

USE OF MICRO-GRID RENEWABLE ENERGY IN SOCIAL RURAL COMMUNITY OFFICES CLUSTERS

(Projected to Circular Economy)

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This is an application to the award program: **APEC Energy Working Group**, the overseeing body of the Energy Smart Community Initiative and other APEC member projects within the sector.

This Application regards centralized communal offices cluster that is, smart buildings implementation of Community Center provided with Smart Renewable Energy Micro-grids in a rural setting based on techniques such as “scenario building” or “horizon scanning” to motivate and inspire people to make decisions intended to attain Smart Jobs, businesses and Consumers through education and progress. A brief reference:

<http://larepublica.pe/impresadomingo/829621-el-sueno-del-barrio-sostenible>

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INTRODUCTION

In Peru, many isolated Citizens do not have energy in their homes, with all the disadvantages that this condition brings. These people share some characteristics: have to walk many miles to reach first aid, so as their children to go to school. To create new infrastructures to integrate these communities to an energy grid because of the costs of the investments would be a utopia right now.

See the following link that to some extent illustrates this situation:

<http://elcomercio.pe/sociedad/juin/extremo-recorrido-alumnos-juin-poder-estudiar-noticia-1947593>.

Still these citizens belong to communities and have to comply civilian requests such as vote, pay taxes, inscribe their properties; their children have to attend school and so on.

These rural communities have no electricity and it is true that to satisfy their basic communal needs will not require so much energy and will provide a frugal entering to modernity with a minimal provision of energy. If this is renewable then the contribution to the goal to progress is appreciable.

OBJECTIVES

Develop a community center in a rural environment is a first phase of a major ambitious project. The final objective is to insert these communities into the national politics and global economy identifying alternatives for rural entrepreneurship and establish business relationships with new markets, both local and worldwide.

These communities have a lot in common and particular conditions, peculiarities, necessities and are free to establish clearly their individual goals in the long term.

Main vector for the transition to building Sustainable Renewable Energy Systems are technology, wide knowledge and supporting economy to afford the improvements.

The level of technology development allows us to ensure the implementation of Smart **Micro-Grid**, which facilitates the creation of Smart Communities Centers, is absolutely reachable, understanding that Smart Micro-Grid concept is related to technology, meanwhile Smart Community Centers is about people and resource managing.

The disruptive nature of renewable energy sources, which are by nature decentralized, and the technologies evolved in order to increase the resilience of rural nets, electrical and telecommunications favor this.

This paper is intended to be the “fuzzy front end” analysis to in a short term facilitate the emergence of Smart Community Centers in rural Villages.

A Smart **Micro-Grid** will provide these buildings electricity, what will allow, with the required supplies, to give first aid and attention to the surrounding population and a

communication channel to fulfill at least the elementary needs to foster social growth, opening a window to progress through public presence.

Smart **Micro**-Grids apply to all resources. (Main renewable energies considered are wind, photovoltaic, Bioenergy and thermo solar).

Legal and Technical Background of the Energy and Environmental Aspects for rural micro-grids in Peru is in construction, so the theoretical and conceptual framework is “sui generis”.

BENEFITS OF THIS PROJECT

There are minimal risks in this project, not to say none and many advantages. The project is innovative, small in budgetary terms, does need decision and frugal investment, requires technology and equipment that are widely used, nonetheless state of the art science.

The benefits of the project in social and environmental improvements go largely far the economic costs. These communities will follow from the beginning renewable energy, sustainable principles and circular economy is intended to be installed.

Progress will not involve contamination, greenhouse gases, and carbon emissions.

Another advantage of the project is it becomes more cost-effective as much as reproduced. This project is to initiate in a community, replicated moreover, and in each case tailored to the conditions of the particular community. However, any development regarding good practice begins with a process of trial and error, and over time, the state of structuring. As knowledge becomes more structured, communities will accept it easily, gaining those communities an advantage being able to see patterns and choose to use these.

Introducing any energy innovation is a complex phenomenon that comprises the management of social procedures. The implementation of an innovation strategy is a challenge too.

INTERVENTIONIST ROLE

The main challenge of the interventionist is to facilitate an open discussion about the barriers and the reluctance regarding the innovation processes.

The interventionist must facilitate the removal of barriers to innovation and in doing so raise the level of motivation and increase the chances of a successful implementation of the changes and hence, the project.

There are technological and non-technological barriers to overcome, so as internal and external. For any of them the tool for the elimination and the reinforcement of a culture for innovation assumes a sequence of actions. These barriers are found in all the levels. A resistance to change is expected.

Measuring the cultural disposition towards innovation and simultaneous identification of barriers and solutions are critical factors to be able to conquer the obstacles. Innovation will achieve, systematically, the removal of barriers when these barriers have been undoubtedly recognized, analyzed their reasons and sources by all the involved following a structure to systematize the essential information for the analysis. Most of these barriers have effects on the resistance of groups and individuals, generally based on the behavioral barriers. The behavioral barriers can and must be surmounted in order to head for innovation, are a critical issue because they influence the elimination of other barriers.

These interventionists are committed to the innovation process at a personal level and their role inspires other members of their organization to assume changes in behavior, improving in this way the innovation culture.

The interventionists usually have leadership skills and personal traits that are respected due to their ability of persuasion, argumentation, developed communication skills, abstract reasoning, a temperament that generates sympathy and knowledge than just by the mere exercise of authority. In this way, they achieve results and assume key roles, opening the way for building positive relationships and structures.

As previously assumed, in the early stage, the interventionists conform the project management. As project management, they organize and lead the process. It requires:

- An acknowledgement of reality, presentation and communication skills to promote the ideas so that the later convoked interventionists or participants be admitted by the community.
- Ability to work in team and interdisciplinary to organize the joint work with internal and external experts.
- Know-how from the strategic and operational points of view of hands on best priced state of the art renewable energy applicable technologies.
- A strategy to, firstly select the one process to be used allowing an optimization along the way.

DEVELOPMENT OF THE PROJECT

Before projects are born and set up, a plan need to be developed. This primary process has to be structured and oriented. Ideas do not come out of nowhere, developing ideas to meet the community demands and the outlining of the standards is to be reached at the end of this early phase. The participants, previously identified, should formulate them. These participants, in this early stage, are the interventionists, project management, and the intervened, community and its political authorities.

The demands and opportunities are a sieve of ideas for further processing. There is a variety of information sources and tools to collect and systematize them, research reports, trend analysis and interviews with sociologists, energy technologists, and so on. The key variables are those that exhibit a greater degree of influence; to visualize and select key variables it is useful to construct a map of activities (the extent to which a variable influences the others) and dependency (the extent to which a variable is influenced by others).

The critical factors are the willingness and the ability to support the process and reduce concerns. This depends more on the decisions, the conviction and the commitment of the interventionists.

Ensuring that the locals identify the purpose of the project is an initial step to unify toward achievement of the goal and cooperation, avoid mistakes and accelerate the process, so local culture understanding and respect is elementary. Communication and factor selection to control the project identifying knowledge gaps and managing how to fill it with external knowledge and bear the internal knowledge of these communities will overcome obstacles.

Development is the phase in which the design of the scenario takes place.

The scenario analysis is to understand the structure of the system (its components). The structural analysis is to identify and select the variables of influence and social actors. The challenge at this stage of the process is to determine different possible states, future configuration of the key variables.

An exhaustive listing of variables of influence may be accomplished by using simple techniques such as brainstorming, cognitive-maps, sketches.

Every variable has measurable characteristics (qualitative or quantitative) that determine their state; the attractiveness of a technology as a variable, for example, can be measured by metrics such as its performance, potential, operational and maintenance costs, price, availability, etc. Magnitude changes in the metrics of the variables lead to changes of state of the system and, consequently, changes of scenarios.

The expected configurations of the key variables determine the possible futures. The more dynamic the planning environment, e.g. rapid technological development or the higher the planning horizon, the greater the space of possible future will be. The challenge outlines in imagining the universe of what is possible, so we can be sure that the space of possible futures has been explored.

Once the most consistent and relevant solution is selected, it is possible to draft the scenarios. The logic of the situation and the implications for the system should be interpreted based on each combination of possible configurations.

In order to reduce complexity, the project must be divided into tasks, and for this, it is necessary to identify the work packages that can be left under the responsibility of certain areas for their implementation. Each steps must be aligned with each other, this is crucial to succeed.

The implementation of the energy project, that is, the complete development of the plan, introduce the facilities to the community and verify that these are properly used and that can be maintained considering and energy efficiency along the project that is economically viable, improves elementary education, job creation and societal growth.

ORGANIZATIONAL STRUCTURE OF THE PROJECT

The organizational structure of the project should build the connections to ensure the communication channels for the production of ideas and the successful bearing of the process.

The interventionists may have a qualified staff but if there are no structures that allow the use of their creative potential, a scheme of functional complementarity with the external cooperation and a connection with the locals and the local conditions, the expected outcomes will not succeed.

Preparation beyond the issues of project management such as planning, fund raising, organizational support, etc., every design exercise of scenarios requires a phase of strategic definition of issues that can determine the quality of the obtained results. The preparation phase involves defining the following:

- Define explicitly which decision will be made based on the scenarios and what the needs or the prospective questions are.
- Define the restrictions, limits and interesting aspects of each object of study. This will be conclusive regarding the type of scenarios that will be designed and the suitability of the particular scenario that will be implemented.
- Establish which knowledge is required to make the decision.
- Define the elements of the analysis framework of a scenario design exercise, it is important to have a previous analysis and a strategic diagnosis of the situation of the topic under study.
- Specify the space that will include the study for the construction of the scenarios.
- Set a prospective time horizon on the one hand, and the retrospective time space (recent past included in the analysis) on the other.

ACTIONS OF THE INTERVENTIONISTS

Each community is a challenge, therefore assigning the right people to fulfil each activity according their uses and environmental conditions taking into account the use of the resources and potential they count and the alternatives to consider. The communities are free to establish clearly their particular goals, their teamwork. Interventionists and locals should encourage different points of view conducting themselves with respect.

Outlined this the proposed framework is:

- Select local or regional governments that have isolated communities that share geographical, climate, language, and social conditions and accept to integrate in this innovate process and commit to follow the consented procedures. Cooperation and partnership are essential to addressing energy security and environmental challenge.
- Visit and study these communities to outline, which would be the best renewable energy applicable for the most of them.
- Select some rural communities that have much in common, prioritizing them or just one, willingly to participate and invest.
- Proposing a scheme of alliances with strategic providers will allow to diversify the latest technological developments that can be used without carrying out the development itself in the process.
- Cooperation with external organizations under a scheme of functional complementarity with the local conditions.
- Regarding the technical aspects, there are many providers and there is no occult science. The best solution could be find the providers in the APEC, the ones that besides the technical solutions, also consider the training.
- Capacitate a local or regional government crew in these renewable energy technics so as they to be able to replicate the capacitation to the responsables of the equipment maintenance and support them along the way if it is required.
- Prepare a basic common plan to replicate in the selected communities:
 - ❖ Design Multifunctional Smart Buildings with Smart off the Grid energy on the community central plaza that consist of all or most of the following: city mayor offices, elementary school, library, medical post, a police station, judge office. **The idea is to use the available technologies in the most efficient application, in these particular locations. From the beginning, all facilities should adopt the best practices and a smart building design.**

- ❖ Train a group of locals that can maintain the smart buildings and grids who will be in charge to prepare more people to share this responsibility.
- ❖ Have a follow-up in order to identify business opportunities for the community that can be supported by the energy innovation group. These follow up will be able to create Smart businesses and Jobs as well as Consumers.
- ❖ A Demand and Opportunity Analysis on each intervened community divided into the analysis of external demands and opportunities on the one hand, and the analysis of internal demands on the other is recommended to be elaborated by the commoners and the interested interventionist and participants.
- ❖ The next stage of the project is go further and make the improvements work: conform offers to the external allies and launch the community out of its borders.

Strategic actions must be directed to build the infrastructure that supports the system. All documents, information and experiences related to the management of projects and the lessons that emerge from them will form part of the assets of the organization. The development of metrics is an important factor that will assess the success and development of the innovation system. For this purpose, use latest information technology for storage, dissemination of information and reporting outcomes, but also to support each stage of the process, capture, storage and dissemination of ideas and experience since a social project requires multiple checkpoints. This progress will be go on as the project gains expertise in the development and alignment of the system and decides to undertake more challenging innovation approaches.

It is vital to have Multi-partnership for a strong economic and environmental impact.

An organizational support is necessary and open to the possibility that accords are to be established

A scheme of alliances with strategic partners will allow diversifying the research areas, the use of the latest technological developments without carrying out the whole search process; close the knowledge gap between what the locals know and what they need to know through training and/or external consultancy in order they take full advantage of the process. Being this a social renewable energy project, a balance after updating of their knowledge platform should align the goals to their capabilities, as the community itself will sustain it in the long term.

COSTS AND FINANCING

Resources are necessary **at the right moment** to achieve the success of the project. After approval at a certain stage, the project must come out of this with the resources to carry out the next stage; otherwise, the approval will have no sense.

Financing could come from different sources:

There are Infrastructure Investment Funds constituted to promote the participation of national and foreign private investors in infrastructure projects.

Funds with incentives for generation, such as funds from the Global Environmental Facility, the UNDP and World Bank, among others, for electricity generation from renewable energy (especially wind energy).

In the next future, maybe even use carbon bonds. As a signatory country to the United Nations Framework Convention on Climate Change, Perú doesn't have quantitative emission reduction commitments and can benefit from the Clean Development Mechanism (CDM) by selling Emission Reduction Certificates to Annex 1 countries.

Fiscal incentives should be looked for and be used with the purpose of promoting investments in machinery and equipment for renewable energy electricity generation.

CONCLUSIONS

This projects development is technically and economically feasible, technically because there is possible to choose among many suppliers and different technologies, economically because it can be done in stages and the community will look for sustainability and expansion of its assets.

This project requires political decision. The electricity provision regulation in Perú, does not allow the free purchase and selling of electricity to private investors, but it allows energy generation for either self-supply or to complement productive processes.

The APEC region includes four of the world's five largest energy users: China, the United States, Russia and Japan. They certainly have the technology to provide the tailored supplies required to upgrade the community centers. The APEC members are also a potential market for first quality agricultural goods and others products that will not involve an appreciable increase of energy consumption and that will be the results of the empowerment of the rural communities intervened. A commercial fair trade will develop.

This project is plausible, consistent; this is free of contradictory conjectures, useful for its relevance for the achievement of strategic objectives, plural.

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