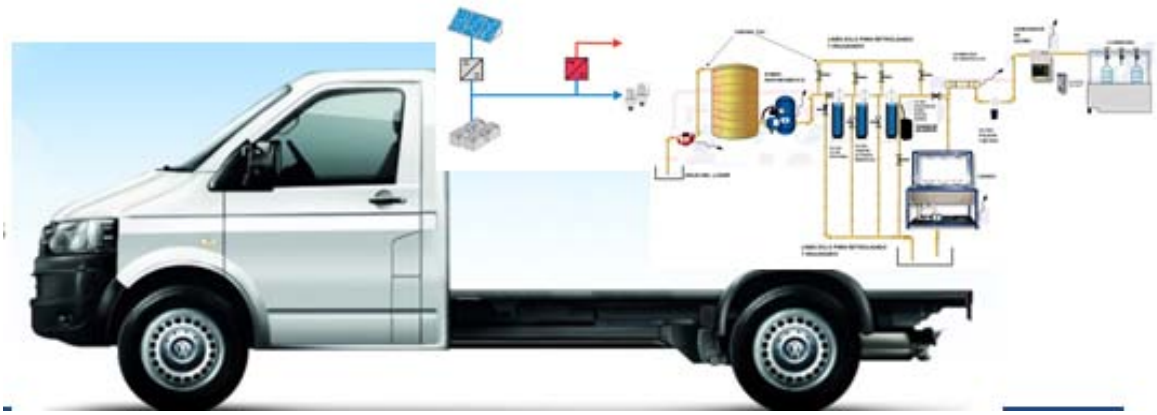


Diagram 11 : Proposed water purification system photovoltaic and transportable

b) Proposal Photovoltaic Electromobility

Proposal number one contribution to Mexico;

Proposal charging stations based automotive battery PV panels, process change and filling

(This is based on as water large bottles are filled, and then exchanged for refill)

Proposal a)

Filling and battery replacement

Note: Changing batteries in the International Automobil visualize Exposition (IAA) in Frankfurt as Renault proposal for Isrraelita market is dealing directly with those charged Reanault pavilion.

The contribution of this paper is how to recharge using a PV process and exchange of batteries, similar to a process used water large bottles in Mexico.

VII. Proposals

a) Proposal Called called water purification system and portable PV

Photovoltaic system mounted in one transport to meet demands in different areas, even in emergency zones, contingency, including support for victims, in this case required the purification system type photovoltaic Island.

This oriented blue ocean strategy [1] can create a new business opportunity-constructive innovation, strategic projection-based strategy toolbox / prospective planning.

This partially replace some of the stations, looking at it from the point of view as a strategic planning and foresight in the diamond of Michael Porter as a factor for gasoline threat of new entrants, and from the point of view of technological innovation as products substitutes.

Proposal b) adequate point of view of authors;

Note: This issue was set out in proposed electromobility forum in Berlin, Germany [6], but only plan to use in specialized designs for this application, so the contribution of authors is to apply the concept to even current and electric cars hybrids forthcoming entry.

Proposal c) Provide 100% of authors, application in mobile stations, to reach rural areas, remote areas where the cost of automotive mobility is even more expensive and involves logistics of fuels, it is released with natural solar energy, although it is a very efficient solution also helps resover a socioeconomic problem.

In addition to the 100% electric cars, and this includes the cars for example Toyota Hybrids Prius Plug-in)

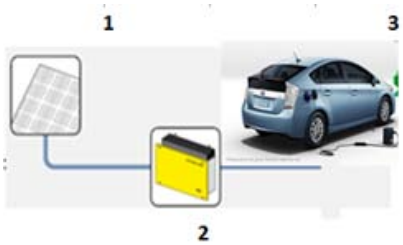
The filling process is not static photovoltaic proposed by Renault ZE in their strategy, source http://www.renault-ze.com/de-de/home-634.html

The contribution of (Luis Barrera Aguilar recharging is the process by electromobility PV based solar power without requiring that cars have integrated photovoltaic system.

This also oriented blue ocean strategy [1] can create a new business opportunity-constructive innovation, strategic projection-based strategy [8] based on methodology toolbox / prospective planning. See diagram 12

Diagram 12 : Proposal b)

Explanation. - The system is based on load type photovoltaic Island (photovoltaic panels that power a charger controller that distributes load DC batteries.), See Figure 5



1.- Photovoltaic System PV+Inverter
2.-Charger battery System
3.-Electro car batteries

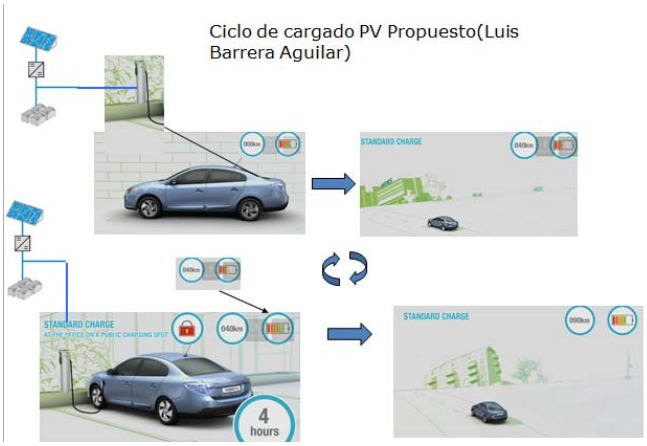


Diagram 13 : System load electro cars, photovoltaic Island type (Proposal)

Proposal number three hybrid system load. (more photovoltaic wind)

Proposal for battery charging stations of electric hybrid systems based automotive charging, photovoltaic panels and wind systems, which can be used in supermarkets and public places.

While this is also based on an idea still in Fraunhofer research in Karlsruhe Germany. For cars specifically for this use, the contribution of authors (Barrera, Nuño), is to use already existing 100% electric cars and hybrids. See diagram 6

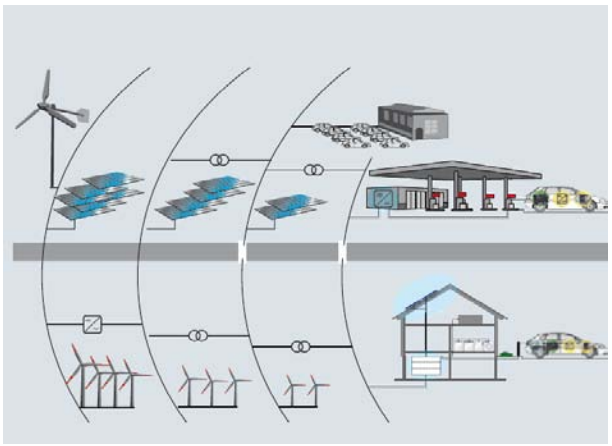


Diagram 14 : Proposal C)

VIII. Recommendations: (Use in Photovoltaic Electromobility)

In the case of public transport in the cities of Mexico, it is recommended to implement the proposal 1, because the change is too fast replacing batteries charged by renewable energy systems for batteries, so efficient changeover time.

In this case you can not use public transport proposal 2 and 3 because the routes are minor and can be recharged while the car was stationary.

For rural zones are also recommended implementation proposals for resolving even the current

disadvantages of logistics fuel, thus can solve this problem.

IX. General Conclusions

This needs-based, there is a photovoltaic system that can be used to meet different needs of vital importance, such as transport (Electromobility photovoltaic), purified water obtained by electricity from solar power, you can even follow a study later that can raise water heating and cooking with the same energy system proposed.

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