

**1. Title:**

A Survey on Smart Grids Technologies: Communication, Technologies, and Standards.

**2. Type of Project:**

Survey.

**3. Keywords:**

Smart grid, Wireless technologies, Wired Technologies, Advanced Metering, Challenges, cybersecurity.

**4. Problem Statement**

Smart grids modernize the transmission of power in a safe and secure manner, laying the groundwork for new market structures and a higher level of customer care. They are a significant enabler for GHG mitigation because they boost renewable generating hosting capacity, make better use of existing power infrastructure, and improve resiliency. The grid is smart because of digital technology that enables for two-way communication between the utility and its consumers, as well as sensing along transmission lines. The Smart Grid, like the Internet, will be made up of interconnected controls, computers, automation, and new technologies and equipment, but in this case, these technologies will interact with the electrical grid to respond digitally to our rapidly changing electric demand.

The primary goal of smart grid technology is to ensure optimal data flow in a wired or wireless environment. There's always a tradeoff between the wired and wireless smart grids with their own set of merits and demerits in the preferred environment. The basic difference in both the approaches is how the flow was enabled. For the wireless smart grids, the flow was between the data centers and smart meters, whereas in wired systems, the flow occurs between the sensor and electrical appliances. Benefits of the Smart Grids: Better utilizing existing capacity of electricity assets, Increasing the penetration of renewable generation, Increasing the reliability, resiliency and flexibility of the power system, Maintaining cyber security, Reducing greenhouse gas emissions.

This survey paper discusses the smart grid communication technologies that are now available and their potential benefits. The main objective is to understand the transition from existing old legacy electric networks to smart grids. Most of the advanced countries have started investing heavily in the smart grids to be the future world beater in terms of achieving the sustainable energy. The smart grid will play a significant role in the future. In 2020, the industry's expected valuation was over \$400 billion; and the global smart grid market is estimated to invest \$2 trillion by 2030. This survey is meant to give participants a thorough understanding of the technologies, applications, and research problems.

**5. Project Objectives**

Understanding the communications technologies available for smart grid:

- Smart grid communication technologies: a look at what's new? Technologies available in the market. Zig-bee, Z-wave etc.
- Comparing the existing old legacy electric networks to smart grids.
- Our project's main goal is to gain knowledge and understanding of various aspects of smart grids, as well as the technologies that can be used in fields such as generation transmission and distribution, home security, and cybersecurity.
- Smart Grids over the years. Advantages and disadvantages of the current technologies.

- Insight into the smart grid's security concerns and roadblocks. Security and standards for different kinds of smart grids.
- The main objective of our project is to gain knowledge and learn about various aspects of smart grids along with its technologies that we can implement in various fields like generation transmission and distribution, home security, cybersecurity.

## 6. Project Procedure/Technical Activities

Our motivation come from the fact that nothing is perfect, and the vulnerabilities always prevail in so many other ways. When we have trouble in transferring the data between two persons perfectly imagining two grids which are full of encoders, decoders and several other equipment's definitely need to have a concrete security implementation else there would be consequences with disastrous impact.

**Step 1:** To understand the current grid architecture and their functioning while surveying about the requirements to implement a smart grid based on specific grid. Because the connection in the grid defines how robust, mobile, or fixed generation plants are required for that particular grid. The grid architecture can be defined based on its locality and the reach of the grid. For example, HANs, BANs, NANs.

**Step 2:** Smart grid security challenges. We shall have a good observation and analyses all possibilities of the vulnerabilities in the grid such as connectivity, power shortage, latency etc.

**Step 3:** Grid communication requirements. We shall highlight the optimal ways for the grid components to communicate with less power consumption, latency to avoid any lag or delay in relaying the information.

**Step 4:** Discuss the current technologies with their advantages and disadvantages depending on their grid capacity and nature of its use.

**Step 5:** Survey on the standards which are currently in place for smart grids incorporated by various countries at different scalability levels. These involve substation automation, process field buss (PROFIBUS) and Revenue Metering Information Model many more.

**Step 6:** Security in Home Area Network device communication measurement control and cyber security.

**Step 7:** We shall conclude this report without surveys on various on which the smart grids are built on and we shall provide our insights too.

The survey report is divided into five parts in order to present the detailed vision. They are Data collection, Analyzing the data, Summarizing the views and opinion, Reviewing the paper and Presentations

## 7. Workload Distribution for Each Group Member

Tasks	Nithish Reddy	Siva Teja
Data collection	•	•
Analyzing the data	•	•
Summarizing views/opinion	•	•
Reviewing the paper	•	•
Presentations	•	•

## 8. Expected Result and challenges

Through this survey report we would like brief and highlight the current status of the smart grids also the to what extent the security and communication is helpful in the grid along with the measures involved in considering the necessity, difficulties and the security measures adopted and need to be worked upon for a better grid. We would also like to highlight the areas of improvements along with the ideas that might impact the upcoming short comes of the grid.

## 8. Project Timeline

Timeline	Topic
Week-1	Overview of smart grid and its infrastructure.
Week-2	Examples of Protocols and encryption algorithms.
Week-3	Briefing and understanding the protocols.
Week-4,5	Identifying the sources of vulnerability in grid.
Week-6	Analysis of grid models.
Week-7	Future prospects of smart grids
Week-8	Finalizing the report

## 9. References

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