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TRANSMISSION NETWORK EXPANSION PLANNING UNDER DEMAND RESPONSE PROGRAM

P.B. Thote[1], C. Rathore[2] and M.B. Daigavane [4]
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ABSTRACT

Several numbers of optimization techniques and new technologies have been implemented on Transmission Network Expansion Planning (TNEP). Due to restructured electricity market different forms of energy saving techniques have been integrated in the system such as demand response (DR), electric vehicles and others. In the presented paper TNEP problem has been analyzed under various DR programs. The objective of this work is to minimize the overall cost of the system. The IEEE 24-bus transmission network has been modified and examined under different cases. The results indicate a significant contribution in the field of proposed study.

Keywords: *Restructure, Demand response, Cost, Transmission network planning.*

1. Introduction

From the past few eras, more focus is towards the use or integration of renewable energy sources into the structure of the power system. This is because of the electricity act 2003 and generation of electricity from renewable energy. This results in more tedious job for the transmission network planner. Hence, different optimization techniques have been adopted by the system planner. Also, in order to reduce the overall cost of the system emerging methods have been incorporated in the system. DR is defined as changes in point-user electricity intake templates in line with changes in electricity prices over time compared to their ordinary routine templates (Albadi & El-Saadany, 2008). The execution of DR programs may be configured as a replacement for the generation and transmission extension (Gbadamosi & Nwuhu2020). Considering deregulated electricity market adaptation of DR has many advantages. Some forms of DR methods have been explained in (Aalami, Moghaddam, & Yousefi, 2010). A review about different optimization algorithms applied to TNEP problem has been reported in (Ude, Yskandar, & Graham, 2019). Work done so far with regards DR and TNEP has been presented in (Kazerooni & Mutale, 2010,Saxena, & Bhakar, 2019, and Rathore& Roy, 2016). The effectiveness of gbest-guided artificial bee colony (GABC) method has been presented by the authors in (Rathore& Roy, 2016). Therefore, it is considered here.

2. Formulation of the Problem

In this work, minimization of multi-objective function is considered. The target is to minimize, the sum of the transmission line investment cost (CTL), the running cost (RC) of generating units and the price of demand response participation (DRC). It is expressed as below:

Objective function $= (\mathrm{CTL} + \alpha \times (\mathrm{RC} + \mathrm{DRC}))$ (1)

Terminologies used in (1) are illustrated below:

The CTL in (1) represents the amount paid for constructing new transmission line (Romero, Rocha, Mantovani, & Sanchez, 2005) and is expressed as

$$\mathrm{CTL} = \sum_{i,k\in\Omega} \mathrm{CL}_{ik}(\mathrm{nn}_{ik}) \qquad (2)$$

The RC is the fuel cost of the generating units and expressed as (Rathore& Roy, 2016):

$$\mathrm{RC} = \sum_{j}^{L_d}\sum_{i}^{N_g} a_i + b_i P_{gi}^{j} + c_i \left(P_{gi}^{j}\right)^2 \qquad (3)$$

where CL_{ik}, a, b and c indicates the price of transmission lines, cost coefficients of the generator.

The DRC indicates the cost for j^{th} load level of DR contribution (Aalami, Moghaddam, & Yousefi, 2010, Rathore& Roy, 2016) and it is calculated using (4)

$$\mathrm{DRC} = \sum_{j}^{L_d}\sum_{i}^{N_b} \mathrm{Ainc}_i^j \times \left(\mathrm{d}_{o_i}^j - \mathrm{d}_i^j\right) \qquad (4)$$

where α in eqn. (1) is the weighting factor.

Subjected to the constraints as expressed in (5)-(8).

$$\sum_{vi\in N_{ik}} f_i^j - \sum_{vi\in N_g} P_{gi}^j = P_{dk}^j \; k = 1, \ldots, N_b \qquad (5)$$

$$\sum_{vi\in N_{ik}} |f_i^j| \le (n_i^o + nn_i^j) f_i^{max} \qquad (6)$$

1

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Performance Assessment of Improved Solar Still Design with Stepped-Corrugated Absorber Plate

Intelligent Manufacturing and Energy Sustainability pp 667-674 | Cite as

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Conference paper
First Online: 03 April 2021

Part of the Smart Innovation, Systems and Technologies book series (SIST, volume 213)

Abstract

Conventional solar still owns poor efficiency and low distillate output, hence not found commercially popular for domestic and industrial applications. The present work demonstrates the improved design of solar still with stepped-corrugated absorber plate for higher energy efficiency and yield. During experimentation, the productivity of stepped-corrugated and conventional solar still is found as 2.50 kg/m^2 per day and 0.90 kg/m^2 per day, respectively. The energy efficiency of stepped-corrugated and conventional solar still is found as 33.33 and 18.67%, respectively. From this exertion, it is concluded that the stepped-corrugated still has better yield and efficiency as compared to the conventional still.

Keywords

Distil water Distillation Solar energy Waterborne diseases Desalination Renewable energy

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Energy and Environmental Scenario of South Asia

Energy and Environmental Security in Developing Countries pp 75-103 | Cite as

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Chapter
First Online: 03 March 2021

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Abstract

South Asia is one of the most important regions in the world for its large population base, vast natural resources, significant geographic positioning, vibrant culture and rich history. Made up of eight countries: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka—South Asia is home to almost a quarter of the world population. South Asian countries are facing severe energy and environmental challenges that are affecting their broader socio-economic developments, technological advancements, and national security. The chapter discusses the energy and environmental scenario of South Asia. Details of each country in terms of energy resources, supply mix, access to electricity, and cooking fuels have been discussed. Emerging trends and renewable energy developments are also reflected. The environmental scenario of the region has also been presented taking into account the implications of climate change. The perspective of the region in terms of Sustainable Development Goals (SDGs) has also been discussed.

Keywords

Energy Environment Sustainable development Renewable energy South Asia

References

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RESEARCH ARTICLE | DECEMBER 18 2020

Energy, drinking water and health nexus in India and its effects on environment and economy

Vikrant P. Katekar; Sandip S. Deshmukh; A. Vasan

Journal of Water and Climate Change (2021) 12 (4): 997–1022.
https://doi.org/10.2166/wcc.2020.340 **Article history**

Abstract

This paper examines energy, drinking water and health nexus in India, and its consequences for the environment and economy. To establish this nexus, K-means cluster analysis and Davies–Bouldin validation index are employed to group 32 Indian states and union territories. The classification was performed based on 16 criteria, and the number of optim clusters arrived at is 8. The nexus between energy, drinking water and health must be cautiously dealt with to ensure the social and economic growth of the nation. The criterion analysis of the states within these clusters indicates that states and union territories facing energy crises are usually deficient in safe drinking water services; consequently, people of those regions suffer from ill-health, which increases the economic burden on people through the loss of work productivity. With a deficient cash reserve, the communities are incapable of fulfilling the demand for energy and safe drinking water. However, while installing desalination plants to fulfil the need for safe drinking water, their environmental impact must be taken into account, as these systems have high energy consumption and significant environmental impact.

HIGHLIGHTS

Dr.Rashmi Jain_Book Chapter Proof

Book

Security and Privacy in the Internet of Things

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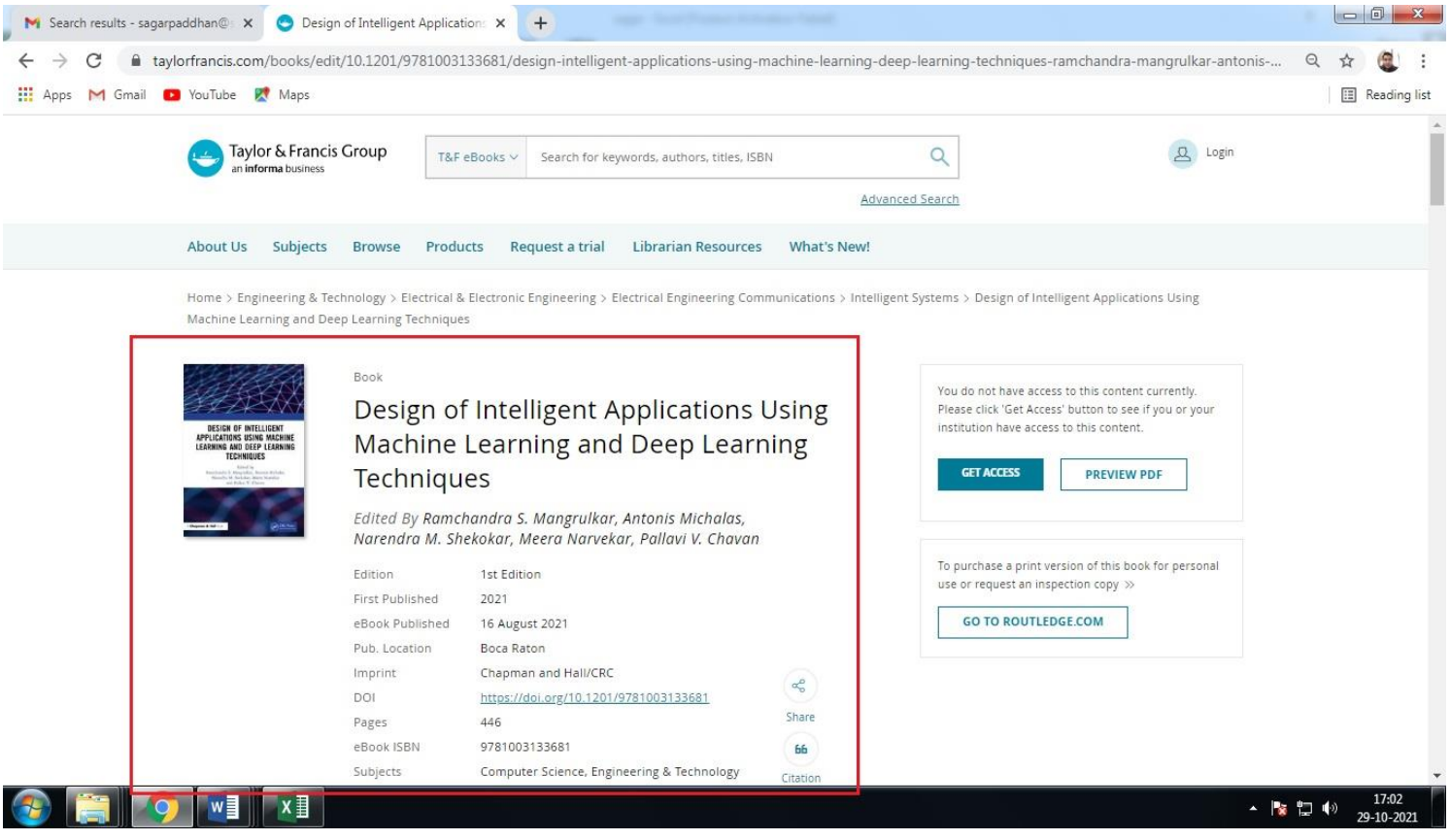

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Book

Design of Intelligent Applications Using Machine Learning and Deep Learning Techniques

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ENERGY AND ENVIRONMENT • Dr. Tasneem K. H. Khan • Dr. Gaurav Bhosekar • Dr. Dilip kumar B. Rana • Dr. Archana Shetye

As per New Syllabus (w.e.f. 2020-21)

B.E.

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(A Complete Text Book For BE. Sem I)

Dr. Tasneem K. H. Khan
Dr. Dilip kumar B. Rana
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FIRST YEAR (SEMESTER I) BACHELOR OF ENGINEERING

(For All Branches)

Course Code	**BSEI3T**			
Course Title	**ENERGY AND ENVIRONMENT**			
Scheme & Credits	**L**	**T**	**A**	**Credits**
	2	**1**		**3**

Examination Scheme :

University Paper : 70 Marks

Internal: 30 Marks

Total : 100 Marks

Duration of University Examination : 03 Hrs

Course Objectives:

1. To impart knowledge in the domain of renewable and non-renewable energy sources.
2. To bring out impact of Energy Technologies on Environment
3. To inculcate knowledge and skills about assessing the energy efficiency of different energy sources and use of advanced materials for sustainable development.

Course Outcomes:

After studying the course it is expected that the students will have/be able to:

1 Obtain the knowledge of solid and gaseous fuels and their Calorific Value determination.

2 Recognize the type of liquid fuels and their uses in IC engines.

3 Apply the knowledge about the use alternative sources of energy.

4 Differentiate the types of waste and its management

5 Analyze the impacts of Industrial pollution and its control.

6 Develop innovative ideas for use of advanced materials in sustainable development.

Syllabus

Unit-I BASICS OF ENERGY AND SOLID FUELS (Marks 11)

1.Basics of Energy - Introduction, sources and types of energy, Units of energy, Thermal Basics of energy -fuels, contents of fuel, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer.

2.Classification of fuels, Calorific Value (HCV & LCV). Determination of Calorific value by Bomb and Boy's Calorimeter.

3.Solid Fuels:- Significance of Proximate and Ultimate Analysis of coal,

4.Numerical based on Dulong's formula.

5.Numerical on Calorific Value determination

Unit-I LIQUID AND GASEOUS FUELS **(Marks15)**

1.Liquid Fuel:- Fractional distillation of crude oil, Catalytic cracking and its advantages

2.Knocking in internal combustion petrol and diesel engine, Octane and Cetane number, Knocking and its relationship with structure of fuel, Doping agents, Power alcohol, Gasohol, Diesehol, Aviation fuel, Bio-diesel.

3.Gaseous Fuel:- CNG, H2 as specialized fuel

4.Combustion Calculations

Unit-III ALTERNATE SOURCES OF ENERGY **(Marks 11)**

1.Hydro energy, Bio-energy, Photolysis of water- Chemical Conversion of Solar Energy. Nuclear fuels.

2.Fuel cells- working, advantages and disadvantages of alkaline, methanol and phosphoric fuel cells.

3.Green Technology: Hybrid Vehicle Technology, Industrial Ecology and Green Computing.

Unit-IV INDUSTRIAL POLLUTION: ITS IMPACTS ON ENVIRONMENT & CONTROL **(11 Marks)**

1.Industrial pollution due to non-renewable energy sources: General introduction of Industrial pollution and its typ

2.Environmental impact and its control, principle, processes, sources of pollution with reference to specific industri Nitrogen containing fertilizers-ammonia synthesis, Cement manufacturing Industry; Sulphuric acid manufacturi Industry and petroleum Industry

Unit-V- WASTE TO ENERGY CONVERSION **(Marks 11)**

1.Characterization of waste - composition, ignitability, corrosivity, reactivity, Toxicity. Freight and transport chemicals, health effects, hazardous waste management technology: physical method, chemical method, biologic treatment, Incineration -eco-friendly incineration, landfill.

2.Utilization of Biogas and Landfill Gas for Biofuels and High Value-Chemicals, gasification and Utilization Syngas, Thermochemical Conversion of Syngas.

3.Rules of regeneration of e-waste recycling and its managements as per government norms.

Unit-VI ADVANCED MATERIALS FOR SUSTAINABLE DEVELOPMENT **(11 Marks)**

1.Introduction of Advance materials, properties and applications: composites, Liquid Crystal Polymers, conducti polymers, insulating materials, adhesives, biodegradable polymers.

Nanomaterial in energy- Introduction, synthesis by Sol-gel and Chemical Vapour Deposition techniques, applicatio in Photochemical devices like lithium-ion battery, Nanomaterial for Energy Storage and photovoltaic cells.

ABOUT THE AUTHORS

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Scheme & Credits	L	T	A	Credits
	3	1		4

Examination Scheme :

University Paper : 70 Marks

Internal: 30 Marks

Total : 100 Marks

Duration of University Examination : 03 Hrs

Syllabus

Unit-I : Periodic Properties and Atomic, Molecular Structure (Marks 11)

- **Periodic Properties :-** Effective nuclear charge, penetration of orbital, electronic configurations, eriodic trends of atomic and ionic sizes, ionization energies, electron affinity, electronegativity and polarizability
- **Atomic, Molecular Structure :-** Atomic and Molecular orbitals. Molecular Orbital Theory and Energy level diagrams of homodiatomic molecules(Hydrogen to Fluorine) and hetero diatomic molecules, NO, NO^+, NO^- and HF. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties (tetrahedral and Octahedral complexes).

Unit-II :- Thermodynamics Functions (Marks 11)

- Thermodynamics Functions : Energy, entropy and Free Energy
- Brief introduction of system surrounding, boundary, extensive and intensive properties.
- Definition & basic equation of internal energy and enthalpy
- Numericals on internal energy and enthalpy change
- Second law of Thermodynamics, reversible and irreversible reactions
- Role or use of Gibbs free energy in (a) chemical equilibrium, (b) oxidation reduction.

Unit-III :- Corrosion of Metals (Marks 11)

- Basic concepts of free energy and emf., Cell potentials, the Nernst equationand applications.
- Corrosion- Definition, Causes, theories of corrosion- dry, wet and differential aeration, types of corrosion- pitting, inter granular, and stress corrosion
- Prevention, and control of corrosion. - design and material selection, cathodic protection.

Unit-IV :- Application of Spectroscopic Techniques (Marks 11)

- Principal of spectroscopy and selection rules,
- Electronic spectroscopy - basic principles, Lambert-Beer's law, Woodward - Fisher Rule for conjugated dienes. Fluorescence, Phosphorescence, Jablonski Diagram and its applications.
- Nuclear magnetic resonance - basis principle, chemical shift, spectral interpretation of some compounds and magnetic resonance imaging.

Unit-V- Basic Green Chemistry **(Marks 11)**

- Green Chemistry : Introduction, twelve principles of Green chemistry with examples, Numerical based on atom economy, Carbon sequestration & Carbon Credits,
- Green reagents, Dimethyl carbonate and its applications, Supercritical carbon dioxide properties and applications, uses and applications of biopolymers (any two)

Unit-VI - Water Technology **(Marks 15)**

- Importance of pH, Hardness and Alkalinity of water.
- Domestic Water Treatment : Brief discussion of coagulation by commonly use coagulants like Alum, polyaluminium chloride, ferric chloride, lime. Sterilization by using Ozone and chloride (Break point chlorination).
- Industrial Water Treatment : Softening of water-principle - reactions, advantages, limitations and comparison of Zeolite process, and Demineralization process. Numericals based on Zeolite process.

  Boiler Troubles - (causes, effect on boiler operation and methods of prevention) - Scales and sludges, Caustic embrittlement.
- Desalination of sea water- Principles methods and advantages of electro dialysis and reverse osmosis processes
- Waste Water Treatment (introduction and importance) - Water treatment from biological waste water to clean water production, Membrane bio reactors.