

**NON - UTILISATION OF SOLAR THERMAL
POWER PLANT**

Ministry of New and Renewable Energy

**PUBLIC ACCOUNTS COMMITTEE
(2022-23)**

SIXTY- FIRST REPORT

SEVENTEENTH LOK SABHA



**LOK SABHA SECRETARIAT
NEW DELHI**

PAC NO. 2290

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PUBLIC ACCOUNTS COMMITTEE **(2022-23)**

(SEVENTEENTH LOK SABHA)

NON - UTILISATION OF SOLAR THERMAL POWER PLANT

Ministry of New and Renewable Energy



Presented to Lok Sabha on:

05-04-2023
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Laid in Rajya Sabha on:

05-04-2023
.....

**LOK SABHA SECRETARIAT
NEW DELHI**

April, 2023 /Chaitra, 1945 (Saka)

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COMPOSITION OF THE PUBLIC ACCOUNTS COMMITTEE
(2022-23)

Shri Adhir Ranjan Chowdhury - Chairperson

MEMBERS

LOK SABHA

2. Shri Subhash Chandra Baheria
3. Shri Bhartruhari Mahtab
4. Shri Jagdambika Pal
5. Shri Vishnu Dayal Ram
6. Shri Pratap Chandra Sarangi
7. Shri Rahul Ramesh Shewale
8. Shri Gowdar Mallikarjunappa Siddeshwara
9. Shri Brijendra Singh
10. Shri Rajiv Ranjan Singh alias Lalan Singh
11. Dr. Satya Pal Singh
12. Shri Jayant Sinha
13. Shri Balashowry Vallabbhaneni
14. Shri Ram Kripal Yadav
15. Shri Shyam Singh Yadav

RAJYA SABHA

16. Shri Shaktisinh Gohil
17. Shri Bhubaneswar Kalita
18. Dr. Amar Patnaik
19. Dr. C. M. Ramesh
20. Shri V. Vijayasai Reddy*
21. Dr. M Thambidurai
22. Dr. Sudhanshu Trivedi

SECRETARIAT

1. Shri T. G. Chandrasekhar - Additional Secretary
2. Shri Tirthankar Das - Director
3. Smt. Anju Kukreja - Deputy Secretary

* Shri V. Vijayasai Reddy elected w.e.f. 13.12.2022.

**COMPOSITION OF SUB-COMMITTEE-I (CIVIL) OF THE
PUBLIC ACCOUNTS COMMITTEE (2021-22)**

Chairperson - **Shri Adhir Ranjan Chowdhury**

Convenor - **Shri Shaktisinh Gohil**

Members - Shri T. R. Baalu
Shri Sudheer Gupta
Shri Pratap Chandra Sarangi
Shri Rahul Ramesh Shewale

(v)

INTRODUCTION

I, the Chairperson, Public Accounts Committee (2022-23) having been authorised by the Committee, do present this 61st Report (Seventeenth Lok Sabha) on "**Non-utilization of Solar Thermal Power Plant**".

2. The Sub-committee I (Civil) was constituted by the Public Accounts Committee (2021-22) (17th Lok Sabha) to examine the subject "**Non-utilization of Solar Thermal Power Plant**" in detail. The Sub-committee I took up the subject for detailed examination and report thereon.

3. The Sub-committee I (Civil) of Public Accounts Committee (2021-22) took oral evidence of the representatives of the Ministry of New and Renewable Energy on "**Non-utilization of Solar Thermal Power Plant**" and examined the subject at their sittings held on 21.02.2022 & 03.03.2022. Due to paucity of time, the draft Report on the subject could not be finalized. Thereafter, the subject was carried forward to next PAC (2022-23). The Main Committee further took the oral evidence of the representatives of the Ministry concerned on 03.08.2022. The draft Report was considered and adopted by the Public Accounts Committee (2022-23) during their sitting held on 28 March 2023. The Minutes of the Sittings of the Sub-committee/Main Committee form Appendices to the Report.

4. For facility of reference and convenience, the Observations and Recommendations of the Committee have been printed in **bold** and form Part- II of the Report.

5. The Committee thank Sub-committee I (Civil) for taking oral evidences of the concerned Ministry and obtaining information on the subject.

6. The Committee would like to express their thanks to the representatives of the Ministry of New and Renewable Energy for the cooperation extended by them in furnishing the requisite information to the Committee.

6. The Committee also place on record their appreciation of the assistance rendered to them in the matter by the Committee Secretariat and by the Office of the Comptroller and Auditor General of India.

NEW DELHI;
03 March, 2023
13 Chaitra, 1945 (Saka)

ADHIR RANJAN CHOWDHURY
Chairperson,
Public Accounts Committee

REPORT

PART I

I INTRODUCTION

The Ministry of New and Renewable Energy (MNRE) sanctioned (September 2009) a Research and Development (R&D) project titled 'Development of a Megawatt-scale Solar Thermal Power Testing, Simulation and Research Facility' to Indian Institute of Technology, Bombay. The project was expected to facilitate development of 1 MWe grid interactive solar thermal power plant. National Institute of Solar Energy (NISE) was required to enter into a Power Purchase Agreement (PPA) with Dakshin Haryana Bijli Vitran Nigam (DHBVN) for sale of solar power. The project was sanctioned for a duration of five years i.e. up to September 2014 and was further extended upto March 2015. An amount of ₹46.72 crore had been released by MNRE for the project. The plant was formally handed over by IIT to NISE with effect from 7 March 2015 and had generated 9Mwh of electricity up to 31 August 2015.

2. The Plant was operated up to August 2015 by human resources employed on contract basis by NISE. Thereafter, the contract was not extended for want of funds. As a result, the plant stopped functioning from September 2015. As of February 2016, a total expenditure of ₹ 46.36 crore had been incurred on the project. IIT refunded (June 2016) the unspent balance (with interest) amounting to ₹37.10 lakh to MNRE. The project completion report submitted by IIT was reviewed (June 2016) by the R&D Project Appraisal Committee (RDPAC) of MNRE. The committee expressed satisfaction with the progress and achievement of the project but observed that the plant was not functional and that it should be handed over to NISE in operational condition. The committee also suggested that PIs should present the performance of the plant over an extended period of time and give their recommendations to facilitate the design of future solar thermal power plants. The committee concluded that the project completion report could not be accepted till it was revised based on its observations and till the plant was formally handed over to NISE in proper running condition. The observations of the Committee were communicated to IIT in July 2017. However, no further action was taken on the project and the plant remained non-functional.

3. This Report is based on Para 9.1 of the C&AG Report No. 2 of 2018 on the subject "Non-utilisation of Solar Thermal Power Plant".

4. The Public Accounts Committee (2021-22) selected the subject for detailed examination and Report. For this purpose a Sub-committee was constituted to examine the subject in detail. The Sub-committee obtained background materials and written replies from the MNRE. They had a briefing by the officers of the C&AG of India on the subject on 21st February, 2022. The Sub-Committee also took oral evidence of the representatives of MNRE on 3rd March, 2022. Due to paucity of time, Report on the subject was not drafted and the subject was carried forward to PAC (2022-23). The main Committee (2022-23) again took the oral evidence of the representatives of MNRE on 3rd August, 2022 on the said subject. Based on these oral and written depositions by MNRE, the main Committee further examined the subject in detail.

Audit findings

5. Audit has brought the following shortcomings in examination of this subject:

- (i) MNRE did not take any action to develop a dedicated workforce needed to run the plant on a continuous basis though the National Advisory Council constituted for the project in its meeting held in May 2011 had discussed the need for a dedicated workforce for running the plant once it was commissioned.
- (ii) The plant was taken over from IIT by MNRE before getting the project performance appraised by the RDPAC and without ensuring availability of dedicated workforce for its operation.
- (iii) No action could be initiated for sale of 1 MWe solar power planned to be generated under the project.

Development of dedicated workforce to run the plant

6. On being asked about the action taken by the MNRE to develop a dedicated workforce to run the Solar Thermal Power Plant on a continuous basis as suggested by the National Advisory Council in May 2011, the Ministry in their written reply stated as under:

(i) The National Advisory Council constituted by IIT Bombay in its second meeting held on 5th May, 2011 in Solar Energy Centre (SEC), suggested that a dedicated workforce need to be developed under SEC for running of the plant once it is commissioned and the project period is completed. However, in the initial sanction, there was no provision of the workforce after completion of the project. During the implementation of the project, the project team consisted of the 12 faculty members from different departments of IIT Bombay and 25 nos. of project staff contributed to the project with a total expenditure of ₹ 3.27 crore which was incurred by IIT Bombay out of the funds made available by MNRE in the project cost.

(ii) Under the project, IIT Bombay had developed a dedicated workforce till the date of completion and was meeting the expenses from the project cost. After handing over to NISE, NISE retained the workforce and operated the plant till August 2015 using its own budget. But, the arrangement was not sustainable as NISE was newly formed and had very limited funds.

(iii) NISE made efforts to run the plant through a third party for which it invited the EOI titled 'For running solar thermal power plant set up at NISE' in August 2015. However, due to poor response from a single party with unreasonable tariff of ₹ 39/kWh, the work could not be awarded.

(iv) Further, NISE in August 2018, floated an EoI entitled "Replacement of identified worn out/defective components/sub-systems; debugging and operationalization of software and; Supply of technical manpower having necessary expertise for operation and maintenance and Preventive Maintenances for 1 MWe Solar Thermal Power Plant Installed at NISE, Gurugram." But, no proper response was received.

(v) Thus, due to the higher cost of revival of the plant as well as higher recurring operation and maintenance cost beside the technical reasons, the sustainable operation of the plant is not possible."

Taking over of Plant from IIT, Bombay before getting the performance appraised by the RD PAC

7. When asked about the reasons for taking over the plant from IIT, Bombay by MNRE before Performance appraised by the Research and Development Sectoral Project Appraisal Committee (RDPAC), the Ministry explained as under:

"The project was appraised by the R&D Sectoral Project Appraisal Committee on Solar Thermal on 07.08.2013. The RDPAC noted/observed the following:

- "All major components of the power plant have been installed and tested for its functionality. This includes testing of turbine using steam generated from the solar field comprised of parabolic trough solar collectors and linear Fresnel reflectors. Power evacuation from the solar plant would start as soon as the weather conditions become favorable.

- An oil test rig has been installed and commissioned at project site for evaluation of thermal performance of concentrators. Presently, trial runs are being performed on a paraboloid dish called Arun supplied by Clique Developments Pvt. Ltd., Mumbai.

- A flux mapping system has been designed for measuring the concentrated flux obtained from linear focusing solar collectors. This is a novel low cost technique and can be effective in laboratory environment as well as outdoor conditions. A Patent has been filed on this system.

- The preliminary version of the simulator was released in July 2011, and subsequently its Evaluation Version v 1.0 was released in November-2012

The committee observed that most of the project goal have been achieved. The project has resulted in facility which offers unique opportunity to gain a lot of experience in operation, vendor management and generating performance data. However, future of facility in terms of assigning responsibility for its operation and maintenance after the project period ends need quick address by the Ministry. In terms of utilization, the facility has high potential for research work aiming at cost effective solar thermal power generation, manpower training and component testing. The Committee suggested Ministry to take view in the matter."

Since, NISE was the one of the consortium partners for the project, the R&D project had been completed with extension, and the project was in NISE campus, accordingly, the MNRE found NISE as responsible agency for its operation and maintenance after the end of project period. For operation and maintenance and smooth transition of project, the Ministry extended the project for period of six months for transferring the works from IIT Bombay to NISE team. It was taken over by NISE on 7th March 2015 from IIT Bombay."

8. In response to the aforesaid reply of MNRE, Audit in their vetting comments stated as under:

"The reply of MNRE indicate that RDPAC appraised the project in August 2013. The project duration ended in March 2015. As such, the Solar Thermal Power Plant was taken over from IIT, Bombay by MNRE/NISE before getting the project performance appraised by the RDPAC."

9. The MNRE on the aforesaid Audit comments replied as follows:

"The plant was handed over to NISE after the review and recommendation of RDPAC in meeting held on August 2013 in which the Committee observed that most of the project goals had been achieved. The project had resulted in facility which offers unique opportunity to gain a lot of experience in operation, vendor management and generating performance data. Since, NISE was one of the consortium partners for the project, the R&D project had been completed with extension, and the project was in NISE campus, accordingly, the MNRE found NISE as responsible agency for its operation and maintenance after the end of project period."

Action for Sale of 1MWe Solar Power under the Project

10. Further, on the issue of non-initiation of action for sale of 1 MWe Solar Power planned to be generated under the project, the MNRE in their reply have stated as under:

"NISE initiated actions with and approached Dakshin Haryana Bijli Vitaran Nigam (DHBVN) for facilitating the feeding of the power to the grid. This led to laying of a dedicated 11 kV, HT cable line from Secor-56 Gurugram to NISE campus for power evacuation from the Plant in May 2013. A meeting was taken by MNRE with Managing Director, Dakshin Haryana Bijlee Vitran Nigam (DHBVN) on 12th November 2012 regarding issues related to connectivity of this 1 MW solar thermal power plant. It was agreed by CMD, DHBVN that connectivity would be provided to the plant with 11 KV line which has already been laid and in the meantime, PPA would be formalized based on decision on tariff. CMD also indicated that the minimum tariff of batch II for PV projects, which is ₹ 7.49 per unit, may be acceptable to DHBVN. It was stated that same would be confirmed after necessary processing within DHBVN. On the MNRE side, it was mentioned that the acceptance on the proposed tariff of ₹ 7.49 per unit would be considered based on the assessment of annual estimated revenue and the requirement of funds for annual maintenance of the plant. MNRE will further consider the offer of DHBVN and get back. Thereafter, once the Plant was grid synchronized, NISE made efforts for signing of PPA for power evacuation with Haryana Power Purchase Centre at the rate of ₹ 6.44 per kWh as per the provision made for Solar photovoltaic power in April 2015. However, no formal response was received."

11. In their vetting comments of aforesaid reply of MNRE, Audit observed that the reply is silent about the action taken by NISE with Haryana Power Purchase Centre after April, 2015.

12. In response to the aforesaid vetting comments, the MNRE in their written replies submitted as under:

"NISE made efforts in signing of PPA for power evacuation with Haryana Power Purchase Centre at the rate of ₹ 6.44 per kWh as per the provision made for Solar photovoltaic power in April 2015. However, no formal response was received.

While NISE was operating the Plant from March 2015 to August 2015, it was found that the power output was much lower than the designed value of 1.0 MWe and operating the plant was uneconomical. As a result, the plant became non-operational from 1st September, 2015. Hence, thereafter no action was initiated by NISE with Haryana Power Purchase Centre for signing of PPA."

Delay in making the Solar Thermal Power Plant functional

13. On being asked for the reasons for such a long delay in making the Solar Thermal Power Plant functional, the MNRE has explained as under:

"After sanction on 07th September 2009, the project was under execution till September 2014, which was extended till 6th March 2015. The IIT Bombay operated the plant till 6th March 2015. Thereafter, it was handed over to NISE w.e.f., 7th March 2015. The plant was operated by human resource employed on contract basis by NISE up to 31st August 2015. During that time, it was concluded that plant could be run on trial basis by NISE. Further, in September 2017, NISE engaged a team to revive the plant and

the efforts resulted in making the plant partially operational during the first week of March in 2018. NISE was able to make the collectors to track the sun manually and some amount of steam was generated. However, sustained operation of the plant could not be achieved.”

14. In response to the aforesaid reply of the MNRE, Audit in their vetting comments stated that the reply is silent about the action taken by MNRE to timely deploy a dedicated workforce. As a result, the plant became non-operational from 1stSeptember, 2015.

15. In regard to the abovesaid Audit comments, reply of MNRE is given as under:

“MNRE identified NISE as responsible agency for operation & maintenance of the plant for R&D purpose. The Ministry extended the project for period of six months transferring the works from IIT Bombay to NISE team. It was taken over by NISE on 7th March, 2015 from IIT Bombay. NISE operated the Plant till August 2015 by retaining the associated workforce using NISE’s own budget. During this period, NISE found that the power output was much lower than the designed value of 1.0 MWe and operating the Plant was technically not feasible.”

Action initiated by MNRE/NISE/IIT, Bombay to make the plant functional

16. When asked about the action taken by the MNRE/NISE/IIT, Bombay to make the plant functional, the Ministry in their reply stated as under:

i.The project was handed over to NISE by IIT Bombay on 7thMarch, 2015, and since then NISE managed operation and maintenance of the plant. However, the plant became nonoperational from 1stSeptember 2015 on account of administrative, financial and technical reasons.

ii.NISE initiated the process for signing of PPA with HPPC in March 2014. Though, the PPA could not be signed for this plant.

iii.The facility was used for training and demonstration purpose since its commissioning. Further, in September 2017, NISE engaged a team to revive the plant and the efforts resulted in making the plant operational for couple of days in first week of March in 2018. NISE was able to make the collectors to track the sun manually and some amount of steam was generated. However, sustained operation of the plant could not be achieved.

iv.NISE took initiative to make the power plant operational and approached the MNRE for seeking funds. NISE also facilitated a study which was conducted through consultants appointed by the United Nations Industrial Development Organization (UNIDO).

v.A detailed study was conducted during January to March, 2019 through a team of consultants (one from Germany and another from India) for assessing the technical problems associated with solar field, power block, other major accessories and software for reviving the operation of the plant and to estimate requirement of funds for this purpose. A detailed report titled 'Refurbishment of the 1.0 MWe Concentrating Solar Power Plant at the NISE' was prepared and was presented in the MNRE in the last week of March, 2019.

vi.The report indicates about the various components, parts/systems to be

overhauled/repaired/replaced along with financial implications for making the plant operational. The detailed list of the spares is also given in the report. The cost of renovation of the power plant was estimated to about ₹3.22 crore and annual operation and maintenance cost was estimated to about ₹ 74.20 lakh. NISE submitted the report to the MNRE for consideration.

vii. The Governing Council of NISE in 8th meeting held on 20.06.2019, recommended that efforts should be made to make the plant functional and possibly on economical basis for recovering the cost of O&M through electricity generation by the project."

17. In their vetting comments, Audit stated that the reply did not indicate the action taken by MNRE/NISE/IIT during the two-year period from 1st September, 2015 to September, 2017.

18. In their reply to abovesaid Audit comments, the MNRE submitted as under:

"During 2015 to 2017, plant was non-operational on account of administrative, financial and technical reasons. The facility used for training and demonstration purpose since its commissioning. NISE made efforts to run the plant through a third party for which it invited the EOI titled 'For running solar thermal power plant set up at NISE' in August 2015. However, due to poor response from a single party with unreasonable tariff of ₹ 39 KWh, the work could not be awarded."

Status of operation of the Solar Thermal Power Plant

19. Regarding the current status of operation of the Solar Thermal Power Plant, the Ministry have replied as under:

"In the initial sanction, there was no provision to run the plant on commercial basis. In RDPAC 2017 it was also mentioned by IIT Bombay that the facility may be treated as a Research and training facility and not as a commercial power plant. At present plant is not in operation. However, the facility in its present condition is being utilized for demonstration and training purpose for the National and International training programmes being organized by NISE, besides for the visitors and students. Till 2019-20, NISE organized 134 National and 36 International training programmes in the campus in which the facility was utilized for training and demonstration purpose. NISE generates revenue out of these trainings."

Midway corrections by MNRE/NISE to improve the efficiency of the Plant to develop a National Training facility

(A) Action taken by the NISE to make the Plant functional.

20. The Ministry in their reply to actions taken by the NISE to make the plant functional have stated as under:

- i. "NISE has initiated number of steps for revival of plant. Mr. Nehra, who was engaged as consultant on behalf of IIT Bombay for installations and commissioning of this plant at NISE and gave action plan for renovation. In September 2017, NISE engaged a team of six technical experts to revive the Plant. The team worked for about 7 months and made efforts in overhauling/servicing of the major equipment/ components of power plant such as PTC solar field,

compressor, boiler, cooling tower, RO system, DM plant, turbine, alternator, HTF system, heat exchangers and other feed pumps etc. Senior manager of M/s Godawari Power Limited was invited to visit NISE to make action plan for revival of PTC filed. Thereafter, their engineers visited NISE and overhauled the PTC field. M/s KG Design (manufactures of LFR) visited NISE for overhauling of LFR field.

- ii. The servicing and overhauling of turbine was also done but pressure of 40 bar @ 325 °C superheated steam could not be achieved due to low available radiation, dust and pollutions and only steam was produced. Many parts were found damaged including automation system and the team proposed the major repair/replacement of parts involving high cost of investment.
- iii. The efforts resulted in making the plant operational partially during the first week of March in 2018. NISE was able to make the collectors to track the sun manually and some amount of steam was generated. However, sustained operation of the plant could not be achieved due to technical and financial reasons, as it required extensive repairs, replacement and overhauling of different sub-systems.
- iv. For carrying out the rectification work, NISE spent a total amount of ₹ 37.17 Lakh including ₹17.84 Lakh towards manpower and ₹19.33 Lakh towards spare parts in addition to the project cost from its own budget during October 2017 to April 2018.
- v. A detailed study was conducted during January to March, 2019 through a team of consultants (one from Germany and another from India) for assessing the technical problems associated with solar field, power block, other major accessories and software for reviving the operation of the plant and to estimate requirement of funds for this purpose. A detailed report titled 'Refurbishment of the 1.0 MWe Concentrating Solar Power Plant at the NISE' was prepared and was presented in the MNRE in the last week of March, 2019.
- vi. NISE conducts trainings for National and International participants in the solar photovoltaics, solar thermal and hydrogen energy. The facility, in its present condition, is being used for various National and International training programmes organised by NISE to showcase PTC and LFR based solar thermal power plant technology."

(B) Use of Plant for training purpose

21. Regarding use of National Training Facility, MNRE in their written replies as under:

"The facility in its present condition is being utilized for demonstration and training purpose for the National and International training programmes being organized by NISE, besides for the visitors and students. Till 2019-20, NISE, organized 134 National and 36 International training programmes in the campus in which the facility was utilized for training and demonstration purpose. NISE generates revenue out of these trainings. Currently online trainings are being organized and it is expected that trainings in physical mode will be resumed shortly."

(C) Training courses being provided in National Training Facility

22. On being asked about the training courses that are being provided in National Training facility, MNRE in their written replies stated as under:

"NISE conducts various trainings for National and International participants in the solar photovoltaics, solar thermal and hydrogen energy. The facility, in its present condition, is being used for various National and International training programmes organised by NISE to showcase PTC and LFR based solar thermal power plant technology. During the last year FY 2019-20, 14 National training programmes were organized by NISE namely start-up Indian Skill Development program, RE training Program for Armed Forces, Training Program for Industry & PSU/ONGC Military Engineering Service (MES)\Power Finance Corporation Ltd(PFC), 6 months Advance Solar Professional Course. Seven International Training Programs i.e. International Training Programme on Solar Technologies and Applications, ITEC Programme in Solar Energy for Master Trainers from ISA Member Countries, Renewable Energy Capacity building program for India Africa Forum Summit III for mid carrier professionals were organized in NISE campus in which the facility was utilized for training and demonstration purpose."

(D) Persons benefited from the Training Facility

23. The Committee sought to know about the number of institutions/organisations and persons that have been trained or benefitted from the Training facility so far, the MNRE stated as under:

"The facility in its present condition is being utilized for demonstration and training purpose for the National and International training programmes being organized by NISE, besides for the visitors and students. Till 2019-20, NISE, organized 134 National and 36 International training programmes in the campus in which the participants were from academic institution, defense organization, public sector under takings, industry, State Governments, Utilities etc. The international participants were mainly from Africa, Latin America and South East Asian Countries. During the FY 2019-20, 514 number of participants in 14 National training programmes and 213 participants in 7 International training programmes organized in the NISE campus participated in the trainings."

(E) Establishing of three more Solar Thermal Power Plants

24. The Committee desired to know that as to how the learning from this project could encourage development of other Solar Thermal power Plants. In response, the MNRE in their written replies submitted as under:

"This Project demonstrated the technology for large scale solar thermal power generation for the first time in the country. We believe that this inspired the developers, who came forward to install the solar thermal power plant under National Solar Mission and following 3 solar thermal power plants with a total capacity of 225 MW were established in India:

- i. 125 MW plant (LFR technology) in Dhursar, Rajasthan completed in 2014;
- ii. 50 MW plant (PTC technology) in Nokh Village, Rajasthan completed in 2013;
- iii. 50 MW plant (PTC technology) in Anantpur, AP completed in 2014."

25. Further, when asked if, solar thermal power generation technology is not able to take off for economic reasons, how 3 more solar thermal power plants with a total capacity of 225 MW were established and are now economically viable. In

response, the MNRE in their written replies submitted as under:

"The following 3 solar thermal power plants operating in India have the advantages of three main factors i.e. higher capacity of 50 MW and above, locations with good solar radiation throughout the year and the higher tariffs from ₹ 11.31/kWh to ₹ 12.20/kWh at which the PPA was signed:

Sl. No.	Solar Thermal Power Plant	Technology	Location	Installed Capacity	PPA Signed Tariff (Rs./kWh)
1.	Godawari Solar Project	Parabolic Trough	Nokh, Pokaran, Rajasthan	50 MW	12.20
2.	Megha Solar	Parabolic Trough	Anantapur, Andhra Pradesh	50 MW	11.31
3.	Reliance Power's concentrated solar power project	Linera Fresnel Reflector	Dhursar, Pokaran, Rajasthan	125 MW	11.97

At present Solar thermal power plants are not competitive & viable for power generation as compared to the low tariff offered by solar PV power plant of about ₹ 2.00/kWh.

(F) Steps taken for revival of Plant by IIT Jodhpur

26. During evidence on the subject, representative of MNRE apprised the Committee that IIT Jodhpur has taken any initiative for revival/relocation of the non-functional Solar Plant situated at NISE. On being asked about the current status of this matter, MNRE in their written replies submitted as under:

"IIT Jodhpur has expressed interest to shift the facility created under this 1 MW project from NISE to IIT Jodhpur for further research purpose. The detail proposal is under submission by IIT Jodhpur. The proposal will be considered by the Ministry on Merit."

27. Apprising the Committee about the details of the project decided to be taken over by IIT Jodhpur, representative of the MNRE deposed before the Committee that IIT Jodhpur intend to make a consortium of one Megawatt by joining the facility of this solar Thermal Power Plant and the Photo Voltaic Power Plant for which PPA of ₹ eight has been decided with an Electricity Purchasing company of Jodhpur.

(E) Steps taken towards achieving the target of 500 GW energy by 2030

28. The Hon'ble Prime Minister of India has laid down a goal of achieving 500 GW energy capacity from non-fossil fuel sources by 2030 in Glasgow. The Committee sought to know about the details of the process and procedures to be undertaken for achievement of this target. Apprising the Committee about these

details, the MNRE in their written replies submitted as follows:

"So far, a cumulative renewable power capacity, including large hydro of 162 GW has been installed and 64.55 GW Renewable Power capacity is under implementation against the target goal of 500 GW of non-fossil fuel capacity in the country by 2030. Hence a balance of about 273.45 GW capacity from non-fossil fuels needs to be achieved by 2030.

Several means, process and procedures and actions are proposed for energy transition to achieve the ambitious renewable energy target of 500 Gigawatt of energy from the non-fossil fuel sources by the year 2030 as given below:

- (a) Permitting Foreign Direct Investment (FDI) up to 100 percent under the automatic route,
- (b) Waiver of Inter State Transmission System (ISTS) charges for inter-state sale of solar and wind power for projects to be commissioned by 30th June 2025,
- (c) Ministry of Power has also issued an order on Renewable Purchase Obligations (RPO) and Energy Storage Purchase Obligations trajectory till 2029-30. This will also support in achieving the target.
- (d) Aligning of the State RPO trajectories to that with the National RPO Trajectory notified by the Ministry of Power upto FY 2029-30.
- (e) Setting up of Ultra Mega Renewable Energy Parks to provide land and transmission to RE developers on a plug and play basis,
- (f) Schemes such as Pradhan Mantri KisanUrja Suraksha evamUtthaanMahabhiyan (PM-KUSUM), Solar Rooftop Phase II, 12000 MW CPSU Scheme Phase II, etc.
- (g) Laying of new transmission lines and creating new sub-station capacity under the Green Energy Corridor Scheme for evacuation of renewable power,
- (h) Notification of standards for deployment of solar photovoltaic system/devices,
- (i) Setting up of Project Development Cell for attracting and facilitating investments,
- (j) Standard Bidding Guidelines for tariff based competitive bidding process for procurement of Power from Grid Connected Solar PV and Wind Projects.
- (k) Government has issued orders that power shall be dispatched against Letter of Credit (LC) or advance payment to ensure timely payment by distribution licensees to RE generators.
- (l) Production Linked Incentive Scheme 'National Programme on High Efficiency Solar PV Modules', for supporting setting up of integrated manufacturing units of high efficiency solar PV modules.
- (m) Amendment in the Electricity act for including penal provisions to comply with the RPO targets notified by the respective SERCs/JERC.
- (n) Electricity (Promoting Renewable Energy through Green Energy Open Access) Rules, 2022, notified for promoting generation, purchase and

consumption of green energy with the end goal of ensuring access to affordable, reliable, sustainable and green energy.

- (o) Establishment of off-shore wind energy projects including various business models for Offshore Wind Development.
- (p) Promotion of energy storage coupled with renewable energy by Solar energy corporation of India.
- (q) Establishment of 13 nos. Renewable Energy Management Centres (REMCs). The REMCs are equipped with Artificial Intelligence based RE forecasting and scheduling tools and provide greater visualization and enhanced situational awareness to the grid operators.
- (r) The National Green Hydrogen Mission has been announced with the over arching objective to decarbonise major economic sectors, making India energy independent and serving as an inspiration for the global clean energy transition.

The Ministry of New and Renewable energy has constituted a Committee for preparing a roadmap to achieve 500 GW of non-fossil fuel-based energy capacity by 2030. The Committee includes representative from important agencies dealing with renewable energy & electricity and can also co-opt other stakeholders. It was decided to constitute four thematic Sub-groups, identifying the responsibility of respective Sub-groups to access the potential for RE capacity addition considering feasibility conditions for RE development. The following responsibilities are assigned to each Sub-group.

Sub Group I: Assess the requirement of Regulatory changes, RPO enforcement, Storage elements and Market Design to achieve 500 GW non-fossil fuel capacity in a least lost manner.

Sub Group II: Assess the role of Open access, Decentralized PM-KUSUM, Roof Top Solar, Hydro Power in achieving the target of 500 GW

Sub Group III: Assessment of additional RE capacity required for green Hydrogen production

Sub Group IV: Assessing the investment in transmission required for achieving 500 GW non-fossil fuel capacity in a cost-effective manner, including use of storage elements in transmission planning."

29. During evidence, the Committee desired to be apprised of the details of energy to be generated from Solar Power and the wind Power.

30. In this regard, representative of MNRE replied as under:

"Sir, roughly 280 to 300 GW will come from Solar. The rest will come from wind. It is a rough figure. We have reached 112 GW. Some capacity of 60 to 70 GW is under implementation. So, if you take all this into account, we have to do about the remaining 270 to 280 GW."

Part – IIObservations/RecommendationsIntroductory

1. The Ministry of New and Renewable Energy (MNRE) sanctioned (September 2009) a Research and Development (R&D) project, 'Development of a Megawatt-scale Solar Thermal Power Testing, Simulation and Research Facility' for implementation by Indian Institute of Technology, Bombay. The project was expected to facilitate development of 1 Mwe grid interactive solar thermal power plant. National Institute of Solar Energy (NISE) was required to enter into a Power Purchase Agreement (PPA) with Dakshin Haryana Bijli Vitran Nigam (DHBVN) for sale of solar power. The project was sanctioned for a duration of five years, i.e., up to September 2014 and was further extended up to March 2015. An amount of ₹46.72 crore had been released by MNRE for the project. The plant was formally handed over by IIT to NISE on 7 March 2015 and had generated 9Mwh of electricity upto 31 August 2015.

The Committee are constrained to observe that the plant was operated upto August 2015 by engaging employees on contract basis by NISE. Thereafter, the contract was not extended for want of funds. As a result, the plant stopped functioning from September, 2015. As of February 2016, a total expenditure of ₹46.36 crore had been incurred on the project, and IIT refunded (June 2016) the unspent balance (with interest) amounting to ₹ 37.10 lakh to MNRE. The project completion Report submitted by IIT was reviewed (June 2016) by the R&D Project Appraisal Committee (RDPAC) of MNRE. The observations of the RDPAC were communicated to IIT in July 2017. However, no further action was taken on the project and the plant has remained non-functional.

Audit findings

2. Audit findings as contained in C&AG Report on the Subject revealed that MNRE did not take any action towards developing a dedicated workforce needed to run the plant on a continuous basis though the National Advisory Council constituted for the project in its meeting held in May 2011 had discussed the need for a dedicated workforce for running the plant once it was commissioned. Further, the plant was taken over from IIT by MNRE prior to getting the project performance appraised by the RDPAC and without ensuring availability of dedicated workforce for its operation. Audit further observed that no action could be initiated for sale of 1 Mwe Solar Power planned to be generated under the project. These shortcomings have been discussed in detail in the succeeding Paragraphs of this Report.

Dedicated workforce for the project

3. The Committee note that although the National Advisory Council had suggested creating a dedicated workforce at the Solar Energy Centre (SEC) for running the plant after commissioning of the project, yet MNRE did not take any action in this regard. Consequently, the plant could not be run. As informed by MNRE, IIT Bombay had developed a dedicated workforce for engagement till the date of completion of the project and the expenses thereon were met from the project costs. After handing over to NISE on 7th March, 2015, NISE retained the workforce and operated the plant till August 2015 by using its own budgetary resources. But, the arrangement was not sustainable as NISE was newly formed and had very limited funds. The Committee are astonished to note that neither the Ministry took any steps towards knowing the fund requirements of NISE for this purpose nor did they try to resolve the issue of funding for creating a dedicated workforce for the project. This is indicative of lack of co-ordination between NISE and MNRE.

The Committee are of the view that NISE being a newly formed agency, the MNRE should have taken adequate steps towards providing proper guidance and direction, as well as adequate funds to NISE. The Committee further note that NISE, in co-ordination with MNRE took initiatives towards operating the plant by means of floating EoI for engaging a third party in August 2015 and in August 2018, but no potential response was received. The Committee are of the view that it was essential on the part of MNRE to take appropriate, adequate and timely action in this regard more so, as NISE was identified as a potential agency for operation and maintenance of the plant for R&D purpose following the commissioning of the project. The Committee, therefore, desire that the MNRE update their monitoring/coordination mechanism so as to avoid such lapses in future. The Committee also find it to be inappropriate that while IIT, Bombay, in a written letter, had suggested that the Plant needs to be run on a continuous basis, no positive action was taken by the MNRE/NISE for ensuring continuous operation of this plant. The Committee desire to be apprised of the reasons for not taking appropriate measures towards developing of a dedicated workforce and recommend that henceforth the MNRE should adopt systemic planning and exercise effective foresight in initiating such type of projects so that similar lapses do not recur. Suitable/clear guidelines need to be developed and prescribed for these types of projects in future. The Committee also recommend that officials responsible for inaction in taking policy measures need to be suitably sensitized so that such happenings do not continue.

Taking over the plant from IIT, Bombay prior to performance appraisal

4. The Committee are constrained to observe that the plant was taken over from IIT, Bombay by MNRE before getting the project performance appraised by the RDPAC. The MNRE, however, indicated that the project was

appraised by the R&D Sectoral Project Appraisal Committee on Solar Thermal on 07-08-2013 wherein the RDPAC observed that most of the project goals had been achieved. The reasoning given by the Ministry that the project was ending in 2015, owing to which it was felt that obtaining approval of RDPAC prior to the timeline is not tenable. The entire responsibility is sought to be put on NISE on the ground that the project was completed with NISE as a responsible consortium partner is also not totally justifiable. The manner in which the Ministry took over the plant from IIT, Bombay without getting the performance appraised by RDPAC and placing the responsibility of operation and maintenance on NISE without assessing the requirements of NISE for enabling in sustained functioning of the Plant is, in the opinion of the Committee incorrect. The MNRE do not appear to have taken this issue seriously till the lapse was pointed out by Audit and that too after a significant time gap, and incurring an expenditure to the tune of ₹ 46.36 crore. The Committee consider it be unfortunate that no efforts were made by MNRE for obtaining the 'completion Report', which is an essential requirement in the process of handing over a project. The Committee feel that had the issue been handled with care and foresight, the expenditure of ₹ 46.36 crore, incurred for completion of the project could have not become infructuous. The Committee, therefore, desire the Ministry to take appropriate measures, at least, now, with a view to ensuring that such issues are avoided in similar projects in future.

PPA for sale of 1Mwe Solar Power under the project

5. The Committee further find that no action could be initiated for sale of 1Mwe Solar Power planned to be generated from the plant. In this regard, the Committee have been informed that NISE initiated actions and approached Dakshin Haryana Bijli Vitran Nigam (DHBVN) for facilitating in feeding the

power to the grid. Although, NISE made efforts towards signing of PPA for Power evacuation with Haryana Power Purchase Centre at the rate of ₹ 6.44 per KWh as per the provision made for Solar Photovoltaic power in April 2015, no formal response was received. Further, as apprised by the MNRE, while NISE was operating the plant from March, 2015 to August, 2015, it was found that the power output was much lower than the designated value of 1.0Mwe and operating the plant was uneconomical. Consequently, the plant became non-operational from 1st September 2015 and no further action was initiated by NISE for signing of PPA with Haryana Power Purchase Centre. During the course of evidence, the representative of MNRE informed the Committee that the project was mainly R&D oriented, power generation was not the main objective of this project, and it was not commercially viable for being run for a long time. The Committee note in this regard that when the decision was taken at first to build this project, the basic objective stated was to generate 1Mwe solar power. It was only after the project proved to be commercially unviable that it has been formed as a R&D project. The Committee feel that if the plan was to conceive the plant as only R&D oriented, the MNRE should have satisfied the audit about the objectives of the plant so that the Audit would have made a suitable Observation and the Committee would not have been seized of the matter. A representative of MNRE too accepted and stated during evidence that if the sanction given was for generating 1 MW electric power, it should have been generated, atleast for a couple of years. The Committee, recommend in this regard that steps should be taken to revive the plant as a significant amount of tax payer's money i.e. ₹46.36 crore has been invested in implementing the project, which remained wasted as there is no generation of energy. The Committee further desire that the Ministry should explore the possibility of improving the

technology of this plant so that it can contribute towards strengthening solar power generation.

Delay in making the Solar Thermal Power Plant functional

6. There was long delay of eight years (September 2009 to 2017) in making the Solar Thermal Power Plant functional. From the information furnished by MNRE, the Committee note that following the sanction on 7th September, 2009, the project was in the execution phase till September, 2014, which was further extended till 6th March, 2015.

The information furnished by the Ministry is also silent on the reasons for delay of three years in operationalizing this Solar Thermal Power Plant (STPP), as well as escalation in cost of plant, i.e., from ₹ 41.17 crore sanctioned in 2009 to ₹ 46.72 crore till 2015. Lack of foresight and proper planning seem to be the reasons behind the delay in making the plant functional and the consequent loss of expenditure incurred thereon. The Committee, therefore, emphasise that, henceforth, the MNRE should follow a systemic planning by taking into consideration all variables like availability of resources, credibility of implementing agency based on past performance, time frame for completion of projects, maintenance and financial viability of the project etc. at the planning stage of such type of projects so as to avoid delay in completing/execution of the projects in future.

Action initiated by MNRE/NISE/IIT, Bombay to make the plant functional

7. The Committee note that during 2015 to 2017, the plant was non-operational on account of administrative, financial and technical reasons. The facility was used for training and demonstration purpose since its commissioning. The Committee are constrained to observe that though NISE had taken several steps viz. engaging a team to revive the plant, making the collectors to track the sun manually, approaching the MNRE for seeking

funds, facilitating a study which was conducted through consultants appointed by the United Nations Industrial Development Organisation (UNIDO) during January to March 2019 for assessing the technical problems associated with solar field power block, other major accessories and software for reviving the operation of the plant, it could not be made functional. The Committee have also been apprised by the MNRE that a detailed Report titled 'Refurbishment of the 1.0Mwe Concentrating Solar Power Plant at the NISE' was prepared and presented to MNRE in the last week of March, 2019, which detailed the various components, parts/systems to be overhauled/repaired/replaced along with the financial implication on account of making the plant operational. Further, the Governing Council of NISE in the 8th Meeting held on 20-06-2019, recommended that efforts should be made to make the plant functional preferably on economical basis for recovering the cost of O&M through electricity generation from the project. The Committee are concerned to note in this regard that no serious interest seems to have been taken for making the plant functional as recommended by the Governing council of NISE. The Committee recommend that the MNRE should take necessary measures towards revamping the plant and making it functional.

Usage of Plant for training purposes

8. The Committee note that the Solar Thermal Power Project in its present condition is being utilized for demonstration and training purpose for the National and International training programmes being organised by NISE, besides having visitors and students to showcase PTC and LFR based solar thermal power plant technology. The Committee have been informed that till 2019-20, NISE organised 134 National and 36 international training programmes in the campus in which the facility was utilized for training and

demonstration purposes. The Committee are of the view that it may not be appropriate to see any R&D project in isolated or 'non-functional state'. The Committee also wish to point out in this regard that ₹ 46.36 crore were spent on this single project which had not lead to any scientific R&D nor contributed to energy generation. Further, the Ministry have not apprised the Committee about the percentage of R&D Budget sanctioned for this purpose and actual R&D expenditure incurred thereon. The Committee desire to be apprised of the number of research projects sanctioned till date; expenditure incurred thereon; output there from; and institutions involved therein.

Steps taken for Revival of Plant by IIT Jodhpur

9. During the oral evidence of the representatives of MNRE on the subject, the Committee have been informed that IIT Jodhpur has expressed interest in the revival of this plant. IIT Jodhpur intend to constitute a consortium for producing 1 Megawatt of power by way of joining the facility of this Solar Thermal Power Plant and a Photo Voltaic Power Plant and enter into a PPA with an Electricity purchasing company in Jodhpur, at a tariff of ₹8/kWh. While taking note of the interest towards operationalising the plant, the Committee would also like to be informed about the progress made in this regard and the current status of this project. The Committee wish to be apprised of the commercial viability of this arrangement and the possibility of reviving and reusing the plant, as a whole.

Steps taken towards achieving the target of 500 GW energy by 2030

10. As regards Power generation, the goal laid down is for achieving 500 GW energy capacity from non-fossil fuel sources by 2030. In connection with preparedness for achieving this Goal, several steps are stated to have been

initiated by the MNRE. The Committee have also been apprised during evidence that MNRE have already commissioned 57 GW of solar energy and 60 GW of generation capacity is in the pipeline. The Committee have further been informed that roughly 280 to 300 GW of power will come from solar sources and the rest from wind energy. Accordingly, MNRE have to achieve the remaining 270 to 280 GW in the next seven years. The Committee would like to be apprised of the strategy formulated by MNRE towards achieving this target, action taken thereon and present status of power generation by means of both solar and wind energy till date.

Conclusion

11. As brought out in the preceding paragraphs, the Committee wish to once again highlight the fact that MNRE had not taken any steps on the recommendations of National Advisory Council (May 2011), which suggested that a dedicated workforce be developed under SEC for running the solar power plant. Due to non-deployment of a dedicated workforce, the plant became non-operational from 1st September, 2015. The Solar Thermal Power Plant was taken over from IIT, Bombay by MNRE/NISE before getting the project performance appraised by the RDPAC. Furthermore, the MNRE could not ensure proper follow up with IIT, Bombay to sustain the project in operational condition. The MNRE also did not co-ordinate with NISE to resolve the issue of funding, to undertake future high potential research works under this developed facility. Further, no action was taken by NISE with Haryana Power Purchase Centre after April, 2015 for sale of 1Mwe Power generated from this plant. MNRE did not provide any substantial future alternatives to recover the cost of plant, except for utilizing the plant for training and demonstration purposes. From this, the Committee cannot help concluding that this project led to an infructuous expenditure of ₹ 46.36 crore

of Public money. The Committee are of the view that had the feasibility of the project been evaluated objectively and comprehensively, the loss could have been avoided. The Committee would, therefore, recommend that at least now, MNRE should explore the possibility of reviving the plant at the earliest and make it functional. The Committee also take note of the submission made as per which by way of studying the technology of this plant, three other projects of similar kind (two in Rajasthan and one in Andhra Pradesh) have been set up and are running successfully. The Committee are, therefore, of the view that if the technology adopted could inspire other private companies, revival of this plant remains a distinct possibility. The Committee, therefore, urge that instead of using this plant as a mere demonstration project for R&D, efforts need to be made for studying the technology used in the other plants of similar nature that are being run successfully so as to enable in reviving the plant.

NEW DELHI;
03 April, 2023
13 Chaitra, 1945 (Saka)

ADHIR RANJAN CHOWDHURY
Chairperson,
Public Accounts Committee
