

## Category: Energy Efficiency

Following are the teams competing in this category and the solution they have proposed.

### Junkiri

We can't envision a world without electricity, thus it's the ultimate kind of energy. Demand of electrical energy is increased exponentially and to cope up with demand, supply is also increased. More electricity generation may not be sufficient; hence energy conservation is critical. Leaving workspace without turning off the lights and appliances may be one of the major causes of energy wastage. Lighting contributes as much as 20-60% of the total consumption of electric power, therefore it would be a waste of energy if the lights are forgotten to turn off. This energy waste will pile up pressure for generation resulting in a significant amount of detrimental greenhouse gas emissions as more than half of the world's electricity is generated from non-renewable sources. So, improvements are needed to avoid energy waste during unoccupied hours. The lighting system should be controlled based on demand to save costs. For efficient consumption and conservation, we have an idea which is technically and practically feasible. In public and private institutions, the problem of switching off light wherever it is not needed is a concern. To solve this problem, we have come up with an idea of **"SMART BUILDING."** The proposed system uses automation to detect the presence of human in a particular space and control the lighting accordingly. From the POV of security and privacy, we have classified the buildings into two categories: 'Camera Friendly Area' and 'Camera Prohibited Area.' The project involves four stages: the power supply stage, the sensor stage, the controller stage and switching mechanism. To power up the project we will use the power supply of the building itself. Camera will be used in the camera-friendly area of the buildings like, classrooms, halls, staircase, etc. Nowadays, modern buildings are already equipped with cameras to monitor their activities like in schools, universities, factories, etc. We will be using computer vision to detect the approach of a person and control the lighting of the area accordingly. It might not be suitable to install camera in every part of the building. For sensitive areas like restrooms, trial rooms, etc., we will be using PIR sensor and LDR. PIR sensor detects the radiated heat energy from a person, the LDR detects the light intensity and convert them into electrical signals, these signals are fed to the controller. The controller then processes the signal and sends a specific voltage to the relay that actuates the power switch accordingly. When a human approach is detected and the light intensity is less than required then the light is turned on and when nobody is detected, the light is turned off. More to this we can toggle our system from automation to manual control system whenever someone want to overpower automation for that moment. We are thinking about a hybrid technology that's both automatic and manual, so there won't be any problems in everyday life, if one of the platforms fails. The project can be easily installed in any buildings without additional electrical wiring as it can be

easily installed in the existing one. Conclusively, the constructed energy control system enhances the efficient utilization of electrical energy. This project has following positive impacts: (1) Increase the life span of electrical appliances. (2) Efficient utilization of electric energy. (3) Improve building security. (4) Decrease carbon emission for electricity generation. (5) Demand side management

## E-go

Polluted air we breathe is responsible for millions of deaths every year. The leading source of GHG emissions and urban air pollution are on road vehicles. The problem gets worse in developing countries like ours. Hybrid and electric vehicles are the hope for the low-carbon future. However even with many government initiatives, adoption remains low due to high cost, lack of charging facilities and slow pickup. Meanwhile millions of fuel based vehicles ply on the roads and will continue to do so for the coming decades. The challenge is how do we make them greener? We are looking up the challenge of creating clean affordable transportation. **We are trying to increase the efficiency of existing on road vehicles by using regenerative energy from the vehicle itself**, harvesting excess energy from the acceleration and braking to generate power and store in a battery. This excess power is used to aid the regular combustion engine, when the vehicle accelerates reducing fuel consumption.

## Aztec

It is well known fact that the power transmission lines are the circulatory system of our modern power grid. In Nepal, several thousands of the approximately 4800 kilometers of power lines i.e 66kV, 132kV, 220kV and 400kV are still above ground because of the potential dangers due to lethal high voltage. And the great heights from the ground level particularly in the high himalayas and hills, the powerline inspections and maintenance works are still a royal pain in the neck for NEA and corresponding energy sectors. Due to challenging topography, the repair maintenance of the power lines is quite difficult and the outages due to vegetation overgrowth leaves more salt in the wound for the concerned authorities. Thus, Our proposed solution would be the use of UAV i.e. Unmanned Aerial Vehicle which is basically a drone. This drones will inspect the power lines of the areas where to reach is difficult or nearly impossible, in a fraction of time. Drones are equipped with hi-res cameras infused with various AI models with computer vision that can detect faults in transmission lines such as cracks in insulators, rusts in the line, broken screws and faults of the tower and prevents the outages from intruding vegetation. Besides it also detects unseen and unwanted electrical malfunction with the help of thermal and corona cameras. Thus the use of these advanced drones will bring the welcome breath of fresh air for the technicians. Also the efficiency , safety consideration and cost reduction would have it's own benefits through the use of these drones

## Category: Alternative Energy

Following are the teams competing in this category and the solution they have proposed.

### Horizon

As Per the problem stated, a country like Nepal with a vast variation in Land structure and climate, it seems difficult to build climate resilient hydro powers with today's concepts applied for protection of Hydropowers. For this we had come with some ideas 1. Previously stated Nepal is country of climatic variation so hydrological model with daily time steps and time charts for the region hydropower is to be built 2. Flood frequency analyses supported by numerical modelling is to be done in flood alert region near hydropower 3. Further Models like Temperature Model of the area , Soil analysis is to be taken in account 4. Investing in smaller, run-of-river projects can reduce risk.

### Virtuous

Seeing biomass as a source of fuel to cook food is common right? What if we say **biomass can be used as a source of electricity**? Biomass is organic material that comes from recently dead plants and animals. We know that biomass is a very important source of energy in Nepal. About 77% of energy consumption is supplied by traditional biomass energy. The current socio-economic situation of Nepal shows that the use of biomass energy will continue to dominate for quite some time in the near future. To convert biomass into electricity, at first, the biomass is burned in a combustor to generate hot gasses. Then it is fed into a boiler to generate steam, which is expanded through a steam turbine or steam engine. Thus electrical energy is generated. Nepal has more villages than cities, and people here are highly dependent on livestock farming and crop cultivation which produces lots of organic wastes. Organic waste produces large amounts of methane gas when it decomposes, which can be very gratefully useful to make biogas, a renewable source of energy. There are many rural areas in Nepal which still lack electricity, and electricity generation through biogas will be very useful for people in those areas. Our project will make maximum efficient use of organic wastes as  $\frac{1}{3}$  of food produced in the world is wasted on a yearly basis. Electricity generation will ease their lives. Electricity generation through organic wastes will improve the environment, reduce the greenhouse effect. Also, local jobs will be created. can be used all the time i.e. independent of weather cost-effective -The major capital cost items for a biomass power system include the

fuel storage and fuel handling equipment, the combustor, boiler, prime mover (e.g. turbine or engine), generator, controls, stack, and emissions control equipment which is approximately Rs.2-3 crores in large scale.

## Tesla

Prospects of Hydrogen based System in Nepal.It describes the ideas ,how the hydrogen is efficient for nepal.A short calculation of data in comparison to hydropower.

## Sparker

With the increment of energy demand throughout the world, the quick extinguishing of non-renewable energy sources i.e. fossil fuel, nuclear energy, etc., and spreading the energy crisis has already existed. The main problem statement is that in a world comprising of huge energy content, we aren't being able to explore those areas where renewable energy is going to waste. Being able to explore and harness energy from such sites would be an energy revolution. So, our idea is to generate energy from customized, innovatively designed speed breakers from our urban streets which are kept to reduce the speed of vehicles to prevent accidents. The Project is basically called, "**Energy generation from speed breaker**". Its working mechanism is, we design a vertically movable speed breaker section instead of a concrete one and it is held and balanced on top original position by spring. The crankshaft (Or Rack and Pinion) is arranged between the speed breaker and shaft. So, whenever a vehicle passes over the speed breaker, it presses the section downward in a balanced way it brings reciprocating motion to the part and it causes to rotate the shaft with the help of a crankshaft. The rotating shaft is further arranged with a chain sprocket arrangement to increase the speed of the shaft (by increasing gear ratio) and in the last step, the shaft is connected to a generator of appropriate rating, which produces energy when the system is operated. The generated energy can be conserved in a battery by using a charging circuit and voltage regulator in order to avoid random incoming voltage range and intermittently producing voltage affect battery life. The harnessed energy could be used for lighting street lights at night or we could use it to charge swappable batteries for electric vehicles. This idea could be equally or more implemented in gym centers and fun parks.

## Category: Demand Side Management

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### ReadME

1. During 7am-9am and 6pm-9pm, peak load occurs on Nepal's power systems. This peak load is around 1.5-2 times more than the base load. This has made NEA to install a large number of power plants which, during most time of the day, remains lightly loaded.

2. During the load shedding era, most of the households in the urban areas had installed at least one battery and inverter system, which after the eradication of load shedding have become obsolete.

Objective: To use these battery and inverter in houses and to manage the power consumption of houses in such a way that the peak load can be shifted to some off peak hours.

### Beginners

The popularity of EV has now started to grow up. It is well known that the replacement of existing vehicles with electric vehicles will definitely bring positive impacts on the environment. But the main problem in electric vehicles is its charging problem and installment of charging stations since main transmission line is not available in every area of Nepal. The possible cause of the problem is due to the lack of good mapping and research of possible alternative energies in respective areas. So, **we are thinking of making a roadmap that shows the charging stations all over Nepal. This will make the EV users convenient in using EV.** Proposed solution: In order to replace vehicles with electric vehicles, we have to study and research the roadmap on Nepal. Since main transmission line is not available in every area of Nepal, there is a problem in installing charging stations. We shall first study all the highways and find out the possible places where there is no main transmission lines. We should first target the tourist areas at high altitudes or remote areas having no main transmission lines. We should study the topography and geographical aspects of that places and find out possible alternative sources of energy there. Eg: Wind energy, solar energy, geothermal energy, local hydroelectricity, etc. So our proposed solution to the problem is designing the roadmap of Nepal mainly including major tourist areas and important rural areas with charging stations powered with efficient alternatives sources.

## STES

The quest to produce renewable energy sources has been increasing ever before. Different techniques have been devised to accomplish this desire. Most of the world's energy come from the coal which produces different types of harmful and greenhouse gases. Gases, produced from coal, cause global warming and climate change. So, to minimize the effect of greenhouse gases we have to produce the clean energy which is possible through different mediums such as wind, solar, biomass, tidal, etc. Amongst which solar energy is most abundant on earth. Though it is diffused and intermittent, a suitable way can harvest enough energy from solar radiation to fulfill today's world energy demand. Energy produced from sun could be abundant, clean, cheap and may last to eternity. The proper research and study may result in better in terms of efficiency and economics. Different techniques that include harvesting solar energy are solar PV cells that convert solar radiation to electricity, solar collectors (SC). Similarly, solar thermal power plants are being constructed worldwide that focus solar radiation to a small spot where enormous amount of heat is generated which is used to boil water and run turbine thereafter. Likewise, solar district heater are also there to heat houses and apartments. Although, they are used in commercial scale, there was always a need to develop the technique that helps for domestic purpose. So, this report demonstrate the methodology to store solar heat for the future purpose. The stored heat is used for heating appliances and other household purpose. The maximum solar irradiation occurs in summer where heating is less required and cooling is required most but the opposite takes place in winter where irradiation is low and heating is required more. Solar heat stored in summer could be a great deal in winter.