Anticipated Heat delivery from various type of CST based systems in different regions of the country (Minimum performance norms) & other relevant information for users including cost, payback etc

Sr. No	Region	Indicative average DNI/ sq. m. / day* (In kWh)	Sunshine days	Fixed focus elliptical dish^ / Non evacuated heat receiver PTC		Evacuated heat receiver PTC/ LFTR		Fresnel reflector/ Paraboloid based dish	
				Efficiency at 150C**	Heat delivery***/ sq. m/ year (in lakhs of Kcal)	Efficiency at 150C**	Heat delivery***/ sq. m/ year (in lakhs of Kcal)	Efficiency at 150C**	Heat delivery***/ sq. m/ year (in lakhs of Kcal)
1.	Leh Ladakh	6.5	320	35%	6.26	40%	7.15	60%	10.73
2.	Gujarat Rajasthan & western M.P.	6.0	300	40%	6.20	45%	6.97	65%	10.10
3.	North- West including Himalayas	4.5	250	35%	3.39	40%	3.87	60%	5.81
4.	North – East & eastern part of Orissa & A. P.	4.0	250	40%	3.44	45%	3.87	65%	5.59
6.	Southern & Central	5.0	280	40%	4.82	45%	5.42	65%	7.83

^ Average effective aperture area of 16 sq. m. fixed focus elliptical dish for receiving normal radiation during whole year is to be taken as 11 sq.m. The heat delivery from a 16 sq. m. elliptical dish in a year in different regions will, therefore, be 11 multiplied by figures given in above table.

Also dual axis automatic tracked elliptical dishes may have higher heat delivery by say 5% in comparison to single axis tracked dishes due to avoided errors in manual N-S adjustments. .

* Can vary by +/- 10% at a particular location in the region

** Its average annualized efficiency and is linked with ambient temperature and wind conditions of particular region. It reduces in the regions having lower ambient temperature and high wind velocity. It also reduces marginally for CSTs working at higher temperatures due to higher heat losses, thereby reducing the heat delivery. Temperature range which can be achieved by various CSTs, their salient features, installed cost & payback period are given in the **Annexure.**

*** Heat delivery will

i) increase if the fluid temperature goes down due to less heat losses. Likewise it will also decrease if working temperature is raised high say upto 350C or so especially in case of Fresnel reflector /Paraboloid dishes which are designed for such temperatures.

ii) decrease by 10% or more if the mirrors are not of solar grade quality.

Note : Based on above heat delivery, payback period at utility place will be calculated by manufacturers and indicated in their proposals which will vary depending on fuel used and boiler efficiency. Non-Imaging concentrators may have an efficiency of 35- 40C with limitation of providing heat up to 150C

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Annexure

Technology	Temp. range	Weight	Other features	Suitability of technology	For Retrofitted system as per MNRE specifications	
					Installed cost ** in Plains/ sq. m. (apprx.)	Payback* range with 30% subsidy
Fixed receiver elliptical dish (Single Axis tracked)	Up to 150C	400 Kg. for 16 sq.m. dish & 850 kg for 32 sq. m. dish	North South adjustment of each dish has to be done manually using levers once in 3-4 days.	Suitable for systems with smaller no. of dishes (say for up to 20 nos.). 32 sq. m. dishes could be useful for high temperature & oil based systems	Rs. 16,000	3.5 -6 years
Same with dual axis tracking	Up to 180C	-do-	Such adjustments are done automatically using photo sensors & motors	Suitable for any size of system.	Rs. 18,000	3.5 -6 years
PTC (Non-evacuated heat receiver)	Up to 180C	40 Kg./ sq. m. of PTC	-	Could be effective if space available in N-S is more due to reduced heat losses/ end effects	Rs. 16,000	3.5 -6 years
PTC (Evacuated heat receiver)	250C & above	-do-	-		Rs. 18,000	3.5 -6 years
LFR (Single Axis tracked)	250C & above	-	-		Rs. 18,000	3.5 -6 years
Arun (Dual Axis tracked)	Up to 350C	13 ton for 100 sq. m. & 20 ton for 169 sq. m. dish	Installed on pillar with foot print of 1-2 sq. m. All piping could be underground. Space between pillars could be used for other use like parking etc	Suitable for ground installations. Smaller dishes may be installed at terrace.	Rs. 20,000	3- 5 years
Dish (Dual Axis tracked)	Up to 350C	5 ton for 90 sq. m. & 2 ton for 43 sq. m. dish		Could be installed on terrace also apart from ground	Rs. 20,000	3- 5 years

** Variation is due to varying DNI in different regions. 5% of the cost is taken as O&M cost while calculating the payback period. 80% depreciation benefit to profit making bodies will reduce the payback by 25% or so. This will also be reduced by 30-40 % or so in special category states where subsidy is 60%.*

*** For newer systems, the cost towards boiler, utensils for cooking and VAM and its accessories for air-conditioning etc may be extra by 15 to 30% respectively. In high altitude areas and difficult terrain, the cost may further increase by 20 to 25%. The payback period for newer systems will, therefore, be somewhat more as compared to that mentioned above*

Note : Land/ swept area required for installation of CST based system is generally double the reflector/ collector area of the system