



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Guest Lecture on

"ECONOMIC DISPATCH OF POWER SYSTEM WITH RENEWABLE ENERGY SOURCES"

REPORT

The department of Electrical and Electronics Engineering has organized a Guest Lecture on "**Economic Dispatch of Power system with Renewable Energy Sources**" on 26th November, 2022.

Beneficiaries : III Year Students (41) & IV Year Students (9)
Date : 26-11-2022
Session Time : 07.00 P.M to 8.00 P.M
Venue : Online (Meet Link: <https://meet.google.com/nbk-ppke-ixz>)
Resource Person : Mr. K. Manikandan, M.E., (Ph.D.),
Assistant Professor, Department of EEE
School of Engineering & Technology
Mohan Babu University
Sree Sainath Nagar, Tirupati, Andhra Pradesh

The main objective of this Guest Lecture is to impart knowledge on the economic dispatch of power system with renewable energy sources.

The Guest Lecture session started with the welcome address delivered by Dr.R.Arulraj AP/EEE. After the welcome address, Dr.R.Arulraj AP/EEE introduced the resource person, Mr.K.Manikandan, to the participants and also mentioned the various academic and research contributions of the resource person in the field of power system engineering.

The resource person started the session by interacting with the students about their basic knowledge in the power system engineering field. He also asked a few questions regarding the economic scheduling of power to the end consumers. Then, the resource person started the presentation by introducing the importance of economic load scheduling and various methods available for economic load dispatch problems by minimizing the fuel cost of the generators. For a better understanding, the resource explained the economic load dispatch problem solved using the basic and conventional Lagrange method. During the problem description, he explained the minimization of the fuel cost objective function in detail with the necessary equations and fuel cost coefficients for different generation units. Later, he pointed out the various constraints taken into account to solve the economic load dispatch problem.

After the basic explanation, he explained the importance of integrating renewable energy sources into the system to minimize the fuel cost and the emissions injected into the atmosphere. Further, he demonstrated the calculation of renewable energy sources (i.e., wind and solar) output using appropriate modeling equations. He then explained the procedure to solve the economic load dispatch problem with renewable energy sources using a neat flow chart. To show the effectiveness of economic dispatch problem with renewable energy sources in power system operation and control, the resource person presented the simulation results attained using the Lagrange method to the students for different cases such as conventional generators without renewable energy sources, conventional generators and PV alone, conventional generators and wind alone and at last conventional generators along with all renewable energy sources. He also pointed out the significant reduction in fuel costs after integrating renewable energy sources into the system.

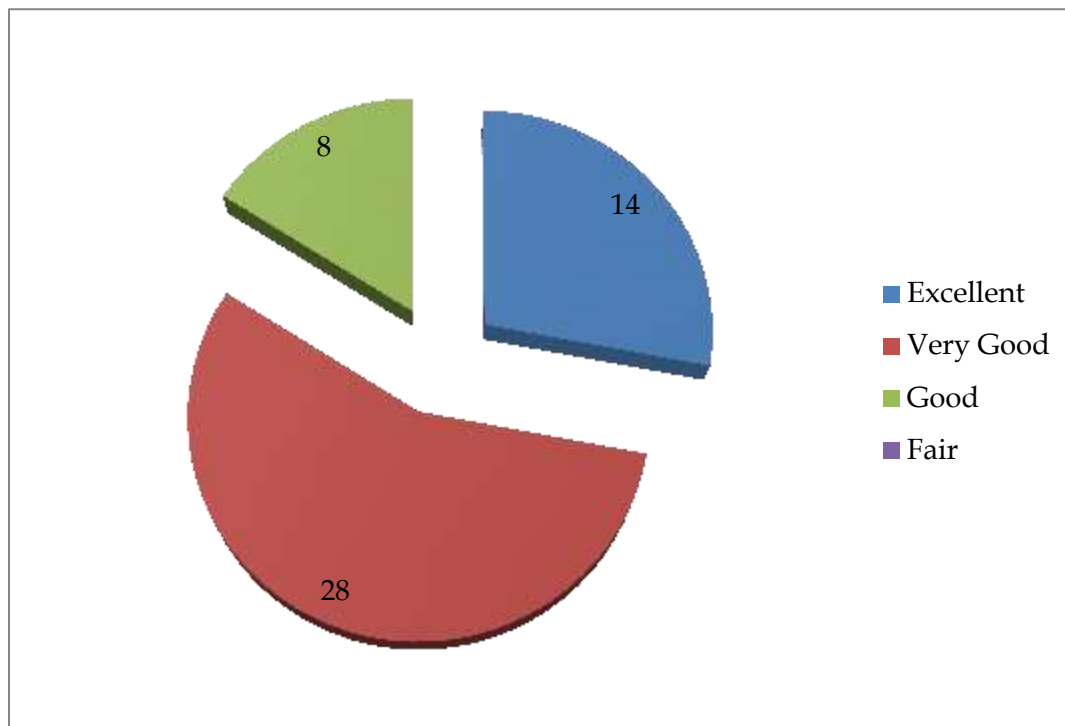
Finally, he gave a deeper insight into thrust areas of research in the economic load dispatch problem and the scope for future research. He also motivated the students to do their projects in economic load dispatch using evolutionary algorithms. He gave useful inputs regarding higher studies in power system engineering in India and foreign countries. In the end, he invited the queries and doubts from the students for discussion and clarification. Students asked some interesting questions, and the resource person clarified their queries with the help of real-time examples.

The guest lecture completely motivated and kindled students' interest in the growing technologies in power system engineering and its positive impact on power system operation. The session was very useful to our student community and provided greater input to their final-year projects. Finally, the Guest Lecture ended with the vote of thanks delivered by Dr.R.Arulraj, AP/EEE.

Outcomes:

- Students can realize the importance of economic load dispatch in power system operation.
- Students can understand the basic concepts of solving economic load dispatch problems using the Lagrange method.
- Students can realize the impact of renewable energy sources in minimizing the fuel cost and hazardous pollutants emitted into the atmosphere.
- Students can select economic load dispatch problems for their project work, paper publication, conference presentation, and PCE activities.

Feedback Analysis:



Photographs of Lecture Sessions

manikandan.susila is presenting

ECONOMIC DISPATCH OF POWER SYSTEM WITH RENEWABLE ENERGY SOURCES

Mr. K. Manikandan, M. E.,
Assistant Professor

SREE VIDYANIKETHAN
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SREE VIDYANIKETHAN ENGINEERING COLLEGE

7:09 PM | nbk-ppke-krz

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MATHEMATICAL MODELLING

- **Mathematical modelling for generators and CHP:**
The cost coefficients of generators and CHP are shown in the table below:

Table 1: Cost coefficients for diesel generator

Cost coefficients	CHP	Gen-1	Gen-2
a	0.024	0.029	0.021
b	21	20.16	20.4
c	1530	992	600

The minimum and maximum generation limits for the generation of DG's are:
 $0 \text{ KW} \leq P_g \leq 650 \text{ KW}$

The minimum and maximum limits for the generation of CHP is:
 $0 \text{ KW} \leq P_{chp} \leq 1000 \text{ KW}$

7:14 PM | nbk-ppke-krz

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Mathematical modelling for solar:

The solar power generation is calculated using the formula:

$$P_{PV} = P_{STC} \frac{G_{sun}}{G_{STC}} (1 + K(T_c - T_1)) \quad (5)$$

Where,

- P_{PV} = Power output (KW)
- P_{STC} = Maximum power of PV at STC (330 KW)
- G_{sun} = Incident solar radiation (W/m^2)
- G_{STC} = Solar irradiance at STC (1000 W/m^2)
- K = Temperature Co-efficient (- 0.0047)
- T_1 = Reference temperature (25° C)
- T_2 = Cell temperature ($^\circ \text{ C}$)

7:21 PM | nbk-ppke-krz

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CASE 5 : 2 Diesel Generators + Solar + Wind + CHP

Time (hrs)	Demand (KW)	Pg1 (KW)	Pg2 (KW)	Pg3 (KW)	Pg4 (KW)	Pg5 (KW)
1:00	215	86.16	85.93	62.71	0	0
2:00	205	61.31	78.95	56.591	0	8.149
3:00	200	32.37	66.62	45.812	0	35.198
4:00	280	73.58	93.90	71.483	0	38.033
5:00	300	85.81	112.78	86.218	0	65.192
6:00	425	117.81	156.42	124.446	0	26.724
7:00	470	109.81	145.92	115.214	78.037	21.018
8:00	437	50.208	83.62	43.2066	215.5294	62.438
9:00	425	18.448	18.76	4.792	280.988	101.008
10:00	330	0	0	0	312.6998	83.434
11:00	375	0	0	0	322.679	73.038
12:00	360	0	0	0	326.724	54.643

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CONCLUSION

- The mathematical models for solar and wind were analysed and all the required data was gathered to perform the economic dispatch for microgrid.
- The theoretical calculations to find the total cost of generation, power generated by various sources of renewable integrated microgrid for each hour was completed using conventional method (Lagrange method).
- The MATLAB code for conventional method has been executed successfully for the all cases and a comparison table was made to compare the total cost of generation obtained theoretically and practically.

7:34 PM | nbk-ppke-lxz

Pr-l-Q 29/11/22
Faculty In-Charge

A. M. M. M. 29/11/22
HOD/EEE

J. Ramakrishna 29/11/2022
Principal