Philippine Higher Education Career System
Executive Development Program

Power from the Sun and Wind: A 'Green' Energy Plan for Cagayan State University (CagSU)

A Higher Education Institution Innovation and Transformation (HIT) Plan
Presented to the Faculty and Staff of the
Philippine Higher Education Career System
Executive Development Program (PhilHECS-EDP)

In partial fulfillment of the requirements for the PhilHECS-EDP implemented by the Development Academy of the Philippines (DAP) for the Commission on Higher Education (CHED) in cooperation with the Philippine Association of State Universities and Colleges in the Philippines (PASUC)

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Preface

This project was developed as a major requirement of the Philippine Higher Education Career System – Executive Development Program (PhilHECS-EDP) implemented on August 22, 2016 – January 14, 2017 by the Development Academy of the Philippines (DAP) for the Commission on Higher Education (CHED) in cooperation with the Philippine Association of State Universities and Colleges (PASUC).

Titled "Higher Education Institution Innovation and Transformation (HIT) Plan," this, as defined by DAP (EDP-HIT Plan Guidelines, 2016), is "a thoroughly researched and consulted plan for a project or initiative that would address any of the critical issues being faced by the candidate's home HEI and its community."

The writer, to complete this project, incorporated into this work his lessons and experiences drawn from the modules of the four EDP key learning areas (KLA) [1) grounding, vision and global thinking, 2) administration and advancement, 3) quality and performance excellence, and 4) personal leadership innovation] and the University Dynamics Laboratory (UDL) held in Batangas City on November 21-December 1, 2016, and other helpful information he collected from the three-month research and picked up from the mentoring and coaching sessions with Dr. Napoleon Imperial, CHED'S deputy executive director; Dr. Ed Gonzales, former DAP president; Ms. May Mendoza, former CSC commissioner; and Mr. Eleazar Ricote, Public-Private Partnership Center deputy executive director.

It was designed to propose a plan for a solar and wind farm for the Cagayan State University (CagSU) Gonzaga Campus. Just a little note about CagSU. At present, the University is a prestigious university to attend, but it is lacking a program on the promotion of alternative energy or renewable ('green') energy. Many things have changed since its birth as a state university from a trade school in 1978. For example, fossil fuels and coal being used by corporations and industries here and abroad have been blamed for greenhouse gasses emitted into the atmosphere, which, in turn, developed global climate change and other potential risks against the environment including super typhoons. Since that time on, the cost of energy resources has been skyrocketing, resulting to a substantial rippling effect on local and international business services and economic activities as well as educational affairs. Now is the time then to start looking into right technologies in harnessing the sun and wind, nature's ultimate energy sources, to make CagSU a more sustainable higher education institution. Hence, the development of this plan.

The implementation of a solar and wind project at the University is seen to be substantially beneficial for the school as it can produce considerable annual savings, the community in the peripheral areas, students, faculty members and other significant parties involved. This is not a remote possibility because today, according to experts, the cost of solar and wind power implementation, has been declining and becoming a more feasible idea even in developing countries such as the Philippines, a reason aplenty that makes it even more compelling for CagSU to seize this advantage and take off for this planned project.

This report begins by presenting ideas showing that CagSU has a future to proceed with this kind of project and the many challenges it will attempt to address. A brief history of renewable energy described in the review of related literatures follows this part which, among other many important items, includes a host of Philippine schools, most of which private, that adopted 'green' energy yet on campus. Guided by the thoughts discussed in the review, the writer, in the succeeding parts, went on to describe the details of the solar and wind farm proposal—objectives, benefits, mode of procurement, etc.-- including the tentative work plan to show a vivid picture of the activities and tasks to be done from conception stage to the execution phase. The writer caps off this piece with his personal reflection on how the whole process of putting together the HIT plan might have affected his views on leadership and governance of state universities and colleges.

Cagayan State University Context and Challenges

The Cagayan State University (CagSU), created in 1978 by Presidential Decree 1436 signed by then President Ferdinand E. Marcos, is the biggest state university in the Cagayan Valley Region with more than 40,000 local and international students, 1,094 faculty members and 607 administrative personnel coming from eight campuses strategically located in different parts of Cagayan province: Aparri, Gonzaga, Lal-lo, Lasam, Sanchez Mira, Piat, Carig and Andrews (main campus), each has a campus executive officer (CEO) with the exception of the main campus where the University President acts as the concurrent CEO.

Recently assessed by the Commission on Higher Education (CHED) as a SUC Level IV institution, CagSU is home to a host of nationally acclaimed programs that are top performing in licensure examinations and have been producing topnotchers in medical technologist, respiratory therapist, certified public accountant, electrical engineer, civil engineer, teacher and veterinarian board examinations.

This fact may have been the reason a lot of students and even professionals from other private and public universities are convinced to join CagSU to experience the institution's brand of higher and advanced education and the kind of campus experience others may not have.

CagSU, an institution of higher learning with 92 (of 114) accredited programs (CSU Annual Report 2015), may have become a prestigious school to attend, but it is lacking progress on alternative energy systems. While it may have listed climate change and disaster preparedness and mitigation in its research and extension agenda (CSU RDET Agenda, 2013), the school does not have a clear program or direction for sustainable and renewable energy. This is felt despite the fact that the university is fully aware of the high costs of consumed energy it pays on a monthly basis to the Cagayan Electric Cooperative (CAGELCO).

Cagayan's neighboring province, Ilocos Norte, has gone 'green' already by installing wind turbines along the shore lines of Bangui and Pagudpud towns—and still expanding-- to generate power in response to the government's policy to, as stated in Republic Act 9513 otherwise known as Renewable Energy Act of 2008, "accelerate the exploration and development of renewable energy resources…", "increase the utilization of renewable

energy…", and "encourage the development and utilization of renewable energy resources as tools to effectively prevent or reduce harmful emissions…."

The province, known for its history in recording the highest heat index in summer (Tuguegarao City), seem to have not been receptive to this technology and is not getting the idea of Bangui and Pagudpud. This is the right time CagSU, the only state-run university in Cagayan, can now enter into the picture and make a strong statement by adopting a project leading toward the accelerated development and advancement of renewable energy resources and its increased utilization, which will serve as a model and a source of inspiration for the local government unit "to develop cheaper alternative renewable energy sources in Region 02 such as wind, solar, water and bio-diesel" (Cagayan Valley Development Plan 2011-2016, Chapter 4-9).

Cagayan is a hot zone frequented by typhoons, which, according to experts, are caused by climate change attributed to gas/carbon emissions from the use of fossil fuels many experts seem to agree that it will run out of supply in the coming years. The latest of these freaking weather conditions was in October of this year, when the province was severely hit by super typhoon "Lawin," leaving many Cagayanos homeless, moving thousands to evacuation centers and causing the eight deaths and considerable damage to private and public properties and to the agricultural sector. CagSU was not spared from the wrath of the super typhoon. In an interview over Radyo ng Bayan dwPE, newly elected University President Urduja Tejada said the cost of damage to properties—classroom, gymnasium, libraries, computer and science laboratories, to mention just a few—was estimated at P800 million. If CagSU will start to embark on a project that promotes renewable energy such as wind and solar energy, the University will have its share to preserve and protect the environment, human lives and properties.

It has been observed that after these extreme weather conditions, the usual or normal situation is that all lines are down and so operations of public and private agencies are also inoperative until CAGELCO shall have restored power, which is normally taking time due to the magnitude of damage sustained by transmission and utility lines. At CagSU, for example, as an aftermath of the recent super typhoon, classes and office affairs have to be suspended for days due to the busy clearing activities on the ground for line restoration and security in offices, classrooms, laboratories and center, which are all dependent on the fossil fuel powered energy transmitted by the National Grid Corporation of the Philippines (NGCP).

This is not healthy to CagSU and the local and national economy as a whole. There should be a way that offers constant and sustained supply of energy to ensure stability in the economic activities. And that way is guaranteed by and can only be done through renewable energy.

After each typhoon when all lines are down and during scheduled power outages, CagSU and those financially able households in the province resort to the use of stand-by generator sets to prevent discontinuity of daily activities or interruption in business operations. When 'Lawin' left Cagayan, for example, many residents bought for themselves a new set of generators to energize all their activities while the grid is being restored by engineers and home-grown line professionals and electricians from various electric cooperatives from Manila, Luzon and Visayas, one of them died of electrocution while doing volunteer work for Cagayanos.

What people do not realize about this technology is that it emits harmful gases to the environment seen by many experts as the cause of global warming, plus the fact that it can be a potent source of noise pollution in the community. If climate change resilient renewable energy sourced from wind and solar is available in the area, this could not have been the scenario we see every time there is power outage or grid failure in this part of the archipelago.

Would it be possible for CagSU to host a large scale solar and wind farm project?

The University, which has many buildings and structures with large roofs, is the biggest in the region not only in terms of student population and personnel but also in terms of land area. Most of the spaces titled to the University are unproductive or unutilized for maximum academic, research and commercial use. CSU Gonzaga Campus, the proposed site of the planned HIT project, for example, has more than 2,000 hectares, only about 40 hectares of which is currently used for academic buildings, student dormitories, demonstration farms, computer and science laboratories, a library, integrated farm project, parking spaces, administration building and a sports oval. According to Campus Executive Officer Dr. Florante Victor Balatico (Personal Communication, September 21, 2016), the rest of the unused land area is now taken care of by the Department of Environment and Natural Resources (DENR) under its National Greening Program (NGP). This thickly forested area backdrops the campus and is home to indigenous people belonging to the 'Agay' tribe who, the author was told, are now being taught through a community outreach program organized

by CagSU and DENR to take care of the area to prevent intrusions and illegal forest activities.

With the election of the new University President, Dr. Urduja Tejada, the writer thinks that the proposed project can possibly be implemented. Dr. Tejada, the former assistant secretary of the Department of Science and Technology (DOST), is an award-winning scientist herself and a champion of rural and countryside development. With her sterling experience in project development and implementation and her linkages and collaborations here and abroad, the writer is confident that the planned project will have greater chances of seeing it implemented during her stint as president. In fact, when this writer introduced the HIT concept to the university head, she advanced to DOST's Regional Director Sancho Mabborang, who was present during my short visit, CagSU's request for financial assistance for such a project.

Speaking of funding opportunities, DOST is not the only agency of government that can offer support to proposals related to renewable energy. The Department of Energy (DOE) also has financing programs for energy projects and in fact has incentives for renewable energy projects and activities enumerated in Chapter VII of RA 9513. To ensure that renewable energy use in academic institutions is promoted, the department launched its "solar roofing program" for Philippine schools.

Two of some prominent higher education institutions that the department has helped switch to solar power include the Manuel L. Quezon University, Manila's first solar powered university, and La Consolacion College – Manila Campus (*please see complete story on pages 18-19*). The plan of the department is to accelerate and expand its program by introducing the technology to other schools outside of Manila, an idea that can serve as good news for CagSU.

This is giving the university hope that renewable energy will have chance to stay in Cagayan province. And that chance is imminent as one glitter of hope flickered in the midst of our quest to give 'green' energy a face in this part of the archipelago. In November this year, Indian social entrepreneur Harish Hande, recipient of the 2011 Ramon Magsaysay Awards, visited Manila to spearhead an energy replication project and a two-day workshop on solar energy. Known as the "Father of Affordable Solar Power in India," Hande explains that the main idea of the project is "to put up projects in Quirino, Cagayan Valley, Visayas and Basilan" (Lukman, 2016), adding that since the Philippine is an island country Filipinos "cannot keep on relying on diesel and other types of fossil fuels."

Aside from government line agencies such as DOST, DENR and DOE, CagSU also has close ties with the local government unit (LGU) of Cagayan. The University has had rich experiences in working actively with the officialdom of the province. The latest of which was when CagSU and Cagayan government partnered for the holding of two national events in Tuguegarao City: the 2015 National SCUAA Olympics in February and the National Youth Day Celebration in October of the same year. These and many others the writer cannot mention here are proofs that when two or three work hand in hand putting together all resources, something good is accomplished. For the proposed renewable project, CagSU will be needing once more the LGU's assistance to ensure its success. Why ask help from LGU? Well, the LGU is a potent force for such a project because under Chapter 4-9 of the Cagayan Valley Development Plan 2011-2016, they are mandated "to develop cheaper alternative renewable energy sources in Region 02 such as wind, solar, water and bio-diesel." Through our partnership and commitment to take the lead to introduce what could be the first of its kind in this part of the country, we can show people that solar and wind power is here to stay and blossom in Cagayan.

One of the best opportunities we have in the University that ensure our chances of engaging in a renewable energy or green project in a large scale is the presence of our College of Engineering at CSU Carig Campus which offers related programs that will later on be involved in the operations, maintenance, monitoring and evaluation of the facility. These programs include civil engineering, electrical engineering, electronics engineering, computer engineering, all accredited programs. Mechanical engineering program, President Tejada said in an interview over dwPE Radyo ng Bayan, shall be offered during her administration. Students and faculty members in these programs will be of best help in the smooth implementation of the project. We are even doubly happy and fortunate that in the same college, we have three ASEAN engineers—Engr. Arthur Ibanez, college dean (civil), Engr. Nestor Rivera (electrical), Engr. Policarpio Mabborang (agricultural)-- in our midst, who, later on, shall be tapped to be part of the project, considering their capacities and partnerships they have already established here and overseas.

Given the magnitude and nature of the proposed renewable/green project, the writer thinks that aside from the College of Engineering, the other colleges that may also have a share in the success of the proposed project are the College of Information and Computing Sciences where robotics and programming are offered as core courses in its information technology program and the College of Business Entrepreneurship and Accountancy. Both colleges are most subscribed to by Cagayano students coming from different walks of life,

who are all assured of benefitting from the facility considered later on as teaching and research laboratory once the project kicks off.

It is clear with the writer that the green project he proposes for implementation would require considerable amount of money and other resources for it to be fully operational. Requesting for funding from the General Appropriations Act or from the Congress–approved annual budget may not be possible. This is the reason funding support from government agencies like those identified earlier will be sought. But apart from this, the writer will also push for the project's procurement through the Public-Private Partnership (PPP) following the rules and regulations issued by the PPP Center, an attached agency of the National Economic Development Authority (NEDA).

Will there be local or international companies willing to participate in the procurement activities? Green energy projects are no longer new in the Philippines. There has been a number of efforts in making them gradually known and attract the curiosity of people in some parts of the country, prominent of which are the tourist frequented wind mills in Bangui, Ilocos Norte and the massive solar farm in Calatagan, Batangas with solar panels that can withstand a typhoon with maximum wind speed of 230 kph (Yzon, Personal Communication, December 10, 2016). In all of these efforts or attempts, local and international private companies who offer renewable energy solutions to interested communities and organizations participated. Some of these include Solar Philippines, United Solar Technologies Philippines Corporation, Solenergy Systems Inc., and Propmech Corporation. All will be invited to vie for the CagSU Solar and Wind Project once it gets the green light from school and government authorities.

Indeed, this is the most appropriate time to look into future technologies to make Cagayan State University and the communities within its periphery more sustainable place. As was said, fossil fuels and coal are predicted to run out of supply in the next 70-80 years and yet these are creating an abundance of greenhouse gasses in our atmosphere and causing climate change and other substantial problems for the environment (Murray et. al., 2014). But the sun and wind are staying 24/7 as nature's ultimate energy sources that might last for billions and billions of years and that can be harnessed using the right technologies. CagSU has the right attitude toward this innovation, has considerable amount of space to host the project, has competent people to work on the idea and knows fully well that the alternative energy source could substantially benefit stakeholders, students primarily, and could produce significant annual savings. We then need to take advantage of this cleaner way of obtaining energy source.

Review of Related Literature

The concept which we now call renewable energy is not a new idea because it has actually been around since the beginning of time. It has become trendy at the moment because the human race is now trying to look for other alternative sources of energy besides that of the one powered by fossil fuel, which according to experts, is going to run out of supply in the near future. People and nations have become more interested in renewable energy due to the dwindling availability of the natural resource and the harm it poses to the environment.

The Birth of Renewable Energy

In what period of man's history did renewable energy come about? Ledlights.org (2016) outlines a brief timeline showing how renewable energy started and the other significant milestones in history:

*The birth of the sun Approximately **4.5 Billion B.C.***
*The sail invented by Ancient Egyptians (wind energy) **3200 B.C.***
*China invents windmill **200 B.C.***
*Middle East uses windmills **1000 A.D.***
*Architecture Hydraulique (treatise on water power) published in France **1774***
*Edmond Becquerel discovers relationship between absorbed sunlight and electricity **1839***
*First Hydroelectric Plant, Appleton Wisconsin - **1882***
*Clarence Kemp invents first solar water heater **1891***
*25% of power supplied by hydroelectricity in Untied States **1920***
*Putnam builds wind turbine (interest suspended due to war effort) **1941***
*United States, under Pres. Jimmy Carter seeks solution to energy crisis **1970s***
*Pres. Ronald Regan halts incentives for solar energy **1981***
*Global Wind Energy Council, Brussels. Belgium **2005***

The site says that there has always been a keen interest in ways to produce power, however, since fossil fuels were much easier to utilize, interest in renewable energy defined by Ciolkosz (2016) of the Pennsylvania State University as energy generated from natural resources—sunlight, wind, tides, and geothermal heat, took a back seat.

To understand how these renewable energy technologies came to being, POB Solar (2016) writes the following capsuled histories of each of the popular renewable energy technologies:

"The development of geothermal energy can be traced back to 1905 when a farmer drilled a well to find fresh water he could use on his land. Instead, he found hot water that would quickly turn into steam as it hit the cool air. From this discovery, the idea of placing a

turbine over steam was created in an effort to generate electricity. This principle has been expanded upon a great deal over the last century, and today there are geothermal plants in existence across the globe that create clean energy 24/7.

"Hydrokinetics has one of the longest histories of any of the renewable energy sources, with its first application coming about in 200 BCE more than 2000 years ago. Water wheels and watermills were created in China, Imperial Rome, and India to power a grind to process flour, and a saw to cut stone and timber. Today the energy source is being used to generate energy from ocean and river currents without harming the natural aquatic life.

"Wind energy also has a long history dating back to 1700 BCE when Hammurabi, the emperor of Babylonia, used wind to attempt to irrigate farmland. However, the power of wind energy was not truly realized until Heron of Alexandria, a Greek engineer, created a wind wheel so that the wind could be used to power a machine. Wind farms today are still in use to create clean power, and as prices continue to drop, wind energy is almost as efficient as coal.

"Solar power using photovoltaics has a more contemporary history that can be traced to 1887 when Heinrich Hertz recorded the photoelectric effect. He saw that when light hit substances that conducted electricity, the electrons would flow. Albert Einstein looked in the matter a bit more deeply and won the Nobel Prize in 1921 for his observations. Today researchers are attempting to make solar energy more efficient and cost effective by looking at nano-scale quantum physics applications.

"Last on the list is the lesser known renewable energy known as biomass, which is the process of creating energy from materials that come from living or recently living organisms. Fire is an example of biomass energy and evidence of fire being utilized to cook food traces back to 400,000 BCE. Over the last century gasification and pyrolysis processes have helped make it easier to get energy from biomass products such as plant clippings, trash, tires, and even animal manure."

Importance of Renewable Energy Use

The Union of Concerned Scientists (www.ucsusa.org) lists some of the many benefits or dividends that we can derive from cutting down our too much dependence on finite resources such as the fossil fuels, which, in the words of social entrepreneur Harish Hande as quoted by Lukman (2016), cannot be relied on by Filipinos because the

Philippines is an island nation, and shifting to “greener” or “cleaner” practices such as solar and wind energy.

In its article titled “Benefits of Renewable Energy Use”, the Union, using the United States context, said renewable energy provides substantial benefits for our climate, our health and our economy.

The first specific benefit it mentioned is that renewable energy technologies have little contribution to global warming emissions as compared to coal-fired power plants.

“Compared with natural gas, which emits between 0.6 and 2 pounds of carbon dioxide equivalent per kilowatt-hour (CO2E/kWh), and coal, which emits between 1.4 and 3.6 pounds of CO2E/kWh, wind emits only 0.02 to 0.04 pounds of CO2E/kWh, solar 0.07 to 0.2, geothermal 0.1 to 0.2, and hydroelectric between 0.1 and 0.5. Renewable electricity generation from biomass can have a wide range of global warming emissions depending on the resource and how it is harvested. Sustainably sourced biomass has a low emissions footprint, while unsustainable sources of biomass can generate significant global warming emissions,” it said.

The second, the Union said, is that there is a vast and inexhaustible energy supply from strong winds, sunny skies, plant residues, heat from the earth and fast moving water, all can provide a vast and constantly replenished energy resource supply.

The Union said: “These diverse sources of renewable energy have the technical potential to provide all the electricity the nation needs many times over.”

Creation of more jobs and other economic benefits is what it also believes what sets apart renewable energy from the non-renewable one. Compared with fossil fuel technologies, which are typically mechanized and capital intensive, it said that the renewable energy industry is more labor-intensive.

“This means that, on average, more jobs are created for each unit of electricity generated from renewable sources than from fossil,” it added.

The Union continued: “In addition to the jobs directly created in the renewable energy industry, growth in renewable energy industry creates positive economic “ripple” effects. For

example, industries in the renewable energy supply chain will benefit, and unrelated local businesses will benefit from increased household and business incomes."

"In addition to creating new jobs, increasing our use of renewable energy offers other important economic development benefits. Local governments collect property and income taxes and other payments from renewable energy project owners. These revenues can help support vital public services, especially in rural communities where projects are often located. Owners of the land on which wind projects are built also often receive lease payments ranging from $3,000 to $6,000 per megawatt of installed capacity, as well as payments for power line easements and road rights-of-way. Or they may earn royalties based on the project's annual revenues. Similarly, farmers and rural landowners can generate new sources of supplemental income by producing feed stocks for biomass power facilities," the Union said.

With the renewable energy providing affordable electricity across the country, the Union believes that prices of energy will be stabilized in the future. This is possible, it said, because the cost of renewable energy technologies have declined steadily and are projected to drop even more.

"While renewable facilities require upfront investments to build, once built they operate at very low cost and, for most technologies, the fuel is free. As a result, renewable energy prices are relatively stable over time," the Union said, emphasizing that in contrast, fossil fuel prices can vary dramatically and are prone to substantial price swings.

Apart from this, renewable energy, according to the Union, is more reliable and resilient than coal, natural gas, and nuclear power plants in the face of extreme weather events.

"Wind and solar are less prone to large-scale failure because they are distributed and modular. Distributed systems are spread out over a large geographical area, so a severe weather event in one location will not cut off power to an entire region. Modular systems are composed of numerous individual wind turbines or solar arrays. Even if some of the equipment in the system is damaged, the rest can typically continue to operate," the Union said.

It said "…coal, natural gas, and nuclear power depend on large amounts of water for cooling, and limited water availability during a severe drought or heat wave puts electricity

generation at risk. Wind and solar photovoltaic systems do not require water to generate electricity, and they can help mitigate risks associated with water scarcity."

Renewable Energy in the Philippines

The history of renewable energy in the Philippines dates back to when the government laid the foundation for commercial utilization of geothermal energy between 1952 to late 1960s through studies and inventories of geothermal activities (Marasigan, 2015). Significant events came after the other. For example in 1967, the Philippines witnessed the historic lighting of several electric bulbs in Southern Luzon. In 1977, the first commercial geothermal power plant (3 MWe) was launched in Negros Island. By the end of 1983, Marasigan (2015) recalls, a total of 896-MWe geothermal installed capacity was developed. Private sectors interested in this technology were allowed to do a private sector development of geothermal facilities following the passage of Republic Act (RA) 6957 (Build-Operate-Transfer Legislation).

The interest of the country for hydro power plants in 1900 for electricity generation and non-power applications (e.g. millings) in rural communities (Marasigan, 2015) enriched the experience of the Philippines on renewable energy. Government supported this movement by initiating the commercial development of such resource through the National Power Corporation and the National Electrification Administration. In 1991, Congress passed the RA 7156 which provided full private sector development of mini-hydro power resources up to 10 MW. Marasigan (2015) said it was during this time that private sector participation in build-operate-transfer scheme for large hydro power projects was encouraged.

Marasigan (2015) said solar photovoltaic systems were introduced in the country in rural electrification program in late 1980s. In mid 1990s, private sector exploration, development, utilization and commercialization for power generation and other uses was initiated under Executive Order 462 as amended by Executive Order 232. In 2005, the country rejoiced when the first wind farm in Northern Luzon with a capacity of 33 MW was installed. Another first came in 2008, when the maiden grid-connected solar PV farm at 1-MWe capacity was completed.

To improve the state of renewable energy in the Philippines, the government through Congress passed four landmark laws: the Electric Power Industry Reform Act of 2001 (RA 9136), the Biofuel Act of 2006 (RA 9367), the Renewable Energy Act of 2008 (RA 9513), and the Climate Change Act of 2009 (RA 9729).

RA 9136 made it as policy of the state, among others, to promote the utilization of indigenous and new and renewable energy resources in power generation in order to reduce dependence on imported energy. It, too, stated that the Department of Energy shall "encourage private sector investments in the electricity sector and promote development of renewable energy sources including small-scale renewable energy generating sources."

RA 9367 provides for fiscal incentives and mandates the use of biofuel-blended gasoline and diesel fuels.

RA 9513 was aimed at accelerating the exploration and development of renewable energy resources such as, but not limited to, biomass, solar, wind, hydro, geothermal, and ocean energy sources, including hybrid systems, to achieve energy self reliance, through the adoption of sustainable energy development strategies to reduce the country's dependence on fossil fuels and thereby minimize the country's exposure to price fluctuations in the international markets, the effects of which spiral down to almost all sectors of the economy; increasing the utilization of renewable energy by institutionalizing the development of national and local capabilities in the use of renewable energy systems, promoting its efficient and cost-effective commercial application by providing fiscal and nonfiscal incentives; encouraging the development and utilization of renewable energy resources as tools to effectively prevent or reduce harmful emissions and thereby balance the goals of economic growth and development with the protection of health and the environment.

RA 9729 builds resilience to the impacts of climate change through the mainstreaming of climate change in various phases of policy formulation, development plans, poverty reduction strategies and other development tools and techniques by all agencies and instrumentalities of the government (Legarda).

Renewable Energy on Campuses

One of the institutions of society that responded to the call for renewable energy use is the academe. In the United States of America, Meyer (2014) states three prominent schools that have their own solid and successful examples of solar working in their respective campuses. One of which is Harvard, which has solar panel systems on eight of its buildings, the largest of which produces 590,000 kWh/year. The university also purchases renewable energy from offsite sources and has a wind turbine mounted on one of its buildings.

Stonehill College is another American school that built one of the nation's largest college campus solar fields. It is a 2.7 megawatt field that contains 9,000 solar panels. The solar field, according to Meyer (2014), is expected to save about $185,000 a year on energy costs and account for 20% of the campus' electrical usage.

Another model school is Brandeis. It installed solar on the roofs of two buildings in 2010. At the time, the project was one of the largest in the state, and these panels currently produce 10% of the annual energy needed at their sports center.

Augenbraun (2010) says that, in Australia, various institutions of higher education have already begun generating solar electricity on campus. One of these is the Monash University in Victoria, Australia, which installed a 416 panel array expected to generate 100,000 kWh of electricity per year. At that time, the author was quoting O'Loughlin (2010) to have described the array as the largest at any Australian University. However, the author as cited in Dunne (2010) said the Monash University project may soon no longer hold the title of hosting the largest in Australia as the University of Queensland at that time was developing a 1.2 MW photovoltaic array that generates up to 1750 MWh per year.

In the Philippines, there are also a few colleges and universities that turned to the power of renewable energy. First in the list is the Manuel L. Quezon University (MLQU) known as Manila's first solar-powered university (Montenegro, 2014). It installed a 96-kilowatt-peak solar panel system on the roof of its buildings, covering a total area of 621 square meters. The solar panels are capable of providing around 28% of the school's daily energy needs. The installation of the solar panels was handled by Propmech Corporation which entered into a memorandum of agreement with MLQU and the Department of Energy for the solar panel system.

If in Luzon it has Manila's first solar-powered university, Visayas and Bohol has Holy Name University (HNU) as the first to have fully integrated solar power energy system in its operation in April 2016. HNU installed a solar power plant on its Scanlon Building. It is composed of 1,100 solar thin film panels provided by Orion Group International Inc. The plant, according to the 'Bohol Chronicle' (2016), is capable of producing 100 kilowatts of electricity. Considered as the largest thin film solar installation in the country today, the HNU plant would save the school roughly 20 to 25 percent of its monthly energy cost.

Photo grab of NHU solar power energy system courtesy of 'Bohol Chronicle'

Also in 2014, La Consolacion College followed the example of MLQU after it had completed the installation of solar panels in its Manila Campus. Like the MLQU, this was done through the DOE's initiated solar roof program. Under the project agreement the school entered with Trademaster Resources Corporation, the first phase involved the installation of panels with a total capacity of 42.84 kilowatts. The second phase would produce an additional capacity of 90.27 kilowatts upon completion. The school applied for a net metering facility with Meralco to allow the academic institution to revert surplus electricity from the solar panels back to the grid, offsetting the equivalent amount of its power bill. Meralco has a net metering program that enables renewable energy producers to offset their grid consumption with power produced from solar and wind technologies.

In Mindanao, Ateneo De Davao University (AdDU) kept the lead for renewable energy use in this part of the country. Villarba (http://www.addu.edu.ph/blog/2016/06/07/ateneo-pushes-energy-sustainability-through-solar-technology/) reports that AdDU currently houses 842 solar panels. The said University generates power through the 48 panels (258 watts per panel) at its Finster Hall, 394 panels (385 watts per panel) at the Community Center and 400 panels (300 watts per panel) at the Martinez Sports Complex, Matina Campus. On average, the solar PVs can generate 285.37 kW of power or 520 MWh of energy each year. Initiated due to the looming power crisis in Mindanao beginning 2011, the solar panels, according to University Dean of the College of Engineering Randell Espina, were designed as a grid-tied system, where the energy generated by the solar panels can be directly used by all energy consuming devices including lights, air conditioning units, computers and other appliances. AdDu's solar power

system includes an inverter with an anti-islanding functionality, which refers to a feature of a grid-tie inverter that shuts itself off when a power outage occurs to prevent electrical overload to happen.

Photo grab of Ateneo De Davao University solar power system courtesy of ADDU

The Philippine Science High School in Diliman, Quezon City also joined the solar energy bandwagon. Donated by a generous project partner Wilfred and Bonnie Uytengsu Foundation, the solar power project, which was initiated by the school's Batch 1985, is worth P2.5 million consisting of photovoltaic panels, LED lights, batteries, controllers, cables, roofing and other accessories. School Director Helen Caintic disclosed that, with the solar project, the school has been realizing savings on electricity that they expect to increase steadily with time.

In Dumaguete City, Siliman University launched in August 2016 what could be a solar power project that is first and largest in Southeast Asia. Partnering with First Solar Orion, Siliman installed solar panels on the roof of its Claire Isabel McGill Luce Auditorium, Robert B. and Metta J. Silliman Library and at the College of Business Administration building. The installation is projected to provide an initial 200 kilowatts of solar power around campus. The school's website says the installation of solar panels in 15 other buildings around the campus are underway and is expected to be completed by December 2016. Once done, the site says, the solar power project will generate around 1.2 megawatts of power all over the University. "This translates to a reduction of around 98 percent in Silliman's carbon footprint," it said.

Photo grab of Siliman University's solarized roof courtesy of www.su.edu.ph.

There are two more 'green' schools that exemplified their commitment to make a strong statement for renewable energy. Solenergy Systems Incorporated or SSI (http://solenergy.com.ph/projects/international-school-manila/) identified the first as the International School Manila. The school, it says, commissioned SSI to install a rooftop solar power system at the institution's Taguig Campus. "The system comprises 312 polycrystalline solar modules connected to 4 independent 3-phase inverters. It is connected to the medium voltage circuit at the site and will provide power to their entire high school building," the company says in its website.

The other school is Grace Christian College (GCC) where we can find a solar power system consisting of three 3-phase inverters with 480 polycrystalline panels that generates electricity for the school's elementary school building. SSI comments: "The shift to solar power proved to be a drastically effective move towards reducing the cost of power consumption and establishing power independence to sustain the operations of the school in the future. Grace Christian College has ventured into a second phase of installment to expand the solar power system and increase its capacity."

Mapua Institute of Technology, St. Scholastica's College-Manila, St. Scholastica's Academy-Marikina, University of Perpetual Help and Miriam College are some of the academic institutions that expressed interest in the installation of photovoltaic panel technologies, which Pearce (2011) says, come in different types depending on the particular circumstances: mono crystalline, advanced mono crystalline, poly crystalline, cadmium telluride thin film and thin film.

Batangas State University (BatStateU) is expected to follow suit. Dr. Rogelio Antenor, current executive director of the school's main campus and university's chief administrative officer, (personal communication, November 24, 2016) shares the plan of BatStateU to solarize the roof of 21 existing buildings and structures in the main campus I (11) and main campus II (10). A mechanical engineer, Antenor says the project already got the nod of the BatStateU Board of Regents and the Regional Development Council of Region 4-A. The planned project is a grid-tied PV Solar Power System with a life span of 25 years and with a total project cost of P41,300,000. When implemented, the facility, he says, will earn the university a monthly savings of P399,075.94 or P4,788,911.26 in a year's time.

Benefits of Solar Energy in Institutional Settings

Murray et. al. (2014) claims in their solar energy paper that there are more solar installations at US universities now than ever before. Quoting a 2011 report from the

Association for the Advancement of Sustainability in Higher Education (AASHE) as cited in Hummel (2011), they said “installed solar capacity (at both universities and private homes/businesses) has grown 450% over the last three years…as institutions have taken advantage of dropping solar prices, state and federal incentives and innovative financing mechanisms.”

In the Philippines, we are seeing the same trend among educational institutions. More and more schools not only Luzon/Manila-based schools but also those who come from Visayas and Mindanao are subscribing to this technology.

What makes these installations so much more possible than ever before?

Augenbraun (2010) provides several reasons explaining this phenomenon. In many cases, the author says, these projects “have been supported by substantial grants and rebates to make them economically feasible.” The author is talking about grants from government.

In addition to the possibility of financial benefits from operating a solar array, the author says there are many non-financial benefits for a university associated with such a project. One such benefit, he cites, is a boost in institutional ranking for universities pursuing agenda of sustainability and low environmental impact. He claims that there is a strong correlation between institutional ranking and sustainability.

The other explanation is using solar electricity generated on campus serves as a symbol of a university’s commitment to the environment. Citing Australian Research Institute in Education for Sustainability (2009, p.3), the author says this symbol encourages students, faculty, and staff to take pro-environmental actions in their everyday lives. This is strengthened by Murray et. al. when they said that adopting more solar on campus will set a positive example for the students, in hopes that they take the strides the university is making to heart. “Letting students know that the university takes pride in their efforts to preserve the environment could potentially alter the overall behavior of the student body, creating a more sustainable attitude campus wide,” they maintain.

Mentioning Narrative Network (2009, p. 4), Augenbraun says that, additionally, using solar energy produced on campus gives universities a public relations boost as evidenced by the media coverage of institutions that install solar rays. There is often extensive media coverage throughout the design, installation, and commissioning stages of any alternative

energy project. This further helps a university become a more widely known and respected institution both nationally and internationally, the author declares.

The author, who did a solar feasibility for Macquarie University, ends the list by saying that a solar installation on campus provides valuable teaching and learning opportunities. A university with solar technology, the author asserts, can allow students hands-on education with solar energy and can design courses and curricula to take advantage of the opportunity provided by having direct access to a solar installation and its associated data. This may also pave the way for collaboration between students and professors for commercial development of solar technology and cooperation of university leaders for the integration of sustainability and environmental literacy into curriculum and practice, the author adds.

Murray et. al. citing Severin (2014) hold that if schools continue to promote solar projects on campus for educational benefits, that could mean bringing in some donation money as well as potential grant opportunities from nationwide sources. They, too, believe that when an academic institution has a very respected environmental attitude due to its efforts toward campus sustainability, the school would be able to attract new students.

Based on this wide range of possible benefits, the author is proposing the exploration of the use of solar energy mixed with wind energy at the Cagayan State University on a massive scale for a number of noble purposes, primary of which are 1) to reduce institutional and residential spending on energy, 2) to make a lasting impression on students as the use of renewable energy brings them a rich, real world solar and wind energy experience into the classroom, and 3) to show leadership in environmental stewardship.

The Proposal

The planned project is the construction/installation of solar and wind farm at the Cagayan State University - Gonzaga Campus, one of the eight campuses of CagSU (Figure 1.) The campus is located in Flourishing, Gonzaga, Cagayan, a first-class municipality 34-kilometer away from the Cagayan Economic Zone Authority (CEZA) in Sta. Ana town and a less than an hour ride to the Northern Cagayan International Airport in the oldest city of Nueva Segovia (now Lal-lo).

Figure 1. Map of CagSU showing the location of its eight campuses

CSU Gonzaga Campus Administration Building. Photo courtesy of Google

The planned farm consists of a solar facility with panels built on the roof of college/administration buildings and on the farm demonstration sites planted with high value agricultural/commercial crops such as coconut, cacao, pineapple and seedlings of fruit bearing trees, which will be grown and sustained by a water/irrigation system run by the generated solar energy from the panels and from the supplemental electricity produced by the solar-energy operated wind turbines to be built on the unproductive spaces within the 2,000-hectare thickly forested mountain which backdrops and shields the campus during typhoons.

The planned facility, which, according to Yzon (Personal Communication, December 10, 2016), an electrical engineer, can start with the solarized roofing first because it is the quickest to install, will be considered as a teaching and research laboratory of engineering, especially electrical, civil, mechanical and electronics engineering, business and information technology students (Ibanez, Personal Communication, November 10, 2016). This is to enhance and enrich the curriculum of the programs which have courses related to renewable and alternative energy and sustainability and environmental literacy, which, when this project succeeds and earns a national and an international mark for the university, can later on be integrated or infused across curriculum and campus practice.

The planned project, which may be replicated in or expanded to other campuses, has a four-fold of objective:

1). To support government's program for clean, sustainable and self-sufficient energy source and disaster preparedness and risk mitigation;

2). To generate megawatts of electricity that will cut down the institution's energy costs and to supply generated energy (stocked) to local electrical utility for distribution to nearby barangays (and towns later) to be credited to the University as an income generating activity;

3). To advocate for 'green' society/campus by reducing the school's carbon footprint and too much reliance on the finite resources of fossil fuel such as natural gas, oil and coal; and

4) To boost institutional ranking/position/reputation in the field of public higher education in terms of sustainability and self-efficiency and research and development along alternative/renewable energy.

Proposed project's consistence with the mandate of the University and regional, national and international development goals:

The proposed project is relevant and consistent with Presidential Decree 1436, the law that created the University, which provides that CSU will and "serve as an instrument towards the rapid development of the national and manpower resources of Region II, particularly of the Province of Cagayan" and "…provide better service in professional and technical training in the arts, sciences, humanities, and technology and in the conduct of scientific research and technological studies."

The decree signed on June 11, 1978 further states that the University was created in order "to hasten the realization of the national goals as well as enhance regional development."

Also, the planned project is consistent with the Cagayan Valley Development Plan 2011-2016 which highly supports efforts for a modern and competitive agricultural sector, the strongest in the economic sector and comprises 40.9% of the region's gross regional domestic product (Chapter 3-5) and which also supports investments on increasing power generation by encouraging "LGUs to develop cheaper alternative renewable energy sources in Region 02 such as wind, solar, water and bio-diesel." (Chapter 4-9)

This, too, backs up the sector outcomes 4.b and 4.c toward the attainment of government's efforts for a competitive and sustainable agriculture and fisheries sector as presented on page 38 of the 2011-2016 Philippine Development Plan.

The project is likewise in line with nine (of 17) of United Nation's Sustainable Development Goals: 1) No Poverty, 2) Zero Hunger, 4) Quality Education, 7) Affordable and Clean Energy, 8) Decent Work and Economic Growth, 9) Industry, Innovation and

Infrastructure, 11) Sustainable Cities and Communities, 12) Responsible Production and Consumption, and 13) Climate Action.

Project Fund Sourcing, Co-Proponent and Stakeholders Involvement:

To be procured via the Private-Public Partnership arrangement due to the large amount it will cost the University, the planned project will involve as proponent the local government unit of Gonzaga, one of the agencies of government mandated to promote sustainable and renewable energy in the region. Other significant partners such the CSU Board of Regents, Cagayan Electric Cooperative, Department of Energy, Department of Environment and Natural Resources, Department of Science and Technology, Department of Agriculture, Office of the Provincial Governor, Cagayan Provincial Council and the Regional Development Council will be consulted to determine their take about and clarify their concrete engagement in the planned farm to be set up in two to three years. This will also be a fertile opportunity to deliberate on the legal, political, environmental and socio-economic questions that may be leveled up for and against the plan.

Following a built-operate-transfer contractual agreement, the farm project will later be a potent space for the establishment of a Center for Renewable and Sustainable Energy, Food Innovation Hub and Training Center for Agro-fishery and Livestock Management (ala-Local Government Academy style) and for major events that will place Gonzaga and CSU and Cagayan as a whole in the national and international spotlight. Because the proposed site is near CEZA, CSU will also soon invite locators especially business incubators and investors for research and IT parks in the area.

Project target beneficiaries and viability indicators:

The beneficiaries include students and faculty members (especially those who come from the College of Engineering which is now gearing toward Level III accreditation), researchers, local government units, local electrical utility, local farmers, business locators, households, small and medium scale entrepreneurs and the transportation sector are some of the target beneficiaries of the project. Parents and relatives of students and staff will also get benefited of the project as they will be prioritized to be part of the manpower resources of the project.

The delivery unit that will be mandated to implement the project is the College of Engineering with help coming from the Campus and University Administration, College of

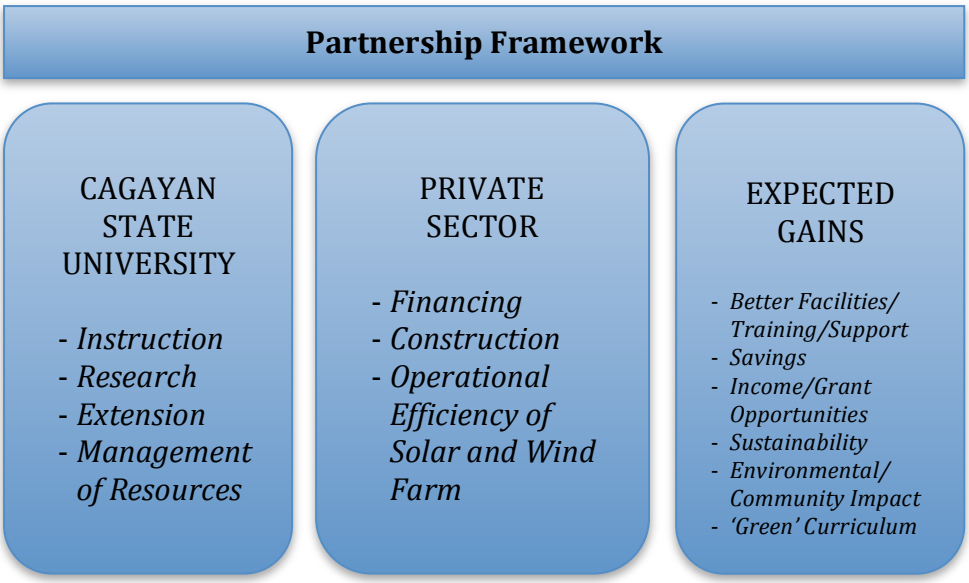
Information and Computing Sciences, College of Business Entrepreneurship and Accountancy, University Business Affairs Office and the University Financial Management Office.

In summary, the writer lists here some of the many viability indicators of the planned project.

1. CSU and the areas in its periphery will save a lot of money for energy costs.
2. Project will create jobs for the locals (including parents and relatives of students and faculty members).
3. Project will make healthy people, healthy environment, healthy animals, and beyond.
4. Project will continuously train students, faculty members, skilled and non-skilled workers and technical workers, who will generate streams of higher income over time.
5. There'll be an increased production of high value commercial crops that will generate revenue for the campus and for the local government due to the sustainable irrigation system powered by solar and wind energy.
6. If CagSU will do well in this technology, research grant opportunities from government and private organizations will be expected to increase.
7. The presence of such an innovation and practice in the campus will attract more students who will be convinced to also be stewards of the environment themselves.

The overall design of the planned project, which is listed by PPP Center as one of the projects eligible for PPPs (Ricote, 2016), is captured in the following framework shown in Figure 2. The project is grounded on the concept of partnership or collaboration of Cagayan State University with a private agency for the establishment of a 'green' university through the installation of a solar and wind farm on campus. The left side of the framework depicts the different mandated mission the University needs to fulfill and the services it offers the community. The center section represents the main activity that CagSU wants the private sector to deliver in order to beef up, enrich and enhance the mission and services of the University. The main activity is the construction, installation, maintenance and operation of a solar and wind farm on campus. The right side depicts the different expected gains that we can accrue from the engagement/collaboration between CagSU and the private sector.

Figure 2. Project Conceptual Framework



Implementation Plan

Leading the path toward the implementation of a green energy program in a massive scale in CagSU is going to be a huge endeavor one cannot achieve without the help of many people inside and outside the University who have direct and indirect interest or stake on the outcome of the project. Aside from the need to engage with these stakeholders in many different fashion given their range of expertise, influence and power on the success (or possibly failure) of the plan, it is also essential to think about available resources to fully realize the planned project and about efforts for an effective resources management in cases where these are scarce or not at our disposal. Plus, we also need to give premium consideration on the element of time to ensure that the project goes according to plan with minimum risks.

This part discusses in detail the different tasks, activities and timelines to show exactly how the proposed project is going to run from its conceptual stage to execution phase.

The preliminary stage of any development project such as the proposed solar and wind farm in CagSU is the conceptual design phase. This phase is already ongoing with the author, he not being an expert on the matter, trying to collect related information and other inputs using all possible research gathering tools to develop this piece which, to the author's mind, is admittedly rough and tentative. After this concept paper (HIT plan) shall have been

presented to the colloquium panel on January 14, 2016, the author shall make efforts to polish the paper based on the inputs of the members and on those additional data drawn from supplemental interviews with people in-the-know, paper and electronic trail and personal visits to sites done while on break in December until February of the following year.

When ready, the concept paper, through the support of the University President, shall be included in the Agenda of the first regular meeting of the CagSU Board of Regents (BOR), which is usually calendared last week of March.

Seeking guidance and assistance from internal experts, the author will work on the improvement of the concept paper to comply with the comments and suggestions of the BOR. He will have until May 2017 to do this task. He will spend this time for extra reading, discussing ideas offline and online with potential partners, and calling in some more experts—electrical, civil and mechanical engineers preferred—for advice. This may also be a very opportune time to get into public consultations and other open consultation activities to seek the views of the stakeholders like the faculty members and students of the College of Engineering, College of Business Entrepreneurship and Accountancy, College of Information and Computing Sciences, Financial Management Office, parents, local businessmen and local officials and others especially in the area where the green energy system is proposed to be built. Consultations, Confesor (2016) says these activities are important because these are fertile avenues for the leadership of organizations like CagSU to tell the community it serves what it wants to achieve. But, these have to be done with no coercive influence, by listening with empathy, and by bringing assumptions into the open, Confesor warns.

We will not miss this event in the plan, of course. The Public Private Partnership Center (PPPC) shall be invited to assist the University with the implementation of the project and capacitate senior officials, middle managers and other concerned staff on the nature of PPP, impediments or bottlenecks on the implementation of the PPP, project preparation and development and other critical issues affecting PPP projects of government.

After this, the revised, finalized concept paper of the project shall be brought once again to the board for approval during its second regular meeting in June 2017 with the request seeking authorization to hire or procure services of external experts to do feasibility study and to create the Bids and Awards Committee (BAC) for this PPP project. Once the BOR gives the green light, the next step will be to create the project team which will be

covered by a special order from the office of the University President to give it a legal face. This will also happen in June immediately after the board meeting.

In July, CagSU administration shall cause the hiring of competent individuals who will form the team that will conduct the feasibility or project study and will do specific works like the development of the terms of reference or scope of work, identification of deliverables and setting out of other targets and timelines. At this time, the administration shall also have organized the members of the BAC who fully understand the bidding requirements of the project and other rules and procedures consistent with PPP guidelines set by the PPPC, the central coordinating agency for all PPP projects in the Philippines, and other legal frameworks of PPP such as Republic Act 7718 – The Amended Built-Operate-Transfer (BOT) Law, BOT Law's Implementing Rules and Regulations (2012 Amendment), Executive Order 243 Revised Joint Venture Guidelines, Republic Act 7160 – The Local Government Code of the Philippines and its 1991 IRR and the mandate of the agency (Ricote, 2016).

Next is the conduct of the feasibility study probably starting August until September. The activity generally aims to determine the capacity of CSU Gonzaga Campus in implementing a solar and wind farm project considering its present buildings and structures for the solarized roofing, the proposed site of the farm and the communities within the periphery, all are important inputs to calculate how much energy can the campus produce given what it has. The activities shown in Figure 3 adopted from www.unitedsolar.com.ph shall be captured in the feasibility study which will involve at the side engineering students and faculty members as observers (Mabborang, Personal Communication, November 8, 2016).

Figure 3. Solar Energy System Implementation Activities Suggested by United Solar

Apart from the said activities, the team will also do some costing or financial analysis to compute the potential monthly/yearly savings from solar and wind energy system. To do

this, the team will need to review the average monthly electric bill of the campus and of the University, determine how many kilowatt hours are used up each month, and other additional tasks to establish that the project is worth the investment. In this activity, the team shall determine the financial feasibility, particularly the debt service capacity of the project. Areas of inquiry that the team will pursue include comparison of the financial costs of project construction and operation with expected revenue streams over the project's lifetime (Ricote, 2016).

The other areas of analyses in establishing a PPP project feasibility are market/demand analysis, technical study, economic analysis, operational analysis, environmental and social analysis, and risk sharing analysis.

Ricote (2016) describes each in the following. The ones in parentheses are the author's comments.

Market or demand analysis consists of 1) determination of the extent of demand for goods/services generated by the project, 2) expected outputs analyzed in terms of past and present behaviors, and the resulting demand supply gaps, 3) survey of quantity and quality of the goods and services of demanded and the secular trend of this demand are survey, 4) quantification of the expected gap that the project under consideration should be directed, 5) competitiveness of product/service with respect to quality and price.

Technical study identifies alternative ways to carry out the project in terms of size, location, technical features, resource requirements, phasing of implementation, and social acceptability.

Economic analysis determines the project's desirability in terms of its net contribution to the economic and social welfare of the concerned community and the country as a whole.

Operational analysis is done to determine whether the project can be implemented considering the political, legal, organizational, managerial, institutional and other administrative constraints that may impinge on the process of project implementation/operation.

Environmental and social analysis examines the project's potential adverse impacts on the environment and compatibility of the project with the socio-cultural environment in which it is to be introduced. (This is a very vital component of the feasibility because the bulk

of the land area occupied by Gonzaga Campus is now under the National Greening Project (NGP) of the Department of Environment and Natural Resources. The author is told that there are less than 20 families of Agay tribe, the first settlers of Gonzaga town (http://www.gonzaga.gov.ph/?p=144), residing in the NGP site).

Risk sharing analysis is aimed at identifying potential risks that should be managed. Here, possible risks, their triggers and the allocation preferences including risk mitigation measures and recovery mechanisms are listed. (Ricote suggests that contracts should be drawn to ensure the parties manage risks most effectively. Two possible risks for the solar and wind farm project may occur. The first is the slow implementation of the project. The person to be pointed at for this is the project management consultant. The action to be done to mitigate and manage this risk is the conduct of regular monitoring and tracking of the pace of the project activities. The second risk that may be experienced in the procurement stage is what if there is no private company or supplier interested to partner with CagSU. The project team may put up a very effective communication/promotion plan to drum up the project or talk with the local chamber of commerce and industry because it is a potential conduit who can help the University invite more players to vie for the project).

It is important that, in the report of the team, the different stakeholders and their respective roles in the project are clearly spelled out. Already, the author mentioned the specific role of the Board of Regents in the project implementation. The feasibility study team should name other stakeholders, for example, from outside, we have PPP Center, the National Economic Development Authority (NEDA), Department of Finance (DOF), Department of Environment and Natural Resources (DENR). The PPP Center's role is to do initial project review, value for money, commercial/financial viability, bankability and financing structure. NEDA takes the lead to do socio-economic analysis, while DENR assesses the project's environmental impact. DOF does appraisal of risk structure and allocation, fiscal requirements and government undertakings, project's financial internal rate of return, and impact on fiscal sustainability. All four agencies of government, according to Ricote (2016), are involved in the appraisal process for major PPP project such as the proposed solar and wind farm in Gonzaga, Cagayan.

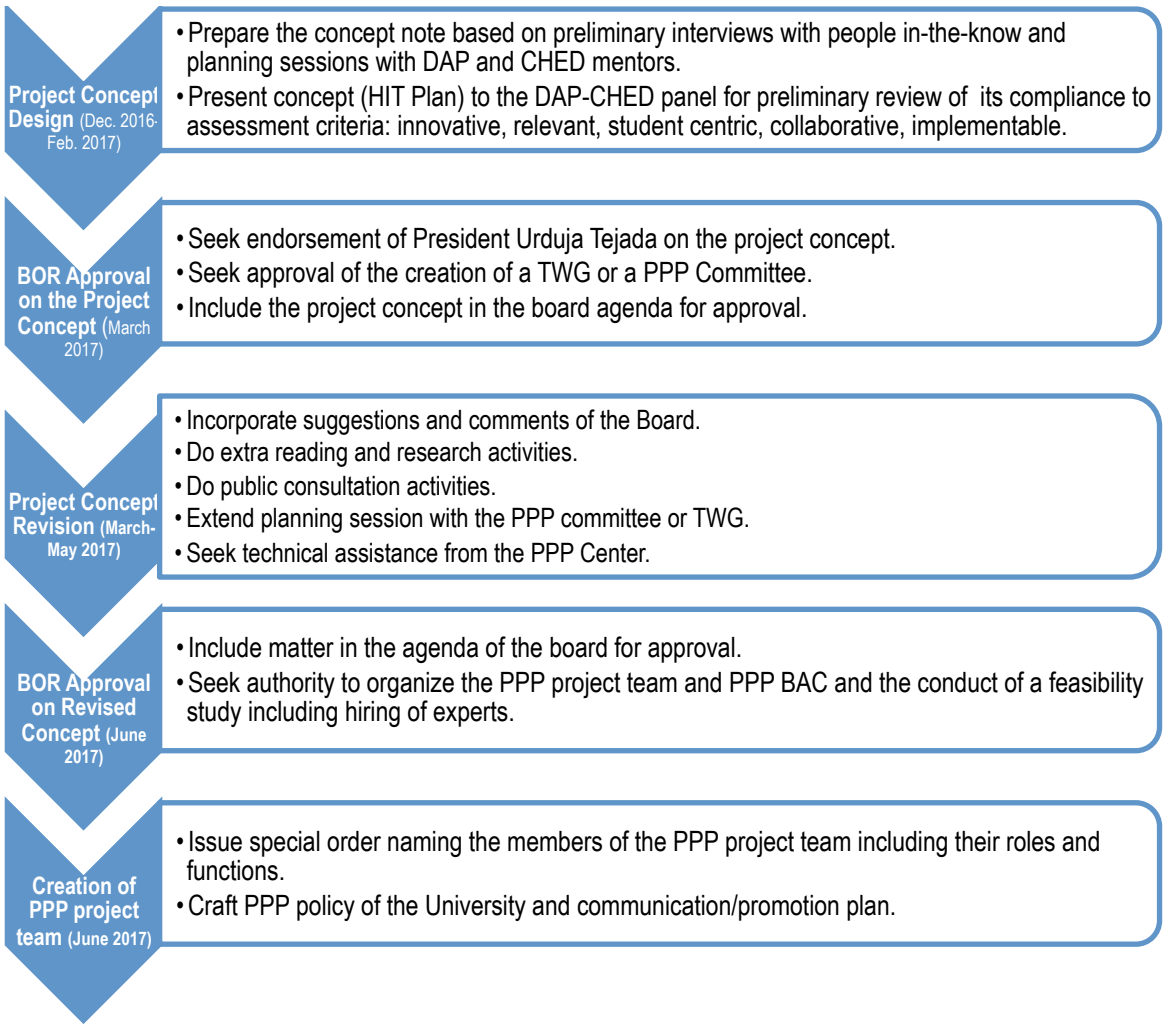
The results of the project feasibility study shall be presented to the Board for acceptance and final approval. Our target for this is September 2017 during the third regular meeting of the highest governing body of the University. As soon as we get the nod of the powerful body, we elevate the matter to the Regional Development Council. If in the study done, the cost of the proposed HIT plan is more than 300 million pesos, the project will have

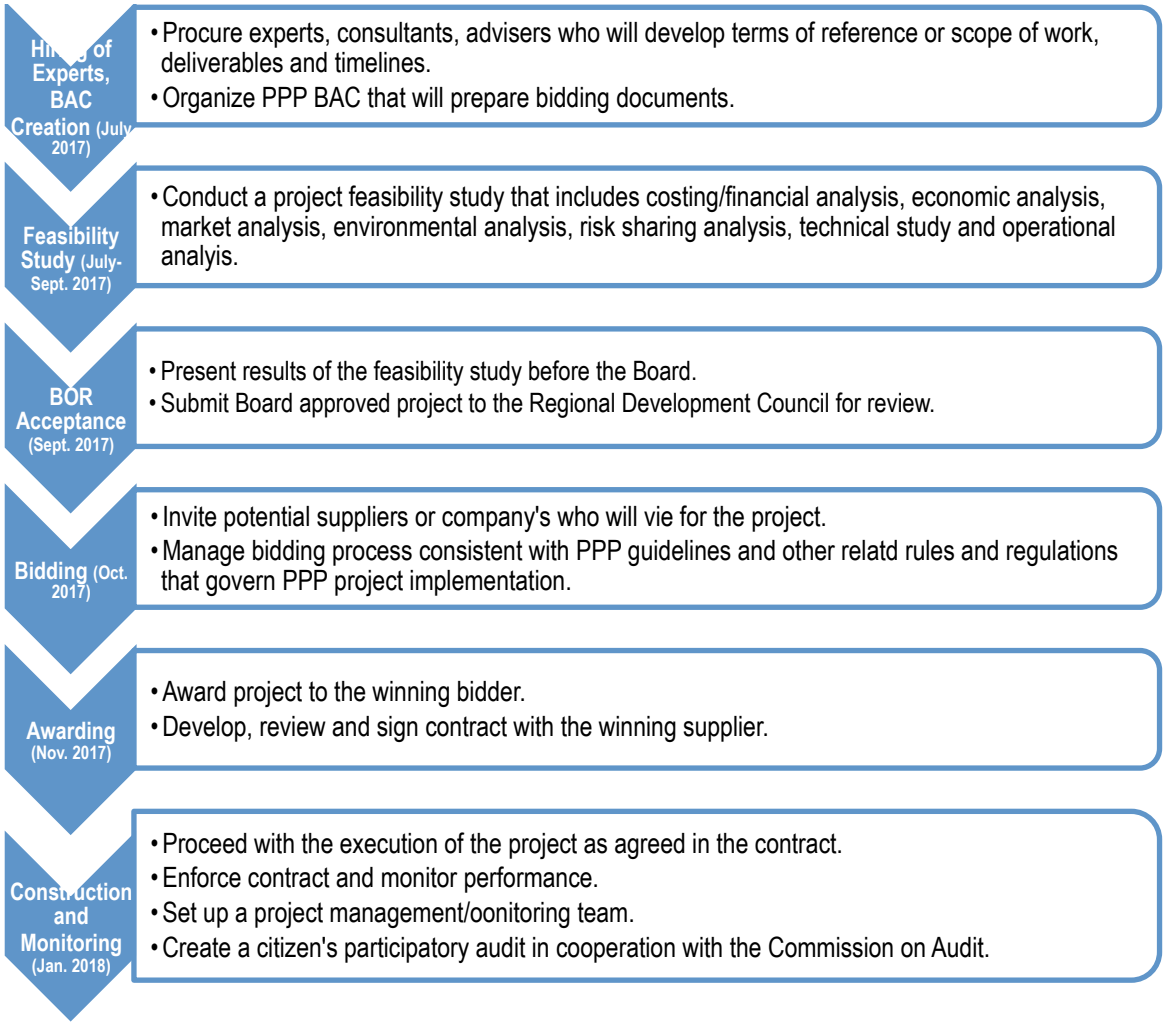
to be brought to the Investment Coordination Committee (ICC) chaired by the DOF secretary for recommendation to the NEDA Board, the body chaired by President Rodrigo Duterte that has the final say on national project implementation.

We can only start with the bidding process until the project earns a favorable decision from the NEDA Board. When this arrives, the created BAC for PPP will commence with the procurement activities strictly following the approved PPP Guidelines and other pertinent laws mentioned earlier.

Contract signing and awarding of the project shall follow as soon as the winning bidder shall have been identified, and in no time, construction begins with a ground breaking or cornerstone ceremony (for the solar and wind farm). Figure 4 tells at a glance the various activities and tasks described in the preceding paragraphs.

Figure 4. Work Plan of the 'Green' Energy Project





Reflection

The HIT plan was a bit of a challenge. I could not believe it until now that I was able to put up something that's so strange from and unrelated to my educational preparation and what I have been doing all my life back in the University. You can just imagine the breadth of adjustments I made and the amount of courage and patience I had to trade in in order to have a good grasp of the concept approved for my HIT plan.

Having found myself berated, humiliated in a mentoring session last month by one of the panel members who dared question my authority to propose a very highly technical subject matter made me almost give up the whole idea of proceeding with the plan. But, that feeling was just momentary. I realized I had to stand my ground because I was picked among many hopefuls to join the first batch of the PhilHECS – EDP for a purpose. So, instead of fainting my interest too soon because of what happened, I built on my admittedly limited knowledge and worked my way toward accumulating ideas and helpful inputs to

make me at the very least a book (or two) away from the others in terms of renewable energy and how it can be infused in the academic function of the University.

I went on engaging my colleagues and friends online and offline in planning sessions. I consulted many people who have a knack for project development and implementation and who have a full understanding of renewable energy and a voracious appetite in the process involved in installation and construction of solar and wind power systems. With the aid of Google and a lot more applications and search engines in the net, I had to read through the pages of online related literature, both foreign and local, apart from those supplied to me by friends for extra self-study. All these reminded me of the best years in college.

Despite my removal from the directorial position and the emotional and physical devastation my family and I went through due the the wrath of super typhoon Lawin, I tried all I can to develop a HIT Plan I hope to implement when my chance comes. Of course, the lessons I got from the EDP modules and from the notes of the invited professors helped me pursue with the plan in great length. Because the proposed project involves the use of government, taxpayers' money, the module that's best applied here is Module 4 – Resource Generation and Financial Management. Topics at work under this Module include resource mobilization of Prof. Joselito Florendo, financial management of Director Ro-Ann Bacal, asset management of Dr. Tirso Ronquillo, and public procurement of Atty. Jose Tomas Syquia. I felt that the inputs of Atty. Carmencita Yadao-Sison on legal landmines and ethics, of President Ricardo Rotoras on SUC governance, and Dr. Arsenio Balisacan on development and challenges in the Philippine economy gave me a good amount of appropriate 'presidential' perspectives not necessarily on the development and operation of the project but on how it can be pursued creatively without circumventing existing laws, policies and thrusts of the government.

But, of all lessons learned, the most important concept that guided me all the way is Prof. Eleazar Ricote's public-private partnership (PPP) project. All the vital information on project development, review and approval, procurement not using RA 9184, implementation and project monitoring and management were seriously considered and could be seen all over this piece. By the way, mention is also needed here that it was really a blessing for me to be mentored even just for a few minutes at the Avatar by Director Ricote. Made gratis for me and other candidates, my mentoring session with him was very enlightening, vibrant, casual, easy, not threatening, and not an interrogation of sort that is loaded with tugging questions coming one after the other. I think that there is a compelling need to get some

more of his breed and caliber into the PhilHECS-ED program. His behavior toward helping others perform better is just so infectious you can readily feel and notice. I will have the same heart for my people when I get my chance to become President or a senior executive of CagSU or any state university I am destined to serve the PhilHECS way.

Other than this, my learning experiences in the University Dynamics Laboratory (in Batangas City) helped me with my work. Already, I mentioned in the preceding parts of this paper that I met Engr. Rogelio Antenor, project leader of Batangas State University's solar power project. He provided me with a lot of helpful inputs and literatures having to do with the BatStateU's proposed solar project to be implemented in its main campus in the city, a two-hour ride to Calatagan town, which, I was tipped off, is one of the largest solar farms in the country. I toyed with the idea of visiting the place while doing the UDL, but, I did not have a considerable time to do so. Besides, I felt DAP personnel might not like the idea of skirting out of the UDL itinerary for this purpose.

I will have my way to go to Calatagan and other solar and wind energy sites during the break to see exactly how renewable energy production works in these areas. In the meantime, I would like to savor the moment, and feel doubly happy at the thought that I succeeded in inking my thoughts and the collective ideas of experts I consulted in one major project: HIT Plan. I hope this work of mine will merit the attention and nod of school and local authorities (Otherwise, it can just be referred to and looked upon future planning of the University). There is no debate. CagSU is faced with the problem on how to approach its humongous energy consumption which is heavily dependent on what the general appropriations act provides each fiscal year. When CagSU adopts the idea, it will make itself a model worth following and a strong statement and commitment for clean energy that will, in turn, attract and convince more students as they see how serious the University is about sustainability and efficiency, and draw more donors, benefactors and supporters from the community who see the mark CagSU leaves as it becomes a beacon for environmental stewardship.

My HIT plan is a very ambitious plan as it espouses for a multi-million worth of government project to be procured through a rather new method (that is, PPP), which, when I become a school head, will be explored and its use optimized or possibly bundled with other resource mobilization mechanisms. But, I think it can be done given the increased level of acceptance and popularity renewable energy is getting in developing economies. The plan is admittedly very limited because I feel that it still contains a lot of tangled thoughts on the subject matter, hence, it really needs to get the appropriate vetting of experts in the

field before it finally sees space in the development agenda of the University. Be that as it may, the message put across in this paper is clear: As a premiere state university in Cagayan Valley, CagSU should start finding a way to harness the free energy coming from the sun and air, and use both efficiently to make herself sustainable now and in the future.

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