



Secretary, Coal calls on Honble CM of Jharkhand

12

CHAPTER

INTERNATIONAL CO-OPERATION

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INDO-EU COLLABORATION

- A proposal titled "Introduction of a new underground mining technology at North-East Coalfields in Assam, India" was put forward to the Indo-EU Working Group on clean coal technology for consideration in 2012. The feasibility study to design a suitable mining technology and operation was awarded to Spanish Consortium led by M/s AITEMIN. M/s AITEMIN has already started their work since December 2013. The members from Spanish Consortium visited Tipong UG mine of NEC, Assam during 10th - 14th Feb 2014. During the visit, they had detailed discussion with concerned CMPDI & NEC authorities and collected necessary data/information regarding the aforesaid work. The Feasibility Study Report, as reported by AITEMIN, has already been submitted to the European Commission on 10th Oct.'14 according to the contract terms and recently, the same has been received through M/s AITEMIN. However, the feasibility study report is yet to be made available to CIL/CMPDI by the European Commission.
- During 8th India-EU CWG meeting held in Chennai from 28th - 29th Nov. 2013, a presentation was made by CMPDI on reclamation practices, land management and utilization of mine voids for storage of mine water which is generally of good quality. Technical know how from EU was sought to bring back the post-mining land use pattern as existing before the mining and utilization of the same for income generation for the local community. A presentation on the requirement of the technical assistance was made by CMD, CMPDI during 9th India-EU CWG meeting held in Germany from 10th - 11th Sept. 2014. However, offer of assistance is still awaited from the EU side.

INDO-US COLLABORATION

The 11th Indo-US CWG meeting was held at Washington DC on 16th Sept.'15, for review of Indo-US collaborative projects. The status of on-going projects under Indo-US CWG was reviewed.

The Status of projects under Indo-US CWG as follows:

- **Development of Coal Preparation Plant Simulator:**
 - o The identified US consultant M/s Sharpe International LLC, USA (SI) was awarded the work in October 2009 for development of a Coal Preparation Plant Simulator. Total work was split into 18 activities out of which 11 activities were completed. Later, SI expressed in October 2013 their inability to complete the work. US representatives were requested to take up the matter with M/s Sharpe for a meaningful conclusion of the project.
 - o US DOE had agreed to contact the software developer and possibly assist with identifying an industry expert to replace the original expert who is unable to complete the project. In the meantime, Mr Manoj Mohanty of Southern Illinois University Carbondale has expressed desire "to complete the project that SI could not complete". As the project was identified under Indo-US Coal Working Group work plan, the proposal of Mr Mohanty is to be routed through US DoE. Mr. Mohanty was requested to submit his proposal through US DoE and MoC, as the project was identified under Indo-US Coal Working Group work plan. Meanwhile, a proposal from Mr. Mohanty was received through US DoE and MoC, Government of India. Comments of CMPDI in this regard has been sent to Advisor (Projects), MoC on 03.10.16 and also to Mr. Smouse Scott of DoE on 27.10.2016 stating the following:

"All the objectives of the project, consisting of three (3) interfacing modules supported by data base management system considered earlier by M/s Sharpe International, may be included in the scope of work".

Submission of proposal in this regard is awaited.

➤ **Cost effective technology for Beneficiation and Recovery of fine coal:**

- o US DOE had identified Virginia Tech University (VTU) for establishing an efficient technique for beneficiation & dewatering of Indian coking coal fines through the testing of coal samples in lab and pilot plants at VTU for identification of state-of-the-art technologies based on which a demonstration plant was to be installed in Sudamdih Washery in BCCL. A joint project proposal was drawn and approved by CIL R&D Board in Dec. 2010. The VTU, however, expressed its inability to sign an international agreement and as such the project could not be started.
- o During the 10th Indo-US CWG meeting in New Delhi on 10.03.2014, US representatives were requested to take up the matter with VTU for meaningful conclusion of the project. US side had advised to contact Dr. Roe Hoan Yoon of Virginia Tech for further discussion in this regard. Subsequently the issue was taken up with Dr. Roe Hoan Yoon to obtain methodology for execution of the assignment.
- o On perusal of the correspondence made with Dr. Yoon, it is observed that VTU in itself is not in a position to associate in the project in accordance with the methodology of the approved project. The issue is being examined for meaningful conclusion. Further, Dr. Yoon vide e-mail dated 08.01.2016 addressed to CMD, CMPDI informed that VTU had developed a HHS process for fine Coal Cleaning and would be submitting a proposal on the same. However, since the project was identified under Indo-US Coal Working Group work plan, Dr. Yoon was requested to route his proposal through US DoE and MoC.
- o Meanwhile, Shri R B Mathur, President, Business Development & Mining Strategy, Virginia Mining Resources Pvt. Ltd. (VMR), submitted vide his email dated 09.05.2016 that VMR is a sister concern of Minerals Refining Company (MRC) which is associated with Dr. Yoon in development of Hydrophobic-Hydrophilic Separation (HHS) Technology. He expressed to undertake a pilot project on HHS Technology under S&T programme in India. He was requested vide email dated 20.05.2016 that a proposal should be sent to this office with details of the HHS Technology, its availability and cost etc. for initiating appropriate action.
- o Subsequently, a proposal titled **"Application of the Hydrophobic-Hydrophilic Separation (HHS) Process for the Beneficiation of Indian Coals"** from M/s MRC was received through US DoE and MoC, Government of India. Comments of CMPDI in this regard has been sent to MoC and also to Mr. Smouse Scott of DoE stating the following:
 - The promotor of HHS technology may be requested to submit a project proposal for **"Design of a POC-Scale Plant"**. The proposal would initially include the setting up of a POC-scale plant at CP laboratory, CMPDI(HQ), Ranchi (in Stage-I) to compare yield of different types of Indian coal in HHS process with that obtained through conventional flotation scheme.
 - Based on the findings of the study carried out in Stage-I, the technology may be implemented in Stage-II for **"Conceptual Design of a Demonstration Plant"**.
- o In the meantime, Shri R.B. Mathur, President (Business Development & Mining Strategy), Virginia Mining Resources Private Ltd. (vide his e-mail dated 21.11.2016) submitted a revised proposal with incorporation of the PROPOSED BUDGET BY TASK, i.e. the total cost of involvement of US side is USD 1,508,312 which has been split into different tasks related to lab scale testing and consultancy services by the project proponent. It can be summarized from the revised proposal that
 - US cost till design of a POC-Scale Plant is USD 923,104 and
 - US cost for the conceptual design of a demonstration plant with retrofit is USD 585,208.

- o On 02.12.2016, CMPDI responded to Dr. Scott Smouse that in addition to the reply made earlier, it may further be noted that the indicated cost as mentioned above is towards laboratory tests on coal samples (to be transported by CMPDI to Virginia Tech laboratory in USA), detailed characterization for pilot design, design of a POC-scale plant, conceptual design of a demonstration plant and developing a flowsheet to Retrofit in existing plant only. It does not include any supply item, not even the cost towards HHS set up required for POC-scale plant, without which the objective of the HHS scheme cannot be accomplished. Reply in this regard is awaited.

➤ **Underground Coal Gasification (UCG):**

- o UCG is one of the key areas under Indo-US collaboration. A project brief for capacity building in the field of UCG development has been sent to MoC for consideration in India-US Coal Working Group Meeting held on 16th Sept. 2015 at Washington, USA for the development of UCG in CIL command area. Initially DoE indicated that UC-CIEE (California Institute for Energy and Environment) can be approached. Thereafter, Lawrence Livermore National Laboratory requested to associate. US DoE agreed to identify US Experts and will inform the Indian side for further course of direct action. Response from DoE is awaited.

➤ **Planning large-capacity opencast mines:**

- o The National Energy Technology Laboratory (NETL), USA has been entrusted with the responsibility for identifying suitable US agencies for cooperation in this area. As advised by US side, M/s Norwest Corporation and M/s Art Sullivan Mine Services were contacted and response from both was received. Subsequently, the subject of "large capacity opencast mine planning, norms and standard, safe designs and dump optimization" was finalized with M/s Norwest Corporation. CMPDI has received the proposal from M/s Norwest Corporation on 29th Sept.'15 that includes cost estimates.

- o After many deliberations on the proposal, it was proposed by CMPDI to route the proposal through Indo-US CWG platform prior to submission at the R&D Nodal Agency (i.e. CMPDI) for funding under CIL. Subsequently, a meeting was held at CMPDI with officials from M/s Norwest Corporation on 20th July 2016 and a decision was taken to formulate the proposal in two phases i.e. Phase-I: Study & Capacity Building, and Phase-II: Implementation in one of the selected OC mines in CCL. CCL has given consent for study and implementation of the proposal in Amrapali OCP vide letter dated 29th Aug. 2016.

- o M/s Norwest Corporation had sent a revised proposal to CMPDI (implementing agency), which was not in line with the requirement of CMPDI. M/s Norwest Corporation has been further requested (vide e-mail dated 21.10.2016) to send the final project proposal incorporating the comments of CMPDI.

- o In the meantime, Mr. Pat Akers, representative of M/s Norwest Corporation, visited CMPDI on 21st December 2016. After detailed discussion on issues raised by CMPDI, Mr. Akers agreed to reframe the scope of work along with associated activities and costs. The revised project proposal is awaited.

➤ **Mine Rehabilitation and Reclamation:**

- o Projects on sustainable mine closure activities and mining wasteland to be utilized as a source of livelihood for local community were proposed to be carried out with the help of US agencies. In this regard, a proposal was received from M/s Norwest Corporation on 15th Dec. 2015.
- o After many deliberations on the proposal, it was proposed by CMPDI to route the proposal through Indo-US CWG platform prior to submission at the R&D Nodal Agency (i.e. CMPDI) for funding under CIL. Subsequently, a meeting was held at CMPDI with officials from M/s Norwest Corporation on 20th July 2016 and a decision was taken to formulate the proposal in two phases i.e. Phase-I: Study & Capacity Building, and Phase-II:

Implementation in one of the selected OC mines in CCL (CCL has given consent for study and implementation of the proposal in Amrapali OCP vide letter dated 29th Aug. 2016). M/s Norwest Corporation prepared the revised draft proposal and sent to CMPDI (Implementing Agency) on 06.09.2016 for necessary scrutiny. The proposal was vetted by CMPDI.

- o In the meantime, CMPDI has incorporated the duly filled Annexures of the proposal and forwarded the same to M/s Norwest Corporation vide email dated 28.11.2016 for incorporating their input in the Annexures before submission of the proposal.
- o India Mr. Pat Akers, representative of M/s Norwest Corporation, had a meeting with CMPDI officials on 20th December 2016 at New Delhi. After detailed discussions on issues raised by CMPDI, Mr. Akers agreed to incorporate the points raised by CMPDI and submit the revised proposal subsequently.

➤ **CMM/CBM Clearing house:**

- o A CMM/CBM Clearing house is functional at CMPDI, Ranchi under the aegis of Ministry of Coal and United States Environmental Protection Agency (US EPA) since 17th November, 2008. It has been established with the financial support of US EPA and Coal India Ltd. on behalf of Ministry of Coal. The website of the clearinghouse is <http://www.cmmclearinghouse.cmpdi.co.in>. USEPA has extended support up to December 2017. Under GMI initiative, a Pre-feasibility study on pre-mine methane drainage feasibility for (a) Sawang UG mine, East Bokaro Coalfield in 2014 and (b) Chinakuri UG mine, Raniganj Coalfield in 2016 has been under taken by the US EPA under the Coalbed Methane Outreach Program (CMOP).
- o A capacity building International Workshop on "Best Practices in Methane Drainage and Use in Coal Mines" is proposed on 9-10th March, 2017 at Ranchi, to be jointly organized by CIL-CMPDI, Global Methane Initiatives (GMI)-US EPA, United Nations European Countries of Energy (UNECE) under aegis of Government of India-MoC.

➤ **Advanced Dry Coal Beneficiation technology**

- o Dry Coal beneficiation is a priority area identified under the Indo-US CWG. Mr. Manoj Mohanty of Southern Illinois University Carbondale submitted a short proposal on Dry Jet Sorting Technologies through US DOE in Aug. 2014, which is based on X-Ray detection and pneumatic sorting technology, similar to ArdeeSort, CMPDI is already trying under R&D Project at Madhuband washery, BCCL. During the last CWG meet held in USA on 16th Sept. 2015 at Washington DC, Mr. Manoj Mohanty contacted to submit a proposal on FGX Dry Coal separator, which he also confirmed through email dated 08.01.2016. The proposal is awaited.

INDO-AUSTRALIA COLLABORATION

CMPDI has a Memorandum of Understanding (MoU) with Commonwealth Scientific and Industrial Research Organisation (CSIRO) signed on 12th June, 2013 for a period of five years for furthering scientific cooperation. A team from CMPDI visited CSIRO, Australia in July 2015 for identifying possible collaborative areas in the field of clean coal technologies.

The status of projects under Indo-Australia collaboration is as follows:

➤ **Capacity Building for CMPDI Lab**

- o CMPDI has established a state of the art Coal Bed Methane (CBM) lab that can carry out parametric studies for resource estimation and reservoir characterization for CBM and Shale gas.
- o In March 2016, S&T Project titled "**Capacity building for extraction of CMM Resource within CIL Command areas**" was approved by Ministry of Coal (MoC) under Govt. of India S&T funding which is jointly implemented by CMPDI and CSIRO. The approved cost of this project is Rs.2392.79 lakh (CSIRO, Australia: Rs. 900.07 lakh, CMPDI: Rs.1492.72 lakh) with three (03) years project duration.
- o In this context, after getting sanction letter of the project and before proceeding further, CSIRO, Australia was insisting for a 'Collaborative

Understanding' document to be signed between CMPDI & CSIRO with 'Dispute Resolution' including 'Referral of Arbitration'. Opinion in this regard was sought by CMPDI from the MoC.

- o MoC, vide letter dated 01.09.2016, opined that "basically it is an S&T project whereas arbitration clause is to accommodate commercial angle. In scientific R&D project, which is process based, presence of arbitration clause would rather be unusual and it cannot be agreed to. In course of the collaboration process, if any dispute crops up, that can be resolved for which a mechanism may be provided. Arbitration being an adjudication process has an element of determination of rights that the R&D project should not provide for. It may be agreed for withdrawal from the collaboration if dispute remains unresolved despite the parties' best efforts.
- o On continued follow-up the Collaborative Understanding for execution of the Project has been signed between CSIRO and CMPDI in December 2016.

➤ **Ventilation Air Methane (VAM)**

- o CMPDI has formulated a project jointly with CSIRO titled "Abatement and utilization of Ventilation Air Methane (VAM) from working underground degree – III coal mine in India". The implementing agencies for the project will be CSIRO and CMPDI with BCCL as a sub-implementing agency. Identified project mine is Moonidih Underground Mine in Jharia coalfield of Bharat Coking Coal Ltd. (BCCL).
- o CIL R&D Board has approved the project in principle with 100% retroactive funding at present and in due course 40% should be reimbursed from National Clean Energy Fund (NCEF) with directive to reduce duration of project from 42 to 30 months in consultation with CSIRO. CSIRO has agreed to reduce the project duration to 36 months.
- o The revised proposal was placed in the 26th Meeting of R&D Board of CIL held on 27.12.2016 and the Board advised to place the proposal before the Apex Committee with certain modification.

➤ **SIMTARS engagement in Mining simulation, Explosion testing and Mining safety training**

- o SIMTARS in collaboration with ISM & CIMFR, Dhanbad has been engaged in mining simulation, explosion testing and mining safety training for Indian coal mines through purchase of mining simulators through an R&D Project funded by CIL.
- o For setting up the Virtual Reality Centre (VRS) at ISM, a meeting was held by Additional Secretary, MHRD with Chairman, CIL on 23.02.2016 and ISM in association with SIMTARS formulated a proposal for setting up VRS at ISM, Dhanbad.
- o SIMTARS agreed to give details about their requirement, financial involvement, component wise details for different modules for training based on some need analysis in Indian scenario, for establishing the Centre for imparting training of trainers etc. SIMTARS proposal included the following:
 - Identification of training requirements
 - Location, site and building work requirements
 - Mine and infrastructure modelling requirements
 - Immersive display system requirements
 - Implementation of logistic requirements
 - Support requirements
- o A space for establishing the Centre has been identified by ISM under the Centre of Excellence in Mining Technology.

➤ **Underground Coal Gasification (UCG)**

- o In the India–Australia Energy Security Dialogues held during 8th - 11th February 2016 at Brisbane, for the development of Underground Coal Gasification (UCG), Australian companies like M/s Carbon Energy Limited was asked to look forward for the opportunities coming up in India in view of the recent UCG policy of Government of India. A meeting via Conferencing (Video/Tele) was organized by Austrade / Delhi on 31st May 2016 where M/s Carbon Energy Ltd shared their

outcome of Key Seam UCG Technology developed at the Bloodwood Creek UCG Trial Project at Queensland in Australia.

- o It was agreed that in view of constitution of Inter-Ministerial Committee (IMC) for the development of UCG blocks, the proponent may approach to the developer to extend technology to them after the awarding of blocks.

➤ **CBM/CMM Development in CIL Command Area**

- o In the India–Australia Energy Security Dialogues held during 8th -11th February 2016 at Brisbane the Australian technology providers and experts from the Australian Universities came forward for participation in developing CBM/CMM areas under the leasehold of CIL in view of new policy of Government of India permitting CIL to explore and exploit CBM/CMM on commercial lines. University of New South Wales (UNSW) has been requested to provide list of experts and technology providers.

➤ **India-Australia Round table Meeting at CIL (HQ), Kolkata**

- o On the request of Australian High Commission, a round table meeting was jointly organized by IIT-ISM and CIL at CIL (HQ), Kolkata on 19.11.2016 to enhance the Indo-Australian collaboration opportunities on coal mining technology, safety, clean-coal technology etc. with the help of Australian Universities and Institutions. The meeting was attended by a number of Australian firms to showcase their technologies and services for possible future collaboration.

INDO-POLAND COLLABORATION

- o A team of 5 members of Polish Experts, 3 members from AGH University, Krakow, Poland & 2 members from GIG, Katowice, Poland visited MoC, CIL, ECL, BCCL and CMPDI along with a team of 4 members from manufacturers of Poland. This visit (4th -7th July) was made by Polish Expert in sequence of visit made by an Indian delegation led by the Secretary (Coal), MoC, Govt. of India to Poland in the month of June, 2016. In view of the above,

a Poland Technology Group (PTG) has been constituted and some of the areas were identified such as Slope stability of overburden dump (using advanced modelling technique), Dry Coal beneficiation, Extraction of remnant coal pillars with surface protection, Pre-drainage of coal mine methane (CMM) and commercial recovery of coal bed methane (CBM) and Control measures for mine fires of Jharia for obtaining the solutions from Polish side.

- o A detailed discussion was held on the identified areas at CMPDI (HQ), Ranchi between Polish Experts and Officials of PTG & other officials of MoC, Coal India Limited/CMPDI, wherein technical co-operation was sought on the identified areas from Polish Experts. Five areas for co-operation short listed are:
 - Slope stability of overburden dumps (using advanced modelling technique),
 - Dry coal beneficiation,
 - Extraction of remnant coal pillars with surface structure protection,
 - Pre-drainage of Coal Mine Methane (CMM) and commercial recovery of coal Bed Methane (CBM) and
 - Control measures for mine fires of Jharia
- o A data dossier on the above identified 5 areas has been prepared by CMPDI with necessary technical help from different subsidiaries of CIL and sent to General Manager (PMD), CIL on 11.10.2016. The matter is being taken up at CIL level.
- o In continuation of the collaborative studies, a team of 4 officers (2 from CMPDI and 1 each from CCL & BCCL) is expected to visit Poland in Jan-Feb. 2017 to enhance skill in the field of Methane extraction and dry coal beneficiation

INDO-JAPAN COLLABORATION

The status of projects under Indo-Japan collaboration are as follows:

➤ **Dry Coal Beneficiation**

- o In response to the e-mail of Advisor (Projects), MoC dated 14.03.2016, Chairman, M/s Nagata Engg. Co. Ltd. vide e-mail dated 19.03.2016, was

requested to send the detail technology including specification and performance data, commercial availability of the separator and cost thereof with other supports (if any). The same is also being followed up from CMPDI's end. The response is awaited.

➤ **Slope Stability Monitoring**

- o In response to the e-mail of Advisor (Projects), MoC, dated 14.03.2016, Dr. Hideki Shimanda of Kyushu University, Japan was requested to share their technical expertise and valued opinion for Indian geo-mining conditions. A reminder has been sent through e-mail on 4th October 2016. Reply is awaited.

➤ **Subsidence Measurement & monitoring using DINSAR Technology**

- o J-Coal delegation led by Mr Masafumi Uehara, Asst. Sect. General, Resource Development Department, J-Coal, Japan visited CMPDI in August 2016 and presented the possible use of DinSAR technology for subsidence monitoring in Jharia Coalfield. The delegation also visited the subsidence sites at BCCL. After the visit, the J-Coal delegation met Director (Tech), CIL at CIL Headquarters, Kolkata and presented the proposal. Director (Tech), CIL opined that since this technology is already in use, there is no R&D component to take up the project in R&D mode and he enquired whether a real time monitoring and subsidence prediction is possible through this technology. Mr. Uehara informed that real time monitoring was at present not possible through this study as the minimum interval for this study can be one and half months, which is the re-visit time of the satellite to acquire the data and moreover they do not have expertise in subsidence prediction presently. Under such circumstances, the project is kept in abeyance.

MOZAMBIQUE

Coal India Africana Limitada (CIAL), a wholly owned subsidiary of CIL was granted prospecting licenses for two coal blocks, covering a total area of 224 sq.km. by the Ministry of Mineral Resources, Government of Mozambique.

Progress of activities related to exploration of the allotted coal blocks in Mozambique are as follows:

- The final Geological Report (GR) of these two allocated coal blocks in Mozambique have been prepared based on the outcome of the exploration programme carried out in the period from 2012 to 2014. Based on the findings of the exploration programme, a total of 170 sq. km. (approx.) where even the topmost coaly horizon was not found upto a depth of 500 m was surrendered. The Government of Mozambique issued prospecting licenses for remaining 54 sq. km. area valid upto 6th August 2019. Based on the Geological Report, mineability study to assess the techno-commercial viability of mining on the 54 sq. km area was also conducted. The mineability study report revealed that the coal blocks are not techno-economically viable for commercial mining.
- The report was considered by the CIL Board and the Board approved complete surrendering of the prospecting licenses. In pursuance of the directives of the CIL Board, application for surrendering of the remaining 54 sq.km of leasehold area for prospecting was submitted to the National Institute of Mines (INAMI), Government of Mozambique. The Government of Mozambique vide their letter dated 16.08.2016 accepted the application for relinquishment of the said licenses. A request has been made to Govt. of Mozambique for allocation of exploration rights for new prospective blocks but no response has been received till date.

SOUTH AFRICA

Pursuant to a G2G dialogue in August 2015 between India & South Africa, it was proposed to explore the possibility of a collaboration between Government owned entities of the two countries represented by Coal India Limited (CIL) and African Exploration Mining & Finance Company (AEMFC). It was proposed to sign a Memorandum of Understanding (MOU) between the two companies for identification, acquisition, exploration, development and operation of coal assets in South Africa. Execution of Memorandum of Understanding (MOU) between CIL and AEMFC has been approved by CIL Board. The same is awaiting reviving of bilateral treaty between Government of India and Government of South Africa in the Mineral Sector including coal, as communicated by Department of Trade & Industry, South African High Commission to India.