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Dual Dynamo And Solar Panel Network: A Supplementary Power-Generation System

Andrie B. Lim[1], Ro-an T. Lobinquinton[2], Jun Loyd A. Panogaling[3], Mjay B. Montero[4], Jashmine M. Singson[5], French Lloyd P. Villavicencio[6], Gamaliel Grose B. Galan[7], Jerome C. Ruda[8], Rasheed T. Libre[9], Francis P. Garnica[10], Dionisio B. Chavez Jr., EdD, PhD[11]

[1,2,3,4,5,6,7,8,9]SHS STEM Strand Students
[10]Teacher-Adviser Tañon College
[11]SEPS DepEd, Professor STI-WNU & Research Consultant of Tañon College

Abstract
Dual dynamo and solar panel power generators network is a prototype model of generating electricity without using petroleum products or electricity. As an innovation, it is designed as supplementary source or alternative to high rate of commercial electricity as well as solution to power outages, global warming caused by emission of toxic chemicals from various power plants across the globe and to support the tourism industry which is one among the contributing sectors to the national economy such as in the Philippines and to the rest of the countries of the world. In this model, the first dynamo powered by a battery has a gear directly connected to the second dynamo. As the first dynamo works, the gear spins causing the second dynamo to work and converts mechanical energy to electrical energy while solar panel absorbs the sunlight and converts the heat energy to electrical energy. Both energies generated by the dual dynamo and solar panel is directly stored in the battery which is ready for consumption. As per implementation result of this innovation, it shows a very impressive and promising result. This result was based on three trials of which the system consistently produced a gross of 50 watts, that is 30 watts from the second dynamo and 20 watts from the solar panel. This gross power produced by the second dynamo and solar panel combined is less 15 watts by the first dynamo. The difference of 35 watts is reserve for consumption. For future development, this innovation can be enhanced by simply by adding more power generating dynamos and solar panels as well as adding wind turbine devices for a more sufficient, reliable and sustainable power generation and supply.

Keywords: Commutator, Mechanical energy, Electrical energy, Gas emission, Innovation, Direct Current, Alternating current, Tourism industry

Overview

Dual dynamo is an initiative of using a twin device with flywheel and gear that are capable of converting mechanical energy to electrical energy. On the other hand, a solar panel is another device designed to absorb heat from the sun and convert it into electrical energy (Tze-Zhang Ang , et al., 2022). These concepts used in this innovation is designed to improve or supplement the generation of electrical energy from the grid propelled by petroleum or electricity which is vital in ushering modernization and an

important mechanism for socio-economic survival of every nation across the globe. However, such modernization needs a well-balance of energy supply, consumption, conservation and environmental protection. Tohidi, F., et al. (2022) noted that energy crisis and environmental issues are the twin challenges in today's changing world where demand for electricity perpetually increasing. This is due to perpetual expansion of population coupled with fossil fuel reservoir depletion and environmental issues such as global waming which is now a serious global concerns.

These challenges prompted modern-day energy conversion systems for which reliability, scalability and sustainability are the three most desired features (Tohidi, F., et al., 2022). Environmentally, the International Energy Agency (IEA) report of 2023 highlighted the energy sector contributed about 75% of the greenhouse gas emissions today in the atmosphere. To reduce the global Carbon Dioxide (CO2) emission to a net of zero by 2050, the need for a large scale transition in energy supply and conversion is imperative. Hence, most studies conducted on energy systems have mainly focused on either improving the efficiency of existing systems or introducing novel systems with higher efficiencies and flexibilities toward using renewable energy sources.

In the context of the Philippines there are still places especially in rural areas have no access to electricity which is among the basic necessity for living. Another problem is the frequent power outage which is very prevalent and a never-ending problem plus high rate of electricity. More so, big cities accross Luzon, Visayas and Mindanao have high electricity demand which greatly contributed to unscheduled power interuptions or outages. This is a very disturbing scenario that seriously affected both domestic and national economy. According to the Philippine Institute for Development Studies (PIDS) of 2023 revealed that electricity supply interruptions seriously affect households, businesses, and industries such as but not limited to service, manufacturing and tourism sectors that has serious economic implications. This resulted to significant rise of their operating expenses in which to keep their operation afloat with reasonable operation cost or expenses like banks, transportation, telecommunications, factories, manufacturing and tourism industry, a stable, reasonable and invironment-friendly power producers is greatly needed.

Normally, a country should have a stable, sufficient, reliable, cost-effective, environment-friendly and sustainable energy source for every household and to propel the multifarious business and industrial operations which are essential requisites for a dynamic social and economic stability. This scenario is in harmony with the twin goals – people empowerment and global competitiveness of Philippines 2000 and beyond, Ecological Solid Waste Management of 2001 (RA 9003), Renewable Energy Act of 2008 (RA 9513) among others.

Being aware and with the conviction that there can still be done to contribute solution to these problems, the innovators conceived the idea of introducing the potential of dual dynamo and solar panel power generators. Unlike the existing system, this prototype model is a self-sustaining system of power generation without using petroleum or electricity.

Innovation Description

Dual dynamo and solar panel power generators is a self-sustaning prototype model that generate electricity by converting mechanical and solar energy to electrical energy without using petroleum products or electricity to make the system work. This model uses dual dynamo, battery, sensor, electric wire, socket, controller, and a solar panel. The first dynamo powered by a battery through direct current (DC) system and the second dynamo is operating through the gear directly connected from the first dynamo. With this, it allows the second dynamo to generate electrical energy though alternating current (AC) and stored in

the battery. On the otherhand, the solar panel absorbs the sunlight and like the second dynamo, the heat energy from the sun that is converted to electrical energy is directly stored in the battery as illustrated in figure 1.

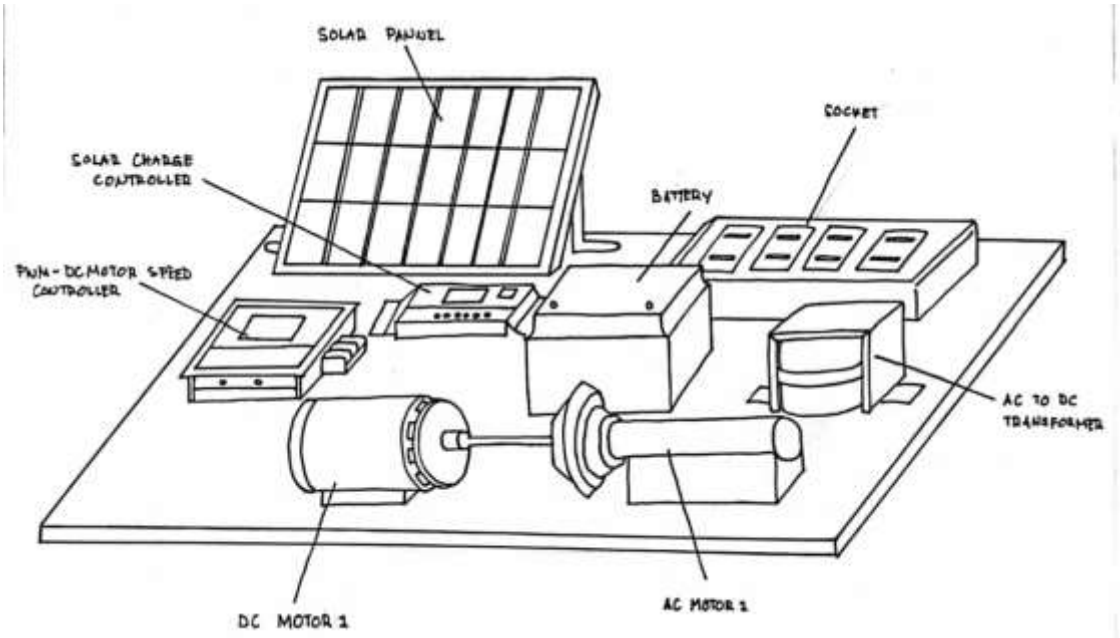

Figure 1. Dual dynamo and solar network prototype model

The following are the benefits and features of the dual dynamo and solar panel network:

1. Sustainable. This prototype model of dual dynamo and solar panel is a self-sustaining power generators. This because as the system work in cycle, it generate electricity and stored in the battery which is intended for consumption;
2. Cost-Saving. Considering that the this model/system work without using any fuel, petroleum or electricity, it is therefore a cost-saving initiative.
3. Environment-Friendly. The system using the dual dynamo operate in cycle and at the same time converting mechanical energy to electrical energy together with the solar panel that converts heat energy to electrical energy. Without using any petroleum product and electricity, it has no emission of toxic chaemicals like nitrogen oxides (NO_X) sulfur dioxide (SO_2) emissions whicjh is a significant source of mercury (Hg), carbon dioxide (CO_2) as end product of fossil fuel-fired power plants are also a significant source of fine particle emissions to greenhouse gas.
4. Practical and Flexible. The materials in creating the dual dynamo and solar panel power generators can be sourced in any local market. It can be assembled easily and upgraded its capacity anytime to suit the preferred electrical consumption.

Goal Statement

This initiative aims to reduce cost of electricity consumption, reduce emission of toxic chemicals, augment the power source, and contribute meaningfully to the school's efforts of promoting the research and innovation culture as a mechanism for continuous improvement across levels of this academic community. Specifically, this innovation aims to achieve the following:

1. Reduce cost of monthly electric bill.

2. Minimize or eradicate the emission of toxic chemicals that are detrimental to environment and to human health;
3. Promote the values of energy conservation, environmental protection and in exploring new ideas for the improvement of the existing household, business, tourism and industry practices;
4. Caution the impact of power interruption and outages; and,
5. Ensure sustainability by providing supplementary power source.

Implementation Procedures

Prior to the implementation of the dual dynamo and solar panel innovation, various activities were done/conducted that started from concept to implementation. This is to make sure that the process is in the right tract and the system is operating safely, securedly, reliably, and consistently according to the intended purpose. During the implementation, careful observation were made and considered all suggestions and areas with notable gaps as bases for improvement.

A. Conceptualization, Consultation, and Validation Activities

1. Observed and collected data regarding power supply and consumption as well as various environmental issues and causes
2. Convened innovators involved in the project for the formulation and delegation specific task for every innovator
3. Drafted the innovation proposal reflecting the action plan in carrying out the implementation and reporting to the instructor
4. Conducted conference among innovators to present and discuss every recommendation indicated in the innovation proposal for improvement and compliance
5. Presented the corrected or enhanced manuscript of the innovation proposal for quality assurance and standard compliance
6. Finalized the innovation proposal and submitted the clean copy for approval
7. Prepared all the needed materials including the communication of the approval to all concerns for smooth implementation of the innovation
8. Implemented the innovation properly with strict observance of safety and security measures
9. Regularly monitored the innovation implementation
10. Collected, evaluated and validated the implementation data of the innovation
11. Noted every area that offers opportunities for further improvement

B. Process Flow/Framework

The innovation started with the submission of the title then the innovation proposal. Its implementation started upon approval of the permission letter by the subject instructor.

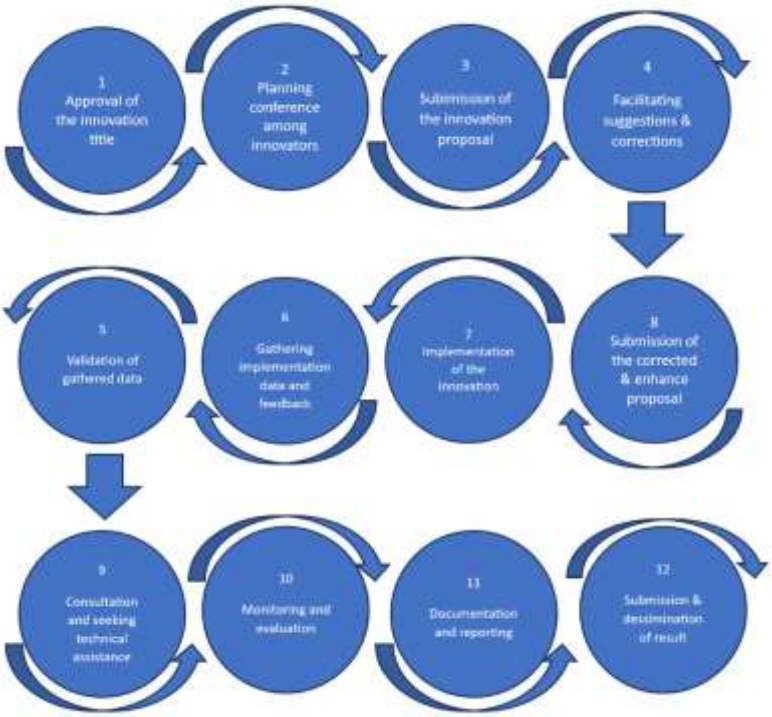

Figure 2. Process Flow/Framework

C. Project Management

In achieving the goal of this innovation, it was subdivided into various tasks and assigned to every member of the innovation team together with the faculty involved as enumerated below:

1. Subject Instructor. *Provided guidance and assistance related to their innovation from start to finish and ensure compliance to standard and safety requirements.*
2. Technical Adviser/Consultant. *Provided the needed technical assistance as to the standard and safety compliance of the innovation.*
3. Innovators

a. Lead innovator. *Responsible in the deligation of various innovation tasks and see to it that every member is doing their assigned task respectively.*

b. Assembler. *Responsible in assembling every material or part of the innovation model and to see to it that it function according to purpose safely and accurately.*

c. Encoder/Manuscript writer. *Responsible in drafting and encoding the innovation manuscript in adherence to the standard institutional format of the innovation.*

d. Public relation. *Incharge of every communication related to the innovation.*

e. Documenter. *Respondible in recording the data and other information before, during and after the implementation of the innovation.*

f. Monitor. *Monitor the conduct of the innovation implementation and to update the lead innovator from time-to-time until completion of the innovation implementation.*

g. Validator. *Responsible of checking and cross-checking the entire operation or implementation of the innovation if it adheres the standard procedures and if the result is valid according to formula and standard.*

D. Timeline

The journey of the dual dynamo and solar panel innovation has passed through stages of implementation as shown in the diagram below.

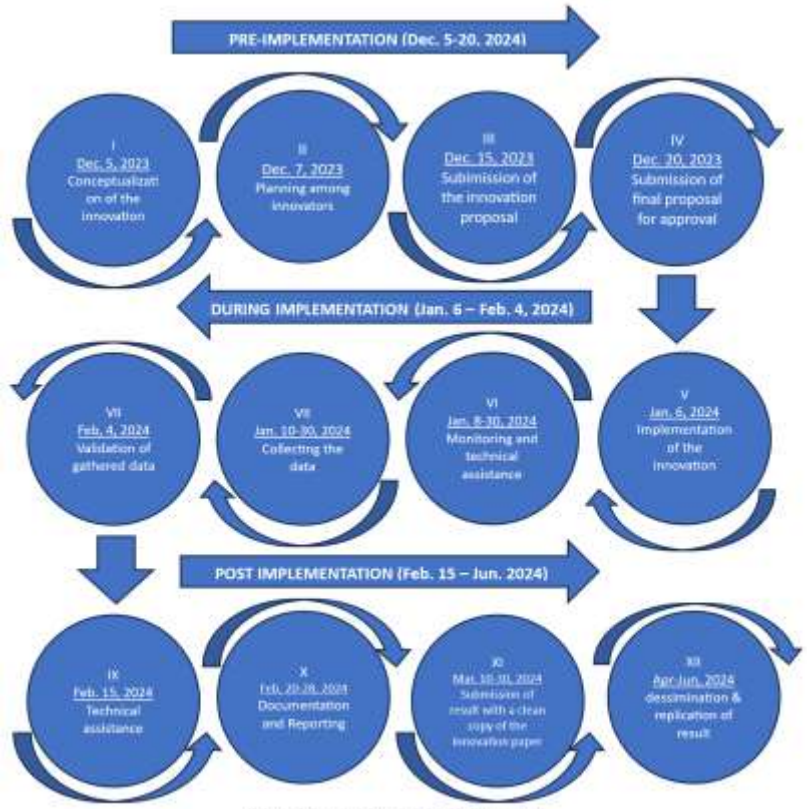

Figure 3. Innovation timeline of activities

E. Resource Utilization

In this innovation, the utilization of all the resources needed are properly and comprehensively accounted according to the intended purpose as well as the people involve from the start to completion of the innovation implementation as indicated in table 1 below.

Table 1. Resource Utilization

Resources	Source	Utilization
Basic Supply (bond paper, ink etc.)	Personal	Used for printing the documents
Gadget (laptop, printer, cellphone)	Personal	Used for research and encoding of documets, printing, etc.
Materials (dynamo, battery, solar panel, solar controller charger, battery, electrical wires and dynamo controller)	Personal	For constructions of innovation model

Financial	Personal	For procurement of all the materials needed in the innovation and implementation.

F. Risk and Issues Management

The various risks and issues relative in the implementation of the dual dynamo and solar panel power generators were carefully identified and properly defined. Doing this allows the innovators in preventing the occurrence or cautioning the impact of every possible risk in the system.

Table 1. Risk and Iddues Management

Risk/Issues	Measures/Solutions
Fiancial and time constraint	Soliciting internal financial inputs Proper scheduling of task and activities related to innovation and implementation.
Members apathy towards the innovation	Rekindling members interest and motivation through constand followup, meetings, and guidance from the subject instructor. Prepoer delegation of task and functions among members of the group.
Internet connectivity issues	Research conducted in school where there is strong internet connection. Members with internet connection at home are assigned to conduct relative to innovation.
Corrupted file	Provision of secondar and tertiary data storage as backup such as USB, external drive, and google drive.
Technical glitches of equipment	Extra equipment like laptop reserve in case of malfunctions or technical glitches.
Mal-function of the innovation model	Seeking assistance to experts as to trouble shooting and replacement of the non funcrtioning part of the innovation system.

G. Progress Monitoring

The monitoring system with regards to the progress of the innovation implementation was strictly observed by the instructor and the innovators themselves. This is to ensure that such implementation is in adherence to ethical, safety and institutional standards. To monitor the implementation, the innovators strictly examine everything in the system in order to ensure that everything are in place and adhered as to basic safety standards.

During the implementation, the innovators closely monitored the input, process and output activities of the system such that it works according to the intended results. Specifically, there were three trials conducted in the implementation of this innovation and the data for every trial were closely observed and recorded until the third trial was completed. Moreso, the process in which the systems worked were

also monitored as to the consistency of the energy generated by the second dynamo and the solar panel as shown in table three.

Table 3. Progress Monitoring Result

Trial	Capacity	Power generated	Remarks
First trial A. Second dynamo B. Solar Panel Total power generated	 30 watts 20 watts 50 watts	 30 watts 20 watts 50 watts	Achieved
Second trial A. Second dynamo B. Solar Panel Total power generated	30 watts 20 watts 50 watts	30 watts 20 watts 50 watts	Achieved
Third trial A. Second dynamo B. Solar Panel Total power generated	30 watts 20 watts 50 watts	30 watts 20 watts 50 watts	Achieved

Output/Outcomes

The interface of Dual Dynamo and Solar Panel Powe generators is a revolutionized concept of improving the existing practices with respect to power generations wih no hazards to environment. Essentially, it offers household and local business and industries that includes the servicing, manufacturing and tourism sectors the opportunity to save coast and sustain their day to day operations.

Table 4: Innovation output/outcomes/beneficiaries

Output/Outcomes	**Beneficiaries**
Prototype model of dual dynamo and solar panel power generators	Future innovators for further exploration of this innovation Business and Industries for the possible adaption and replication of the concept of this innovation
Supplementary power supply	Households, business & industries that includes the service, manufacturing, tourism sectors, and power plants
Cost saving in terms of electricity consumption	Households, business and industries that includes service, manufacturing, tourism, and power plants
	Environment and the mankind

Minimize toxic chemicals in the atmosphere	

Sustainability Plan

Significantly, this innovation and its benefits is intended for long term impact to household economy, business and industry that includes service, manufacturing and tourism sectors, and environment. However, there is a need for certain mechanism to ensure its continuity such as institutionalization, adaption, and replication of this innovation as indicated below.

1. Advocacy of this innovation to the academic community of Tañon College.
2. Submit executive report to the school authority as well as to the LGU if possible as input to their policy and decision making.
3. Communicate the result of this innovation to stakeholders for possible adaption and replication.
4. Disseminate the results and recommendations of this innovation to various conferences across levels for wider oppurtunities for replicability and sustainability.
5. As much as possible, publish this paper to legitimate peer reviewed journals to national or international levels for references and citation purposes.

Recommendations

The success of this innovation is a worthy contribution in the field of science and technology to power suppliers, households, business and industry sectors such as service, manufacturing and tourism, and environment. Thus, the innovators offers these recommendation based on some notable areas that offers opportunities for continuous improvement as follows:

1. As a prototype model of dual dynamo and solar panel power generators, this innovation can be expanded into a much bigger capacity and coverage so that more sectors of society will be benifited.
2. Due to time constrenght, this innovation was limited only to dual dynamo and solar panel power generators. However, this can still be enhanced by having more secondary power generating dynamos to be powered by the first dynamo and add more solar panels to increase its energy generation and supplementation.
3. More so, a wind turbine is another device that can be added to this innovation to provide more enegy sources making it a network of *multi dynamo, solar panel and wind turbine power generators* for a more sufficient, reliable and sustainable power generation and supply.

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