

PROJECT COMPLETION REPORT
POTASH PLANT PROJECT

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I. Summary

All services and goods financed by A.I.D. under the Potash Plant Project were completed within the project's PACD of March 31, 1984. On December 13, 1984 USAID approved the final disbursement of A.I.D.'s \$38.0 million loan contribution to the project.

Substantial progress has been made toward achieving the project's purpose, which is to assist Jordan in increasing its foreign exchange earnings. Although a number of factors, which will be discussed in this evaluation, have delayed the achievement of a positive cash flow, the Arab Potash Company (APC) expects to break even in 1986 as potash production levels are raised. By 1987, APC expects that the necessary salt pan and refinery modifications will be completed to increase production to operate "in the black." The profits realized by the APC will help meet the project's goal of increased economic independence from outside assistance.

It is noteworthy for a project of this size and technical complexity that it was completed on schedule and reasonably within budget*. However, as an ongoing, income-generating venture it has encountered some unanticipated problems, including an initial delay in potash production, a failure of the solar evaporation pans to produce potash at the designed level, technical problems within the refinery, much lower than projected world potash prices and some difficulties in recruiting and retaining qualified Jordanian counterparts to assume the positions of the foreign consultants.

* See attachment A for discussion from APC regarding financial and project costs and conversion to Jordanian manpower

USAID continues to monitor progress on the resolution of these problems, has financed a study to suggest remedial measures to increase potash production and has offered technical advisory and training assistance for APC personnel. Because of USAID's major role in financing the completed project and because of USAID's interest in achieving the project purpose, it is recommended that USAID continue to cooperate with APC on correcting its current problems and on developing ideas for plant expansion and diversification. A.I.D. is considering (partial) financing of a plant expansion feasibility study. A.I.D. is also actively discussing the privatization of APC. (It is important to note that since this report was originally drafted in May 1985 problems with the solar evaporation pans have been largely resolved and carnallite production is now sufficient to support an overall yearly production of potash of 1.2 million tons. However, in order to reach that output level modifications will also be required to the refinery. Invitations to tender were issued and proposals due January 15, 1986; estimated cost is \$19 million. An alternative plan for raising capacity of the refinery to 1.4 million is also being considered; estimated cost of the latter is \$29 million).

II. Project Background

Limited commercial potash production started at the Dead Sea as early as the 1930's. Following the formation of the (Israeli) Dead Sea Works in 1952, the Arab Potash Company (APC) was founded and studies and design work undertaken to build a commercial operation in Jordan. Although an A.I.D. loan was authorized in 1967 to finance a commercial venture, regional hostilities prevented its implementation. In 1975, A.I.D. contributed \$6.0 million toward a feasibility study, which recommended the construction of a facility to produce 1.2 million metric tons per year.

On August 28, 1978, a \$5.0 million loan agreement was signed between the Governments of Jordan and the United States, and an incremental loan of \$33.0 million was signed between the two governments on January 25, 1979. The \$38.0 million in loan funds were relented by the GOJ to the APC to finance foreign exchange costs of technical services and equipment to be obtained under the project. The total project financing included APC equity of \$193 million (45% of the project's total financing), with contributions from the Government of Jordan (GOJ) and other Arab governments and institutions, debt of \$218 million (51%) and APC cash generations of \$18 million (4%)*. The loans from the United Kingdom and Austria were used in their entirety to cover part of the cost of two contracts which were awarded, respectively, to a British firm for civil works construction and an Austrian company for erection of the processing plant. All other loans, except the A.I.D. loan, and the equity were available, without substantial restrictions, for procurement in the international market in accordance with World Bank regulations.

The project, which is located near Ghor Safi at the southern end of the Dead Sea, included the following components:

1. Construction of a solar pan evaporation system, consisting (i) of about 58 kilometers of dikes enclosing evaporation ponds which cover an area of approximately 70 square kilometers; and (ii) the pumps and related equipment and facilities necessary to transfer brine from the Dead Sea into the evaporation ponds and between those ponds;
2. A carnallite harvesting system designed to remove carnallite from the bottom of the carnallite ponds and to transport it to the processing plant (refinery);
3. Construction of a refinery based on the hot-leach/crystallization process, together with all the required equipment, to produce annually approximately 1.2 million metric tons of fertilizer grade potash from the harvested carnallite;

See Attachment A for APC comments on project costs.

4. Construction and equipment of water supply systems to provide the refinery and the township described below with process and potable water;
5. Steam and power generating facilities to supply the refinery with the required process steam and to generate about 17 megawatts of electric power;
6. Construction of a township consisting of about 380 housing units and the required roads, water and power supply facilities and other required infrastructure;
7. A fleet of trucks of a size and design necessary to transport the output of the refinery by road to the Port of Aqaba;
8. Truck loading facilities at the site of the refinery designed to handle the output of the refinery and storage facilities for about 60,000 metric tons of potash;
9. Engineering services required to design all of the facilities enumerated above and to supervise their construction, the installation of all equipment and the testing and start-up of all the production and ancillary facilities;
10. Technical advisory services needed to assist APC in the management of the design and construction activities;
11. Financial advisory services needed to assist APC in the establishment of the required systems and procedures for accounting and financial control and reporting;
12. Operations and management assistance required to assist APC in the start-up and operation of the production and related facilities and in training its personnel for the management and operation of such facilities.

A.I.D.'s \$38.0 million loan is broken down, in approximate numbers, as follows:

Design and construction supervision	- \$ 10.8 million
Fiberglass reinforced pipe	- \$ 3.8 million
Carnallite harvesters and spare parts	- \$ 13.0 million
Refinery equipment, machinery and spare parts	- \$ 10.4 million

Despite the complex technical nature of the project (using solar energy for evaporation and carnallite precipitation), the coordination of eight lending agencies and the remoteness of the project site and the corresponding infrastructure challenges, the actual project costs remained close to the original estimates and the construction was completed within schedule, with the project being officially inaugurated on March 18, 1982.*

During the past three years, APC has continued to work with its foreign (Jacobs Engineering) consultants on remedial measures for the solar pan and refinery and on staff training. The Jacobs O & M contract runs until May 1986, at which point it is planned that all management and administrative responsibilities will be met by APC personnel with possibly some limited foreign O & M assistance.

III. Evaluation Methodology

The Project Paper did not anticipate a formal final evaluation of the project, but did suggest that an internal (USAID) project completion report would be appropriate. The purpose of this project completion report is to review the project's inputs, outputs and end-of-project status, to analyze

* See Attachment A for APC comments on Project costs.

in a preliminary manner what the project's impact may be and what lessons have been learned, and to close out the project.

At one point, consideration was given to a more in depth, joint IBRD/USAID project review. It was later decided that the project completion report would satisfy A.I.D.'s requirements; this report does, however, incorporate many of the preliminary findings discussed during the IBRD "supervisory mission" of January, 1985, during which APC's current production problems were discussed.

Although this Project Completion Report is mostly an internal review, involving the project officer and other knowledgeable USAID officials, it has also been distributed to appropriate officials in APC and the Ministry of Planning. The conclusions in this report are a result of comments received from those officials and a review of the project files. APC's comments are included in Attachment A.

IV. External Factors

Two major external factors have had an effect, the extent of which is yet unknown, on the project -- the failure of potash prices to approach the levels predicted in the consultant's 1977 feasibility study and the delay in filling some key APC managerial and technical positions with qualified Jordanians.

The economic feasibility of the project was based on the eventual production of 1,200,000 metric tons of potash per year, selling at a price

ranging from JD 33 to JD 50 per ton (over the first five years following production), according to a marketing study conducted by an independent firm. However, whereas the feasibility study projected a selling price of JD 33 per ton in 1982 (the first year of production), the actual world selling price was close to JD 25 per ton. World potash prices, affected by the general world recession of the early 1980's, only recently (in 1984) rose to approximately JD 28 per ton, as opposed to the feasibility study projected 1984 price of approximately JD 45 per ton. Based on actual potash production levels for 1982-1984, this represents a short-fall, due to much lower-than-projected potash prices, of approximately JD 11,997,000 (\$30.0 million) for the period 1982-1984. In fact, if we include the difference in actual potash production (779,000 tons) over the three year period to the projected output (1,728,000 tons), and calculate the difference in actual revenues generated (JD 21,130,000 or \$53 million) versus the projected revenues at projected potash production and world prices (JD 72,360,000 or \$180 million), the shortfall in projected revenues would have been close to \$127 million.

As of May 1985, it is too early to state whether adequate APC operations staff will be prepared to take over the plant management and operation and maintenance functions by May, 1986, which is the expiry date of the current O & M contract with Jacobs Engineering*. Although APC has made every effort to assign good counterpart personnel to work under the foreign advisors, the remoteness of the project site, the GOJ's recent decision that most management personnel must live on site and the attraction of higher paying jobs in the oil rich countries of the region have made it

* Although APC is making good progress as of February 1986 with Jordanian takeover, a few foreign specialists may need to be retained when the Jacobs contract expires in May 1986.

somewhat difficult for APC to recruit and retain qualified personnel in some positions. The foreign consultants have evolved their roles into those of advisors (versus hands-on operators) in an effort to give their Jordanian counterparts responsibility and experience at an accelerated pace. The transfer of technical and professional skills needs to be closely followed to ensure a qualified and continuing Jordanian management presence after the Jacobs personnel have departed. APC management is well aware of potential problems in this area.

V. Key Project Assumptions

The project paper "logframe" narrative lists the following assumptions at the output level:

- "(1) That all funds to be provided under the financial plan will become available when needed;
- (2) That the facilities can be built reasonably within the cost estimate;
- (3) That the efforts of the consulting engineers to build the facilities on schedule are successful;
- (4) With respect to output No. 2 (the creation of an operating company managed and staffed by trained personnel ...), that all consultants having training functions will reach their training objectives and that APC will find the personnel needed for the operation of the company; and,
- (5) That the political situation in the area remains sufficiently stable to construct and operate the plant."

These assumptions, with the possible exception of number (4), are still

valid. Project funds were available when needed. The project was built reasonably within budget and on schedule--a remarkable achievement for a project of this size and magnitude. There has also been no recent (since 1967) question about the political stability of the area. Only the assumption that APC can identify, employ and retain adequate counterpart personnel for the foreign consultants has not yet been fully validated.

The following is the PP assumption at the purpose level:

"That APC will produce and sell potash substantially at the design capacity of its plant."

It is this assumption which, during the past two years, has proven to be the most controversial and potentially of greatest concern to the APC. It would be unrealistic for a project of this size and state-of-the-art to not expect problems in design and production. However, the APC would be justifiably concerned if it was determined that remedial measures could not be undertaken to fulfill the assumption stated above.

The project was inaugurated in 1982, when 14,000 tons of potash were produced (well below the 156,000 tons forecast for that year). Ever since, the rate of increase of production has remained significantly below design projections, which, combined with lower than anticipated world potash prices, has created serious cash flow problems for APC. The table below shows the difference in potash levels projected by the 1977 feasibility study and those currently being predicted by Jacobs and the APC. For example, in 1983 and 1984, projected versus actual potash production levels were 504,000 and 280,000 tons, and 1,068,000 and

485,000 tons, respectively. APC's revised projections continue to show a significant shortfall for the near future. With modifications to the solar evaporation pans and refinery, APC hopes to approach the design level of 1,200,000 tons per year by 1987 (a production level projected in the feasibility study to be reached by 1985).

Annual Potash Production (Metric Tons)

	<u>Feasibility Study</u>	<u>Jacobs Engineering Estimate</u>	<u>APC Experience and Estimate</u>
1982	156,000	40,000	14,000
1983	504,000	590,000	280,000
1984	1,068,000	890,000	485,000
1985	1,200,000	1,150,000	850,000
1986	1,200,000	1,200,000	1,000,000
1987	1,200,000	1,200,000	1,200,000

The cause for this production shortfall is twofold -- lower-than-expected evaporation rates in the carnallite pans and less-than-designed refinery efficiency. In order to find ways to correct these deficiencies, APC asked Jacobs Engineering and two independent consultants (one financed by USAID) to study the solar pans and refinery operations and to recommend remedial actions. The consultants' recommendations were reviewed by a World Bank team in January, 1985. The tentative conclusion by the World Bank team was that current APC production capacity is between 900,000 and 1,000,000 tons per year (with 1,000,000 tons being the breakeven point at current potash prices). In order to reach the design level of 1,200,000 tons, the team recommended implementing the consultants' recommendations, including conversion of some salt pan area to carnallite production (est. cost of \$4.0 million), construction of a fourth carnallite pan and addition of another harvester (est. \$ 16.0 million) and modifications to improve the

refinery efficiency from 67 to 75 percent (est. \$8.5 million). Details of these remedial measures are included in the consultants' reports and correspondence in the project files. APC intends to begin immediate implementation of these recommendations in order to increase production to the original design level by 1987. (Attachment B provides a recent update on production and cost implications as of November 1985.)

The following are the PP assumptions at the goal level:

- (1) That an improvement in Jordan's balance of payments position will remain a key factor in realizing Jordan's aspirations to become independent from foreign economic assistance; and
- (2) That the operations of APC will, during a 25-year period, contribute about \$1 billion to Government resources."

Certainly the first of these assumptions is currently valid and will undoubtedly remain so. In all economic sectors Jordan continues to seek ways to make its operations more efficient and, where appropriate, competitive on the world market. As Jordan's fledgling industries expand, as its agricultural output increases and as its tourism opportunities are exploited, it will become less dependent on foreign economic assistance.

Regarding the second assumption, it is still too early to assess its validity in actual revenue terms, which is to some extent controlled by such external factors as the fluctuation of world potash prices and the political stability of the area. However, anticipating the implementation of remedial measures to increase APC potash production and assuming the rising trend in potash prices continues, there is good reason to be optimistic that this assumption is still valid.

VI. Inputs

A.I.D.'s \$38.0 million loan was intended to finance the foreign exchange costs of goods and services having their source and origin in A.I.D. Code 941 countries. \$10.8 million of A.I.D. funds financed the design and construction supervision services provided by Jacobs Engineering of Pasadena, California. \$13.0 million was used to finance four carnallite harvesters and spare parts supplied by Rahco Disc, Inc. of Spokane, Washington. Various pumps, centrifuges and other equipment machinery and spare parts were provided by U.S. suppliers at a cost of \$10.4 million. \$3.8 million of A.I.D. funds were used to purchase fiberglass pipe from the Arab Pipe Company in Jordan.

A waiver was issued by the A.I.D. Administrator to allow this last expenditure to a non- 941 country. The justification, which is presented in detail in the project files, was essentially that the purchase of this pipe would avoid a project implementation slippage of almost one year, possibly resulting in a financial loss of close to \$100 million, and that this expenditure would use up most of A.I.D.'s at that time uncommitted funds under the project.

A.I.D.'s financing of the harvesters called for the delivery of one prototype unit in September, 1980, and the delivery of four production units in 1982 and 1983. Although the delivery of the prototype harvester (a custom designed and manufactured machine to "harvest" the precipitated carnallite from the bottom of APC's carnallite pans) took place with only slight delay, two developments affected the remainder of the

procurement. First, the weight of the prototype had been grossly underestimated by Jacobs, resulting in a machine which proved too heavy to be supported by the bottom salt layer of the carnallite pans. Second, the slower-than-anticipated rate of deposition of salt (caused by exceptionally heavy winter rains) required another year's salt deposition before the carnallite could be precipitated. The result was a new harvester design to float the harvester on a barge. This change of design increased the cost of the harvester procurement by more than 25 percent. The performance of the modified harvesters was satisfactory.

In 1982, an audit was performed by the firm of Ernst and Whinney to cover the direct and indirect costs claimed by Jacobs under their cost reimbursement contract with APC for construction supervision (financed by A.I.D.). The net audit finding was \$832,199 in disallowances, which could have been costs ineligible for A.I.D. financing. It was determined that A.I.D. should disassociate its financing from these questionable costs, and, in substitution therefore, agree to reimburse APC for an equivalent amount of eligible costs incurred under the project. Further details are available in the project files.

Total project inputs were comprised of the following participation*:

<u>Loans From Institutions</u>	<u>Amount (\$ Million)</u>	<u>Percent of Long-term debt</u>	<u>Percent of Project cost</u>
IBRD	35	16%	
AID	38	18%	
Kuwait Fund	35	16%	
Arab Fund	15	7%	
Libyan Govt.	50	23%	
OPEC Fund	7	3%	
Commercial	20	9%	
GOJ	<u>18</u>	<u>8%</u>	
Total Loans	218	100%	51%
<u>Equity</u>		<u>Percent of Equity</u>	
GOJ	98	51%	
Arab Mining Co.	48	25%	
Islamic Dev't Bank	12	6%	
Arab States/Private Shareholders	8	4%	
Others	<u>27</u>	<u>14%</u>	
TOTAL EQUITY	193	100%	45%
INTERNAL CASH	18		<u>4%</u>
GRAND TOTAL	\$429 Million		100%

* Exact project costs are difficult to establish because of multiple investors and radical exchange rate fluctuation during disbursement periods. See Attachment A.

These inputs were delivered on time enabling the project to be implemented within its schedule.

VII. Outputs

The PP lists the following project outputs:

- "1. The construction of facilities necessary to produce 1.2 million tons of commercial grade potash reasonably on the established schedule;
2. The creation of an operating company managed and staffed by trained personnel able to conduct all company operations without substantial outside assistance."

The difficulties in attaining these outputs have been discussed in Sections IV and V above. All project components, designed to produce or support the production of 1.2 million tons of potash per year, were completed on schedule and reasonably within their established schedule. Within the past two years, it has been determined that certain modifications need to be made to the solar evaporation pan system and the refinery to achieve the design level of production. APC is currently contracting for the construction services required to implement the recommended modifications. (See Attachment B for an update on these modifications).

It is still too early to tell whether the APC will meet the second output target*. The Jacobs O & M contract expires in March, 1986, at which point

Although APC is making good progress as of February 1986 with Jordanian takeover, a few foreign specialists may need to be retained when the Jacobs contract expires in May 1986.

it is planned that Jordanian personnel will take over all plant, as well as administrative, management functions. In order to accelerate this transfer of managerial technology, the O & M team has been assuming an increasing advisory role, and has been leaving the actual plant operation to their assigned Jordanian counterparts. A major APC management objective should be providing enough incentives to retain its newly trained Jordanian managers, who may be enticed away from APC (as was the recent case with a promising young mid level manager) by higher salaries in the region or elsewhere.

VIII. Purpose

The project's purpose is "to assist Jordan in increasing its foreign exchange earnings." As discussed above, a number of factors, including lower-than-anticipated world potash prices and required modifications to the solar pan and refinery have delayed the project's operating "in the black." 1985 will be a critical year for APC, with a current production projection of 850,000 tons and a need for additional financing for the required capital modifications, resulting in an estimated cash-flow shortage of 15-20 million Jordan Dinars. However, given the high (approximately 85 percent) fixed costs of production, it is important to consider all modifications which will result in even a modest increase in production, since APC profits will be largely determined by marginal increments to production at around 1,000,000 tons per year. If APC is able to introduce the required modifications this year, production should reach the breakeven point of 1,000,000 in 1986 (whereby APC would be in a

self-sustainable position able to service its debt and finance costs of operations) and increase to profitable levels in 1987. At this point, and assuming continued efficient and economic operation of the plant, the project purpose will be achieved, and the project will have a positive impact on achievement of the project goal -- the increase of Jordan's economic independence from outside assistance.

IX. Beneficiaries

The project has had a significant impact on the life in the Kerak - Ghor Safi area. Approximately half of APC's total work force of 1,100 commute daily from Kerak. Furthermore, the construction of the project's township, which includes a school, clinic, club and shops, has provided new employment opportunities for local residents as well as a commercial center for local agricultural products.

A number of Jordanian technicians and managers have benefitted from the technical, financial and administrative training they have received under the project. The field staff of Jacobs Engineering has worked closely with APC's staff through the construction stage and into the production stage. The Jacobs O & M team has developed , over the years, close personal as well as professional relationships with their APC counterparts, to whom they have provided on-the-job training. In addition, APC's general managers have benefitted from on-the-job and outside training in establishing a comprehensive system of accounting and financial reporting and control.

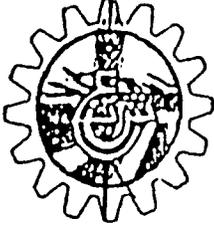
Whereas APC's managers and employees and the commercial suppliers to the township have been direct beneficiaries under the project, the indirect beneficiaries from Jordan's improved budgetary position, as a result of APC foreign exchange earnings, will be the entire Jordanian population.

X. Unplanned Effects

The project, to date, has had no major unexpected results or impacts. A potential unanticipated spin off of the project is the creation of small ancillary chemical process industries such as the manufacture of table salt, etc. APC intends to study the economic and technical potential for these industries over the next few years.

XI. Lessons Learned

A project the size and complexity of the potash plant project could never have been implemented on schedule without a concerted coordination effort on the part of APC and the participating donors. Debt financing included contributions from the IBRD, A.I.D., Kuwait Fund, Arab Fund, Libyan Government, OPEC Fund and the GOJ and commercial sources. Whenever possible, international contracting procedures were used. Donors' meetings were held, on an annual basis, to review the project's status and to discuss pending and future actions. It would be recommended that future, multi-donor projects be designed and implemented with the same degree of coordination as this project.



شركة البوتاش العربية للتجارة العامة

The Arab Potash Co. Ltd.

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Ref. : 8/17/21/4889

: الرقم

Date : 25/6/1985

: التاريخ

H.E. Minister of Planning
Amman
Jordan

Dear Sir,

We write with reference to your letter number 108/23/2251 dated May 18, 1985 concerning the USAID project completion report.

There are two points on which we wish to comment.

Firstly, the report expresses doubt on the ability of APC to attract and retain sufficient Jordanian Managers of the required skill and experience to take over all management functions when the Jacobs Engineering OMT contract expires in May 1986. We have in fact already made considerable progress in this respect, with Jordanians as they gain experience gradually replacing expatriates in many key positions. We are confident that with the training and experience our Jordanian staff are obtaining, in 1986 we shall be able to fill all management positions with Jordanians.

Secondly the values placed on project inputs on page 9 are not defined, and are not completely accurate. This is a complicated subject, which we discuss in the attached appendix.

However, in general we consider the report to be competent, accurate and fair.

Sincerely yours,

Ali Y. Ensour
Managing Director

TOTAL PROJECT INPUTS

The presentation of total project inputs is complicated because the loans made to the company were expressed in many currencies, and were drawn at differing times while the company's accounting is in Jordanian dinars. Furthermore the repayment of loans began in 1983.

The figures shown in the USAID report as loans represent loans outstanding as at 31st December 1984 converted into dollars at rates applicable on the 28.2.85, apart from the IBRD loan which is stated at the dollar equivalent at the time the loan was advanced.

This is not quite the original input of loan capital.

Going back to the original amounts advanced, but continuing to convert to \$ at the exchange rates applicable on the 28.2.85, the loans become:

	Amount <u>(\$ Million)</u>
IBRD	35
AID	38
Kuwait Fund	32
Libyan Bank	10
Iraqi Fund	14
OPEC Fund	7
British Gov't.	11
Austrian Bank	26
Syndicated Loan	12
Bonds	17
Total	<u>202</u>

at original exchange rates is as stated here, but at 28.2.85 exchange rates was approximately \$ 24,000,000.

Equity share capital of JD 63,000,000 converted to dollars at the 28.2.85 exchange rate becomes \$ 152,000,000.

Total project costs as forecast in the feasibility study were \$ 418,000,000. In terms of JD, at the exchange rate used in the feasibility study, this was equivalent to JD 139,750,000. Actual project costs come to JD 169,476,000. Note that the method used to calculate total project costs included additions to fixed assets for 3 years after start up, and working capital required 5 years after start up, so the actual figure includes some forecasts for the future. JD 169,476,000 converted to dollars at the 28.2.85 rate (\$ = JD .415) is \$ 407,000,000.

In summary this gives the following picture:

	<u>\$ Million</u>	
Loans	202	50 %
Equity	152	37 %
Internal Cash	53	13 %
Project Cost	<u>407</u>	<u>100</u>

This should not be interpreted to mean that the project cost was less than the \$ 418,000,000 originally forecast. As noted above, actual project costs are assessed as JD 30,000,000 higher than the feasibility study forecast.

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If we calculate the figures using a conversion rate for JD to dollars of .334, which is closer to the average rate applying during the construction period when most of the loans and share capital were being taken up, then the project inputs become:

<u>Loans</u>	<u>Amount</u> <u>(\$ Million)</u>
IRBD	35
AID	38
Kuwait Fund	40
Iraqi Fund	17
Libyan Bank	10
OPEC Fund	7
British Gov't.	14
Austrian Bank	32
Syndicated Loan	15
Bonds	21
Total	229

Share Capital \$ 189,000,000

Project Cost \$ 507,000,000

<u>Summary</u>	<u>\$ Million</u>	
Loans	229	45 %
Equity	189	37 %
Internal Cash	89	18 %
Project Cost	507	100

This is an approximation but probably gives a better comparison with the feasibility study in terms of dollars.

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ARAB POTASH PROJECTWorld Bank Mission Nov 24 - Nov 30, 1985Aide - Memoire

A World Bank Mission (Messrs, Venkataraman , Borin and El Daher) visited Jordan from Nov 24th to 30th , 1985 to follow up on the Arab Potash Project .

The mission reviewed the progress of the Potash operation and discussed with the Arab Potash Company (APC) their development plans and prospects .

After the corrective measures implemented during the year by APC on the solar evaporation ponds (diversion dike in the salt pan and conversion of pre-carnallite into carnallite area (C5 and C6). APC and their consultants have established that the capacity of the ponds will now exceed the 1,250.000 tpy level - with a potential for annual production of 1.4 million tpy with improvements in refinery efficiency . The remaining constraints to actually reach that level are inherent to the refinery where modifications have been initiated to bring , by mid - 1987 , the capacity to no less than 1,250.000 tpy .

The actual production of APC in 1985 has exceeded 900,000 tons and is projected at 1,050.000 tons , limited mainly by refinery inadequancies in 1986 . Bringing the level of output in the refinery to 1,250.000 tons would entail an additional investment of \$ 15 million on the refinery for which invitations to tender have been issued (to 12 pre-qualified firms) and for which proposals are expected by Jan 15, 1986

Contracts could be awarded as of end march 1986 , which would ensure works completion by mid 1987 and an output of 1,250.000 tons during the year 1987 .

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With the build - up of production thus foreseen , APC would be generating an annual cash surplus as of 1986 (from a cash deficit of about JD. 5,5 million in 1985) . However the accumulated cash deficit is not expected to be eliminated before 1990 , taking into account a capital increase of JD. 9,5 million in 1986 .

On the basis of the results of the 1985 campaign , APC estimates , with further operating improvements , the capacity of the ponds to be close to 1,4 million tpy . At the same time , the capacity of the refinery could be increased to 1,4 million tpy level by an additional capital investment of \$ 4 to 5 million .

APC and the world bank mission consider such investment to be well justified given its high return (a return of over 100% on the total incremental investment of \$ 19 million which would bring output from the 1,050.000 tpy level up to 1,400.000 tpy) .

The additional US \$ 5 million investment in the refinery should however not be committed before APC gain further experience and knowledge of the solar pond system's operation and capacity . Such investment , therefore , should not take place before the end of 1987 - early 1988 .

Medium and Long Term Development Plans

Once the corrective and optimization measures have been implemented along the proposals so outlined , APC is looking at a further growth of its operations in the long - term , to take full advantage of the potential of its site and facilities . Further growth of APC operations should be viewed in the context of a continued reduction of average production costs , in conjunction with the insertion in the present refining facilities , of a cold crystallization unit which could result in an increase of total output by about 30% (initial screening and separate treatment of the carnallite coarse fraction) to a level of about 1.8 - 2.0 million tpy .

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Such a level of production would also call for an expansion of the solar ^{power} network, which ^{would} have to be optimized based on further studies .

Such a development , as considered by APC , calls for a thorough set of studies which are broadly in annex I (3rd phase) .

The first stage under that 3rd phase may entail a cost of up to \$ 3 million , including a market / marketing analysis to derive and justify the level of expansion . Should that 1st stage result in positive conclusions , a second stage would consist of the preparation of basic engineering designs and preparation of technical specifications and bidding documents on the basis of which contractors can eventually be selected and detailed engineering designs prepared .

This second stage work has an estimated cost of up to \$ 1.5 million

An implementation schedule for the studies so contemplated is provided in annex II .

Presently the overall cost of such expansion is estimated broadly by APC at around US \$ 100 million which would result in an incremental capital / out put ratio of US \$ 176 to 250 / ton for the eventual expansion (from 1.4 million tons to 1.8 - 2.0 million tpy) as compared to a ratio of US \$ 340 / ton for the initial project , which makes the development prospects - assuming market is no constraint - a-priorie promising

APC financing requirements

APC is committed to the program of work in its three phases as outlined in annex I . This consists of :-

- Phase I - Corrective measures for capacity increase from 1,050.000 to 1,250.000 tpy , at a corresponding cost of about \$ 15 million , as mentioned .

- Phase II - Optimization measures to ensure a plant output of 1.4 million tpy , at a corresponding cost of up to \$ 4 - 5 million .

- Phase III - 1st stage of studies through the assessment of the feasibility of expansion at a corresponding cost of US \$ 3 million .

A 2nd stage , if the 1st stage is conclusive , may require further financing of up to US \$ 1.5 million for detailed engineering and bidding specifications .

APC is considering various sources of finance to meet the corresponding expenditures , including bilateral and commercial sources , as well as multilateral . The financing package for the various phases is not yet finalized .

Under its invitation for tender for phase I , APC has also invited financing proposals on commercial / suppliers terms which may cover up to between 70 to 85% of the cost involved .

APC has expressed interest in having the world bank participating in such a package under co-financing or other arrangements . APC informed the World Bank Mission that procurement for that phase of works has so far been , and will be , done following standard World Bank guidelines .

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In this context APC may submit to the World Bank a request for financial assistance in the range of US \$ 2 to 4,5 million , assuming such assistance can be secured in time , given the advanced stage of project implementation .

As regards Phase II , and once an output of 1,250.000 tpy has been guaranteed , and APC has fully tested the capacity and potential of its plant , a financial requirement of up to \$ 4 to 5 million may arise to optimize the plant and secure , with a high return , a plant output of 1.4 million tpy . No specific source of finance has so far been identified by APC which therefore has also expressed interest in a potential world bank financial assistance in this regard .

As regards phase III , APC has secured so far bilateral commitment (US Aid) of about US\$ 1,5 to 2 million . A shortfall of about US \$ 1 to 1,5 million to complete the first stage would have to be covered , with a commitment to provide an additional US \$ 1,5 million for the 2nd phase of the studies , should it be warranted APC also expressed interest in having the World Bank involved in the financing of this phase in its 2 stages .

If World Bank participation in the three phases were feasible , it would entail a financing package of between \$ 7 to 11 million

This mission would convey to the World Bank management the proposals and requests as formulated by APC and agreed to by the World Bank Mission . After consultation with , and approval of , the Government of Jordan , APC intends to detail in an official letter to the World Bank the extent of its specific requests as to the assistance of the World Bank

Amman - Nov 30, 1985 .
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1° PHASE - Increase capacity from 1.05 tpy to 1.25 tpy
KCl Corrective measures based on the Jacobs study .

Estimated cost:- US\$. 15 million

2° PHASE - Expand capacity from 1.25 tpy to 1.4 tpy KCL

Estimated cost:- US\$. 5 million

3° PHASE - Optimization study to expand capacity from 1.4 tpy
KCL to 1.8 ÷ 2.0 tpy KCL .

The study will be carried out in two steps :

1st Step : Feasibility Study which would include :

- (i) Identification of measures to expand Solar evaporation pans output .
- (ii) Implementation of cold crystallization pilot plant test .
- (iii) Execution of KCL market / marketing study .
- (iv) Preparation of detailed investment and operating cost estimates .
- (v) Execution of economic and financial analysis for selected options to determine optimal solution. Assessment of visibility of expansion project .

Estimated Cost

of 1st Step : US \$ 3 million

2nd Step . Basic Engineering (Subject to satisfactory result of 1st step)

- (i) Execution of basic engineering of proposed expansion which would include engineering work to integrate such expansion within the existing plant .
- (ii) Preparation of technical specifications and bidding documents for implementation of the expansion project .

Estimated cost of

2nd step : US \$ 1.5 million

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PRELIMINARY IMPLEMENTATION SCHEDULE FOR OPTIMIZATION PROJECT

