F. No. 271/7/2019-CST Division
Government of India
Ministry of New and Renewable Energy
***

Block no. 14, CGO Complex,
Lodi Road, New Delhi -110003
Date: 7 September 2019

Notice for Stakeholder consultation

Subject: Request for comments of stakeholders on findings of third-party evaluation of the 'Off-Grid and Decentralized Concentrated Solar Thermal (CST) Scheme' and also on the suggested performance based financial support scheme.

The third party evaluation of 'Off-Grid and Decentralized Concentrated Solar Thermal (CST) Scheme' of Ministry of New and Renewable Energy was conducted by Gujarat Energy Research and Management Institute (GERMI). In the report GERMI has presented its finding and also suggested to provide performance based financial support to CST projects instead of capital subsidy earlier being provided by MNRE.

2. The major findings of the report and performance based financial support scheme suggested by GERMI are placed at Annexure with the request to all concern stakeholders to provide their comments/suggestions/views on the same, in word format**, latest by 21.09.2020** at aravindh.mnre@gov.in

(J K Jethani)
Scientist-E

To

All concerned stakeholders

Annexure

Third-party evaluation of the

'Off-Grid and Decentralized Concentrated Solar Thermal (CST) Scheme'

A. Major findings of the report submitted by GERMI are as under:

1) The previous financial assistance model is linked to 'area of CST', and it hadn't the control over 'Project Quality' and 'Performance'.
2) There was no accountability in the previous CST scheme, which means, there were no penalty on non-functioning of CST projects.
3) Lack of supplier support/commitment or poor-quality supply is the main reasons for the non-functioning of around 80% of the CST projects.
4) At many sites, the proper 'Demand Supply Gap' and 'Committed Heat Output from CST' were not properly estimated for the project, which raised disputes between supplier and beneficiary. There was no financial penalty mechanism for poorly designed proposals.
5) In the case of supplier and beneficiary disputes due to either of service availability, or committed performance/saving from CST plant, the chances are likely for the system non-functionality. There was no control in this matter in the previous scheme.
6) The previous CFA allocation method took long approval process, which many suppliers reported time taken process resulted in the distrust of the beneficiary.
7) The previous scheme does not evaluate the available technical manpower with the beneficiary for the operation and maintenance of the plant. Lack of technical manpower available at site has also resulted in improper functioning of the CST plant.
8) The size of the normal CST product is larger than the other solar technologies. Due to the larger size of the technology and the fragile nature of the components like mirrors/glass and reflectors., mandatory rule 'to test CST system every three year' should be used judiciously or it should be revised based on actual experience. As an alternate option, mobile testing of CST technology should be promoted.
9) MNRE may inform different SNAs for having provisions for dedicated (Nodal) officer(s) for CST projects, which will not only help in local monitoring of CST, but this will also help to create awareness on CST technology in their states and its promotion.
10) MNRE should focus on CST technology and necessary theme- based conference or exhibition on CST should be promoted. This will increase the CST technology awareness to the larger audience with an impact.

B. Proposed financial support mechanism for CST Projects by GERMI:

The financial assistance could be provided over a period of 5 years after commissioning of the project as under:

Category of CST Technology	Min. Performance by CST System (kWh/m^2/yr)	Min. Performance by CST System (Mcal/m^2/yr)	Financial Assistance to Beneficiary (₹/m^2)			Financial Assistance to Supplier (₹/m^2)		Total Financial Assistance by MNRE (₹/m^2)
			1st Year	2nd Year	3rd Year	4th Year	5th Year	
Imaging CST Collector (Tracking)	324	278.6	1125	1050	975	75	75	3300
	432	371.5	1500	1400	1300	100	100	4400
	486	418.0	1800	1620	1440	113	113	5086
	540	464.4	2000	1800	1600	125	125	5650
	594	510.8	2200	1980	1760	138	138	6216
Non-Imaging CST Collector (Non- tracking)	520	447.2	960	880	720	64	64	2688
	585	503.1	1080	990	810	72	72	3024
	650	559.0	1200	1100	900	80	80	3360
	715	614.9	1320	1210	990	88	88	3696

C. Suggested Guidelines for implementation of proposed financial support mechanism:

1) To avail financial assistance, performance measurement instruments should be installed in the CST plant with online monitoring system as given below:

Measurement instruments	Hot Water/Oil based CST System	Steam based CST System
Temperature Sensor (PT-100)	03 Nos	03 Nos
Pressure Sensor	02 Nos	02 Nos
Temperature Gauge	02 Nos	02 Nos
Pressure Gauge	02 Nos	02 Nos
Normal Water Flow Meter	-	01 No
Digital Fluid Flow Meter	01 No	-
Digital Steam Flow Meter	-	01 No
Online Monitoring System	01 Set	01 Set

The Temperature sensor, pressure sensor, and gauges should be installed at the inlet and outlet of CST main header pipe. Digital flow meter shall be installed at the outlet of the CST system. Water flow meter (non-digital) shall be installed at the inlet of steam-based CST system. If there are more cluster-based CST installation with same beneficiary, these instruments should be installed separately and shall be integrated in online monitoring system.

2) The financial assistance for each year will be according to 'Annual Heat Generation', 'Total installed area', and 'Type of CST technology Category'. The generated performance of each year shall be individually considered for the respective financial assistance.
3) Financial assistance for the first 3 years will be allocated to the beneficiary. The 4^{th} and 5^{th} year financial assistance shall be allocated to the supplier. The financial assistance to the supplier may be considered as a necessary aid for the operational and maintenance cost for that plant. This will reduce the financial investment by the beneficiary for O&M of CST plant. In all cases (till 5^{th} Financial Assistance), data should be submitted by the beneficiary to MNRE.
4) Imaging Technology shall be considered concentrating technologies having single or double axis tracking such as ARUN Dish, Linear Fresnel Reflector, Parabolic Trough Collector, Paraboloid Dish, and Scheffler Dish technologies.
5) Non-imaging Technology shall be concentrating technologies having single axis tracking or no tracking, such as ETC-CPC, Vacuum based FPC Concentrators.
6) The CST plant should have at least 5 year AMC (Annual Maintenance Contract) with the supplier. Dairies and other process heat industries/organizations having dedicated CST technical staff (at least min. 3 Diploma or Degree engineers) may have at least 1 year AMC or above based on their convenience.
7) The commissioning date of the plant shall be considered as a plant starting date, and the first day of performance measurement cycle year.
8) In case of the closure of CST plant for a year, it will yield no performance from CST and hence, non-availability of subsidy that year. If the plant starts functioning in the subsequent year, the financial assistance shall be resumed from the previous allocation.
9) The hot water/oil-based CST system will avail Rs. 70,000/- and steam based CST system will avail Rs. 1,00,000/- Capital financial assistance from MNRE for the Measurement instruments, on the approval of the CST project. The minimum CST installation area should greater or equal to 160 m^2 to get eligible for this financial assistance for Measurement instruments. In case of system size lower than 160 m^2, to avail the financial assistance for 5 years, it should have the above suggested measuring instruments. There shall be no Capital financial assistance from MNRE to purchase such instruments.
10) The ESCO based projects, having a minimum 6-year performance contract with the beneficiary, shall have an additional 10% financial assistance to respective year and performance.
11) The beneficiary of dairy plant, food processing industries, and process heat industries having 'heat requirement for 330 or more operational days', shall have an additional 10% financial assistance to the eligible financial assistance. To avail this, there should be minimum 3 Nos. of degree engineers with the beneficiary, who look after CST system performance monitoring.
12) The special category states have additional 10% financial assistance to respective year and performance.

13) Considering solar thermal cooling projects with more prospective for saving refrigerants, the capital financial assistance of Rs. 2000 per TR of 'single stage – VAM' (Vapor Absorption Machine) shall be provided. VAM should be single stage model to avail this assistance.
14) The supplier should have a detailed study of the heat requirement of a beneficiary and should commit a justified performance guarantee to the beneficiary and the same shall be registered to MNRE to avail this financial assistance. The supplier should commit based on their experience and realistic assumptions (if required). More than 15% lower performance generation may lead to negative remarks in the MNRE online portal.
15) The Capital financial assistance for measuring instruments should be only 1 time at respective beneficiaries' site. For further, CST installations, the beneficiary/supplier has to install measurement instruments by own cost.
16) The Operating Cost of the CST plant should not exceed 1.5% of the Total Capital Cost of the plant installation.
17) The tracking and glass/mirror/reflector components should have 5-year warranty. The glass/mirror/reflector should not degrade (reflectivity) maximum 5% for the first year and thereafter 2% annually.

Summarized CFA of GERMI's suggested mechanism

Sl. No.	Category	CFA & Remarks
1.	For all beneficiary & suppliers	5 Year CFA, as per The financial assistance could be provided over a period of 5 years after commissioning of the project as
2.	CFA for Measuring Instrument (single time per site location)	Rs. 70,000/- (Hot Water/Oil based CST) Rs. 1,00,000/- (Steam based CST) (projects with area greater than 160 m^2 are eligible)
3.	ESCO Project (> 6 year contract)	Additional 10% to CFA as per The financial assistance could be provided over a period of 5 years after commissioning of the project as
4.	Dairy/Food Processing/ Process heat industries	Additional 10% to CFA as per The financial assistance could be provided over a period of 5 years after commissioning of the project as (heat requirement days > 330 days will be eligible)
5.	Special category states	Additional 10% to CFA as per The financial assistance could be provided over a period of 5 years after commissioning of the project as
6.	CST Space Cooling Projects	Rs. 2000/TR of 'single stage VAM'

D. Other suggestions for successful implementation of proposed mechanism:

1) **Common Online Portal:** A common portal having provision for online monitoring for all plants, having common complaint resolving mechanism, performance submission, and financial assistance track record and evaluation data for further CST program may be developed/identified. CST plant performance results may be put into the public domain to gain trust and adoption of CST technology further. This action is highly suggested to MNRE to make this proposed model successful.
2) **Mandatory Radiation Measurement:** The MNRE should continue the rule, to install a radiation monitoring system having an installation area greater or equal to 500 m^2. During the present assignment, GERMI found poor maintenance of the online monitoring system at site. Hence, the mandatory functioning of the system for at least 5 years after installation will help to generate realistic performance generation data and it will help to create future MNRE CST Scheme model.
3) **Actions against Poor Suppliers:** More than 15% lesser output than the committed by the supplier for considered 'operational days of CST plant by beneficiaries', shall have a penalty on the supplier for making unjustified performance commitment to the supplier. For such cases, more than 3 such cases to any supplier, shall result in penalty or black-list such suppliers, whatever actions appropriate seems to MNRE. This will reduce the beneficiary's distrust on CST system and services of suppliers.
4) **Data Verification:** Accurate data submission from the site is essential for this model. MNRE may allocate site inspection to any Third-Party independent agency, for verification of physical measurement value from gauges, flow meter and verify the data submitted to Online Portal. This work may also be allocated to any calibration service providers. If results are more than 3% deviation, MNRE may suggest the beneficiary to replace or repair the instruments for availing the subsidy, or direct difference may be managed/calculated in Online Portal. The data may also be verified each year with the help of SNA and local calibration/ Third party independent agency.
5) **Mandatory Warranty on Glass/Mirror/Reflector & Tracking Components:** The MNRE should continue the rule, for the 5 year committed warranty on Glass/Mirror/Reflector. This should also be mandatory for tracking components. For glass/mirror/reflector degradation should not exceed maximum 5% for first year and thereafter 2% annually. In case of failure of the above case, necessary penalties or actions are suggested against suppliers. Additionally, the suppliers should have to adhere to the glass manufacturer's good practices for glass/mirror installation strictly (i.e. No direct contact of glass/mirror surface with metal parts to avoid corrosion).
6) **Quality Structural Material & Design:** MNRE may make a mandatory rule for each CST technology model, should have a structural withstand capacity of at least 160 kmph. Like Solar PV, this may be validated to 'each CST technology model' for 'each supplier', using structural analysis software such as STAAD. The wind speed limit should be accordingly higher for the high wind & coastal zone areas.