

**CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI**

**Petition No. 252/2009
with IA.No. 62/2009**

**Coram: Dr. Pramod Deo, Chairperson
Shri S. Jayaraman, Member
Shri V.S.Verma, Member**

Date of Hearing: 12.1.2010

Date of order: 15.2.2010

In the matter of

Implementation of WAMS project in Western Region and utilization of surplus amount available in Unscheduled Interchange Pool Account Fund.

And in the matter of

Western Regional Load Despatch Centre, Mumbai. **Petitioner**

Vs

1. Western Regional Power Committee, Mumbai
2. Power Grid Corporation of India Ltd., New Delhi **Respondents**

The following were present:

1. Shri A.S.Kushwaha, WRLDC
2. Shri Pushpa Seshadri, WRLDC
3. Shri S.G.Tenpe, WRPC
4. Shri B.Vansi, PGCIL
5. Dr. Sunita Chohan, PGCIL

ORDER

Through this petition, the petitioner, Western Regional Load Despatch Centre, Mumbai has sought approval for utilisation of surplus funds available in UI Pool Account Fund (hereinafter "the fund") towards funding of a Wide Area Management System (WAMS) project based on Phasor Measurements Units (PMU) installations in the Western Regional Grid under sub-clause (b) of clause (1) of regulation 11 of the CERC (Unscheduled Interchange Charges and Related Matters) Regulations, 2009

(the regulations). Through the IA No.62/2009, the petitioner modified its prayer seeking permission for the project under sub-clause (a) of clause (1) of regulation 11 of the regulations.

2. The petitioner has sought approval of the Commission for allocation of funds to the tune of Rs. 10.7669 crore (Rs. 8.7638 crore on Power Grid portion of the project cost + interest of Rs. 2.00316 crore) for re-payment of loan to CSIR and an additional estimated expenditure of Rs. 2.21 crore to make the PMU data available at SLDC/RPC for WAMS project of Western Region for enhancing grid security and safety.

3. Gist of the submissions by the petitioner is as under:

(a) The complexity in grid operation of the Northern, Eastern, North-Eastern, Western (NEW) grid has increased with four regions operating in a synchronised manner, with significant exchange of power among the Regions, at times leading to congestion of the links. Several factors like seasonal loads, effects of weather and special events lead to complex operating scenarios due to change of power flow patterns coupled with significant emergency loadings on the networks. In this scenario, carrying out security assessment and dealing with contingences is an onerous task for the system operator. Certain automatic corrective actions like adaptive islanding, blocking/ de-blocking of distance relay zones under power swings, better visualization through state determination etc. would help in preventing the compounding effects of disturbances in real time.

(b) The new technology of wide area management systems (WAMS) is a step towards intelligent/self healing grid and has been introduced by several utilities across the world. The Western Regional grid is strategically located, wheeling power between various Regions. Introduction of WAMS technology in Western Region would help in ensuring grid security and safety.

- (c) The technology for intelligent monitoring for electric grid using WAMS is quite a new concept and is in the process of being evolved worldwide. In view of this, WAMS projects based on Phasor Measurement Units (PMUs) was proposed to Council of Scientific and Industrial Research (CSIR) under New Millennium India Technology Leader Initiative (NMITLI) which is a step to promote development of indigenous technology. The project has been vetted by the domain experts from IISc Bangalore, CPRI, Bangalore, IIT, Bombay and POWERGRID and approved by CSIR. It has been agreed by CSIR to fund the project through a combination of loan and grant.
- (d) The scope of the project include the following:
- (i) Development of algorithms for strategic placement of PMUs in order to maximize observability and security.
 - (ii) Installation of PMUs at around 25 to 30 locations in Western Regional Grid. The data from PMUs shall be acquired at WRLDC.
 - (iii) Use data from PMUs to arrive at the state of the transmission grid and bring visibility into it's dynamic behavior.
 - (iv) Development of software functions using PMU data.
 - (v) Development of involved analytics to convert the PMU data into knowledge and use the derived knowledge to operate the grid closer to the limits than being done at present.
- (e) The project will deliver specific analytic functions that will use PMU data acquired using the WAM system to provide:
- (i) Dynamic State Estimator/monitor including the development of algorithm of optimal placement of PMUs.
 - (ii) Supervised Zone-3 Blocking functionality to prevent tripping of distance relays on power swings, voltage instability, load encroachment etc.
 - (iii) Emergency control schemes for controlling frequency and voltage instabilities.

- (iv) Schemes for controlling angular instability (ie., out of step protection and smart islanding)

(f) The estimated cost of the project is Rs 16.75 crore which is to be shared by the consortium partners as under:

S. No.	Institute/Industry	Total (in crore)
1.	POWERGRID	8.76
2.	IIT Bombay	2.77 (grant)
3.	Tata Power	1.44
4.	TCS	3.77
	Total	16.75

- (g) Under the NMILTI, the CSIR will provide soft loan to industrial organizations viz POWERGRID, TCS, Tata Power and grant to educational institution i.e. IIT Bombay.
- (h) POWERGRID would obtain a loan of Rs 8.76 crores from CSIR at the rate of 3% interest per annum repayable in ten yearly installments, ranging from Rs. 90.267 lakhs to Rs. 127.701 lakhs after completion of the project. The targeted completion schedule of the project is 3 years.
- (i) The break-up of the proposed expenditure of Rs. 8.76 crores is as under:

S. No.	Particulars	Amount Break up (in Rs. Crore)
1	Phasor Measurement Units (PMUs)	3.24
2	Control Center Hardware, Software & Communication System	3.47
3	Installation, Testing & Commissioning Services	0.93
4.	Miscellaneous including Field Trials, data & Analytics results validation and Performance Evaluation etc.	1.12
	Total	8.76

(j) The roles of partners have been defined in the petition as under:

The role of partners is summarized as follows:

i. POWERGRID:

1. detailed engineering specifications for the PMU based WAM system
2. installation & commissioning of as well as operating the PMU based WAM system

3. provide the communication infrastructure for the PMU based WAM system
 4. continued maintenance of the complete system
 5. post-project closure, generate periodic performance reports of the WAM system
- ii. IIT, Bombay:
1. preparation & finalization of the software requirements & design specifications for the Analytic functions
 2. integration of Analytic functions with the field data
- iii. TCS :
1. overall project management
 2. preparations & finalization of the System Requirements Specifications
 3. development & testing of the Analytic functions
 4. organization of external experts' interactions & site visits
 5. closure report preparation
 6. commercialize & develop IPR
- iv. TPC:
1. detailed engineering specifications for the PMU based WAM system
 2. manage the implementation & maintenance of the WAM system until project closure
 3. participate actively in the development & integration of the Analytic functions

(k) The expected benefits of the project would be as follows:

- (i) PMU data shall be utilized by WRLDC for grid operation as and when the PMUs and associated control center software are commissioned. This shall be possible even without software to be developed by consortium partners. PMUs purchased under this project would become assets of POWERGRID/WRLDC and shall continue to be utilized for better insight in grid operation.
- (ii) The software developed shall be installed at WRLDC who shall have the right to use the software without any additional expenditure on that account.

- (iii) The software proposed to be developed are not presently available commercially but are expected to be in the market after few years. As a grid operator/user if POWERGRID/SEB's deploy this technology using commercially available products, the software product would require customization etc. But in this project, the requirements shall be addressed as part of product development itself.
- (iv) Association with this project will provide exposure to this upcoming technology, and skills thus gained would help in implementing such projects across the grid in other Regions. This project shall also give unique opportunity for collaboration between power sector and professionals from different fields such as Industry, Academia and Research institutions and utilization of the expertise of well known experts in WAMS technology, power system protection and stability of the Grid.
- (v) POWERGRID would become co-owner of this newer technology of Grid monitoring and share the revenue generated through IPR by possible commercial exploitation of the product. As per the proposal, details of IPR sharing for 10 years among partners are as follows:

S. No.	Institute/ Industry	Return Sharing (in %)
1.	POWERGRID	24%
2.	IIT Bombay	24%
3.	Tata Power	23%
4.	TCS	24%
5	CSIR	5%

- (vi) The project development of software would involve R&D, which is to be taken up by TCS and IIT Bombay jointly. POWERGRID's role in this activity is limited to providing feed back as user of Power System Operator and thus would not involve any expenditure. It may be mentioned that any R&D activity involves risk but in this project that risk is not being taken by POWERGRID. The assets created by POWERGRID portion of project cost shall remain with POWERGRID. It is expected that these software for which R&D activity is to be taken up would be available commercially in few years which can then be installed at WRLDC for better utilization of the POWERGRID assets.

l) The breakup of cost for making data available at SLDC/RPC is as follows:

S.No.	Particulars	Amount (Rs. in Crore)
1	Control Center Hardware, Software & Communication System (0.193 X 6)	1.158
2	Installation, Testing & Commissioning Services (0.1187X6)	0.7122
4.	Additional Control centre (WRLDC) system cost (Rs. 3.47 @ 10%)	0.347
	Total	2.21

m) Initially, the project is to have consortium of TCS, IIT, Bombay, Tata Power Company Ltd. and Maharashtra State Electricity Transmission Company Ltd. (MSETCL) as members. As MSETCL opted out of the consortium, M/s. TCS approached PGCIL to join the consortium to which CSIR has agreed.

n) WAMS PMU data shall be made available at SLDCs, RPC and PMU study groups. The additional expenditure to be incurred to make the PMU data available at SLDC/RPC shall be met from the surplus amount available in the UI pool account fund.

o) Since the location of PMUs is based on the optimal PMU placement algorithm, which may lead to unequal allocation of PMUs to each state, it was felt prudent by the petitioner to use common funds for the project. As the project achieves the common objective of grid security and safety, the petitioner found it appropriate to petition the Commission for the use of funds available in the UI pool account.

5. The Petitioner has stated that in the TCC meeting held on 29th May 2009, POWERGRID made a detailed presentation on the programme namely "Intelligent monitoring & Control of the interconnected Power Grid using Wide Area Measurements (WAM)". As this project is of high/ new technology area, the TCC recommended that the technical details etc. of the project may be discussed in a meeting of all the constituents of Western Region at working level and thereafter the

matter should be put up to TCC/ WRPC for further direction. The matter was deliberated in detail and the WRPC endorsed the decision of TCC. The technical details of the project were discussed in the 105th Protection Committee Meeting of WRPC held on 18th June, 2009 at WRPC, Mumbai, in the 106th Protection Committee Meeting held on 1st and 2nd September, 2009 at WRPC, Mumbai and in the Special Meeting held on 17th September, 2009 at WRLDC, Mumbai. During the Special Meeting it was agreed that WAMS PMU data shall also be made available at SLDCs, RPC and PMU study groups. The implementation of WAMS Project in Western Region was discussed in the 11th TCC/WRPC Meeting held on 24th and 25th September, 2009 at Raipur. The WRPC endorsed the technical aspects of the project. In respect of the funding of the project, it was unanimously felt by WRPC that the surplus amount available in Unscheduled interchange Pool Account fund shall be used for repayment of the loan from CSIR for the project.

6. We have given our thoughtful consideration to the proposal put forth by the petitioner. As stated above, the petitioner had initially prayed for funding of the pilot project for installing the PMUs under clause 11(1)(b) of the regulations. Subsequently, the petitioner through the IA modified its prayer seeking approval for funding of the project under clause 11(1) (a) read with Regulation 12 of the regulations.

7. Relevant provisions of the regulations are extracted hereunder for ease of reference:

“11. Application of fund collected through UI

(1) The amount left after final settlement of claims of Unscheduled Interchange charges of the generating station and the beneficiaries shall be utilised, with the prior approval of the Commission, for either or both of the following activities:

(a) Servicing of investment for transmission schemes of strategic importance, Provided that the Central Transmission Utility in consultation with Central Electricity

Authority shall identify the inter-State transmission schemes of strategic importance, not being utilised up to optimum level and seek prior approval of the Commission for servicing of capital costs during the initial years from amount left in the “Unscheduled Interchange Pool Fund” after settlement of claims of Unscheduled Interchange Charges.

Provided further that when utilisation of such transmission line or transmission system included in the transmission schemes of strategic importance reaches the optimum level of utilisation, the cost of such scheme shall be recovered from the users of the scheme in accordance with the methodology specified by the Commission.

(b) Providing ancillary services including but not limited to ‘load generation balancing’ during low grid frequency as identified by the Regional Load Despatch Centre, in accordance with the procedure prepared by it, to ensure grid security and safety:

(2) The amount of fund, allocable for the purposes specified under clause (1), shall be decided by the Commission from time to time.”

8. It is seen from the above that clause 11(1) (a) provides that the fund could be used for servicing of investment on transmission schemes of strategic importance but not being utilised up to the optimum level. CTU shall identify such scheme in consultation with CEA and seek prior approval of the Commission for servicing of capital costs during the initial years. This implies that certain transmission schemes are initially under-utilized and in order to ensure that a high transmission charge is not imposed on the users of such transmission schemes, funds from the UI pool fund can be used for servicing the investment up till the time of its full utilization.

9. Clause 11(1) (b) of the regulations provides for use of the above fund for providing ancillary services not limited to “load generation balancing” during low grid frequency to ensure grid security and safety. The phrase ‘ancillary services’ has not been defined in the regulations. Clause 11(1) (b) leaves the scope of the phrase wide open by giving an inclusive statement that it is ‘not limited to load generation balancing’. Accordingly, we are required to ascertain the scope and content of the phrase ‘ancillary services’. This being a technical term, common dictionary meaning of

the phrase will not be of any help. We are therefore required to rely on the sense in which the phrase is used in the technical literature pertaining to the subject. Based on the study of literature relating to ancillary services for various transmission utilities around the world, we observe that the most common ancillary services are as under:

- (a) Frequency control services (i.e. a balance of load and generation of active power)
- (b) Voltage control services (i.e. a balance of load and generation of reactive power)
- (c) System restart services (i.e. black start)

10. However, the scope of the term is not universally confined to the above only. The phrase, 'ancillary services' in some of the utilities around the world cover more such services. For example, in the case of Western Power, a T&D utility of Western Australia the phrase includes "other services required to support the security and reliability of the power system that are not covered by other ancillary services". Further, in the case of Swiss Grid, ancillary services cover "system coordination and operational measurements to ensure reliable operation of the system".

11. We therefore, feel that since the setting up of PMUs in the Western grid would amount to operational measurement for the purpose of system coordination with ultimate objective of enhancing grid security, it falls within the ambit of ancillary services and would more appropriately be covered under section 11(1)(b) of the said CERC regulations.

12. The Commission is aware that it has already allowed funding of a pilot project on PMU installation in Northern Region under clause 11(1)(b) of the regulations.

Since PMU is a new technology and is of significant importance in power system monitoring for greater utilization of the existing transmission assets, we would not like to stymie the initiative and efforts being made by the WRLDC in association with leading and reputed institutions and organisations. Taking into account the importance of such a pilot project, and in view of the fact that the scheme has already been agreed to by the constituents of the Western Region, we approve the funding of the WAMS project for the Western Region under clause 11(1)(b) of the CERC regulations. However, instead of continuing the liability of paying interest on the loan proposed to be taken by Power Grid from CSIR for 10 years, we direct that a one-time expense of Rs 10.97 crores (Rs. 8.76 crores towards the part cost of the project and Rs. 2.21 crores towards the cost for making data available to constituents & WRPC) from the fund may be used for funding the Power Grid part of the project.

13. The petitioner has stated that PMUs purchased under this project would become assets of Powergrid/WRLDC and would also become co-owner of this new technology and that the revenue generated through Intellectual Property Right (IPR) by commercial exploitation of the project would be shared by 5 partners in the ratio mentioned in para 3(k)(v) above. In view of the fact that the PMUs alongwith hardware, software, communication systems etc. would be used for enhancing the security of grid and optimum utilization of the transmission assets, the assets should be maintained by Powergrid. Accordingly, we direct that Powergrid/WRLDC will become owners of these assets at nominal value in accordance with Accounting Standard-12 issued by the Institute of Chartered Accountants of India. Since the funds for the project are being utilised from the surplus amount available in the UI fund, we further direct that all revenues generated by Powergrid/WRLDC (out of its

share of 24%) through IPR by commercial exploitation of the project be refunded to the fund, after retaining 25% thereof.

14. We direct that the petitioner shall submit a program for commissioning of the project and keep the Commission updated through a monthly progress report indicating the physical progress of the project and expenditure incurred thereon.

15. Petition No.252/2009 alongwith IA No.62/2009 are disposed of in term of the above.

-sd/-
[V. S. Verma]
Member

-sd/-
[S. Jayaraman]
Member

-sd/-
[Dr. Pramod Deo]
Chairperson