FAQs on Concentrated Solar Cookers & Concentrated Heating/Cooling Systems

Q: What types of solar cookers are available in market?

A: There are two types of cookers:

i) Box solar cooker, and

ii) Concentrating Solar Cookers

In concentrating solar cookers there are further three types

A) Dish Solar Cooker, B) Indoor Community Solar Cooker, C) Solar Steam Generating Systems.

Q: What is the difference between these two cookers?

A: A Box Solar Cooker is a static device that reflects the sunlight on the pots through the perpendicular mirror. It is a gradual form of heating device that may require anywhere between 2-5 hours to cook depending on the temperature, solar radiation and type of food cooked. In case of a dish cooker the solar radiation is focused at a given point using automatic or manual tracking. The temperature that can be achieved is upto 400^0C at the bottom of the vessel, thus rendering faster cooking. It has thermal efficiency of about 40%. For effective results the solar radiations and focusing of the sunrays play crucial role. The initial investment is high as compared to box cooker but renders faster cooking, however uses more space.

Q: How do they work?

A: Box Solar Cooker: The Solar Cooker must be placed on an area which receives constant and ample sunlight. Open the box cover and position the solar cooker in such a way that the double glass lid receives direct sunlight. Adjust the angle of the mirror so that additional light falls evenly on the black tray inside the cooker and not outside it. Place the cooking containers with the food item filled inside the black tray and close the double glass lid. The black pot & the black tray absorb the heat thus cook the Now, lift up the double glass lid and support it with stand attached to the lid. Place the cooking containers inside and shut the lid firmly by pressing it down from all sides. As the direct rays of the sun fall on the glass. The sun's heat passes into the Inner Cooking Box and it is trapped there. The mirror also reflects the sun's rays on the glass thus providing additional heat. The black lids of the containers and the black tray absorb this heat quickly. As a result the temperature inside the cooker is maintained between 110^0-120^0C, which is adequate for cooking. Food cooked in this simmering heat, not only retains it nutritive value, but also enhances the natural flavours.

Dish Solar Cooker: The items to be cooked are placed inside the pressure cooker. The pressure cooker is then fitted in the stand by setting the dish. This dish is preferably kept facing south and the angle of tilt is adjusted so as to focus the sunrays on the pressure cooker. Depending on the solar radiation and the quantity of the food items cooking time will vary between 30min to 2 hours.

For static systems they should face southwards in order to obtain maximum radiation.

Q: What can you cook?

A: The time required to cook food in box solar cooker varies between 2-5 hours depending on solar radiation and quantity of food item. The time require to cook food in dish solar cooker varies between 1-5 hours depending on solar radiation and quantity of food item. Everything that makes up your daily meals and non-fried snacks plus some of the delicacies that brighten up festive occasions can easily be cooked in the Solar Cooker. Some of these are:

- rice, khichadi, pulao, biryani
- kheer, dudhpak, basundi, flavoured milk
- dal, pulses, cereals
- green and root vegetables
- bread, biscuits, cake, nankhatai, cookies
- dhokla, idli
- fish, chicken, meat, eggs
- soups
- jam, and pickles.
- sun dried vegetables, spices and condiments for preservation
- ghee from white butter

Q: What are the three types of concentrating solar energy equipment presently used in India?

A: The three types of solar concentrating systems are:

i. Manually tracked dish solar cooker to cook food for 10-40 people.
ii. Fixed focus E-W automatically tracked dishes for direct indoor cooking 50-100 people & for steam generation for the purpose of community cooking, laundry, space cooking etc. of any capacity.
iii. Dual axis fully tracked Fresnel dishes for process heating, cooling.

Q: What type of tracking is used for dish type solar cooker?

A: Manual type of tracking is used for solar cookers.

Q: What temperatures are achieved & what is the efficiency of dish solar cooker?

A: The temperature achieved at the bottom of the vessel will be between 350 oC to 400 oC which is sufficient for roasting, frying and boiling.

Q: What is the thumb rule for Scheffler dishes?

A: As a thumb rule 3 to 4 dishes of 16 m2. each should be sufficient for cooking food for around 250- 300 people depending on site.

Q: For meeting cooking needs of more than 300 people what is the area required?

A: These systems are modular hence more dishes can be added if number of people are more. For example, a 10 dishes system (160 m2.) may be sufficient to cook food for around 1000 people. The cost will reduce proportionately due to lower heat losses.

Q: What capacity of water can be boiled in Dish solar cookers?

A: It can boil 2 to 3 liters of water for every 1.4 m2 of dish area.

Q: Can these cookers cook all food items?

A: In case of Box cookers boiling and roasting up to 1200C is possible. However it cannot be used for preparing instant food, frying or preparing rotis or parathas. It is less efficient on cloudy days.
In case of dish cookers it can cook all types of food that requires temperature upto 4000C. However during early mornings and late afternoon instant food cannot be prepared. Instant frying is also not possible. Similar to box cooker rotis and parathas cannot be prepared.

Q: How much time these take to cook food?

A:

i. Cooking time in the Solar Cooker varies according to the material to be cooked and the availability of sunshine. Changes in seasons and in the daily weather also affect cooking time and duration.
ii. In winter months, the Solar Cooker can only be used in the morning hours between 9 a.m. and 2 p.m.
iii. In summer,-both lunch and dinner can be prepared in the cooker. Material for the morning meal should be put in the cooker at 9 a.m. and for the evening meal at about 1 p.m. After 3 p.m. there is not enough heat to cook the food.
iv. Baking is best done in summer since it takes too long in winter. For baking preheat the cooker for at least one hour before putting in the material to be baked.
v. Once the food is cooked, if the mirrored lid is tightly shut, the food inside remains hot for at least three hours.

Q: What are the advantages of Solar Cooker?

A: The advantages of solar cooker are:

i. It does not require kerosene, coal, cooking gas or firewood because it works with the heat energy received directly from sun. So no matchsticks, no lighters, no fuel bills.
ii. It does not create pollution of any kind. Hence it keeps the atmosphere, the kitchen and the cooking utensils clean and sootfree. It does not emit any smoke or fumes and so it isn't a health hazard either.
iii. It is the safest cooking device as there is no danger from fire, explosion, cylinder bursts, gas leakage or electric shock.
iv. As cooking is done slowly and at a regular moderate temperature, the prepared food is tasty, retains its original flavour, colour and texture and its nutritious elements remain intact. The vitamin, protein and mineral contents of the food are preserved unlike in cooking with other media where either because of overcooking or high temperature these nutrients are destroyed.
v. There is no fear of spills or of food being burnt or charred since the temperature is maintained at "SIMMER" level only. (The food must not be left much longer in the cooker than necessary because the water content can dry up).
vi. There is no need for someone to be present during the process of cooking. Moreover four items can be cooked at the same time.
vii. Since the Solar Cooker has a simple design with no moving parts and is easy to use, there is hardly any possibility of it going out of order.
viii. The Solar Cooker needs little care and repair work is comparatively inexpensive and quickly done. With a little routine care, the cooker gives trouble-free performance for years together.
ix. Once the food is cooked, just shut the cover of the cooker. The heat inside keeps the food hot for at least three hours.

Q: How to use it correctly?

A: Place the Solar Cooker at a spot which gets the highest amount of sunlight for the longest time. The courtyard or terrace which is unshaded is the ideal location. Face the mirrored cover towards the south so that the sun's rays are reflected onto the glass lid and into the tray throughout the day. Adjust the shadow reflected by the mirror so that it falls exactly on the glass. Fifteen minutes before the containers are placed inside the cooker, open it and leave in the sun so that the warming process begins. This will also eliminate any stale smell that may be trapped inside the tray. **Important**: It is to note that during the cooking process the mirrored lid should be open and the glass lid firmly pressed down.

Q: How much water is needed for cooking?

A: Solar Cooker cooking needs only the correct amount of water. Too much water will only lengthen the cooking time.

- Remember that along with the raw material to be cooked the water level should touch only halfway up the container.
- There is no need to use water when cooking leafy vegetables such as cabbage, spinach, methi, etc.
- When making lightly cooked vegetable, add only a tablespoon of water but more of oil (or any other cooking medium).
- Remember that different varieties of rice require different proportions of water. For basmati rice the proportion is, one cup of rice, two cups of water.
- While making tur dal, take water enough to cover the dal only. Extra water will make cooking difficult.

Q: Is the method of cooking same as in conventional stoves/ chullahs?

A: Any solar cooking device cannot undertake instant cooking and instant frying. In short it suffers from providing instantaneous heating. It may be noted that it is a supplementary device for saving fuel and offers healthy and nutritious cooking.

Q: If not, how to use them for cooking?

A: In Dish Solar Cooker items to be cooked are placed inside the pressure cooker. The pressure cooker is then fitted in the stand by setting the dish. This dish is preferable kept facing south and the angle of tilt is adjusted so as to focus the sunrays on the pressure cooker. Depending on the solar radiation and the quantity of the food items cooking time will vary between 30min to 2 hours.

Q: What are the preparations made before cooking?

A: Preparation before cooking begins:

Much time and energy can be saved by preparing the material needed for cooking well in advance. In Solar Cooker cooking, this kind of preparation saves a lot of trouble at the last minute. Remember that each time the glass lid is opened to put in something that has been forgotten, a lot of heat escapes, slowing down the cooking process.

Remember:

i. Pulses which take a long time to cook, should be soaked overnight.
ii. Wash vegetables thoroughly and chop them finely before putting them into the cooker,
iii. Either put in the required amount of water, salt and spices with the raw materials or add the salt and spices later on. Never open the cooker midway.
iv. Whenever you plan to prepare handvo, dhokla, idli etc. which require presoaking/fermenting please do so. Similarly while preparing cakes, bread, biscuits, nankhatai etc., keep all the materials ready at hand.

v. Ensure that all the food containers are ready at the same time so that they can all be put into the cooker at the same time. Do not keep opening and shutting the glass lid now and then to put in the different containers.

Q: What are physical features of Indoor Community Solar Cookers?

A: The unique feature of this cooker is that it is possible to cook using solar energy within the kitchen itself.

Q: What are the salient features of community solar cooker?

A: The salient features of community solar cooker are:

i. Can cook food for around 40 to 50 people.
ii. Since solar rays are directed in the kitchen hence makes indoor cooking possible.
iii. Due to high temperature the cooking rate is significantly faster.
iv. Due to high temperature it is possible to cook all the traditional dishes which is not possible in box type cookers.
v. It has a mechanical clockwork arrangement that tracks the sun automatically.

Q: Can we use solar cooker in winter?

A: Of course, it takes a little longer to cook than it does in summer, but you can surely cook one full meal. The most effective time to use the winter sun is between 9 a.m. - 2 p.m. Hence, lunch/dinner or evening snacks can be conveniently prepared. In winter always remember to preheat the cooker for at least 45 minutes, after 9 a.m., before putting in the raw materials. Also, allow 30-45 minutes extra cooking time. If hot water is added to any of the raw materials which require water that will speed up the cooking process. Do not use the cooker on cloudy and misty days.

Q: Also, what happens when clouds come during cooking time?

A: During cloudy days, the cooker will not be able to receive direct radiant sunlight hence will be less efficient and will not be able to cook during rainy days.

Q: What are the physical features of dish cookers?

A: It is a concentrating type parabolic dish solar cooker with aperture diameter of 1.4 meter and focal length 0.28 meter. The reflecting material used for fabrication of this cooker is anodized aluminum sheet which has a reflectivity of over 75%.

Q: What to do if the food remains uncooked due to clouds?

A: Food uncooked due to clouds must be re-cooked using conventional means through fuel like LPG, kerosene. Preferably avoid using solar cookers during cloudy and rainy days.

Q: Can solar cooker replace my LPG chullah/ Kerosene stove?

A: No, it cannot replace LPG chullah/stove but is a useful supplementary device to save these fuels. Besides it has limitations to instantaneous heating and frying hence use of LPG chullah/stove is obvious.

Q: What kind of problems could be faced?

A: The following types of problems can be faced:

i. Breakage of Glass: The glass used in the lid of the cooker is easily available and is of the ordinary type. You can change it yourself by unscrewing the wooden frame and fitting in the new glass. A photo-framer can also do this job for you.
ii. Breakage of Mirror: This is ordinary mirror, easily available in the market. Buy a good quality mirror of size 490 x 490 x 3 mm, unscrew the frame and fit it in.
iii. Peeling off of Black Colour: Any good quality dull black paint with which blackboards are painted can be used to paint the tray and the container lids. Before applying the fresh coat of paint, rub and clean the tray with a fine grained emery/sand paper.
iv. Accumulation of Moisture between the Double Glass Lid: Generally if the glass lid of the cooker is left open for 15-30 minutes after the cooking is over, the moisture evaporates on its own. If there is too much moisture and it continues to remain accumulated, unscrew the glass lids and leave in the sun until the moisture dries up.
v. The manufacturer may not replace certain items during warranty period mirror, glass, etc. In case one has shifted to another place where the solar cooker was purchased the manufacturer may not have a dealer there. In such cases seek advice of the manufacturer how it can be attended locally.
vi. In case of Box cooker the black paint offenly peels off in such cases they can be repaired through local manpower. Rubber beadings can be replaced seeking help of local hardware suppliers. Mirrors and glasses can be replaced as per the specifications given in IS 13429:2000

Q: What maintenance and precautions must be taken when operating a solar cooker?

A: <u>Precautions:</u>

i. The Solar Cooker works without fuel and hence there is no danger from explosion or fire. But remember that the heat accumulated in the tray at the end of cooking can be very intense. So keep yourself safe from steam burns by: Gently and slowly opening the glass lid till all the steam escapes. Guard your face and torso while doing so. Use the hand gloves provided with the cooker while removing the container.
ii. For cooking place the Solar Cooker at a spot which gets the maximum direct sunlight.Unshaded areas in the courtyard or terrace are the ideal spots.
iii. Adjust the mirror's reflection so that it falls squarely on the double glass lid. If the reflection falls elsewhere on the ground, the cooker will not receive the full intensity of the Sun's heat.

<u>Maintenance:</u>

a. After cooking is over, clean the cooker with a dry cloth. Leave it open for fifteen minutes so that all the moisture dries off. Close it only after it has cooled.
b. When you open it to start cooking, clean it with a dry cloth. If anything is spilt on the tray, wipe it with a soft dry cloth.
c. If the black colour of the tray and the container lids peels off, get it repainted immediately. The paint should be of matt and not gloss finish.
d. Take care of the glass lid and the mirror.
e. Wipe both sides of the glass and the surface of the mirror with a clean cloth. If there is a layer of dust on either, it will affect the performance of the cooker.
f. When not in use, keep the cooker closed and in a shaded place.
g. Keep the cooker away from water and rain.

Q: Are there any service centers to get them repaired on having any problem?

A: If the cooker is under warranty contact the manufacturer and/or their respective supplier from where it was purchased post warranty also contact the manufacturer suppliers and report the problem to the nearest available dealer or repairer. You can also call on Toll free number 1800-2-33-44-77 for obtaining the list of manufacturers.

Q: How much fuel can be saved on use of solar cooker (LPG cylinder/ firewood/kerosene)?

A: Box Cookers can save upto 50kgs/year. Dish Solar Cooker will save about 150kgs of LPG/year on full use and depending on the atmospheric conditions.

Q: How much savings can be achieved from Scheffler, Arun dish, Dish Cooker, Indoor Cooker?

A: **Scheffler:** A typical solar steam system (excluding cooking vessels & conventional boiler) comprising of 96 m2 of Scheffler dish area (6 dishes each of 16 m2) can save around 4,500 liters of diesel in a year. It may generate about 150 to 200 kg of steam in a day could pay back the cost in 4 years with support available from the Ministry.

Arun Dish: Rs. 35 to 40 lakhs could generate 500 to 600 kg of steam per day depending on solar insolation and steam pressure. More dishes could be installed for meeting the required steam in an establishment at desired temperature and pressure. The payback period may come to around 5-6 years for establishments availing MNRE subsidy and depreciation benefit.

Dish Cooker: A dish solar cooker of smaller size can cook food for about 10-12 people and may cost around Rs. 6,000. It may be able to save around 8-10 LPG cylinders in a year on full use. Bigger size cookers may cost Rs. 30,000 appx. And may be able to cook food for about 40 people. It should be able to save around 30 LPG cylinders in a year on full use.

Indoor Cooker: An indoor cooking system may use dish of 7 to 16 sq. m. area and could cook food for 50 to 100 people depending on size. It may cost Rs. 75,000 to 1.6 lakh depending on size and may be able to save 30 to 65 of LPG cylinders in a year.

Q: Which parts of country are suitable for dish solar cookers?

A: Most suitable for North-West, South & Central parts of country.

Q: What is the cost of dish solar cooker & box solar cooker?

A: A 1.5 m2 dish solar cooker can cost between ₹ 6,000- 7,000 and can cook food for 10-15 people. For lager capacities the number of dishes can be increased pro-rated being modular. The cost would however be not pro-rated and would slightly reduce as area increases.

Box cookers are available in sizes ranging from 20”x20” to 24”x24” and can cost between ₹ 1,600-3,000. It can cook food for 4-6 people.

Q: I want to buy a solar cooker. How to get it?

A: Ministry of New and Renewable Energy (MNRE) has approved manufacturers of solar cooker, list of which is available on http://mnre.gov.in/file-manager/UserFiles/list_solar_box_cooker_manufacturer.htm http://mnre.gov.in/file-manager/UserFiles/list_manufacturers_dsc.pdf you can directly approach these manufacturers and obtain the dealer closest to you.

Q: Where can I get the list of dealers or suppliers of these cookers?

A: You may contact the respective manufacturers as below and ask them the list of dealers and suppliers.

Box solar cooker http://mnre.gov.in/file-manager/UserFiles/list_solar_box_cooker_manufacturer.htm

Dish Solar Cookers for direct/ indoor cooking for people ranging from 5 to say 100

http://mnre.gov.in/file-manager/UserFiles/list_solar_box_cooker_manufacturer.htm

Concentrated Steam Cooking Process

http://mnre.gov.in/file-manager/UserFiles/list_scs_sadc.pdf

Q: Is there any subsidy from the government (Central/State)?

A: Yes, capital subsidy of 30% is available for all. Special category states like Himalayan regions, north-eastern states can avail of 60% capital subsidy is available. The subsidy applicable is as given below:

Dish solar cookers & steam generating systems based on following type of collectors	**Capital subsidy (₹ / sq.m. of collector area) or 30% of project cost whichever is less***
Concentrators with manual tracking	2,100
Non- imaging concentrators	3,600
Concentrators with single axis tracking	5,400
Concentrators with double axis tracking	6,000

For state related subsidies contact the respective State Nodal Agencies http://mnre.gov.in/mission-and-vision-2/contact-us/state-nodel-agencies/ or call toll free HELPLINE number 1800-2-33-44-77

* *Besides capital subsidy, soft loan at 5% for balance cost of system excluding beneficiary share of 20% may also be available. Also for special category states, this subsidy will be double limited to 60% of project cost. In un electrified rural areas, subsidy for solar thermal power plants will be 60% in all category of states.*

Q: How can I get the subsidy?

A: For availing subsidy contact the channel partners of MNRE, list of which is available on http://mnre.gov.in/file-manager/UserFiles/list_channelpartners_st_cst_jnnsm.pdf. You can also apply directly through the designated State Nodal Agency in your State/Territory. The inspection will be made within a month after the supplier/ beneficiary informs MNRE & State Nodal Agency (SNA) about commissioning of the system. In case, it is inspected by the officials of SNA only along with supplier the report will be submitted to MNRE along with audited statement of expenditure for complete project cost, performance report for atleast 15 days in enclosed format along with photograph of system for release of subsidy directly to the beneficiary. Also visit http://mnre.gov.in/file-manager/UserFiles/criteria_releasing_govt_subsidy_solarsteamgeneration_indoorcookingsystems.pdf

Q: Do I have to approach for the subsidy or I get it at net of subsidy?

A: The system is provided at net of subsidy if you are purchasing from the channel partners of MNRE, list of which is available at http://mnre.gov.in/filemanager/UserFiles/list_channelpartners_st_cst_jnnsm.pdf . Alternatively you can also contact the State Nodal Agency of MNRE existing in your state/territory who will guide you how to make application for subsidy. The list of State Nodal Agencies is available at http://mnre.gov.in/file-manager/UserFiles/list_sna.pdf.

Q: How do I ensure that I get good quality solar cooker? Are there any standards quality control measures being taken by the government?

A: MNRE has laid down minimum technical requirements for installation of box solar cooker in the field. There is Bureau of Indian Statndard IS 13429:2000 which is followed. The salient features can be obtained at
http://mnre.gov.in/file-manager/UserFiles/specifications_dish_solar_cookers.pdf
It is essential that manufacturer / supplier are adhering to these requirements, to ensure quality.

Q: What are the things I have to see in a cooker to see that it is of good quality? (Box/Dish cooker)?

A: While purchasing a Box Cooker the following salient features must be observed

i. The number of pots will vary between 2 and 4.
ii. The pots are matt black coated & are made of either aluminium or steel.
iii. The body is either of aluminium or FRP.
iv. The bottom cover plate is double glazed and made of toughened glass.
v. Mirror is firmly pasted on the inside of cover lid.
vi. Must have 4 castor wheels.
vii. The gaskets are made of neoprene/EPBM.
viii. BIS certificate/test report from MNRE approved test centers are enclosed.
ix. Ensure that the manufacturer has made box cooker as per BIS specifications IS 13429:2000.

While purchasing a Dish Solar Cooke the following salient features must be observed**:**

i. Reflector material of bowl should be made of bright anodized aluminium of thickness 0.4 mm, reflectivity of cover 75%. This reflector fins should be tied with supporting wings.
ii. Outer ring should be powder coated aluminium.
iii. Supporting frame should be FRP material/MS wire mesh.
iv. High temperature resistant black powder coated bottom.
v. Should have manual/E-W automatic tracking mechanism.
vi. Is supplied with accessories like cap, hand gloves, goggles & manual installation and usage.
vii. Five year guaranty for the reflectors and two years for the balance systems.

Q: What are the various types of solar steam generating systems?

A: Two types of solar steam generating systems; one based on fixed receiver E-W automatically tracked concentrating technology (Scheffler) and the other on fully tracked receiver on dish technology (Arun) are under promotion in the country.

Q: What are the other types of concentrating solar technology?

A: Dual axis tracked parabolic dishes, linear Fresnel reflectors, non imaging concentrating type.

Q: How much steam is generated in a solar steam generating system?

A: A solar steam system comprising of 96 sq.m of dish area of this technology (6 dishes each of 16 sq. m) may generate around 150 to 200 kg of steam in a day depending on location and various other features can save around 4,500 liters of diesel in a year.

Q: How much steam is generated in a fully automatically tracked steam?

A: It is a Fresnel paraboloid reflecting concentrator (named Arun 160) mounted on a flat dish with downward facing cavity receiver at its focus designed to absorb the concentrated solar energy and to transfer it for useful application. The concentrator tracks the sun on two axes, continuously facing it to capture maximum amount of solar radiation over a day. The dish concentrator along with the receiver is mounted on a specially designed tower. The system is equipped with a heat retrieval mechanism (which may consist of piping and fittings, insulation, fluid circulating pump, etc.), and system controls related to tracking, thermal system and security/ emergency measures.

Q: What are the various applications of concentrating solar systems?

A: They are suitable for cooking food in community kitchen, process heat in industries, food processing industries, laundry, in hybrid mode with conventional boilers, vapour absorbtion machines and air conditioning.

Q: What should be the concentration ratio?

A: The concentration ratio should be over 80 for single axis & 120 for double axis tracking concentrator.

Q: What is the Aperture area of a concentrated system?

A: The aperture area of a concentrated system should be minimum of 10 m2 (for Scheffler dishes, it will be π /4 X lengths of major & minor axis of the ellipse)

Q: What should I look while choosing a mirror?

A: The mirror should be of high quality glass with minimum 90% reflectivity & a maximum degradation of 10% over its life span. It should be warranted for 5 years. Should have high quality adhesive or positive locking so as to withstand high wind areas.

Q: What is the maximum dishes that can be installed at place?

A: Systems with Scheffler dishes having single axis automatic tracking arrangement will not be installed with more than 30 dishes at a place.

Q: What is fixed receiver E-W tracked technology?

A: A solar steam generating system based on this technology comprises elliptically shaped parabolic solar concentrators (each of 16 sq. m. size) arranged in pairs of sleeping and standing dishes in parallel modules, aligned in a perfect E-W direction. Receivers (heat exchangers painted black) are placed in the focus of each pair of dishes. Above the receiver is a header pipe half-filled with water. Cold water enters the receiver through the inner pipe coming from header. Solar rays falling onto the dishes are reflected and concentrated onto the receivers. Due to the high temperatures achieved, the water within the receiver is converted into steam. The steam generated in the system is stored in the upper half (empty portion) of the header pipe and if the steam is not drawn, the pressure of steam keeps on increasing. The steam is then drawn / sent to the kitchen for cooking food or to other units for variety of applications including laundry, process heat, sterilization, air conditioning etc. This mechanism keeps on moving the dishes in the direction of the sun. This type of tracking system is called central tracking. To ensure that steam is available even when sun is not there (at night and on cloudy days in monsoon) the Solar Steam Generating system is connected with a Fuel fired boiler which acts as a back-up system.

Q: What are the areas where solar steam systems can be used?

A: Community kitchens in Institutions, Hostels, Hospitals, Hotels, Ashrams, Para-Military/Defence establishments, prisons for cooking Industries, hotels, hospitals etc for solar cooling, laundry & other applications for saving LPG/Electricity/Diesel etc.

Q: Will solar steam system work in hilly & difficult terrain areas?

A: In high altitude areas and difficult terrain, the cost may further increase by 20 to 25%. Another 3 to 5% could be towards operation, maintenance & Annual Maintenance Contract(AMC) for 5 years.

Q: What is the cost of solar steam systems?

A: ₹ 14,000 per sq. m. of dish area for single axis tracked systems and Rs. 14,000 to 16,000 for two axis tracked systems depending on site and data acquisition & control system installed with cost decreasing for increased size of systems. This cost is for retrofitted systems and excludes cost towards boiler, utensils for cooking/ VAM & its accessories for cooling as applicable, civil works, Annual Maintenance Contract, etc. For newer systems, the cost towards boiler, utensils for cooking and VAM and its accessories for air-conditioning etc may be extra by 20 to 30% respectively.

Q: Are there any installation charges additional to the benchmark prices quoted?

A: The installation charges would vary depending on the manufacturer and the associated infrastructure cost. They are not a part of the benchmark cost.

Q: What should be the warranty of concentrated solar systems?

A: Warranty for a minimum period of 5 years will be provided by the supplier. All parts/components will be of weather resistant design/specifications to withstand natural weathering outdoors under local climatic conditions, for a minimum period of 15 years.

Q: It is known that solar energy can also be used for cooling. Where can I get more information?

A: Solar concentrated systems is useful for cooling and already some demonstration projects have been setup by MNRE please refer to the case study on the following link http://mnre.gov.in/file-manager/UserFiles/solar_energy_potential_in_industries.pdf

Q: Where can I get the data of solar radiation of Indian cities?

A: The data for Solar Radiation is monitored by centre for wind energy technology and can be found at http://www.cwet.tn.nic.in/html/departments_srra.html

Q: Is there any helpline on Solar Energy query?

A: The Government of India operates a toll free HELPLINE number 1800-233-44-77. The timings are from Monday to Friday 9.30am to 6.30pm & on Saturday 9.30am to 1.30pm except Sunday and Gazetted holidays.