Literature Planner

Student Name: Utkarsh Sethi **Student Number: 7336330**

Topic: Smart Grid and Internet of Things

Reference Number: 1 **Authors:** H. M. Hussain et al.

Title of Article: What is Energy Internet? Concepts, Technologies, and Future Directions

Type: Journal Article **Publication:** IEEE Access

Year Published: 2020 **Number of citations:** 16 (google scholar)

Primary or Secondary: Secondary

Publication Rating:

CiteScore: 4.8 Rank: 39/297 Percentile: 87%

In-Category: General Engineering CiteScore Year: 2020

What themes were discussed in the Literature Review? Energy Internet (EI), smart grid, shortcomings,

What was the research question? The paper tries to unite the numerous varied definitions of energy internet by reviewing similarities and differences of existing literature and provide a universal definition. It also tries to identify key technologies to enable various subsystems of EI architecture. It also highlights requirements and challenges for future development. In addition, the author also talks about some coordination and control schemes.

Design: A structured review of existing literature and definitions of EI, and the author tries to provide a universal definition. The author also reviews different technologies that will serve as enablers for Energy Internet.

What was the finding? Similarities and differences in the definitions is highlighted with different contexts while summarising a universal definition while also touching upon technologies as a facilitator for the system.

What were the gaps? The paper highlights the complexity of the system as a drawback requiring further research. Further work is also required for management of Energy Internet systems in terms of both distributed and centralised strategies and systems.

Reference Number: 2 **Authors:** Yuke Li et al.

Title of Article: Smart Choice for the Smart Grid: Narrowband Internet of Things (NB-IoT)

Type: Journal Article **Publication:** IEEE Internet of Things Journal

Year Published: 2018 **Number of citations:** 151 (IEEExplore)

Primary or Secondary: Primary

Publication Rating:

CiteScore: 14.9 Rank: 2/157 Percentile: 99% In-Category: Hardware and Architecture CiteScore Year: 2020

What themes were discussed in the Literature Review? narrowband Internet of Things (NB-IoT), low power wide area network (LPWAN)

What was the research question? To explore and analyse current communication technologies for application to smart grids basis key performance indicators. To do a quantitative and qualitative

study of smart grid communication requirements and evaluate suitability of NB-IoT for various purposes. In addition, evaluate the performance of NB-IoT in scenarios like rural, bad urban, typical urban, and hilly areas.
Design: A comparative study of numerous wired and wireless technologies is carried out highlighting their data rates, latency, coverage, cost and limitations. The evaluation of NB-IoT performance is carried out basis BER performance vs SNR using Monte Carlo simulations.
What was the finding? The suitability of technologies for home area networks (HAN), neighbourhood area networks (NAN), and wide area network (WAN) is summarised basis requirements. NB-Iot is seen to be most suitable for NANs. After analysis of SG communication requirements, NB-IoT is found suitable for application in AMI, DRM, V2G and G2V charging. NB-IoT is found suitable for all four scenarios basis the simulations.
What were the gaps? Analysis of NB-IoT was done basis simulations.

Reference Number: 3 **Authors:** Shalli et al.
Title of Article: Dynamic clustering approach based on wireless sensor networks genetic algorithm for IoT applications
Type: Journal Article **Publication:** Wireless Networks Springer Nature B.V.
Year Published: 2019 **Number of citations:** 38 (google scholar)
Primary or Secondary: Primary
Publication Rating:
CiteScore: 4.3 *Rank: 97/329 Percentile: 70%* *In-Category:* Information Systems
CiteScore Year: 2020
What themes were discussed in the Literature Review? Dynamic clustering, WSN, Genetic algorithm, Applications of IoT
What was the research question? A Dynamic Clustering based genetic algorithm for routing is proposed to increase the energy efficiency in WSNs. The Cluster Node with high energy takes the role of Cluster Head, to maintain stability of the network.
Design: MATLAB based simulation is carried out with 100 simulated nodes spread over an area of $100m^2$. The results are evaluated basis fitness function performance metrics, high availability and efficiency.
What was the finding? The algorithm (DCRN GA) is effective at increasing lifetime of the network by improving efficiency in low and medium data loads. It is found to perform better vs both DCRN and LEACH protocols.
What were the gaps? Better assessment can be done using System C based simulations, using greater number of generations of the Genetic Algorithm and a bigger population size.

Reference Number: 4 **Authors:** Zeinali, Mehdi
Thompson, John
Title of Article: Comprehensive practical evaluation of wired and wireless internet base smart grid communication

Type: Journal Article **Publication:** IET Smart Grid
Year Published: 2021 **Number of citations:** 1 (scopus)
Primary or Secondary: primary
Publication Rating:
CiteScore: 2.9 Rank: 153/334 Percentile: 54% In-Category: Computer Networks and Communications CiteScore Year: 2020
What themes were discussed in the Literature Review? SG communication,
What was the research question? An evaluation of internet infrastructure in UK to provide parameters for SG communication design. The performance of TCP and UDP is evaluated as a measure of the network performance, while previous results were simulated, and performance measures were much superior to real world scenarios. The impact of compression techniques is studied on latency in the communication link.
Design: A hardware test bed is used to carry out the analysis. A PC is used as an emulated Control Centre, and Raspberry Pi platforms are emulated to be clients. Different scenarios are emulated and observed for performance parameters with data packets varying from 50 bytes to 10Kb over TCP and UDP over six weeks using five different internet network technologies.
What was the finding? UDP packets suffer higher packet loss and 90% higher latency than TCP packets. The latency varies significantly with data traffic in the network, while no significant co-relation was found between communication links. Data compression offers reasonable latency improvements at the expense of higher processer utilization.
01What were the gaps? A single control centre was used for analysis. The study focuses mainly on latency, and was localised to UK. Further study can be done to analyse parameters like packet loss, throughput.

Reference Number: 5 **Authors:** Fang et al.
Title of Article: Smart Grid — The New and Improved Power Grid: A Survey
Type: Journal Article **Publication:** IEEE Communications Surveys & Tutorials
Year Published: 2012 **Number of citations:** 3176 (google scholar)
Primary or Secondary: Secondary
Publication Rating:
CiteScore: 62.1 Rank: 1/693 Percentile: 99% In-Category: Electrical and Electronic Engineering CiteScore Year: 2020
What themes were discussed in the Literature Review? smart grid, major systems in SG, past programs and trials for SGs,
What was the research question? To survey current Literature and classify major subsystems of a smart Grid and highlighting challenges and future research. While also reviewing various legislations and standards related to SGs.
Design: Survey of 11 Programs and Trials of Smart Grids.

What was the finding? SG is a revolutionary technology for better power services which are environmentally friendly, but there is still a lot of progress to be made on the front.
What were the gaps? The paper defines major subsystems of SG namely, the smart infrastructure system, the
smart management system, and the smart protection system. It also summarises learnings form previous trials. While SG have various benefits government and companies need to find a way to pass the benefit to consumers for widespread adaptation. The current energy providers might not have the expertise when it comes to implementation and will have to include the software and telecommunications sectors due to heavy reliance on communication and information subsystems. While the SG work towards more environment friendly and cost saving services they should not compromise on safety, security and privacy as they can lead to a disaster and compromise on long term reliability. Before adopting the new technology proper and through risk assessment should be carried out to minimise threats.

Reference Number: 6 **Authors:** Park et al.
Title of Article: A micro-distributed ESS-based smart LED streetlight system for intelligent demand management of the micro grid
Type: Journal Article **Publication:** Sustainable Cities and Society
Year Published: 2018 **Number of citations:** 21 (google scholar)
Primary or Secondary: Primary
Publication Rating:
CiteScore: 10.7 Rank: 8/704 Percentile: 98% In-Category: Geography, Planning and Development CiteScore Year: 2020
What themes were discussed in the Literature Review? Distributed Energy Storage System (ESS), micro grids, efficiency in a micro grid
What was the research question? Can using a distributed ESS in micro grids improve efficiency and peak demand stability while reducing installation costs vs the currently used centralised ESS.
Design: The paper uses a hardware implementation and simulation to analyse
What was the finding? The system can be used to provide peak load management in the micro grid using distributed ESS, while also lowering the overall management cost. It is found that using LEDs in Korea's streetlights would reduce energy usage decrease CO2 emissions by up to 40%. The system would be highly scalable with low installation cost and be able to function independently in case of blackouts or communication loss being able to power the external micro grids for short durations thus contributing in-case of an emergency.
What were the gaps? The system was mainly a prototype level demonstration and simulation and needs actual field tests. The study is limited to Korea's street light system.

Reference Number: 7 **Authors:** Xiaoyi et al.
Title of Article: IoT driven framework based efficient green energy management in smart cities using multi-objective distributed dispatching algorithm

Type: Journal Article **Publication:** Environmental Impact Assessment Review

Year Published: 2021 **Number of citations:** 3 (Scopus)

Primary or Secondary: Primary

Publication Rating:

CiteScore: 7.9 Rank: 26/704 Percentile: 96% In-Category: Geography, Planning and Development CiteScore Year: 2020

What themes were discussed in the Literature Review? Multi-Objective Distributed Dispatching algorithm (MODDA), smart grid, energy management, IoT, green energy

What was the research question? The paper introduces MODDA and evaluates its capability to efficiently manage energy in a smart grid.

Design:

What was the finding? Lab-scale results show the algorithm to minimize energy wastage and system costs.

What were the gaps?

Reference Number: 8 **Authors:** Faheem, M. Gungor, V. C.

Title of Article: Energy efficient and QoS-aware routing protocol for wireless sensor network-based smart grid applications in the context of industry 4.0

Type: Journal Article **Publication:** Applied Soft Computing Journal

Year Published: 2018 **Number of citations:** 79 (scopus)

Primary or Secondary: Primary

Publication Rating:

CiteScore: 11.2 Rank: 32/389 Percentile: 91% In-Category: Software CiteScore Year: 2020

What themes were discussed in the Literature Review? Smart Grid Industry 4.0 (SGI 4.0), QoS, Energy efficient and Quality-of-service-aware Routing Protocol (EQRP), bird mating optimisation (BMO)

What was the research question? The paper proposes a novel routing protocol based on bird mating optimisation (BMO), which is energy efficient and QOS aware called EQRP. The paper tests if the proposed protocol can offer improved network reliability, memory utilisation, and reduced packet retransmission, energy consumption for WSN based SG networks. This protocol should be be better at cluster formation for a more balanced resource utilization.

Design: Simulations are carried out on EstiNet9.0 to compare and evaluate the performance of EQRP vs other approaches based on smart grid field parameters.

What was the finding? The protocol is found to decrease end-to-end delay and improve packet delivery, memory utilization, energy consumption and throughput.

What were the gaps? Further work needs to be done to improve latency by examining mobile sinks, and to introduce swarm intelligence-based framework which has parallel communication capabilities leading to better fidelity for WSN based SG.

Reference Number: 9 **Authors:** Alkahtani, Hasan Aldhyani, Theyazn H. H.
Title of Article: Intrusion Detection System to Advance Internet of Things Infrastructure-Based Deep Learning Algorithms
Type: Journal Article **Publication:** Complexity
Year Published: 2021 **Number of citations:** 7 (scopus)
Primary or Secondary: Primary
Publication Rating:
CiteScore: 3.3 Rank: 20/110 Percentile: 82% In-Category: Multidisciplinary
CiteScore Year: 2020
What themes were discussed in the Literature Review? Intrusion detection systems (IDSs), cybersecurity, IoTID20, deep learning, artificial intelligence
What was the research question? To develop a novel deep learning based secure, moveable framework for securing large IoT networks. It uses a combination of artificial intelligence algorithms like CNN, LSTM to develop a hybrid CNN-LSTM system to detect intrusions in the network.
Design: The system used data set from IoTID20 generated in 2020 by Pcap files as a testbed, and then compared with the research article that developed the data. The WiFi cameras were victim devices while all the other devices in testbed were attacking devices. The evaluation metrics used were sensitivity, specificity, precision, recall and F1 score.
What was the finding? The proposed deep learning-based framework is effective at detecting real-world attacks and enhances the security of the IoT environment. LTSM based models were found to perform best compared to CNN and CNN-LTSM, and the system presented superior results compared to previous implementations.
What were the gaps? Further evaluation can be done over time of performance in a real-life system, over and above the analysis on real-life data sets.

Reference Number: 10 **Authors:** Yılmaz, Yasin Uludag, Suleyman
Title of Article: Timely detection and mitigation of IoT-based cyberattacks in the smart grid
Type: Journal Article **Publication:** Journal of the Franklin Institute
Year Published: 2019 **Number of citations:** 8 (scopus)
Primary or Secondary: Primary
Publication Rating:
CiteScore: 7 Rank: 23/548 Percentile: 95% In-Category: Applied Mathematics
CiteScore Year: 2020
What themes were discussed in the Literature Review? Minimally Invasive Attack Mitigation via Detection Isolation and Localization (MIAMI-DIL), criticality of cybersecurity in Smart Grid, IoT initiated attacks
What was the research question? To provide a novel framework called Minimally Invasive Attack Mitigation via Detection Isolation and Localization (MIAMI-DIL) for detection and mitigation of cyber attacks against the Smart Grid, which is protocol and data agnostic.
Design: To study the effectiveness of the system a simulated study is carried out. With 10 data aggregators, 100 smart meters under each aggregator, 10 smart appliances under each smart meter

resulting a simulated total of 10,000 smart appliances and 1000 smart meters. Evaluated scenarios include, Dos via Jamming, false data injection, identification of compromised nodes, heterogeneous data.

What was the finding? The framework is numerically demonstrated to be effective in detecting attacks in simulated scenarios.

What were the gaps? The paper assumes the data to be vulnerable, but the statistics used for defence mechanisms and monitoring to be transmitted securely via separate channels, and the case where they are vulnerable requires further work. Further work is also required for attacks such as intermittent DoS and low-rate DoS.

Reference Number: 11 **Authors:** Viel et al.

Title of Article: An efficient interface for the integration of iot devices with smart grids

Type: Journal Article **Publication:** Sensors (Switzerland)

Year Published: 2020 **Number of citations:** 11 (scopus)

Primary or Secondary: Primary

Publication Rating:

CiteScore: 5.8 Rank: 13/128 Percentile: 90% In-Category: Instrumentation
CiteScore Year: 2020

What themes were discussed in the Literature Review? IoT, Smart Grid, Communication protocol, CoAP, OSGP

What was the research question? To provide a method to enable data packet exchange between IoT devices installed at homes which use general application protocols like CoAP and SG industry devices which use application specific protocols like OSGP by proposing a mapping interface COIIoT (CoAP and OSGP Integration for the Internet of Things).

Design: The test environment is simulated on a Debian based Desktop PC as a Gateway, an ESP32 as a OSGP Smart Meter, a smartphone as a CoAP client.

What was the finding? The proposed solution successfully integrates CoAP and OSGp protocols on an embedded platform to perform packet to packet mapping. It is also expected to reduce development time by abstracting the complexity between mapping both protocols.

What were the gaps? The evaluations only considered the mapping methods and not function calls. The security of the system was also out of scope. The experiment was only conducted as a POC and further testing with larger systems is required in different types of situations.

Reference Number: 12 **Authors:** Awan et al.

Title of Article: Machine Learning-Enabled Power Scheduling in IoT-Based Smart Cities

Type: Journal Article **Publication:** Computers, Materials & Continua

Year Published: 2021 **Number of citations:** 4 (scopus)

Primary or Secondary: Primary

Publication Rating:

CiteScore: 4.6 *Rank: 56/290* *Percentile: 80%* *In-Category: Modeling and Simulation* *CiteScore Year: 2020*

What themes were discussed in the Literature Review? PSO, IBR, Machine Learning, IoT, Smart Cities, CDBR

What was the research question? To see if collaborative execute-before-after dependency-based requirement (CDBR) performs better than PSO and cluster based EMS to reduce electricity pricing.

Design: The paper used home energy management system simulations to evaluate electricity costs PAR using MATLAB.

What was the finding? The algorithm is found to perform better for percentage cost reduction, peak to Average ratio and Power variance mean ration.

What were the gaps? Smart Grids need to be secured from cyber attacks and requires a lot of work.

Reference Number: 13 **Authors:**

Title of Article: Distributed Finite-Time Consensus Control for Heterogeneous Battery Energy Storage Systems in Droop-Controlled Microgrids

Type: **Publication: IEEE Transactions on Smart Grid**

Year Published: **Number of citations:**

Primary or Secondary:

Publication Rating:

CiteScore: *Rank:* *Percentile:* *In-Category:* *CiteScore Year:*

What themes were discussed in the Literature Review?

What was the research question?

Design:

What was the finding?

What were the gaps?

Reference Number: 14 **Authors:** Sani et al.

Title of Article: Cyber security framework for Internet of Things-based Energy Internet

Type: Journal Article **Publication:** Future Generation Computer Systems

Year Published: 2019 **Number of citations:**

Primary or Secondary:

Publication Rating:

CiteScore: *Rank:* *Percentile:* *In-Category:* *CiteScore Year:*

What themes were discussed in the Literature Review?

What was the research question?

Design:

What was the finding?

What were the gaps?

Reference Number: 15 **Authors:** Centenaro et al.

Title of Article: Long-range communications in unlicensed bands: the rising stars in the IoT and smart city scenarios

Type: **Publication:** Institute of Electrical and Electronics Engineers (IEEE)

Year Published: **Number of citations:**

Primary or Secondary:

Publication Rating:

CiteScore: *Rank:* *Percentile:* *In-Category:* *CiteScore Year:*

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What was the research question?

Design:

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Reference Number: **Authors:**
Title of Article:
Type: **Publication:**
Year Published: **Number of citations:**
Primary or Secondary:
Publication Rating:
CiteScore: *Rank:* *Percentile:* *In-Category:* *CiteScore Year:*
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Type: **Publication:**
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Publication Rating:
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