IOT PROJECT : REVIEW III

Course Slot : B2

Course Instructor : Dr. B. D. DEEBAK / SCOPE

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Project Title: IOT driven framework based efficient green energy management in smart cities using multi-objective distributed dispatching algorithm

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Acknowledgement:

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We would also like to express our gratitude to VIT who gave us a platform and chance to showcase our project work even in these tough times.With the help of this project we were able to increase our knowledge and confidence going forward.

Abstract:

Even In our Daily life we see that a lot of resources and energy are being wasted and used in an improper environment . We felt that for solving this problem we can devise a system which will help to not only regulate but also conserve and maintain the availability of the resources in the coming times which will ultimately lead to a better quality of life and also to maintain an ecological balance.

The aim of this project is to firstly implement this system in a smart city with the help of IOT fundamentals and the presence of strong connectivity we would be able to grasp an proper idea of our work.

Abbreviations:

MODDA - multi-objective distributed dispatching algorithm

C02 - Carbon Dioxide Gas

02 - Oxygen Gas

H20 - Water

Problem addressed:

With the abundance of various IOT platforms in recent times we would like to construct a system of green energy management in smart cities with the help of multi - objective distributed dispatching algorithm. This is a quantitative type of research where we with the help of a multi - objective distributed dispatching algorithm (MODDA) we would look to solve the problem of efficiently managing green energy in various smart cities. In this research we will take into considerations various environmental factors like global warming ,air pollution ,water pollution , biodiversity loss , etc

Prior research:

While going through many articles , one such article Lewandowska, A., ChodkowskaMiszczuk, J., Rogatka, K., & Starczewski, T. (2020). Smart Energy in a Smart City: Utopia or Reality? Evidence from Poland. Energies, 13(21), 5795. MDPI AG. Retrieved from http://dx.doi.org/10.3390/en13215795 . We came to know that a lot of green energy is getting wasted all over the world due to improper management. All these articles on the internet which we read while preparing our system motivated us to devise a system of green energy management. Conserving and managing green energy is a big problem in a third world country like India. Proper management of green energy is a very crucial aspect for the big industries in India as it is an important part of manufacturing and distribution of supply chain for various industries.The high initial cost of installation and setup of the system to manage the green energy is one of the biggest challenges. Proper system planning and integration is another important aspect as the capacity and type of project is to be decided where availability of the energy source can be ensured. Most green energy management systems are dependent on weather conditions thus factors like sunny days , rainy days take a count. The article fails to mention that problem of improper green energy management is a huge concern as using more green energy can lower the prices of and demand for natural gas and coal by increasing competition and

diversifying our energy supplies. And an increased reliance on green energy can help protect consumers when fossil fuel prices spike especially in countries like India where these fuels are very expensive nowadays. A relevant article that was not cited by the author is: Pilipczuk, O. (2020). Sustainable Smart Cities and Energy Management: The Labor Market Perspective. Energies, 13(22), 6084. MDPI AG. Retrieved from http://dx.doi.org/ 10.3390/en13226084

Significance:

With the help of the article we came to know that sustainability is one of the strategic goals of smart cities. They are the essential solution to creating the sustainable future. Green energy is important for the environment as it replaces the negative effects of fossil fuels with more environmentally-friendly alternatives. Derived from natural resources, green energy is also often renewable and clean, meaning that they emit no or few greenhouse gases and are often readily available. On the other hand, the smart city is intended to deal with the problems of energy management. Pei, P., Huo, Z., Martínez, O. S., & Crespo, R. G. (2020). Minimal Green Energy Consumption and Workload Management for Data Centers on Smart City Platforms. Sustainability, 12(8), 3140. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su12083140 . The paper goes through the research gap about energy manager profession transformation considering smart sustainable city concept. The aim of the paper is to create an up-to-date holistic energy manager skill model with a focus on emerging technologies.. It is concluded that the core elements of the smart sustainable city concept have an impact on energy management are sustainability and big data. Ma, Y., & Li, B. (2020). Hybridized Intelligent Home Renewable Energy Management System for Smart Grids. Sustainability, 12(5), 2117. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su12052117 . The high initial cost of installation and setup of the system to manage the green energy is one of the biggest challenges. Proper system planning and integration

is another important aspect as the capacity and type of project is to be decided where availability of the energy source can be ensured. Today reaching these goals is only possible because of the cutting edge modern technologies. We have used the concept of MODDA to solve the problem of green energy management in smart cities to an extent. We tried to develop the idea of a system where using the formulas of MODDA we will be able to evaluate the required green energy that is being consumed and conserved in a smart city

Introduction , Literature Review and Methodology :

We tried to develop a method in which we would use the modern technological concepts like sensors(temperature ,pressure, etc.) say NDIR (Non-Dispersive Infrared) gas sensors , actuators(Electric motor , Hydraulic cylinder , etc) . We also used the concepts of MODDA to evaluate the green energy consumption in a smart city. Then we took this data with the help of a local area network to a cloud server where it was stored for further processing. Bayar, Y., Gavriletea, M. D., Sauer, S., & Paun, D. (2021). Impact of Municipal Waste Recycling and Renewable Energy Consumption on CO2 Emissions across the European Union (EU) Member Countries. Sustainability, 13(2), 656. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su13020656 . The concepts of MODDA were combined to generate formulas which we used for the evaluation of energy consumption in each building of a smart city. Firstly we went through some detailed analysis to get an idea about the total cost of energy required , total CO2 emitted and the total amount of revenue earned from selling the electricity back to the original grid . We also used a local area network which was fast and precise enough for continuous flow of data from each building which forms the very basis of our system . The network allows the sensors, actuators to effectively communicate not just with each other but also with the sensors and

actuators of other buildings with the help of which we were able to develop the final solution. Fashina, A., Mundu, M., Akiyode, O., Abdullah, L., Sanni, D., & Ounyesiga, L. (2018). The Drivers and Barriers of Renewable Energy Applications and Development in Uganda: A Review. Clean Technologies, 1(1), 9–39. MDPI AG. Retrieved from http://dx.doi.org/10.3390/cleantechnol1010003 . We also used a cloud server where data came flowing from each building all the calculations were processed again for error detection and also to get a final solution which we will use to evaluate the green energy consumption and the ways in which we can conserve it.The problems in the approach were Availability of Power (One of the biggest concerns in the field of renewable energy is power generation depending on natural resources that are uncontrollable by humans.) , Cost issue , Resource Location , etc. We will have to also keep in mind the errors in calculation of MODDA for which we will have to be extra careful while the calculation of the data is being done. Energies emitted in the form of CO2 from utility power and fuel consumption also form the basis of our calculations.

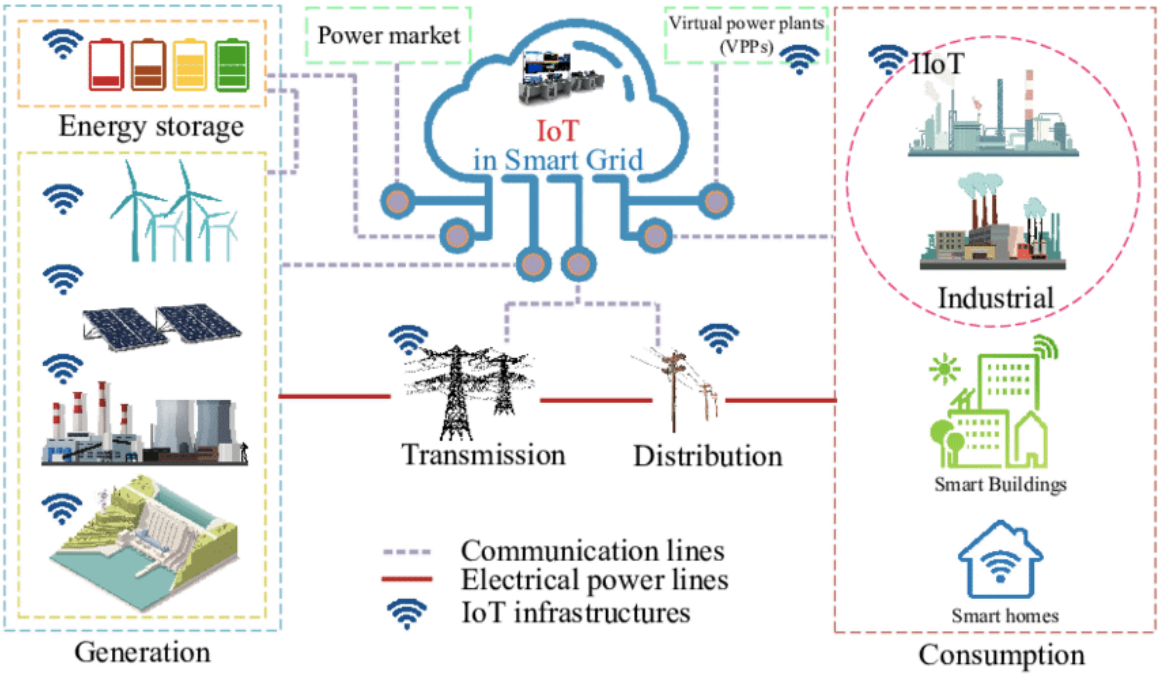
Contributions :

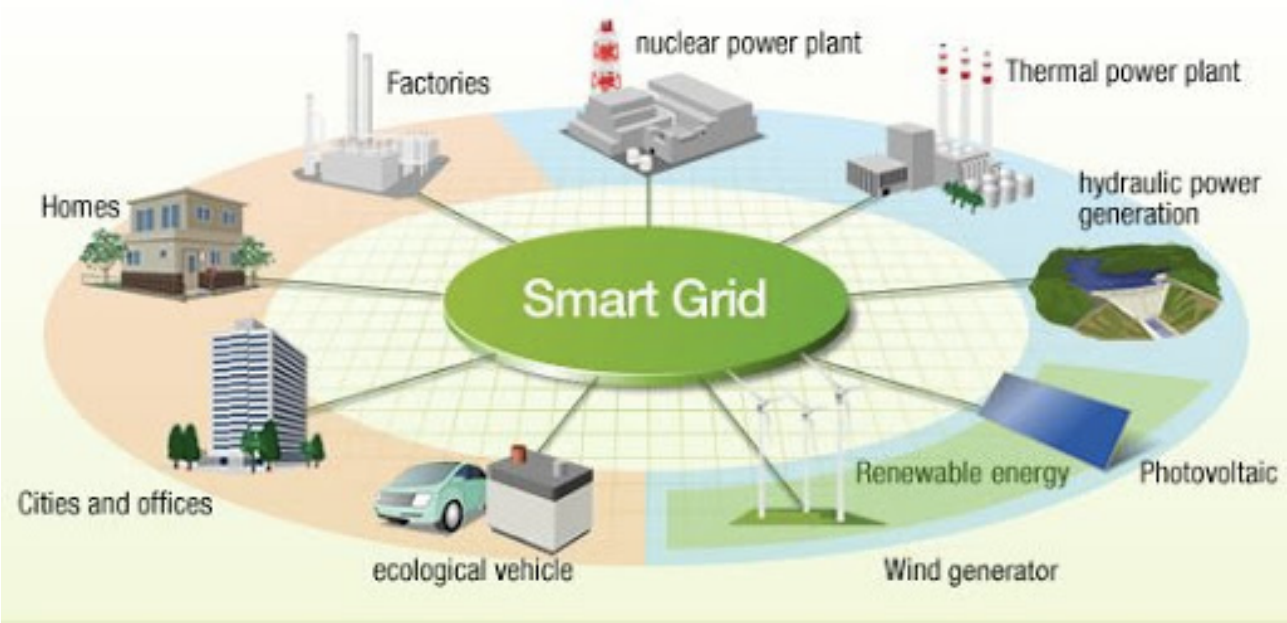
All the group members researched , discussed and planned this project together as a team.

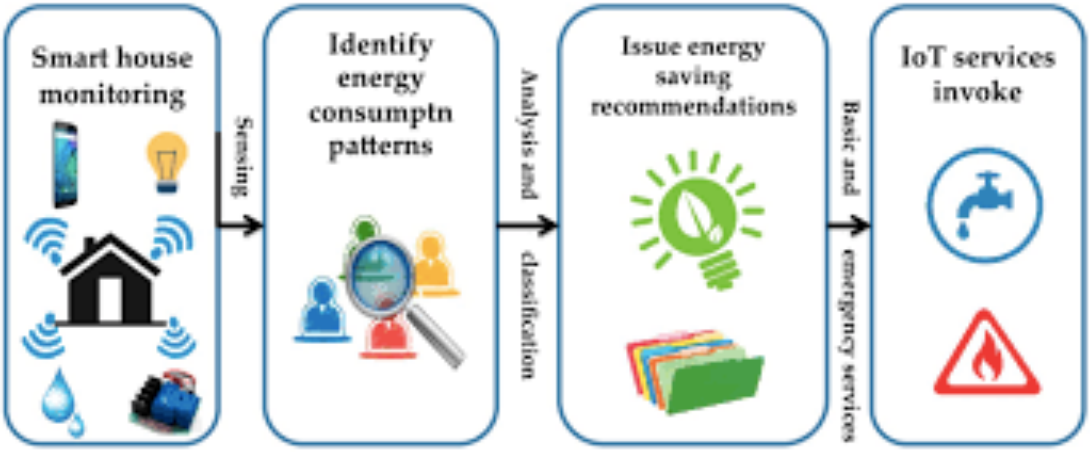
Min Total Energy (x) = a(electricity) + a(energy) +a(fuel purchase) +a (investment) - a(revenue earned from selling electricity back to original grid) would be used.

Min Total CO2 emission(y)= a(emission from Utility Power) + a(emission from Fuel Consumption) Min Energy Conserved = Min Total Energy(x) - Min Total CO2 emission(y)

By using above formulas like these we will be able to generate the Data which will then be taken to the cloud server by the help of local area Network . All this data will be combined there to help us get an idea about the Total energy that is being consumed and can be conserved.


Power market
Virtual power plants
(VPPs)
IIoT
Energy storage
IoT
in Smart Grid
Industrial
Transmission
Distribution
Smart Buildings
Communication lines
Electrical power lines
IoT infrastructures
Smart homes
Generation
Consumption


nuclear power plant
Factories
Thermal power plant
Homes
hydraulic power
generation
Smart Grid
Cities and offices
Renewable energy
Photovoltaic
ecological vehicle
Wind generator


Smart house monitoring
Sensing
Identify energy consumptn patterns
Analysis and classification
Issue energy saving recommendations
Basic and emergency services
IoT services invoke

Further research :

The research can be extended in areas like smart health management , smart car parkings, smart mobility , smart Hydraulic power generation plants , etc. This article calls for further research in renewable energy sources (RES) facilities which are currently a popular direction in urban transformation . The article has limitations like Geographic limitations and their Enforceability , Storage capabilities and their needs.

With the relationship between consumer and producer becoming so close to each other now the consumer not only is just a consumer but also helps to serve the system by providing feedback and reporting bugs which ultimately helps it to run smoothly.

The demand of smart energy systems have hugely increased in the recent times and various nations have become extremely reliant on renewable sources of energy we would like to work on meeting the demand of the consumers and extending the range of our system to as many consumers as possible.

References :

Lewandowska, A., Chodkowska-Miszczuk, J., Rogatka, K., & Starczewski, T. (2020). Smart Energy in a Smart City: Utopia or Reality? Evidence from Poland. Energies, 13(21), 5795. MDPI AG. Retrieved from http://dx.doi.org/ 10.3390/ en13215795

Pilipczuk, O. (2020). Sustainable Smart Cities and Energy Management: The Labor Market Perspective. Energies, 13(22), 6084. MDPI AG. Retrieved from http://dx.doi.org/ 10.3390/en13226084

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Bayar, Y., Gavriletea, M. D., Sauer, S., & Paun, D. (2021). Impact of Municipal Waste Recycling and Renewable Energy Consumption on CO2 Emissions across the European Union (EU) Member Countries. Sustainability, 13(2), 656. MDPI AG. Retrieved from http://dx.doi.org/10.3390/su13020656

Fashina, A., Mundu, M., Akiyode, O., Abdullah, L., Sanni, D., & Ounyesiga, L. (2018). The Drivers and Barriers of Renewable Energy Applications and Development in Uganda: A Review. Clean Technologies, 1(1), 9–39. MDPI AG. Retrieved from http://dx.doi.org/ 10.3390/cleantechnol1010003 .