

SMALL SCALE SMART GRID CONSTRUCTION, ANALYSIS AND WEATHER TRACKING

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“Smart grid” is a computer-based remote controlled automation for delivering, consuming and conserving electricity. These systems allow two communication between the user and the grid, which is followed in the industries. Advanced higher end electricity networks, are being used to transfer the electricity from the power plants and wind farms, to the consumers of electricity in homes and businesses. The benefits are centrally focussed on consumers mostly seen as vast improvements in energy efficiency on the electricity grid and in the energy users’ homes and offices. In the past decades, humans manually visit the places where the electricity demand is being faced and they manually resolve the problem. The measuring instruments used by the workers maybe broken or may show incorrect readings which leads to poor regulation and poor clearance of the fault. Hardly any of the instruments used in measuring and transferring electricity are being automated. The opportunities available for us in the current scenario to automate the electric grid are immense. In this paper we also discuss how smart grid can also be used in advanced mode by using weather monitoring system and thus saving electricity from over consumption.

2. KEYWORDS:

Smart grid, PHEV(plug in hybrid

4. ACHIEVEMENTS:

In national leadership role, the key stakeholders from industry, academia, and state governments are partnered with OE to modernize the nation’s electricity delivery system. OE along with its partners identifies research and development (R&D) priorities that address challenges and accelerate transformation to a smarter grid, supporting demonstration of new business models, policies, and societal benefits in addition to the basic smart grids. The advancement of this transformation through cooperative efforts of the National Science and Technology Council (NSTC) Subcommittee with the OE on Smart Grid and the Federal smart Grid task force.

Designed with a unique purpose, the electrical grid which is currently used in the United States (US) is formed with a single purpose to “keep the lights glowing”. The system is centrally planned to control the fluctuations in energy demand. The energy demand is growing rapidly as the nation and the economy becomes increasingly digital.

5. FEATURES:

- Decentralization of energy production and storage, by incorporating renewable energy as generation is widely obtained from local solar panels from homes, wind turbines, and other forms.
- reliable two-way communication from end users or appliances and the energy network
 - A tremendous reduction in cost
 - Reduction in waste and emissions
 - Researches can be done in the areas of Super conductivity and power electronics to improve the smart grids.
 - This system has integrated a weather sensor to predetermine the amount of electricity that will

7. SYSTEM OUTLINE:

The Smart Grid contains four main categories: sources(renewable and non-renewable), storage(bulk and dynamic), sinks(both static and dynamic), and the control system(sensing and control). The other important part of this is solar panel and the weather tracking system. The precise batteries with considerable capacity should be used. The controller is the integral part of this whole system. It does the function of switching between the renewable and the non-renewable energy sources. This is manually done by the method of coding in any of the software mainly ETAP, LABVIEW, and MATLAB etc.

8.APPLICATION IN DAILY USE:

- A huge industry which installs smart grids and supply power on a commercial basis sends the energy to a distribution centre, from where it can be sent to different destinations based on the consumer needs.
- The power lines that reach the customers also have certain sensors which are used to measure the amount of power that is being supplied to the given destination.
- These sensors also send back the information to supplier about the amount of electricity being used, so that the supplier can track the area of high use and can provide a proper supply.
- A monitor is also installed on the consumer end to track the amount of electricity they use.
- Unnecessary power sent back to the grid can be stored in batteries and can be sent back to the companies for distribution in other areas.

9. ADVANTAGES:

- The maintenance cost of the smart grid is very low.
 - Higher customer satisfaction is obtained due to the installation of smart grids in homes.
 - Increased asset utilisation of renewable resources is obtained.
 - Losses' occurring in transmission and distribution of the electricity is reduced.
 - Transmission congestion costs are reduced.
 - Peak load and energy consumption is identified and the system provides an alert message and disconnects itself from the main grid if instructed.
 - Increased intelligence enabling advanced control and improved operator understanding of the electric grid.
 - The life of the apparatus and the instruments is improved by the usage of smart grids.
 - The productivity is improved by the information provided by the smart grid.
 - The weather forecasting compared with the load forecasting provides efficient and a precise amount of the electricity required and the amount of electricity produced.
 - The smart grid installation in homes facilitates the usage of the plug in hybrid electrical vehicles.
- The weather tracking system provides an accurate information about the exact amount of electricity produced, which helps us to know the amount of electricity we will have and helps us to control usage

3. OVERVIEW

A Smart Grid is a new approach to the field of energy infrastructure. It empowers the user to have a secure and a safer energy grid, and it is capable of being more economical, environment friendly and efficient than the current energy grid system that is currently used in every other part of the world. The definition of a Smart Grid which is newly emerged has not been universally defined, which leads to various competing definitions. The definition varies from involving the installation of smart meters in homes to integrating decentralized energy sources into the grid. The European Regulators'

Group for Electricity and Gas uses the following definition:

“Smart Grid is an electricity network that can cost efficiently integrate the behaviour and actions of all users connected to it – generators, consumers and those that do both – in order to ensure an economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety”.

The number of applications that can be used on the smart grid once the data communications technology is deployed is growing as fast as inventive companies can create and produce them. The benefits of smart grids include highly improved cyber-security,

handling renewable energy sources of electricity like wind and solar power and even integrating electric vehicles onto the grid. Smart grid technology or services is offered by technology giants, established communication firms and even brand new technology firms. be produced in the grid and this is an added advantage.

- This system improves the decision making capacity of the user by providing a wonderful user interface and decision support.
- It is possible to even sell the solar power generated if it is excess and not used.
- Each and every part of the system is able to send real-time information and can communicate with the end user.

6. DESCRIPTION:

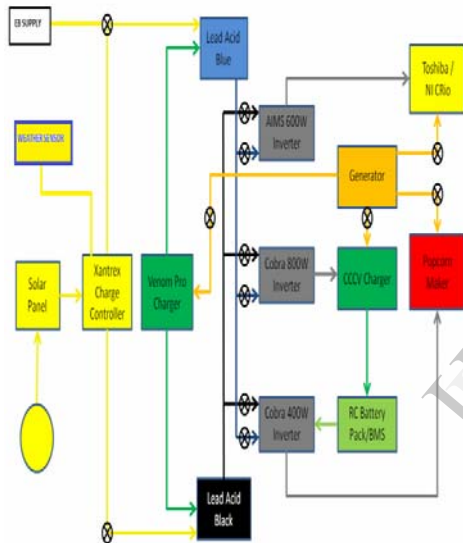
Solar energy is possible as a bulk source of energy, but it is more often implemented as an auxiliary reserve source of power. Two distinctive battery banks store the renewable energy for immediate or later usage. Conventional or renewable sources can deliver power to three distinct sinks in the system. A gasoline generator can be plugged directly in order to charge the batteries using a conventional grid. A higher quality inverter and two cobra inverters produce 120VAC from 12VDC battery storage. The two Cobra inverters are modified sine wave inverters which are less efficient, while the power inverter produces a higher-efficiency pure sine wave to allow for a comparative analysis. Controlling the charging and discharging of the PHEV pack is an Elithion Lithiumate consisting of circuit boards attached to each parallel set of cells in the series, a Hall Effect current sensor and a controller. This measures each individual cell's voltage using the cell boards and monitors the current flowing into or out of the pack using the sensor. Each PHEV vehicle on the market has a unique battery pack; hence, it acts to charge and balance the cells properly in order to protect the battery pack and prolong its lifetime. This uses relays to control the charging and discharging of the battery pack while protecting against under-voltage, over-voltage and discharging and maximum charging currents. The solar panel was deployed in slightly hazy conditions for a 29-minute test, providing a varying output ranging from 6.66 to 18.74W. Overall, when the solar panel output was at its maximum, the efficiency is high. We can interface a weather tracking system and decide the mode of operation of our utilisation of energy i.e. we can switch to grid power when solar power is low and constantly charge the car without any obstructions. This way we can save power in a procedure that we need to charge only the grid and not the car directly which would consume extra energy. Although this smart grid technology is not new the weather tracking system has not been implemented so far and is believed to achieve satisfactory

SOLAR PANEL:



11. CONCLUSION:

Making the autonomous easy to operate for the user and the designers should concentrate more in producing autonomous cars. So that we could find ourselves using these autonomous cars in the near future. Due to speed control technique, accident free driving is possible and fuel saving is also made possible by the technique. The proposed system is implanted in manually driven cars also for safety without taking away the pleasure of driving.



10. DISADVANTAGES:

- The smart grid mainly depends upon the renewable energy resources, so when the weather is bad, the source is not available.
- The smart grid does not depend on a single device. It depends on various Batteries for Plug-in Hybrid Electric Vehicles (PHEVs): technology components such as: software, the power generators, system integrators.
- There are lots of difficulties faced in the installation of the smart grid and so, not every company is ready to invest in the smart grid installation.
- The infrastructure instruments are costly and pose a threat.
- The smart grids use two way transmission of the power through transmission lines, for which a typical transmission lines are used, which we need a tremendous amount of initial investment.