LITERATURE REVIEW

1. **M. M. Ahmed. (2008)**, The development of a Supervisory Control and Data Acquisition (SCADA) based Remote Terminal Unit (RTU) for customer side distribution automation system (DAS). It is to apply automation technique for operating and controlling low voltage (LV) downstream of 415/240V. The SCADA system developed provides fault isolation operation, monitoring and controlling functions for the operators and data collection for future analysis. An embedded Ethernet controller is used as RTU to act as converter for Human Machine Interface (HMI) and to interact with digital input and output modules. RTU is the master and digital input and output modules are the slaves. RTU will initiate the transaction with the digital input and output modules. Two proprietary software systems are used are to develop algorithm for the controller and to develop HMI for monitoring and controlling functions for the operator.

2. **Dennis j. Gaushell et .al (1987)**, The acquisition of data, the processing of those data for use by the operator, and operator control of remote devices are the fundamental building blocks upon which all modern utility control systems are based. The systems to accomplish these functions are known as Supervisory Control and Data Acquisition (SCADA) systems. This paper provides an overview of the functions of SCADA and the fundamental operation of SCADA systems, including a brief description of the key man-machine interface. Several of the key issues and problems in modern SCADA systems, i.e., message standards, system performance testing, and system obsolescence are discussed. The paper concludes with the current trends toward distributed processing, improved man-machine interface, standard systems, smarter RTUs, and standard software. The authors‘ view of the future, using interchangeable system parts, is provided.

3. **O. C. Osunbor1 et .al, (2017)**. A descriptive analysis of automated supervisory control and Data Acquisition(SCADA)-based monitoring and remote control of circuit breakers. The automated supervisory control and Data Acquisition (SCADA) system architecture has two main parts – The Hardware and The Software. The hardware comprises the circuit breaker monitor (CBM), the personal computer(PC) concentrator and the Global Positioning System (GPS) clock receiver. The circuit breaker is made up of the intelligent electronic devices (IEDs) which are
found in the breaker cabinet in the switchyard. The global positioning system (GPS) receiver and the personal computer (PC) concentrator are also found in the control house. A point to multipoint (wireless) connects the personal computer concentrator with the intelligent electronic device. This kind of arrangement work as master-slave architecture. The circuit breaker monitoring slave unit is positioned at each breaker in the switchyard and are wired together to achieve the signals from controlled circuit breaker.

4. Kirti –(2017), Survey on SCADA: Supervisory Control And Data Acquisition. This discussion is centered on overview of SCADA, History of SCADA, security issues, security in SCADA, and application of SCADA, operation of SCADA. SCADA systems perform data collection and control at the supervisory level. Some SCADA systems only monitor without performing controlling functions, but these systems are still referred to as SCADA systems.

5. Shuangshuang Li et al. (2017), An effective Supervisory Control and Data Acquisition (SCADA) system can improve the reliability, safety and economic benefits of a micro grid operation. In this research, the lower central controller and upper WEB (World Wide Web) monitoring system are connected by the SCADA system, which is the hub of a micro grid intelligent monitoring platform. This system contains a set of specific functions programmed by Java as a middleware and can provide communication and control functions between the central controller and the upper monitoring system. For the sake of security and stability of the micro grid, the SCADA system realizes business processing on real-time data acquisition and storage, load balancing and resource recovery, concurrent security processing, and control instruction parsing and transmission. All those functions were tested and verified in actual operation.

6. James Formea et al. (2016), Supervisory control and data acquisition (SCADA) systems date back to the early 1960s and have been widely used by large utilities since the 1980s to remotely monitor systems in real time. Through the data provided by SCADA systems, investor-owned utilities have been able to improve grid reliability, proactively detect and resolve problems, meet power quality requirements, and support strategic decisions. However, SCADA systems no longer need to be relegated to control room settings that support large systems with dedicated staff. The basic technology that supports SCADA can now be cost-effectively scaled to smaller
systems with as few as just one substation. This paper will highlight how smaller utilities may benefit from SCADA functionality, perceived barriers to implementation, typical requirements, technical considerations, and best practices for engaging engineering and construction partners from recent projects.

7. Quan Zhou et al. (1 July 2017), The construction of large-scale wind farms results in a dramatic increase of wind turbine (WT) faults. The failure mode is also becoming increasingly complex. This study proposes a new model for early warning and diagnosis of WT faults to solve the problem of Supervisory Control And Data Acquisition (SCADA) systems, given that the traditional threshold method cannot provide timely warning. First, the characteristic quantity of fault early warning and diagnosis analyzed by clustering analysis can obtain in advance abnormal data in the normal threshold range by considering the effects of wind speed. Based on domain knowledge, Adaptive Neuro-fuzzy Inference System (ANFIS) is then modified to establish the fault early warning and diagnosis model. This approach improves the accuracy of the model under the condition of absent and sparse training data. Case analysis shows that the effect of the early warning and diagnosis model in this study is better than that of the traditional threshold method. Keywords: wind turbine; cluster analysis; improved Adaptive Neuro-fuzzy Inference System (ANFIS); fault early warning.

8. Ashish Tiwary et al. (2017), Control recipe represents the detailed instructions to operate chemical batch plants. The design of complete and accurate control recipe is a complex process and requires continuous modifications to cope with the dynamic changes in market demands and product specifications. This paper presents automated solution called AOPS to synthesize master recipe and generate the corresponding control recipe. Master and control recipe are defined on the basis of recipe formal definition language (called RFDL), which enables the smooth and systematic mapping between operating procedures and domain knowledge. Topology editor and user interface are designed and used to capture plant design model and the associated domain knowledge, and to visualize and validate the generated control recipe. A case study of two-stage polymerization batch plant is used to illustrate the proposed solution Introduction
9. **Hosny Abbas et al. (2015)**, SCADA (Supervisory Control and Data Acquisition) is concerned with gathering process information from industrial control processes found in utilities such as power grids, water networks, transportation, manufacturing, etc., to provide the human operators with the required real-time access to industrial processes to be monitored and controlled either locally (on-site) or remotely (i.e., through Internet). Conventional solutions such as custom SCADA packages, custom communication protocols, and centralized architectures are no longer appropriate for engineering this type of systems because of their highly distribution and their uncertain continuously changing working environments. Multi-agent systems (MAS) appeared as a new architectural style for engineering complex and highly dynamic applications such as SCADA systems. In this paper, we propose an approach for simply developing flexible and interoperable SCADA systems based on the integration of MAS and OPC process protocol.

10. **Hemant Jhamnani et al. (2017)**, - The main aim of this work is to Design and Develop the SCADA (Major) and Control System (Minor) of a Solar Plant to continuously monitor various energy parameters. Supervisory control and data acquisition (SCADA) systems are used in solar power plants for monitoring, control, remote communication purpose. The Solar plant does not have any moving parts, as a result we need live and historical details about the plant, so we use SCADA system that monitors all the critical field devices such as inverters, mfm, smb and weather parameters like humidity, temperature and weather. All this is combined to provide a real time and plant comprehensive view of the entire solar plant with continuous alert system, viewed from anywhere (at site/corporate office) - on PC/Mobile Index Terms— Opto22 Snap PAC R1 controller, solar SCADA monitoring and optimization, data acquisition system, PAC Control Pro, PAC Display Pro, Supervisory monitoring and control station.
11. **Solomon Nunoo et al. (2013)**, - This paper investigates the use of internet-based Supervisory Control and Data Acquisition (SCADA) system to monitor power transformer parameters remotely and to investigate into how personnel can have access to their system regardless of their location. There are several parameters that can be monitored for efficient operation of a power transformer, although temperature, voltage, load and bushing condition are considered in this work because they are the major cause of transformer failure. In carrying out this work, the software and hardware components required to carry out the remote monitoring function was considered. Means of preventing hackers from getting access to the network have been considered. The implementation of the monitoring system will help to save running cost by optimizing maintenance schedule and reduce risk of failure to the power transformer.

12. **Manohar GS et al. (2016)**, - To increase the utilization and development of solar energy which is Eco friendly. Weather Predication is done in order to improve the performance and maintain its consistency for long term to deliver secure and reliable power while managing uncertainties. In order to enhance and improve the performance, we need to do preventive maintenance of solar power plant by implementing Operation & Maintenance (O&M) activities using predictive analytics and supervisory control and data acquisition (SCADA). With the help of internet(cloud) along with IOT devices, Operation and maintenance, Supervisory Control And Data Acquisition the preventive maintenance can be improved. Many industries in India are working towards increasing the performance ratio of solar power plants in large scale. In this paper we present a comparative study to improve the performance of solar power plants through IOT and predictive analytics. Keywords: IOT, solar energy, scada, O&M

13. **Engin Ozdemir et al. (Jan 2016)**, SCADA is the acronym for “Supervisory Control And Data Acquisition.” SCADA systems are widely used in industry for supervisory control and data acquisition of industrial processes. Conventional SCADA systems use PC, notebook, thin client, and PDA as a client. In this paper, a Java-enabled mobile phone has been used as a client in a sample SCADA application in order to display and supervise the position of a sample prototype crane. The paper presents an actual implementation of the on-line controlling of the prototype crane via mobile phone. The wireless communication between the mobile phone and the SCADA server is performed by means of a base station via general packet radio service _GPRS_ and
wireless application protocol _WAP_. Test results have indicated that the mobile phone based SCADA integration using the GPRS or WAP transfer scheme could enhance the performance of the crane in a day without causing an increase in the response times of SCADA functions. The operator can visualize and modify the plant parameters using his mobile phone, without reaching the site. In this way maintenance costs are reduced and productivity is increased.

14. **Parth Desai et al. (2014)** - SCADA is an acronym that denotes Supervisory Control and Data Acquisition. SCADA is a control system with applications in managing large-scale, automated industrial operations. Factories and plants, water supply systems, nuclear and conventional power generator systems etc are a few examples. The SCADA system consists of one Central Terminal (which could be several kilometers away from the site of operations) and one or several remote sensor terminals close to the site of operations. The sensor units send data to the central terminal which monitors and manages this data. Communication devices, a user interface and the software to make it all work together complete the picture of what makes a SCADA system. Automation systems in a power utility are required for generation, transmission, distribution and management of power in order to increase the efficiency of a power utility.

15. **James Formea** - Supervisory control and data acquisition (SCADA) systems date back to the early 1960s and have been widely used by large utilities since the 1980s to remotely monitor systems in real time. Through the data provided by SCADA systems, investor-owned utilities have been able to improve grid reliability, proactively detect and resolve problems, meet power quality requirements, and support strategic decisions. However, SCADA systems no longer need to be relegated to control room settings that support large systems with dedicated staff. The basic technology that supports SCADA can now be cost-effectively scaled to smaller systems with as few as just one substation. This paper will highlight how smaller utilities may benefit from SCADA functionality, perceived barriers to implementation, typical requirements, technical considerations, and best practices for engaging engineering and construction partners from recent projects.

16. **Rajeev Kumar – et al. (2010)** - SCADA is an acronym for Supervisory Control and Data Acquisition. SCADA systems are used to monitor and control a plant or equipment in industries
such as telecommunications, water and waste control, energy. A typical SCADA system comprises of 1/0 signal hardware, Controllers, software, network & communication. Supervisory control and data acquisition system is a system in which message or commands that are individual are sends to the external world. Provides a host control functions for the supervisor to control and define settings. The basic natural sources like Coal, gas, Diesel, atomic etc are single time useable due to which the quantity of these sources is decreases day by day. The emissions of these fuels are also responsible for air pollution. On the other hand if we use the water power and solar power to generate the electricity. We can reduce the pollution as well as the generation cost of the energy. The quantity of the water is varies in the rivers according to the season and the sunlight intensity is vary according to the day hours. So we have developed a system in which consumers are connected to different type of power plant via a grid. The grid load and plants are monitored and controlled by the SCADA system. This provides the uninterrupted power supply at minimum power generation cost.

17. Miro Antoni jевич et al.- Most electrical substations are remotely monitored and controlled by using Supervisory Control and Data Acquisition (SCADA) applications. Current SCADA systems have been significantly enhanced by utilizing standardized communication protocols and the most prominent is the IEC 61850 international standard. These enhancements enable improvements in different domains of SCADA systems such as communication engineering, data management and visualization of automation process data in SCADA applications. Process data visualization is usually achieved through Human Machine Interface (HMI) screens in substation control centers. However, this visualization method sometimes makes supervision, control and maintenance procedures executed by engineers slow and error-prone because it separates equipment from its automation data. Augmented reality (AR) and mixed reality (MR) visualization techniques have matured enough to provide new possibilities of displaying relevant data wherever needed. This paper presents a novel methodology for visualizing process related SCADA data to enhance and facilitate human-centric activities in substations such as regular equipment maintenance. The proposed solution utilizes AR visualization techniques together with standards-based communication protocols used in substations. The developed proof-of-concept AR application that enables displaying SCADA data on the corresponding substation
equipment with the help of AR markers demonstrates originality and benefits of the proposed visualization method. Additionally, the application enables displaying widgets and 3D models of substation equipment to make the visualization more user-friendly and intuitive. The visualized SCADA data needs to be refreshed considering soft real-time data delivery restrictions. Therefore, the proposed solution is thoroughly tested to demonstrate the applicability of proposed methodology in real substations.

18. Jianwei Zhang et al. (2019) - The matrix converter (MC) is a promising converter that performs the direct AC-to-AC conversion. Model predictive control (MPC) is a simple and powerful tool for power electronic converters, including the MC. However, weighting factor design and heavy computational burden impose significant challenges for this control strategy. This paper investigates the generalized sequential MPC (SMPC) for a three-phase direct MC. In this control strategy, each control objective has an individual cost function and these cost functions are evaluated sequentially based on priority. The complex weighting factor design process is not required. Compared with the standard MPC, the computation burden is reduced because only the pre-selected switch states are evaluated in the second and subsequent sequential cost functions. In addition, the prediction model computation for the following cost functions is also reduced. Specifying the priority for control objectives can be achieved. A comparative study with traditional MPC is carried out both in simulation and an experiment. Comparable control performance to the traditional MPC is achieved. This controller is suitable for the MC because of the reduced computational burden. Simulation and experimental results verify the effectiveness of the proposed strategy.

19. Donghun Lee et al. (2019), -Recently, the prediction of photovoltaic (PV) power has become of paramount importance to improve the expected revenue of PV operators and the effective operations of PV facility systems. Additionally, the precise PV power output prediction in an hourly manner enables more sophisticated strategies for PV operators and markets as the electricity price in a renewable energy market is continuously changing. However, the hourly prediction of PV power outputs is considered as a challenging problem due to the dynamic natures of meteorological information not only in a day but also across days. Therefore, in this paper, we suggest three PV power output prediction methods such as artificial neural network
(ANN)-, deep neural network (DNN)-, and long and short term memory (LSTM)-based models that are capable to understand the hidden relationships between meteorological information and actual PV power outputs. In particular, the proposed LSTM based model is designed to capture both hourly patterns in a day and seasonal patterns across days. We conducted the experiments by using a real-world dataset. The experimental results show that the proposed ANN based model fails to yield satisfactory results, and the proposed LSTM based model successfully better performs more than 50% compared to the conventional statistical models in terms of mean absolute error.

20. Minh-Trung Duong et al. (2019) - In this paper, finite element analysis demonstrates the difference between dual permanent-magnet-excited machines (DPMM) and surface-mounted permanent magnet machines (SPM) in terms of tangential force at the same air gap, diameter, stacking length, and input current. Different from most conventional machines, a novel DPMM has two sets of permanent magnets employed on both stator and rotor. To make a fair comparison, the novel DPMM, based on an original design, is specified to have the same dimensions as a conventional SPM. With the aid of 2D finite element analysis, tangential force generated from the novel DPMM is 167.65% higher than the conventional SPM. To verify the validity of the analyses, a prototype was fabricated and tested. Experiments showed that average deviation was only approximately 1.85%.

21. Nan Wei et al. (2019) - Forecasting daily natural gas load accurately is difficult because it is affected by various factors. A large number of redundant factors existing in the original dataset will increase computational complexity and decrease the accuracy of forecasting models. This study aims to provide accurate forecasting of natural gas load using a deep learning (DL)-based hybrid model, which combines principal component correlation analysis (PCCA) and (LSTM) network. PCCA is an improved principal component analysis (PCA) and is first proposed here in this paper. Considering the correlation between components in the Eigen space, PCCA can not only extract the components that affect natural gas load but also remove the redundant components. LSTM is a famous DL network, and it was used to predict daily natural gas load in our work. The proposed model was validated by using recent natural gas load data from Xi’an (China) and Athens (Greece). Additionally, 14 weather factors were introduced into the input
dataset of the forecasting model. The results showed that PCCA–LSTM demonstrated better performance compared with LSTM, PCA–LSTM, back propagation neural network (BPNN), and support vector regression (SVR). The lowest mean absolute percentage errors of PCCA–LSTM were 3.22% and 7.29% for Xi’an and Athens, respectively. On these bases, the proposed model can be regarded as an accurate and robust model for daily natural gas load forecasting.

22. Donglai Jiao et al. (2018) - Obtaining and visualizing the internal state and position information of the remote device using sensors are important aspects of industrial manufacturing. For large-scale geo-sensors that have been recently used, map-based management and visualization of the geo-sensor devices have become ubiquitous. Users often build multiple map symbols to represent the multiple states of a device based on traditional map symbols. Visualizing multiple geo-sensor data in real time with one map symbol is difficult. In this paper, a protocol-coupling map symbol and a construction method for real-time data visualization is introduced where different sensor states of the geo-sensor are expressed with one symbol. The sensor data visualization method in supervisory control and data acquisition systems (SCADA) was introduced and applied to the construction and visualization process of map symbols. First, based on the traditional vector map symbols and the communication protocol parsing interface, the mapping relationship between the sensor data item and the graphic element is defined in the map symbol construction process. Second, by referring to the streaming services method in ArcGISGeoEvent, geo-sensor data acquisition and a transfer broker in a GIS server is built, through which the real-time sensor data can be transferred from the remote side to the map client and used for map symbol rendering. Finally, the new map symbols are used for real-time geo-sensor data visualization in applications. In the application of the real-time monitoring of geo-sensor devices, remote device information was acquired by sensor and transmitted to the broker then cached on the server side. If the cached sensor data has changed compared to the previous, the changed data will be pushed to map client by broker. The communication module in the map client that communicates with the broker receives changed geo-sensor data and triggers a refresh of the map. Then the protocol-coupling map symbol is rendered according to the mapping profile and the status of the geo-sensor device will be displayed on the map in real time. All the methods and processes were verified in client-server and browser-server GIS architecture.
23. **Nicoleta ARGHIRA et al. (2011)** - This paper presents SCADA concepts used mainly in power systems, as a critical infrastructure in all life sectors. New power system demands regarding energy quality and efficiency, power system load or stability has risen for system operators all around the world. The new control and monitoring strategies include better SCADA systems and new measurement systems (wide area measurement systems with synchrophasors). The SCADA concepts discussed in the paper were implemented at the national power system dispatcher and also, at the power plant level.

24. **Dr. Aditya Goel (2014)**. In this paper we have developed an integrated wireless SCADA system for monitoring & accessing the performance of remotely situated device parameter such as temperature, pressure, humidity on real time basis. For this we have used the infrastructure of the existing mobile network, which is based on GPRS technique Supervisory Control and Data Acquisition (SCADA) is a field of constant development and research. This project investigates on creating an extremely low cost device which can be adapted to many different SCADA applications via some very basic programming, and plugging in the relevant peripherals. Much of the price in some expensive SCADA applications is a result of using specialized communication infrastructure. The application of infrastructure, in the proposed scheme the cost will come down. Additionally the generic nature of the device will be assured. Wireless SCADA deals with the creation of an inexpensive, yet adaptable and easy to use SCADA device and infrastructure using the mobile telephone network, in particular, the General Packet Radio Service (GPRS). The hardware components making up the device are relatively unsophisticated, yet the custom written software makes it re-programmable over the air, and able to provide a given SCADA application with the ability to send and receive control and data signals at any non-predicted time. GPRS is a packet-based radio service that enables “always on” connections, eliminating repetitive and time-consuming dial-up connections. It will also provide real throughput in excess of 40 Kbps, about the same speed as an excellent landline analog modem connection. From the wireless SCADA system which is proposed in setup the temperature of around 30°C could be sufficiently recorded from remote location. In the similar manner reading of electric energy meter could be read 223 Kilo Watt Hour (KWH) or 223 Unit.
The properly designed SCADA system saves time and money by eliminating the need of service personal to visit each site for inspection, data collection /logging or make adjustments.

25. **M. N. Lakhoua (2010)** - This paper presents the applications of a supervisory control and data acquisition (SCADA) system in thermal power plants (TPPs). In fact, a supervisory system must take into account the physiological and cognitive features of the supervisory operator. The paper briefly discusses on the one hand the different steps of the application of a SCADA system and the difficulties to manage and on the other hand it presents three examples of the application of a SCADA system in a TPP in Tunisia and the instrumentations and the measurements used. The first application is related to a counting system of the natural gas, the second one is related to the supervision of pumps vibrations and the third one is related to the supervision of heavy fuel oil.

26. **Bin Qiu (2002)** - The operational and commercial needs of the power industry require information systems to not only perform traditional functions but also support many of the new functions, specifically to meet the needs of competition with deregulation. The rapid development of the Internet and distributed computing have opened the door for feasible and cost-effective solutions. This article describes and demonstrates a unique Internet-based application in a substation automation system that is implemented based on the existing system control and data acquisition (SCADA) system and very large-scale integration (VLSI) information technologies (IT). The user can view the real-time data superimposed on one-line diagrams generated automatically using VLSI placement and routing techniques. In addition, the user can also control the operation of the substation at the server site. The choice of Java technologies, such as Java Native Interface (JNI), Java Remote Method Invocation (RMI), and Enterprise Java Bean (EJB), offers unique and powerful features, such as zero client installation, on demand access, platform independence, and transaction management for the design of the online SCADA display system.

27. **John D. Fernandez et al. (2005)** - Supervisory Control and Data Acquisition, otherwise known as SCADA, is a system for gathering real time data, controlling processes, and monitoring equipment from remote locations. As more companies are implementing an open
SCADA architecture through the Internet to monitor critical infrastructure components such as power plants, oil and gas pipelines, chemical refineries, flood control dams, and waste and water systems, vital systems are becoming increasingly open to attack. This paper provides an overview of SCADA, outlines several vulnerabilities of SCADA systems, presents data on known and possible threats, and provides particular remediation strategies for protecting these systems.

28. Cristian et al. (2012) - The present paper represents a part of a research study performed by authors in the field of energy management systems based on independent or connected to public supply network renewable energy systems. The main objective deals with the design and implementation of such management system so as to facilitate decision-making role in providing management and energy availability for consumers, both economically and in terms of safety power supplying. The requirements, the technical solutions, the electronic and software technologies are identified and followed by a prototype implementation to validate the proposed solution. The research results illustrate that by using such management information systems, the renewable energy sources in both individual and hybrid configurations, independent of the permanent or intermittent primary energy resource availability, can be effectively used.

29. João M. Figueiredo et al. (2008), Solar and wind energy are non-depletable, site dependent, non-polluting, and potential sources of alternative energy. However, common drawback with solar and wind energy is their unpredictable nature. The development of supervisory systems that control and monitor the energy production from renewable sources and the evaluation of the consumption from the users is of main importance to balance production and consumption needs. The developed strategy is composed by a network of Programmable Logic Controllers (PLC) controlling locally each power plant. These local controllers are connected through a Master-Slave network, making accessible the operational data from each remote production plant. Above the operational network, a SCADA system (Supervisory Control And Data Acquisition) is installed to allow a user-friendly decentralized global management. The developed monitoring and control strategy is simulated, based on the requirements of the new renewable energy experimental park (PETER) that is being implemented at University of Évora - Portugal.
30. **B. Qiu et al. (2000)** - The World Wide Web (WWW) has become a convenient way to access information on the net because the WWW browser integrates different network services into a common easily accessible user interface. These features coupled with low investment cost are especially suited for accessing information of the SCADA (Supervisory Control and Data Acquisition) system. This paper describes a unique Web-based application which is implemented based on the client/server architecture. The user can view the real-time data superimposed on one-line diagrams generated automatically using the VLSI’s placement and routing techniques. In addition, the user can also control the operation of the substation at the server site. The choice of the Java language offers unique and powerful features such as zero client installation, on-demand access and platform independence to the design of the SCADA display system.

31. **TAREK RABBANI et al. (2009)** - population of more than 6 billion people, food production from agriculture must be raised to meet increasing demand. While irrigated agriculture provides 40% of the total food production, it represents 80% of the freshwater consumption worldwide. In summer and drought conditions, efficient management of scarce water resources becomes crucial. The majority of irrigation canals are managed manually, however, with large water losses leading to low water efficiency. This article focuses on the development of algorithms that could contribute to more efficient management of irrigation canals that convey water from a source, generally a dam or reservoir located upstream, to water users. We also describe the implementation of an algorithm for real-time irrigation operations using a supervision, control, and data acquisition (SCADA) system with an automatic centralized controller. Irrigation canals can be viewed and modeled as delay systems since it takes time for the water released at the upstream end to reach the user located downstream. We thus present an open-loop controller that can deliver water at a given location at a specified time. The development of this controller requires a method for inverting the equations that describe the dynamics of the canal in order to parameterize the controlled input as a function of the desired output. The Saint-Venant equations [1] are widely used to describe water discharge in a canal. Since these equations are not easy to invert, we consider a simplified model, called the Hayami
model. We then use differential flatness to invert the dynamics of the system and to design an open-loop controller.

32. **Chee-Wooi Ten et al. (2008)** - Vulnerability assessment is a requirement of NERC’s cybersecurity standards for electric power systems. The purpose is to study the impact of a cyber-attack on supervisory control and data acquisition (SCADA) systems. Compliance of the requirement to meet the standard has become increasingly challenging as the system becomes more dispersed in wide areas. Interdependencies between computer communication system and the physical infrastructure also become more complex as information technologies are further integrated into devices and networks. This paper proposes a vulnerability assessment framework to systematically evaluate the vulnerabilities of SCADA systems at three levels: system, scenarios, and access points. The proposed method is based on cyber systems embedded with the firewall and password models, the primary mode of protection in the power industry today. The impact of a potential electronic intrusion is evaluated by its potential loss of load in the power system. This capability is enabled by integration of a logic-based simulation method and a module for the power flow computation. The IEEE 30-bus system is used to evaluate the impact of attacks launched from outside or from within the substation networks. Counter measures are identified for improvement of the cybersecurity.

33. **Z. A. Vale et al. (2009)** - Currently, Power Systems (PS) already accommodate a substantial penetration of DG and operate in competitive environments. In the future PS will have to deal with largescale integration of DG and other distributed energy resources (DER), such as storage means, and provide to market agents the means to ensure a flexible and secure operation. This cannot be done with the traditional PS operation. SCADA (Supervisory Control and Data Acquisition) is a vital infrastructure for PS. Current SCADA adaptation to accommodate the new needs of future PS does not allow to address all the requirements. In this paper we present a new conceptual design of an intelligent SCADA, with a more decentralized, flexible, and intelligent approach, adaptive to the context (context awareness). Once a situation is characterized, data and control options available to each entity are re-defined according to this context, taking into account operation normative and a priori established contracts. The paper includes a case-study
of using future SCADA features to use DER to deal with incident situations, preventing blackouts.

34. Z. Vale et al. (2010) - In the energy management of a small power system, the scheduling of the generation units is a crucial problem for which adequate methodologies can maximize the performance of the energy supply. This paper proposes an innovative methodology for distributed energy resources management. The optimal operation of distributed generation, demand response and storage resources is formulated as a mixed-integer linear programming model (MILP) and solved by a deterministic optimization technique CPLEX-based implemented in General Algebraic Modeling Systems (GAMS). The paper deals with a vision for the grids of the future, focusing on conceptual and operational aspects of electrical grids characterized by an intensive penetration of DG, in the scope of competitive environments and using artificial intelligence methodologies to attain the envisaged goals. These concepts are implemented in a computational framework which includes both grid and market simulation.

35. F. Richard Yu et al. (2011) - There is growing interest in renewable energy around the world. Since most renewable sources are intermittent in nature, it is a challenging task to integrate renewable energy resources into the power grid infrastructure. In this grid integration, communication systems are crucial technologies, which enable the accommodation of distributed renewable energy generation and play an extremely important role in monitoring, operating, and protecting both renewable energy generators and power systems. In this article, we review some communication technologies available for grid integration of renewable energy resources. Then we present the communication systems used in a real renewable energy project, Bear Mountain Wind Farm in British Columbia, Canada. In addition, we present the communication systems used in photovoltaic power systems. Finally, we outline some research challenges and possible solutions about the communication systems for grid integration of renewable energy resources. Communication Systems for Grid Integration of Renewable Energy Resources,
36. **Dr. Yogesh Kumar Sharma (2018)**, This paper In spite of the fact that 5G systems will be altogether different contrasted with their forerunners in a few respects e.g., using virtualisation what's more, bolster for various and basic non-telecomoriented administrations, they will in any case share likenesses and they will reuse and expand existing ideas that have demonstrated fruitful and that are generally received In this paper, we break down Zhang et al's. CLGSC plot. We exhibit that their plan is unreliable by giving an insider assault, which demonstrates that their plan is helpless as far as secrecy. We likewise call attention to the mix-ups in the verification of their plan. In this way, their light-weight and hearty security-mindful D2D-help information transmission convention for versatile wellbeing framework is shaky, as well.

37. **Dr. Yogesh Kumar Sharma and Ghouse Mohiyaddin Sharif G.M (2018)**, In this paper, I reviewed attempt to set up the foundation for additionally look into in the territory of Security Preserving Data Mining (PPDM). We set forward institutionalization issues in PPDM. Despite the fact that our work depicted in this paper is primer and reasonable in nature, we contend that it is a crucial essential for institutionalization in PPDM. Our essential objective in this work is to consider a typical system for PPDM, prominently regarding definitions, standards, arrangements, and necessities. The benefits of a structure of that nature are: (an) a typical structure will abstain from confounding designers, professionals, and numerous others keen on PPDM; (b) selection of a typical structure will hinder conflicting endeavors in various ways, and will empower merchants and engineers to make strong advances later on in the PPDM territory. Our commitments in this paper can be condensed as takes after: 1) we portray the issues we look in characterizing what data is private in information mining, and talk about how protection can be disregarded in information mining; 2) we characterize protection conservation in information mining in view of clients' close to home data what's more, data concerning their aggregate movement; 3) we depict the general parameters for portraying situations in PPDM; 4) we examine the ramifications of the Organization for Economic Collaboration and Development (OECD) information security standards in learning revelation; 5) we recommend a few approaches for PPDM in view of instruments acknowledged around the world; and 6) we propose a few prerequisites for the advancement of specialized arrangements and to manage the organization of new specialized arrangements.