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20516

DP/ID/SER.C/41
28 January 1994
ORIGINAL: ENGLISH

PILOT PLANT FOR SCIENTIFIC GLASS PRODUCTS

DP/VIE/92/007

VIET NAM

Report of the evaluation mission*

Prepared in cooperation with the
Government of the Socialist Republic of Viet Nam,
the United Nations Development Programme, and
the United Nations Industrial Development Organizztion

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* This document has not been edited.

V.94-20494

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SUMMARY

Part A

Project title: Demonstration Plant for Scientific Glassware

Project number : DP/VIE/80/030

Executing Agency	UNDP Budget (US$)	Project Approval
UNIDO	Orig. 1,874,548 Rev. 2,572,552	21.3.1988

Government Implementing Agency	Government Budget (VN Dong)	Operation Started
People's Committee of Hanoi, Hanoi Scientific Glassworks (HSGW)	27,177,400	May 1988

Evaluation Team

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Evaluation Dates

13 - 28 November 1993

I. Objectives

The immediate objective was stated to be the development and demonstration of local production capability of pyrex (hard borosilicate) quality scientific glassware. The project was to increase the quality and durability of currently produced scientific glassware; introduce new types and designs; increase service life through repair facilities and establish feasibility of expanding the production of such glassware.

II. Purpose of the Evaluation Mission

Beyond assessing the achievements of the project against its objectives and expected outputs the emphasis of this evaluation was to assess the factors that have impeded the fulfillment of those objectives. Issues which were to be reviewed include the suitability of the technologies selected, adequacy of pilot plant design, performance of all parties concerned, reasons for delays and cost increases, prospects for financial and technical self-sufficiency and recommendations on how to proceed to bring the project to a successful conclusion, if possible. See terms of reference (Annex 1) and List of Persons met (Annex 2).

III. Summary of Findings and Conclusions of the Evaluation Mission

After an extremely long project planning phase lasting just over five years the project was signed on 18 March 1988. The basic project design was set during 1983 as a result of two preparatory assistance missions. Delays in getting the project approved mostly revolved around the choice of appropriate technology for the project. Differing expectations of what the project was to achieve needed to be resolved. Should the project focus on new product development or on actually producing hard borosilicate glass. The technical requirements for each focus are

obviously different. The approach finally chosen was an amalgamation of both approaches without fully considering resource implications. The continuing lack of adequate financial resources severely constrains the likelihood of success in fully achieving either of these objectives.

Moreover, the sophisticated technology which had to be ultimately chosen to be able to produce would class hard borosilicate glass proved to be more expensive than estimated and much more difficult to transfer to (Hanoi Scientific Glassworks) HSGW than planned. In hindsight when troubles became apparent during 1990 an evaluation should have been carried out to provide analysis for either stopping the project or to recommend that the demonstration facility be developed on a build, operate and train sub-contract basis.

The project budget had to be increased by 37%. Underestimations were made in all budget components. However, the non-expendable equipment component was responsible for 80% of the 37% increase. Expenditures, however, were well managed and controlled and great deal of time on the part of all concerned was spent to find the least expensive inputs as possible. Budget constraints affected project implementation timeliness from the beginning and the quality of many pieces of equipment supplied.

Further problems were experienced by HSGW inability to meet their counterpart obligations in a timely and adequate fashion. Most of the problems encountered were beyond their control. They experienced working capital problems, and problems of absorptive capacity were apparent throughout the project's implementation phase. Expert advice and assistance was planned on a split mission basis. Too much of their time had to be spent trouble shooting to get the facilities ready for commissioning at the expense of having time to develop production management systems and to train staff.

Short missions also forced the experts to leave behind long lists of things that HSGW were supposed to do which were unrealistic. Problems with this approach persist to date. The feasibility of the project is now in question in view of new Government market oriented policies and the down-scaled production facility provided under the project. The extent to which low cost labour can counterbalance high per unit consumable and energy costs remains to be seen. Recommendations to help resolve this problem are made in this report.

As it now stands, with the exception of the secondary forming section, none of the stated objectives of the project have been achieved because the facilities have yet to be completed. If support to HSGW were be withdrawn now, they would not be in a position to realize planned capacities nor would sustainability be assured.

IV. Recommendations

The project may be continued in either of the three following scenarios:

(i) complete only the installation of the furnace

(ii) up to the completion of the installation of the whole production plant, or

(iii) until production facilities are completed, and the transfer of production skills and management capacities are achieved.

The report details prerequisites for continuation which includes the need to ensure adequate working capital for HSGW and greater managerial autonomy for HSGW.

The current confusion with respect to who is responsible for what action needs to be resolved immediately. Initially UNIDO should moderate between HSGW and the major supplier, AFT Ltd. Subsequently the National Project Director (NPD) should take ownership of the project and manage it to its successful conclusion.

How to complete the production plant under the three scenarios listed above are set out in the Recommendations Chapter of this report, cost estimates are also provided. (See paragraph 94 for a special recommendation concerning project supplied gas generators.)

V. Lessons Learned

- Preparatory assistance to identify and design projects do not guarantee good project design. Experts hired to carry out such assignments need to be fully briefed and guided throughout their assignment. Moreover, preparatory assistance should not be used to justify a pre-conceived project ideas but should question the relevance, cost-effectiveness and sustainability of the idea before proceeding with the design of a project.

- Very detailed consideration during the design and implementation phases has to be given to the existing capacities and capabilities of staff in terms of their ability to absorb new technologies, especially if the technology chosen is highly sophisticated and which in effect represents a jump from first to a third generation technology.

- Technology transfer requires more than supplying machines and teaching staff how to operate them. Management quality, safety and business practices have to be up-graded as well.

- If there is a requirement to transfer a sophisticated production technology requiring a multitude of coordinated tasks and inputs from various sources under difficult conditions, a comprehensive supply, build and train sub-contract should be given to implement the project. Although expensive at first sight, in the long run it should prove to be more cost-effective.

- The projects critical assumptions and external factors changed during its design and implementation. Although everyone was aware of these changes not enough consideration was given to the possibility of reassessing the project when the changes occurred. An early decision to carry out an in-depth evaluation is desirable under these conditions.

I. PROJECT CONCEPT AND DESIGN

A. Socio-economic and Institutional Context of the Project

General context

1. Vietnam's recorded gross domestic product (GDP) was estimated to be US$ 9.1 billion[1]. Annual average growth rate of GDP during 1986-1990 was 3.9%. In 1992, the GDP increased by over 8%, and this growth rate is expected to be maintained for the rest of the decade. The estimated GDP composition in 1992 was agriculture 34.5%; industry 22.6%; services 42.9%. The adjusted GNP per capita is 220 US dollars (1992 estimate), one of the lowest in the world. During 1992, the inflation rate was 17.5%. The exchange rate at the end of 1992 was 10,700 Dongs per US dollar.

2. The transformation from a bureaucratic centralized economy to a market oriented economy managed by the State, called "Doi Moi", began in an *ad hoc* manner during the late 1970s and the early 1980s. It was formally launched as a programme in 1986, intensified in 1988, with sweeping reforms, and is now in full swing. Vietnam now has multi-sectoral economy where the state and the private sectors operate and compete on a more or less equal footing.

Vietnam's "Doi Moi" Reform

3. Vietnam is reforming its administrative structure, economic management systems and social programmes. These reforms include opening-up of opportunities for private sector development; increased autonomy for state enterprises and requirements that they operate on a non-subsidized basis and in a competitive environment; decontrol of prices, allowing market supply and demand forces to work; trade liberalization and reorientation to export led growth; and encouragement of foreign investment.

4. These reforms will place great demands on the people of Vietnam. However, the macroeconomic situation is seen to have greatly improved, and a positive investment climate has emerged. Instability is still a danger during this transition period. State enterprises will no longer be the main revenue base, since their protected environment has been stripped away to allow greater domestic and international competition.

Vietnam's Competitive Advantages

5. Vietnam is endowed with several comparative advantages. Foremost is Vietnam's large, hard working and literate labour force. Vietnam's labour force is therefore a potential competitive force, if it can be coupled with effective management, sound policy and technology. Large numbers of educated unemployed and underemployed, and a low wage structure are attracting a growing volume of investment in light industry.

6. To absorb the approximately 32 million labour force, as in the case of other developing countries, Vietnam wants to pursue employment creation opportunities in the processing and service-related industry. Vietnam is well situated to do so. In addition to its competitive labour force, Vietnam is located in the most dynamic economic region in the world.

7. Vietnam's strategy for socio-economic stabilization and development focuses on the following eight key components:

- Investing in people:
  - (a) Investing in education and training;
  - (b) Promoting health, nutrition and family planning;

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[1] Statistics taken from General Statistics Office, published in document 'Vietnam: A development perspective', Hanoi, September 1993.

(c) Human settlements and housing;
(d) Labour force adjustment and employment assistance.

- Sustainable development and environmental protection:
  (a) Commitment to the principles of Agenda 21;
  (b) Reduce the negative environment of careless exploitation of forests;
  (c) Minimizing damage to marine ecology caused by offshore oil and gas exploitation.
- Strengthening investment, savings and efficient resources allocation:
  (a) Macro-economic stability;
  (b) Continuation of market oriented reform;
  (c) Promotion of foreign direct investment;
  (d) Restructuring of public administration;
  (e) Rationalization of state enterprises;
  (f) Strengthening of the legal system, especially concerning property sights, taxation and financial reforms.
- An outward oriented trade policy:
  (a) Reduce export and import restrictions;
  (b) Improve tariff system and exchange rate;
  (c) Strengthen trade relations with neighbours;
  (d) Seek membership in GATT.
- Build on comparative advantages and sectoral strengths:
  (a) Strengthen agricultural sector in conjunction with integrated rural development;
  (b) Transfer land to farmers;
  (c) Improved access to credit facilities;
  (d) Apply achievements of science and technology to agricultural production;
  (e) Improve rural infrastructure;
  (f) Promote investment in food processing;
  (g) Better use of pesticides and herbicides;
  (h) Extensive reforestation;
  (i) Better provision of energy sources to light industry;
  (j) Improved product quality through improved technologies;
  (k) Improve quality of tourist services;
  (l) Develop reserves of natural raw materials to improve processing capabilities and attract foreign investment.
- Target future public sector investment to where maximum development effects can be attained:
  (a) Develop efficient transportation, communication, infrastructure;
  (b) Improve supply of electricity and other forms of power for expanding production activities;
  (c) Balance development amongst the regions in the country.
- Strengthening science and technology:
  (a) Modernize economy;
  (b) Intensify research in applied sciences and application of appropriate technologies most importantly in agricultural sector and natural resource industries.
- Maintain flexibility in implementation of development strategy:
  (a) If required adjust strategy based on lessons learned.

8. While a great deal has been accomplished largely with Vietnam's own resources, the Government has stated that these achievements can only be sustained if supported by additional resources Towards this end, the normalization of relations with the International Monetary Fund (IMF), the World Bank and the Asian Development Bank (ADB) has made it possible for new opportunities for increased external assistance and foreign investment to be realized. Foreign direct investment is seen as an important element bringing with it new trading opportunities, the latest technology and up-to-date management expertise. While actual investments have so far

been modest (US$ 1.5 billion 1988-1992), compared to some Asian countries, commitments are growing at an impressive rate.

9. To realize this programme, which envisages to double Vietnam's GDP by the year 2000, an increase of investment as a percentage of GDP is planned to be raised from its current level of 12 per cent to about 25 per cent of GDP by the year 2000.

Source of investment	*US$*
State budget	9 billion
Private sector and state enterprises	11 billion
Official development assistance (ODA)	7-8 billion
Foreign direct investment	12-15 billion

10. Overall, UNDP has played a leading role in the provision of development assistance, particularly during the time when technical advice and other resources from the convertible currency area were very limited. UNDP financed and UNIDO implemented projects have played a major role in developing Vietnam's industrial sector. Vietnam anticipates that the IMF, World Bank and the Asian Development Bank will play an increasing development role in Vietnam. They are already seen to be playing an important role in providing advice on the implementation of social, economic and management reforms.

Position of Glassware Industry in the National Economy

11. Basic consumption goods and materials manufacturing is an industrial category that has been given priority in the Vietnamese Government's development strategy, porcelain and glass/glassware industry is one of 15 major industries belonging to this group.

12. The raw materials for glass such as silica sand; feldspar; dolomite are abundant in Vietnam. All other batch materials except alumina hydrate and cerium concentrate could be sourced in Vietnam.

13. The main glass/glassware factories are operated by central state enterprises:

(1) Khanh Hoi glassware factory in HCMC, producing bottles for beverages with a design capacity of 25,000 tons per annum.

(2) Dap Cau sheet glass factory, producing sheet-glass for windows with a design capacity of 2 million sq.m. per annum.

(3) Hai Phong glass factory, producing home-use glassware and vials for injections with a design capacity of 8,000 tons per annum.

(4) Hai Hung medical glassware factory, producing glass tubes for medical equipment and hospital use.

14. In addition there are several small glassware factories operated by municipal people's committees, among which is the Hanoi Scientific Glass Works, which is being assisted by the project.

15. Current annual domestic production is about 32,000 tons of glass/glassware. To this production volume HSGW contributes about 130 tons.

16. Scientific or laboratory glassware constitute an indispensable input to the sectors of education, medicine and health care, scientific research and industrial research, development and control. The effective functioning of these sectors is considered to be of vital importance to the rehabilitation and further development of the Socialist Republic of Vietnam. The present serious deficit in availability of these materials which range from simple test tubes and flasks to the most

sophisticated scientific glassware represents serious obstacles to the smooth functioning of the sectors referred to above. For these reasons, the local manufacture of scientific glassware is regarded as an activity of national importance.

Present Situation of Hanoi Scientific Glassworks

17. The scientific glassware manufactured in HSGW with the coefficient of thermal expansion of $54.10^{-7}/°C$ leave much to be desired, in spite of HSGW's proprietary in producing this quality glassware throughout the country.

18. At present, the production facilities of Hanoi Scientific Glasswork may hardly be said to have the reached an industrial standard and level of production. HSGW has two production sites. The old site was established during 1947 which has a melting section there are five one-pot furnaces with capacity of 200kg per pot-batch. Most of the forming section uses hand-blowing and manual forming technology.

19. The second site was built to house the demonstration production facility supplied by this project. The factory has yet to start production. The facility will be described in detail later in the report.

20. The factory's personnel comprises 160 people including the administrating staff of 20% and direct labour. Twenty skilled glass forming workers (primary and secondary) are presently employed.

21. HSGW's annual contribution to GNP and to the national budget is approximately VND mil. 400-500 and VND mil. 100-120 (including different taxes, capital depreciation; social insurance etc.). Since 1989, the business operates on market supply and demand principles. HSGW has recently managed to supply hand blown glassware to Japan.

B. Project Document

22. The project titled "Demonstration Plant for Scientific Glassware"; numbered VIE/80/030 started during January 1983 with a planned duration of three years.

Project Objectives

23. The development objective of the project is to meet the domestic demand for scientific glassware in terms of quality, quantity, range of articles; price and delivery time. The problem to be addressed under this objective was described to be the poor capability of the domestic scientific glassware industry in terms of quantity as well as quality.

24. The immediate objective was stated to be the development and demonstration of local production capability of pyrex quality scientific glassware. The project was to:

(1) Increase quality and durability of currently produced scientific glassware.

(2) Introduce new types and designs made of scientific glass.

(3) Increase service life of glassware through the establishment of a mobile capability for repair of damaged glassware as well as for assembly of complicated glass articles from standardized components.

(4) Demonstration of scientific glass market potential and by analyzing the economic feasibility of expanding the production of such glassware.

Project Document - Analysis of the Design and Appraisal Process

25. The project design process benefitted from two preparatory assistance missions to formulate the project. The first mission took place during July 1982. The objective of the Preparatory Assistance was to plan UNDP/UNIDO assistance to help Vietnam to produce a "certain number of laboratory glass of standard quality, including thermometers and densimeters. The development objective was stated to raise the level of training and scientific research in the country by placing at the disposal of laboratories glass apparatuses required to carry out research in support of the "techno-scientific revolution" in the country.

26. Towards this end a project was to be designed which envisaged that a facility be established to: (a) repair technical and scientific equipment; (b) develop sophisticated scientific instruments made from glass; and (c) produce scientific high quality glass products for chemical laboratories through a new production pilot plant.

27. The problems the project was to address include the following:

- the lack of enterprises with the capability to produce quality scientific glass products;
- the number of technicians in this field were inadequate;
- their level of skills were low;
- the capacity to produce an adequate number of scientific glass products was too low;
- the scientific glass equipment produced was of low and highly varied quality;
- existing production facilities are only able to meet a very small portion of the demand.

28. It was further stated that importation of scientific glass was costly, took a long time and carried the risk of breakage. The solution to the above stated problems was a project to develop capacities to significantly meet the needs of the country and promote the development of new industries. Moreover it was felt that scientific glass products were indispensable for the teaching of science.

29. A need to rapidly repair existing scientific glass products and instruments close to the locality where they are being used was also considered necessary.

30. The outputs of the preparatory assistance project included a preliminary market study and based on this study a project document which specified the expertise and equipment required to carry out project activity. A scientific glass expert was to be given three months to produce these outputs. UNDP during July 1982 reduced the time allowed to two months for reasons which are unknown.

31. The market study was to assess the market potential for scientific glass, existing production capacities and the kind and quantities of glass products being imported. The study was also to estimate the demand for scientific glass products and the feasibility of producing scientific glass apparatuses locally. The project to be formulated was to include a plan of action for the development of the sector and include a proposal for the establishment of a pilot plant and for the training of personnel required. The project proposal was to be for a maximum duration of two years and a budget limit of approximately US$ 500,000 was set.

32. It should already be noted here that the Preparatory Assistance Document presupposed the need for a pilot plant despite the fact the preparatory assistance was to first carry out a market cum opportunity study.

33. The consultant who carried out the Preparatory Assistance proposed a project which a total budget of US$ 975,000. UNDP requested UNIDO to prepare a final draft document within this amount using the newly introduced "short" format for project documents which was under experimentation at that time. The project proposal prepared by the preparatory mission included

an equipment component totalling US$ 400,000 which required special justification under the criteria laid down in PPM Section 4600.

34. The original draft proposal prepared by UNIDO Headquarters based on the preliminary draft prepared during the Preparatory Assistance phase during 1983, was submitted on 14 May 1984 after UNDP was able to inform UNIDO that the Government of Vietnam had confirmed that US$ 975,000 could be allocated from the IPF.

35. The draft document prepared by UNIDO had three immediate objectives:

(1) To cover most of the demand for scientific glass, including the introduction of new types of scientific glass apparatus, the introduction of hard borosilicate and the improved useability and durability of scientific glass products.

(2) Establish the possibility of repairing scientific glass apparatus to reduce the need for replacements and were relevant imports.

(3) To create awareness amongst glass producers of the need for quality scientific glass and to train a core group of glass producers on how to produce quality glass.

36. The outputs needed to achieve the above objectives were:

(1) A range of apparatus designed and produced on a pilot basis which are more sophisticated to what is presently be produced and where there is a large demand.

(2) Designs and prototypes produced of hard borosilicate glass as required by local end users.

(3) Quality specifications developed for scientific glass products already being produced.

(4) The means to produce the above outlined products locally and producers trained in new techniques required to improve existing production.

(5) The establishment of four repair centres.

(6) Staff and workers trained to be aware of the needs of end-users and able to apply the technologies introduced by the project.

37. The above project proposal was severely yet correctly criticized by UNDP because it lacked specificity. The input and output section was considered useless for project management and monitoring. UNIDO was requested to redraft the document using the old project document format in accordance with UNIDO project document formulation guidelines. The draft eventually prepared was appraised to be more clearly formulated.

38. Yet the May, 1984 'short format' proposal listed external factors which correctly predicted potential problems which could affect project sustainability. External factors included: eventual problems in supply raw materials including project tubes; adequate source of energy; ability of government to supply counterpart contributions for the repair centres; the degree of staff turnover at the pilot centre and their willingness to cooperate in achieving project objectives.

39. The original UNIDO proposal mainly called for didactic equipment for secondary glass working, a small batch furnace for US$ 110,000 and pyrex tubes (12 tons for US$ 75,000) for secondary forming. A continuous production furnace was not included. A pilot training centre was to service three production plants. On 31 July 1984 UNDP Hanoi criticized that the project did not contain essential elements such as a production furnace and semi-automatic glass forming machines. UNDP stated the Government of Vietnam was disappointed about this omission. UNDP

then requested UNIDO to incorporate these items. They also requested that a full time Chief Technical Adviser be included.

40. On October 12, 1984 UNDP's Technical Advisory Division (TAD/BPPE) also prepared an appraisal of UNIDO's proposal. The appraisal highlighted that the Preparatory Assistance Mission clearly proposed that a "Pilot Production Unit" 2 km from the existing Hanoi Glasswork Factory should be built. TAD also criticized the preparatory assistance report by saying that it excludes information and data on scientific glassware requirements and that the report does not explain how a production facility producing 4-8 times more than the existing facility can be considered a "pilot" facility.

41. The appraisal criticized the poorly executed project document logical framework. TAD also supported UNDP Hanoi by commenting that the UNIDO proposal lacked two crucial items, a furnace and its auxiliary equipment and a semi-automatic glass forming machine. The exclusion of these items would make the whole pilot plant inoperable. In conclusion the document was considered technically so poor that a proper appraisal was considered to be impossible.

42. In response UNIDO notified UNDP that a 'pilot production facility' would cost more money. On 16 March 1985 UNDP informed UNIDO that the project budget could be increased to US$ 1,350,000 which would be the final allocation. This increased amount was to cover a full time Chief Technical Adviser and a furnace and annealing Lehr machine as well as inputs already included in previous project proposals. The initial proposal to establish three repair workshops was dropped by Government.

43. UNDP Hanoi also requested UNIDO to list the project end-users and end-products as contained in the Preparatory Assistance report. UNDP also specified that the pilot plant should be able to produce 2,000 to 3,000 tons per year.

44. At this juncture it appears that the nature of the project had been changed from a small pilot training demonstration project to a small scientific glass production facility project.

45. On 3 May 1985 UNIDO in an internal memoranda expressed concern that the furnace and Lehr annealing machine required for this project are of a larger capacity than what one would normally recommend for a simple pilot and demonstration unit, and wondered about UNDP's ability to approve the project with such a large proportion of equipment.

46. On 15 July 1985 UNDP Hanoi, submitted the latest draft project document prepared by UNIDO to UNDP's Regional Bureau. They explained that the long delay in producing the draft is because two Preparatory Assistance Missions did not succeed in producing an acceptable project document, and that the project allocation originally foreseen by the Government was insufficient and had to be increased several times with delays in getting approvals at each stage.

47. UNDP praises the July 1985 version of the project. The objectives were judged to be precise and the outputs were considered to be properly quantified and qualified, and clearly related to activities and inputs. The project also had more information about end-users and the current situation of the scientific glass industry in its background and justification section.

48. From reading the UNDP's appraisal letter, it was made clear that the project should set up a pilot production facility which should meet the 2,000 to 3,000 tons 1986/87 per year demand estimate of Government, even if the plant to be built would be five times the current production capacity of the Hanoi Glass Works Company (HSGW).

49. Yet UNDP adds in the letter that the purpose of the project was to introduce new technology and designs for the manufacture of scientific glassware in Vietnam. The new plant was to demonstrate the new technologies and train staff in applying them. The inconsistency is apparent in that the plant will *de facto* be more than a pilot plant given the size of production expected, especially when the planned facility is compared to the existing production capacities.

50. In response to UNDP's questions about the high proportion of equipment in the project, UNIDO on 10 March 1986 stated that there is no justification for the large size of the furnace and the lehr annealing machine, which together would produce five times the present domestic manufacture in Vietnam, to develop new product types and shapes using new technologies. A smaller furnace would be sufficient along with an equally appropriate Lehr machine (chamber type). The cost for such equipment was expected not to succeed US$ 100,000.

51. UNIDO added, if Government wished to install production type equipment UNDP would have to accept a much larger investment so that the unit cost of output becomes more economical. UNIDO also proposed that if funds are short that the Government may wish to consider financing the equipment.

52. During a mission to Vietnam a UNIDO senior staff member (15-25 April 1986) was informed by Government that they were erecting a new plant to house modern production facilities and that these facilities would house as well the project supplied pilot plant and training unit based on UNIDO recommendations. Government intended to gradually increase production from 100 t/y to 500 t/y in three years (1990) and to 1,400 t/y in another five years (1995). The pilot line was to produce in a balanced fashion 100 t/y of borax glass but should also be capable of producing pyrex and other types of glass[2]. A chemical quality control laboratory and thin wall glass tubing production machines were also required.

53. In response to the above information UNIDO seeking expert advise from several sources concluded (in a Note for the File dated 16.9.86) that a production facility is only viable at an annual production capacity of 1,500 - 2,000 tons. Machines producing glass tubes have a minimum production capacity of approx. 1,000 tons/year. Therefore a 100 tons/year unit must be based on imported tubes combined with a small furnace to enable semi-automatic or manual shaping . The minimum capacity for a small furnace was considered to be 5 tons/day. Smaller capacities would require a pot melter.

54. It was again felt that the project should concentrate on training of local staff and on the development of scientific glass based on domestically available raw materials. The 100 t/y unit should be based on imported tubing.

55. At the same time the project should also take preparatory steps toward a full scale tube factory before deciding to expand facilities. A market and feasibility study would be required which should consider an eventual joint venture arrangement.

56. Meanwhile the Vietnamese Government was applying pressure to get the existing project document approved (cable UNDP to UNIDO dated 25.8.86). The major problem on the UNIDO side was the difficulty they were having to find a supplier able to provide the scaled-down production equipment and provide an estimate of how much such a facility would cost.

57. UNIDO notified UNDP Hanoi on 27 August 1986 that delays are being caused by difficulties in obtaining responses from equipment/engineer companies to supply a 100 t/y borosilicate glass production facility. UNIDO was finding it extremely difficult to put together a workable technological package.

58. UNIDO, in response to pressure from Government, offered to finalize a tentative revised version of the project document using the, at that time, imposed limit of US$ 343,000 for non-expendable equipment. UNIDO said that if in the meantime clarification from suppliers is received which requires a substantial increase of budget, UNIDO would inform UNDP. The Backstopping Officer was sent to Vietnam to reformulate the project document during the third quarter of 1986.

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[2] This was later found to be infeasible.

59. The project document finally prepared represented an "amalgamation" of the points of view of all parties concerned. The proposal included a pyrex only melting furnace for the first time. The question was whether such a furnace could be supplied for US$ 300,000 budgeted in the draft document. Copies of the draft document were sent to UNDP Hanoi and to UNDP, New York for appraisal.

60. Appraisal comments were received from the Technical Advisory Division (TAD) of UNIDO during October, 1986. UNDP Hanoi agreed with the appraisal and asked UNIDO to reflect TAD's appraisal comments in the final version of the project document.

61. UNDP, New York supported the approval of the project and considered it a "suitable basis for further negotiations". The approval recommendation is based on the proviso that UNIDO provides UNDP with a more realistic cost estimate based on yet to be received replies from suppliers. UNDP and UNIDO at this juncture, both expressed concern that a firm technological foundation had not been found to support the expressed project approach. UNDP, New York on the other hand said that UNIDO has made a significant effort to find a solution and said that they were monitoring their efforts closely.

62. It was subsequently found that for small furnaces to produce pyrex quality glass an all electric furnace is required, that the technical solution based on 100 t/y was impossible, and that the project would, therefore, require a large increase in the equipment component. The Government also preferred a 100 per cent electrical furnace. UNDP New York and Government wanted justification for the proposed equipment before formally approving the revised project budget, which now totalled US$ 1.74 million.

63. A Country Programme (III) Review Mission discussion on 19 February 1987 agreed that UNIDO should prepare a comparative statement and analysis of the equipment offers received analyzing the capacity and the advantages of various offers. Based on this analysis the project document should be revised once again.

64. On 8 May 1987 UNIDO sent a revised version of the project which included US$ 900,000 for a furnace. On 20 October 1987 UNDP based on information received from UNIDO and after having obtained concurrence from the Government submits a project document for the pilot plant which will require a US$ 600,000 increase in the budget.

65. An appraisal report dated 20 October 1987 prepared by the UNDP Hanoi Office was attached to the project document. The appraisal highlights the following:

Budget	
Total UNDP Project	US$ 1,874,548
Total Government Input	Dongs 27,177,400
Duration	3 years
Breakdown of UNDP budget	
Personnel	US$ 458,133
Training	US$ 77,000
Equipment	US$ 1,330,000
Miscellaneous	US$ 9,415

66. The report stated that the choice of technology to be used was a major factor for the delay of over five years to approve the project. The large increases in budget was mainly due to the decision to go for a continuous furnace which was deemed to have substantial advantages over simple and less expensive technologies. Detailed justifications for this had been requested from UNIDO. The technology chosen for this project will be analyzed in a subsequent section of this report.

67. The UNDP appraisal provided a useful summary of the problems to be solved by the project. The production of scientific glassware was suffering from underutilized capacity, energy and material shortages. shortage of foreign exchange, old and poorly maintained capital stock, and low productivity. By addressing these problems the project was to increase the availability of scientific glass to the hundreds of educational, health, scientific and production institutions which have laboratories, quality control and related activities requiring precise and durable scientific glassware. Justification was further provided by a report describing the urgent need for glass in the pharmaceutical industry and by the fact that many UNDP projects had to import initial stocks of scientific glassware. The proposed solution to be provided by the project was to help overcome some of the operational constraints by upgrading the technology of glass making and widening the range of domestically produced products while increasing their quality. The focus on the solution was stated to revolve around the pilot plant which will increase the production capacities.

68. The shift to a production facility is now fully evident in this appraisal note. The production plant has now overshadowed the demonstration aspects, pre-production pilot activities and most importantly the training focus of the original proposal.

69. Only one major question was raised albeit an important one. The absorptive capacity of the counterpart factory was questioned. Would they be able to increase capacity to increase production from 120 t/pa to 500 t/pa from 1987 to 1990 during the project's lifetime and to 1,400 tons/pa by 1995.

70. To address the issue of further investment requirements the project included allocations for a feasibility study to promote investment interest for further production capacity.

71. The end-users of the high quality pyrex glass to be produced included:

Schools
Universities
Engineering and technical
Research institutions
Hospitals
Pharmaceutical industries.

72. The Government counterpart commitment was considered to have been amply demonstrated by having already completed the construction of the buildings for the production facility during the long preparation phase. It was reported that only detailed work on layouts and infrastructure requirements still needed to be clarified.

73. Finally, on March 14, 1988 the full project was signed, five years and five months after the start of the Preparatory Assistance phase of the project.

Analysis of Original Project Document

74. The logic of the project at the Development Objective and Project Objective level was correctly formulated namely that if the immediate objectives to increase the quality/quantity durability and variety of scientific glassware is achieved the project will have help solve the wide discrepancy between demand and supply due to low production of high quality glass, which would in turn help solve the problem of a lack or shortage of scientific glass instruments in the country. The alternative of simply importing these requirements was, however, not fully discussed.

75. The project third objective to increase the service life of glassware through repair was later dropped due to financial constraints. The fourth objective to demonstrate the potential and provide an analysis of the economic feasibility for the expansion of the production of scientific glassware was an understatement in that the project was intending to more than demonstrate an already proven technology in that a down-scaled production facility was planned even if it was to be only small one by international standards.

76. The objectives lack project success criteria and critical assumptions and are as vague as they were five years before. The Background and Justification Section provides a good list of reasons why the beneficiary institution Hanoi Glass Works was producing inferior glass products. They are:

i) Inaccurate raw material preparation and mixing as well as lack of proper temperature control in the furnace;

ii) Variations in tube dimensions due to hand drawing techniques;

iii) Lack of high temperature burners in the hand forming glass blowing department;

iv) Otherwise imprecise working routines and lack of quality consciousness among the staff;

v) Ineffective annealing resulting in high susceptibility to breakage;

vi) Insufficient or non-effective quality control procedures.

77. The answer to these problems were stated to be the introduction of new technologies in "all parts of the production process". Whereas the causes for the lack of quality not related to technological hardware were not properly discussed nor are they being addressed by the project now. This demonstrates that the project overall is a technology/engineering driven project. Where any eventual increase in quality is expected to originate more from the operation of advanced equipment. Specific programmes and training to create awareness and knowledge of the importance of quality and how even under difficult or primitive conditions this can be achieved were not included in the project.

78. Moreover, to successfully run a commercially viable scientific business requires more than the introduction of modern technology. It requires staff with marketing, financial management, human resource management, cost-control, sales and distribution, purchasing, product design, quality management etc. skills. These aspects were not covered by the project.

II. PROJECT IMPLEMENTATION

A. Delivery of Inputs

UNDP/UNIDO Inputs

The breakdown of the original budget and the latest approved budget is provided below:

Breakdown of budgets

BL	DESCRIPTION	Original budget approved on 21.3.1988		Budget revision P 13.6.1991		Percentage increase or decrease
		M/M	US$	M/M	US$	
	PROJECT PERSONNEL					
11-01	CTA	33.1	234.683	33.1	293.883	+ 25%
11-02	Blowing expert	12.0	85.200	12.8	96.162	+ 13%
11-49	Total		319.883	45.9	390.045	+ 23%
11-50	Short-term consultants	15.0	111.300	15.0	147.649	+ 32%
11-99	**TOTAL EXPERTS**	**60.1**	**431,183**	**60.9**	**537,694**	**+ 25%**
15	Project travel		5.000		19.672	+ 293%
16	Other costs		21.950		21.949	0%
19	**TOTAL**	**60.1**	**458,133**	**60.9**	**579,315**	**+ 26%**
21	Sub-contracts		0		1.116	N.A.
31	Fellowships		56,000		54.038	- 3%
32	Study tours		15.000		39.740	165%
33	In-service training		6.000		6.000	0%
39	**TOTAL TRAINING**		**77,000**		**99,778**	**+ 30%**
41	Expendable equipment		50,000		25.000	- 50%
42	Non-expandable		1,280,000		1,857.669	+ 45%
48	Savings		0		-222	N.A.
49	**TOTAL EQUIPMENT**		**1,330,000**		**1,882,447**	**+ 41%**
59	Miscellaneous		9.415		9.896	+ 5%
99	**PROJECT TOTAL**		**1,874,548**		**2,572,552**	**+ 37%**

79. Subsequent to the full project document approval on 21 March 1988 up to 16 June 1991 there have been six project revisions. Three were mandatory end of year revisions. Three revisions were significant in that they respectively increased the budget by US$ 516,030 (on 27.2.90), US$ 95,299 (on 27.11.90) and US$ 77,975 (on 16.6.91).

80. In financial terms the project's budget had to be increased by US$ 698,004 (37%) from 21 March 1988 to 16 June 1991 of which US$ 577,669 were needed to cover underestimations in the non-expendable commitment component which not only included the cost of major prices of equipment but also for their installation and commissioning. The non-expendable equipment component was responsible for 80% of the overall 37% increase in project budget. The other budget line increases average 30% and mostly reflect dollar devaluation and inflationary factors.

81. The non-expendable equipment component was budgeted at a total of US$ 1,280,000, of which US$ 900,000 were earmarked for the glass melting furnace. Ultimately, the furnace was purchased for US$ 1,143,465. The considerations and decisions leading to its eventual purchase in December 1988 are documented as a separate item in this report.

82. This additional expense consumed a major part of the equipment funds balance. Only after a tripartite review meeting in February 1990 did the Government and UNDP accept a budget increase sufficiently large to accommodate the cost overrun as well as the increased costs of other equipment items resulting from price increases over the years. It was also during this tripartite meeting that first doubts were raised regarding the feasibility of sourcing a stand-by generator in Vietnam as originally foreseen in the project document. In the end, the project had to import a generator for US$ 75,000, which of course increased the non-expendable equipment component of the project.

83. Overall, the budget was inadequately prepared, major underestimations were made in manufacturing and secondary forming and control equipment. Due to financial restrictions already imposed during the design stage, funds required to readily ensure that eventually a high quality product is produced were seriously curtailed.

84. The reasons for the large underestimation of the non-expendable equipment component is analyzed under the project inputs section of this report.

85. For reasons of computerized book-keeping at UNDP Headquarters, New York, the original project number DP/VIE/80/030 could no longer be used, and it was, therefore, decided to close the old budget as of 31 December 1991 and to transfer the remaining funds to the new project with the same title and objectives but with a new number DP/VIE/92/007. The exact amount available under this project was US$ 225,708 of which only the up to then unobligated amount of approximately US$ 140,000 remained available for programming.

Training

86. Six HSGW staff benefitted from six in-depth training programmes to the U.K. Below is a table indicating the staff trained, the place of training and duration.

No	Full Name	Profession	Project	Place of training	Time of training
1	Nguyen Ngoc Chau	Silicate engineer	Chief engineer	Bibby Ltd Gyproc Ltd	2 weeks 2 weeks
2	Nguyen Phuong Dong	Mechanical engineer	Mechanical superintendent	Bibby Ltd Gyproc Ltd	2 weeks 2 weeks
3	Nguyen Hong Nga	Electric engineer	Electric superintendent	Gyproc Ltd	4 weeks
4	Nguyen Mai Nhung	Silicate engineer	Furnace superintendent	Gyproc Ltd	5 weeks
5	Nguyen Duc Long	Silicate engineer	Benchworking superintendent	Bibby Ltd	7 weeks
6	Dinh Huu Hung	Forming worker	Forming worker	Corning Ltd	4 weeks

87. In addition three senior staff benefitted from a study tour to visit potential suppliers of project equipment in Doncaster (U.K.), Nürnberg, Düsseldorf and Wuppertal (FRG) from 30 September to 30 October 1988.

Equipment

88. The UNDP/UNIDO have supplied the following equipment: melting furnace, annealing lehr batch equipment, complete set of equipment and tools used for 15 positions of bench working, office supplies and two automobiles, cullet and several chemicals, machines and tools used in laboratory, stand-by generator (650 KVA), press and blowing machine repaired by

project, moulds for 300 ml and 500 ml serum bottles, screw conveyor for batch transfers.

89. Special Case of Project supplied furnace On 7 May 1987 UNIDO prepared a note to provide justification for the continuous furnace provided under the project. The note states that there are three options a pot, a day tank and a continuous furnace. The quality of glass improves from option one to three because of the larger volume of the melting vessel as well as inclusion of additional features which promote higher melting temperatures, higher chemical and physical stability and homogeneity of the glass and better control. These features were reported to increase cost. By how much was not known.

90. The only real alternatives for high quality glass according to experts was a day tank and a continuous furnace with the latter having advantages of homogeneity of glass melt. A continuous furnace has flexibility in controlling output. By increasing energy input and raw material feed, one can increase the output by twice the total volume of glass held and if necessary the pull can be reduced to a small fraction of maximum with a minimum amount of glass extracted and recirculated as cullet. The problem of not being able to shut off the furnace, and the high cost of electrodes and refractories replacement was not discussed.

91. The note stresses that UNIDO recommends that a continuous melt furnace be given first priority and that this position is fully supported by the counterpart authorities. The problem at that time was stated to be that the minimum capacity furnace available is around 3-4 tons/day, but that UNIDO was endeavouring to identify smaller models. Another issue was the source of energy which may be either electricity or fossil fuel or a combination thereof. Because electricity has distinct advantages it was considered the first option by UNIDO and Government.

92. The conclusion was then that a continuous furnace, fully electrically heated with the minimum capacity available on the market should be purchased. This solution was considered the most appropriate technical solution from point of view of glass quality and flexibility of operation. The idea being once this technology is proven the design of new and larger production furnace based on the technology developed could be planned. The decision to proceed with this approach forced the project to spend US$ 243,465 more than planned for the furnace despite great efforts to find a cheaper offer and an additional unforeseen expense of US$ 75,000 for a stand-by generator to ensure a continuous power supply.

93. Gas generators problems with quality and safety The two gas generators supplied by the project are performing far below specifications. The gas produced is only enough for 13 high temperature burners instead of the expected 26. Moreover, the materials used for their fabrication is of lowest quality. The safety devices failed early and had to be replaced by locally produced copies. Overall the gas plant gives the impression that it was shoddily produced and more importantly is highly dangerous. Throughout the evaluation the room which housed the plant smelled strongly of gasoline vapors which of course is highly explosive. The gas plant should be closed down, especially since the gas room is attached of the secondary forming section outer wall and is next to the entry of the administration block where all visitors of cars pass. A carelessly disposed cigarette or an electric spark from a car could be all that it would take to set off an explosion.

94. The plans to scrap the gas plant should be immediately undertaken since methane gas in now available in the market. It is the opinion of the CTA, project experts and the evaluators that such gas generators should not be purchased from the same source again unless a radical change of design and materials are made. If units cannot be satisfactorily put into operation suppliers should be requested to place these units in full working order at their own expense.

Government Inputs

95. HSGW has provided the buildings with a total area of over 3,000 m^2 to house the pilot plant, the buildings were already completed by 1980, however, they were only put to use during 1990 when the melting furnace and equipment for the secondary forming section were being

installed. Because of inadequate design and lack of maintenance for about ten years the quality of the buildings were determined to be inadequate. During 1990 remedial works were carried out to strengthen the buildings and to weatherproof them.

96. During the implementation of the project many changes to the buildings had to be carried out to enable the equipment to be installed. A number of these changes were not in the original project design, for example the need to build a raw material store, build a generator house and a basement for the electric furnace for the cooling plant. Each change caused a increase in the counterpart budget which required the approval of higher authorities which in turn caused delays. Government was also committed to provide electricity and unforeseen facility infrastructure requirements for installation of the equipment. These were provided albeit with great delays mostly due to slowness in getting adequate financial allocations from the People's Committee of Hanoi.

97. Other government commitments are fully described in the project document pages 18 to 20, and include:

- senior, technical and clerical staff
- technicians and unskilled labour
- non-expendable equipment which are available or can be produced in Vietnam
- operational and maintenance costs including raw materials and supplies
- logistic support including local transport of project staff, secretarial support, custom clearance and transportation of UNDP supplied equipment

98. Inputs such as 100 tons of sand had been purchased by HSGW during 1989 and other materials were bought since 1991. The NPD has been holding over 500 million Dongs VN of her production budget in abeyance for years. Furnace and other equipment installation had been delayed partially due to the lack of experience of Vietnamese workers, and lack of tools.

99. Special case concerning stand-by generator During project implementation a great deal of anxiety was encountered in deciding on a suitable solution to the need of ensuring that a reliable source of electricity would be available in case the mains supply is interrupted. For this contingency a stand-by generator was envisaged which according to the project document would be supplied as a counterpart contribution in kind. However, when the project counterparts tried to locate a suitable generator locally they were not able to do so. Subsequently UNDP and UNIDO tried to obtain authorization from the Vietnam Government to increase the UNDP project budget to import a stand-by generator. Since the project was already costing more than planned and represented the largest project financed by UNDP in Vietnam there was a reluctance on the part of the Vietnam Government to agree to an upward project revision to finance the generator. HSGW stated that the problem of locating a generator locally was also caused by the changes of specification by the CTA and AFT. The original specification of 250 KVA was progressively increased to 650 KVA. With each change a new search was started.

100. Formal correspondence on this issue started on 23 February 1990 when the CTA wrote a letter to justify the need for a reliable stand-by generator. The CTA indicated that a suitable generator was unlikely to be found in Vietnam and proposed that a second-hand unit be purchased abroad. On 28 May 1990 the UNIDO Country Director wrote to the National Project confirming his support for the CTA position and requested a quick decision on the stand-by generator.

101. During July 1990 the UNIDO Country Director reminded the counterpart organization of the CTA's recommendation to purchase the stand-by generator. The UNIDO Country Director sent a letter to the People's Committee of Hanoi to remind them of the outstanding problems of the project and requested an urgent meeting. The People's Committee responded on 22 September 1990 asking the UNIDO Country Director to request UNDP to provide additional funds to purchase the stand-by generator.

102. Subsequently an urgent meeting was held between the UNIDO Country Director and the People's Committee of Hanoi where it was decided that the NPD and the CTA should be requested to prepare a full justification for the generator. The justification for the generator was submitted on 9 October 1990. The UNDP Resident Representative sent a letter on 22 January 1991 to the People's Committee of Hanoi reminding them of the pending decision on the stand-by generator. A further letter was sent on 19 February 1991 elaborating on outstanding problems. The letter was quite strong in that it was stated that the pending decision on the generator and doubtful project sustainability that only two solutions were possible, either releasing additional Government/UNDP funds or cancel the project.

103. During the second TPR meeting it was agreed on 25 February 1991 that the future sustainability of the project was important, however, a detailed discussion on the sustainability issue was not carried out. The People's Committee of Hanoi representative informed UNDP and UNIDO during the meeting that a second-hand generator had been identified in Vietnam.

104. However, on 11 March 1991 the second-hand generator was found to be useless by UNDTCD consultants to a UNDP/DTCD project on Power Plant Maintenance. The DTCD report on the generator was submitted on 22 March 1991. On 4 April the CTA sent another letter to the NPD stressing the urgent need for a stand-by generator.

105. The UNIDO Country Director sent another letter to the People's Committee of Hanoi reminding them that the lack of a Government decision was seriously jeopardizing the project which is likely to be cancelled in the absence of Government action.

106. During April the UNDP Resident Representative phoned the Deputy Director-General of UNIDO responsible for Programmes to alert him of the problems being encountered with the project. The Deputy Director-General intending to discuss these problems at UNDP headquarters in New York on 26 April requested that a briefing note be prepared by the backstopping officer. The note was comprehensive yet succinct and gave a good summary of the project's history, current status and proposed solutions to the problems identified. The note stated that the project authorities had over the last two years have made many well meant attempts to locate a suitable generator and had identified at least ten second-hand generators which they believed to be suitable but which one by one were found to be of inadequate design, capacity or in a poor state of maintenance after close inspection.

107. In anticipation that a generator will not be found in Vietnam, the furnace supplier AFT Ltd had identified various second-hand generators in the United Kingdom of which a 750 KVA generator with all the necessary control equipment at a price of approximately US$ 70,000 was most interesting. The note adds that the missing generator was the only factor determining whether the furnace can be lit and production started. Although the generator was a critical factor in ensuring a reliable power supply required to ensure that rapid cooling and solidification of glass melt and evaporation of the electrodes do not cause irretrievable loss of the whole furnace, as will be seen later the generator was in fact only one of many factors hindering progress.

Problems with Pilot Plant Building

108. Along with the issue of the stand-by generator discussed above the quality of the building provided by the Hanoi People's Committee was also a cause for concern during project implementation. The need to improve the industrial standard of the building was remarked upon in letters to the Vietnam authorities on 6 July 1990. An independent survey of the building was conducted between 27 and 30 July 1990. The survey report confirmed that the civil engineering work was unacceptable and that improvements were required. In a letter dated 10 August 1990 the UNIDO Country Director stresses that the People's Committee of Hanoi are responsible for the improvement of the civil works of the building which should be carried out in accordance with the survey report. On 28 September 1990 the People's Committee of Hanoi promised local funds for improvement of the pilot plant building. Between then and the TPR held on 25 February 1991 improvements to the pilot plant building were noted.

B. Implementation of Activities

109. The project activities in Vietnam was basically managed by the NPD or the Managing Director of HSGW and her technical staff. They were supported by a CTA who made several missions to Vietnam to assist in monitoring the work of HSGW staff, the international technical and short-term experts.

110. During his missions the CTA monitored progress in preparing the site, helped solve study tour administrative problems and advised on project inputs from raw materials to equipment selection. Technical discussions were also frequently held to familiarize the national counterparts with the technical and quality aspects of glass and glassware which would be produced by the project.

111. Market forecasting work was also carried out in order to rationalize the planned product line and to determine common glassware requirements and resultant training requirements. Detailed work responsibility of HSGW staff was worked out and included: mineralogical examination of a representative sample of locally available sands in geological labs in Vietnam; investigations whether suppliers of other raw materials and chemicals could guarantee conformity with specifications; specification of glass tubing requirements; building of batch mixing plant and other infrastructure development tasks.

112. During the early stages of the project there was a great deal of discussion on the most suitable equipment for the project. Despite intensive discussions in Hanoi, in the United Kingdom and Vienna, a significant amount of equipment delivered under the project can be considered to be sub-optimal. Part of the reason for this is the underestimation of secondary forming equipment costs, which required cheaper solutions, such as purchasing used equipment. It was felt that second hand equipment could allow the project to upgrade the quality of equipment and the ware it produces without requiring greater capital expenditure.

113. The CTA also had discussions on the needs for equipment for glass melting and composition control. Some expensive items were deleted. It was suggested to HSGW that they should contract out the more sophisticated tests, especially since there were testing facilities available under other UNDP supported projects.

114. According to the CTA, a lot of time was wasted having to organize and chase the clearances and completion of formalities required to get the study tour participants overseas. CTA assistance in the United Kingdom is understandable, but it appears to the mission that using an expensive CTA, to chase local authorities, was a waste of valuable time.

115. Beside the CTA, a secondary forming technical expert also supported project activities and a few short-term experts assisted as well. The international expertise was to ensure that all aspects of the planned manufacturing operation are taken care of. Apart from a secondary forming glass forming specialist and a borosilicate glass chemical analyst, an expert was also considered to be important to cover normal production items of laboratory ware, grinding operations and graduating work. The combination of a longer term technical expert and consultants was thought to be adequate for training HSGW staff.

116. The job description of the secondary glass forming expert was specified by the CTA. The training requirements were to be specified by the technical expert during his first mission. The evaluators, however, could not find any evidence of an overall manpower training needs assessment or a human resource plan for HSGW.

117. During the CTA's second split mission (report dated 12 April 1990), certain hand blowing items and laboratory equipment still had to be identified. Due to budgetary constraints, a decision was made to improve the performance and quality of selected existing machinery at HSGW instead of buying new machines. The CTA assisted in deciding on the moulds required for furnace performance evaluation. Schedules for future split missions of the CTA and the glass forming

expert were also established during this time. Arrangements on the use of specialist short-term consultants in forming and production operations were also agreed to. In his report the CTA highlighted that he also conducted a seminar and carried out other activities which were not formally part of the project.

118. The problem of an inadequate project budget appeared to be becoming a major problem during early 1990. "Fall-back" options were being discussed in Vienna. Solutions were sought which would put little or no risk to the project objectives. At this time it was reported that the technical expert chosen for glass forming was less than satisfactory. Another expert was located from another project who had already graciously helped this project during his assignment in Vietnam on another project.

119. The project during 1990 was grappling with the resolution of equipment issues, finalization of study tours, and sourcing of raw materials. It still was not clear whether the majority of raw batch materials and chemicals could be sourced in Vietnam. Confirmation of compliance with material specifications still needed to be clarified by HSGW. The problem of sourcing a "stand-by" generator locally also cropped up. This problem, which in the end was a major source of indecision and project delay, is treated separately in this report (see para. 99). Provision for this item had not been made in the UNIDO budget, as it had been said to be available in Vietnam.

120. A great deal of the time of the secondary forming expert was also spent finalizing the equipment list, supervising the building and installation of the benches, solving supply problems and installing pipework.

121. During the CTA's visits "sliding" work plans were produced together with the National Project Director. These work plans were also used to help schedule project expenditures and to phase expert inputs.

122. Considerable delays were already being experienced, partly caused by the undercosted and underspecified project budget. Major cost underestimates have become apparent in the major manufacturing and prime forming and control equipment sections.

123. The CTA and the glass forming expert gave a series of seminars during their missions including such topics as the use of modern energy saving techniques to achieve lowest cost per ton of melted glass.

124. By April 1991, the CTA reports that the majority of work was being spent to regain time lost from the lack of a suitable stand-by generator and other equipment essential to protect the furnace from catastrophic destruction. During the long period before the decision was taken to make money available to purchase a generator in the United Kingdom, all expenditure was halted. The lack of decision paralyzed the project. Meanwhile some problems (poor equipment quality and delivery delays) slowed the training programme in the Bench Section since the fifteen bench stations could not be fully utilized until the second gas plant was installed (see para. 93).

125. The building erected by the national authorities to house the pilot plant had many defects, and during 1990 remedial work had to be carried out. This was especially important to allow the erection and commissioning of the annealing Lehr. Despite this improvement, the quality of the building in terms of protecting equipment from rain storms and the quality of the floor left much to be desired, and still do (see para. 108).

126. The CTA reports in 1991 that the date for commissioning the glass melting furnace depends entirely upon the installation, housing and commissioning of the stand-by generator. to date, the generator has not been completely installed. However, most of the other work outstanding could have been carried out independently of the stand-by generator problem.

127. Some of the in-plant fellowships have taken place by now, except three which were scheduled to take place end 1991. Two fellowships have still not taken place.

128. Basic items such as sand benification equipment and a sand drier still had not been fabricated. Major pieces of UNIDO supplied equipment had not been delivered. Some essential items were still under discussion. Key short-term experts e.g. semi-automaticpressing machine and furnace operation were still awaiting Government approvals.

129. While the CTA was occupied "chasing" capital equipment and building improvements needed to complete the glass melting and forming facilities, the glassforming expert spent his time on completing of secondary forming section infrastructure requirements, sourcing supplies and starting his training activities.

130. Meanwhile, short-term consultants for furnace commissioning had been selected as well as a semi-automatic glass pressing expert. An expert for glass analysis and physical and chemical properties control and for hand blowing techniques have yet to be found. A vibrating table separator and cascade type and drier were sourced in Vietnam and were installed in the factory.

131. Raw materials ordered from abroad were poorly packed, and during decontainerization during transhipment quantities of material were lost and contaminated. Meanwhile, various equipment was trickling in from overseas, while quotations on others were not yet received. The Lehr erection team was expected as soon as visas could be organized.

132. The CTA's sixth mission from 19 May to 6 July 1991 was mostly spent on the Lehr machine, its uncrating, assembly and cold commissioning together with an engineer from the supplier. The hot commissioning can only be carried when the melting furnace start-up takes place. A generator was finally located and forecasted receipt was November 1991, which meant that the earliest the furnace could be commissioned was end November/ mid December, which proved to be widely optimistic.

133. The floor in the factory was showing signs of deterioration even under light traffic.

134. The study tour for hand glass working has now been arranged at Corning Glass in the United Kingdom. Places for two other fellows for hard borosilicate analysis and batch control could not be found. The electronics expert has yet to be identified and short-term consultants for glass analysis and control, bottle machine operation and marketing as well. The majority of the equipment has now been ordered, but decisions on glass making moulds were still outstanding. The supply of equipment seems to be the dominant theme of project activity and appears to be dealt with in spurts, unnecessarily drawing out the activities of the project.

135. A schedule for commissioning the furnace has been agreed to as well as the activities required to train the HSGW staff on its operation in Vietnam. The on-site training schedule foreseen covers a total of ten months.

136. During the CTA's sixth mission during July 1991, major delays on counterpart support work became evident, caused by the delays encountered in the delivery of expertise and equipment on the part of UNIDO. Local work on completing the batch house, batch transport system, mixing and cullet handling, crushing and dispensing is also delayed. Some of this preparatory work is still pending to date. AFT, the supplier, was working to get agreement on who is responsible for what in these areas.

137. A test of the cabling to the pilot plant indicates that they were less than a third of the rating required. HSGW undertakes to improve the cabling. During July 1991, the bottle (blow/suck) machine belonging to HSGW was being reconditioned in the United Kingdom, and the Pearson press machine had been received. Upon its return it was kept in its crate and is still crated to date. The hand tools have now been ordered and various actions were taken to ensure that moulds would be available for glass furnace commissioning.

138. During the Lehr erection, a lot of delays were encountered connected with inadequate work planning and supervision of HSGW labour. Moreover, difficulties and delays were encountered due to the lack of suitable tools, services and utilities. A lot of this could have been foreseen before. Lack of interpretation services are also slowing the work of the experts.

139. As of July 1991, an electrical and engineering workshop and mould preparation and mould shop have not been set up. All four facilities are essential for plant operations. Again scheduling seems to be overly optimistic, much remains to be done in the pilot plant facility, yet the commissioning of the furnace is forecasted for November/December 1991. The furnace has yet to be fully installed, the infrastructure required to run the furnace is still not in place and the experts required during commissioning in hand pressing, semi-auto pressing, semi-auto bottle making, handworking, analysis and batch composition control still have to be identified.

140. Work by HSGW to develop a plant register and maintenance system as requested by the CTA was also moving slowly.

141. During the CTA's seventh split mission, from 14 September to 12 October 1991, it is reported that most of the time was spent identifying available options for the electrical supply to the furnace and to ensure automatic switching when the mains fail. The generator was now expected to arrive mid December. The poor quality of the concrete floors were again noted. Dust from the cement can affect the quality of the forming processes. The missing workshops for mechanical, electrical, mould preparation and store room are noted again. The changed batch handling scheme developed by HSGW was still considered to be unsatisfactory. The electronics expert has not yet been found. The marketing expert was selected. The other short-term experts were still being searched. Batch house equipment was also not fully installed. The CTA also stresses, as he has done in the past, that safe working practices and quality consciousness needs to be improved, if consistent high quality glass is to be produced for export, which is essential for hard currency earnings needed to pay for imported raw materials and furnace rebuilding costs after three years melting furnace life, estimated at US$ 250,000.

142. During October 1991, despite the fact that the stand-by generator had not arrived, cabling had not been sorted out, key short-term experts had not been identified, various productions machines had not been installed, workshops were not in place, testing facilities had not been completely set up, the CTA predicted that final furnace and hot Lehr trials cannot be expected before January 1992, which again is wildly optimistic considering the halting progress made so far.

143. Other problems included:

- Performance trials of sand bonification equipment not carried out;
- Lack of proper doors to keep out rain from entering into the glass factory;
- No work has commenced on the batch house or on the batch and cullet conveyance system to the furnace. A solution to this problem remains to date;
- Laboratory has not been completed;
- Press moulds and other items for laboratory were still pending;
- Processing of local sand had not yet commenced;
- Proposals for locally constructed sand drier were still be considered;
- Sand treatment building not yet constructed;
- Pyrex cullet from the United Kingdom has not been cleaned. Eight tons of clean dry cullet for initial filling, start-up and first days charging to the furnace are required.
- Overall scheme for handling the cullet in all areas of the factory from melting furnace to store had not been produced by the NPD, which was then supposed to be discussed with the CTA.
- Scheme detailing all emergency electrical circuits from the stand-by generator expected from HSGW had not been produced. There were doubts about arrangements if mains cut-in occurs, while the stand-by generator is still

supplying power;
- The furnace refractory and insulation works had not been completed. Temporary internal supports were still in place. Electrodes and thermocouples were not yet fitted and checked for adequacy;
- Electrical cable terminations not completed;
- Glass container mould still in the United Kingdom for reconditioning;
- Moulds for serum bottle not yet received;
- Press and blow machine not installed;
- Press moulds only partially in hand;
- Hand tools not yet received.

144. Meanwhile, according to the CTA, the arrival of four short-term consultants from the furnace supplier needed to prepare for final run up to, and entry into continuous glass melting was held in abeyance until firm dates for completion of stand-by generator, power cables, automatic switch gear and emergency circuitry would be known. However, from the list of uncompleted preparatory work listed above, much more than the electrical installation would need to be completed before the furnace could be started up.

145. Suitable consultants for glass analysis and batch/composition control were still being urgently searched. Consultants for the forming machines could not be scheduled and others were still being sought for hand forming by both blowing and pressing.

146. Plant register and preventive maintenance schedules expected from HSGW staff had also not yet been started.

147. From reading the expert's reports, it becomes apparent, which was confirmed during the evaluation, that the demands made on the HSGW staff were unrealistic. For example, developing a maintenance system requires specialized expertise and to expect HSGW to complete this for equipment, which were entirely new to them, which were not vet installed or not yet received, was much too much to expect. Continuing lack of progress in this area and in many other assignment given to HSGW should have been a clear signal to the CTA and UNIDO that there was a major problem of absorptive capacity and a growing communication gap between the international team and the HSGW staff.

148. A major setback hit the project when the CTA had to be discontinue his work on the project during November 1991 due to heart problems. Since then no replacement has been recruited in the hope that the CTA would recuperate and be medically cleared to complete his assignment. Since then the Furnace Supplier representative took on additional tasks beyond installing the furnace and assisted with the installation of other equipment while the CTA continued to provide support from home base.

149. HSGW staff gave the evaluators the impression that given local constraints they had done all they could to help install the equipment and complete the plant infrastructure on time. Critique was levelled at the experts who seemed not to appreciate these local constraints, lack of HSGW experience and Vietnamese sensitivities. Work delegated to HSGW staff was at times improperly carried out for reasons mentioned above. When commented upon by the experts HSGW staff felt to be unfairly criticized which affected their enthusiasm and confidence in carrying out some of the other work without the direct supervision and or guidance of the CTA and/or the AFT representative. Lack of progress during their absence can partially be explained by this problem. Some assignments were simply to much to expect of HSGW staff. The experts then tried to make up for lost time during their relatively short missions by doing work which should have been completed by HSGW while more important and complex tasks were often left in abeyance. Poor use of expert time certainly resulted.

Secondary Forming Section Development

150. The Secondary Forming Section development started when the technical expert started activities during autumn of 1989 at home to start identifying and sourcing equipment. The expert's terms of reference were very much focussed on the selection, organization of and set-up of equipment for the secondary forming section. The expert spent two months at home on a part-time basis to select appropriate second hand equipment in order to optimize the use of limited funds. A few of the "critical" pieces of equipment were purchased new. The equipment was collected in Rotterdam over a period of 3 months which required his supervision to check all delivered items. The equipment once in Vietnam was unloaded and installed also under the supervision of the expert.

151. The expert also had to spend an inordinate amount of time to resolve problems connected with the gas plant mentioned earlier in this report. The layout of the secondary forming section was designed by the expert and he also supervised the laying of pipes and other connections. The expert also instructed staff on how to operate and maintain the new equipment in this section, particularly the oxygen generator, cutting, drilling and guiding equipment. On site work was carried out from 16 May to October 1990 with a break in between for a total of 4 man/months.

152. During his assignment lectures, demonstrations and practical institutions were provided to concerned staff to ensure proper handling and maintenance of equipment.

153. The equipment component of the project absorbed too much of the experts available time. Repair, maintenance and modification of project supplied equipment was continually required to optimize the section. The one major problem, however, was the low gas pressure to the burners making full usage of the bench section impossible.

154. A technical manual was also prepared by the expert which outlines all the requirements of the used equipment. The expert also highlighted the need for better safety practices.

155. During his second mission early 1991, the secondary forming section expert focussed his work on completing the installations and on training staff. The third mission carried out during October to November 1991 was to concentrate on training a small group of staff. Initially 14 were selected out of 25 places available. The number was then reduced to 7. Only 28% of the places were filled and as the expert correctly stated normally it would be expected that the training capacity would be oversubscribed at the outset. Even during this mission equipment problems arose again and considerable time had to be spent on the redesign of project machinery. Achieving the project goal in the bench work section to fully utilize the design capacity of newly created facilities were being questioned by the expert at this point due to the small number of trainees.

156. The consultant's final mission was completed in March 1992. The bench working section is now producing a limited amount of products from glass tubes imported from the United Kingdom. The total number of people trained amounted to only ten. Of installed capacity of 25 bench places only 15 can be used because of the gas pressure problems.

157. The expert also expressed his concern that the lack of a CTA due to his illness has hampered the completion of the project. Shortcomings in the bench section were listed to be the need to upgrade project supplied burners; glassblowing techniques for a larger variety of glassware need to be taught and the level of production techniques required to execute of commercial orders needs to be upgraded.

158. Concern was also expressed that the marketing aspect of the project needed greater attention. The need to match the production capabilities with the market demand in Vietnam remained. Only after local demand is met major export orders can be filled whereas the initial goal of the project was import substitution and training. Overall the expert expressed the view that his involvement was only partially successful.

Short-term Consultancy Assistance

Scientific Glass Manufacturing Expert

159. The project was also assisted by a scientific glass industry expert who undertook three assignments. The first assignment lasting three months was essentially to study the conditions and parameters of the glass melting process in Vietnam. the expert was to assess the prevailing conditions in Vietnam to guide in the final choice of pyrex melting technology (energy, raw materials, technical skills, market requirements, physical infrastructure, etc.). Based on this analysis, the expert helped formulate tender documents for international bidding for the pyrex melting furnace and ancillary equipment. The expert assisted in the initial evaluation of the tenders received and recommended a short list of potential suppliers. He then advised on the finalization of the furnace specifications. Finally, a plan for the implementation of the furnace installation and other related activities of the project was developed.

160. The expert initially studied local conditions from 29 April to 5 May 1988, especially with respect to the analysis of local raw materials. During this mission he also assessed the quantity and quality of melted glass being produced by the existing facility which highlighted the deficiencies of current production. He then established the quality parameters for the glass to be produced by the new glass melting technology. Physical, thermal and chemical properties were covered.

161. The project would set up a facility which would produce hard borosilicate glass without asenic, zinc and lead in its composition. The glass should contain:

Oxides	Percentage
SiO_2	80.00
Al_2O_3	2.00
B_2O_3	13.48
Fe_2O_3	0.02
K_2O	1.10
Na_2O	3.40
	100.00

Physical properties
- Specific mass: 2.23 gr/cm^3
- Compression resistance: 3,600 kg/cm^2
- Elasticity (Young): E = 6,500 kg/mm^2

Thermal properties
- Average dilation coefficient between 20-300°C: 32×10^{-7}
- Annealing Temp.: 550°C
- Melting Temp.: 820°C
- Working Temp.: 1260°C

Chemical properties
- Devitrification temperature: 1200°C
- The glass should be corrosion resistant especially during sterilization. Resistance to water corrosion should meet the AFNOR standard B 35601, which around 0.009 mg Na_2O/gr based on 1 gr of glass tested at 100°C for one hour.

162. Detailed specification for the batch raw materials and glass at various stages of production were also established, for both local and imported materials. The glass melt requirements were also set which included furnace physical characteristics, various heat parameters and fuel requirements.

163. The expert also provided product demand estimates for serum bottles, volumetric bottles, decanter, Erlenmeyers and glass tubes. The importance of highest quality refractory brick materials was stressed.

164. After setting out the parameters and characteristics of the glass making technologies, the expert help assessed the equipment supply offers which also included visits to the companies. Their capacities and capabilities were assessed, and recommendations were made to UNIDO for selection. The expert strongly recommended that the contract for the plant should as much as possible be equivalent to a turn key project. Moreover, a recommendation was also made that, in view of the complexity of the technology, HSGW would need five years of technological assistance support, especially for trouble shooting and continuous training.

165. In his first assignment report, dated September 1988, the expert warns that the production of hard borosilicate glass to international scientific quality standards is a very difficult operation. Only profound knowledge of glass technology and experience would allow success in such an endeavour.

166. The sophisticated nature of the technology required and limited number of suppliers of such technologies made it difficult to select an appropriate supplier. The small size of the installation envisaged made it even more difficult.

167. The approach to the technology recommended by the expert for the pilot facility was that it should use electricity to the maximum extent possible for melting. The melt capacity should be kept small and the production process should be automatized as much as possible so that the lack of profound knowledge and experience in the production of hard borosilicate glass is compensated by the sophistication of the technology to be introduced. The assumption appears to have been that once the facility has been set and the staff trained to operate it, with the help of sophisticated controls, it would be relatively straight forward to consistently produce high quality glass. The approach follows the principle of maximizing quality output, through know-how with a minimum of know-why. The latter would be embedded in the equipment and controls supplied. HSGW would only need to follow instructions, monitor results and adjust inputs and processes accordingly. This approach is questionable.

168. Following his previous mission, the results of which were just discussed, and the visits made to short-listed potential suppliers for the furnace, UNIDO gave the contract to AFT (UK) Limited on 21 November 1988. To finalize detail requirements, a meeting was organized with AFT at UNIDO on 12 and 13 December 1988. A protocol of the discussion was signed by both parties. UNIDO requested the scientific glass industry expert to accompany the AFT Director to Hanoi to brief HSGW and the Hanoi People Committee on the current status of the project, to provide them with details of the technology finally selected and to discuss the contractual clauses for its supply. The mission was also to establish final AFT work requirements for the installation of the furnace. AFT assessed local conditions and the state of the preparations already carried out by HSGW. Based on their findings, an agreement between AFT and HSGW was to be made for the installation and commissioning. A work plan for HSGW and AFT should then be agreed to. The mission took place between 2 and 8 March 1989.

169. The scientific glass manufacturing expert stressed once again the complexity of transferring hard borosilicate glass technology. During the equipment installation process, strong cooperation between HSGW and the suppliers will be required. The tasks each party agree to carry out need to be strictly adhered to, if the installation is to be completed on schedule.

170. During the mission, it was agreed that AFT and local laboratories will carry out a comparative study of the sand quality from two locations in Vietnam, Van Hai and Cam Ranh. AFT will establish a list of chemicals required in addition to the sand. The list will include the chemical and physical characteristics required and the prices of these chemicals in Europe. HSGW would, on their part, find out, if they could be procured locally. AFT in its comparative study will indicate whether locally procured chemicals could substitute for imported ones. After AFT provides the specifications, HSGW will endeavour to obtain a stand-by generator. AFT will test the water in the UK and compare the results with the test results already obtained locally. The equipment required for the quality control laboratory was provided to UNIDO. The laboratory needs to be operational before the performance guarantee trials can take place. AFT agreed to

supply instructions and procedures required to carry out the necessary tests. HSGW will need to follow the prescribed procedures to carry out the quality checks of materials received and during their mixing to avoid any problems during the performance guarantee trials. HSGW agreed to investigate the testing facilities available in Vietnam, which could help to check whether the raw materials purchased locally meet the specifications required.

171. Training should take place during the month of August 1989, during the visit of the HSGW staff to the UK to check the equipment before shipping.

172. AFT agreed to prepare a detailed work schedule setting out the coordination and cooperation required between them and HSGW. UNIDO was expected to provide HSGW with other equipment required and also the techniques needed to prepare batches for the furnace.

173. The scientific glass manufacturing expert completed his third mission between 17 and 21 April 1989 in the UK to review the AFT technology package along with UNIDO. The package was to contain all engineering details and manuals. Due to the complexity of the engineering package, when the mission took place during April, the package had not been finalized. It was, therefore, impossibie to review the proposal in all details. It was estimated that an additional three weeks would be required. The AFT mission to Vietnam had also to be postponed from beginning May to beginning June. Agreement was reached that the final engineering package would be sent to UNIDO by beginning June.

174. During the experts' mission to the UK, AFT's Director, Sales Manager, Manager of Engineering and Managing Director of Glassworks Services Ltd were in attendance. The importance of perfect coordination and cooperation between AFT and HSGW was again emphasized. The need to establish a definitive and detailed work plan for all the actions required to be completed by HSGW was needed. Precise coordination and clarity were required.

175. During his visit, agreements were reached concerning the sand, need for imported raw materials , the suitability of local water and size of the stand-by generator (250 KVA). The possibility of training places in the UK was discussed and the need was stressed for UNIDO to ensure that all the ancillary equipment is in place, especially testing equipment, before the furnace is completed.

176. AFT carried out several bench scale melting trials with the sand from Vietnam. A report on the results was to be prepared by AFT. UNIDO was expected to inform AFT whether training in the UK was envisaged. Since its organization would need to be carefully planned and negotiated with the yet to be designated providers of training.

177. The operating, maintenance and start manual was prepared by AFT, it includes the following subjects:

- Burner system
- Air cooling system
- Secondary conductors
- Installation
  - Programme
  - Personnel required
- Check-out of furnace prior to start-up
  - Electrical
  - Equipment
  - Power system
  - Miscellaneous equipment
  - Safety devices
  - Batch charger
  - Mechanical
  - Binding steel
  - Batch charger and level control

Electrodes and holders
- Heat-up and commissioning
  - Heat-up
  - Furnace fill
  - Commissioning
- Operation
  - Electrodes/radiant elements
  - Batch charging
  - Water system
  - Burner system
  - Air cooling system
  - Secondary conductors
- Safety
  - General guidelines
  - Personnel protection
  - Main power equipment guidelines
- Appendix
  - Drawing test
  - Vendor manuals

Glass Plant Consultant

178. In addition to a seven day site inspection during 1989 and construction supervision for 62 days during 1990 and training coordination work in the United Kingdom for 30 days, UNIDO hired the Director of AFT as a Glass Plant Consultant to undertake three further under the projects consultancy budget to review the work still needed to be carried out on the furnace installation, since work effectively stopped a year before. The Glass Plant Consultant was hired in response to a request by the CTA that help was needed to assist HSGW in other areas such as batch house, including weighing, raw material storage, batch mixing, batch feed to furnace copper, cullet protection through the plant and electrical distribution system.

179. During his first mission which lasted from 12 October to 20 November 1991 most work focussed on determining workable solutions to batch house problems together with HSGW staff. Furnace completion work was mostly left in obeyance due to equipment problems with power drills, power saws etc. To avoid further confusion the expert prepared numerous equipment and facility drawings to enable HSGW to proceed with the completion of the facilities in his absence. The expert commented that major delays are being incurred. Part of the problem was termed to be the lack of industrial exposure to the type of hard borosilicate glass technology being installed.

180. He estimated that if rate of progress being achieved by HSGW personnel does not improve it will be impossible to finish installation before the third or fourth quarter of 1992. The expert strongly suggested that HSGW needed to purchase tools and that on site specialist assistance was required if the schedule was to be met.

181. The expert provided a complete list of outstanding work which covered approximately 43 separate items, quite of number of them being major ones, for example: "install machine shop/maintenance equipment" or "investigate the possibility of an improved store system being implemented". These and many other requirements remain uncompleted to date.

182. The Glass Plant Consultant undertook a second mission which commenced on 27 February 1992 and ended on 25 March 1992, to continue the work started during the October-November 1991 mission. As with the first mission work focussed on giving technical assistance to HSGW in areas such as the batch house, raw material storage batch mixing, batch feed to furnace hopper, cullet collection through the plant and electrical distribution system.

183. Although some progress was achieved since his last mission the majority of work was still to be completed, and some parts, notably the electrical system was being installed to an

unacceptable standard and had to be disassembled and re-engineered.

184. Due to the heart condition of the CTA which required his hospitalization in Bangkok during a stopover on his way to Hanoi and the need for the UNIDO backstopping officer to care for him, the tripartite review meeting scheduled for 5 March 1992 had to be cancelled.

185. The expert noted that there was an increase of activity prior to the meeting which visibly ebbed once it was postponed. Various items of equipment were now being airfrighted into Vietnam by UNIDO which help increase the pace of work.

186. The expert once again complains that HSGW is not making a sufficient effort to maintain an adequate level of tools and labour on-site. The expert pleads with UNIDO to give additional on-site technical assistance and that HSGW provide sufficient interest and resources to complete plant construction and commissioning programme. Unless HSGW commits itself 100% the project commissioning was considered to be "indeterminate" by the expert.

187. During the third mission, 10 June to 8 July 1992, of the Glass Plant Consultant the work carried out during the first two missions was essentially continued. Meanwhile, the TPR was held in early May 1992, based on a decision taken during this meeting the Glass Plant Consultant (also Director of AFT Ltd) was requested by the backstopping officer to investigate the possibility of AFT Ltd completing the outstanding contract work within the limited time left in the project. This request was prompted by the perception that no completion date was in sight and that project funds were rapidly depleting. This view of the state of affairs was shared by the NPD and UNDP Hanoi. The expert then spent time to work out how to resolve the impasse.

188. During the expert's mission the inadequate counterpart support provided to him during his previous mission continued. The expert pleads once again that HSGW must ensure that all site services that the necessary equipment, labour and finance, are fully committed to the project and that the level of work be intensified.

189. The target date of commissioning was questioned. At this point the expert writes a letter to the UNIDO Hanoi office that in his estimation it will be impossible for HSGW to complete their work by September 1992. As an example of the lack of support provided to the expert during his current mission, was the fact that the store keeper had been off site for an estimated 80% of the time and that there were no alternative procedure for obtaining materials and equipment during her absences.

190. In a final act of desperation the expert lists "typical" requirements which need to be completed by HSGW.

"1. HSGW must complete all outstanding works as per detailed in the first three missions of the expert and the more detailed list to be submitted to UNIDO and HSGW.

2. HSGW must complete all 380V, 50Hz single and three phase supply to all outstanding items of plant.

3. HSGW must supply a satisfactory water feed and mains tank with auto-fill facility to the sealed recirculatory water cooling system.

4. HSGW must supply all miscellaneous labour and materials necessary for the complete execution and commissioning of the furnace."

Finally the expert lists "additional contract requirements" saying that additional time spent on site by AFT of contractual personnel due to delays or problems of HSGW making will be at the cost of the client.

Marketing Consultant

191. A Marketing Consultant was fielded in Vietnam from 23 November to 14 December during 1991. One half of his time was spent meeting with the NPD and her staff and the rest of the period was spent in travelling to visit various Government Departments, institutes, hospitals, hotels and factories.

192. The result of the mission was summarized by the expert by writing that the "market appears larger than current estimates." Overall potential clients who were importing glass products from East Europe and increasingly West Europe and China welcomed the idea of buying locally produced scientific glass. HSGW would, however, have to convince prospective customers that the glass quality from the new production facility will compare with presently imported supplies. Customers will need to be able to examine actual product samples. This is important because users complained that they had unsatisfactory performance with HSGW produced glassware.

193. During the marketing consultant's mission the CTA was unfortunately not present due to his illness and at HSGW there was no glass technologist who could assure him of the feasibility of being able to produce items outside the present HSGW product range. Since the production facility had not been completed samples showing glass quality were not available. The expert himself stated that only some of the objectives of his job description were therefore achieved.

194. Despite the 'market study' undertaken by the expert, he recommended that a review of the demand for scientific glassware range needs to be carried to determine the priority items for production in the new plant. A proposal for the form, content and costs for the design, layout, artwork, printing of promotional material listing and presenting all information on the proposed scientific glassware range was required. Research in Europe and Asia for possible markets for HSGW should be conducted. The specialized market for (particularly filter coffeemakers, vacuum flasks, bistro coffeemakers to exploit the small quantity production capacity and low labour costs of HSGW should be explored. Expert assistance in preparing the promotional material and in conduct market research was recommended.

195. Overall HSGW should exploit its capability to make short production runs and its low labour costs in manipulation and assembly by directing it marketing efforts to the component glassware market (where a glass component forms part of a larger product, e.g. coffeemaker, vacuum flask).

196. During the consultants visits he was unable to find out HSGW's current output and future production plans. The work of the Marketing expert has to be judged to have been unsatisfactory. in part because of the time allowed to do his work and the absence of the CTA, however, the quality of his report was deficient in that he stated the obvious, was sketchy and did not reflect an in-depth knowledge of the scientific and/or general glassware market. HSGW will need marketing assistance once its new production facility is in operation.

Procurement Consultant

197. AFT's sales manager was hired to assist UNIDO in sourcing "very" specialized glassware equipment. The equipment once sourced and all the information obtained was passed on to UNIDO Purchase and Contract Section, with copies to the CTA and the backstopping officer. Once the orders were placed, purchase orders were sent to the consultant to contact all suppliers, who regularly followed-up all deliveries. Deliveries to the shippers were also checked by the consultant.

In-plant Training Programme United Kingdom

198. The National Project Director and the CTA discussed the best use of the 33.5 man weeks of training time allocated in the project budget. The maximum time was allocated to the superintendent of the bench working section. AFT the furnace supplier and the CTA spent a lot

of time trying to find suitable training venues. Early 1991, the training venues were still not finalized. Agreement to use AFT as consultants to place fellows in liaison with the British Council and potential suppliers was agreed to by the UNIDO backstopping officer. Five in-plant training programmes were implemented during November/December 1990. The six in-plant fellowship took place during September/October 1991 (see in-plant training programme table para. 86) Initially the training reports prepared were uninformative. The CTA was of the opinion that if comprehensive reports cannot be made available, the training from a technical point of view was a waste of time. The trainees then made every effort to improve the reports.

199. During the evaluation five of these reports were submitted to the evaluators. Only four of the reports could be reviewed since one had not been translated. Two companies were selected for in-plant training. One company Bibby Ltd is a manufacturer of scientific glass equipment from glass tubing, the other Gyproc Co Ltd a manufacturer of glass wool insulating material.

200. The first company was selected since they produce similar products produced by HSGW. The second company melts glass with a furnace supplied by AFT which has similar characteristics to the furnace supplied to HSGW. Unfortunately, the product produced by Gyproc had nothing to do with the products to be produced by HSGW. Consequently the operation of the primary forming and blowing and Lehr annealing machines supplied to the pilot plant could not be observed.

201. The major lesson learned by the trainees appears to be the operation, maintenance and replacement of electrodes which apparently only last three months. The rest of the reports merely describe the size and operating characteristics of the plants visited. If the information provided in the reports reviewed could be combined into one report an accurate picture of the plants visited would emerge.

202. All trainees were dissatisfied with the short duration of the programme and felt insecure about the prospect of operating the pilot plant without additional training. It is hoped that the experts who will assist in the plant commissioning will be able to impart enough skills and knowledge to enable HSGW technical staff to operate the plant.

203. The forming worker trainee who visited Corning Glass U.K. during 1991, had difficulty communicating his experience in the U.K., however, it appears that little was learned since the operations observed were fully automatic and bore little relevance to the semi-automatic equipment in HSGW, which are still in packing cases anyhow.

204. Overall the overseas training programme cannot be considered have been fully applicable and adequate to the training needs at hand, especially since two fellowships in the areas of quality control and batch composition were cancelled due to UNIDO's inability to find training venues.

Project Monitoring

205. The project's management prepared three Project Performance Evaluation Reports (PPERs) dated 15/11/1989, 13/10/1990, 16/11/1991) whereas five should have been prepared during the period from May 1988 to May 1993. In the first PPER dated 15 November 1989 project management reports that the project is progressing 'as planned'. Requests are made to UNIDO to order project equipment and carry out the training programme, and to the Government to increase the counterpart budget to ensure supply of materials required for tests and production. Neither UNDP nor UNIDO commented on the 15 November 1989 report. The report also states that the tripartite review meeting is long overdue.

206. The backstopping officer, however, assessed the project to be 'less than planned'. He suggested that the budget should to be increased due to unspecified equipment price increases. He summarizes by saying that a number of delays and changes in technical approach have taken place but that the project should now be ready for on-schedule implementation.

207. The UNIDO Evaluation Staff comment on the project was that delays and undercosting should be reviewed by a tripartite review. The second PPER dated 13 October 1990 explains that progress is delayed by provision of essential stand-by generator. Similar delay to installation and commissioning caused by remedial work on the building is also reported.

208. The project management, NPD and CTA request the Government to provide adequate funds for building work, batch house and laboratory and preparation of raw materials. The backstopping officer complains of inadequate counterpart support - in terms of quality and financial resources as well as the slow decision process. The project should be redesigned to update inputs, work plans and to provide a sharper definition of outputs. The backstopping officer, however, considers that the in-depth evaluation recommended during the February 1990 tripartite review would be more useful at a later date. All agree now that the project implementation is 'less than planned'.

209. The UNIDO Country Director agrees that the project is behind schedule and that a tripartite review is required to discuss this. The Country Director confirms that the evaluation can be postponed until the glass furnace is commissioned. Two issues for the evaluation are listed: a) effective measures to ensure a successful project completion, b) prospects for project sustainability. The UNIDO Evaluation Staff confirmed that the factors delaying the project need to be resolved and that a tripartite review meeting should take place as soon as possible.

210. The terms of reference for the planned evaluation are finally prepared on 16 January 1991. The timing for the evaluation were discussed with the backstopping officer on 4 February 1991. It was proposed to delay the evaluation until the factory becomes operational the issues of the furnace commissioning, building completion and a decision on the stand-by generator and its financing were delaying its completion. Completion was expected by August-September 1991.

211. The last PPER prepared under this project dated 26 December 1991 provided a thorough analysis of the project's status and difficulties encountered, however, nothing seems to have changed. All parties agree that an in-depth evaluation would be useful. The Evaluation Staff called the backstopping officer on 14 January 1992 to enquire about the status of the in-depth evaluation. The response was that the installations had not been completed and that the forthcoming tripartite meeting would again consider when it should be conducted. The third tripartite review took place on 14 May 1992.

212. Meanwhile a decision was taken for unexplained reasons that a 'technical review' should precede an in-depth evaluation. The backstopping officer informed the Evaluation Staff of this decision on 1 March 1993. The backstopping officer telex on 28 May 1993 to UNDP to inquire about an apparent confusion on whether a 'technical review' or an evaluation will take place.

213. On 2 June 1993 the Evaluation Staff express their disagreement to a 'technical review' which is to be followed by an in-depth evaluation. The point made that evaluations are also technical and that two similar missions would be a duplication. The 'technical review' combined with an overlapping evaluation were scheduled for August 1993. UNIDO submits on 13 July 1993 the CV's of two technical experts to represent UNIDO in the in-depth evaluation. Meanwhile UNIDO learns that the 'technical assessment' started on 19 August 1993 without prior consultation with UNIDO. UNDP does not agree with the evaluation candidates proposed and requests an experienced evaluator from the Evaluation Staff. The evaluation is now set to start on 21 November 1993.

214. The technical assessment carried out by UNDP although providing a useful summary of the status of completion of the primary forming section of the pilot plant, was considered to be unsatisfactory in several respects: 1) it was not entirely accurate, 2) the first draft demonstrated the consultant was not fully conversant with glassware manufacture, 3) the secondary forming section and raw material section were not assessed. 4) the consultant hardly discussed the project with the NPD and did not discuss his report before it was issued, 5) the problems encountered during project implementation nor the technology chosen were analyzed, 6) the details provided

for commissioning were not specific enough.

215. Three tripartite review meetings were held during February 1990, February 1991 and May 1992. The PPERs discussed above were used as a basis for discussion. The problems encountered by the project were thoroughly discussed during these meetings with the exception of the problem concerning the stand-by generator during the second meeting but overall few decisions could be taken during these meetings. As outlined in the previous section of this chapter many *ad hoc* meetings had to be held with the project authorities to discuss the need for urgent decisions. Despite efforts on the part of UNDP and UNIDO decisions to revise project budgets to meet unforeseen requirements took a long time.

216. It is unfortunate that the evaluation did not take place late 1990 or early 1991 as originally decided. Evaluations are not only carried out to assess the achievement of project objectives they are also useful in analyzing factors impeding project progress in producing outputs and can help resolve implementation problems before they seriously affect project cost-effectiveness and sustainability.

III. PROJECT RESULTS

217. The project was to assist in setting up a demonstration plant designed and equipped for the purpose of improved technology for the manufacture of hard borosilicate glassware of international standard quality and for the closely related purpose of training national staff in the correct application of these technologies. The status of outputs required to achieve project objectives are summarized below.

Output 1 (a) Primary Forming Section[3]

1. Raw material and batch preparation unit. Raw Material Batching. This section includes 5 silos for the storing of raw materials, each silo is equipped with a discharge screw converger feeding to a central clute and an electric scale below the chute to weigh each type of raw material. There is an overhead electric hoist to raise the raw materials to the platform on top of the silos to load raw materials into the silos.
This section is not complete: Control cabinet for screw conveyors and electronic scale and cabling between scale and control cabinet to be installed. The control cabinet is in the store.
   - Hoisting container for raising raw materials not on site;
   - Container for collecting and weighing raw materials not on site.

   The mixing section comprises a rotary high speed mixer complete with skip hoist to mix the raw materials. The following needs to be completed:

   - the machine is to be connected electrically;
   - outlet chute to be fabricated and installed;
   - container and trolley to collect material and transfer to furnace not on site.

   Sand dryer and vibrating sand filter on site and operational. Small cullet crusher also on site.

2. Glass melting section. Continuous electrically fired furnace for melting of borosilicate glass down to 32-33 * 10^{-7} cm/cm/°c (pyrex quality). A two ton/day all electric furnace comprising of the following sections is almost completely installed:

   Batch Hopper and Screw Charger including a skip hoist to feed the raw materials into a hopper and screw charger with level control for feeding the raw material into the melting section of the furnace.

   To be completed includes:
   - an access stairway to the top of the batch hopper and platform to hopper gate which would need to be fabricated;
   - the operating mechanism for the gate on the hopper is missing;
   - electric wiring to level control to be checked;
   - electrodes and thermocouples to be installed including connection with control instrumentation;
   - in a few places holes still need to be drilled in order to be able to insert electrodes and/or thermocouples.

   Wind cooling section includes an electric driven fan, galvanized steel duct, 12 flexible ducts with nooles and two steel pipe manifolds. The installation is virtually

[3] Status of outputs under Primary Forming Section taken from Technical Assessment Report by SGS dated October 1993.

complete except for the following :

- starter to be purchased for the fan to be installed and connected, electric cable is lying in the trench;
- one flexible duct to be clamped to main ducting;
- the drawing shows a 50 mm manifold above melter, this has not been installed or was not required. The manifold is available in the store.

Water cooling section is a closed circuit cooling system comprising pumps, air blast cooler and interconnecting piping with flow meters for each circuit and provides water to electrode holders, batch charger, throat water box, level control etc.

The installation is virtually complete except for the following:

- installation of high temperature rubber flexible hoses between steel piping and the equipment to be cooled the parts are in the store;
- due to the length of time the equipment has been standing, the inside of the steel piping is corroded. The complete system needs to be flushed, cleaned and inspected.

- due to high humidity below the furnace all the electrical equipment will have to be examined and tested (motors flow switches etc.). Where necessary electrical equipment will have to be blow dried and in some instances replacement parts may be required.

Heat Up System section consists of a portable burner system for the heat up of the furnace and includes:

- 3 burners operating on oil and compressed air;
- air fan;
- nozzles, regulators and hoses.

All the parts are in the store but needs to be checked. Burners, lance and manifold have to be assembled. The fan needs to be mounted on a mobile trolley which needs to be fabricated. The installation of the compressed air lines and fuel lines has to be completed.

218. The furnace comprises melter, refiner, distributor and working ends. Each section of the furnace is equipped with heating elements (electrodes, radiants, and thermocouples) to control the temperature. The furnace requires the following:

- install electrodes, radiants and thermocouples and connect cabling. All electrodes, radiants and thermocouples are in the store, but the following is required:
  i) support plate for electrodes (fabricate locally);
  ii) terminals for electric cables for electrodes which need to be purchased;
  iii) drilling machine and drill bits to make hole in refractors for the thermocouples to be brought by the supplier.

- install gathering hole in block in working ends which are in the store;
- close the opening in rear wall of melter materials are in the store;
- check and repair refractors and insulation because minor damage is evident;
- check and install missing jacking bolts and plates on binding steelwork which needs to be fabricated;
- close opening for overflow in working ends and install boxes to collect overflow the materials are in the store;
- block up all openings after heat up.

3. Forming and blowing section with mechanized (semi-automatic) suction blow machine and simple press machine. This section comprises a hand fed glass press and blowing machine complete with moulds. The glass press is still in the packing case next to the annealing Lehr, the moulds are in the store and the blowing machine and moulds are in packing cases at the old factory.

The two machines have to be placed in position, levelled, fixed to the floor and connected electrically, with water and compressed air. Previously detected damage to the machine, during transit and subsequently repaired has to be checked and remedied if necessary.

4. Annealing Lehr Section corresponding to the capacity of the furnace. The annealing lehr is complete 14.5 m long and has a 1 m wide stainless steel belt. The machine has been cold commissioned and needs to be hot commissioned when the furnace is also commissioned.

The machine is complete except for a compressed air supply to operate the doors at the feed end. The air line is next to the machine and only needs to be connected. It is recommended that some tables will be required at the discharge and of the machine for examination and packing of finished products.

5. The auxiliary services comprise power generation and supply, compressed air and fuel supply. Power generation and supply - a 700 kva diesel generator has been placed in generator building the supports need to be removed, the unit needs to be levelled and bolted to the floor, the generator should have been placed so that the radiator is next to the louvers in the wall to allow hot air to exhaust.

219. The generator should be rotated 180° or, louvers should be fitted on to the two steel doors of the building. The diesel tank has to be connected to the generator, i.e. feed line and return line. In the transformer house, the diameter of the holes in the current transformers are to small to pass over its power cables, therefore new transformers are required. It is not clear whether an automatic turn on and shot off system is in place and/or has been checked whether it works, and whether the power from the generator will also provide electricity to other essential equipment (emergency lighting etc.) to enable the plant to keep operating.

220. Compressed air is required for the furnace to heat up system, press and blowing machines and annealing lehr. The air receiver is in position and the air supply line from receiver to factory is installed. The air compressor is in the store, this must be placed and fixed in position, connected electrically and fitted with relevant filter, water drain, valves, gauges and pipework.

221. Fuel supply is required to heat up system, the main supply line has been installed but must be completed, i.e. interconnecting piping, valves and quick couplings to the three burners.

222. Much of the equipment have been subjected to rain water spray and high humidity. To a large extent the deterioration may be cosmetic but remedial work is necessary. Particular attention must be paid to the electrical/electronic components of the installation.

223. Overall most of the installation has been completed and the equipment and parts required to be installed are in the store at the factory except for a few items to be purchased locally. At the moment, however, the project is at a standstill due to a lack of agreement on should or is responsible to complete the work still outstanding.

224. Not covered in the SGS report is the condition of the quality testing laboratory the equipment supplied has not been operationalized and training will be required to get the laboratory into operation. Moreover, the mechanical and electrical workshops and mould room are not set up in accordance with the instructions of the CTA.

225. The process line once operational will undergo a performance guarantee test with the following production parameters:

Type of product	Quantity/shift	Weight/Unit	Total weight/ shift/ Kg
Erlenmeyor 1000 cc	400	245 gr.	98
Beaker 1000 cc	400	200 gr.	80
Serum bottle 500 cc	1,200	270 gr.	324
Small Flask 125 cc	1,000	100 gr.	100
			602 kg

Total production three shifts/day = 1,806 kg.

Output 1 (b) Secondary Forming Section, including Output 1 (c) Calibration and Control Section

226. 25 working places for glass blowing, i.e. finalization and/or assembly of more or less complicated glass apparatuses based on blown and pressed ware form the primary forming section. Imported pyrex tubing and during a transition period soft borosilicate tubing of local, manual manufacture is available. The section carries out manual operations such as drawing, blowing, bending, setting, fitting, but also includes mechanical cutting, grinding and equipment handling as well as intermittent and final annealing.

227. Results achieved are partial since the furnace has yet to produce pyrex quality glass and the press and blowing machines are not yet installed and the annealing lehr has not been commissioned. That part of the secondary forming section output which specified that glassware would be produced using glass from the primary forming section will only be possible when the primary section is commissioned. However, a secondary forming section has been established which is capable of performing the operations listed under this output. However, the capacity has not been established in that only 15 burners can be used at any one time and only 10 blowers have been trained in contrast to the target number of 25. All the equipment specified by the project and later modified by mutual agreement have been delivered and installed. From March 1991 onwards final glass products are being produced from glass tubes purchased by the project from the United Kingdom. Commercial operations of the section started October 1991. At the time of the evaluation the section was producing handblown medical apparatuses for export to Japan. By chance the Manager of the Japanese Company visited the plant during the evaluation. He expressed his complete satisfaction with the products of HSGW. The products, however, are rather simple to make by well trained glass blowers. The comparative advantage that HSGW had according to the Japanese manager was that the cost of handblown glass was low due to the extremely low salaries paid to the workers. Moreover, handblown glass is hardly produced in Japan anymore because of high labour costs and unwillingness of Japanese workers to carry out such manual work.

228. It is difficult to provide a detailed assessment of what has been accomplished in setting up the secondary forming section since the experts terminal report does not assess achievements as against what was planned in the project, in clear terms.

229. A glass blowing workshop was set up, however, as already mentioned the number of workers and burners which can be operated at any one time is less than planned. This task has only been partly completed. Training on the job has been conducted which consisted of practical and theoretical work sessions. The trainees received instruction on modern glassblowing and calibration technologies. What exactly they were trained to do, and what their capabilities are now was not addressed in the experts report. However, the few glass blowers 6-7 who were busy filling the Japanese order appeared to be highly skilled.

230. The expert was also to introduce quality consciousness in the manufacturing process including control procedures and standards. The expert is silent on what he has achieved in this respect, except in all his reports he continually complains that he had difficulty installing a safety consciousness amongst the workers. This of course is related to quality concerns and may indicate that a high level of quality consciousness may be still lacking. The expert was able to introduce new and improved designs but he remains silent on what they were. The secondary forming

section is comprised of:

Saw machine - full use made
Drilling machine - full use made
Mini saw machine - full use made
Horizontal grinding machine - full use made
Dividing machine, for marking and linear division - further training is required to make full use of machines
Pentograph, most modern design for lettering on glass - recently installed, performs adequately, more training may be required.
Illuminated magnifier - full use possible
Kocken furnace - up to 800 degrees centigrade, works well
Heraeus FU 60/100-650 furnace - suitable for larger production up to 650 degrees celsius.
SMIT - reportedly works well
Gas plant - basically a disaster, shoddy materials and performing below specifications
Compressor - after some initial problems is working well
Oxygen generator - after some initial problems is working well
Glass lathe, with 8" bore spindle - the existing gas plant cannot handle the pressure required, bottled gas has to be used.
Glass lathe with 80 mm bore spindle.
Burners - Thueringian model.
Burners as above but horizontal design.
Glassblowtable - made from stainless pipe and steel covered plywood tops with gas, oxygen and air lines installed.

231. A practical training course for glassblowers in two volumes and a training instruction manual was prepared for all equipment on site. The secondary forming section could be made more commercially viable if equipment from another glass project could be transferred to this one. Repeated efforts have been made to do this with no success so far. The other project is not operating well and is underequipped. The expert was of the opinion that only by combining the equipment of both projects can a commercially viable production be made possible.

232. To avoid a very possible explosion it was recommended in the strongest terms to use bottle propane gas instead of the project supplied gas plant which cannot supply an adequate supply of gas anyhow.

Output 2

233. Some products have been developed based on hard borosilicate tubing provided by the project and a few of them are already being sold to customers. Moulds for four machines made items (serum bottle, petri dish and cover and stop cock) have been produced for use during commissioning. However, the main activities related to this output cannot be initiated before the start of indigenous hard borosilicate production. The target of 10 new designs and prototypes of volumetric equipment as well as 20 types of analytical or processing equipment of more complicated design will not be reached by this project.

Output 3

234. A decision was taken by the first TPR meeting on 16 February 1990 to suspend the establishment of a mobile repair and service unit.

Output 4

235. A comprehensive analysis of the economic feasibility of an expansion of the production of scientific hard borosilicate glassware cannot be initiated before a stable flow of production has been reached in the pilot plant.

Commissioning Programme

236. The backstopping officer met with the furnace supplier and the CTA in the United Kingdom to develop a detailed action plan to break a stalemate in the project concerning who is responsible for what in completing the preparatory work before the commissioning programme can start. This meeting resulted in a very detailed list of action required dated 11 August 1992, which was then sent to HSGW for comments.

237. In response a letter to the UCD dated 20 October 1992, the management of HSGW agreed with a majority of the items which need to be completed by them before commissioning can start. However, there were quite a number of important items which either HSGW did not fully understand or agree to. Two letters, dated 29 October from the CTA and 28 October from AFT gave their reaction to UNIDO's backstopping officer who passed on their letters to the NPD. Both parties expressed their lack of comprehension on why at this late stage there should be any misunderstanding.

238. In the opinion of the evaluation team the tone and content of these responses indicate that patience had run out. It was unfortunate that the backstopping officer simply passed on these letters HSGW without analyzing and synthesizing their technical points in a separate document. The counterparts had enough difficulty understanding and finding out how to do all the preparatory work expected of them without having to decipher two uncoordinated letters criticizing their lack of understanding. This episode clearly indicated to the evaluators that the project has reached a standstill and that there was an urgent need for the backstopping officer to negotiate in great detail a workable list of pending activities with HSGW and then the CTA and AFT. This was done with HSGW during the second week of the evaluation when the backstopping officer arrived to resolve this problem. A similar negotiation is also required with the suppliers.

239. It is the opinion of the evaluators that the detailed commissioning work plan prepared by the backstopping officer with collaboration of the CTA and AFT does not correctly delineate between those actions required to prepare the facilities and set up the equipment, as compared to the actions required to start-up commissioning performance tests and the actions required to complete the final acceptance. The suggested plan of action appears to be one sided in favor of the supplier where it will be too easy for the supplier to say that HSGW has not complied with their obligations and commissioning is therefore not possible. Whereas AFT would most likely not share this opinion.

240. However, everyone agrees that the preparation and start-up should be a joint activity of the HSGW engineers and the suppliers technical staff. The test and acceptance has legal implications and definitely requires an objective third party who witnesses the quantity and quality of production inputs and outputs. Another important aspect is the laboratory which conducts the tests these inputs and outputs. It is questionable whether the existing laboratory will be able to carry out the tests required.

241. The commissioning work plan drafted by the CTA, UNIDO and AFT (see para. 236) is detailed and quite alarming when one considers all the actions which still have to be completed before the actual commissioning programme can start. The NPD after having studied the programme in detail had questions on the following work plan items. The NPD questions and the responses of the CTA and AFT are provided in matrix following this section.

Para.

1.2.4 Construct hand rails on upper platform to drawings in drawing file;

1.4.1 Complete outstanding drilling for all thermocouple holes;

1.6.5 Fill water system and drain from suitable points to ensure the system is thoroughly flushed out. Check and repair any leaks and ensure valves are working correctly. Only

when clean water is passing should the drains be closed and the system bled as detailed in vendors manuals;

1.6.6 Ensure that all electrical connections to dual pump station and blast coolers are complete and test to ensure motors are working correctly;

1.7.1 Complete primary cabling to furnace fan including fitting of starter box. Test out to ensure the motor is rotating in the correct direction;

1.7.2 Complete primary cabling for the burner system blower including temporary positioning of the blower. Test out to ensure the motor is rotating in the correct direction;

1.8.6 Generally check that all connections in all transformers are correctly made and ensure that the system is ready for energizing;

2. Check and complete all electrical primary systems;

3. Clean, check and oil all parts including electrical system;

4.2.1 Install all screw conveyors, including drives, electrical supply etc. Test out screw conveyors to ensure that the screws are rotating in the correct direction;

4.2.3 Install weighing platform including cabling to load all;

4.3 (4.3.3) Construct hole in wall adjacent to mixer to allow access to the control panel and drives. (4.3.4) Make electrical connections to the mixing unit and hoist. Ensure that the equipment is working properly. N.B. Relevant manuals must be consulted at this stage;

4.4 Construct frame and safety platform for crusher and connect electrically;

4.5.2 Construct 6 borrows for transport of raw materials from bins around the factory;

5 + 6 Install, connect, fill, clean etc. press and suck/blow machine;

9.1 + 9.2 Install diesel tank, fit diesel pumps, run diesel line, fill diesel tank, ensure guarantee supply of fuel;

9.4 Install second compressor, check all systems.

242. The following matrix is provided to provide a documented picture of the misunderstandings presently prevailing between HSGW, the CTA and AFT. It also provides evidence that the project is quite far away from being able to commission the plant.

	Letter from NPD dated 2.10.1992	**Letter from CTA dated 21.6.1992**	**Letter from AFT dated 28.10.1992**
1.2.4	**does not understand**	simple request for railing	**within HSGW capability**
1.4.1	**Need longer bits for thermocouple drilling, AFT last mission not successful**	Incorrect, drilling stopped due to bit wear, will be completed by AFT during next mission	**Partly incorrect worked stopped because wear in bits, problem of drill getting wet, will use air compressed drill**
1.6.5	**Water supply not hooked up to electrodes, AFT have not checked recirculation cooling system, no operational instructions, HSGW cannot fill system**	This standard check for adequate flow, leaks etc, supply to electrodes can be short circuited to test remaining system	**Operating instructions are in Vendors Manual section 3, Volume 3**

	Letter from NPD dated 2.10.1992	Letter from CTA dated 21.6.1992	Letter from AFT dated 28.10.1992
1.6.6	Electrical connections to motors to dual pumps station and blast cooler completed, AFT will need to witness turning them on	Why? This is simple check, well within staff capability, has staff capability changed!	If HSGW unable to do will need to be completed during commissioning programme additional time will be required by AFT staff
1.7.1	AFT's operation instruction required here so as to avoid possible breakdown	Primary cabling does not require AFT's instruction, needs clarification	If HSGW unable to do will need to be completed during commissioning programme additional time will be required by AFT staff
1.7.2	Oil supply to furnace burner system not completed, testing to ensure motors are rotating in the correct direction requires AFT instructions on site	Why? Routine electrical test applied to all motors, if help need will require payment to AFT	If HSGW unable to do will need to be completed during commissioning programme additional time will be required by AFT staff
1.8.6	Current transforming rings of small size, cannot run two 240 mm^2 rubber cables through them, automate of transformer does not work, AFT already informed nothing sent	Already discussed on site by Fletcher, he will hand carry a larger grommet	Already discovered about rings, automate of transformer not working needs clarification will install correct size
2	Regarding electrical primary system, HSGW has run all cable needed from source and electrical panel to every equipment position, the supply of AFT and afterwards needs to be examined by AFT, Because the mixer, electrical scales screw conveyors and cullet crusher without any instructions	Electrical connection circuits were included and delivered with the mixer and crusher and like the screw conveyors and scales, are in case simple, if they are too complicated for HSGW electrical staff, then AFT will have to spend unbudgetted time ... etc.	see comments 1.6.6
3	The Lehr has been installed in accordance with manufacturers instructions, although cold commissioned the hot commissioning could not be carried out, HSGW have discussed with AFT more than once, HSGW will not take responsibility for the Lehr unless hot commissioning is fulfilled by AFT	Lehr was installed under on-site instructions by suppliers supervisor, there was no ability to either cold or hot commissioning as no electricity supply was available, in any case needs to be done prior to production when full with hot glass products. The Lehr supplier agreed to commission just prior to production use, this was made clear to HSGW in the presence of suppliers supervisor, AFT is not responsible for hot commissioning	Do not understand the purpose of HSGW statement, HSGW not being asked to take responsibility for the Lehr, only to carry out remedial work
4.2.1	Screw conveyors are installed AFT needs to supervise start-up to ensure motors are rotating in correct direction	Why is AFT's presence required unless HSGW are confirming that their electrical staff are incapable, if this is so then AFT will have to spend ... etc.	see comment 1.6.6

	Letter from NPD dated 2.10.1992	Letter from CTA dated 21.6.1992	Letter from AFT dated 28.10.1992
4.2.3	HSGW awaiting AFT installation and operating instructions on electrical scales, electrical supply from computer to the scales and from electrical system to scale electrical panels	Already known and agreed during AFT's last mission except for basic wiring which HSGW should complete, computer cabling will be brought by AFT on next visit as agreed, if HSGW are incapable then AFT will have to spend ... etc., on the other hand this may be a case of HSGW trying to avoid buying cable locally in hope that UNIDO or AFT will supply this instead of HSGW	see comment 1.6.6
4.3	HSGW has completely installed the mixing equipment following AFT's design, HSGW does not know exact position of hole in the wall (ref. 4.3.3) and electrical connections to mixing unit and hoist have not been made as their layouts have not been received	The position of the hole in the wall does not need precision location, as was pointed out to HSGW by AFT during his last visit a hole is required to enable access for repair and maintenance, this is certainly not possible now, the wiring scheme for the mixer was provided and arrived with mixer several months ago, if HSGW have mislaid this, or if their electrical staff are incapable of following it then AFT will have ... etc.	The hole in the wall is to allow access to the mixer control panel and drives these are all visible, HSGW can make a hole as big as they wish provided they have access to all relevant parts
4.4	The existing crusher can hardly meet the requirements of a two ton/day furnace, HSGW would like AFT to suggest a solution	Incomprehensible. Why, many months after its agreed ordering and delivery do HSGW now consider the crusher unsuitable? AFT gave advice on its positioning and access to feed it during last visit, references of being too small and 3 dm^3 tray are not understood, please rephase and explain and then full consideration can be given to any problem	HSGW should check manuals and ascertain the manufacturing comments relating to though put, crushers servicing large plants are not particularly large
4.5.2	Construction of a wheel barrow still requires discussion between HSGW and AFT prior to construction so as to avoid a third failure despite AFT advice	The original barrow was made against CTA advice by HSGW and rejected by AFT on the grounds of design, materials, appalling construction and deplorable workmanship, the second one made under AFT supervision and advice was acceptable and worked, AFT dealt with this during the last visit but it appears that will have to be covered again during the next	Comments are grossly inaccurate, the first barrow was shoddily built the second works very well, however, after further discussion with the CTA it was decided that a larger barrow would be necessary for actual mixing area only, this should be a larger version of the second successful barrow, AFT will provide a drawing

	Letter from NPD dated 2.10.1992	Letter from CTA dated 21.6.1992	Letter from AFT dated 28.10.1992
5	The press machine installation requires an expert from the machine manufacturer to avoid unforeseen problems	Incorrect. Instructions and special oils, fluids were supplied with the machines by other suppliers and since then the CTA provided details of services needed on site. this was later repeated by AFT on CTA's behalf. unless HSGW carry out connections and fill the reservoirs with appropriate fluids correctly as originally agreed then the suppliers will have to spend unplanned time during and out of the already short commissioning time allocated. if HSGW is incapable of doing this then AFT will have to spend ... etc.	If HSGW are unable to complete it will have to be done during commissioning additional time should be allocated for AFT to direct or contract personnel to help complete
6	Suck/blow machine: the same as item 5		
9.1 + 9.2	To fully install stand-by generator awaits expert instruction, the estimated diesel consumption has not been provided to HSGW, making it difficult to reserve fuel	As stated not true. When AFT discussed with HSGW during last visit the problem was not expressed as one of lack of knowledge of quantities and consumption. instruction, information etc.. all of which had been supplied but a concern and surprise on HSGW's part that it was a large quantity of diesel fuel and its cost to them for which they are responsible to ensure protection of capital equipment and maintenance of safety. does HSGW still have other doubts. if so please detail them as they do not read correctly as they stand	HSGW have not been asked to commission generator merely to complete other work required prior to commissioning, diesel consumption as shown in operating manual
9.4	HSGW has received a second compressor but without a pressure stabilizing tank, AFT would like install next to the first one but there is not enough space, in addition the air lines from the house to the press and suck/blow machines and Lehr will need to be very long, consideration on a alternative solution is sought	Concerning the compressor concerns were basically shared and constructive advice given to HSGW. letter closes with an expression of concern that HSGW appear to have decided that they are not only much less competent than first assured to us but also that they are by themselves incapable of carrying out the simplest tasks. if this is correct it bodes ill for the operation and future and safety of the highly sophisticated melting equipment	AFT suggested best position for second compressor was adjacent to the first, HSGW alternative is acceptable, letter closes by saying that project status entirely dictated by funds available for completing the project, if HSGW are unable to complete the works listed in the commissioning programme, then the only alternative is for AFT to direct contract personnel to give additional assistance, this will be impossible within the existing financial constraints

IV. ACHIEVEMENT OF THE IMMEDIATE OBJECTIVES

Present Status

243. Much time (about 2 years) was wasted on a single item: specification, selection and procurement of a stand-by generator. Times were also wasted on many minor disagreements: tools, capacity of the cullet crusher and that of the petrol-solvent gas generator, absence or late delivery of documentation and information on equipment items, etc.

244. The status of the plant installation has been repeatedly assessed and reported by UNIDO in June 1992 based on the visit of made to the project site and the UNDP contracted monitoring mission of the Société Générale de Surveillance (SGS) in September 1993. These findings are accurate and remain true with the execution of item 1.1 below.

245. Secondary forming workshop. This secondary forming workshop which carries out the finishing of glass products and machine-blows goods from glass tubes is in operation. Its facilities have been instrumental in meeting the goods ordered from a Japanese client for export.

246. Glass plant. However, the erection works in the main production plant are yet not finished. With the execution of the press, the blower and the furnace, the erection of all other machineries are essentially completed but the connection to the utilities supply lines (i.e. electricity, compressed air and water) are yet to be made. Since the plant is not yet ready to run, no immediate and development objectives of the project have been achieved. The production process is organized into 4 sections.

247. 1. Primary Forming Section

1.1 Sand preparation There are a vibrating bed for sand separation and a coal based-fluidized bed dryer. Both items are of Vietnam design and manufacture. The installation of these items is complete and is already operational.

1.2 Raw material batching There are a small cullet crusher, a micro-computer controlled weighing/batching installation and a rotary mixer. They are all erected but electric supply cables and control switches are yet to be completed.

248. 2. Glass melting section This is the core section of the plant with an electric glass melting furnace. It is the very item which defines all other aspects of the production: production output and quality of finished glass, productivity, cost-competitiveness, etc. While its frame structure, most of the refractory laying and part of the electric wiring and air/water piping are installed, the heating system of this furnace is yet to be completed.

249. 3. Forming and blowing section There are 2 machine items in this section: a press and an old HSGW blowing machine which was sent by the project to an engineering shop in UK to be repaired and refurbished. Both items are not installed and still remain in packing cases.

250. 4. Annealing Lehr section This is covered by a single equipment item, the lehr machine. It is installed. Only the compressed air and electric utilities need to be connected.

251. Utilities supply and maintenance facilities Question was raised with regard to the correctness of the stand by generator position within its building. The exhaust outlet of its engine is yet to be put on. All other utilities supply facilities (air compressor, water and fuel supply) are completed and ready to be connected to the production machineries.

252. Because of the technological features of the furnace, the production plant will operate around the clock with 3 shifts a day, and 7 days a week. Consequently, a workshop, to be equipped with Government (HSGW) supplied basic machine-tools, is required to provide on site

repair services. No installation work had been performed yet, but the national counterpart clearly indicated that all equipment items are available and are ready to be installed at immediate notice.

Suppliers' Warranty

253. Since the plant is not operational, not a single item of the equipment supplied by UNIDO had been test-run and commissioned. Each item was ordered from a separate manufacturer/supplier. UNIDO relies mostly on AFT services for sourcing, on its advises for specification and selection, and on its assistance in negotiating the conditions of sales including warranty and commissioning procedures, etc. Because of the long delays which have occurred since the delivery, the unfinished installation and, thus, the long idling of the equipment items, it is not clear whether these suppliers continue to abide by the original warranty clauses. This needs to be reconfirmed and/or renegotiated and the commissioning procedures will have to be established accordingly.

Workplan

254. UNIDO had prepared, since September 1992, a draft paper with detailed list of activities to be undertaken to complete the plant installation and to proceed with the final commissioning of the machineries. Although substantive comments and suggestions were repeatedly exchanged between the HSGW and the executing agency, no definite work plan had been agreed and little progress was achieved. While each task is well specified, the reading of the draft paper tend to suggest that HSGW would have to carry out all work planned, there are no indication of shared liabilities and responsibilities, either explicit or implicit, from the suppliers.

V. CONCLUSIONS

255. The design, and appraisal of this project were time consuming and were subject to many controversies among the 3 parties involved. Even the course of its implementation was changed many times and in many ways. The Government parties were mostly concerned with the hardware side of the technology and was strongly confident about its economic cost-effectiveness and the capacities of the national implementing agency (HSGW) to bring the project to a successful conclusion. On its side, UNDP was striving to ensure that its resources not be used for industrial scale and commercial investment purposes. UNIDO did not seem to stand firm and steady neither with regard to the choice of production technology nor to the capacity of the furnace. The executing agency was heavily relying upon the advises of consultants who were mostly experienced in industrial undertakings and not in development projects. Perhaps, also the absence of an integrated plant design concept was a major loop hole which had caused most of the delays and problems of implementation.

256. According to the approved design, the project was aimed at introducing a new industrial technology by:

(i) its hardware. The AFT designed furnace is the very first electric glass melting to operate in this country.

(ii) its end-products. This will be the only plant in Vietnam to produce hard borosilicate glass (PYREX type quality). It may target at producing either scientific glassware or heat resistant consumer glassware.

257. Despite of 2 consulting missions undertaken long ago in the course of preparatory assistance, considerations of cost-effectiveness, product competitiveness and marketing were never studied. Likewise, the process of imparting management practices was not designed and that of transferring technological knowledge was only partially covered through few training fellowships.

258. The feasibility of the project would have not become a critical issue if the Government had not shifted to a national economic management driven by market mechanisms. In the current environment of national policies and strategies applicable to public sector economic enterprises, and the current state of market development of Vietnam, it is nearly impossible for HSGW to operate the production plant of VIE/80/030 within the constraints and criteria of financial viability.

259. As it now stands, with the exception of the secondary forming section, none of the stated immediate objectives of the project was reached, because the neither the erection of the production plant nor the installation of the quality control laboratory had been completed. If support from UNDP, UNIDO and Government were to be withdrawn now, HSGW would not be in a position to realize planned capacities nor can sustainability be assured of installed capacities. Since HSGW would face arduous and complex problems to bring the facility to full operational conditions and to sustain its business in the new market driven economy.

VI.RECOMMENDATIONS

260. From the engineering standpoint, the bulk of the plant erection had been done. With the exception of the furnace, the installation can be completed by HSGW with little external assistance. On the other hand, the furnace must be completed under the direct supervision and responsibility of its supplier, AFT (UK). In light of the large investment already incurred by the Government and UNDP on this project, the mission is firmly convinced that support and technical assistance should not be terminated now. The project may be continued in either of the 3 following scenarios:

(i) to complete only the installation of the furnace,

(ii) up to the completion of the installation of the whole production plant, or

(iii) until the production facilities are completed, and the transfer of production skills and management capacities be achieved.

Prerequisites for Continuation

261. Because of the nature of the melting technology chosen, the continuation of this project with HSGW may not be possible unless the following prerequisites will be met:

- working capital is to be made available for HSGW to ensure constant supply of raw and consumable materials, the payment of utilities supplies, wages and other costs of production. According to a rough estimate made by the HSGW management team, and if given a 3-month security margin, this would amount to about VN Dong 6,000,000,000.

- the relationship between Hanoi People's Committee and HSGW management needs to be greatly reformed. Currently, the management of HSGW operates within the strict policy guidelines and control of Hanoi People's Committee, although the Government had adopted new policy and practices with regard to the state management of economic activities, particularly the business development of state enterprises: (i) full autonomy of enterprise management including such matters as personnel administration, financial and plant management, procurement, pricing policies and marketing, and (ii) reorganization of capital and management structure, for instance.

Leadership in Project Management

262. Until now, too many problems and unsolved issues have occurred and impeded effective implementation. This was due to the confused sharing of responsibilities between too many parties (NPD, UNIDO, CTA, AFT, etc.), particularly in project management. The evaluation mission recommends that a clear and strong leadership must now be instituted to take control of work and resources planning, day-to-day management of implementation, and be accountable of the overall results of the project. The NPD would be the right nomination for this position.

Suppliers' Contract Warranty

263. It is recommended that UNIDO seek clarification from each of the equipment suppliers about the validity/conditions of their warranty clauses. Acceptance and/or terms of negotiation will be promptly prepared after careful analysis by : (i) UNIDO's procurement and legal departments, and (ii) HSGW possibly with the assistance of in-country expert.

How to Complete the Production Plant

264. Work plan It is recommended that a comprehensive work plan be established. This would require that HSGW and UNIDO revise the list of the remaining tasks to complete the plant

installation. The work plan will specify each task, the resources requirements (i.e. manpower including expert services, tools, materials, etc.), cost implication (VN Dong if national inputs, US Dollars if external inputs) the implementation and supervising parties, time schedules (start/end dates), etc. A PERT type task management plan should be drawn up accordingly.

265. Preparation for start up Complete lists of raw and consumable materials, tools and material handling equipment, manpower repair and quality control service facilities, etc. have already been prepared. It is recommended that HSGW ensure that these are all available within the conditions of accessibility and quality as specified.

Scenario (i): to complete only the installation of the furnace

266. Based on the work plan above, HSGW will undertake the tasks required to finish the installation of all equipment items, (except the furnace), repair facilities, energy, water and compressed air supplies, prepare the production and maintenance manning plans and organize the supply of raw and consumable materials for the start up of the plant. When all these tasks will be completed by HSGW, UNIDO will require that AFT come to finish the installation of the furnace, thereafter to start up and proceed with the performance commission test of the furnace.

Scenario (ii): up to the completion of the physical installation of the production plant

267. In this scenario, UNDP/UNIDO may assist HSGW to complete the plant installation to ensure full reliability through the services of specialized contractors available in Vietnam: electrical installation specialists; programmers and micro-processor control specialists; analytical instrumentation specialists; etc.

268. Terms of reference In this scenario, the Terms of Reference for AFT contract will need to be redrafted carefully. Based upon the work plans above, and the renewed conditions of warranty of the suppliers, UNIDO will prepare, in consultation with HSGW, the revised terms of reference for the contract services of AFT (UK) to complete the installation of the furnace and batch-house, and subsequently to proceed with the performance test-run and final commissioning. This contract should encompass AFT services to verify the correctness and reliability of the installation works performed by national contractors of HSGW, and the assistance to ensure proper preparation for and start up of the plant. This AFT contract may also include the performance test-run and commissioning of other equipment items (rotary mixer, annealing lehr, press, blower, and stand by generator) if the suppliers of these machineries would agree so.

Scenario (iii): until the production facilities are completed and the transfer of production skills and management capacities be achieved

269. This scenario extends beyond the scenario (ii) to include technical assistance for effective transfer of technology covering the services of a production/plant management expert with specialized experience in borosilicate glass production, and training abroad of selected managers: production, plant maintenance, marketing and quality control.

Performance Test and Commissioning

270. The mission recommends that the procedure of performance test and the criteria and conditions of equipment/plant commissioning be prepared with great care and details. From the discussion with HSGW engineers and managers, it is obvious that HSGW plant engineers know well what these procedures and conditions are to be. These ought to be firmly negotiated with UNIDO and AFT and be explicitly specified in the Terms of Reference indicated in paragraph 268 above.

Sustainability

271. As it now stands, it will not be feasible for HSGW to operate the production facilities outside of the strong financial support and economic protection of the State and the assurance that the central planning mechanism will continue to take care of its sales and distribution functions. In light of the comprehensive reforms of its economic management system, it is obvious that the Government will not provide these protective shelters. In other words, HSGW will have to strive to survive within the competitive dynamics of the market forces.

272. Because of the investment it put up for the project, including the idling of high volumes of raw and consumable materials, it seems HSGW is encountering great cash flow problems. With an estimated production cost of about US$ 2 to 3 per kilogram, the prices of the scientific glassware, when and if the new plant will be successfully completed, will be comparable to products (seemingly of lesser quality) imported from the neighbouring countries. However, these prices will be out of reach for the local research institutions, schools, vocational training centers, colleges and universities. Currently, HSGW has little marketing capacities both in terms of staff and market intelligence. Its management structure remains highly production oriented and not business development oriented. These 3 issues (cash flow, prices and marketing capacities) are the most immediate and critical problems facing HSGW.

273. These cannot be readily and successfully resolved unless a complete overhauling of the company's structure combined with a recapitalization (including a sizeable injection of running capital), and be either totally detached from the Hanoi City People's Committee, or greatly autonomous from its control and involvement, or to be merged with another more business-capable and successful state enterprise. At the same time, it may strive at developing more commercial contracts with local and foreign buyers. A revamped statute and structure would help projecting a more dynamic and attractive business image of HSGW for these purposes.

274. It may, also, request the assistance of the national authorities such as the State Committee for Cooperation and Investment (SCCI) and the State Planning Committee (SPC) to seek for foreign partnership, either (i) to identify foreign companies which would be interested in joint venture investment to bring the project facilities up to a full scale industrial capacity, or (ii) to enter into partnership agreement for marketing or management-cum-transfer of technology.

Technical Assistance

275. In the scenario (i), further assistance of UNDP may cover about 4-8 work/months of AFT services and provision for US$ 25,000 worth of replacement parts. Total UNDP contribution would then amount to US$ 85,000.

276. In the scenario (ii), further assistance of UNDP will cover the assistance of an international expert in borosilicate glass production for 6 work/months (estimated at US$ 60,000), the services of national consultants or consulting firms to completed the remaining installation of electrical/water/air supplies and micro-processor devices (estimated at US$ 12,000), and full services from AFT to complete the furnace and to carry out the performance test and commissioning of all plant machineries (estimated by UNIDO at US$ 250,000). Total UNDP contribution would then amount to US$ 322,000).

277. In the scenario (iii), it is recommended that, beyond and in addition to the services described in 276 above, UNDP would also provide a full time adviser to assist HSGW in establishing efficient production/plant management system and procedures, training of key production and marketing managers and facilities to seek/negotiate foreign partnership arrangements. UNDP contribution would cover the following:

BL 10 Personnel	
BL 11 1 senior adviser for 12 w/m	US$ 120,000
BL 16 UNIDO Headquarters	15,000

BL 20 Subcontract	
Local contract/installation	12,000
Preparation of joint venture profiles	5,000
BL 30 Training	
Fellowships (5-10 fellows)	80,000
Study Tours/joint-venture investment promotion	25,000
BL 40 Equipment	
Expendable	10,000
Non-expendable (AFT contract)	250,000
BL 50 Miscellaneous	3,000
GRAND TOTAL	US$ 520,000

278. A compromise solution would be for UNDP to select either scenario (i) or (ii), and at the same time for the Government to request the support of bilateral assistance from France, or Japan or UK to cover inputs related to BL 11, and 30.

In-depth Evaluation

DP/VIE/80/030

Pilot Plant for Scientific Glass Products

TERMS OF REFERENCE

I. BACKGROUND

Project

The development objective of the project is to meet the domestic demand for scientific glassware in terms of quality, quantity, range of articles, price and delivery time in order to enhance the operation of the sectors of public health, education and research where laboratory glassware and other scientific glass constitutes one of the essential inputs.

The problem addressed is the wide discrepancy between demand and supply and the inability of Hanoi Glass Works to satisfy more than a small fraction of the country's need for laboratory glass ware and that only at a quality level which is totally inadequate for quality scientific laboratory work.

Since the original plant of Hanoi Glass Works which dates back to 1947 and still is the only domestic manufacturer of scientific glassware was found to be beyond rehabilitation and definitely cannot be converted into a producer of hard borosilicate glass, the project design was based on the establishment of a new pilot plant designed and equipped to produce and process hard borosilicate glass from its individual raw material components. The strategy adopted was to use this plant equipped primarily with UNDP financed equipment for development of the optimum technology for local borosilicate glass manufacture and to train local personnel in all aspects of this demanding manufacturing technology in preparation for the establishment of a full-scale production plant.

The project which was initiated under preparatory assistance in 1984 was finally approved in March 1988 and the process of detailed equipment specification, procurement, delivery and installation initiated. The order for a 2 tpd all electric furnace was placed in December 1988 and other equipment items were ordered at successive later dates determined by (a) the time such equipment was required in Hanoi governed by the delivery and erection schedule of the furnace and (b) the availability of funds.

In 1990 the project experienced a certain delay due to the need to carry out a substantial rehabilitation and strengthening of the civil engineering structure - especially floors and foundations, and at the time of formulating these terms-of-reference the start-up of furnace and overall plant operation is scheduled for second quarter 1991.

Evaluation

The project has a total UNDP budget of US$ 2,494,577 and is therefore according to the established UNDP criteria (PPM section 30608) required to be subject to an in-depth evaluation.

During the Tripartite Review Meeting held in February 1990 it was agreed by all the parties concerned to undertake this evaluation in order to assess the overall achievements of the project and to suggest possible changes in the project.

Since the operational pilot plant itself will represent the most tangible achievement of the project, at least at this stage, it has been agreed to carry out the in-depth evaluation only after the start-up of the furnace and other related equipment of the primary forming section of the pilot plant.

II. SCOPE, PURPOSE AND METHODS OF THE EVALUATION

In accordance with the provisions of the UNDP Policies and Procedures Manual (PPM), the primary purposes of the in-depth evaluation are as follows:

(a) To assess the achievements of the project against its objectives and expected outputs, including a re-examination of the project design;

(b) To identify and assess the factors that have facilitated the achievements of the project's objectives, as well as those factors that have impeded the fulfilment of those objectives;

As part of the above-mentioned tasks, the mission will also review whether the approach utilized in the project has led to optimum results, or whether another approach could have improved the results. This will include a review of the following:

1. Suitability of the technology applied and in particular of the specific furnace design selected and implemented, bearing in mind the pilot nature of the plant and the declared objective of achieving a production of hard borosilicate glass of international quality;

2. Actual performance (qualitative and quantitative) of the furnace and related equipment as documented during the acceptance trials;

3. Suitability of the bench working section in consideration of its dual function, serving both training and production requirements;

4. Relevance of the overall pilot plant design and its operational capabilities to the national needs for scientific glassware;

5. Relations established with users of scientific glassware in the country to improve the quality services which the project may provide them;

6. Performance of all parties concerned (Central Government, People's Committee of Hanoi, Hanoi Glass Works, UNDP and UNIDO) during the course of establishing and running in of the pilot plant with particular attention to:

- quality of the inputs and services;
- timeliness of the inputs and services;
- cost of the inputs and services;

7. Reasons for delays and cost increases experienced and their implications for the project;

8. Prospects of achieving financial self-sufficiency in the operation of the pilot plant within the lifespan of the project;

9. Possible future implications of the close linkage between Hanoi Glass Works and the People's Committee of Hanoi.

In view of the fact that the production of marketable items by the pilot plant will only barely have started at the time of the evaluation, the mission should also reveiw to which extent its operation, including production, planning and choice of product range, should be guided by other organizations with interest in ensuring an adequate supply of scientific glass ware, including repair or salvaging of broken items, and how the integration of these organizations into the medium and long-term management of the plant can be achieved.

While a thorough review of the past is in itself very important, the in-depth evaluation is expected to lead also to detailed suggestions of the remaining part of the project and for further assistance to the sector of scientific glassware and to the Vietnamese glass sector in general, including also other users of the country's non-metallic mineral resources.

III. COMPOSITION OF THE MISSION

The mission will be composed of the following:

- One representative of UNDP;
- One representative of the Government of Vietnam;
- One representative of UNIDO.

These representatives should not have been directly involved in the designing appraisal or implementation of the project.

IV. CONSULTATIONS IN THE FIELD

The mission will maintain close liaison with the resident representative of UNDP in Vietnam, the concerned government organizations, local UNIDO staff, and the project's national and international staff.

The mission is also expected to visit other selected manufacturers of scientific glassware (soda lime glass and soft borosilicate glass) in Vietnam, the Company for Scientific Technical Materials which is responsible for procurement and distribution of inter alia Scientific Glassware and a number of representatives end-users of such glassware including universities, research institution, hospitals and schools. A visit to the University of Hanoi with which the project has established a close cooperation is also expected.

Although the mission should feel free to discuss with the authorities concerned all matters relevant to its assignment, it is not authorized to make any commitment on behalf of UNDP or UNIDO.

V. TIMETABLE AND REPORT OF THE MISSION

In so far as required, the UNDP and UNIDO representatives will receive briefings at their respective Headquarters. Upon arrival in Hanoi the mission will be briefed by the resident representative of UNDP, who will also provide the necessary substantive and administrative support. The mission will attempt to complete its work within from two to three weeks starting in Hanoi on a date to be determined depending on the time of plant commissioning. Upon completion of its work, it will be debriefed by the resident representative of UNDP. At the end of the mission, the resident representative of UNDP will organize a meeting involving senior government officials at which the mission will present its initial findings, conclusions and recommendations, and be ready to discuss these. Finally the UNDP and the UNIDO representatives will be debriefed at UNIDO Headquarters - and, if required, at UNDP Headquarters as well.

The mission will complete its report in draft in Hanoi, in accordance with the attached guidelines. It will leave a copy of the draft with the resident representative.

The final version of the report will be submitted simulataneously to UNDP and UNIDO Headquarters (3 copies each) and to the resident representative of UNDP (10 copies). The latter will be responsible for the formal submission of the report in 6 copies to the Government.

Annex 2

LIST OF PERSONS MET

HSGW

Ms. Tran Thi Thuan, National Project Director HSGW
Mr. Nguyen Ngoc Chau, Vice Director, Chief Engineer
Ms. Nguyen Hong Nga, Electrical Engineer
Mr. Nguyen Phuang Dong, Mechanical Engineer
Mr. Dinh Huu Hung, Forming Worker
Mr. Nguyen Van Thanh, National Expert

State Planning Committee

Dr. Phan Thu Huong, Vice-Director
Ms. Thoa, Expert

Ministry of Heavy Industry

Ms. Nguyen Thi Thanh Binh, Technical Expert, (Evaluation team member)

Ministry of Foreign Affairs

Mr. Phan Hong Nga

Ministry of Finance

Ms. Pham Thi Lien

People's Committee of Hanoi City

Prof. Nguyen Ngoc Le, Vice-Chairman

Hanoi Department for Foreign Economic Relations

Mr. Long

Hanoi Industrial Development Department

Mr. Nguyen Dong Ty

Yamaguchi Medical Instruments, Osaka

Mr. Yoshitomo Fujiki, Manager (Customer of HSGW)

UNDP

Mr. Michael Gautier, Senior Deputy Resident Representative

UNIDO

Mr. Niels Biering, Senior Industrial Development Officer (Backstopping Officer)
Mr. Preben Hjortlund, Field Officer, Officer-in-Charge of UNIDO Office, Hanoi
Mr. Nguyen Khac Tiep, National Programme Officer