

Summary of Report on 1st Round table conferences arranged by CEEAMA

Sub: KVAH Billing Challenges and Solutions.

7th June Pune, 21st June Mumbai.

- 1) The technical need of reactive power control over Indian grids to improve and maintain power quality was appreciated by members present.
- 2) The members experience also revealed that the OLD system especially in Maharashtra which was considering LEADING power factor as unity was misused by many consumers causing inappropriate blockage of installed KVA capacity. This was also causing power quality issues at few places.
- 3) Meetings also noted that achieving KVAH = KWH at consumer end will need noticeable investment and consumers for whom energy cost does not form substantial part of indirect expenses, the actions to be taken MAY NOT BE VERY prompt. If this is largely followed, utilities may not achieve desired result from this new change. Utilities may continue with some sort of incentive initially to make this popular.
- 4) It also noted that most of the Industry sectors have not understood technicalities involved in this change.
- 5) Some veteran members expressed that by adopting the change as proposed by MERC during Sept 2018 and during Feb 2019, utilities have started achieving the desired goal by penalizing consumers for excess KVA use. Technically also this system is very close to the aim of KVAH billing. The members felt that under this situation, there was no need to replace tariff meters for recording KVAH. Most of the GCC countries are charging separately for KWH, KVARh Lag and KVARh Lead.
- 6) Meeting noted that for green field projects, hence forth consultants will have to pay special attention to Reactive power compensation and Harmonic mitigation to ensure that initial investment in this area will not become redundant to achieve optimized running energy cost for the project.
- 7) Meeting noted that a systematic audit of reactive power requirement at various distribution levels within existing projects coupled with system simulation can provide cost optimization for required reactive power compensation. This solution can include judicious combination of fixed, APFC and hybrid correction. All these solutions required at LT and MV level are available indigenously.

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Roundtable Meeting on KVAH billing – challenges and solutions.

As per verdict given by MERC during Sept 2018 most of the DISCOMs are going to start KVAH billing in place of KWH billing from 1st April 2020 in Maharashtra. With this Real time POWER FACTOR control is going to be important as never before to optimize Industrial and commercial electrical energy bills.

As per experience of our esteemed members various stake holders are looking at this change from different perspectives. Lack of understanding of the problem and possible solutions is also observed over last 8 months. This prompted CEEAMA to take up this subject and discuss the same with all possible stake holders. A seminar usually puts audience into listener's role, whereas a moderated meeting can get involvement from all the participants. After organizing two such meetings CEEAMA feels that this is a better way to get involvement from all concerned and generates better output.

CEEAMA management expresses sincere thanks to M/S Clariant Power Systems Ltd Pune (who are exclusively involved in offering state of the art solutions for reactive power compensation and harmonic mitigation in association with German collaborator) for sponsoring both these meetings.

Aim of meeting:

- Gather stakeholders related to the subject (Members and Nonmembers) and understand their viewpoints.
- Discuss Expected problems and solutions in implementation.
- Summarize the outcome as Suggestions to CEEAMA Members.
- Identify suggestions regarding policy change required if any.
- Circulate summary to all CEEAMA Members, Other related stakeholders.
- CEEAMA office to take up statutory follow-up required if any.
- Propagate CEEAMA visibility with an aim to increase CEEAMA membership.

Stake holders decided - All attendees were invites.

- Electrical System designers
- Utility representatives
- Electrical contractors
- Reality developers
- Municipal corporation as bulk government consumer
- Consultants from Multinational projects
- Professors and students from Engineering college
- Representatives from Manufacturing sector, Hotel Industry, Hospital Industry:

Attendance:

- Meeting at Pune was not attended by Utility representatives, where as meeting at Mumbai was attended by MSEDCL, TATA POWER and Adani Power.
- Both meetings were well attended by our LFM's.
- Meeting at Pune was attended by contractors. We had reality developers for both meetings.

Pune meeting was attended by representatives from Pimpri – Chinchwad Municipal corporation.
We had representatives from multinational consulting firms in both the meetings,
Pune meeting was attended by college professor and students.
Manufacturing sector was not present at both meetings, while Mumbai meeting was attended by representative from a hospital.

In Maharashtra all utilities were accepting leading power factor as unity for few decades, this change was long awaited. 55% of Indian state utilities have already adopted KVAh billing. Few sample audits conducted by MSEDCL last year revealed that this is measure cause of harmonic amplification and unproductive use of installed KVA. Utilities also realized that on top of this consumers were getting hefty incentives. This realization TRIGGERED present changes

Questions Raised:

- What triggered this change?
- What are benefits to utility companies from this change? – Technical / Commercial
- What are benefits to Consumer from this change?
- Can we Quantify the change in billing with some symbolic consumption figures?
- What are peculiar challenges in optimizing KVAH (Specific reference to Long distance cable capacitance and underloaded Large capacity UPS systems).
- What is technical interdependency between reactor power compensation and Harmonic Levels?
- What is level of awareness in Industry?
- What is level of awareness in Contractors?
- What are expected changes in design strategies to optimize billing for new projects?
- What are available passive solutions?
- What are available electronic solutions?
- What are specific load patterns – where Electronic / Hybrid solutions are recommended?
- Costing of solutions and ROI

Pune Meeting proceedings:

1 Consultants having experience on designing electrical systems for developed countries had opinion that this problem (KWh not close to KVAh) does not exist with their design ... as they always design reactive power compensation systems to keep power factor close to unity and harmonics under control after considering load patterns.

Mr. Aaneet Sathe and Mr. Ranjan Mathur LFM CEEAMA.

2 Consultants involved in designing large commercial complexes who can convince project owners for little extra expense also expressed that users of their designs did not experience much difference since Sept 2018 when utilities changed policies for PF calculations as original designs incorporated necessary precautions.

Mr. Vinayak Vaidya + Representatives of Panchsheel group (A large Reality group from Pune)

Reality developers are not serious about this as they walk away after project is handed over and these costs become part of operating expenses for users.

Mr. Mahadevan from Godrej Properties.

3 Electrical cost in complete project is not even 10% of complete project cost, so little extra can be convinced to project owners if consultants can take lead and put their foot down for long term benefits of project as regards power quality and optimizing running cost.

Mr. Narendra Duvedi. LFM

- 4 Effective study of complete project can suggest standalone capacitors / detuned capacitors getting connected to line when loads are ON. Such arrangement can optimize cost by selecting APFC /RTPFC only for balance variable requirement at PCC.

Mr. Mandar Khadilkar. LFM

Such arrangements can be precisely worked out using electrical system simulation software.

Mr. Narendra Duvedi. LFM

- 5 Contractors having firsthand direct and continuous contact with consumers expressed that there is lack of understanding and awareness among majority consumers today. Utility engineers also need lot of training. Contractors expect change in mindset of end users and also expect investments in technically correct long-term solutions then attending to only immediate needs and breakdowns.

Mr. Milind Naik. Mr. Sameer Deodhar.

- 6 If KVARh (lag + lead) is up to 30% of KWh, actual impact on bill will be close to 5% and if electricity cost is around 5% of total indirect expenses; impact on profitability is negligible. So heat of extra expenses is not felt by finance people and large budgets may not be allocated for required system changes as the paybacks are not attractive. In such case utility may not be able to get advantage as consumers may prefer to remain within contract demand (KVA) and will not spend more to go nearer to unity PF. PF incentive was a direct indicator of performance of maintenance team. With KVAH billing if it is completely abolished, managements may think as above. It is suggested that some incentive should continue till the system adopts itself to new regime.

Mr. Narendra Duvedi LFM

- 7 If most of the consumers decide to bring Kwh close to KVAh; utility will get benefited by releasing large KVA capacity and reduction in technical losses. Issues related to system stability and voltage profile at Grid level can be addressed if wasteful reactive power flow through the system is controlled / optimized. The grid stability is becoming point of concern these days due injection of large uncertain renewable energy – which does not provide for associated reactive energy.

Mr. Vinayak Vaidya. LFM

8 Major challenges

- a) Long HT cables laid between utility meter and 1st transformer. Cable capacitance results into accumulation of large KVARh. Compensation needs shunt reactors. The reason for this issue is insistence from utility to have Meter very close to fencing and requirement of free access to meter room.
- b) Large capacity underloaded UPS system, which have built in Power factor correction also draw leading current from source and meters record RKVAh lead.
- c) Large EHT consumers usually have HT loads with HT capacitors. Due to limitations on HT capacitor rating resolution and limit on number of operations of HT contactors and VCBs, It is not possible to realize close to unity PF in real time. It is impossible without Hybrid systems. Which cost more.

- d) Load imbalance due to concentration of single-phase loads - in such cases it is not possible to get unity PF always without Hybrid solution which may not have acceptable paybacks in such cases. Examples are medium size hotels, hospitals etc. Consumers may install some fixed capacitors and accept the increased electricity bill.
- e) There are lot of technical issues related to LT Three phase metering and Billing. MSEDCL had promised refund of power factor penalties recovered earlier in April, May and June. Consumers are facing difficulties in this. MSEDCL should address these issues immediately by opening special counters in respective offices and involving minimum paperwork.

Mr.Narendra Duvedi LFM and Mr. Yogendra Talware.

9. From ACEDEMIA: There are lot of issues related to KVAh metering as per electrical engineering theory. MSEDCL should declare in clear terms as to how their meters are going to calculate apparent energy. Apparent energy does not get arithmetically added over the network and hence may need different techniques. Unless there is transparency, it is likely that this decision will get challenged in court once implemented. ACEDEMIA can help associations like CEEAMA to take this ahead and define the issues. Engineering colleges are taking efforts to give exposures to such practical issues to their student in colleges.

Dr.Mrs Geetanjali Vaidya (Professor PVG College Pune)

10. Electrical system simulation tools like ETAP can be used while designing the systems to get 95% correct engineering answers for building reactive power control and harmonic mitigation and then 5% correction may be given after commissioning.

Mr. Anil Bhandari – LFM and Hon EX - President CEEAMA

Mumbai Meeting proceedings:

- 11) KVAh billing is proposed to be introduced more for technical reasons like system stability. Utilities will automatically pass on benefit of bill optimization to consumers, who maintain real time power factor close to unity. If consumer is operating bellow CONTRACT DEMAND, then contract demand tariff structure should take of FIXED costs of utility and as such there is no additional benefit to Utility – Utilities will revise KVAH tariff downwards as compared to present KWH tariff.

Mr. Ajit Joglekar Head of Distribution Tata Power.

Mr. Narendra Duvedi expressed that with release of KVA for utilities, they may experience better revenues for installed assets. Utilities will have to install reactor power compensation which will demand investment.

- 12) Concentration of NON-LINEAR LOADS has increased over last two decades – which provide energy saving and host of other benefits to manufacturing units. Current Lag in case of nonlinear loads is not due to Inductive nature of load, but due to delayed electronic switching of current with respect to voltage. Upcoming power electronic technologies are offering inbuilt power factor correction – which leads to over correction during light loads. All this needs to be compensated at consumer end – which initiated KVAH billing.

Mr. Ashutosh Representative from Adani Electric

- 13) The end users use to take advantage of earlier billing system by providing excessive power factor capacitors as utilities were considering monthly average power factor and also leading pf was considered as unity. Some industrial users were keeping Capacitor banks ON during day times without consuming active power and were using active power during nighttime with TOD benefits. On top of this they were availing load factor and power factor incentive of almost 21%. This was causing power quality issues on such feeders and extra losses in MSEDCL system for all the time.

Mr. Sanjay Patil Representative from MSEDCL

- 14) Decision makers from Reality sector are not very much bothered about this issue as they do not face recurring cost of energy. They walk away as soon as projects are handed over to project owners.

Mr. Subash M. from Godrej Properties

- 15) Electrical cost in complete project is not even 10% of complete project cost, so little extra can be convinced to project owners if consultants can take lead and put their foot down for long term benefits for project as regards power quality and optimizing running cost. Utilities can introduce some checks during sanctioning process as mandatory requirement. They can ask project owners to submit calculations for design of reactive power compensation and provisions made to compensate the same in KWH = KVAH mode.

Mr. Narendra Duvedi. LFM and Hon Secretary CEEAMA.

- 16) Consultants having experience on designing electrical systems in India had so far recommended design to keep average power factor close to 0.95 Lag or Lead. However real time PF maintenance was never considered as it was not required.

Mr. A.V. Gadre. LFM

- 17) Members raised concern regarding formula that will be used in kVAH billing as it is difficult to calculate exact kVAR & kW of all 3 phases.

Mr. Deepak Bhise from Tata Power Metering informed that average current is used for calculation by all meters manufactured by reputed make.

Mr. Sanjay Patil from MSEDCL informed that kW and kVAR shall be derived from all the 3 phases and then kVA shall be calculated by formula. MSEDCL had already started to replace Energy meters of existing customers.

- 18) Consultants having experience on designing electrical systems for developed countries had opinion that this problem (KWh not close to KVAh) does not exist with their design ... as they always design reactive power compensation systems to keep power factor close to unity and harmonics under control after considering load patterns.

Mr. Ranjan Mathur. LFM and Ex. President CEEAMA

- 19) Presently utilities are considering (RKvahlag+RKvahlead) figure for calculating billing power factor along with KWh. All these figures are available from existing installed meters and are precise. This method is almost equal to calculating KVAh technically and is serving the purpose – in addition it is allowing some monitoring tool at consumer end. Keeping this in view, it is difficult to digest METER REPLACEMENT initiated by all utilities.

Mr. Ramkishan – EX BARC.

- 20) GCC countries have adopted a tariff method which charges for KWh and RKVARh both with different tariff rates and consumer is billed for the addition. Obviously those who keep (RKvahlag + RKvahlead), to minimum are billed optimally.

Mr. Narendra Duvedi LFM.

- 21) In UK electricity billing system varies in different locations and depends upon available grid capacity and loading thereon. Some Utility operators do not charge for reactive power While some other do not charge for reactive power if the same is not more than 33% of KWh in same period. This % is different in different areas.

Mr. Prashant Kashikar LFM

- 22) Clariant Power Systems Limited Pune had Sponsored both the meetings. Mr. Narang CEO of the company presented their profile. The company works with German collaboration and offers various solutions for reactive power control and harmonic mitigation at HT / LT levels throughout India and abroad. His presentation included product details and few interesting case studies which explained that getting billing power factor as unity with new MSEDCL formula is possible and can offer attractive paybacks. He also explained that variety of passive solutions are available to tackle these issues and optimize investments in electronic – hybrid solutions.

Mr. Narang CEO Clariant Power Systems Limited Pune