Vol 60 No 12 December 2020 ₹100

Since 1961

Electrical India

ISSN 0972-3277

India's oldest magazine on power and electrical products industry

60th Year of Service to the Industry

REACHING NET-ZERO EMISSIONS

Electrical India Ranked Among World's Top 100 Publications in "The Future of Energy"

A Chary Publication®

Follow us on

SUBSCRIBE/RENEW Online • Log on to www.electricalindia.in

Scan the QR Code to know more about EI Website

RELIABILITY.

WINNER OF DEMING PRIZE 2019

At E&A, it's in our DNA

L&T Electrical & Automation has been a pioneer in driving innovation and development in the electrical and automation industry. The organisation has earned the confidence of its stakeholders as a partner to rely on, given its track record of delivering on promises. It is something we are proud of and has remained unchanged, in our DNA. Reliability.

#DNAUnchanged

Customer Interaction Center (CIC)
BSNL / MTNL (toll free): 1800 233 5858
Reliance (toll free): 1800 200 5858 Tel: 022 6774 5858
Email: cic@Lntebg.com www.Lntebg.com

L&T Electrical & Automation

INDO TECH

A PROLEC® PARTNER

- 45 years of expertise
- Robust operational processes
- Experience and qualified professionals
- Strong commitment to reliability & quality

SALIENT FEATURES OF TRANSFORMERS & FACILITIES

- NABL Accredited test lab
- 97% success rate in Short Circuit Transformers... Consistent process capabilities
- BIS certification for distribution transformers as per IS 1180
- Technology support from Monterrey, Mexico

PRODUCTS OFFERINGS

	RANGE	CUSTOMERS
DISTRIBUTIONS TRANSFORMERS 	• 100 KVA - 5000 KVA, 33KV • Distribution as per IS 1180 • Special transformers • Wind and solar applications	• Utilities • Contractors and developers • Distributors and direct customers • Renewables
POWER TRANSFORMERS 	• 5.0 - 200 MVA, 245KV HV • Substation Transformers • Generator step-up • Auto Transformers	• Electrical utilities • Engineering and Construction firms • Private enterprises • IPPs & Renewables

SPECIAL OFFERINGS

SKID MOUNTED SUBSTATIONS (SMS)

- 70% reduction in installation time and overall foot print
- Significant reduction in labour requirement at site
- Scope includes Transformers / VCB Panel / DP Structure / Fencing

ESTER OIL FILLED FIRE SAFE DISTRIBUTION TRANSFORMERS

- Suitable for indoor installation...fire point 300°C
- Viable alternative for dry-type transformers
- High overloading ability
- Bio-degradable oil
- Longer life-span with high reliability
- Reduced risk to operating personnel

7,500 MVA Chennai, India

INDO TECH TRANSFORMERS LIMITED

A Subsidiary of Shirdi Sai Electricals Limited

CIN: L29113TN1992PLC022011

Reg. Off. & Factory: S. No. 153 - 210, Illuppapattu Village, Near Rajakulam, Chennai - Bangalore Highway, Kancheepuram - 631 561.

Tel/Fax: +91 (0) 44-37290518 · info@indo-tech.com · www.indo-tech.com

POWERING INDIA

Transformation through Innovation

SSE® SHIRDI SAI ELECTRICALS LTD

Shirdi Sai Electricals Ltd established in the year 1994 with a vision to cater the emerging needs of Energy sector:

- Largest manufacturer and supplier of energy efficient Amorphous core transformers.
- Technology License holder from Metglas Inc., USA, a subsidiary of Hitachi Metals, Japan, for Amorphous core.
- Fully backward integrated & automated manufacturing facility.
- Erected over 100 Substations & 80,000 KMS of LT & HT Lines.
- Wide product range of Distribution Transformers, Power Transformers and special type Transformers ranging from 5 kVA to 50 MVA, up to 132 kV Class.
- EPC Division handles Electrification works, Distribution system improvement works (HVDS) & Substation erection works.
- Manufactured and supplied over 4,00,000 Transformers.
- In-house design team with in-house design software.

Corporate Office:
Shirdi Sai Electricals Ltd.,6-3-8-879/B 3rd Floor, Green Lands, G Pulla Reddy Sweets Building, Beside CM Camp Office, Begumpet - 500016, Hyderabad, Telangana, India
Phone: +91- 40-30759966/77

Factory Address:
Shirdi Sai Electricals Ltd., Plot No: 58,59, Industrial Estate, Kadapa - 516004, Andhra Pradesh, India
Phone: +91 8886711110, +91-7799885809
www.ssel.in info@ssel.in

NATIONAL ENERGY CONSERVATION AWARD 2014 WINNER

BIS CERTIFIED

An ISO 9001:2015 ORGANISATION

From the Publisher's Desk

India is already aligned with the global trend

Since January 2020, globally, the power sector had to face multiple challenges because of the spread of the Corona virus, it goes without saying that with such a backdrop, it was quite difficult to maintain the growth momentum. However, being the driver of all other industries, the global power industry had to continue its operations – may be at a low scale at many parts of the world. As far as the power industry is concerned, it's not a complete setback, because this year of impeded progress due to repeated lockdowns at different countries for varying durations gave decision makers time to think strategically – and formulate policies for the coming days. While global climate change is a big threat to the entire human race, decision makers in different countries have utilised this time to chalk down their future courses of action. Obviously, most of their plans are inclined towards harnessing renewable energy at a much more accelerated pace.

Globally, some notable major decisions have been taken in 2020. For example: recently, the Polish government has approved a draft of Offshore Wind Act to award about 32 billion zlotys in support of the construction of 10.9 GW of capacity in the Baltic Sea. Now, almost 80% of energy produced in Poland comes from coal-fired thermal plants, thus, the country was under pressure from the European Union to reduce carbon emissions. In The UK too, the Department of Business, Energy and Industrial Strategy (BEIS) has given nod to the country's biggest lithium-ion battery-based energy storage project, which will come up at DP World London Gateway port. India, being one of the pioneers in developing carbon-free economy, has operationalized the plan to boost the domestic production of renewable energy equipment to stop import dependency.

Mahadevan

Publisher & Editor-In-Chief

Directors
Pravita Iyer
Mahadevan Iyer

Publisher & Editor-In-Chief
Mahadevan Iyer
miyer@charypublications.in

Commercial Director, Digital & Print
Pravita Iyer
pravita@charypublications.in

Editorial Department
P. K. Chatterjee (PK)
pkchatterjee@charypublications.in

Editorial Assistant
Abegail D'mello
abegail@charypublications.in

Advertising Department
Head - Marketing
Yasmeen Kazi
yasmeen@electricalindia.in

Design
Sachin Parbalkar
Jebas Thangadurai

Accounts Department
Dattakumar Barge
accounts@charypublications.in

electricalindiamagazine
electricalindia
ElectricalIndia
electricalindia1961

Chary Publications Pvt. Ltd.
906, The Corporate Park, Plot 14 & 15,
Sector 18, Vashi, Navi Mumbai 400703
Phone: 022 4961 2499
www.electricalindia.in

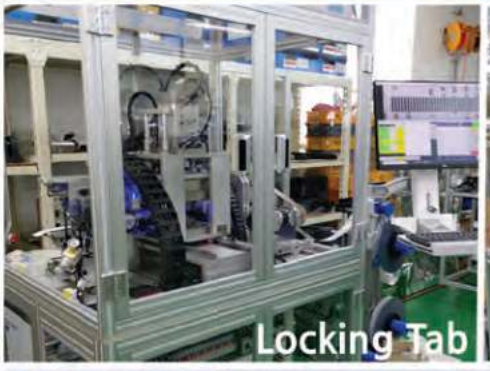
Single Issue: ₹ 100 / Annual Subscription: ₹ 1000

Printed, Published and owned by Mahadevan Iyer from 906, The Corporate Park, Plot 14 & 15, Sector 18, Vashi, Navi Mumbai 400703 and Printed at Print Tech., C-18, Royal Indl Estate, Naigaum Cross Road, Wadala, Mumbai - 400 031. **Editor: Mahadevan Iyer**

INTERNATIONAL FLAT CABLE

www.ifcw.com

International Flat Cable (IFC) is world-class market leader specialaizing in the manufacturing of Flexible Flat Cable (FFC) lamination facilities for more than two decades with the accumulated knowledge and extensive experience as a leader in the FFC industry.



Locking Tab

Shielding

Folding

Global Clients

KOREA
MOBASE CONNECTOR CO.,LTD
(SHINCHANG CONNECTOR CO.,LTD)
SHINYOUNG Co.,LTD
(YOUNGSHIN Co.,LTD)
SUNGWOO TECHRON CO.,LTD.
SERONICS CO.,LTD.
UJU ELECTRONICS CO.,LTD.
BOWON CONNECTOR CO.,LTD.
GAP
DOOSAN CO.,LTD.

TAIWAN
FOXCONN CO.,LTD.(in China)
HAMBURG CO.,LTD. (in China)
DEREN CO.,LTD. (in China)
HUNGFU GROUP. (in China)
TENNIRICH INTERNATIONAL CO.(in China)
CVILUX CORPORATION. (in China)

MALAYSIA
SUMITOMO ELECTRIC
FLAT COMPOMENTS, INC.
HITACHI CABLE CO.,LTD.

INDIA
JET TECHNOLOGIES

JAPAN
SUMITOMO ELECTRIC FLAT
COMPOMENTS, INC.
HITACHI CABLE CO.,LTD.
TSUJIMOTO ELECTRONICS CO.,LTD.
SONY CHEMICAL CORPORATION

HONGKONG
TUNG HING ELECTRIC WIRE LTD.
TECH CABLE LTD.
SHS HARNESS MANUFACTURE LTD.

USA
NICOMATIC NORTH AMERICA.
PARLEX USA LLC.(Johnson Electric)

INDONESIA
PT. VENTURINDO JAYA BATAM.
TECH MASTER ELECTRONICS CO.,LTD.

VIETNAM
UJU ELECTRONICS CO.,LTD.

GERMANY
GERMAN COMPANY(NDA)

CHINA
RICHANG AUTO PARTS CO.,LTD.
HITACHI CABLE CO.,LTD.
HUNGFU GROUP.
FOXCONN TECHNOLOGY GROUP.
TSUJIMOTO ELECTRONICS CO.,LTD.
JESS-LINK PRODUCTS CO.,LTD.
TENNRICH GROUP.
DEREN ELECTRONIC CO.,LTD.
ASEN MAGNET&ELECTRONIC CO.,LTD.
PETER'S TECHNOLOGY CO.,LTD.
DONGRI TECHNOLOGY ELECTRONICS CO.,LTD
NEW GRAND TECH CO.,LTD.
XINYA ELECTRONICS CO.,LTD.
SHS HARNESS MANUFACTURE LTD.
RONGCHANG AUTO PARTS CO.,LTD.
HAMBURG INDUSTRIES CO.,LTD.
XIAMEN GUANLIAN ELECTRONIC
TECHNOLOGY CO.,LTD.
P-TWO ELECTRONIC CO.,LTD.
NICOMATIC (TIANJIN) ELECTRONICS CO.,LTD.
PARLEX (SHANGHAI) INTERCONNECT
TECHNOLOGIES CO.,LTD.
ZHENG HAO ELECTRONICS CO.,LTD.
DONGGUAN TANGSHA OZHEN ELECTRONIC CO.,LTD.
UJU ELECTRONICS CO.,LTD.
HUSISHIN INDUSTRY.

IFC INTERNATIONAL FLAT CABLE

Head Office & Factory : 190, Songseon-ro, Pocheon-si, Gyonggi-do, 11161, Korea.
Tel : + 82-31-541-4505, 4506, 4507 E-mail : ifcw@ifcw.com / james@ifcw.com

Electrical India

Contents

Vol. 60 | No. 12 | December 2020

REGULARS

ESYLUX

For more details contact:

iTvis Lighting First

iTvis Innovations Pvt Ltd
t: +91 253 2236444
m: +91 94224 98376
info@itvisinnovations.com
www.itvisinnovations.com

HYGIENIC LIGHT SWITCHING. ESY!

CONTACTLESS ENERGY-EFFICIENCY WITH PRESENCE AND MOTION DETECTORS

FITTING PRODUCTS FOR APPLICATIONS

The higher the number of people who use a particular room, the greater the hygiene problem presented by the light switch – this applies to sanitary facilities, staircases and corridors in particular, but also in offices.

SANITARY FACILITIES

CORRIDORS

STAIRCASES

OFFICES

PERFORMANCE FOR SIMPLICITY

ESYLUX GmbH | www.esylux.com

You can find more informations on the ESYLUX website:

IREDA SIGNS MOU WITH MNRE

Indian Renewable Energy Development Agency Ltd (IREDA) has signed a Memorandum of Understanding (MoU) with the Ministry of New and Renewable Energy (MNRE), Government of India setting key targets for the year 2020-21. The MOU was signed by Indu Shekhar Chaturvedi, Secretary, MNRE and Pradip Kumar Das, Chairman & Managing Director, IREDA in the presence of senior officials from MNRE and IREDA.

Officials from IREDA and MNRE during the signing of the MoU…

Govt. of India has set a revenue target of Rs. 2,406 crore under 'Excellent' rating along with various performance-related parameters such as Operating Profit as percentage of Revenue from Operation, PAT as a percentage of Average Net worth, Loan disbursement, Overdue loan etc.

Till 2nd November 2020, IREDA has financed more than 2700 renewable energy projects in India with cumulative loan disbursements to the tune of Rs. 57,000 crore, and has supported green power capacity addition of 17,259 MW in the country.

Contextually, IREDA is a Mini Ratna (Category – I) Government of India Enterprise under the administrative control of Ministry of New and Renewable Energy (MNRE). IREDA is a Public Limited Government Company established as a Non-Banking Financial Institution in 1987 engaged in promoting, developing and extending financial assistance for setting up projects relating to new and renewable sources of energy and energy efficiency/conservation with the motto: 'Energy For Ever'. Recently, IREDA has opened its third branch office in the country in Mumbai for facilitation of its customer, borrowers and other stakeholders.

MNRE ISSUES CONCEPT NOTE FOR DEVELOPMENT OF WIND PARKS

Wind Energy Park will provide a plug & play solution (availability of land, transmission, necessary infrastructure and necessary approvals) to the investors for installing wind/ wind-solar power projects…

Wind and solar energy sources are emerging as an alternative to the conventional sources of energy to meet the requirements of India. The estimated solar power potential in the country is 749 GW and that of wind power is 695 GW at 120 metre above ground level. Unlike solar resource, wind resource is mainly concentrated in the states of Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Tamil Nadu.

The Government has adopted a transparent competitive bidding process for large scale wind, solar and wind-solar hybrid power projects – and has issued guidelines for the same. Accordingly, projects of more than 11 GW wind power and 1.44 GW wind-solar hybrid power have been awarded through transparent competitive bidding process. The bidding has resulted in competitive tariffs, which are much lower than traditional Feed-in Tariffs.

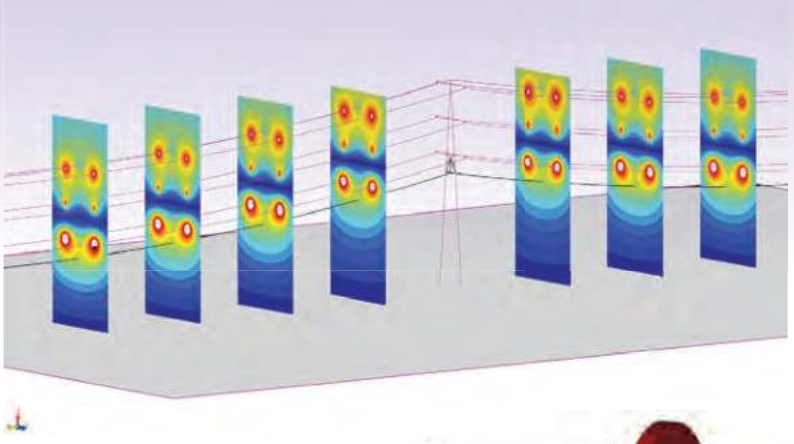
However, a number of projects have been delayed due to land, NoCs and transmission related issues. These challenges and uncertainties have raised the concern of investors in the sector. Further, while solar power project is commissioned on contiguous land, the wind power project requires scattered land on footprint basis, which not only increases the transmission cost but also adds to the possibility of land related issues.

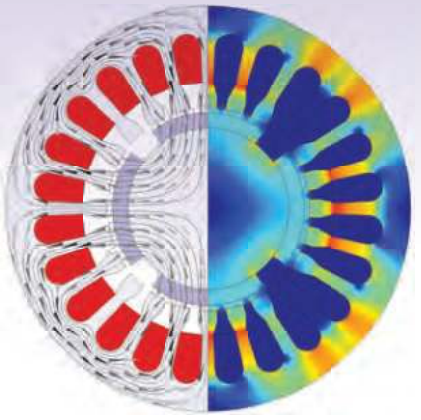
In order to overcome these challenges, the scheme for "Development of Wind Parks/ Wind-Solar Hybrid Park" has been proposed. The park will be a concentrated zone of development of Wind/ Wind-Solar Hybrid power projects with required infrastructure.

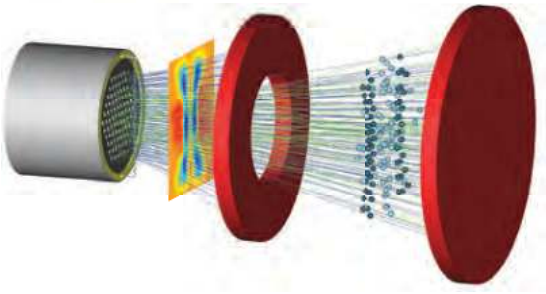
INTEGRATED

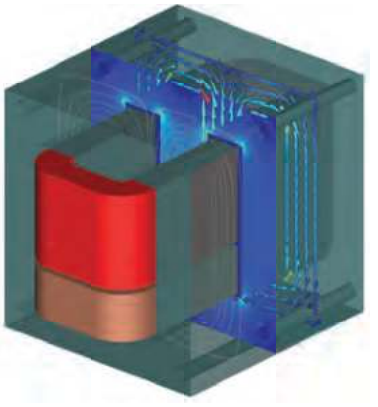
ENABLING YOUR INNOVATION
FROM CONCEPT TO PERFORMANCE

SOFTWARE THAT LIVES UP TO THE POWER OF YOUR IDEAS









COMPETITIVE ADVANTAGES

- New! "Smart Workspace"
- Search-based design simulation
- Program your own applications with API
- Precise field calculations using our proprietary BEM, FEM and FDTD solvers
- Intuitive and easy-to-use interface

"For our purposes, 'ELECTRO' is actually the preferred software tool for every-day engineering. It is important to have software that is very quick and easy to learn and this product is more than capable of handling the large models we require."

Dr. Beriz Bakija, Siemens AG's Energy Sector, Germany

ASK FOR AN ONLINE DEMONSTRATION

contact@integratedsoft.com / (204) 632-5636
integratedsoft.com

INTEGRATED
ENGINEERING SOFTWARE

OPTIMIZING DESIGNS SINCE 1984

MOP MANDATES ALL DISCOMS TO COMPLY WITH EC-ACT 2001

The Ministry of Power (MoP), GoI has recently issued notification S.O. 3445 (E) – to cover all the DISCOMs under the preview of the EC Act. As per the notification, which was formulated in consultation with Bureau of Energy Efficiency (BEE) "All entities having issued distribution license by State/Joint Electricity Regulatory Commission under the Electricity Act, 2003 (36 of 2003)" are notified as Designated Consumers (DCs).

The move will assist in developing projects for reducing the electricity losses…
Image by Susan Cipriano from Pixabay

Henceforth, all the DISCOMs will be governed under the various provisions of EC Act, such as Appointment of Energy Manager, Energy Accounting & Auditing, Identification of Energy Losses – Category wise, Implementation of energy conservation & efficiency measures etc., for each DISCOM. Earlier, the DISCOMs whose annual energy losses were equal to or above 1000 MU were only covered as DCs. Now with this notification, the number of DISCOMs covered under the EC Act will increase from 44 to 102. This decision will facilitate Energy Accounting & Auditing as mandatory activity for all the DISCOMs, leading to the actions towards reducing losses and increase profitability of DISCOMs.

The amendment is expected to help DISCOMs to monitor their performance parameters and bring in transparency in the Distribution Sector through professional inputs. It will also assist in developing projects for reducing the electricity losses by DISCOMs and implementing effective solutions. This is also expected to improve the financial state of the DISCOMs. Contextually, BEE assists in developing policies and strategies with the primary objective of reducing the energy intensity of the Indian economy.

NTPC'S R&D OUTCOME WILL EXPAND THE HORIZON OF FLY ASH UTILISATION

The technical parameters as per Indian standards for the new product's suitability to be used in concrete works were tested by NCCBM, Hyderabad…

NTPC Ltd has successfully developed a Geo-polymer coarse aggregate from fly ash. The development will help in replacing natural aggregates reducing the impact on environment. The company's research project on production of Geo-polymer coarse aggregate from fly ash has met the statutory parameters of Indian Standards – and has been confirmed by National Council for Cement and Building Materials (NCCBM). The Geo-polymer coarse aggregates will be a replacement to natural aggregates. The development is NTPC's R&D achievement in expanding the horizon in ash utilisation.

India's demand for these aggregates touches close to 2000 million metric tons mark every year. The aggregate developed by NTPC from fly ash will help in meeting the demand to a great extent and also will reduce the impact on environment caused by Natural aggregates, which require quarrying of natural stone.

In India, every year, approximately 258 MMT of ash is produced by the coal-fired thermal power plants. Out of this around 78% of the ash is utilised and the balance remains unutilised, which remain in ash dykes. NTPC is exploring alternate ways to utilise the remaining ash that includes the current research project to generate aggregates using more than 90% ash.

The Geo-polymer aggregates find its extensive usage in construction industry turning the ash eco-friendly. These aggregates are extremely environment-friendly and do not require any cement for application in concrete where the fly ash based Geopolymer mortar acts as the binding agent.

Low Noise Amplifier for NavIC L5 Band

Applications:

- IoT
- Vehicle Tracking Systems
- Mobile devices
- Wearables
- Drones

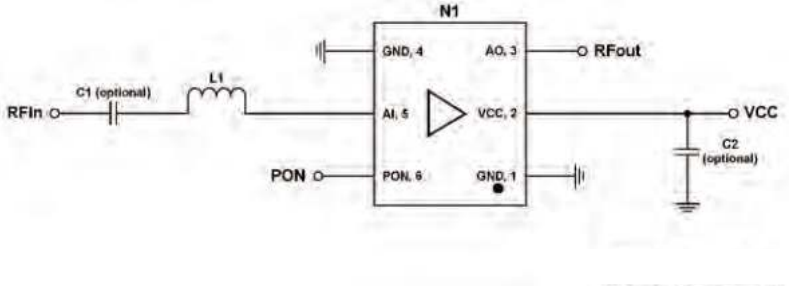
Key performance specification:

- Operating frequencies: 1164 - 1300 MHz
- Insertion power gain: 17.8dB
- Low noise figure: 0.60 dB
- High linearity, IIP3: 0 dBm
- Low current consumption: 4.8 mA

Salient features:

- GNSS LNA for L2/L5 Frequency
- Improves location accuracy down to cm range (~30 cm). Enables indoor navigation
- Ultra small TSNP-6-10 leadless package (footprint: 0.7 x 1.1 mm^2)
- RF output internally matched to 50 Ohm
- Only one external matching component needed
- Complies with industrial standard JEDEC47/20/22

Application schematic:



www.infineon.com

UNION MINISTER REVIEWS PERFORMANCE OF BHEL

Union Minister of State for Heavy Industries & Public Enterprises and Parliamentary Affairs, Arjun Ram Meghwal, recently reviewed the performance and the future readiness of Bharat Heavy Electricals Limited (BHEL) during a visit to the company's Corporate Office at New Delhi. Dr. Nalin Shinghal, CMD, BHEL; Directors on the Board of BHEL, and other senior officials welcomed the Hon'ble Minister.

Union Minister Arjun Ram Meghwal (3rd from left) with BHEL officials…

Meghwal was briefed about the performance trends of the company, diversification initiatives taken for enhancing competitiveness and growth, and building R&D capabilities. The Hon'ble Minister appreciated BHEL's growth-oriented performance and assured it of full support. He also addressed BHEL employees including heads of units/divisions, across the country, through Video Conferencing.

BHEL, having 50 years of experience, is the Indian engineering company with global presence. The company is the single source for multiple solutions for energy, industry and infrastructure segments. It has been catering to all energy types including coal, hydro, nuclear, gas and solar. BHEL is also a leader in servicing core sectors like: transmission, industrial systems & products, transportation, e-mobility & battery storage, renewable energy storage, renewable energy, oil & gas, water and defence & aerospace.

With references in more than 84 countries, BHEL is now executing 24 overseas projects spread over 16 countries for around 7,000 MW. The company has already contracted around 17,000 MW of overseas projects. It has already installed 190 GW globally.

TPCODL TAKES STEPS TO ENSURE TO ENHANCE CUSTOMER EXPERIENCE

In Odisha, to ensure faster restoration of power supply, TPCODL's SCADA system has been made operational…

Odisha generates power more than the state's requirement from its Hydro, Thermal and Renewable sources of energy. It is therefore important for this power surplus state to be governed by an efficient power distribution company in order to reduce aggregate technical and commercial losses and ensure a reliable and quality power supply. Prompted by this need, CESU's management underwent a significant transformation under the leadership of TP Central Odisha Distribution Limited (TPCODL), a Joint Venture between Tata Power and the Government of Odisha within a short span of six months.

TPCODLs focus lies in developing a healthy network for the High Transmission (HT) and Low Transmission (LT) lines, which have been going through technical losses and are also less reliable as they are long lines, were subject to lesser maintenance and were running through bushes and vegetations. For this, the company identified and focused on the top 10 tripping feeders with lesser reliability and are taking appropriate measures to improve their performance & enhance reliability.

Furthermore, with a customer centric approach, TPCODL has set a new example, which aims at enhancing all the aspects of customer services with smooth and efficient power distribution in CESU's operational areas. It has partnered with a few maintenance service companies to carry out systematic preventive & predictive maintenance of its distribution substation & network. It is also geared up to attend the faults 24 x 7 and provide reliable power round the clock by strengthening divisional & sections work forces.

Be sure. testo

- ✓ Power Utilities
- ✓ Solar Thermography
- ✓ Electrical maintenance
- ✓ Building Thermography
- ✓ Mechanical maintenance
- ✓ Research & Development

Limited Period Offer

20th Nov to 25th Dec 2020

Now available @ Exclusive Offer Price*

The Now or Never Deal!

Thermal Imager testo 872 at a never before price.

- **Unmatched image quality:** Resolution up to 640 x 480 pixels (With inbuilt SuperResolution technology)
- **Accurate:** Detect temperature differences from 0.06 °C
- **Large temperature measuring range:** -30 to +650 °C
- **Practical:** With digital camera, laser marker and App
- **Loaded with functions:** With testo ε-Assist and testo ScaleAsist features
- **Bluetooth connectivity:** Integrates measurement values from the thermohygrometer testo 605i and the clamp meter testo 770-3
- **Smart and networked:** Prepare and send reports on site and save them online using the free testo Thermography App

For professional Thermography with Best in Class image quality

Bluetooth and Wi Fi connectivity

Contact us to avail Special Price

Testo India Pvt Ltd

+91 20 2592 0000 | info@testo.in | www.testo.com

MADE IN GERMANY

* Terms & conditions apply.

BELECTRIC TO INSTALL ONE OF THE LARGEST SOLAR PLANTS IN INDIA

BELECTRIC, a German based company, further increases its footprint in the ever-growing solar industry of India by securing a major contract for a PV project in Rajasthan. BELECTRIC will be the construction and commissioning partner and will provide operation and maintenance services (O&M) to the large-scale solar plant on behalf of the owner Fortum Solar Plus Private Limited (Fortum). With a planned installed capacity of 250 MW AC the solar power plant will be one of India's largest installations.

Photo by Kelly Lacy from Pexels

Focusing on the new order, Ingo Alphéus, CEO of BELECTRIC Solar & Battery GmbH, said, "At the beginning of the year we delivered a new 250 MW AC solar plant for our customer Fortum, safely, on time and with a quality build. I am delighted that Fortum have placed again their trust in us and awarded BELECTRIC for its next large-scale solar project in India. This underpins our strong position as a system integrator and general contractor for utility-scale ground-mounted PV in the challenging Indian market. Together with the project in Rajasthan, BELECTRIC will break through the one-gigawatt level of installed capacity in India this year."

Highlighting BELECTRIC's capability, Jitendra Singh, CEO & Managing Director of BELECTRIC Photovoltaic India Pvt Ltd, said, "We are pleased to secure this new contract. It goes to demonstrate that we are highly competitive in the Indian market and that our costumers recognize both our high quality project management and health and safety standards."

PATEL ENGINEERING BAGS NEW ORDER OF RS. 1,564.42 CRORE

The company has expertise in prestigious works spanning around tunneling, underground works for hydropower generation, irrigation and urban infrastructure projects...

Patel Engineering, an ISO 9001:2008 civil construction company focused on hydropower sector, has recently received a contract worth Rs 1,564.42 crore. The company will build the 2,000 MW Subansiri Lower Hydro Electric Project (HEP) in Arunachal Pradesh. It will be the single largest hydro power generation project in India. Contextually, Patel Engineering is the only Indian Company with experience in RCC, Micro Tunnelling and Double Take Tap Work. Patel Engineering has been able to obtain this project and even mobilize the same during this Covid-19 Pandemic.

The project is located at Village Kolaptukar in Kamle (formerly Lower Subansiri) district of Arunachal Pradesh. It consists of balance civil works of Power House Complex including HRT Intake Structures, Tail Race Channel etc., with the following main components: Construction of 8 nos. HRT intake structures; Construction of 8 nos. 9.5 m diameter horseshoe shaped Head race tunnels with lengths varying from 610 m to 1170 m; Construction of 8 nos. 8m diameter circular steel lined pressure shafts; Construction of Surface power house (285 m X 61 m X 64 m) including control block and transformer hall cum GIS; Construction of tailrace channel of width 206 m and length 35 m joining to river; Construction of adits associated with underground structures. Construction of 8 inclined surge tunnels of dia. 9.5m of length varying from 475m to 390m; and 8 Construction of vertical surge shafts of 9.5m circular in shape height varying from 10.5m to 12.5m.

Assuring Strength Across the Globe

We just don't draw wires,
We draw customer satisfaction.

Trust...
25 Years of Customer Satisfaction
Through Service Excellence

Strength...
13,260 Sq Mts.
Well Equipped Unit

Assurance...
ISO 9001:2015
Certified

Global Footprint
Covering Entire Globe
Including SAARC Nations,
African Countries &
Middle East

Manufacturer of Wire & Wire Products

- ACSR Core Wire & Strands
- Barbed Wire & Binding Wire
- Cable Armour Wire & Strip
- Earth Wire & Stay Wire
- Farming GI Wire
- General Engineering Purpose GI Wire
- Hard Drawn Steel Wire
- PC Wire
- RDSO Cable Tape
- Rope Wire - Black & Galvanized
- RQ/FQ Black & Galvanized
- Shutter Wire
- Spring Steel Wire
- Welded Wire Mesh
- Welding Electrodes

HD WIRE (P) LTD

17-20, Sanwer Road, Sector E, Industrial Area, Indore - 452 015.
Ph.: 91-731-4211199 Mob.: 98269 28878, 97520 90210
Telefax: 91-731-4211111 • Email : sales@hdwires.com

HV SUBSTATION IN PERU ADOPTS SIEMENS' TECHNOLOGY

Siemens Process Bus Technology, which involves positioning a merging unit close to the instrument transformer, has been installed at the new high-voltage substation in Los Sauces for one of the largest Peruvian distribution network operators, Luz del Sur.

Siemens' process bus technology at the new high-voltage substation in Los Sauces…

This process bus installation with Siprotec merging units and Siprotec protection devices is one of the first fully digitized energy automation system in operation. The new technology sets benchmarks with its future-proof design and will help optimize the entire operation of the power grid.

Luz del Sur is currently expanding its 220 kV network. Instead of conventional 1:1 cabling between the transducer and the protection device, a merging unit records the measured values from the transducer, converts them into digital format and sends them to the respective protection units via a fiber-optic ethernet cable.

The merging unit is a modular, interoperable and powerful solution between primary and secondary technology, which offers multifaceted process data recording, self-sustaining automation and secure communication. In total, 13 Siprotec 6MU85 merging units are used in this latest installation in Los Sauces, which is one of the first to utilize this technology on a large scale. The process bus from Siemens makes it possible to cover the digitalization along the process level using merging units to improve the reliability of the system, optimization of the installation, reduction of hard-wired components, and security of the maintenance staff.

UCF RESEARCHER FINDS WAY OF INCREASING BATTERY LIFE

Yang Yang's technique of introducing a copper-tin alloy to prevent the shift of anode inside the battery is quite unique…

Assistant Professor Yang Yang of University of Central Florida has been working on extending the charged period of rechargeable lithium-ion batteries. He is doing this by making the batteries more efficient, with some of his latest work focusing on keeping an internal metal structure, the anode, from falling apart over time by applying a thin, film-like coating of copper and tin.

In practice, an anode generates electrons that travel to a similar structure, the cathode, inside the battery, thus creating a current and power. Yang, an expert in battery improvement, including making them safer and able to withstand extreme temperatures, is using a unique technique by introducing a copper-tin alloy. This is an important and scalable improvement in stabilizing rechargeable battery performance.

The research has been funded by the National Science Foundation through its Division of Chemical, Bioengineering, Environmental and Transport Systems' Electrochemical Systems program and through UCF's startup funding and preeminent postdoctoral programs. The new technique has been described in details in a recent study in the Journal Advanced Materials.

The study co-authors are Guanzhi Wang, a doctoral student in UCF's NanoScience Technology Center, Department of Materials Science and Engineering; and the paper's first author; Megan Aubin is a doctoral student in UCF's Department of Materials Science and Engineering. Yang holds joint appointments in UCF's NanoScience Technology Center and the Department of Materials Science and Engineering.

ABB'S MOTOR TO EQUIP FIVE FINCANTIERI VESSELS

Once again ABB has proved its ability to control marine movements by winning the preferred supplier position in the cruise segment. The company's specialised venture ABB Marine & Ports will equip five newbuild vessels of Fincantieri with Azipod electric propulsion.

Azipodr propulsion for cruise vessels…

Each cruise ship will be powered by twin Azipod units, bringing the total ordered propulsion power for the five newbuilds to 178 megawatts (238,700 horsepower). Part of the order includes the largest and most powerful Azipod propulsion units ever to be installed at Fincantieri, rating at 20 megawatts each. The vessels will enter service between 2023 and 2026. Each vessel will also feature ABB's integrated electric power plant setup, encompassing generators, drives, switchboards, propulsion transformers and a remote-control system to maneuver the Azipod units from the bridge.

With the electric drive motor situated in a submerged pod outside the ship hull, the Azipod system can rotate 360 degrees, significantly increasing maneuverability and operating efficiency of a vessel and cutting fuel consumption by up to 20 per cent compared to conventional shaftline systems. Today, over 100 cruise vessels rely on Azipod technology, which has become the industry standard in the cruise segment.

In line with ABB Marine & Ports' 'Electric. Digital. Connected.' approach that envisages shipping's digital and connected future, these vessels will have the capability to leverage the ABB Ability Collaborative Operations infrastructure and centers. This uses remote equipment monitoring and data analytics to enable predictive maintenance, planned interventions and remote technical support.

CEC FUNDS TO ACCELERATE ZERO-EMISSION TRANSPORTATION

Besides bridging the gap in California's electric vehicle charging network, the new plan will invest 50 per cent of funds to benefit disadvantaged communities…

The California Energy Commission (CEC) has recently approved a $384 million plan for critical clean transportation investments to boost the adoption of zero-emission cars and trucks and help the state reach its climate, clean energy and public health goals. The plan focuses on closing gaps in zero-emission fuels and infrastructure to support Governor Gavin Newsom's executive order phasing out the sale of new gasoline-powered passenger vehicles by 2035.

"The zero-emission transportation market continues to be California's for the making, delivering jobs and cleaner air especially in communities most in need of relief. This funding plan is another down payment on electrifying transportation while helping ensure everyone can take part through access to convenient refueling, innovative mobility options, workforce training programs and more," said Lead Commissioner for transportation Patty Monahan.

The 2020-2023 Investment Plan Update for the CEC's Clean Transportation Program (formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program) prioritizes funding for Zero-Emission Vehicle (ZEV) infrastructure, related workforce development and manufacturing.

The plan approved includes: $132.9 million for light-duty EV charging infrastructure; $129.8 million for medium- and heavy-duty ZEVs and infrastructure; $70 million for hydrogen refueling infrastructure; $25 million for zero-and near-zero-carbon fuel production and supply; $10 million for recovery and reinvestment; $9 million for ZEV manufacturing and $7.5 million for workforce development. The funds will become available over the next three years and will be distributed to projects through a mix of competitive funding solicitations and direct funding agreements.

The transition from conventional energy to renewable energy

The webinar presents the challenges that obstruct the growth of wind energy in India. The panellists discuss from different perspectives such as finance, development, servicing and so on, analyzing the wind sector in India and ways through which India can transit into a country of sustainable environment.

Indian Wind Turbine Manufacturers Association organized a webinar on 'Wind is the answer for Energy Transition' sponsored by LM Wind Power, Axis Energy and Suzlon Group. The webinar began with an inauguration ceremony followed by round table conferences.

Tulsi Tanti, Founder, CMD, Suzlon Group said: "The country has installed more than 37.7 GW, 80% is domestic manufacturing that enhances the Governments initiative of 'Make in India or Atmanirbhar Bharat'. Renewable energy is also becoming a catalyst to stimulate the growth of our economy. Wind energy has the capacity of generating more than 100 GW energy on onshore projects and 150 GW energy on offshore projects across the country. Wind energy will have a major impact on climate change and a reduction in the import of oil content."

Freddy Svane, Ambassador, Royal Danish Embassy stated: " When Global Crisis is over, we would have to look for a new kind of normalcy. In 2019, almost 47-50% of the power usage in Denmark was generated, through wind energy. Climate Change is a risk Globally and wind energy is a solution to it."

Svane concluded saying: "Stay Green, Think Green, Act Green that's the way forward!"

Dr. Ajay Mathur, Director General, The Energy & Resources Institute (TERI) said: " We indeed have already passed the cusp of the transition. Solar energy is the cheapest form of energy when the sun is shining, however, during peak hours (6 PM-11 PM) particularly from July-September solar energy is unavailable but, wind energy is available. By the year 2030, we will have at least 40% of the electricity generated from renewables." He also spoke about the capacity cost and variable cost for renewable energy, and questioned if we should move towards a unified approach for methodology now or in the next 5 - 10 years.

Shantanu Jaiswal, Analyst, Bloomberg New Energy Finance BNEF said: "The New Energy Outlook (NEO) is BloombergNEF's annual long-term analysis on the future of the energy economy till 2050. According to that, the Worlds Power Market will triple in size by 2050. Wind and PV grow to meet 56% of world electricity demand in 2050. 76% of our energy will be generated, from zero-carbon sources. The wind is going to play a significant role

in the future. COVID-19 has helped reduce carbon emission."

Round Table Highlights:

Speaking on the challenges, Tulsi Tanti, said: "Since the last three years the wind sector observed a y-o-y growth between 20-30%. The transition from State Government process to the Central Government was the reason to unlock the wind and renewable energy's potential. There are eight wind states in total which only two states are constructing projects. Due to which almost 70% of the capacity has disappeared. The other reason for which the wind sector has been affected drastically is the absence of strong alignment within the value chain or no good ecosystems."

Speaking on the necessity to relook at the wind projects business models Rajenthiran Pannirselvam, VP & Head of Services at Siemens Gamesa said: " We all know that the change from Feed-in-Tariff (FiT) to competitive bidding range has completely changed the renewable energy business landscape in the country. Making it natural for any company in the renewable energy business to relook at their business strategy ad its model. The volumes are down, prices and market pressure is continuing. Further at least for short term to mid-term period most of the OEMs will prefer to concentrate on cost, manufacturing the turbines and servicing it. We are trying to remain more competitive and moving toward emerging hybrid opportunities. Yes, as everyone said this is the time we have to relook at our business models and if OEMs have to restricts themselves to supply and services and who the developers are going to be is something that the wind sector needs to think about."

Speaking from the development angle Balram Mehta, COO, ReNew Power said: "In the complete sector, there is one critical element missing and at one point ReNew performed that critical role of the complete assessment, taking approval and then offering it. Since the last 2-3 years, no one is interested in developing the assessment. There are no formal mechanisms or land that can be allotted to the workers on those sites. Nobody is getting the time to do a complete assessment."

Vendor Pankaj Sindwani, Chief Business Officer, Tata Cleantech, said: "We love financing anything to do with clean energy and, so far we have funded a lot of projects in wind and solar. The only distinguishing factor. I wanted to is the relatively higher number of variables in wind energy that you need to control. The wind has a higher number of variables compared to solar and the outcome cannot be assured. We should focus on wind and solar both as we can do a lot more with both than just wind or solar."

Vipul Tuli, Managing Director, Sembcorp Energy India Ltd., highlighted: "It is important to understand why wind is such a critical resource within the energy sector. Once you understand this solution will also come. It is also necessary to realize that India is in the middle of 20-40 years energy transition, committed from higher levels, but to make this energy transition work we have to find high PSL solutions that work for peak hours as well. The wind is the only resource when combined with solar allows high PLS. We not only have to look at the value of energy that is generated, but we also have to look at the time at which it is generated and for that wind becomes the critical resource for the country." EI

REACHING NET-ZERO EMISSIONS

Although there are other factors, the traditional thermal power generation techniques, which produce different kinds of pollutants, need to change ASAP – to prevent further deterioration of the climate. India is one of the pioneers in this move…

- P. K. Chatterjee (P. K.)

Almost the entire year 2020 has been lost from the global productivity enhancement target to fight against the man-made killer virus COVID – 19. It is one of the most maculated years in the history of human civilisation when a country's ongoing devastating research work based on malintent – suddenly escaped from the confinement of laboratories and caused 1,453,355 deaths globally till the end

of November 2020 (Source:World Health Organization, 10:23am CET, 30 November 2020).

The economy of almost all the countries has been affected – because of the unforeseen closures or scaled down operations of many industries due to a prolonged lock-down period. Some of the countries that have a resilient economy have started recovering whereas others are still in doldrums. It is quite natural when the industrial activities slow down, the demand of power also reduces. The situation often becomes more complicated during the recovery period, several unforeseen challenges come to the way – especially in many cases the unpredictable load management poses a big challenge.

Recently, during the compilation of IEA's Energy Technology Perspectives (ETP) 2020, discussions were held on the power scenario, drives and requirements in several countries across the globe. It was found through the IEA's review analysis that transforming the power sector alone will only get the world one-third of the way to net-zero emissions.

Highlights of the major findings

The recent IEA report highlights a few vital points that global experts feel are absolutely essential to address the growing demand of power without causing further deterioration of the climate. They feel that a major effort to develop and deploy clean energy technologies worldwide is urgently needed to meet international energy and climate goals, particularly in order to reduce carbon emissions from areas beyond the power sector such as transport, buildings and industry.

"We need to tackle emissions from the vast amounts of existing energy infrastructure in use worldwide..."

- Dr Fatih Birol
Executive Director, IEA

With global carbon emissions at unacceptably high levels, structural changes to the energy system are required to achieve the rapid and lasting decline in emissions.

The IEA report has suggested 800 different technology options to assess what would need to happen to reach net-zero emissions by 2070, while ensuring a resilient and secure energy system.

However, as stated above, it is not only the power sector that can alone transform the scenario. The IEA report also states that transitioning just the power sector to clean energy would get the world only one-third of the way to net-zero emissions. Completing the journey will require devoting far more attention to the transport, industry and buildings sectors, which today account for about 55% of CO_2 emissions from the energy system. Much greater use of electricity in these sectors – for powering electric vehicles, recycling metals, heating buildings and many other tasks – can make the single largest contribution to reaching net-zero emissions. Thus, many more technologies will be needed to achieve the ultimate goal.

Global optimism

Although, in the post-COVID scenario, apparently it is a very difficult task to transform all sectors and implement sustainable practices everywhere, the global leaders are quite optimistic on achieving the goal – at least in the energy sector. Confirming the positive outlook, Dr Fatih Birol, the IEA's Executive Director, said, "Despite the difficulties caused by the Covid-19 crisis, several recent developments give us grounds for increasing optimism about the world's ability to accelerate clean energy transitions and reach its energy and climate goals. Still, major issues remain."

He finds that solar is leading the renewables to new heights in markets across the globe, ultra-low interest rates can help finance a growing number of clean energy projects, more governments and companies are throwing their weight behind these critical technologies, and all-important energy innovation may be about to take off. But highlighting a gap in initiatives, he said, "We need even more countries and businesses to get on board, we need to redouble efforts to bring energy access to all those who currently lack it, and we need to tackle emissions from the vast amounts of existing energy infrastructure in use worldwide that threaten to put our shared goals out of reach."

The Energy Technology Perspectives 2020 (ETP 2020) has identified some of the major areas

of inefficiency, which need to be addressed urgently. It states, "The challenge of long-lasting energy assets already operating around the world – including inefficient coal power plants, steel mills and cement kilns, most of which were recently built in emerging Asian economies and could operate for decades to come," needs to be taken care of.

As per the report, the power sector and heavy industry sectors together account for about 60% of emissions today from existing energy infrastructure. That share will climb to nearly 100% in 2050, if no action is taken to manage the existing assets' emissions, underscoring the need for the rapid development of technologies such as hydrogen and carbon capture.

Necessities at the moment

Highlighting the present shortcomings, the IEA report states that – ensuring that new clean energy technologies are available in time for key investment decisions will be critical. In heavy industries, for example, strategically timed investments could help avoid around 40% of cumulative emissions from existing infrastructure in these sectors. Accelerated innovation is crucial for this – and for scaling up the clean energy technologies needed across the energy system.

Future expectations

While listening about the need for huge transformation, naturally the question arises what the anticipated or expected future scenario is. The IEA report has drawn a nice landscape on it. It states, "Hydrogen is expected to play a large and varied role in helping the world reach net-zero emissions by forming a bridge between the power sector and industries where the direct use of electricity would be challenging, such as steel and shipping."

"New technologies will be vital in the future to reduce carbon emissions but those technologies must be accessible, affordable and appropriate to country contexts…"

- Prakash Javadekar, Minister of Environment, Forest and Climate Change (and Minister of Heavy Industries and Public Enterprises), India

In the IEA's Sustainable Development Scenario – a pathway for reaching international energy and climate goals – the global capacity of electrolysers, which produce hydrogen from water and electricity, expands to 3 300 gigawatts in 2070, from 0.2 gigawatts today. In 2070, these electrolysers will consume twice the amount of electricity that China generates today. Carbon capture is also employed across a range of sectors in the Sustainable Development Scenario, including the production of synthetic fuels and some low-carbon hydrogen. And modern bioenergy directly replaces fossil fuels in areas like transport and offsets emissions indirectly through its combined use with carbon capture.

What should be done?

Everywhere, reaching the expected goal needs chalking out a time-bound plan beforehand. The IEA report has talked about the blistering pace of technological transformation that would be necessary for the world to reach net-zero emissions by 2050. It states, "To meet the huge increase in demand for electricity, additions of renewable power capacity would need to average around four times the current annual record, which was reached in 2019. Governments need to play an outsized role in accelerating clean energy transitions towards meeting international goals."

According to IEA, the economic stimulus measures in response to the Covid-19 crisis offer a key opportunity to take urgent action that could boost the economy, while supporting clean energy and climate goals.

The Indian stand

Now India is at fifth global position for overall installed renewable energy capacity. The IEA held the India launch of ETP 2020 during a webinar on 19th November 2020. In the event, Prakash Javadekar, Minister of Environment, Forest and Climate Change (and Minister of Heavy Industries and Public Enterprises) delivered the keynote address. He highlighted the Government of India's commitment to fighting climate change while providing clean and affordable energy to all Indians. Welcoming the new IEA report, the Minister also reiterated that new technologies will be vital in the future to reduce carbon emissions but those technologies must be accessible, affordable and appropriate to country contexts.

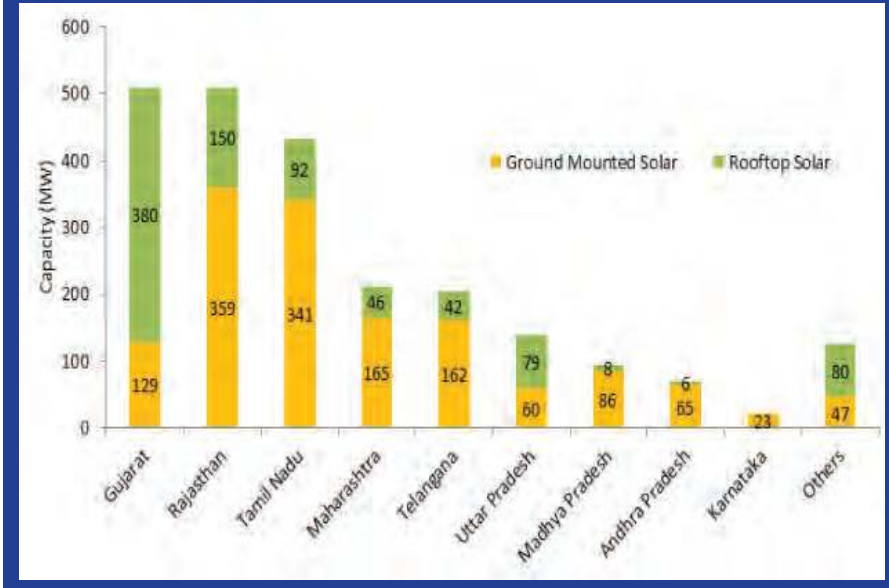
Praising India's nitiatives in this regard, Dr Birol highlighted that India has moved to the centre of global energy markets due to the government's continued success and leadership in energy access, energy efficiency and renewable energy. He also noted that clean energy transitions need to happen in all parts of the energy sector, which will require the development of low emissions technology solutions at commercial scale. He committed the IEA's ongoing support for India in continuing its move towards a sustainable, secure and affordable energy system.

Commendable progress despite COVID-19

As per the data released by the Ministry of New and Renewable Energy (MNRE) for the period starting January 2020 till Sep 2020, about 2,320 MW of solar capacity comprising 1,437 MW of Ground Mounted Solar and 883 MW of Rooftop Solar was added in India.

A recent research work by JMK Research reveals more details on solar installation. It gives a state-wise break up: Rajasthan (360 MW), Tamil Nadu (341 MW) and Maharashtra (165 MW) were the leading states with most of the large-scale solar installations during this period.

Before the COVID-19 outbreak, JMK Research had projected nearly 7-8 GW of utility-scale solar capacity addition in 2020. However, only 1.4 GW capacity commissioned in the first nine months. Because of COVID 19, there were construction delays, restricted movement of equipment supply, and labour shortages eventually leading to project delays. To compensate for this, MNRE has issued a blanket extension of five months to all project developers. Now, most of this delayed capacity is likely to come up in the first half of 2021.



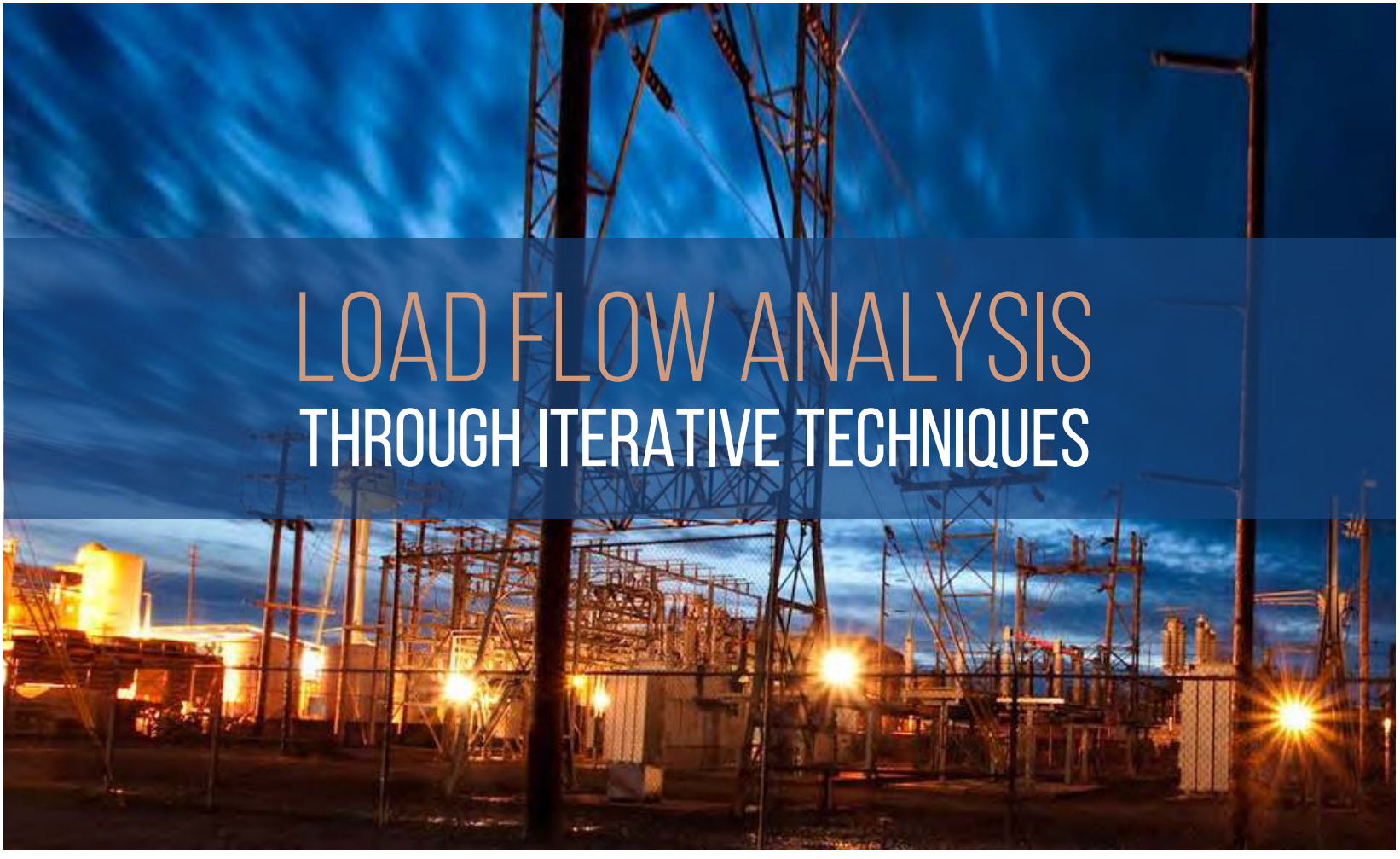
State-wise solar capacity addition in India from Jan 2020 till Sep 2020...
Source: MNRE, JMK Research

On the rooftop solar side, Gujarat ranks first with 380 MW capacity addition, contributing nearly 43% of the total rooftop installations in the first nine months of 2020, followed by Rajasthan (150 MW). The primary reason behind the significant capacity addition in Gujarat is the "Surya Urja Rooftop Yojana – Gujarat" that targets installation of solar rooftops for eight lakh consumers by March 2022 in the residential sector. This scheme provides 40% of state subsidy on installation of systems up to 3 kW of size and 20% subsidy for 3 kW - 10 kW.

The JMK Research report cites another reason for this upsurge in rooftop activity in Gujarat. It states that the MSME policy introduced in September 2019 by the Gujarat state government, as part of which MSMEs are allowed to install solar projects with more than 100% of their sanctioned load or contract demand. Earlier, the permitted installation limit was 50% of the sanctioned load. As per the new policy, MSMEs are also able to sell excess solar energy to the state government at a price of Rs. 1.75/ kWh. The policy also permits MSMEs to buy solar power from third parties. After Gujarat, Rajasthan (150 MW) and Tamil Nadu (92 MW) are the leading states, who have added the highest rooftop solar capacity.

Conclusion

As JMK Research report has shown above, around 20 – 25% of the predicted solar installation has been possible even during the restricted period of lockdown imposed in the country because of COVID – 19 pandemic. Our country is expected to bridge the gap in the first quarter of 2021. If no other interference comes up in between, and we can keep the expected deadline, then India will easily catch up with the preset time-frame.



LOAD FLOW ANALYSIS
THROUGH ITERATIVE TECHNIQUES

In this article, authors have discussed various Load Flow Analysis techniques such as Gauss-Seidel method, Newton-Raphson Method and Fast-decoupled method. With a schematic case study, they have explained a 3 bus power system study, and results of load flow studies are also presented. Power World Simulator is used for modeling the power system. Comparison and advantages, disadvantages of all methods are listed out for selection of iterative technique...

The Load Flow Analysis is a very fundamental and important tool in interconnected power system analysis. Load Flow Analysis results play major role during the operational stages of any power system for its control and economic schedule, as well as during the expansion or design stages. The main purpose of any Load Flow Analysis is to compute precise steady-state voltages and voltage angles of all buses in the network, the reactive and real power flows into every overhead trasnmission line and power transformer (located at Sub-stations), under the assumption of known generation and load. The load flow solution also gives the initial conditions of the system when the transient beheviour of the system is to be studied. In actual practice, it will be required to carry out numerous power flow solutions under a variety of conditions.

To understand the the load flow analysis, the knowledge of various Bus such as Load bus, Voltage controlled bus (Generator bus), Slack bus and thier data is required for applying any iterative techniques such as Gauss-Seidel method, Newton- Raphson Method and Fast-decoupled method.

Load Flow Methods:

Gauss- iteravie Method

The load flow problem can be formulated as a set of nonliner algebraic equations, which can be solved by an iterative algorithm called Gauss method. In this method, non linear equations can be solved by guessing the initinal solution approximately. Then, this guessed solution is used in conjuction with the original equation to cmpute a new and more accurate estimate for the solution can be used. The second estimate is used to find the third estimate. The process is continued until the difference between successive estimate is extremely negilible. The main disadvantage of this method is that it requires an extremely large number of iterations to reach sufficiently close to the solution, but with the use of computers it may not be thought of as a drawback. Another drawback is that this method may not converge, if the solution does not exist or if the iteration process is divergent.

Gauss-Seidal Method

Gauss-Seidel (G-S) method is one of the simplest iterate method. It is a modification of Gauss-Iterative method. This modification will reduce the numbers of iterations. So, it is suitable for the power flow study of small power system. To understnad the method, we can take two cases such as When PV Buses are absent and another is When PV Buses are present. Following schematic system is used to understnad the method. The schmetic system is simulated in Power World Simulator and it can show the Power Flow also.

Schematic diagram of Load Flow Analysis and Solution

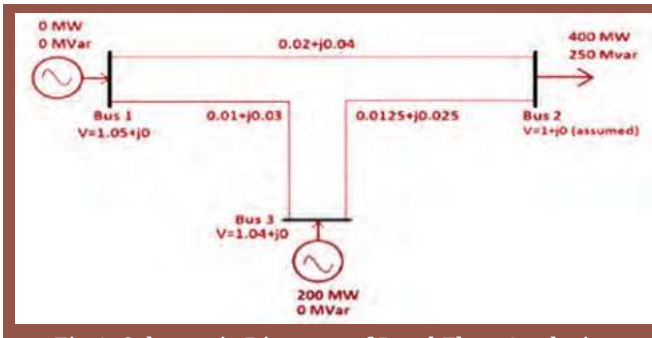


Fig 1: Schematic Diagram of Load Flow Analysis...

Power Flow through Gauss Seidel Method:

Case Information: Case voltages set to flat start values
Generator MVAR outputs brought inside their limits
Starting Solution using Gauss-Seidel
Number: 0 Max P: 400.000 at bus 2 Max Q: 250.000 at bus 2

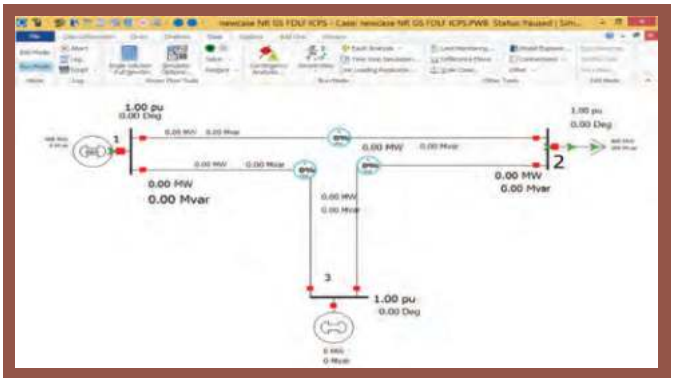


Fig 2: Solution Through Power World Simulator...

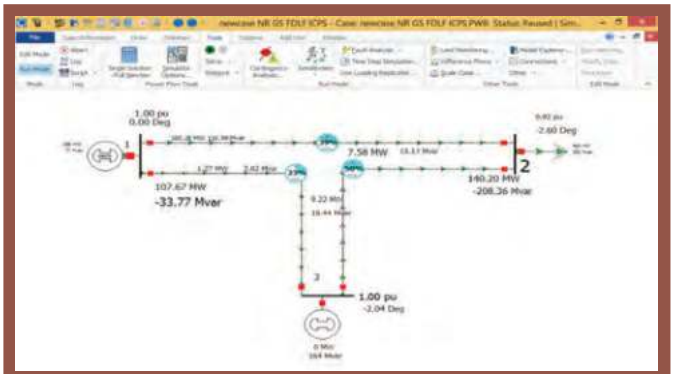


Fig 3: Solution Through GS Method...

Number: 1 Max P: 107.118 at bus 2 Max Q: 53.786 at bus 2

NR PowerFlow - Single iteration complete

Solution Finished in 0.001 Seconds

Simulation: Power Flow did not converge!

Mathematical Equation Based on GS Method:

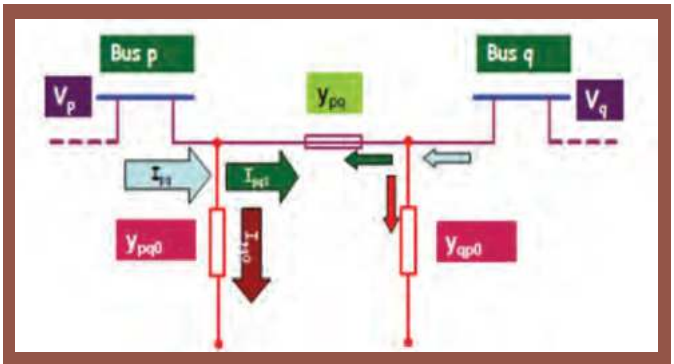


Fig 4: Computation of Line Flows...

- **PV Buses are Absent**

$$V_p = \frac{1}{Y_{pp}}\left[\frac{P_p - jQ_p}{V_p^*} - \sum_{\substack{q=1 \\ q\neq p}}^{n} Y_{pq}\, V_q\right], \quad p = 2,3,\ldots,n$$

$$V_p^{(k+1)} = \frac{A_p}{\left(V_p^{(k)}\right)^*} - \sum_{q=1}^{p-1} B_{pq}\, V_q^{(k+1)} - \sum_{q=p+1}^{n} B_{pq}\, V_q^{(k)}, \quad p = 2,3,\ldots,n$$

- **PV Buses are Present**

1. First repeat the iteration for PQ buses, then continue the iteration for PV buses.
2. At the PV buses, P & V are specified and Q & δ are unknown to be determined.
3. Therefore, the values of Q & δ are to be updated in every iteration through bus equations.

Advantages of GS Method:

- Small Computer memory requirement
- Simplicity of technique
- Less Computational time per iteration.

Disadvantages of GS method:

- Increase of number of iterations directly with the increased number of buses.
- Slow rate of convergence and thus, large number of iterations.
- Effect on convergence due to choice of slack bus.

NR method:

- Let us assume that an n -bus power system contains a total np number of P-Q buses while the number of P-V (generator) buses be ng such that n = np + ng + 1.
- Bus-1 is assumed to be the slack bus.

The Newton-Raphson procedure is as follows:

Step-1: Choose the initial values of the voltage magnitudes $|V|^{(0)}$ of all n_p load buses and n − 1 angles $\delta^{(0)}$ of the voltages of all the buses except the slack bus.

Step-2: Use the estimated $|V|^{(0)}$ and $\delta^{(0)}$ to find out a total n − 1 number of injected real power $P_{calc}^{(0)}$ and equal number of real power mismatch $\Delta P^{(0)}$.

Step-3: Use the estimated $|V|^{(0)}$ and $\delta^{(0)}$ to estimate a total n_p number of injected reactive power $Q_{calc}^{(0)}$ and equal number of reactive power mismatch $\Delta Q^{(0)}$.

Step-3: Use the estimated $|V|^{(0)}$ and $\delta^{(0)}$ to make the Jacobian matrix $J^{(0)}$.

Step-4: Solve for $\delta^{(0)}$ and $\Delta |V|^{(0)} \div |V|^{(0)}$.

Step-5 : Obtain the updates from

$$|V|^{(1)} = |V|^{(0)}\left[1 + \frac{\Delta|V|^{(0)}}{|V|^{(0)}}\right]$$

Step-6: Check if all the mismatches are below a small number. Terminate the process if yes. Otherwise go back to step-1 to start the next iteration.

Power Flow through NR Method:

Case Information: Case voltages set to flat start values
Generator MVAR outputs brought inside their limits
Starting Solution using Rectangular Newton-Raphson

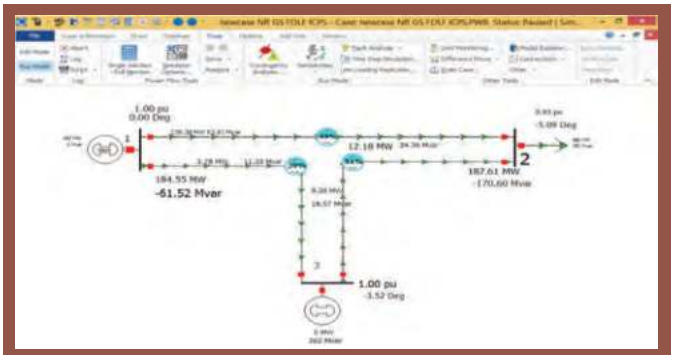


Fig 5: Solution through NR Method...

Number: 0 Max P: 400.000 at bus 2 Max Q: 250.000 at bus 2

Number: 1 Max P: 16.120 at bus 3 Max Q: 39.945 at bus 2

NR PowerFlow - Single iteration complete
Solution Finished in 0.000 Seconds
Simulation: Power Flow did not Converge!

Advantages of NR Method:

- This Method is faster, more reliable and results are more accurate.
- Generally it's suitable for large systems.

Disadvantages of NR Method:

- The programming logic is more complex than GS method.
- As the numbers of iterations are more the requirement of computer memory is higher than GS method.

Fast Decoupled Method:

- Do not build Jacobian at each iteration (J constant)
- Decoupling between P-δ and Q-V (not recommended in system highly loaded and/or with low voltage levels)

$$\begin{bmatrix}\Delta P^{(r)} \\ \Delta Q^{(r)}\end{bmatrix} = \begin{bmatrix}H^{(r)} & N^{(r)} \\ J^{(r)} & L^{(r)}\end{bmatrix}\begin{bmatrix}\Delta\delta^{(r+1)} \\ \Delta V^{(r+1)}/V^{(r)}\end{bmatrix}$$

Assume:

i) $|V_i| \approx 1.0 \quad \forall i$

ii) $G_{ik} << B_{ik} \quad \forall i,k$

iii) $\cos(\delta_i - \delta_k) \approx 1.0$
$\sin(\delta_i - \delta_k) \approx 0.0$

iv) $|Q_k| << B_{kk}$

Power Flow through Fast De Coupled Method:

Case Information: Case voltages set to flat start values
Generator MVAR outputs brought inside their limits
Starting Solution using Fast Decoupled Power Flow

Number: 1 Max P: 400.000 at bus 2 Max Q: 421.258 at bus 2

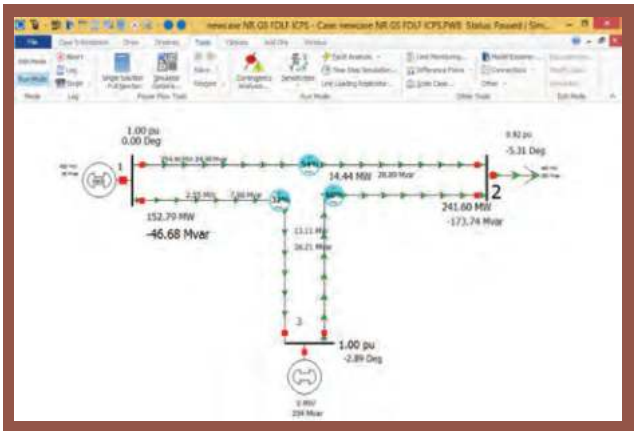


Fig 6: Solution through FDLF Method...

NR Power Flow - Single iteration complete
Solution Finished in 0.000 Seconds
Simulation: Power Flow did not converge!

Advantages of FDLF Method

- This Method is easier because of linearization of the matrix equations.
- The power system where X/R ration is higher it's suitable over there.
- Memory requirement is less compared to NR Method.

Disadvantages of FDLF Method

- Require more number of Iterations than NR method.

Conclusion:

Load Flow Analysis is iterative process. Though there are different techniques that used to figure out the flows of power and bus voltage magnitude. As per the above discussion and simulation result, in view point of Authors, there are pros and cons of different methods, depending upon the requirement of system different methods GS, NR and FDLF will be the used for Load Flow calculation.

Prof. Minesh K. Joshi,
Assistant Professor, Department of Electrical Enggg, A D Patel Institute of Technology (ADIT), A Constituent College of CVM University, Vallabh Vidyanagar, Gujarat

Prof. Paresh R. Modha,
Assistant Professor, Department of Electrical Enggg, A D Patel Institute of Technology (ADIT), A Constituent College of CVM University, Vallabh Vidyanagar, Gujarat

"AMPLUS OFFERS A RISK-FREE SOLAR SOLUTION..."

Amplus Solar is Asia's leading distributed energy company providing low carbon energy solutions to industrial and commercial customers. It provides clean energy to its clients by setting up both on-site solar projects (rooftop and ground-mounted) and off-site solar farms. In an exclusive e-interaction with Electrical India, the company's Senior VP & Head - Institutional Relations, Ritu Lal, is fielding questions from P. K. Chatterjee (P. K.). Excerpts...

What is meant by 'low carbon energy solutions' in the field of electrical energy?

Power production from energy sources that emit low carbon emissions, compared to the conventional sources like thermal power plant, is considered as low carbon energy sources. Renewable sources such as Solar and Wind are good examples of low carbon energy production.

What is the minimum terrace size where solar energy plants can be installed?

A Minimum shadow-free area of 100 square feet is required to install a 1kW plant.

How is the awareness level in India? What is your contribution in increasing awareness?

Awareness of the benefits of grid-connected solar plants has increased in the past few years. The recent pandemic has made consumers more aware about health and sustainability.

Companies are focusing on bringing down their operating costs, and hence are now more open to adoption of solar to save on their electricity bills. Amplus has been at the forefront on many platforms of CII, FICCI and other industry bodies to

Amplus Rooftop Solar plant at Grifith Foods, Bangalore...

educate commercial and industrial customers on finer details of adopting a solar solution.

Homeowners are opting for the latest technology of modules and inverters to increase the longevity of the plant. They are choosing new solar products with higher efficiency and aesthetic structure designs to complement their home exteriors too. Among other initiatives, Amplus' residential solar brand HomeScape has partnered with CEEW to conduct solar awareness drives across New Delhi to educate homeowners on solar technology, its benefits, and regulatory compliances required to own a solar plant.

What are the prominent Indian industries where you have installed solar plants?

We have installed distributed solar plants across major Automotive, FMCG and Consumer Durables companies on OPEX model.

In residential, we are offering our expertise in designing and installing a solar plant that lasts 25 years on CAPEX model.

What is your USP (Unique Sales Proposition)?

Amplus offers a risk-free solar solution to its customers in its Solar Power 'As a Service Model'. Under this model, Amplus Solar invests its own capital to set up a rooftop solar PV plant on the customer's premises. Customers sign a Power Purchase Agreement (PPA) with Amplus to pay for the generated power at a lower-than-grid tariff, ensuring guaranteed savings for every unit of solar power generated. Thus, Amplus is delivering immediate, risk-free savings – and end-to-end solutions to its customers. Our company focuses on delivering the best quality solution to our customers, whilst ensuring safety at all stages.

Amplus has also introduced innovative products that suit urban homeowners' needs to render their terrace space useful rather than occupying it with low height solar structures. Under the brand 'HomeScape', we offer real time monitoring of solar generation and home energy consumption on HomeScape App. Consumers can control their system from anywhere with instant alerts and remote access. This makes our Residential Solar Solution offering unique.

HomeScape Solar plant for Residential customers in Amrit Farms, Delhi...

What are the additional fields where you are planning to diversify?

A need to decarbonize the energy value chain brings about a transformational change to the same, generating new opportunities. Amplus started as an Independent Power Producer (IPP) for Behind The Meter (BTM) applications for solar with a focus on Commercial and Industrial (C&I) customers.

We have already diversified to large open access projects, and have also launched HomeScape to cater to residential demand. With Yelo, Amplus is trying to capitalize on new growth opportunities arising from the electrification of mobility. We are also exploring energy storage solutions for BTM applications.

Amplus continues to monitor synergistic next-generation technologies as well, to become the choice of all consumers for their low carbon energy needs.

Which are the ideal places for setting up energy storage facilities?

The introduction of energy storage within the energy value chain is inevitable as increasingly non-load following renewable generating sources enter the power mix. One can install energy storage projects at Generating Sources, or at Transmission & Distribution Stage or at Consumption Level.

Amplus is currently focusing on consumption-level energy storage applications, which we believe provides a sizable opportunity and is synergistic with our current business. Energy storage can come as a containerized solution meant for outdoor applications. Commercial and industrial BTM (Behind The Meter) applications energy storage can be used for energy and peak shifting, for diesel abetment, as a source of uninterrupted power supply and controlling power quality, and increasing locally generated renewable power mix by providing flexibility to match demand with supply.

Can you put some estimates on the cost aspect of solar, EV charging and energy storage projects?

The Solar and energy storage projects are customized solutions based on the requirement of the customer, and hence the cost would vary. Though the cost of solar has stabilized over a period and industry standard is well-known, energy storage cost varies significantly based on the user case, selection of technology and of course site conditions.

EV charging cost can also vary depending on the kind of solutions required. Setting up a fast-charging station requires technology to compensate for the rigidity of our Transmission and Distribution (T&D) system – whereas a slow charging continuous power station can be relatively cheaper. EI

ASTRA

Active Harmonic Filter

"Best Power Quality Solution"

Multi-level Inverter

Filtering Upto 61st Order

High Filtering Efficiency

Made in India

Made for India

⋆ Available from 380 to 690 Voltage, 30 to 630 Amps ⋆ 3-Level Topology ⋆ Extremely Efficient ⋆ Low Losses ⋆
⋆ Hybrid Compensation ⋆ Handles Floating grid ⋆ Auto Voltage Stabilization ⋆ Eliminate Grid Resonance ⋆
⋆ Dual Quad core DSP Processor 4.4 GHz ⋆ Inbuilt Cloud Connectivity ⋆ Smart Operation Mode ⋆

Applications: Steel, Cement, Textile, Railways, Process, Automotive and other manufacturing Industries

Powerful Performance - Latest Technology - Economical Price

sales@inphase.in
+91 9632421402
www.inphase.in

InPhase
The Power People®

Thermography that is Smart & Networked

Application Image:
Thermography at work...

Why do you need a thermal imager?

In contracting as well as in the industrial sector, you profit considerably from the use of a thermal imager:

- You carry out status-oriented servicing work and prevent expensive system downtimes.
- You overcome the limitations of a pyrometer by measuring not just individual points but whole surfaces.
- You deal with jobs such as preventive maintenance of high voltage systems, circuit breakers or mechanical components on plants more quickly than before, thus saving time and money.
- You always provide best quality and ensure the satisfaction of your management or your customers – for example by testing and impressively presenting the faultless fitting or the functionality of system.

Convincing features for efficient thermography.

- **High resolution and image quality**
  Up to 320 x 240 pixels – with testo SuperResolution, even up to 640 x 480 pixels. Image quality and resolutions are ideal for all applications in both contracting and industry.
- **Connection to App and other Testo measuring instruments**
  Create and send compact reports on site with the testo Thermography App. Transfer the measurement values of the testo 605i hygrometer and the clamp meter testo 770 wirelessly to the imagers, in order to identify mould/humidity related danger or to complement thermal images with current/voltage values. For example – in solar panels.
- **Automatic setting of emissivity**
  The testo ε-Assist function automatically sets the emissivity and temperature of the measurement object, thus facilitating precise thermography.
- **Objectively comparable images**
  testo ScaleAssist adapts the thermal image scale to the inner and outer temperatures of the measurement object and the difference between them. This ensures comparable and error-free thermal images of the thermal insulation behaviour of a building.

Work smart and networked

Testo thermal imager 872 can also be connected to the testo Thermography App. The App available for iOS and Android, turns the user's smartphone into a second display and a remote control for the thermal imager, and serves to create compact reports quickly on site, to save them online and send them by e-mail. Apart from this, the App offers useful tools for fast analysis on site – for example for inserting additional measurement points, determining the temperature development via a line or adding comments to a thermal image. Also, it is very useful because with the App you can transmit thermal images live to your smartphone/tablet, and can use it as a second display.

Connectivity with testo Hygrometer and testo Clamp Meter

Testo 872 thermal imager can be additionally connected

Bluetooth & Wi-Fi Thermal Imager- testo 872...

wirelessly with the thermohygrometer testo 605i and the clamp meter testo 770-3. The measurement values of both compact measuring instruments are transmitted to the imagers by Bluetooth. This allows fast and clear identification of where exactly the thermography is to be done in any given climatic condition–or at what load a switching cabinet is running.

Testo India

With more than 60 years of measurement experience, Testo SE & Co. KGaA is headquartered in Titisee, Germany. **Testo India Pvt. Ltd.**, a 100% subsidiary of Testo SE & Co. KGaA was established in 2006 and has shown phenomenal growth over the last 14 years with its head office in Pune and a PAN India network.

Courtesy: Testo India Pvt. Ltd.

For more info: Write to info@testo.in or visit www.testo.com

"Kusam-Meco" AC / DC True RMS Digital Clamp Meter: Model – KM 088

Model KM-088 is a new AC/DC True RMS Clamp Meter introduced by "KUSAM-MECO", an ISO 9001-2008 certified company. It has backlight function, MAX/MIN/AVG Recording mode (Auto ranging), flashlight for easy operation in dim areas. It has a unique AmpTip function, not available in any other instrument in the market. This feature allows users to keep the current carrying conductor at the top end of the clampmeter & get accurate measurements whereas in other meters, the current carrying conductor has to be at the centre of the clamp to get the best accuracy. KM 088 also has VFD-V & Hz function specially designed for variable frequency drives. It can measure TRMS 1000A AC Current upto400Hz frequency, DC Current upto 1000A, TRMS AC voltage 1000V up

to 400Hz frequency, DC1000Volts, Capacitance up to 2500 μF, AC+DC Current 1000A up to 400Hz, frequency, continuity, resistance, diode test upto 2.000V. It can also measure & has a special feature of Non-contact EF detection. It has Crest peak-RMS hold & data hold facility. It has the highest safety levels having transient protection up to 8 KV lighting surge and meets the requirements for CAT III 1000V & CAT IV 600V AC & DC. It meets E.M.C. requirements and Double insulation per UL/IEC/EN61010-1 Ed. 3.0, IEC/EN61010-2-033 Ed. 1.0, CAN/CSA C22.2 No. 61010-1 Ed. 3.0, IEC/EN61010-2-032 Ed. 3.0 & IEC/EN61010-031 Ed. 1.1. It has a fire retarded casing. The conductor size is up to 51mm dia. It is supplied with Soft Carrying Pouch, Operating Manual and Test lead set.

For more info: Write to sales@kusam-meco.co.in or visit www.kusamelectrical.com

Reforms in the Indian Power Sector

The developments in the Indian power sector from the very beginning to the present have been analyzed and discussed in this article. It has also highlighted the reforms that laid the foundations for India's power sector – and addresses the key points of each reform. Also, it highlights some of the challenges and the current efforts to overcome those…

The power industry has always been a key driver for industrial development, infrastructure growth and social welfare. The journey of electricity in India began with the transfer of electricity-based technologies from England to India during the colonial period, from the first flickering of the light bulb in Calcutta in 1879 to the first commercial hydroelectric power station in 1897. The motivation behind this was to leverage the resources and not to transfer the knowledge. The electricity was generated and distributed primarily by private companies in the urban areas before independence.

During the colonial period (1910-1947)

The first law that came into the picture was the Electricity Act of 1887, to control power generation and supply. This act was amended as the Indian Electricity Act 1903 (IEA 1903). Year after year different changes were made in the IEA to resolve the power demand and to make it easier for private companies to participate. During this time, electricity was not very prominent; companies

gave advertisements through newspapers and ballot papers to promote energy usage. The Indian Electricity Act 1910 was a fundamental foundation for India's electricity supply industry. It provides the opportunity for private companies to generate and supply state government-issued electricity. This move encourages utilities to generate more electricity. The benefit achieved after this act was increased in the supply of electricity to 58 times from 363MW in 1910 to 21,082MW in 1915. Damodar Valley Company (DVC) and Calcutta Electric Supply Company Ltd. (CESC) were the main corporations.

Post-independence era (1948 - present)

The progression of the power industry started with the Electricity Supply Act 1948, which established State Electricity Boards (SEBs). Such SEBs became the autonomous body responsible for expanding the country-electrification that was limited to a few cities. Central Electricity Authority (CEA) was established under this act to administer SEBs at the national level. The nation faced an energy crisis in the 1970s by indiscriminate progress. The government was searching for renewable alternatives, and in 1981 the Commission for Additional Energy Sources (CASE) was established. In renewable energy, only wind energy was first used as a cheaper alternative to diesel pump sets in India in the 1950s primarily for agriculture and irrigation purposes.

Strengthening of reforms

In 1964 our nation was split into five electricity regions to make the planning process smoother. These regional grids were implemented to meet common demands and efficient grid operations, namely Southern, Northern, North-Eastern, Western and Eastern. SEBs were unable to meet the people's demands in their respective states, to cope up with this situation in 1976 a central organization was formed for generation and transmissions like National Thermal Power Corporation (NTPC), National Hydro-electric Power Corporation (NHPC) and National Power Corporation (NPC). In the next few years, the condition of the SEBs became grim as the debt rose to 41,000 crores. This issue had predominantly risen because of high transmission losses and political interference over SEBs in granting of subsidies to the farmers. The privatization wasn't even considered to be good at that time, somehow the government decided in 1991 to open up the paths for private companies in the power sector. These were permitted to generate and supply electricity in confined areas. With the involvement of private companies in the sector, the responsibility of SEBs was increased, thereby requiring a regulatory body for proper governance. The Electricity Regulatory Commission Act 1998 (ERC Act 1998) was formed to monitor and keep the government away from tariff determination. The Central Electricity Regulatory Commission (CERC) at the national level and the State Electricity Regulatory Commission (SERC) at the state level were set up to rationalize the electric tariff. The consequence of these laws can be seen from the growth of electricity generation, which boosted from about 5.1 billion units to 420 billion (82-fold increase) and the per capita consumption of electricity also increased from 15 units in 1950 to about 338 units in 1997-98, which was about 23 times higher.

There were also many maladies in the Indian power sector, Electricity Act 2003 was introduced to eradicate these maladies. This was the most essential act in Indian history that properly integrated all previously established acts. The various objectives of this act are enumerated below:

- To promote competition in the market.
- Strengthening the laws relating to power generation, transmission and distribution.
- Guaranteeing transparency in the subsidy programs.
- Strict rules for the minimization of theft and misuse.
- Mandatory metering in all houses.
- Ensuring that electricity reaches all areas.
- To protect the rights of the consumer.
- Fostering efficient and environmentally sustainable policies.
- To take action for the development of the power industry.

This act was amended several times between 2004 to 2014. The 2005 reforms centered specifically on energy protection, with the offenses relating to power stealing, energy poles and meter manipulation as recognized offenses. The distribution sector did not remain untouched by the restructuring of the power sector.

Reforms in distribution sector

SEBs maintained a monopoly in the electricity distribution sector after the Electricity Supply Act 1948. Thereafter, more emphasis on government was on increasing the installed capacity whereas less focus was given on the expansion of the distribution sector. It can be demonstrated by the CEA Report 2002, the installed capacity's Compound Annual Growth Rate (CAGR) increased to 4.1 per cent during the 1995-2001 period, while the CAGR growth

in transmission and distribution lines was estimated at just 2.8 per cent over the same duration. The burden on distribution lines was increased that resulted in low voltage problems and frequent tripping was common. The transmission and distribution losses were estimated by utilities about 40 to 50 per cent. The main reason for these higher losses was the lack of strict electricity distribution policies. Theft of electricity, bypassing meters, unmetered connections and improper tariff policies had brought SEBs in debt. SEBs had been financially devastated that led to the state-wide inability of transmission line expansion. Various reforms that played an important role in the restructuring of the distribution sector are described below:

- **Accelerated Power Development Programme (APDP) -** APDP scheme was initiated in 2000 with the main emphasis on providing financial assistance to SEBs to further renovate and upgrade the distribution and transmission network. In all districts, 100 per cent metering was introduced to reduce electricity theft and ensure transparency. Under this act, the privatization of the distribution sector was done by dividing the state in different zones.
- **Electricity Act 2003 -** Electricity Act 2003 came into being with the expansion of the transmission network – and lays the foundation for the transformation and privatization of the distribution sector. This act changed the whole structure of the power sector in India. Various features of this act in the power distribution sector include allowing private utilities to participate in the distribution of power, making meters mandatory and allowing construction of special transmission lines. Private participation had increased competition in the distribution market that provided benefits to the consumer in price reduction.
- **Integrated Power Development Scheme (IPDS) -** It was launched in 2014 to strengthen the transmission and distribution system of urban areas through implementing Information Technology (IT). This policy was primarily based on the urban areas distribution sector through the metering of customers and feeders. IPDS was a major step towards the upliftment of distributed renewable energy resources. This was also made mandatory to provide customers with a load of more than 1 MW by law free access to energy, thereby enabling them to enter into bilateral procurement agreements. At present, more than one supplier may be working in a market, giving consumers the power to choose the seller. Through this step, the idea of smart grid and smart meter was gathering traction.
- **Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY) -** This scheme was approved in 2014 for metering and electrification purposes in the rural areas. It was for the enhancement of the distribution network in rural areas. Under this scheme, 98.7 per cent of villages were electrified till March 2015 and further rural electrification was done under Saubhagya scheme. Till 19-05-2020, 99.99 per cent of villages have been electrified. Only a few villages of Chhattisgarh are left to be electrified as per Saubhagya dashboard.

Transition in the power sector

Central Government launched various schemes for the electrification of every household, one of them is Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) on 4th April 2005 for attaining the National Common Minimum Programme (NCMP) goal of providing access to electricity to all households in the country in five years. In this step, the rapid growth of solar energy is only made possible with the Jawaharlal Nehru National Solar Mission (JNNSM), which was launched to encourage environment-friendly development while tackling India's energy security issue. It will also mark India's main contribution to the global initiative to confront the problems of climate change. The Mission's immediate goal was to focus on creating an encouraging environment for the country's penetration of solar energy at both centralized and decentralized level. With the motive of transparency and competition in trading of power in 2008, the Indian Energy Exchange (IEX) and Power Exchange India Limited (PXIL) have been established. PXIL and IEX facilitate transparent trading of electricity, a larger market spectrum, and allows the participation of other players in the market. IEX's services include Term Ahead Market (TAM), Day-Ahead Market (DAM), and much more. Availability-based tariff is one of the main mechanisms to estimate the DAM successfully. Fig. 1 shows the transformation of the Indian power sector.

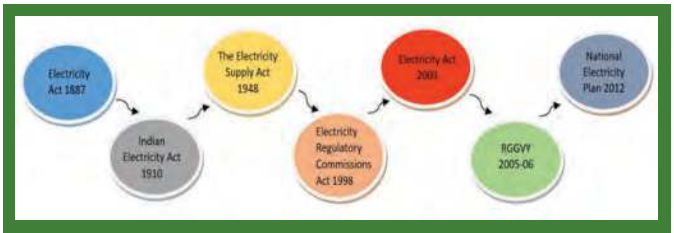


Fig. 1. Transformation of the Indian power sector...

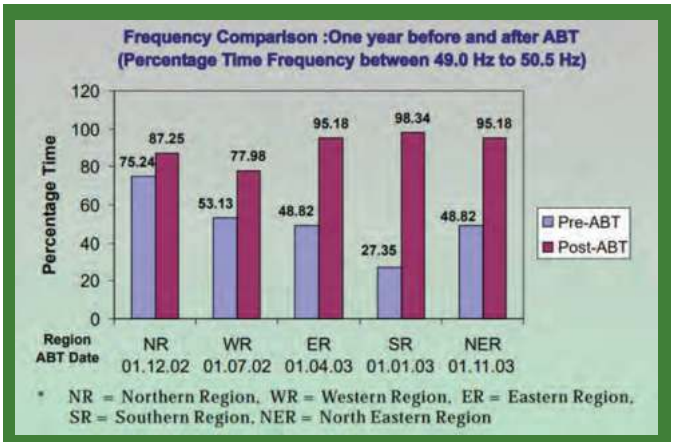


Fig. 2. Percentage time-frequency between 49 Hz to 50.5 Hz...

The next and foremost important revolution in the Indian Power Sector was the implementation of "Availability Based Tariff (ABT)" in the tariff structure. The frequency of the grid increases when generation is more than demand and if the generation is less than demand the frequency falls. The past problems associated with the grid are low frequency at peak load periods, high frequency during off-peak hours, and frequent tripping of generators. ABT has proved to be the best equipment for handling all these problems. To maintain the grid frequency at its nominal value of 50 Hz, the ABT introduced the concept of Unscheduled Interchange (UI) charges. In this tariff framework, the generating station is entitled to obtain the incentive payment for the additional amount of generation according to the frequency guided rate whenever the actual energy supplied is greater than the pre-committed scheduled amount and will pay fine in a vice-versa situation. The ABT was implemented in all the five regions of India by 1 November 2003 and also its enactment had displayed a notable improvement in grid discipline. The permissible frequency band is reduced from the introductory range of 49 – 50.5 Hz in 2002-03 to 49.7 – 50.2 Hz in 2012. After ABT was introduced, the frequency profile of all regions was improved greatly and Fig 2 shows the frequency comparison of all regions within one year of pre-ABT and post ABT period.

Power supply position in India

The aforementioned reforms undoubtedly opened up all the avenues for the growth of the power industry. Yet the situation was different, the gap between demanded and supplied energy rose from 8.1% in 1997-98 to 11.1% in 2008-09. The two key factors that hampered the development were power generation capacity and failure to reduce distribution losses. In order to address this problem, the generation capacity was increased from 723.8 BU in 2008-09 to 1376.09 BU in 2018-19 within a decade. It brings the deficit to 0.6% in 2018-19 as shown in Fig. 3. In certain regions, the electricity was in surplus condition therefore, the other states were provided with unused electricity.

According to the CEA report, installed capacity was raised to 369,428MW till 29.02.2020, from which thermal energy had its contribution of 62.8%, renewable energy had 23.5%, hydro energy had 12.4% and remaining was from nuclear energy. The growth in the renewable sector is appreciable from 2015 onwards, the rise last year was 24%. The Indian market was flooded with china's cheap solar module and the government subsidy help boost renewable energy generation which marks the 23.5% share of total generation.

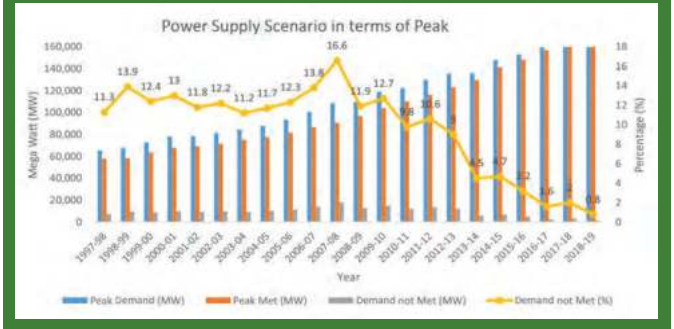


Fig. 3. Power supply position in India...

Intelligent Electronic Devices (IEDs)

The outdated electrical transmission and distribution network has several drawbacks like high transmission losses, electricity theft, inaccurate demand response forecasting and those are unreliable in the integration of distributed resources. Hence, technological advancement with the implementation of Smart Grid technology, Electrical Storage System, Smart meters and Blockchain can maintain grid stability with today's demand.

Smart grid

In India, renewable energy has registered tremendous growth in few years mainly in solar and wind energy. So, the grid needs to become smarter to maintain grid stability from such intermittent sources of energy. Today's distribution grid has become old, inefficient and unreliable for operating with Distributed Energy Resources (DERs). In order to avoid blackouts, brownouts and inefficiencies of the power system, the implementation of the smart grid is the best option. The grid, which is equipped with the sensors, actuators and smart meters and

allows multi-way communication between consumers, prosumers–and the system can be called a smart grid. It allows two-way communication between consumer and utility by the flow of power from the utility to consumer and the flow of information from the consumer. Data from the sensors that are mounted in the distribution grid can be used to balance the demand and supply. Real-time data of generation, transmission and distribution from IED can help utilities and consumers to utilize power efficiently.

Smart grid has a potential to takeover generation, transmission and distribution from centralized to the decentralized way with the incorporation of DERs and electrical storage system. Implementation of the smart grid can be expensive but it has a wide variety of advantages for both customers and utilities. Consumers have the ability to adjust their loads at peak hours to reduce their bills and prosumers may also gain profit by selling the electricity at peak hours. People can buy and sell electricity from their own choice and despite being dependent on single utility. One-third of the power generated is to get wasted in transmission and distribution losses. With Peer to Peer (P2P) energy trading, everyone can get power at an economical price that has low losses in transmission and distribution. The smart grid provides a platform for P2P energy trading, the prosumer who generates energy from renewable energy resources such as solar and wind can sell their surplus energy to their neighbour. For buying and selling power an application regulates the smart meter, which monitors the usage of electrical energy and transmits information to the user. Security of the grid from the cyber-attacks is also one of the main concerns that arise with the implementation of the smart grid. The threat of cyber-attack is prolonged because the data collected from the sensors is stored in a centralized server of power utilities, which can be easily targeted by the attackers. The researcher finds out the way to secure the grid from cyber-attack by implementing blockchain. Blockchain technology is used in P2P energy trading to make the trade more secure and ensure credibility. It's the same technology behind bitcoin.

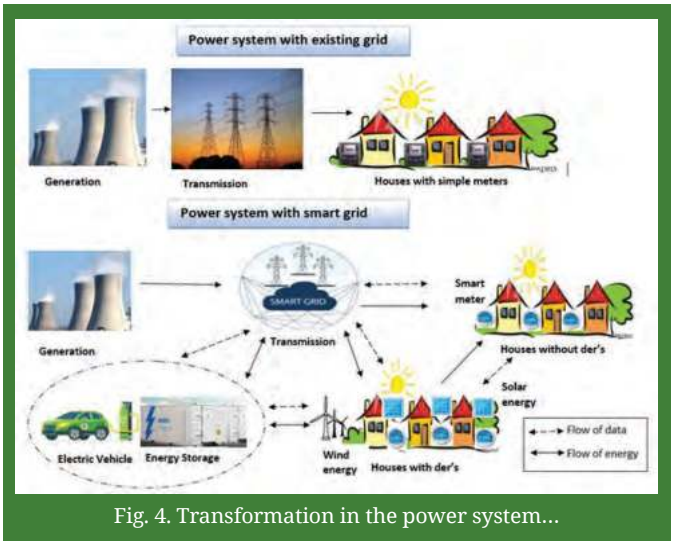


Fig. 4. Transformation in the power system...

In India, the UPPCL and BSES Rajdhani power limited have introduced blockchain technology to its rooftop solar power segment to implement large-scale P2P energy trading trials across the existing solar infrastructure in a selected group of solar consumers in the UP and Dwarka region in New Delhi respectively. The Indian Government had initiated a National Smart Grid Project (NSGM) to deploy smart grids in India. NSGM is functional under the Ministry of Power from January 2016. It was designed to be completed in two stages, the first phase (2014-2017) to investigate the different possibilities and plan the infrastructure for implementation – and various smart grid schemes had to be deployed in selected cities during the second phase (2017-2020). Eleven Smart grid pilot projects, such as IIT Kanpur Smart City Pilot, CESC Mysore etc., have already been completed and five have been active projects.

Smart metering infrastructure

With the increase in rooftop PV implementation and grid-integrated solar deployment, net metering is of vital importance. In the case of net energy metering, various studies have shown how a consumer is been now acting as a prosumer i.e., they can switch roles between consumers and a seller as per the condition of the prevailing time. Hence, prosumers are now able to use the energy generated by their own sources DG set, PV etc., and the surplus would be exported to the utility grid whereby the consumer receives an incentive for the exported electricity. It faces certain variations in terms of pricing as the consumer buys electricity from the grid and charges for it at the retail rate, while all electricity generated from a distributed generation is sold to the grid at a predetermined rate (which may vary from the retail rate). In India, multiple steps have been taken ahead to advance the smart grids including Puducherry Smart Grid Pilot Project and Battery Energy Storage System, Chamundeshwari Electricity Supply Corporation Ltd. (CESC), Mysore etc.

Electrical Storage System (ESS)

It provides flexibility in the integration of intermittent wind and solar energy sources. ESS can play a game-changer role in balancing load and generation. Nowadays, Energy Storage Systems (ESSs) have created their imperative space in renewable energy integration. With the substantial growth of renewable energy in India, energy storage can help to reduce the intermittency of renewable energy. It incorporates a method by which electrical energy is converted into a type that can be stored in off-peak hours i.e., when surplus is generated and can be converted back to electrical form to utilize it in peak hours. Indeed, many systems are available for energy storage, which we will discuss in this section of the article. According to ESSs are classified as follows:

Based on the form of energy stored

The ESSs are widely classified based on the form of energy that is used for storing:

- **Mechanical Energy Storage –** A good example of this kind of energy storage is a 'Pumped Hydro Energy Storage (PHES).' In this type, Gravitational Potential is stored by lifting the water at high altitude (charging) at off-peak hours and released in a way so that gravitational potential energy is converted into mechanical energy, which in turn is converted into electrical energy. E.g., Tehri Pumped Storage Hydroelectric Power Plant in India.
- **Electrochemical Energy Storage –** In this facility,, the electrical energy is stored by converting it into the electrochemical form of energy; an example is Battery Storage Systems (BSSs). Battery storage system technology is the most extensively used energy storage system for the application of the power grid. Various types of batteries include sodium sulphur battery, lead-acid battery, lithium-ion battery etc.
- **Electrical Energy Storage –** A Double Layer Capacitors (DLC) or Supercapacitors, it follows the same concept of traditional capacitors behind storing electric energy except DLCs have thinner dielectrics and large surface area to accumulate a large amount of charge. Giga Capacitor Hyderabad Test Project (IL) in Hyderabad India, is a super-capacitor based facility with a rated power of 15,000kW.
- **Thermal Energy Storage (TES) –** These TES systems are used to store the electricity or the waste heat in the form of thermal energy, which further can be harnessed to get electrical energy.

Based on Discharge Duration	Short Term Response – This is capable of responding for a limited period, and is primarily used while transients to ensure the voltage stability.
	Medium-Term Response – It is capable of supplying electricity from a few minutes to hours, mainly used in frequency regulation.
	Real Long-Term Response – Capable of supplying electricity for days or weeks and typically used to fulfill demand.
Based on Form of Energy Stored	Mechanical, Electrochemical, Electrical, Chemical, Thermal

ESS can provide the stored energy at peak hours and reduce the fluctuation in the grid. The most prominent ESS in India is the Pumped Storage Hydro (PSH) system. The first PSH plant in India "Nagaarjun Sagar - Andhra Pradesh" was commissioned in 1985. Several advancements had taken place to reach the first grid-scale battery-based energy storage system of 10MW that was established in New Delhi at this level in 2019.

Aniket Raj is from the Department of Electrical Engineering, M.M.M. University of Technology, Gorakhpur, U.P., India

Prabhakar Tiwari is from the Department of Electrical Engineering, M.M.M. University of Technology, Gorakhpur, U.P., India

S.N. Singh is from the Department of Electrical Engineering, Indian Institute of Technology, Kanpur, U.P., India

Utkarsh Gupta is from the Department of Electrical Engineering, M.M.M. University of Technology, Gorakhpur, U.P., India

Automation & Control Systems

Automation providers and utilities are beginning to utilize fleet management tools that allow the optimization of power production across all the plants operated by a company or across a region…

Power is an important facet for infrastructure enlargement. It also empowers economic growth of a country. Indian power sector is quite diversified and comprises Thermal, Hydro, Nuclear and Renewable sources for generation of power. Development of power infrastructure is vital to meet the growing demand-supply gap. The automation sector has wide scope of building new plants, renovating older ones to revamp efficiency and to improve transmission and distribution system. Advances in technology permits personal interaction with world- wide experts who have real-time access to information from a process plant. Current lockdown scenario is a practical example of this.

History of Automation

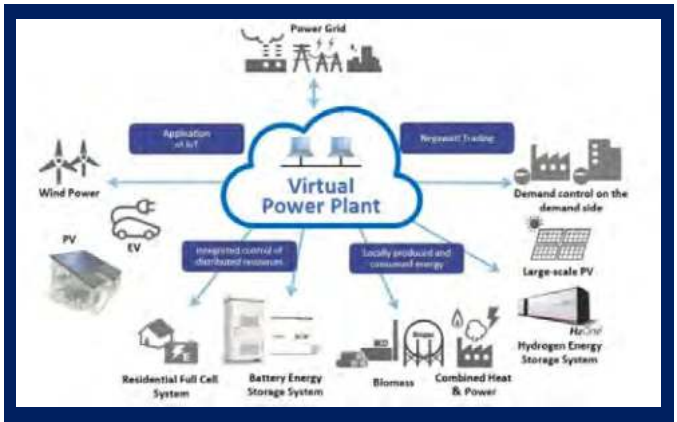
The first direct digital control systems of the 1970s offered graphical interfaces that immitated conventional Boiler Turbine Generator (BTG) boards. Few variables appeared on the low-resolution monitors and this problem was called the 'keyhole effect'. Few years later, operator guidance messages were incorporated. Their implementation was included into process control system and its engineering tools. Systems stimulated in 1980s such as neural networks, fuzzy logic were implemented to optimise functions like emissions, unit heat rate and boiler fireside cleaning.

Current Scenario

Automation of power plants has become increasingly civilized over the past 20 years due to advances in computer engineering. Earlier a power plant was controlled by an operator facing a bank of gauges and controls but automation has resulted in control of many plants from their designed control rooms. The systems including controllers and input-output modules are made compact while their computing power has increased exponentially. These modules meet strict government policies, surge withstand capabilities, economic constraints and environmental specifications. The operation unit puts more pressure on automation systems to provide timely information to all departments concerned with plant operation, maintenance and other specialists who can be called on at times.

Automation systems are now network enabled and are emerging out as mediums that provide real-time information to those who provide input to the decision-making process. Networked functionality is important as units face new operational environment that requires them to constantly reconsider the generating assets needed to match demand based on external factors such as environmental constraints.

Large power plants are controlled and managed by production and maintenance units, which use process control system to automate process functions and provide information to decision makers. The role of the control system in power plant is to automate, inform, take preventive call and store data in Centre of Excellence for further analysis and study. Wireless engineering stations can also access information from the system about field devices, receive information from other sources and allow technicians to make configuration changes. Information from any plant device such as pumps, fans, valves, transmitters, electric motors, heat exchangers, boilers and turbine is collected in real time. Also, quality and cost data are all available for scrutiny by experts anywhere in the world. The automation system is a platform, which is an important tool of supervisory optimisation and



Source: https://www.openpr.com/news/2030537/virtual-power-plant-market-to-watch-spotlight-on-abb-autogrid

control. Without combined advancement in computer hardware and communication fields such automated systems would not have existed. Advances in sensor and measurement technology have enabled power plant operating parameters to be measured and monitored– thereby providing a detailed analysis of power plant in real time. Also, modern Distributed Control Systems (DCS) provide the ability to regulate the operations of the plant more precisely. The availability of precise data and the widespread introduction of DCS have created a foundation upon which an automation and control system works effectively. Advanced control systems are available for all types of power plant, but it is in steam-turbine-based combustion plants that they offer perhaps the greatest advantages.

A good automated control system permits control of the combustion process in the boiler, which is important for plant emission performance and efficiency. It controls the steam temperatures and pressures throughout the steam cycle and allows the best efficiency to be achieved by minimizing mechanical stresses. Automation providers and utilities are beginning to utilize fleet management tools that allow the optimization of power production across all the plants operated by a company or across a region. It will be advantageous both for fossil fuel plants and for renewable and is seen as an important growth area for the future. While optimization technology is relatively new, the market for power plant optimization is not limited to new plants. Many older plants still rely on much earlier generations of control and automation systems. Recent advances have been so significant that it is often cost effective to completely replace the original control system in a power plant more than 20 years old with a modern system. The cost can be recouped in more efficient operation, lower maintenance costs and greater ability to match grid operator demands.

Need of Automation and Control

The aim of automated power plant operations is to manage the plants in the optimum way to provide the highest heat rate or a high level of flexibility in order to generate the highest economic returns. Earlier this was limited by the ability to integrate the operations of all the different parts of a power plant, but now the automation systems have the ability to optimize the elements of the power plant and the whole plant as a single unit. By maintaining tight control of conditions during start up and shutdown or when a plant is ramping, an automation system can help extend the lifetime of plant components. In addition to this, the recording of the conditions experienced by each plant component during each cycle can be used to build up a historical picture of its evolving state of health and it can be used for predictive maintenance, analysing working of components before failure. Stress reduction and predictive maintenance allow a power plant to operate more efficiently by reducing downtime for outages and by reducing overall maintenance costs. The three main factors of primary importance in driving optimisation technology are:

- The advance of renewable generation.
- Global fuel costs.
- The effect of environmental concerns and legislation.

In the US, cheap gas is making it difficult for coal plant operators to generate for a profit, while in Europe high gas prices are challenging gas-fired plant operators. In both cases the ability of an optimization regime to maintain tight control of the combustion system while minimizing stresses and holding maintenance costs down can be the difference between economic and non-economic operation. Environmental concerns that have stimulated the rise in renewable generation are also having a direct impact on fossil fuel-based plant operations as a result of environmental legislation.

Conclusion and Future scope

Optimisation, efficiency and safety are the main goals of an automation system. Monitoring, data handling and controlling emissions are other contributing factors. In the coming years, plant functions such as operation, maintenance and management will be integrated across all plant functional areas. A virtual network of experts will be constituted around production activities and they will support the future automation system. Everything will be available through portals to the outside world to reduce operating costs. Automation and control systems of the power plants will further improve plant reliability by providing an advanced and open information technology tools to the remotely located experts.

Simmi Sharma: With 11 years of teaching experience, the author is pursuing PhD from DTU, DELHI. She is interested in the fields of Control Systems and Renewable Sources of Energy. There are more than 10 published papers in her credit.

ALL INDIA INSTALLED CAPACITY (IN MW) OF POWER STATIONS
(As on 31.10.2020)

Region	Ownership/ Sector	Mode wise breakup								Grand Total
		Thermal					Nuclear	Hydro	RES * NRE)	
		Coal	Lignite	Gas	Diesel	Total				
Northern Region	State	16659.00	250.00	2879.20	0.00	19788.20	0.00	5777.25	725.51	26290.96
	Private	22425.83	1080.00	558.00	0.00	24063.83	0.00	2817.00	16325.84	43206.67
	Central	14352.96	250.00	2344.06	0.00	16947.02	1620.00	11450.52	379.00	30396.54
	Sub Total	53437.79	1580.00	5781.26	0.00	60799.05	1620.00	20044.77	17430.35	99894.17
Western Region	State	21740.00	1040.00	2849.82	0.00	25629.82	0.00	5446.50	555.54	31631.86
	Private	32847.17	500.00	4676.00	0.00	38023.17	0.00	481.00	25892.40	64396.57
	Central	19147.95	0.00	3280.67	0.00	22428.62	1840.00	1627.50	666.30	26562.42
	Sub Total	73735.12	1540.00	10806.49	0.00	86081.61	1840.00	7555.00	27114.24	122590.85
Southern Region	State	19782.50	0.00	791.98	159.96	20734.44	0.00	11774.83	586.88	33096.15
	Private	12747.00	250.00	5340.24	273.70	18610.95	0.00	0.00	41996.32	60607.27
	Central	11835.02	2890.00	359.58	0.00	15084.60	3320.00	0.00	541.90	18946.50
	Sub Total	44364.52	3140.00	6491.80	433.66	54429.99	3320.00	11774.83	43125.10	112649.92
Eastern Region	State	7450.00	0.00	100.00	0.00	7550.00	0.00	3537.92	275.11	11363.03
	Private	6153.00	0.00	0.00	0.00	6153.00	0.00	96.00	1277.10	7526.10
	Central	13684.05	0.00	0.00	0.00	13684.05	0.00	1005.20	10.00	14699.25
	Sub Total	27287.05	0.00	100.00	0.00	27387.05	0.00	4639.12	1562.21	33588.38
North Eastern Region	State	0.00	0.00	498.86	36.00	534.86	0.00	422.00	233.25	1190.10
	Private	0.00	0.00	24.50	0.00	24.50	0.00	0.00	105.28	129.78
	Central	770.02	0.00	1253.60	0.00	2023.62	0.00	1263.50	30.00	3317.12
	Sub Total	770.02	0.00	1776.96	36.00	2582.98	0.00	1685.50	368.53	4637.00
Islands	State	0.00	0.00	0.00	40.05	40.05	0.00	0.00	5.25	45.30
	Private	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.87	24.87
	Central	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10	5.10
	Sub Total	0.00	0.00	0.00	40.05	40.05	0.00	0.00	35.22	75.27
ALL INDIA	State	65631.50	1290.00	7119.86	236.01	74277.36	0.00	26958.50	2381.53	103617.40
	Private	74173.00	1830.00	10598.74	273.70	86875.45	0.00	3394.00	85621.81	175891.26
	Central	59790.00	3140.00	7237.91	0.00	70167.91	6780.00	15346.72	1632.30	93926.93
	Total	199594.50	6260.00	24956.51	509.71	231320.72	6780.00	45699.22	89635.65	373435.58

Figures at decimal may not tally due to rounding off

Source: CEA

Amprobe Launches New Multi-Meter

AM 420 is Amprobe's one of most popular Compact Digital Multimeters, now it is available for the Indian customers…

The AM 42O Digital Multi-meters are specially designed for technicians working in field of repair of mobile phones, laptops & computer peripherals, LCD panels and other electronic gadgets, residential appliances like washing machines, AC, fridge, kitchen appliances etc. This accurately measures voltage in power sockets, single phase distribution boards, switches, extension cords and light fixtures.

Its continuity function can be used to easily troubleshoot light bulbs and fuses. This compact tool is designed for in-home repair and electrical testing applications, including measuring presence of voltage in electrical sockets, extension cords, batteries and other electrical circuits up to 250 V AC/DC.

It is a must-have tool for residential projects including installation, troubleshooting or repair of light fixtures, fans or appliances. DC ranges of voltage and current are included to help with automotive diagnostics of electrical systems. The battery test feature checks the amount of charge remaining in standard 1.5 V and 9 V batteries.

Amprobe 420 Multimeters are compact DMMs that combine functionality with user-friendly form factor and great value. The Digital Multimeters come with 1 Year Replacement Warranty – and are backed by Fluke India service network. These are available across India through Fluke India sales channel network.

For more info: Write to info.india@fluke.com

Newtronics Green Energy bags Award (A Virtual Event)

NEWTRONICS GREEN ENERGY has bagged the prestigious "Rajasthan Green Future Leadership award" through a Virtual Event held at Mumbai, in November 2020. The award recognises leaders who have made valuable contribution and made a tangible difference in sustaining the growth of the renewable sector. NEWTRONICS GREEN ENERGY, one of the leading Solar solution firm, received this award on the basis of their contribution towards the development of renewable energy sector.

Customised Solar rooftop solutions (On-Grid and Off-Grid interactive systems), solar EPC, solar LED Street Lighting systems and Solar petrol pump etc. by NEWTRONICS GREEN ENERGY, contribute towards energy savings, and thus, reduce emission of CO_2. Their MAD (Making a Difference) approach towards the work, driven by passion and commitment towards social change, made them the right choice for the award. The entire program was graced by Dr. R. L. Bhatia, Founder of World CSR.

The criteria adopted to form the basis of this award was:

- Environment strategist and change manager
- Incorporating ethical values
- Developers & responsible leaders
- Involvement in communities and protection of the environment
- Strategic perspective and building collaborate relationships
- Effective and sustainable mobilisation of resources in support of programme and project work, including support from local communities
- Demonstration of efficient management of financial and human resources, good governance practices and transparency and accountability and effective communication.
- Those who can make a difference to the lives of others are chosen.
- For the quality of their work in rural reach and outlook and ability to contribute value of social change.

For more info: Write to info@newtronicssolar.in, jeet12solar@gmail.com, Website: www.newtronicssolar.in

SUBSCRIPTION RATES

PERIOD	No. of Issues	Print			Digital	Print+Digital	
		By Normal Post	By Registered Parcel	By Courier	By E-mail	By Registered Parcel	By Courier
ELECTRICAL INDIA							
1 YEAR	12	1000.00	1600.00	1800.00	1000.00	2100.00	2300.00
2 YEARS	24	1750.00	2950.00	3350.00	1750.00	3825.00	4225.00
3 YEARS	36	2500.00	4300.00	4900.00	2500.00	5550.00	6150.00
5 YEARS	60	4000.00	7000.00	8000.00	4000.00	9000.00	10000.00
COOLING INDIA							
1 YEAR	12	1000.00	1600.00	1800.00	1000.00	2100.00	2300.00
2 YEARS	24	1750.00	2950.00	3350.00	1750.00	3825.00	4225.00
3 YEARS	36	2500.00	4300.00	4900.00	2500.00	5550.00	6150.00
5 YEARS	60	4000.00	7000.00	8000.00	4000.00	9000.00	10000.00
LIGHTING INDIA							
1 YEAR	6	750.00	1050.00	1250.00	750.00	1425.00	1625.00
2 YEARS	12	1350.00	1950.00	2350.00	1350.00	2625.00	3025.00
3 YEARS	18	2000.00	2900.00	3500.00	2000.00	3900.00	4500.00
5 YEARS	30	3000.00	4500.00	5500.00	3000.00	6000.00	7000.00
MEDICAL EQUIPMENT & AUTOMATION							
1 YEAR	6	750.00	1050.00	1250.00	750.00	1425.00	1625.00
2 YEARS	12	1350.00	1950.00	2350.00	1350.00	2625.00	3025.00
3 YEARS	18	2000.00	2900.00	3500.00	2000.00	3900.00	4500.00
5 YEARS	30	3000.00	4500.00	5500.00	3000.00	6000.00	7000.00
AUTOMATION & ROBOTICS WORLD							
1 YEAR	6	1200.00	1500.00	1700.00	1200.00	1875.00	2075.00
2 YEARS	12	2160.00	2760.00	3160.00	2160.00	3435.00	3835.00
3 YEARS	18	3200.00	4100.00	4700.00	3200.00	5100.00	5700.00
5 YEARS	30	4800.00	6300.00	7300.00	4800.00	7800.00	8800.00

Chary Publications Pvt. Ltd. To Subscribe, visit: www.charypublications.in

Subscription Form

Yes, I would like to subscribe **ELECTRICAL INDIA / COOLING INDIA / LIGHTING INDIA / MEDICAL EQUIPMENT & AUTOMATION / AUTOMATION & ROBOTICS WORLD** for _____ years at Rs. _____. Payment needs to be in favour of "**CHARY PUBLICATIONS PVT LTD**"

Cheque/DD.No	Dated	Drawn On

Preferred mode will be NEFT/RTGS for which the details are as under :-

Account Name: Chary Publications Pvt.Ltd	Account Type : Cash Credit
Account Number : 000930110000085	IFSC Code: BKID0000009
Bank : Bank of India	Branch: Chembur, Mumbai-400071

Name:_____ Designation : _____

Company : _____

Address : _____

City : _____ Pin Code : _____

Email : _____Tel.No._____ Mob.No. _____

Signature : Stamp :

Chary Publications Pvt. Ltd.
905-906, The Corporate Park, Plot No. 14 & 15, Sector 18, Opp. Sanpada Railway Station, Vashi, Navi Mumbai - 400 703
Email: sub@charypublications.in • Contact : 022 4961 2499 • Website: www.charypublications.in

INTEGRATED Engineering Software, Winnipeg, Canada

INTEGRATED Engineering Software, Winnipeg, Canada is a leading developer of complete solutions for electrical engineering and scientific designs. INTEGRATED offers a complete toolbox to high voltage designers with applications such as: Transmission lines, Insulators, Power Generation/Utility, Power Transmission and Distribution, Power Systems, Transformers, Switchgears, and Bushings to name a few. For over 35 years, satisfied customers such as Siemens, LAPP Insulators, Hubbell Power Systems, Nexans, 3M, Maclean Power Systems, and NASA have relied on INTEGRATED to significantly reduce design and prototype costs while increasing quality and reliability. INTEGRATED provides engineers and scientists with greater insight into their design optimization and verification, which ultimately improves their bottom line.

INTEGRATED is the industry leader in **Boundary Element Method (BEM)** CAE software. BEM not only provides the most accurate numerical field solutions, but it is also the method of choice for problems involving the modeling of space around the device: that is what we call "large open regions". Today, no one else in the market offers such a variety of field solvers within the same software packages (BEM, FEM and FDTD). INTEGRATED takes pride in its achievement of combining state of the art technology with quick, responsive customer service and support.

INTEGRATED's software delivers a wide range of advantages:

- The maximum versatility of field solvers finds the best option for each specific application: choose from Boundary Element Method and Finite Element Method (both in the same package at no extra-cost) and Finite Difference Time Domain Method.
- The best optimization tool for each particular design, including: parametric analysis, scripting or Application Programming Interface (API).

In addition, multithreading (or parallelization) capability is included in the software package at no extra cost.

Our software programs come complete and ready to use. There is no need to purchase additional modules or options; all programs are fully functional CAE tools.

INTEGRATED's commitment is to provide designers with the most sophisticated analysis tools to assist them in the creation of the future. It is staffed with leading R&D engineers in areas such as electrical engineering, magnetics, and high frequency applications. Our software programs are used in a wide variety of industries, including manufacturing, automotive, medical, telecommunications, power and aerospace markets, as well as universities and research laboratories.

INTEGRATED's programs allow engineers and scientists to reduce design cycles, save time and money, and deliver more efficient products to the market, faster than ever before.

The Boundary Element Method (BEM), created by INTEGRATED's pioneers, has been the best option in terms of solvers for engineers and scientists working on open region applications.

The Finite Element Method (FEM) is also included in the same software package, given that some applications perform better when using one solver instead of another. Our customers have the option to select the solver that better fits their needs. In the same package, at the same cost, we offer the option not only to choose the best solver for each specific application, but also to compare results.

Specific products offered are:

- **Electro** and **Coulomb** for 2D/3D electric field modeling.
- **Magneto** and **Amperes** for 2D/3D magnetic field modeling.
- **Oersted** and **Faraday** for 2D/3D time-harmonic and eddy current field modeling.
- **Lorentz** for 2D/3D charged particle and beam modeling in the presence of both electric and magnetic fields.
- **Singula** for 3D high frequency full wave field modeling.
- **Kelvin**, **Celsius** and **Elasto** provide thermal/mechanical modeling and are used in conjunction with IES' electromagnetic modeling tools.

Dr. Amandeep Bal, has been working in INTEGRATED Engineering Software for the last 05 years. She obtained her Ph.D. in 2014 from Guru Nanak Dev University, Punjab, India and currently she is one of the members of INTEGRATED'S Technical Support Team. She also acts as a liaison between INTEGRATED's sales/marketing and software development team.

Igus offers a high degree of design freedom

Now, two filaments can be joined together in a single production step to form a lubrication-free and highly stable component...

Cologne-based plastics specialist igus has now started offering 3D printers that can produce components with various filaments. Different material properties can be easily combined in this 2-component 3D printing. For example, 3D printing can be used to produce components that require both special rigidity and high wear resistance. This gives companies more freedom and flexibility in design.

According to a study by the industry association BITKOM, 3D printing has become a serious alternative to machining processes – such as turning and milling in industry. Thirty two per cent of industrial companies already used the technology in 2019, twelve per cent more than that in 2016.

The 2-component printers work with the FDM process. The two molten plastics each flow through a separate pressure nozzle. The 2-component printers can switch between materials at any time during printing, and they merge at the transitions.

The filament portfolio includes lubricants and high-performance polymers with fire-retardant, hygienic and antistatic properties, amongst others. An exceptional case only arises if the melting temperatures of the filaments differ greatly and no material fusion is possible. In this case, designers can create a form-fit connection such as a dovetail, which connects two areas made of different plastics.

For more info: Write to nitin@igus.net

THE DIARY

ISH FRANKFURT

Date: 22 - 26 March 2021
Location: Germany
Contact: +49 69 75 75-0

ELECTRIC POWER TECH KOREA

Date: 17 - 19 May 2021
Location: South Korea
Contact: +82 (0)2/555-7153

INTERSOLAR EUROPE

Date: 09 - 11 June 2021
Location: Germany
Email: info@solarpromotion.com

SOLAR PV WORLD EXPO

Date: 16 - 18 August 2021
Location: China
Email: service@gzhw.com

THE BIG 5 SOLAR

Date: 12 - 15 September 2021
Time: 11:00 - 19:00
Location: UAE
Contact +971 4 438 0355
Email: info@dmgevents.com

WEBINAR

Webinar Name: The EU Market Outlook
Date: 12th January 2021
Time: 11:00 AM CET
Organizer: The smarter E Global

Webinar Name: HoriZone of IoT - Energy-efficient security for cloud-ready IoT Devices
Date: 10th November - 08th December 2020
Organizer: Renesas

IN THE JANUARY 2021 ISSUE

POWER ELECTRONICS, TEST & MEASUREMENT

Power Converters, Power Inverters, Motor Drives,

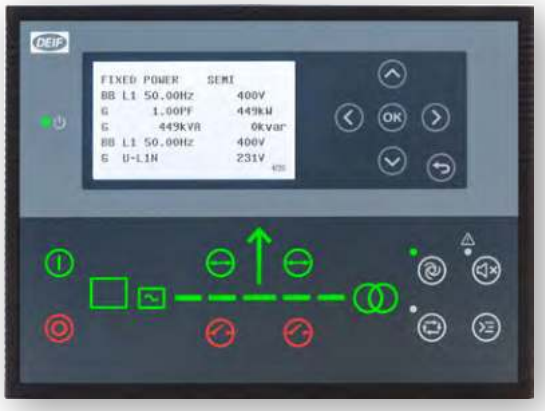
Motor Soft Starters, Semiconductors

AGC 150

Cost-effective & scalable controller

NEW

- EasyConnect
- User-friendly interface
- Guided experience
- New slim design - Easy to mount
- Built-in analogue AVR and GOV control



DEIF Advanced Genset Controller, AGC 150, meets and surpasses OEM needs for synchronisation. A cost-effective, compact, scalable and all-in-one product.

AGC 150 will be available in three variants: **Core**, **Extended** and **Premium** to meet the diverse user requirements.

Read more about DEIF AGC 150

www.deif.com/products/agc-150

DEIF India Pvt. Ltd.
602, 6th Floor Town Center – II, Andheri Kurla Road, Andheri (East), Mumbai – 400 059
www.deif.com - india@deif.in - Ph.: +91 22 42452000

RNI No.: 6226/1961 • Published and Posted on 5th of every month at Patrika Channel STG. office, Mumbai 400 001.
Postal Registration No. NMB/183/2018-2020 • Licence to post without prepayment WPP Licence No. NMR/TECH/WPP-15/NM/2020