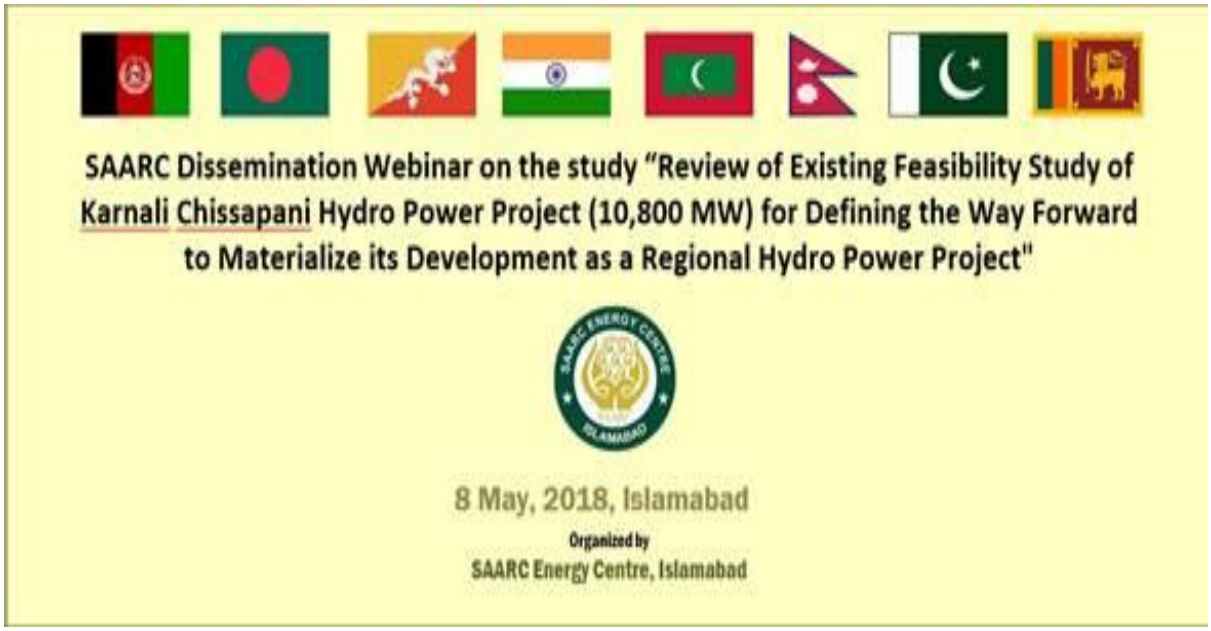
SAARC Energy Centre,
Islamabad

THE REPORT



08 May, 2018

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Introduction

SAARC Energy Centre, Islamabad under its approved programme activity for FY 2018, successfully conducted one-day Dissemination Webinar on "Review of Feasibility Study of Karnali Chissapani Hydro Power Project (10,800 MW) for Defining the Way Forward to Materialize its Development as a Regional Hydro Power Project" on 8th May 2018. The Webinar Agenda is attached at Annexure I.

1. SEC, during FY 2017, had outsourced a study on the "Review of Feasibility Study of Karnali Chissapani Hydro Power Project (10,800 MW) for Defining the Way Forward to Materialize its Development as a Regional Hydro Power Project". The study report reviewed the feasibility studies conducted in the past and most specifically the study carried out in 1989. The study team was also assigned to prepare the terms of reference for hiring the consultant to prepare updated feasibility study to develop Karnali (Chissapani) Hydro Power Project as a Regional Power Project. The aim of conducting this webinar was to disseminate the outcomes, findings and recommendations of the study report among the Member States and developers.

Participation

2. 67 professionals participated in the Webinar that included delegates from Member States, Representatives of Regional and International organizations, Academia and Private Sector. The resource persons for the Webinar from India, Nepal, Pakistan and World Bank

(South Asia) delivered detailed presentations on different aspects. The study team consisting of experts from India and Nepal presented the outcome of study report while the peer reviewer from Pakistan presented "The Strategy and Challenges for development of Karnali Chissapani as a Regional Power Project". In addition, the World Bank (South Asia) gave a presentation on the "Hydropower Development and Regional Integration for Nepal" reflecting the World Bank engagement with such large Hydro Power Projects. Participants list is available at Annexure II while list of resource person and SEC team members is available at Annexure III.

Description

3. The webinar was conducted with the objective to disseminate the finding and recommendations of the study report among the stakeholders for adding value and making consensus on the terms of reference for updating the existing feasibility study. The Webinar had detailed presentations on the study report which included, the Karnali Chissapani Hydro Power Project Overview, Review of Feasibility Study of Himalayan Power Consultants, Dec. 1989, Development of Karnali Chisapani as a Regional Hydro Power Project, ToR, Cost for Hiring Consultants and Way Forward. In addition, the peer reviewer i.e., ELAN Partner (Pvt.) Ltd. from Pakistan presented the "Strategy and Challenges for Development of Karnali Chissapani as a Regional Power Project" while the World Bank representative presented on the "Hydropower Development and Regional Integration for Nepal".

Opening Remarks

4. Dr. Shoaib Ahmad welcomed all the delegates and participants from around the globe for attending the webinar and extending keen interest in the subject program. He also acknowledged the commitment and contribution of resource persons in materializing the conduct of webinar.

5. He started with brief introduction of the SEC and it plans ahead. He informed the participants that SEC conducts programme activities supervised by the Governing Board (GB); the GB comprises representation from all Member States of SAARC region. The programme activities of SEC includes policy-based research studies, knowledge sharing events i.e., workshops, seminars, webinars, trainings, and pilot projects in all fields of Energy.

6. He apprised the participants that the Member States in SAARC region have huge and abundant resources of hydro power potentials which have not been harnessed to their

actual potential. The huge gap in energy demand and supply in South Asia which asks for new initiatives, aggressive policy decisions and investments in environmentally friendly power generation and infrastructure development projects. He informed that SAARC Member States are also to build upon their political will for regional cooperation in power generation and its cross-border trade. Efforts were being made in the past for the development of Karnali project and in step with the past efforts, SEC therefore, proposes development of a large, regional hydro power plants in the South Asia; mainly focusing on the huge hydropower potential in Nepal and Bhutan. He remarked that this webinar is just a first step, and SEC shall in future; continue conducting such knowledge sharing events. At the end, he again thanked all the participants and resource persons for taking out time to attend this webinar.

Technical Proceedings

7. All the presentations delivered during the webinar are available at SEC's website www.saarcenergy.org. A very brief information on the content of the delivered presentations are as follows:

Need to Revisit Karnali Chissapani Feasibility Study

8. Mr. D.N. Raina, study team lead for the study gave presentation on the need to revisit the Karnali Chissapani Feasibility Study. He stressed that if constructed, Karnali could be the second largest hydro power project in the world. SAARC has enormous hydro and solar potential of which only a portion is being harnessed. Three major studies were conducted in the past i.e. Hydro Power Resources in South Asia, SAARC Regional Energy Trade Study and Regional Energy Security for South Asia. Despite a number of recommendation and way forward in the report nothing much has been done in these areas. He highlighted the studies done in the past on Karnali project.

- Karnali (Chisapani) Multipurpose Project would be the largest storage project in Nepal.
- Feasibility Studies carried out in the past were conducted by:

  - Nippon Koei in 1966, (1800 MW).
  - Snowy Mountains Hydroelectric Authority in 1968 (3600MW).
  - Norconsult and Electrowatt in 1976 (3600MW).

Himalayan Power Consultants (HPC) consortium comprising Acres, Canada; Ebasco USA; Shawinigan, Canada; and SNC, Canada (10,800MW), 1989.

He felt that the study conducted earlier needs to be relooked at because there have been numerous changes in various aspects, be it on environmental, hydrology, sedimentation, energy demand, energy price, technology change, geology, up gradation of the capacity etc. Therefore, there is a need to carry out the feasibility study on Karnali Chissapani project to update with the changes that have taken till date.

Karnali Chissapani Hydro Power Project Overview

9. Mr. Lila Nath Bhattarai, study team member broadly gave the overview of the Karnali Chissapani Hydro Power Project. He highlighted the conclusion/recommendation of the past studies.

Conclusions

a) Feasibility study of 1990 concludes that the project configuration defined is technically feasible and economically viable and very attractive.

b) However, the study is unable to confirm environmental feasibility of the project; mainly, because of deficiencies in baseline data and field inventories.

c) Three aspects of feasibility namely technical, economic and socio-environmental are summarized below.

i. Technical Feasibility

a) A multipurpose water resources project on the Karnali River at Chisapani (upstream dam site) is technically feasible.

b) It include a 270-m high gravel-fill dam, an underground powerhouse on the left bank with 18 x 600 MW generating units, a chute spillway on the right bank capable of discharging 19,200 m^3/s, a downstream reregulating facility (which includes an 84-MW power plant and two irrigation outlets).

c) Five 765 kV transmission lines from the Chisapani power plant, and a 220 kV transmission line from the Reregulating facility power plant into Northern India.

d) However, more needs to be known on the geological and hydraulic conditions in the fan area affecting design and cost of the reregulating facility.

e) The study also concludes that the upstream dam site (approximately in the middle of the gorge) is superior due to the more favorable topography and better geological conditions, and overall economy.

ii.Economic Viability

a) The Chisapani project is economically viable and very attractive - without qualification, as the Consultant was aware of no comparable project offering such low generation costs.

b) Based on normally accepted economic evaluation methodology, the gross benefits of the project were estimated at US $16,780 million, compared with the associated economic cost estimated at US $6,808 million.

c) The resulting net economic benefit and B/C ratio was estimated at US $9,972 and 2.46 respectively.

d) For the entire range of sensitivity analyses, and even when examining a worst case scenario, the net economic benefits and the B/C ratio both remain high, thereby confirming the economic viability of the project.

e) Furthermore, early implementation was desirable, as estimated economic opportunities foregone are US $700 million (about US $2 million/d) for each year of delay in implementation.

iii. Socio-environmental Feasibility

a) The study was not able to confirm environmental feasibility of the project through the study programme because of deficiencies in baseline data and field inventories.

b) Additional field studies are required to define an adequate programme of mitigation, compensation, enhancement and management measures.

c) Furthermore, The Consultant concluded that the time of completion of the study (early 1990) was a good time to proceed with the project from the view of the above technical and economic aspects covered in the study.

d) The magnitude of the project net benefits are such that a reasonable proportion assigned to Nepal would provide a major boost to the national economy.

Further, he also highlighted on project description and various project features like main dam, power facilities, reregulating dam, power evacuation, socioeconomic and environmental issues, project implementation, capital cost, economic evaluation and the need for 1989 Feasibility study.

Review of Feasibility Study of Himalaya Power Consultants, Dec 1989

The scopes of the review, including the following were presented as well.

a) Assessment of demand-supply in Nepal and in the regional countries.

b) Updating of hydrological studies (using longer years of river flow and meteorological data now available; refining the hydrological modelling using GIS and remote sensing technologies).

c) Updating of geological, geotechnical and seismic studies/ investigations.

d) Carrying out dam break/ safety studies.

e) Project optimization (including dam height) to match the regional power market, and in light of the prevailing environmental and social, and safety concerns.

f) Design of the structures (dam--RCC, rock fill, or concrete gravity dam, power house-underground v/s surface).

g) Project cost and benefit assessment (irrigation, flood control, navigation, and so on).

h) Assessment of cost of generation.

i) Studies on environmental and social safeguards.

j) Power evacuation related studies.

k) Assessment of institutional, regulatory and legal issues of cross border power trade.

l) Study of the regional power market.

m) Design of the project governance structure for regional development of the project.

n) Implementation and financing modality.

Development of Karnali Chissapani as Regional Hydro Power Project

10. This was presented by Mr. D.N. Raina the study team lead. He highlighted some major information about SAARC nations e.g. energy resource endowments, installed capacity, electricity access, per capita electricity consumption and hydropower potential. Beside these he also highlighted the following on the Karnali project.

a) The project (10,800 MW Capacity) in addition to fully meeting Nepal's demand can meet significant part of the energy demand in SAARC Member States.

b) Joint development by SAARC countries will facilitate early financing of the project.

c) Participating countries will off take 100% energy generated, thereby assuring a steady stream of revenues and timely debt servicing.

d) Spreading of risk through multiple shareholding will help reduce the financing costs.

e) DFIs promoting regional energy cooperation in South Asia will provide financing, technical assistance and support in other forms.

f) "SAARC Framework Agreement on Energy Cooperation (Electricity)" signed by the member states commits them to facilitate electricity flows across SA; obviating the need to obtain the right of way for transmission corridor for Karnali Chisapani HEP.

g) Energy cooperation has the potential to encourage cooperation in other sectors as well, leading to long-lasting peace in South Asia.

h) Following further studies need to be undertaken to fully assess the economic benefits:

i) Power Market Study of SAARC Member States.

j) Willingness and affordability of consumers to pay for power from Karnali Chisapani.

k) Power System Studies to evacuate energy from the project.

l) "Energy Security for South Asia"**,** highlighted the need to harness hydro resources in SA to meet the energy demand in the region.

ToR, Cost for Hiring Consultants and Way Forward

11. These topics were presented by Mr. Mahesh P Acharya from the study team. He highlighted the detail on the Term of Reference and Cost of Hiring the Consultant for the new feasibility study.

I. ToR

a) The main objective of hiring Consultant is to prepare the Project for implementation from the current level of Feasibility Study.

b) The overall objective of the consulting service is to update the Feasibility Studies in considerations of the project as a regional project of multipurpose nature with storage for irrigation, electricity generation, flood mitigations, etc.

c) Conduct environmental and social studies of KCMP in Phase I and carry out Detail Engineering Design along with detailed structural design of the project and preparation of construction drawings and schedules and to prepare tender documents inclusive of tender drawings and construction plan in Phase II.

II. Cost of Hiring Consultant

a) The cost estimate of the consulting assignment is based on the estimate of the person-months of each identified expert for the assignment and the estimated monthly rates, and the related direct cost components.

b) The monthly rates are based on the experience of the experts from recent procurement of consulting services for the two storage projects in Nepal--1200 MW Budhi Gandaki Hydropower Project, and 300 MW Dudh Koshi Hydropower Project.

c) While estimating the person-month inputs, the available information from the contract signed with the Himalayan Power Consultant for the Feasibility Study of the Karnali (Chisapani) Multipurpose project has also been utilized.

d) The monthly rates of the national consultants are based on the suggested billing rates of Society of Consulting, Architectural & Engineering Firms (SCAEF, Nepal).

III. Way Forward

12. The Way Forward for the new feasibility study has been presented by all the three team members. The following points were covered in their presentation.

a) Preparation of request for proposal (RFP) documents for the hiring of international consultants through quality-based selection (QBS) or quality and cost-based selection (QCBS) procedures with Time-Based Contract.

b) The RFP document should be prepared in accordance with the procurement guideline of the funding agency, and the standard RFP document issued by the funding agency. (4 months including review)

c) Short-listing of the consultant firms. This is normally done by issuing a notice inviting the eligible confirms to submit the expressions of interest (EOIs). (2 months)

d) Issuing the RFP documents to the shortlisted consulting firms, and submission of the proposals (2 months)

e) Evaluation of the technical and financial proposals. (4-6 months including decision making and approval)

f) Negotiations and award of the contract (2 months).

g) Setting up of a contract administration office by SEC in Kathmandu.

h) Commencement of consulting assignments.

i) Submission of deliverables by the consultants (36 months from the date of commencement--for Phase I).

j) Review of the updated feasibility report by SEC and participating regional countries.

k) If the project is found feasible to extend the contract of the consultants for Phase II of the assignment.

l) Road show to investors - multilateral, bilateral and private investors, may be with assistance of an excellent merchant banker. (2-4 years)

m) Construction of the Project (9 years).

Hydropower Development and Regional Integration for Nepal

13. Dr. Xiaoping Wang, Energy Program Lead for Nepal, World Bank highlighted on the World Bank Engagement in Hydropower projects in the region. Beside that she also presented on the Electricity Supply situation in Nepal over the past years and future projections, future Capex and investment in Nepal, future opportunities and barrier to attract investors in the Energy Sector. A methodology adopted for Kabeli a Hydropower Debt Financing Structure was explained in detail. She concluded with the Nepal-India Electricity Transmission and Trade Projects for facilitating the regional integration.

Strategy and Challenges for development of Karnali Chissapani as a Regional Power Project

14. Mr. Muhammad Ziauddin, Chief Executive Office and Mr. Mujeeb Ahmed, Hydropower Expert from ELAN Partners (Pvt.) Ltd. presented the strategy and challenges associated with the project. M/s Elan Partners (Pvt.) Ltd was the peer reviewer for the study report conducted for Karnali last year. They explained that the Karnali Chissapani HPP project is considered to be technically viable. It is also envisaged that the updated feasibility will make it more relevant to the present conditions and future needs. Even on the basis of the studies carried out so far one can conclude that it is a feasible project while taking into account the cost of the project and the benefits that can be accrued from it. However, one needs to ensure while formulating the tariff model that the proposed tariff should be within the range of prevailing tariff in the region.

15. Being a 10,800 MW project with a price tag of approximately 20 billion USD the project is not feasible if taken up by the Nepalese Government alone as it neither has the demand for the project capacity nor can finances for the project. It will only be feasible if it is developed while taking into account the regional demand and more appropriately the demand in the neighboring country of India. Regional co-operation has been a dream on a global stage since the start of statehood. It has been in practice in different parts of the world in many aspects bearing fruitful results. However, it success has depended largely on

factors that are driven by politics. Since, the Karnali (Chisapani) Multipurpose Project is a large project needing investments unprecedented in any single infrastructure in South Asia, getting necessary finances would be a challenge. For this purpose, a management consultant firm may be hired to determine the modality of the project development (PPP or as a regional project with investment from the participating countries), and to assess the viable financing structure for the implementation of the project.

Knowledge sharing session

16. The participants of the webinar provided their feedback on the quality and content of the event. In general, they commented that it is a very useful and timely intervention by SEC. All the participants were curious to know about this project for years and SEC's effort to deliver the findings were well appreciated. However, many questions still remain for the delay in materializing the project and way forward. Mr. D.N. Raina team lead from study report indicated that all the countries who want to participate in the development of this project should start having discussion and consultations and find out best ways out for its development as a Regional Hydro Power Project at the earliest.

Conclusions and Recommendations

17. Mr. Umar Muktar, Research Fellow (ETE) read out the recommendations which were gathered during the course of the webinar and from the outcome of the previously conducted study report. They are as follows:

a) In this webinar, we have listened to the authors, peer reviewer of the study report. We also had presentation from the representative of the World Bank to have Bank's views in its engagement with such projects.

b) Energy is the prime mover of almost all economic and technological advancements across the globe and consequently plays a crucial role in the development of human life. Economic growth in South Asia can only be ensured by making energy accessible, affordable and reliable.

c) A holistic view of the energy situation in South Asia reveals that optimal utilization and sharing of indigenous resources of the Region needs to be prioritized since it would ensure energy security for the people of this region and shall maximize the socio-economic benefits for them.

d) Huge gap in energy demand and supply in South Asia asks for new initiatives, aggressive policy decisions and big investments in environmentally friendly power generation and infrastructure development projects.

e) SAARC Member States are also to build upon their political will for regional cooperation in power generation and its cross-border trade. Implementation of Inter-governmental Framework Agreement on Energy can be a right step in this direction.

f) Studies carried-out in the past with the financial assistance of the Asian Development Bank and others, have established the benefits of having regional power projects and power markets in the SAARC region.

g) The aim of this review is to define the terms of reference for hiring of consultants for updating the existing feasibility studies of Karnali Chissapani project with respect to changing conditions.

h) The outcomes of this study also include the way forward to undertake the project as a regional power project benefitting multiple Member States.

i) The objective of this webinar is to disseminate the findings and recommendations of the study report among the stakeholders for adding value, increasing awareness and making consensus on the various aspects highlighted in the study.

Closing of Webinar

18. Mr. Umar Muktar, Research Fellow (ETE) expressed his thanks to all participants and resource persons for joining the webinar. He was acknowledged the cooperation and support extended by all of them in this regard. This depicts their resolve and commitment to the cause of energy and making it available to those who do not have it. He informed all the participants that the presentations will be available on SAARC Energy Centre's website (www.saarcenergy.org). He requested the participants to submit suggestions and comments to SEC for any further improvement. Moreover, they may suggest and submit any topics of their interest to SEC for arranging future webinars. He closed the webinar with thank you note to everyone for attending the Webinar.

Annexure I

SAARC Energy Centre
Islamabad

Final Agenda

Dissemination Webinar on

"Review of Feasibility Study of Karnali Chissapani Hydro Power Project (10,800 MW) for Defining the Way Forward to Materialize its Development as a Regional Hydro Power Project"

Tuesday, 8 May 2018

1000 – 1005	Introduction
1005 – 1015	Opening Remarks *Dr. Shoaib Ahmad, Deputy Director, SAARC Energy Centre*
1015 – 1020	1. Need to revisit Karnali Chisapani Feasibility Study. (By *Mr. D. N Raina)*
1020 – 1040	2. Karnali Chisapani Hydro Power Project Overview. (By *Mr. Lila Nath Bhattarai-Chapter1, 2)*
1040 – 1120	3. Review of Feasibility Study of Himalayan Power Consultants, Dec. 1989 *(By Mr. Lila Nath Bhattarai -Chapter 3)*
1120 – 1240	4. Development of Karnali Chisapani as Regional Hydro Power Project *(By Mr. D N Raina - Chapter 4)*
11:40 -1200	5. ToR, Cost for Hiring Consultants and Way Forward *(By: Mr. Mahesh Acharya-Chapter 5, 6: and By Study Team Chapter-7).*
1200 – 1230	Q & A session
1230 – 1300	**Lunch Break**
1300 – 1315	6. Hydropower Development and Regional Integration for Nepal *(Presenter: Ms. Xiaoping Wang, Senior Energy Specialist, South Asia)*
1315 – 1320	Q & A session
1320 – 1400	7. Strategy and Challenges for development of Karnali Chissapani as a Regional Power Project *(Presenter*: Mr. Muhammad Ziauddin & Mr. Mujeeb Ahmad from *ELAN Partners (Pvt.) Ltd.)*
1400 – 1415	Q & A session
1415 – 1430	Knowledge sharing session
1430 – 1500	Conclusions and Recommendations
1500 – 1510	Closing of Webinar

Annexure II

List of Participants

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Annexure III

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