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AN OVERVIEW OF THE TRAINING IN ALTERNATIVE ENERGY TECHNOLOGIES

AT THE

UNIVERSITY OF FLORIDA

SESSION

by

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GUYANA NATIONAL ENERGY AUTHORITY

C O N T E N T S

		Page
1.	ABSTRACT	1
2.	INTRODUCTION	2
	2.1 Introductory Proceedings	2
3.	COURSE MATERIAL	3 - 6
	3.1 Solar Energy	3
	3.1.1 Photovoltaics	3
	3.1.2 Hot Water Systems	3
	3.1.3 Space Heating and Cooling	3
	3.1.4 Water Distillation	4
	3.1.5 Solar Cooking	4
	3.2 Thermomechanical Engines	4
	3.3 Wind Power	4 - 5
	3.4 Hydro Power	5
	3.5 Geothermal Energy	5
	3.6 Projects	5 - 6
4.	FIELD TRIPS AND SIGHT SEEING TOURS	7 - 8
5.	GENERAL OBSERVATIONS	9

1. ABSTRACT

The fifth session of the Training in Alternative Energy Technologies, at the University of Florida, was an informative programme.

Lectures, work-shop construction sessions and laboratory sessions accompanied each of the many topics that were investigated.

Projects were done either by individuals or as a group effort but time was the main problem for not accomplishing the practical part of the project.

The technologies that were investigated to some depths, included the following:-

(a) Solar Energy

(b) Thermomechanical Engines

(c) Wind Energy

(d) Hydro Energy

(e) Geothermal Energy

2. INTRODUCTION

The Alternative Energy Technology Training Programme at the University of Florida, had been accomplished at an appropriate period of time, i.e., at a time when the entire world is interested in non-conventional sources of energy.

2.1 Introductory Proceedings

This fifth training session, was conducted from the 21st of February 1982, to the 4th of June 1982. An arrival and registration week was allocated, and this lasted from the 15th through to the 19th of February.

Before leaving Guyana for this programme, Miss S. Samuels of the Guyana Mission, USAID, gave a brief on the content of the training programme, basic American life patterns, literature on the University of Florida and its surroundings, and emergency telephone numbers to be used while in the U.S.A.

An officer of the USAID, assisted me from my arrival at Miami, to the starting point of the second leg of the journey.

During the registration week, participants were divided into groups and were briefed on administrative matters by the TAET (Training in Alternative Energy Technologies) staff. Following this, a cheque was issued, participants accompanied to the bank and then to the supermarke

Weekly schedules of the programme were issued each week, and covered the activities of the following week.

During the first week of training, a tour of the Engineering and Agricultural Libraries was made. This was followed by visits to a few other parts of the campus to complete a partial tour. At the end of the week, all the participants were invited to an open-air party on the lawns of the Treeo Centre (Training Centre).

A package of general information on various activities in the Gainsville area, was placed in our apartments. In addition to this, some fruits and other eatables were placed in our apartments, for use on arrival.

On the 22nd of February, we assembled in the auditorium of the Treeo Centre for the welcome remarks. This was conducted by Dr. Marston, President of the University of Florida; Dr. Collier, Mayor of Gainsville; Dr. Ohanian, Associate Dean, College of Engineering, U.F.; and Dr. Farber, Director, U.F. Solar Energy and Energy Conversion Laboratory. This was followed by an official tour of the laboratory at Treeo Centre. During this session, we heard of the objectives of the programme.

A few days later, each participant was invited to introduce themself, and speak briefly on their work and interests.

3. COURSE MATERIAL

The Alternative Energy Technologies Training Programme at the U.... included most of the major energy conversion systems that can be classifed as non-conventional. More emphasis was placed on some technologies than others, but a great amount of knowledge was shared generally.

3.1 Solar Energy

The utilisation of energy from the sun, was examined with much depth. Most of the participants have this resource and the path or motion of the sun relative to the earth was explained. This was followed by the quantity of energy generated by the sun, energy lost to different mediums and energy delivered to the earth's surface. Some of the different solar energy utilising systems are discussed below.

3.1.1 Photovoltaics

The construction of photovoltaic cells and their charteristics were explained. Following this, we were shown how they were used in different operations and some of the problems encountered. An engineer from NASA shared some of his experience with us. We heard of the capacities, care and the kind of maintenance to be done on these photovoltaic arrays. Special mention was made of the Suchulli Solar System in Arizona, which we later visited.

3.1.2 Hot Water Systems

Much indepth work was done with Solar Hot Water Systems. It included the description of different types of passive and active systems.

The collectors were thoroughly described, and experimental models were examined. Calculations were done on the passive systems taking the height of the storage tank and the consumption-rate into consideration. We also examined the types of paint, construction material and the method of construction of some types of collectors.

Experiments were done in the lab, which examined the radiation levels, the inlet water temperature and the outlet temperatures for different flow rates.

Use of automatic controls were also explained, and their function was found mainly to prevent relatively hot-water from passing through the collector when the temperature of the collector is lower than that of the water in storage.

3.1.3 Space Heating and Cooling

Solar Space Heating and Cooling Systems were done mainly for the rock-storage or water storage types.

For space heating, lectures were done on systems where hot-water was pumped through solar collectors and into a rock storage, or into some water-tank. Heat from the storage was then allowed to radiate naturally or pumped into a heat radiating arrangement for space heating. Expirments were done for the hot-rock storage systems, where air was blown through a collector, and took heat to the rock storage unit.

3. COURSE MATERIAL

3.1 Solar Energy (cont'd)

3.1.4 Water Distillation

Exhibits for the distillation of water, when using the sun's energy, were examined. They were all of simple construction, mainly of a transparent sloping roof which covers the liquid, and traps the vapour.

We were also informed of an emergency type which only needs a piece of plastic and a container to collect the condensate. For this system, a hole is dug in the moist earth, the contain is placed inside, and it is covered with the plastic. A pebble is put on the plastic to create a conical shape, which then allows the condensate to fall into the container.

3.1.5 Solar Cooking

In the area of Solar Cooking, we were exposed to lectures and slide shows on what is being done in a few countries around the world.

We examined some exhibits on concentrating mirrors, and an umbrella which was coated with aluminium foil-paper on the inside to collect and relfect the sun's rays and concentrate them on a container.

We also saw a system where oil was heated in a Solar Collector and passed through a heat-exchanging coil, where cooking was accomplished.

3.2 Thermomechanical Engines

Many lectures and demonstrations were done on the Stirling Engines, ana Free-Piston Engine-Pump mechanism. The Stirling Engine was equipped with a large fire-box where wood was burnt, and the hot exhaust gas was used to operate the engine.

The Free-Piston Engine-Pump mechanism, burnt LPG as its heat source, but it is possible for Wood-Gas to be used as the alternative source of fuel. This type of pump is only made in the smaller sizes, and of low head and operating pressure.

3.3 Wind Power

Wind Energy Systems were examined in great detail. The lectures were concentrated mainly on the following areas:

(a) Type of data needed before installing a wind machine

(b) Collection of data

(c) Types and Sizes of wind systems

(d) Blade Designs

(e) Construction materials

(f) Different mechanisms involved in the safe operation of a wind powered machine

(g) Estimated wind energy resources around the world.

3. COURSE MATERIAL

3.3 Wind Power (cont'd)

The many lectures were accompanied by an examination of the physical samples of certain components, slide shows and booklets with greater detail.

Most of the different types of wind systems were observed at the Rocky Flats Test Centre in Colorado.

3.4 Hydro Power

For the utilisation of hydro power, the information shared, consisted of general material on the following:-

(a) Types of turbines

(b) Types of dams

(c) Data gathering before construction

(d) Site selection

(e) Effects of some hydro systems

(f) Safety systems

(g) Faults encountered on different systems around the world

A special demonstration was done on the Suwannee River in Florida, where the river flow was measured and the available power was calculated.

A hydro station in the Rocky Mountains was also visited. At this location, we observed the entire operation of this simple and efficie system.

3.5 Geothermal Energy

A specialist in Geothermal Energy informed us of the wonders of this energy source. The general information was centred around the following areas:

(a) Source (the earth's crust)

(b) Potential sites

(c) Methods of drilling and extracting the heat source

(d) Types of geothermal energy plants

(e) Problems encountered with these systems

These lectures were reinforced by the use of slide-shows and booklets

In Utah, we visited a geothermal site where a plant was being erected.

3.6 Projects

All of the participants on this programme were required to be involved in either an individual project, or worked together in small groups or a common project.

The idea of doing a project, was introduced to us during the third week of the 15 week programme. During this period of time, we were to plan, design, test and compile a Report on the project. A half-of-day was normall allotted during each week for project work.

3. COURSE MATERIAL

3.6 Projects (cont'd)

Because of limited time, the practical part of my Project [Maximum Utilisation of Wood-Gas in Surface Transport] was not accomplished. It would have involved the fabrication of the following:-

(a) A gasifier

(b) A cyclone/water heater

(c) A filter/oil bath/cooler

(d) A wood-gas/gasolene fuel system

(e) A water distillation unit

(f) A low temperature heating oven.

Added to the above mentioned components, the electrical controls for the fuel system and the heating/cooling units were to be installed.

The workshop was fully equipped to handle the greater part of the construction and testing of all the projects that were undertaken.

4. FIELD TRIPS AND SIGHT-SEEING TOURS

In addition to the class room lectures and workshop assignments, we were involved in many field trips and sight-seeing tours.

Our educational trips were made to the following places:-

4.1 During the first week of the programme, we visited the Engineering and Agricultural Libraries of the University of Florida's Campus.

4.2 Visited the Florida Solar Energy Centre at Cape Canaveral, where we saw experiments being done on different types of solar cells (panels), and solar-hot-water systems.

4.3 A bus tour of the Kennedy Space Centre in Florida.

4.4 A visit to Disney World.

4.5 We saw an on-farm wood gasifier-tractor, which used wood as its fuel source in order to plough a field. This unit is located at the Rocky Creek Farm, of Lacrase, Florida.

4.6 Visited a Fuel Alcohol Still, which processed corn to produce the fuel. This unit is located at Hatch Enterprises, in Branford, Florida.

4.7 Visited the Commercial Cellulose Plant at Bukeye Cellulose Corporation, Perry, Florida.

At this location, we saw the forest harvesting operations, and we were given lectures on the other parts of the system.

4.8 Visited the Suwanee River in Florida, where Dr. B.A. Christensen demonstrated the assessment of hydro potentials in the flowing river.

4.9 Visited a wood-gasifying plant which fuelled a kiln that is used for drying lumber. This system is located at the Sherrod Lumber Company, Greensville, Florida.

4.10 Visited a wood-biomass plantation at Austin-Carey Forest, Florida.

We saw trees of different ages that were treated with different amounts of chemical, and planted at different spacings. One of the objectives was to find a tree with more mass, which grew in the shortest time.

4.11 Visited the Biogas-Microalgae Hycinth Project at the Energy Research and Education Park, University of Florida.

At this site we saw the Water Hycinth Plant being grown, harvested and used in gas producing equipment.

4.12 Visited the Solar Park of the University of Florida. We saw a few different types of mobile homes, permanently installed, and connected to a computer. Data on their temperature and humidity at selected points were recorded and analysed.

4. FIELD TRIPS AND SIGHT-SEEING TOURS (cont'd)

4.13 Visited a laundry in Florida which uses hot-water from plastic coils on the roof of the building.

4.14 Visited the Gainesville Municipal Airport, where the Solar Array (photovoltaic cells) provides heating and cooling for the building.

4.15 Visited the Budweiser Brewery in Jacksonville. At this plant, an active solar hot-water system was seen. Also, extensive damage was observed on their hot-wax storage system.

4.16 Visited the Saint Petersburg Times building in Saint Petersburg, Florida. There we observed a computer controlled Darrius wind-machine, used for supplying electricity to the building, and a solar photovoltaic system.

4.17 Visited some of the laboratories of SERI.

4.18 Visited the Rocky Flats Test Centre in Arizona, where we saw many different types of wind machines under test.

4.19 Visited the Suchilli Village in Arizona. At this location, we saw a photovoltaic powered system that supplied the electrical needs of those residents.

4.20 Visited the Grand Canyons and other nearby State Parks.

These are a larger part of the many places that were visited, but, the others were of equal importance and serve as a source of knowledge.

5. GENERAL OBSERVATIONS

During the Alternative Energy Training Programme, I was informed from (GNEA, Guyana) of a proposed extended training programme at NASA. This was followed-up by a few phone-conversations from Mr. Marsic in the USA, who promised to send my return tickets that will cover the trip to and from Gainesville/Ohio/Washington.

After leaving Guyana with little or no cash, I requested some cash to cover my expenses on this additional programme, but nothing was sent from Guyana and Mr. Marsic promised to repay the bills.

Because of the non-availability of cash, the training at NASA had to be aborted.

However, the Alternative Energy Technologies Programme was very informative and the effort for understanding the science was very great.

Some of the topics were done in greater depth than others, mainly because the energy resource was not common to all of the participants' homeland. But, the knowledge gained, will allow all the participants to have firm background knowledge in most of the technologies which can be applied around the world.

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The Director,
USAID (Guyana Mission),
Main Street,
Georgetown.

Attention: Ms. Sylvia Samuels

Dear Sir/Madame,

Report on the Training in Alternative Energy Technologies at the University of Florida, during February/June 1982

Attached herewith, please find my Overview of the Energy Technologies Programme, which I attended earlier this year.

My Project Report, entitled "Maximum Utilisation of Wood-Gas in Surface Transport", was already delivered immediately on my return to Guyana.

I hereby express my sincere thanks to the USAID, for the opportunity to be trained in Alternative Energy Technologies. Also allow me to express special thanks to Ms. Sylvia Samuels for her logistical support in ensuring that my attendance to the programme began without major discomfort.

Yours truly

A. Marks

A. Marks

c.c. Cde. B. Crawford
Cde. A. Felix
Cde. E. Carberry

12