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Consulting Electrical Engineers Association of Maharashtra

CEEAMA E-NEWS

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From the Secretary's Desk

Hello Friends,

It's a pleasure welcoming you all aboard yet another CEEAMA E NEWS ISSUE. This is my first communication with you all since I have assumed the position of Secretary CEEAMA. I am associated with CEEAMA for almost half the journey of CEEAMA as a company. I am thankful to all veteran electrical consultants who saw dream of such a vibrant organization and also amazed at their ongoing inspiring enthusiasm.

Electrical engineering profession especially in India is going to face lot many challenges on technical as well as statutory fronts in coming years. Issues like system stability, power quality etc will gain unprecedented importance in all sectors in near future. As a result of having PEOPLE CENTRIC government, implementation of electrical safety related statutory provisions will gain momentum. Adherence to various standards and safe electrical design practices will become part of every design.

We as consultants will have to play very important role in this by convincing and educating clients and demanding quality from contractors and equipment manufacturers.

CEEEAMA has decided to take various initiatives in this regard and "CEEAMA Roundtable meets" is one of them; which are happening in this month on "KVAH BILLING". Next CEEAMA E NEWS issue will have report on outcome of these meetings.

Lot is said about quality of electrical engineering education in India. CEEAMA intends to start structured long term practical training for our employees to equip them for taking new challenges in design. I will come back with more specifics in next issue. CEEAMA Governing council appeals to all members to offer full support and active participation in various initiatives and also to come forward with new ideas to steer your organization.

Goodbye till next issue.

Narendra Duvedi

Hon Secretary.

What is New?

Producing electricity at estuaries using light and osmosis

Osmosis is a natural process whereby molecules migrate from a concentrated to a more dilute solution across a semi-permeable membrane in order to balance the concentrations. At river estuaries, electrically charged salt ions move from the salty seawater to the fresh river water. The idea is to harness this phenomenon to generate power.

Researchers from EPFL's Laboratory of Nanoscale Biology (LBEN), which is headed by Professor Aleksandra Radenovic at the School of Engineering, have shown that the production of power using osmosis could be optimized using light. Reproducing the conditions that occur at estuaries, they shined light on a system combining water, salt and a membrane just three atoms thick to generate more electricity. Under the effect of light, the system produces twice as much power as it does in the dark. Their findings have been published in Joule.

The addition of light means the technology has moved one step closer to real-world application. The system involves two liquid-filled compartments, at markedly different salt concentrations, separated by a molybdenum disulfide (MoS2) membrane. In the middle of the membrane is a nanopore -- a tiny hole between three and ten nanometers (one millionth of a millimeter) in diameter.

Every time a salt ion passes through the hole from the high- to the low-concentration solution, an electron is transferred to an electrode, which generates an electric current.

The system's power generation potential depends on a number of factors -- not least the membrane itself, which needs to be thin in order to generate maximum current. The nanopore also has to be selective to create a potential difference (a voltage) between the two liquids, just like in a conventional battery. The nanopore allows positively charged ions to pass through, while pushing away most of the negatively charged ones.

The system is finely balanced. The nanopore and the membrane have to be highly charged, and multiple identically sized nanopores are needed, which is a technically challenging process.

According to the researchers, a system of mirrors and lenses could be used to direct this light onto the membranes at river estuaries. Similar systems are used in solar collectors and concentrators -- a technology already widely employed in photovoltaics.

Source: https://www.sciencedaily.com/releases/2019/05/190523111359.htm

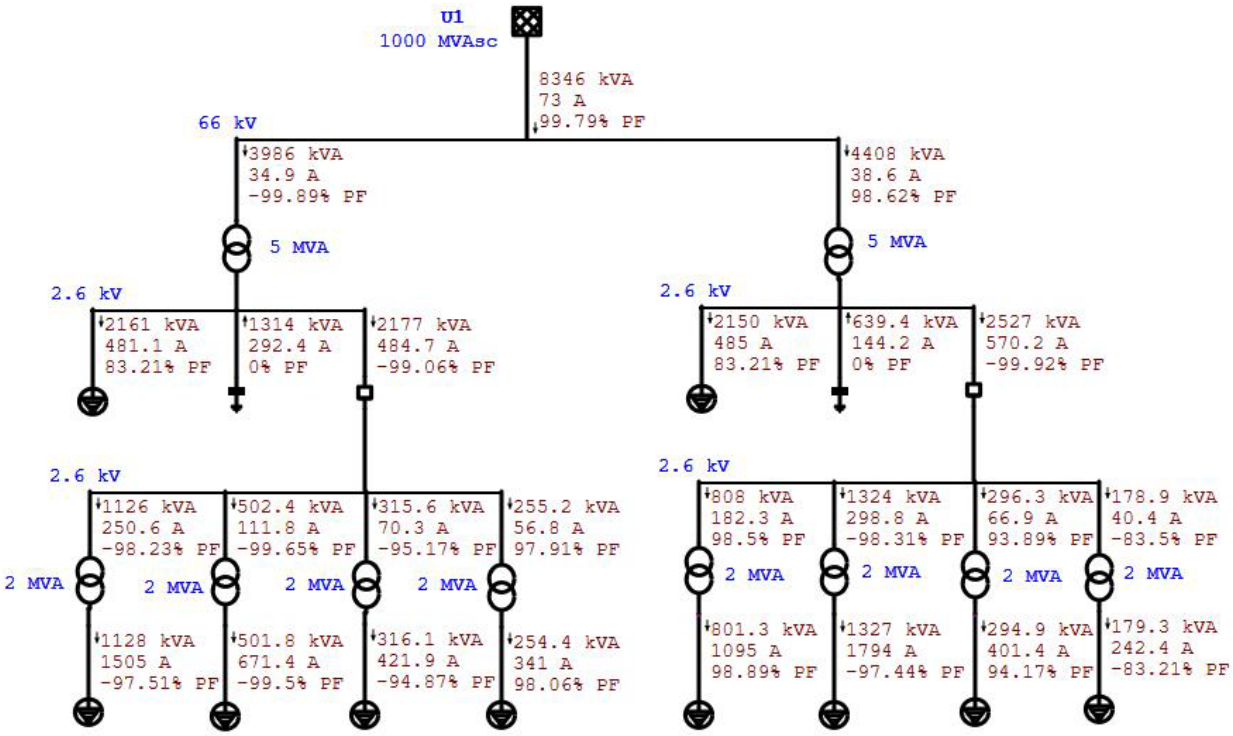
Contributed By Mangesh Shirgaonkar

KVAH Billing for Large consumers using HT Capacitors.

By now most of the bulk consumers of electricity have understood (!!) the forthcoming change in electricity billing system. MSEDCL has completed the dress rehearsal of what's going to happen from 1st April 2020 and is getting ready by replacing meters which are suitable for recording KVAH. Tata power also has fallen in line and has implemented the MERC ruling from 1st Jan 2019.

Large consumers having contract demands in excess of 5MVA are mostly HT or EHT consumers. They employ two stage "voltage step down" (May be 132 to 11 KV and further 11KV to 433Volts). Usually they have some HT loads like chillers, compressors, large equipment motors with voltages ranging from 2.4kv to 11kv. Such consumers have HT capacitors installed working in either auto or manual mode, which offer power factor correction. There are some consumers who have all loads as LT loads but still they have HT capacitors as their contract demands are large.

Till recent times when the requirement was to keep PF in leading mode for bill optimizing, this arrangement was working fine as utility was interested in monthly average power factor and not instantaneous real time power factor. Further in most states, leading power factor was considered as unity. Let us consider following case –



This client has

- 66Kv input supply.
- 10MVA contract demand – about 8500 KVA as MD.
- About 145000 Kwh as daily consumption.
- About 4300KVA as distributed HT load and rest is distributed LT Load.
- All distributed loads run as per process demand so their KW / KVAR demands are dynamic.
- 330KVAR x 4 – 2.6 KV for TR1 and 330KVAr x 2 - 2.6 KV for Tr2 capacitors installed. The steps are manually operated.
- Reactive power requirement of all LT loads is compensated (Partially or fully) by APFC / FIXED capacitors Connected at their respective trans formers.
- Maintenance team was monitoring the most upstream PF at 66KV once every hour and was adjusting PF to leading side.

Following would have been average PF pattern as per earlier considerations.

Month	KWh	PF
May 18	4284480	0.979
June 18	4215560	0.974
July 18	4220160	0.977
Aug 18	4265520	0.981
Sept 18	4161200	0.979
Oct 18	4034720	0.980
Nov 18	2726720	0.991
Dec 18	3707080	0.982
Jan 19	3852080	0.979
Feb 19	3557160	0.979
March 19	3773720	0.974
Apr 19	3836800	0.954

Management and maintenance team can reasonably remain happy because Power Factor as seen by utility was good and reasonable power factor incentive may become available. Leading PF considered as unity and no need of frequent adjustments of capacitors.

Actual pattern as reflected in the bills looks like as shown below. This data is from Haryana, where KVAH billing is in force since more than 2 years.

Actual figures from bills of a large plant in Hariyana				
Month	KWh	KVAh	Diff	PF
MAy 18	4284480	4377760	93280	0.979
June 18	4215560	4327920	112360	0.974
July 18	4220160	4320760	100600	0.977
Aug 18	4265520	4348320	82800	0.981
Sept 18	4161200	4249600	88400	0.979
Oct 18	4034720	4118880	84160	0.980
Nov 18	2726720	2751120	24400	0.991
DEC 18	3707080	3775360	68280	0.982
Jan 19	3852080	3935960	83880	0.979
Feb 19	3557160	3634720	77560	0.979
March 19	3773720	3876160	102440	0.974
Apr 19	3836800	4020080	183280	0.954
			1101440	KVAh Extra
	Rs.@7.70/KVAh		8481088	Increase in Bill
Plant paid almost Rs.85 Lacs extra in a year				

Although the Average PF is maintained, the real time power factor is not close to unity which results into accumulating more KVAh then KWh, and plant pays about Rs.85 Lacs extra in year.

The problems faced here are :

- HT capacitors generally are available for KVAR values above 100KVAR.
- Even if they are arranged in APFC mode, they can not be switched at faster rate. Fast switching can damage the capacitors and switchgear associated with it.
- HT capacitor switching can introduce voltage dips on internal and external electrical distribution – which may not be acceptable to the system.
- All this makes it difficult to get real time power factor as unity and KWh = KVAh for optimization of bill.

The solution:

In case the cost of electrical energy forms major part of manufacturing expenses and / or the payback period falls within 1.5 to 2 years, it is advisable to go for installing equipment to correct this situation and optimize the bill.

The power factor in real time can be kept very close to unity using HYBRID reactive power compensation solutions. The per KVAR cost of this HYBRID system goes to Rs. 4000 to 5000. This equipment is a combination of detuned filters and electronic static Var generator. Static VAR generator can draw lagging or leading current for power factor compensation and works with real time power factor feedback. Being electronic it acts in few milliseconds and works continuously. The KVAR correction resolution is very fine and there are no steps involved. The correction is usually applied on LT side while the feedback is taken suitably from HT side. If required a separate transformer may also be used for installing this correction.

The designer must think about minimizing the investment required, so following steps can be followed for such cases which have combination of HT and LT Loads.

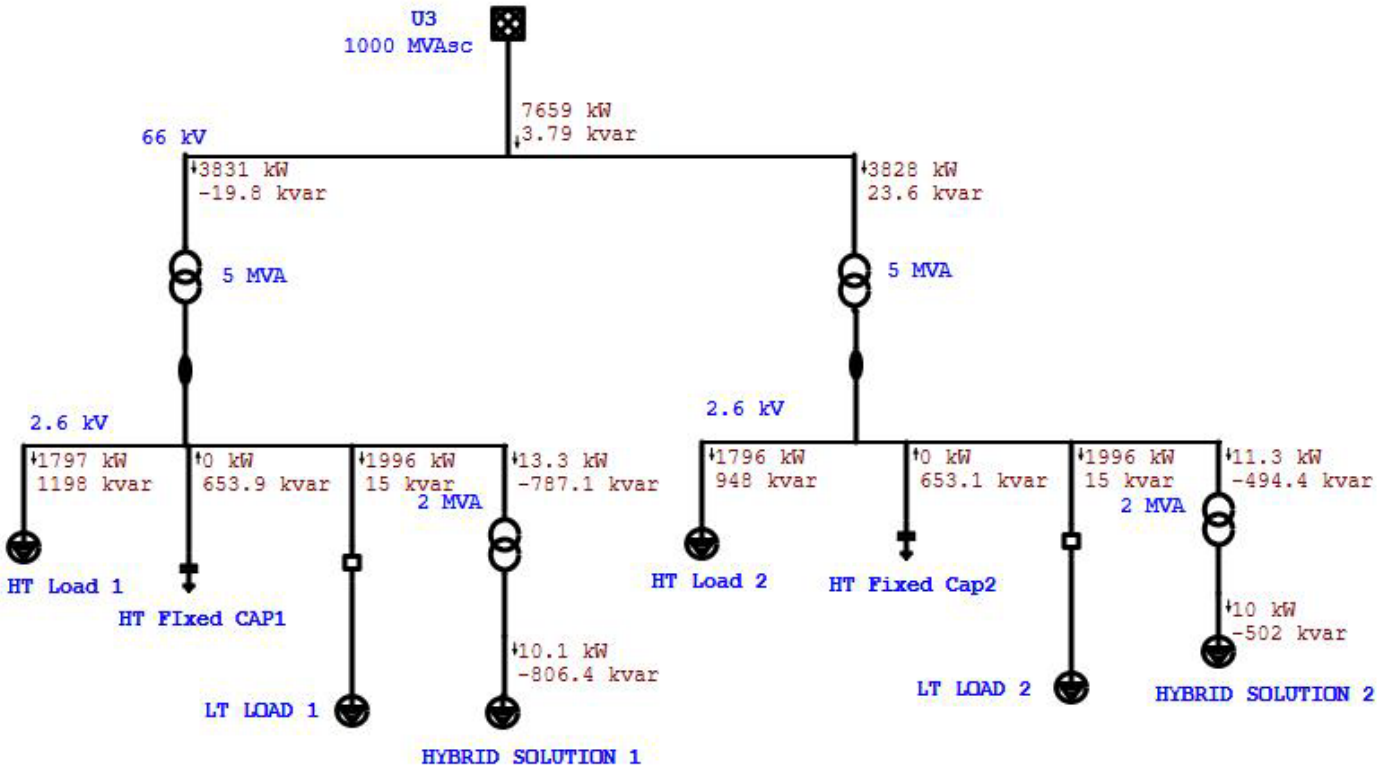
a) Understand KW / KVAR trends **for all LT loads** at respective transformer PCCs and design **individual RTPFC / APFC solutions** for these loads. This will ensure that there will not be any KVAR requirement in real time for all these loads at HT level.

b) Understand KW / KVAR trends for HT PCCs at respective transformers and know **base KVAR requirements**. These can be compensated **by fixed HT capacitors / detuned capacitors**.

c) The **balance** requirement can be compensated **by HYBRID** solution with HT feedack

d) Due consideration needs to be given to harmonic mitigation also at LT as well HT level so that harmonic resonance can be avoided.

The implemented solution for the plant under consideration will be as shown below:



For the plant under consideration, the total solution will cost around Rs. 200Lacs and the payback will be around 2 years. Improvement in internal power quality and reduction in distribution loss will be additional benefits.

By Narendra Duvedi

ABB Ltd Nashik – MV Switchgear Factory Visit Report

ABB Nashik Factory visit was arranged with great efforts and extensive planning by Hon. Director Mr. S.V. Iyer and Mr. Immanuel P. Sales Director of ABB Ltd which was conducted on 24th May 2019. Altogether, 22 LFM and Patron Members of CEEAMA from Mumbai and Pune attended ABB Nashik Factory. This visit was arranged for Mumbai centric CEEAMA members and ABB has now offered to arrange one more visit for Pune centric members.

ABB Factory is spread over five acres. This facility is equipped with smart manufacturing features, processes and assets, capable of relaying real-time data and web-based integrated traceability system for daily planning and review. There are state of art onsite digital screens at various sections which provide information and thus there is transparency across the factory and its products between all ABB setups on world map.

Initially CEEAMA team was introduced to ABB safety requirements and predefined evacuation processes under any emergency.

CEEAMA team then visited manufacturing unit which includes compact substations, medium voltage products like vacuum interrupters, circuit breakers, ring main units, air insulated switchgear.

The MV Busbar temperature monitoring system introduced by ABB recently and Arc flash sensors for mounting inside MV switchgear chambers was a also a novelty to many members.

Later, CEEAMA team visited their new facility which manufactures outdoor products for substations like live tank vacuum-circuit breaker, auto reclosers and indoor ones like Gas-insulated switchgear. Getting detail information about GIS was a novelty to most of the members. The auto reclosers are used on overhead power distribution systems to detect and interrupt momentary faults and to improve uptime of the system. The gas-insulated switchgear (GIS), which occupy up to 45 percent less space than air insulated switchgears, freeing up space for power distribution and is getting popular across industrial sectors and public use by utilities.

CEEAMA team was satisfied visiting the best in class smart facility manufacturing products acceptable in Indian as well as international market.

"1st Roundtable Meet at Pune - 7th june on KVAH BILLING"

Upcoming Events

- 21st June Roundable meet at Mumbai on KVAH BILLING
- Sep, Dec. March, 2020 - 6 Roundtable meeings on "Importance on Codes and Standards in Electrical Design"
- Jan 2020 CEEAMATECH Conference Mumbai