

CHAPTER VIII: MINISTRY OF NEW AND RENEWABLE ENERGY

8.1 Activities of Solar Energy Centre

SEC surrendered 44 to 76 per cent of the funds allocated during 2002-07 indicating poor financial management as it had little work of project implementation. The testing facilities established at SEC were underutilised. SEC did not take up any in-house, joint collaborative research, consultancy, bilateral and multilateral projects with other research institutions/industry. It also did not develop any new technology or have any research papers published in reputed Indian and foreign journals. Three grants-in-aid projects were not completed successfully resulting in unfruitful expenditure. The scientific manpower responsible for implementation of various projects were frequently transferred from SEC to the Ministry which seriously impacted the activities of SEC.

8.1 Introduction

The Solar Energy Centre (SEC), established in 1982, is a dedicated unit of the Ministry of New and Renewable Energy (MNRE) for development and promotion of solar energy technologies in India. The main objective of SEC is to serve as an effective interface between the Government and institutions, industry and user organisations for development, promotion and widespread utilisation of solar energy in the country. The SEC campus is located in district Gurgaon and is headed by an Advisor & Head who is assisted by the Director and the heads of various divisions.

8.2 Objectives

The objectives of the Solar Energy Centre are as follows:

- To act as a national test and standardisation centre for solar energy materials, components and systems.
- To take up joint collaborative research projects with other research institutions and industry.
- To provide advisory and consultancy services to industry and users.
- To organise training courses, workshops and conferences.
- To coordinate /participate in bilateral and multilateral projects.
- To undertake systems design, engineering and prototype development.
- To evaluate new and improved technologies/ products/systems to assess their adaptability to Indian conditions.

Audit findings related to achievement of objectives by SEC are discussed in the succeeding paragraphs:

8.3 Financial Management

Fund requirements for SEC were included in the Demands for Grants of MNRE. The details of funds budgeted and actual expenditure incurred during 2002-07 were as under:

(Rs. in lakh)

Year	Budget Estimates	Expenditure	Amount unspent	% of amount unspent
2002-03	500.00	216.52	283.48	56.68
2003-04	380.00	212.29	167.71	44.13
2004-05	405.00	150.79	254.21	62.77
2005-06	495.00	174.44	320.54	64.75
2006-07	930.00	223.84	706.16	75.93
Total	2710.00	977.88	1732.10	63.91

It is evident from the above table that the SEC could not spend 64 per cent of the budget allotment during 2002-07. The extent of savings at the end of each financial year also increased consistently from 44 per cent in 2003-04 to as high as 76 per cent in 2006-07. Further, rush of expenditure ranging between 45 to 100 per cent was also observed under various heads in last quarter and in the month of March during 2002-07. Huge unspent amounts indicated poor financial management and affected project implementation.

The major expenditure of SEC i.e. 76 per cent was on Secretariat expenses whereas other activities accounted for only 24 per cent of the total expenditure during 2002-07, indicating insignificant expenditure on R&D activities.

Reasons for savings /low expenditure under various heads was attributed by SEC to limited scientific manpower in position/non availability of suitable manpower, delay in getting inputs and concurrence of floating of tenders, delay in finalisation of technical specifications, delay in issue of sanction for programme continuation of SEC, non clearance of files from higher authorities, frequent transfer of scientific manpower in the ministry, non-finalisation of tenders, non taking up of new projects as meeting of R&D Advisory Committee did not take place, non availability of suitable candidates under visitors programme and postponement of training programmes. The savings resulting from the reasons stated above affected the activities of SEC.

While accepting the facts, SEC stated in October 2007 that sanction for recruitment of around 30 specialised scientists for the Centre with adequate exposure and experience in the subject is awaited and budget provision is made with good intention to undertake required activities. The reply of SEC is not tenable as the savings under salary were insignificant (2006-07) as compared to the savings under the heads like machinery and equipment, grant-in-aid etc.

8.4 Testing, Standardisation and Certification

One of the main objectives of SEC was to act as a national test and standardisation centre for solar energy materials, components and systems. In pursuance of this objective, SEC established Solar Thermal and Photovoltaic Testing Facilities during 1992-94 and a Battery Test Facility in December 2000. However, SEC did not conduct any feasibility study to assess the number of samples likely to be received and tested before creation of facilities. MNRE also did not make it mandatory for all manufactures to get their products tested and certified by SEC. Consequently, the number of samples received for testing was very low. A review of SEC in respect of these facilities revealed the following:

8.4.1 Solar thermal testing facility

SEC did not fix any targets for the testing of samples. Further, analysis of data of samples revealed a decreasing trend of samples of solar thermal devices received and tested during 1992-97 (74 samples), 1997-2001 (69 samples), and 2002-2007 (26 samples) despite the fact that number of manufacturers of solar thermal devices in the country had increased from 51 in 1997 to 82 in 2007.

SEC tested an average of five samples each year earning only Rs.0.27 lakh during the period 2002-07, which demonstrated the fact that the testing facility was not being efficiently utilised for testing of solar thermal devices.

8.4.2 Solar photovoltaic testing facility

It was observed that SEC did not fix any targets for testing of these samples also. Analysis of data of samples of photovoltaic devices received and tested revealed a decreasing trend during 1992-97 (1085 samples), 1997-2001 (668 samples) and 2002-07 (538 samples).

Further, it was observed in audit that SEC did not work on the qualification testing of crystalline and thin film based materials. It also did not evaluate field supplied/installed systems involving Other Authorised Test Centres (OATC) by development of field kits, formats, procedures, coordination of testing activities of OATCs. The creation of additional facilities for qualification testing modules/components and creation of additional mechanical test facilities for shock, bump, vibration testing/development of new standards/test procedures was not done by revising the existing standards of test procedures as proposed in the Tenth Plan period.

SEC, in its reply in October 2007 stated that the basic objective of setting up these facilities were not routine testing only but also to facilitate the industry and research organisations for development of products. So, targets for testing of samples were not fixed. The contention of SEC was not acceptable as not only did the number of samples tested declined over the last three Plan

periods, SEC could not also take adequate steps to upgrade testing facilities and revise existing standards of test procedures. The performance of SEC in undertaking R&D activities was also dismal as discussed in paragraph 8.5 below.

8.4.3 Battery test facility

There are about 75 Photo voltaic (PV) System manufacturers in India using different type of batteries in PV Systems. While creating the battery test facility, SEC anticipated an average of about 20 samples to be tested in a year and revenue generation of Rs.10 lakh per annum with Rs.50,000 per samples as testing fee. Against the target of testing of 100 samples and revenue generation of Rs.50 lakh, SEC could test 50 samples with revenue generation of Rs.4.28 lakh only during 2002-07¹ at the rate of testing only 10 samples per year. The revenue generation from testing of samples was low due to not conducting qualification tests.

To operationalise the battery testing facility, SEC procured battery testing equipment and battery charger in February/March 2000 for Rs.33 lakh. The facility remained operational for about six months in the beginning but was put on hold as no officer of SEC took over the facility from September 2002 to May 2005. The facility was reactivated in May 2005. As such the facility, which was created after incurring an expenditure of Rs.33 lakh, remained completely unutilised for about three years due to non deployment of an officer to run the facility.

Thus, due to under-utilisation /non-utilisation of the facility, the objectives set forth while creating the facility were only partially achieved.

SEC accepted the fact of under-utilisation/ non-utilisation of the facility for three years during 2002-05. Regarding non achievement of target of revenue generation, the reply of SEC that revenue generation was not a mandate of SEC was not acceptable as it could neither achieve its mandated objective nor minimise its dependence on Government funding by generating internal revenue. Also, SEC while justifying the setting up these facilities in 1999, had specifically projected revenue generation of Rs.10 lakh per annum through sample testing, which was not achieved.

8.4.4 Photovoltaic Global Accreditation Programme for testing of solar photovoltaic module

To enable Indian photovoltaic industries to participate in global tenders and to get global recognition for SEC reports, SEC, in July 1998, initiated a proposal for testing of solar photovoltaic module. The nodal agency for International Electrochemical Commission Quality assessment (IECQ) accreditation was

¹ SEC collected only Rs.4.28 lakh as qualification testing was not done and charges for qualification testing were higher than the other tests.

Standard Testing Quality Certification (STQC) Directorate in the Ministry of Communications Information and Technology. In September 2001, SEC engaged Electronic Regional Test Laboratory (ERTL), New Delhi for consultancy job for preparation of quality manual, procedure manual and other necessary documents and advise on various issues related to IECQ accreditation. SEC was requested to fulfill the condition that all equipment would be in working order and trained manpower would be available for conducting tests. It was observed in October 2003 that three environmental chambers were non functional and there was problem of trained manpower as the scientists actively involved in IECQ accreditation activity were transferred from SEC to Ministry in October 2003. SEC did not take any further action on this for getting IECQ accreditation. Thus, the main objective of enabling photovoltaic industry to participate in global tenders with SEC report was also not fulfilled due to infrastructural and manpower problems.

SEC in its reply in October 2007 accepted the fact and stated that initiatives are now being taken for taking IECQ Accreditation.

Thus, the objectives of SEC to act as a national test and standardisation centre for solar energy materials, components and systems remained unfulfilled as solar thermal testing facility, solar photovoltaic testing facility, battery test facility remained underutilised and the Photovoltaic Global Accreditation Programme for testing of solar photovoltaic module did not fructify due to poor project management.

8.5 Projects and R&D activities

One of the objectives of SEC was to take-up joint collaborative research projects with other research institutions and industry and to coordinate/participate in bilateral and multilateral projects and consultancy projects. During 2002-07, SEC did not take up any in-house, joint collaborative research, bilateral, multilateral projects with other research institutions/industry. Further, no consultancy projects were undertaken.

During 2002-07, SEC did not develop any new technology to be adopted by the end users and did not publish any research paper in any reputed Indian/foreign journal. It also did not develop any prototype/product.

It was observed that SEC disbursed grants of Rs.63 lakh for three projects during the period 2002-07. However, none of them were successfully completed, thus making the total expenditure of Rs.63 lakh unfruitful as discussed below:

8.5.1 Solar Desalination system

SEC sanctioned a project “Design, Development and Testing of Low Temperature Solar Desalination System” to The Energy and Resources Institute (TERI) in February 2002 for rural and industrial applications with an

outlay of Rs.13.27 lakh for a duration of two years. The project involved the design and testing of a proto-type solar desalination system with capacity of 100 litres per day (LPD) of desalinated water with an improved cost efficiency ratio of at least 30 *per cent*.

SEC released Rs.13 lakh to TERI and the duration of the project was extended upto May 2003. The progress report submitted by TERI in October 2004 was sent to an expert in August 2005 for obtaining views on the project implementation/completion. The expert expressed his disappointment stating that results of TERI system were the same as conventional methods but at double the cost. Further, the expert was of the view that there was no creative input at TERI's end. As a result, the project executed by TERI was termed as null and void. The maximum yield obtained from the system was only 61 LPD against the proposed yield of 100 LPD.

Thus, the main objective of the project to design a proto-type with capacity of 100 liters of desalinated water per day and to improve the cost efficiency ratio at least by 30 *per cent* was not achieved rendering the expenditure of Rs.13 lakh, wasteful.

SEC, in its reply accepted the facts and stated that the matter has been brought to the notice of the R&D Advisory Committee of MNRE in July 2007 and an expert panel has been constituted for suggesting remedial measures.

8.5.2 Midway Closure: Development of test procedures for thermal devices

The SEC sanctioned a grants-in-aid project "Development of test procedures for solar thermal devices" in March 2002 to Indian Institute of Technology (IIT), New Delhi at a cost of Rs.20.74 lakh for three years. As per work plan, the full fledged test facility, infrastructure and expertise available with SEC were to be used to achieve the objective of development of test procedures for thermal devices. SEC released first installment of Rs.7 lakh in March 2002.

In March 2004, the Principal Investigator (PI) from IIT informed SEC of non-functioning of the test facility. Despite this being pointed out repeatedly, SEC failed to make the test facility functional. As a result, PI discontinued the work on the project after submission of second interim report in October 2004, without achieving the objectives fully. Thus the project was terminated midway rendering the expenditure of Rs.7 lakh unfruitful.

Further, the Advisor, Solar Energy Group of the Ministry, while examining the project proposal had commented in March 2002 that SEC should not become a grant giving body and ideally such work should be done by SEC itself. Despite such comments of Advisor, SEC did not take up the project as an in-house R&D project and instead, sanctioned the project to IIT.

Even though in the Tenth Plan document it was proposed that R&D projects at SEC would be taken up independently as well as in collaboration with other institutes, SEC did not take up any project independently during 2002-07.

SEC, in its reply in October 2007, stated that due to limited manpower, the projects were not taken up as in-house R&D. The reply is not tenable as taking up research projects independently as well as in collaboration with other agencies is one of the prime objectives of SEC.

8.5.3 Integration of Solar thermal plant with biomass gasifier system

SEC installed and commissioned a 50 kWe² Solar Thermal Power Plant (STPP) in 1989 at a cost of Rs.2 crore for harnessing solar energy. However, as it could not demonstrate its rated capacity of 50 kWe. SEC proposed integration of biomass gasifier with the existing 50 kWe STPP to generate reliable power by using the heat generated through Biomass Gasifier.

To achieve this objective, SEC sanctioned a project “Solar Hybrid Renewable Energy Power Plant” in August 2000 to TERI with a total outlay of Rs. 31.03 lakh for duration of two years. TERI was to design, develop and fabricate the biomass gasifier boiler and integrate it with 50 kWe STPP to supply steam for operating the STPP at full capacity on a continuous basis. The system was to be operated in a standalone solar mode as well as in an integrated mode with the biomass gasifier.

SEC released a total of Rs.43 lakh in three installments during October 2002 to March 2004 and extended the duration of the project from October 2002 initially to October 2004 due to change in design and configuration of the plant. TERI reported to SEC in October 2004 that they had achieved 20.5 kWe load (lower than the rated capacity of 50 kWe). In December 2004, the grill of the gasifier broke and the system was opened for maintenance but could not be repaired and the plant has remained mostly non functional for the last three years. Thus, the main objective of the project was not achieved even after lapse of six and a half years from the date of start of the project and after an expenditure of Rs.43 lakh released to TERI.

Thus, the STPP which was installed at a cost of about Rs.2 crore with additional expenditure of Rs.43 lakh for integration of biomass gasifier system, is now non functional, both in the standalone solar mode as well as in an integrated mode with the biomass gasifier. Further, SEC could not achieve its objective of harnessing solar energy for the generation of energy.

While accepting the facts in October 2007, SEC stated that the matter has been brought to the notice of R&D Advisory Committee of MNRE and an expert committee has been constituted to review the matter and submit a report.

² Kilowatt energy

8.6 Lack of monitoring/evaluation of projects

In the Tenth Five Year Plan, it was proposed to set up a Research Advisory Committee (RAC) for SEC having members from academic institutions, industry, users, programme implementation agencies and concerned Ministries and Department of Central Government. The Committee was to meet twice in a year to review the work of SEC and to advise on new programmes and projects to be taken up. SEC did not constitute RAC as proposed. Thus, activities/programmes of the SEC were not monitored by the Committee.

Further, though the grants-in-aid projects were sanctioned by the RAC of MNRE, the progress/final reports were not submitted to RAC for monitoring/review. Thus, the monitoring mechanism of projects was inadequate.

The reply of SEC that it is a technical division of MNRE and therefore, its functioning is being monitored by the Secretary of MNRE was not acceptable as no progress reports/final reports of projects were submitted to RAC of MNRE for monitoring and evaluation of projects.

8.7 Manpower

The number of scientists in position in SEC varied from 4 to 12 during 2002-07. During 2002-07, the strength of scientists kept fluctuating indicating frequent transfers from SEC to MNRE and vice versa. MNRE did not frame any transfer policy for the scientific cadre due to which the R&D activities of SEC were affected. MNRE also did not conduct any work-study for assessing the actual requirement of manpower in SEC since its establishment. The continued poor performance of SEC with respect to non-achievement of objectives was attributed by SEC to serious manpower constraints, which remained unaddressed by MNRE.

8.8 Training

Organising training courses was one of the objectives of the SEC. However, it was observed that the SEC did not prepare any annual training programme or fix annual targets. SEC conducted only four training programmes during 2002-05 as compared to 17 training programmes during 2005-07.

SEC accepted the facts in October 2007 and attributed the shortfall in training to manpower constraints.

8.9 Workshop

SEC established a workshop in 1982 for fabrication and maintenance of mechanical items required to support development and testing works of various divisions. The workshop had a working strength of eight technical persons. No work relating to fabrication of Solar Thermal or Photovoltaic

testing divisions was done during 2002-07. Machinery costing Rs.11.56 lakh installed in the workshop had not been utilised at all after 2003. In addition, equipment worth Rs.17.86 lakh issued to workshop till 2000 were yet to be installed and equipment/spares worth Rs.1 lakh procured for the workshop were still lying in the stores. Due to non utilisation of the workshop, the entire expenditure of Rs.30.42 lakh was rendered unfruitful.

It was further observed that out of the available 51,892 man hours, only 686 man hours were utilised during the period 2002-07 rendering 98.70 *per cent* of the available time as idle. Even the utilisation of 686 hours was for insignificant jobs such as polishing of furniture, painting of almirahs, painting of signboards, etc., which was not the mandate of workshop. Thus, the manpower deployed in workshop remained idle and SEC incurred unproductive expenditure of Rs.39.65 lakh on pay and allowances during 2002-07 on idle manpower.

SEC in its reply accepted the facts and stated that the manpower recruited for the workshop has been engaged in other activities. However, SEC did not furnish the details of activities where the manpower was redeployed.

8.10 Infrastructure

As on 31 March 2007, SEC had infrastructure worth Rs.19.30 crore. The infrastructure created was under utilised/ non- utilised as discussed below:

(i) Land: SEC was allotted 199.66 acres of land by Government of Haryana in January 1986 free of cost. Out of 199.66 acres of land, around 4.20 acres was utilised for office building, power plant, workshop, pump room etc., and remaining land was not being utilised by SEC for any purpose. SEC stated that the land is being utilised for a pilot research project on bio fuel plantation apart from technology demonstration and evaluation projects.

(ii) Building: In 1991, SEC occupied the office building constructed by CPWD at a total cost of Rs.5 crore. The building has an administrative and technical block, two rooms in porta cabin, two rooms in battery bank and power control room, three rooms in sun simulator building, one big hall for workshop and seven rooms and two halls in guest house. Out of the 57 rooms in administrative and technical block, 21 rooms are lying vacant since 1991. The big hall of the workshop has been occupied with old and idle machinery. The guest house has seven rooms with 14 beds with a very low occupancy of only 6 *per cent* during 2002-03 to 2006-07.

Further, the technical block was constructed with centrally air-conditioned facility which was not functional and SEC made alternate arrangement by procurement and installation of 40 air conditioners costing Rs.7.83 lakh instead of making the existing facility operational. Thus, SEC maintained

large infrastructure which was neither commensurate with its present activities nor justified on the basis of deployed manpower.

While accepting the facts, SEC stated that as part of strengthening SEC, plans are being made for setting up the fuel cell centre for the Ministry and construction of an international guest house when national guesthouse had little use. Regarding vacant buildings, SEC accepted the facts and stated that the initiatives had been taken for utilisation of vacant portions by setting up advanced lighting laboratory, expanding the battery test facility and indoor exhibition hall etc.,

8.11 Conclusion

Despite availability of huge amount of funds at their disposal, SEC failed to achieve any of its objectives. The testing facilities established at SEC were underutilised. SEC was also unable to obtain global recognition for testing of solar photovoltaic module to enable photovoltaic industries to participate in global tenders. SEC did not take up any in-house, joint collaborative research, consultancy, bilateral and multilateral projects with other research institutions/industry. It also did not develop any new technology or have any research papers published in reputed Indian and foreign journals. Three grants-in-aid projects were not completed successfully resulting in unfruitful expenditure. The monitoring mechanism of projects was inadequate. The scientific manpower responsible for implementation of various projects, conduct of R&D and testing and certification of solar energy materials/systems were frequently transferred from SEC to the Ministry; seriously impacting the activities of SEC. The large infrastructure maintained by SEC was not justified with reference to its present activities and deployed manpower.