1.  **Mother’s words on Desalination**

*N*Mother’s* Agenda, Vol. 10*

*August 30, 1969*

….North of Pondicherry, there are places by the sea where nothing could ever be done (they’re constantly flooded), but there’s a way to make use of them, so I am trying to get the government’s permission to occupy it all. If we can get all of it, then we can have a free port, a free airport, an airfield (but more inland), also cultivation based on the new methods of irrigation with sea water, and naturally the transformation of sea water – but they’ve found something to transform sea water into drinkable water (Mother takes a brochure by her side). It’s French, I think, and an economical method; it’s very interesting. It’s under way, and if we wait for a few more years, they’ll have perfected it quite well….

*Mother's Agenda, Vol. 6, p. 140*

“…From a practical point of view, it would be very good: at the edge, outside the park, we could build reservoirs that would provide water to the residents…."

*Mother’s Agenda, Vol. 6, p. 147*

“…The biggest difficulty is water, because there is no nearby river up there; but they are already trying to harness rivers. There is even a project to divert water from the Himalayas and bring it across the whole of India (L. had made a plan and discussed it in Delhi; of course, they objected that it would be a little costly!). But anyway, without going into such grandiose things, something has to be done to bring water; that will be the biggest difficulty, that's what will take the longest time. As for the rest – light, power – it will be made on the spot in the industrial section – but you can't manufacture water! The Americans have given serious thought to a way of using sea water, because the earth no longer has enough drinking water for people (the water they call "fresh"... it's ironical); the amount of water is insufficient for people's use, so they have already started chemical experiments on a big scale to transform sea water and make it usable – obviously that would be the solution to the problem.”

S.: “But it already exists.”

“It exists, but not in a sufficient proportion.”

S.: “Yes, in Israel.”

“They do it in Israel? They use sea water? Obviously, that would be the solution – the sea is there. It
has to be studied. Then the water would have to be sent uphill... “

[1] "Fresh water" is eau douce in French, douce meaning "gentle" or "sweet."

Mother’s Agenda, Vol. 10, p. 496

“...But of course, what is needed ... There are material difficulties: for this islet, we need water – naturally, otherwise it’s not an islet! To have the water, we must transform it – there isn’t enough underground water.”

S.: “Not enough water?”

“There is water, but it’s enough for one or two houses, anyway not enough to create a permanent flow. We would need transformed sea water. In Israel they have found a way to do it economically (we even have brochures on this), but you understand, economical for a city, not economical for an individual! So then, we’d need to have water to make this islet, that’s the difficulty.”
2. **Udar’s write-ups from meetings with the Mother on Solar Energy**

6. Sri Aurobindo’s Action—August 1974

**Solar Energy: New Views, New Hopes**

There is now an increasing interest world wide in the search for a larger and more diverse utilization of the energy that comes from the sun. Up to now it has been largely of academic interest or a sort of a hobby with some enthusiasts; but now it is coming into greater prominence, being forced to attention by the pressure of circumstances. This, at least, is one view, the view generally considered in all who now approach the subject. There is another and more relevant view given by the Mother and this we shall discuss as it is not commonly realized and must therefore be presented as forcefully as possible.

Let us first examine the circumstances that appear on the surface to which all attention is now directed. It will be relevant to refer to the January 1974 edition of the *Unesco Courrier*, wholly devoted to this subject. UNESCO being an international organization, the views expressed in its official Journal may be taken as world view. The introduction to the subject matter of the first article, "Our Dwindling Energy Resources", gives a clear view of the situation as is seen by serious people all over the world:

*Recent world events have focused attention on the grave energy crisis facing the world. With total energy demand growing at a rate of about 5% a year and conventional energy resources rapidly dwindling, the problem is urgent with serious implications not only for the developed but also for developing countries. World population is expected to have doubled by the year 2000 and merely to maintain this population, with no attempt to raise living standards, will require over three times the current rate of energy production. Power is the key to expanding food and industrial production and to many other vital problems of world development. For this reason world energy needs have for many years been a matter of grave concern to the United Nations and UNESCO. The following article presents a global energy "balance sheet" from which it becomes clear that our present problems and future requirements call for the speediest possible developments of power sources other than fossil fuels.*

This then expresses clearly and forcefully the superficial reasons for the sudden spurt of interest in the uses of Solar Energy, which have to do with, as The Mother has said, the pressure of "crashing circumstances". But if we go behind the appearances we may find even the cause of these crashing circumstances and the true insistence which leads us to the sun.

We are now at a crisis in our evolution and at the point of the sudden turn to a new phase. This point, according to the plan of nature, is preceded by a great destruction, the *pralaya*, and then follows the long and painful period as we begin anew the upward curve in our progressive...
movement. It is to avoid this *pralaya* and to bring in the new phase of evolution, consciously and joyously, that Sri Aurobindo and The Mother undertook their great *tapasya* and evolved the system of the Integral Yoga. Through this they opened the way to the new world into which we have to evolve and to bring down the very power of that world, the force of that new consciousness itself to lead us there. This is the supramental plane and the force, the supramental Truth Conscious Force.

They succeeded in making a break-through in 1956 and since 1970 this force has become definitely active in all areas of our life and is forcing us, often in spite of ourselves, towards the transformation. Thus abound all about us the "crashing circumstances" as we approach "The Hour of God".

And we are being driven towards the sun, the physical symbol of the supramental, and away from the reliance on fossil fuels which belong to the long-dead past, as their very name signifies. The drive towards finding new and more effective ways of using Solar Energy has the Divine force itself behind it.

We must, however, sound a note of warning. In the drive towards new sources of energy and force, unless we consciously move towards the true future, we may be sidetracked into a source, a very powerful source of energy, also new, but one that is linked with the *pralaya* and not with the transformation. In particular we must be very alert to the danger of the forces released by nuclear fission or thermonuclear fusion. These are the forces that can lead to *pralaya*, and however much we imagine using them only for peaceful, progressive purposes, the forces of *pralaya* will create the conditions such that they be used for destruction.

So we should concentrate on the development of uses of *Solar Energy*, for not only is the sun the symbol of Truth, but also, in a practical way, its energy has such immense possibilities that it can more than meet the needs of the whole world.

In the Ashram and at Auroville we are doing much in this direction, as far as our means permit. There is already in use a Solar Still for distilled water and a Solar Cooker using steam for five people. A Solar Water Heater for domestic use is almost complete and will be a prototype for general use. A Solar Refrigerator project has been taken up. The most exciting is the project of a five horsepower Solar Pump, presently under study. Its development will signal a great achievement as it is what is most needed in the country by small farmers. The pump will work without electricity or oil and only by energy from the sun. It will not, of course, work on rainy days but then it will not be needed if it is used for irrigation.

There are many uses to which Solar Energy can be put but the most promising is in the conversion of the Sun's heat and light into electric energy. The photo voltaic cell is the most promising as it makes the conversion directly. It appears that already cells with 16% efficiency are in production but at
prohibitive costs.

If these costs could be brought down and efficiency increased to at least 20% (23% is the maximum possible, theoretically) then this would be a positive solution.

In July, 1973, at Paris, Unesco sponsored a Congress of Scientists entitled:

"The Sun in the Service of Mankind".

From this has emerged a Working Group that will recommend programmes of research and development all over the world which can be sponsored and assisted by Unesco directly or through other world organizations or by Governments themselves.

I am trying to get the interest of this Working Group in our projects at the Ashram and Auroville but more particularly in the setting up here of a top level Institute of Research in Solar Energy with particular reference to photo voltaic cells. The reason for this is that I hope that in such an Institute of Research we may be able to use the true method of Scientific Research of which The Mother has spoken, that by the Yoga, the scientist may open to that plane of Consciousness where the knowledge he seeks already exists. Then he should, again by the power of Yoga, bring that knowledge down into the prepared field of the Laboratory. The knowledge may come in flashes of inspiration or in a steady stream of light.

In the United States, in 1972, I spoke of this process to many scientists, some of them Nobel Prize winners, and all showed great interest in this approach. In particular very much interest was shown at the N.A.S.A. Institute by a group of scientists working on the photo voltaic cell. It is there that the cells used in the American Spacecraft are made. They want very much to co-operate with us here and so an Institute working through yogic processes would be of immense value not only to us in India but to the whole world. Hence we here are working with all the means and the various contacts we have to see that such a proposal materializes. This is a magnificent opportunity to show to the world what India really is and how she can lead the world and not just follow in the footsteps of the so-called advanced and developed countries. The lead would be on new paths of knowledge and practical application, as steps towards the new world towards which Sri Aurobindo and The Mother are leading us.

UDAR PINTO
3. Sri Aurobindo's Action---June 1979,

Letter from the Secretary (Second topic only)

Solar Energy

There is, at present, quite some anxiety about resources of energy. All this disquietude arises from our narrow view that our energy requirements can only be met by coal and oil and both are becoming more difficult of access whether from our own resources or from other countries.

Let us examine this question with some spiritual vision and that is really the only true vision on any subject. For such spiritual vision we can know best by asking what The Mother has said on these points because, as Mother had Herself so often explained to me, whenever I asked Her a question, She answered from what She saw and not from what She thought. She repeated often that for over 40 years She had not thought but only 'seen'.

Regarding coal and oil, Mother said, both are fossil fuels and so, by their very nature, belong to a dead past. We should look for our energy requirements-from things of the present leading into the future. With regard to nuclear energy, as I have already written before, (December 1978), this energy is obtained by breaking up the nuclears of the atoms and so, in the very principle, is a destructive energy, the force selected by the Powers that try for the destruction of the world, the Pralaya. The Mother said that we should concentrate our research on Solar Energy. The sun, Mother said, is the physical sign of the supramental, the goal towards which we are moving in Their Yoga. The sun pours down a tremendous amount of energy and only a very little fraction of its is being used, almost all of it goes waste. Particularly in India, we are very fortunate in having so much of the glory and blessing of the sun that we should thank God constantly for it. But we do not realise this great boon and sometimes even complain of it. So I appeal to our scientists and research organisations to make the maximum possible efforts for solar energy research.

Udar


Nuclear and Solar Energy

The 12th World Energy Congress ended at Delhi on 23rd September 83 with the participation of 62 nations in the deliberations on the important question of energy. This reminds me of what I wrote earlier on the development of nuclear destructives and solar energy. I had stated that according to the vision of the Maharshis and Mahayogis our country should keep away from the dark path of nuclear competition.
Our Government now says that even if all the other countries in the world make the nuclear bomb India will not do it. This should have been said earlier and the Mother had tried to get the Government to say this before we had our nuclear explosion. To say it now is closing the stable door after the horse has run away.

The more important thing to state is something which physical science will not accept and that is that energy has characteristics. They maintain that energy is neutral and can be well used or ill used but the Mother has said very strongly that nuclear energy is evil in its very base. It comes from the destruction of the basis of matter, the nucleus of the atom and so its very characteristic is destructive. Even the so-called peaceful purpose is a blind. It can never be peaceful and, somehow or the other, will cause great damage. On the other hand the Mother has shown that the true spiritual energy in the physical comes from the sun. It is the physical symbol of the Supramental and it pours down on us enormous quantities of wonderful energy of which we now use only a very, very small fraction. So our whole attention must be concentrated on using solar energy, in all its forms.

The best form of solar energy is of course what the Mother had seen in an experience where enormous amounts of solar energy was being produced just by the sun shining on vast panels. This is a clear vision of the use of photo voltaic cells for producing electricity directly from the sun's light. Scientists all agree about this, but they say at present the cost of the solar cells is prohibitive for any widespread use. The answer to this is very simple. Let us do more and more research till we find a way of making these cells at quite a low cost. Even now, Japan is making them at one-fourth of the cost of production in the U.S.A. and Western countries. If we in India just stop copying what other countries are doing and do our own research I am sure we can produce the cells very, very cheaply. Instead of spending all that we do on nuclear energy research and even on maintaining the present nuclear research and the power stations we could do much more in photo voltaic research. We have both the scientific capacity and abundance of labour at low cost, so our productivity can be stupendous. I have a dream, and not such an empty one at that, of producing these cells here at Pondicherry with the Mother to guide us to a wonderful result.

But in the meantime there is another low cost method of producing electricity, the lowest cost that exists anywhere and one so highly suitable for our country and yet nothing is being done at all in that sphere. They are doing it in a big way in Israel and in Australia but here, where conditions are so very suitable, nothing at all is done, or very little. I am referring to the use of solar ponds for generating electricity. We had the visit here of Professor Carl Neilson, Professor of Physics at the Ohio University in the U.S.A. and he was here for nearly a month. He gave a talk at the end of his visit and I do wish he had given it earlier. He is perhaps the leading world-authority on solar ponds. On hearing what he had to say I knew how very well we are situated for such a set-up here, particularly at Pondicherry. I am sure that we can set up a 5 Megawatt plant with a solar pond which may be enough for the whole requirement of the Pondicherry town. This idea I am now investigating.
and, if found feasible, I will approach the Government. For one thing I feel we can count on Professor Neilson to help us quite a bit.

Udar

13. Sri Aurobindo's Action-February 1984, Letter from the Secretary

In our Dec. 83 issue I mentioned briefly about the solar pond system of producing electricity. I will develop this a bit further now. But first I must mention about the very important and dedicated work in solar energy that is being done here by Dr. Chamanlal Gupta, one of the members of the Ashram, under the aegis of the Tata Energy Research Institute, and his fine collaborator, his wife Shipra. Presently they are setting up in several places installations of solar water heating systems and they are manufacturing very efficient solar cookers. They had also set up a solar pond in one of our estates but it was a small pond for experiment and they were able to collect valuable data. Now for the big pond that we propose in Pondicherry it is they who will help prepare the scheme.

Let us see how the solar pond works. Generally the water should be to a depth of about three meters and the lowest meter should have a very high concentration of ordinary salt dissolved in it. The middle layer is of a middle concentration and the top layer of a still less concentration. The layers remain separate by themselves and do not mix. When the sunlight falls on the pond it heats the water, but most of the heat goes to the lowest level and stays there leaving the upper layer relatively cool. There is a substantial temperature difference between the lowest level and the top level. In Pondicherry this will be around 46 °C. In the hot, lowest level are laid coils of pipe carrying a low boiling-point fluid like Freon. It is vaporized by the heat and the vapor turns a steam turbine which is coupled to an electric generator. After passing through the turbine the vapor is led into the top layer of the pond where it is cooled back into a liquid and led to the lowest level of pipe coils. The whole system is a closed circuit.

This method of generating electricity is used quite effectively in Israel where they have a 5 megawatt unit. Australia also has some units. But India is ideally suited for such systems and particularly here in Pondicherry we are very well placed.

We have found an area where there is a large expanse of waste water and the whole place is left unused. This can easily be made into a solar pond. As there is a good salt industry in Pondicherry, salt will also be easily available. The proposal has been put to the Govt. of Pondicherry and has been enthusiastically received. Dr. Chamanlal Gupta of TERI has been requested to produce an urgent primary estimate of costs for sanction and then to see about a more detailed scheme. It is suggested that a 50 KW unit be set up in the first instance. It can be expanded later. It will be a unique achievement in this country.
Here are some general facts about solar ponds' electric generation: 1 sq. meter will generally produce 3 to 4 watt-hours. The solar pond keeps its heat even during the night, so the power generation is for 24 hours.

Udar

14. Sri Aurobindo's Action---May 1984, *Letter from the Secretary*

As there seems to be so much interest in Solar Ponds, I follow up the previous notes given in my letter by some more notes.

The 3 zones of the solar pond can be shown in the cross-section diagrammatic sketch of a solar pond given below:

1. **Low Density Surface Mixed Zone**
2. **Gradient Zone**
3. **High Density Storage Zone**

It will be noted that the 3 zones are not of equal depth as had been wrongly stated before. The top, cooling layer is relatively thin and the lowest layer, with the high density salt solution and which contains the heating pipes, is much deeper.

Stagnation temperature may exceed 100°C in this lowest level. The fraction of solar energy converted to useful heat can vary from 20% to 35%, which is very large, indeed, compared to other systems.

Solar ponds can be used to provide process heat for such applications as water heating, crop drying, desalination, absorption refrigeration etc., as well as to operate thermal power units to generate electricity.

Another important advantage of a Solar Pond power generating unit is that it can be operated at peaking modes. For example, the power output available from the 7,000 m² in Bokek pond is less than 2 W per m² or around 14KW electric. Yet it has been operating a 150KW power unit on an intermittent basis. This shows the feasibility of extracting heat for peak loads at more than ten times the average rate without damaging the gradient zone structure of the pond. On this basis, in Israel, the new 250,000 m² pond will operate a 5 Megawatt power station on a duty cycle of between 15 and 20 percent.

From the experience at the Solar Pond at Bhavnagar in India, some of the problems a pond has to face are wind mixing and poor transparency from silt and algae in the sea water used. For a wind
barrier, to minimize the wind mixing, at the Pondicherry project it is suggested that effective blocks of Casurina trees be grown all around especially on the side of the incoming winds in the different seasons i.e. in the South West and North East sides. But this will increase the clouding of the water surface with the dead leaves falling from the trees. So a simple surface cleaning system should be introduced, with a long rope and simple brush, to clean the surface daily or even twice a day. This can be quite easy and inexpensive.

There may be some other practical problems that will arise but it is anticipated, that they will not be serious ones and will be easily met. The experimental pond at Pondicherry, with which I hope to be closely associated as also Dr. C. L Gupta and his wife Shipra, will give us valuable data for larger ponds in India. We have this wonderful gift from God, of so much sun shine that it is a criminal act to let it go to waste.

Now we come to costs. This is the question everyone who is interested will ask. I will give some material on this in the next follow-up letter.

I must here state that practically all the information I have given and will give comes from a brochure, not generally available, titled "A Programme for Solar Pond Development in India" by (1) Shri V.V.V. Kishore of the Central Salt and Marine Chemicals Research Institute, Bhavanagar, (2) Prof. C. E. Nielsen of the Ohio State University, U.S.A., (3) Shri K.S. Rao of the Gujarat Energy Development Agency, Baroda, and Dr. C. L. Gupta, of the Tata Energy Research Institute, at Pondicherry.

I gratefully acknowledge my debt to the above persons and thank them for the data they have provided me.

I pray to the Divine Mother, to bless this adventure in the sun, with Her Light and Grace.

Udar Pinto

14 Sri Aurobindo's Action---June 1984, Letter from the Secretary

In my last letter I wrote that I would follow up with some cost details on Solar Ponds as this will be the decisive factor in the scheme of a Solar Pond. These cost estimates will be very tentative as there are so many varying factors to consider. These varying factors are principally whether a lined or unlined pond will be required. If the soil at the spot chosen is impermeable then an unlined pond can work and this will reduce the cost very much. The lining of a pond with cement concrete walls will be relatively costly.

Other factors which will determine the costs are the availability of salt and its cost. Here at Pondicherry salt is easily available and is relatively cheap. Then to maintain an efficient temperature
gradient in the pond the ready supply of cool sea water which we will have here will reduce the cost appreciably. Then the size of the installation is a very important consideration as the larger the pond the less the cost per KW-installed. Finally there must be some comparison with the cost of power generation with a coal-fired thermal unit.

I give rather briefly some figures from the brochure I have mentioned in my last letter, "A Programme for Solar Pond Development in India", prepared by Messers Kishore, Neilson, Rao and Gupta. They have studied first the cost of Industrial Process from a Solar Pond in relation with that by coal burning.

In this, from the figures given which are fairly recent they show that the cost per KWhr (thermal), including the cost of the land at Rs. 50/- per m², is at Rs. 0.10 and Rs. 0.08 for a lined and an unlined pond. For a coal burning system, with coal price taken at Rs. 600/- per tonne, the corresponding cost would be Rs. 0.22 per KWhr (thermal). This shows the solar pond installation at an advantage. For Power Generation there would be additional factors such as more heat exchangers and turbo generators. But they stress the great difference in the costs of small and larger installations. The tables they have given show the costs of Power Generation of two installations, one of an area of 5,000 m² and another of 1 km², in lined and unlined ponds. Here they find that for the 5,000 m² pond the cost of the power plant per KW installed is Rs. 63,000/- and Rs. 46,900/- for lined and unlined ponds. Against this, for the 1 km² pond the costs are Rs. 45,000/- and Rs. 35,000/- per KW installed for lined and unlined ponds.

The figures given are necessarily tentative and can vary with coal the conditions and also on the experience gathered by installing The smaller units. From the figures in the table referred to above, the cost per KWhr (Electrical) is shown as Rs. 2.68 and Rs. 2.31 for lined and unlined ponds of 5000 m² and Rs. 1.24 and Rs. 1.02 for a 1 km² area. At Pondicherry we have very favorable conditions and so these cost figures can be very substantially reduced to make them quite competitive with a coal-fired thermal unit. These favorable factors are the easy availability and low cost of salt, the sea water, the low cost of the land, the comparatively low cost of labor, especially for the maintenance of the cleanliness of the pond which is very important. And then we have a very good fall of sunlight which can be well above the estimated average of 250 W per m². In their calculations they have taken a solar input of 240 per m².

Finally, from the progress the writers foresee in this field they come to a reserved but optimistic cost estimate which can drop from the present estimate of Rs. 1.0 per KWhr to Rs. 0.40 per KWhr (electrical). This is very encouraging.
15 Sri Aurobindo's Action---December 1989, Letter from the Secretary

A friend has sent me a copy of an article published in "The (Brockton) Enterprise" of the 8th May 1989 written by Christopher Callahan of the Associated Press. It is about a solar car and I found it very interesting for various reasons, so I share my interest with others. The car was designed and built by James Worden, a 1989 graduate of the MIT (Massachusetts Institute of Technology). It is a single seater car, weighing only 270 pounds and named by the designer as "SOLECTRIA". It has a 11ft. by 6 ½ ft. flat panel on the top which carries the photo voltaic cells. The panel is quite low so there is a plastic bubble in it through which the driver can see things. The electric power generated by the cells drives a small electric motor which can move the car up to 90 mph on a flat road. James Worden drove his car from Los Angeles to Washington, a distance of 3,200 miles in two weeks which is a record for such cars. At Washington he was greeted by Senators at the Capitol who praised the car and found it as a great forerunner to a model which will really solve the problem of pollution-free transport and a very good alternative to the dwindling fuel resources.

What interested me most is that this is part of the Mother's vision. Mother had told me very forcefully that the days of the fossil fuels were over and it had to be so. We were living on our past, our dead past as the word fossil itself indicates. We should now move to our future, our glorious future, to an energy from the sun, the physical symbol of the Supramental. Mother had had a vision in which she saw a very large area covered with some kind of flat panels and from this there was a constant supply of electric power coming. Mother asked me if I could interpret her vision in terms of what I knew of the scientific approach in such matters. I told her that it was very clear that the panels were covered with Photo Voltaic Cells which generate electricity directly from the sunlight that falls on them. The current is direct but this could easily be changed to alternate current if required. Mother then said that this is the true future of our power supply and we, especially Indians, should do maximum research in this field. I informed the Mother that the research, at present, had to be in two fields.

- To find more easily made and cheaper materials which give this photo voltaic reaction and with a much higher efficiency than at present and then for more efficient collection of the sunlight on to the cells, such as with Fresnel Lenses etc.

Then there was the research to be done on much better ways of storing the power generated in daylight to be used at night. Research is going on in these fields all over the world and in India also but here on a very small scale, with quite a low priority. We have the talent, quite good talent but much of this goes elsewhere where there is more appreciation and better opportunity for advance than in our country. This must change, it really MUST.

There was one point in the report which really shook me. One Senator said that the amount of carbon
emitted from the exhaust of one single car in one year was equal to the weight of the car itself. This statistic seems quite exaggerated and yet it may be true.

There is more that I will write about Solar Energy in subsequent letters.

23.10.98

Udar

16 Sri Aurobindo's Action—August 1991, Letter from the Secretary

Further to my letter in the June issue of our Journal on the Sri Aurobindo Learning Centre at Baca in the U.S.A. here is some more news about it and the Peace Ship project.

To anyone who may be interested the address of the Centre at Baca is: Seyril Schochen, "Savitri House", BACA, P.O. Box 88, Crestone Co. 81131, U.S.A. The new news is that they are going for Solar Energy in as large a way as possible for them in their present circumstances and are setting up what they call the "Solar Bridge" which will be an all solar electric home. They want to give expression to The Mother's very clear direction that the future world energy must come from the sun which is the physical symbol of the Supramental. In addition there is a plan for a Solar Conference Room, and a Savitri Solar School and in the future a Savitri Solar Village.

Now, the Peace Ship Project. On the ship, on its voyage out to Auroville and back to Rio de Janeiro in Brazil there will be a Floating Seminar on Human Unity and related subjects where some well known world persons will participate. These include Mr. Devan Nair, once President of Singapore Republic, Dr. Karan Singh, The Dalai Lama, Robert Muller, Chancellor of the Peace University, some Youth leaders etc. Dr. Maurice F. Strong, Secretary General of U.N. Conference on Environment & Development at the U.N., New York, is taking a very active part in all these projects. He is one of the candidates to the U.N. Secretary General post when the present incumbent retires. Dr. Strong has donated 61 acres of land to the Sri Aurobindo Learning Centre at Baca Bluffs which will be developed into the proposed Savitri Solar Village.

28.6.91

Udar
2.1. Sri Aurobindo and Solar Power

MOTHER INDIA, April 1967

May 8, 1926, SRI AUROBINDO: In the West the highest minds are turned not towards spiritual truth but towards material science. The scope of science is very narrow; it touches only the most exterior part of the physical plane.

And even there, what does science know really? It studies the functioning of the laws, builds theories ever renewed and each time held up as the last word of truth! We had recently the atomic theory, now comes the electronic.

There are, for instance, two statements of modern science that would stir up deeper ranges for an occultist:

1. Atoms are whirling systems like the solar system.

2. The atoms of all the elements are made out of the same constituents. Different arrangement is the only cause of different properties.

3. If these statements were considered under their true aspect, they could lead science to new discoveries of which there is no idea actually and in comparison with which the actual knowledge is poor.

According to the experience of ancient Yogis, sensible matter was made out of five elements, Bhutani: Prithivi, Apas, Agni (Tejas), Vayu, Akasha.

Agni is threefold:

1. Ordinary fire, Jala Agni,

2. Electric fire, Vaidyuta Agni and


Science has only entered upon the first and the second of these fires. The fact that the atom is like the solar system could lead it to the knowledge of the third.¹

Beyond Agni is Vayu of which science knows nothing. It is the support of all contact and exchange, the cause of gravitation and of the fields (magnetic and electric). By it, the action of Agni, the formal element, the builder of forms, is made possible.

¹ This statement heralds the later scientific discovery of nuclear energy and even of "fusion" (solar fire). (Editor)
3. Syllabi of the Presentation of Dr. Kalam, President of India, to the Legislators of the Pondicherry Legislative Assembly, 1st of November 2004

Ten immediate missions

Dear Members, may I now summarize the ten important missions for your consideration and implementation for sustained prosperity and empowerment of Pondicherry and its regions besides providing employment opportunities for over one lakh of the people of Pondicherry and its regions.

1. 100% literacy for all and Health Care for through Medical Insurance.

2. Establishing 7 - PURA clusters (P3, K-2, M-1, Y-1).

3. Waste Land Development – 20,000 acres leading to 15000 tones of bio-fuel per annum.

4. Total self-sufficiency in milk and dairy products, vegetables, fruits, poultry through intensive Commercial Agriculture

5. Sustainable Water Resource management and arresting further penetration of salinity and setting up of small desalination plants with renewable energies.

6. Establishment of 100 mega watt (VLS-PV) solar power stations, 6 Bio-fuel production plants each of 2500 tones per year capacity and 7 units each of six megawatt municipal waste based power plants Renewable Energies.

7. ICT business alone has to generate revenue of Rs. 500 crores.

8. Thrust in infrastructure for doubling of our tourist arrival and increasing the foreign tourist visits by a factor of five.
9. Aqua Culture and deep sea fishing added with high sea sales should lead to the target of Rs. 300 crores business per year through a collaborative program.

10. Establishing value added Garment industry with an export target of Rs. 1000 crores.

**Mission # 3: Bio-fuel from Wasteland Cultivation**

The total non-agricultural wasteland in Pondicherry is about 15,000 hectares or about 42,500 acres which is about 31% of the total land area in Pondicherry, Karaikal, Mahe and Yanam. Even if we transform 50% of this area to serve a Bio-fuel Mission, nearly 15,000 tones of bio-fuel can be produced from the four regions of Pondicherry in a manner that will serve to integrate their economies, ensure balanced economic growth and generate employment for about 21,000 persons.

This will need setting up of 6 plants at a total cost of about Rs 4.0 crores to process Jatropha seeds into bio-fuel, with each plant having an output of 2500 tones of bio-fuel per annum, yielding a total bio-fuel production turnover of about Rs 15 crores.

**Using Bio-fuel to Produce Drinking Water from Seawater**

The normal use of bio-fuel is to be a substitute for diesel fuel for automotive and industrial purposes. However, for your coastal economy, I suggest a unique application of bio-fuel. Studies carried out in India show that perennial supplies of fresh water can be obtained in a cost-effective manner by desalination of seawater using renewable energies, a system and technology option which is particularly useful for population centers living on the coast line.

Pondicherry and its regions are also endowed with plentiful sunlight. Hence, small desalination
plants can be set up at selected sites on the East and West coasts of India using solar energy and bio-fuel as hybrid renewable energy systems. The bio-fuel production from wasteland cultivation if used exclusively for production of sweet drinking water from the oceans will enable Pondicherry to create 40 million liters of fresh water daily from the oceans.

In this manner, Pondicherry can resolve major two problems with one integrated solution viz-productive use of wastelands and providing sweet drinking water to population centers living along the coastline, through use of new technologies.

**Mission # 5: Integrated Water Resource Management.**

I understand that in Auroville, a UNESCO endorsed International Seminar brought out the problem of seawater ingress into fresh water aquifers in Pondicherry and Tamil Nadu. It is essential to formulate a 20-year Integrated Water Management Plan based on further detailed studies, and then implement the Plan, in an integrated manner. I shall now discuss about the immediate measures for water table improvement and establishment of desalination plants.

**Water harvesting and Recycling:** Water harvesting should become mandatory for all. To improve water table we need to build check dams; develop water sheds, de-silt ponds and rivers, clear the inlets and outlets to the ponds and water bodies and recharge the wells. If our rural areas are made to have operational water bodies, recharging of the wells will take place automatically. These activities will also generate employment.
Water Desalination: In the coastal regions where ground water availability is scarce, India with large coastline of 7500 kms can afford to have number of seawater desalination plants using solar energy. I have seen many of the desalination plants in UAE, where the fossil fuel power sources are abundant. India should use solar power for desalination process, which will be cost effective. Desalination technology has advanced in such a way that there are plants in the world today, which can produce 1000 liters of potable water for Rs. 25. The allocation of special fund in the Central Government Budget 2004-05, brings out a necessity to have a mission-mode programme for setting up of desalination plants. For Pondicherry, it is equally important to plan such a desalination plant using solar power/bio-fuel.
Mission # 6: Renewable Energies

India’s power generating capacity is one-lakh megawatts. For meeting the development targets till 2020 our generating capacity has to increase to three lakh megawatts. This additional power has to come from nuclear energy, hydroelectric systems, renewable energy and thermal energy. The contribution of renewable energy especially from solar energy and wind energy has to be increased to one hundred thousand mega watts. Urgent measures are needed to reduce the distribution loss to less than 5% from the existing 25%. Use of bio-fuel has been discussed earlier for wasteland development mission, which has tremendous potential in the Pondicherry region.

Solar Energy: Productivity and profitability of farmers is affected by unreliable power supply, high cost of electricity, and availability only at night. With increasing demand for energy and increasing oil prices this problem is going to be more serious for farmers in the future. Installation of centralized solar photovoltaic systems, which can be fed to a grid, will be a long-term economically viable solution with added benefits of pollution control. We should build a few 100-megawatt solar power stations, capable of meeting the needs of the farmers with minimum maintenance expenditure. VLS-PV systems can be set up in Pondicherry regions, and gridlocked into the national electricity grid.

Power through Municipal Waste: Increased urbanization has led to a serious problem of accumulation of municipal solid waste in many towns and cities. Efficient and environmentally clean disposal of garbage has always been a major technological challenge. While being a threat to the environment, mounting garbage is also a rich source of energy. The potential for converting this waste into useable energy, which will eliminate a major source of urban pollution, was realized by
one of our innovative organizations- Technology Information Forecasting and Assessment Council (TIFAC) of DST, which helped in developing a completely indigenous solution for the processing of waste into a source of fuel. This fuel could, in turn, be used for generation of electricity through mini-plants. Already in our country two plants, which generate 6.5 megawatt electric power using municipal waste bricks, are in operation. India needs thousands of mini power plants using municipal waste. This can be replicated in Pondicherry and its regions including cities and village clusters as an infrastructure build-up project with the aid of Corporate Houses. This project apart from being an employment generator will provide a clean environment for the people to live in.

**Mission 6: Power through Municipal Waste (Experience)**

Two power plants with 6 MW capacities have been established

Based on solid municipal waste technology developed by TIFAC by two entrepreneurs.

This model can be replicated in other municipal and village clusters

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4. About the Authors

4.1. Martina Schimanski

Martina Schimanski graduated 2004 her Master in environmental engineering from the University Of Applied Sciences Weihenstephan, Germany. Main subjects of her studies were renewable energy systems and waste management. The usage of solar energy by a photo bioreactor was her main interest and the topic of her thesis (Diploma), that she carried out at the Commonwealth Scientific and Industrial Research Organization CSIRO, Melbourne, Australia.

Parallel to her studies, she was employed at the Fraunhofer Institute for solar energy systems ISE, Freiburg and at the Hahn-Meitner-Institute HMI, Berlin, Germany. During this period she was able to gain valuable experiences in this subject on solar energy systems.

In January 2005, she joints the Team of Walter Wagner and Dirk Nagelschmidt as consultant for renewable energy systems.
4.2. Dirk Nagelschmidt

Dirk Nagelschmidt started his career 1988 as professional draughtsman in civil engineering for water, roads and landscaping. From 1992 to 1998 he studied civil engineering at the University of Applied Sciences, Aachen. During his study he specialist in water, waste water and waste. He finished successfully the University with the German title “certified Diploma Engineer” (Dipl. Ing.) which is equal to Master of Engineering (M.Eng.).

Mr. Nagelschmidt has worked as project coordinator and planning engineer at different companies in Aachen and Cologne/ Germany.

In 2002 he came to Auroville/India where he started his company AQUA ENGINEERS.

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4.3. Walter Wagner

Walter Wagner studied landscape architecture and environmental care at the University of Munich/Weihenstephan, Germany, from 1970-1975. As a certified engineer in landscape architecture and environmental care he worked for different companies in Germany and Egypt. He lives and works in Auroville, India, since 1987 and was a member of the Matrimandir management until 2003.