ANNEX H

ANNEX - H

PROGRAM FOR IMPLEMENTATION

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H. PROGRAM FOR IMPLEMENTATION

H.1 INTRODUCTION

On the basis of the preliminary design proposed for three alternative plans of El Torito - Los Veganos complex, programs for the implementation of the complex are studied with respect to the construction plan and method, as well as the construction schedule. The construction plan and schedule are integratedly studied with a view to implement the complex in the shortest possible time and in the most economical manner.

The construction plan, proposed in Chapter H.2, is therefore formulated in view of the time factor and cost factor. The estimate of the construction cost will be made on the basis of the construction plan proposed herein.

In Chapter H.3, a tentative construction schedule is proposed. In view of the power supply situation as reviewed in Annex B, the construction is scheduled to be completed at the earliest possible time. It is planned that the three alternative complex will be completed with a target as follows:

	Period from Commencement of Construction Work
El Torito dam - Los Veganos weir complex:	
No. 1 power station (El Torito)	Within 51 months
No. 2 power station (Los Veganos)	Within 36 months
El Torito weir - Los Veganos weir complex:	
No. 1 power station (El Torito)	Within 51 months
No. 2 power station (Los Veganos)	Within 36 months
Pino de Yuna weir - Los Veganos weir complex:	
No. 1 power station (Pino de Yuna)	Within 49 months
No. 2 power station (Los Veganos)	Within 36 months

The construction schedule noted above is programmed on the condition that contractors for the construction and installation works will be selected by international competitive bidding. (The contract package will be decided during the period of preparation of tender documents.) It is also noted that the construction schedule for Los Veganos scheme will not be affected even in case that El Torito dam or weir scheme or Pino de Yuna weir scheme will not be implemented.

An organization for implementation of the complex, in either case of the alternatives, is proposed in the stage of construction and operation, as described in Chapter H.4.

Additionally, a preliminary study is made on the resettlement plan which is required to be implemented, especially in case that El Torito dam plan is selected through economic and financial evaluation. The preliminary study on the associated program for resettlement is made primarily by referring to the study made by CDE, as described in Chapter H.5.

Further, a preliminary study on reforestation in the catchment area of the proposed schemes is made as a part of the programs associated with the complex. The reforestation program, described in Chapter H.6, is preliminary in nature, and contemplates a pilot program to be implemented in the course of the construction of the complex.

H.2 CONSTRUCTION PLAN AND METHOD

H.2.1 El Torito (T-1 & T-2) Dam Plan

The major construction works involved in El Torito dam plan are planned to be executed in such manners as proposed hereunder.

1) Diversion Tunnel and Cofferdam:

For El Torito dam plan, two concrete-lined diversion tunnels are excavated: one in the left abutment of T-1 dam (9 m in diameter and 350 m in length) which will be utilized as a part of spillway, and the other in the left abutment of T-2 dam (5 m in diameter and 420 m in length).

A top heading and bench cut method is recommended to be applied for the diversion tunnel excavation for T-1 dam. Rock drilling will be carried out by using 6-boom drill jumbo for the top heading, 7 m^3/min crawler drill for the bottom bench cut and leg hammer for side wall. The broken rock will be loaded by 0.7 m^3 side-muck loader and 1.2 m^3 tractor shovel into 8-ton dump truck. While, a full-face attack method is recommended to be applied for the tunnel excavation for T-2 dam. Rock drilling will be made by using 6-boom drill jumbo and the broken rock will be hauled by using 1.2 m^3 tractor shovel and 6-ton dump truck.

With regard to the concrete-lining work, an arch-side wall and arch-then-invert method is recommended to be applied for T-1 tunnel, and an arch-and-then-invert method for T-2 tunnel. The concrete from 0.75 m^3 x 2 batcher plant will be transported by 3.2 m^3 agitator and placed behind sliding form of 12 m in span, by means of 45 m^3/h concrete pump car.

2) T-1 and T-2 Dams:

Foundation excavation at T-1 dam and T-2 dam is estimated at 73,000 m^3 and 163,000 m^3 in volume, respectively. The selected excavated materials will be utilized as the impervious earth and inner shell embankment materials for the main dams. The excavation will be carried out by using 32-ton and 21-ton bulldozers with ripper, and the excavated materials will be loaded by 2.3 m^3 tractor shovels into 11-ton dump trucks. Regarding the

rock excavation, drilling will be made by 10 m^3/min crawler drill. Foundation excavation mainly for the impervious earth portion will take about 6 months after the river diversion.

The blanket and consolidation grouting work will be perfomed in parallel with the foundation excavation. Upon the completion of foundation excavation, the curtain grouting work for T-1 dam will be made in advance of the impervious earth embankment. An inspection gallery is planned to be constructed for T-2 dam. Holes for the injection of grout will be drilled with 10 m^3/min crawler drill for blanket and 5.5 kW rotary drill for consolidation and curtain. The cement grout will be mixed at central plant, delivered to 200ℓ x 2 grout mixer installed at work site and injected by 7.5 kW group pump.

Embankment volume of impervious earth materials is estimated at 45,000 m^3 for T-1 dam and 70,000 m^3 for T-2 dam. The impervious earth material is planned to be borrowed from the borrow areas and the construction area for a connection channel between T-1 and T-2 reservoir. The excavation will be done by 21-ton bulldozer and be loaded by 2.3 m^3 tractor shovel into 11-ton dump truck for hauling to the dam. The material will be spread by 11-ton bulldozer and compacted by 13.5-ton tamping roller in layers with compacted thickness of 0.2 m.

The filter embankment is scheduled to be made in parallel with the impervious earth embankment. The embankment volume is estimated at 34,000 m^3 for T-1 dam and 54,000 m^3 for T-2 dam. The filter material is planned to be supplied from the quarry site. The filter material will be hauled by 11-ton dump truck, spread by 11-ton bulldozer and compacted by 5-ton vibrating roller.

The rock embankment volume including inner shell and selected materials is estimated at 264,000 m^3 for T-1 dam and 389,000 m^3 for T-2 dam. The rock materials will be sourced from the rock quarry site. Rock excavation in the quarry site is planned to be done by the bench cut method. Drilling will be carried out by 10 m^3/min crawler drill, and the broken rock will be collected by 32-ton bulldozer with ripper. The excavated material

will be loaded by 3.2 m^3 tractor shovels into 20-ton dump trucks, spread by 11-ton bulldozer, and compacted by 8-ton self-travelling vibrating roller.

All the embankment works will take about 20 months after the completion of the most parts of consolidation and blanket grouting and a part of inspection gallery construction.

3) Headrace Tunnel (No. 1-1):

One 2.0 m concrete-lined tunnel of 5,300 m in length will be excavated in the left abutment. In order to shorten the construction period, No. 1-1 headrace tunnel is planned to be divided into four tunnel sections by No. 1, No. 2 and No. 3 work adits. In addition, No. 4 work adit is planned to be branched from No. 3 work adit for excavation of Arroyo Colorado diversion tunnel. The whole construction period including adit and grouting works is planned to be about 3.5 years.

A full-face attack method and arch-then-invert method are recommended to be applied for the work adit construction. Work adits No. 3 and No. 4 are scheduled to be initiated first. Work adits No. 1 and No. 2 are excavated while the diversion tunnel from Arroyo Colorado weir is excavated. For the excavation of No. 1-1 headrace tunnel, a full-face attack method is planned to be applied, and the hauling is to be made by the rail method. Three tunnel headings are planned to be attacked simultaneously. Drilling is carried out by using leg hammer, and broken rock is hauled by using 3.0 m^3 muck car with 6-ton battery loocomotive.

A full-circle method is recommended to be applied for concrete-lining work. The concrete from 0.75 m^3 x 2 batcher plant will be transported by 3.2 m^3 agitator and discharged into 2 m^3 pneumatic placer with 4-ton battery loocomotive. The concrete will be placed behind the sliding form of 12 m in span by means of pneumatic placer. After the completion of concrete-lining work in each section, backfill grout by mortar grout will be carried out by using 11 kW low pressure grout pump.

4) Surge Tank and Penstock:

Construction of a vertical shaft concrete-lined surge tank (4 m in

diameter and 46 m in height) is planned at the downstream end of No. 1-1 headrace tunnel. A shaft sinking method is recommended to be applied for the shaft excavation. Drilling is made with sinker drill and shaft mucking is done by using 0.4 m^3 loader, 30-ton truck crane with 1 m^3 muck skip. Concrete lining is executed from the shaft bottom. Concrete is discharged from 3.2 m^3 agitator into 1 m^3 bucket, handled to concrete hopper by 20-ton truck crane and distributed into the placing spot through chute from the hopper. The construction work will take around 4 months.

A steel penstock (2.0-1.0 m in diameter and 660 m in length) is installed. Open cut excavation is carried out by using 21-ton bulldozer, 2.3 m^3 tractor shovel and 11-ton dump truck. Concrete placing in this section is performed by combination of 20-ton truck crane with 1 m^3 concrete bucket and 45 m^3/h concrete pump car. Steel penstock will be fabricated at the contractor's work shop with a unit length of 6 m. The unit pipe sections are transported by 20-ton trailer, and installed by 20-ton truck crane and rail mounted carrier with winch. Circumference edges of unit pipes are welded and inspected by X-ray test. Construction and installation of the penstock line will take 13 months, and it should be scheduled to be completed, at the latest, one month before the final testing of generating equipment.

5) Arroyo Colorado Intake Weirs:

Upon completion of the Arroyo Colorado diversion tunnel, intake weir construction will be started. River water is passed through diversion conduits in the weir body. Foundation excavation is executed by using bulldozer with ripper, tractor shovel and dump truck. Concrete will be transported by 3.2 m^3 agitator from 0.75 m^3 x 2 batcher plant. Concrete will be placed by 45 m^3/h concrete pump car. Construction of the intake weir will take about 6 months.

6) Powerhouse and Generating Equipment:

A powerhouse (Yuna No. 1) of reinforced concrete structure (22.0 m in length, 18.5 m in width and 27.5 m in height) is constructed to accommodate one 10.3 MW Francis type turbine and a 12,700 kVA generator.

Excavation of foundation is planned to be carried out by using 21-ton bulldozer and 32-ton bulldozer with ripper. Excavated materials are loaded by 2.3 m^3 tractor shovel into 11-ton dump truck for hauling to the disposal area. Immediately after the foundation excavation, concrete work is executed in two stages. At first stage, concrete for substructure is placed for installation of overhead crane, and it will be followed by installation of draft-tube liners. Subsequently, installation of turbine and generator will be executed. The second stage concreting around the draft-tube liners and the remaining concrete works will be carried out thereafter. The first staged substructure concrete will be transported by 3.2 m^3 agitator from the 0.75 m^3 x 2 batcher plant and placed by 45 m^3/h concrete pump car and 20-ton truck crane with 1 m^3 bucket. The second staged concrete is placed by 45 m^3/h concrete pump car. Construction of powerhouse is planned to be completed in 15 months.

H.2.2 El Torito (T-1 & T-2) Weir Plan

El Torito weir plan is an alternative to El Torito dam plan. Major structures proposed for this alternative plan are programmed to be constructed in such manners as explained hereunder.

1) El Torito Intake Weirs:

Construction of two weirs are proposed at El Torito. T-1 diversion weir is planned at a site 130 m upstream of T-1 damsite and T-2 intake weir is planned at a site just upstream of T-2 damsite. T-1 weir is 17 m in height, 50 m in crest length and 6,400 m^3 in concrete volume, while T-2 Wier is 22 m in height, 86 m in crest length and 8,700 m^3 in concrete volume. River diversion during construction is planned to be made by diversion conduits in the weir body. Foundation excavation is executed by using 32-ton bulldozer with ripper, 2.3 m^3 tractor shovel and 11-ton dump truck. For consolidation and curtain grouting, holes will be drilled with 5.5 kW rotary drill and cement is injected by 7.5 kW grout pump. Concrete will be transported by 3.2 m^3 agitator, hauled by truck crane and placed by 45 m^3/h concrete pump car. Diversion conduit closure is scheduled to be completed one month before the final test operation. All the weir construction work will take about 2 years.

2) Headrace Tunnel (No. 1-2):

The headrace tunnel (No. 1-2) of 2.0 m in diameter and 5.2 km in length is driven in the left abutment. In order to shorten construction period, No. 1-2 headrace tunnel is planned to be excavated in 4 tunnel sections by No. 1, No. 2 and No. 3 work adits. In addition, No. 4 work adit is planned to be branched from No. 3 work adit for excavation of Arroyo Colorado diversion tunnel, as in the case of headrace tunnel No. 1-1 for El Torito dam plan. The whole construction period of the headrace tunnel, including adits and grouting, is planned to be about 3.5 years.

A full-face attack method and arch-then-invert method are recommended for the work adit construction. Work adits No. 3 and No. 4 are scheduled to be initiated first. Work adits No. 1 and No. 2 are excavated while the Arroyo Colorado diversion tunnel is excavated. A full-face attack method is also planned for excavation of No. 1-2 headrace tunnel. Hauling is made by the rail method. Drilling is carried out by leg hammer, and broken rock is hauled by 3.0 m^3 muck car with 6-ton battery locomotive.

As in the case of No. 1-1 tunnel, concrete lining is made by applying a full-circle method. Concrete will be transported by 3.2 m^3 agitator and discharged into 2 m^3 pneumatic placer with 4-ton battery locomotive. Concrete is placed behind the sliding form of 12 m in span by means of pneumatic placer. Three tunnel headings are planned to be attacked simultaneously.

3) Surge Tank and Penstock:

Construction of a vertical shaft surge tank (4 m in diameter and 44 m in height) is planned to be constructed in 7 months. A shaft sinking method is applied for the shaft excavation. Concrete lining is practised in the same manner as proposed for the surge tank construction for El Torito dam plan.

A steel penstock (2.0-1.0 m in diameter and 615 m in length) is installed. Open cut excavation, concrete works and installation of the steel pipes of 6 m in unit length will be carried out in the same manner as the penstock installation under El Torito dam plan. The construction work will take about 13 months.

4) Arroyo Colorado Intake Weir:

Construction of the intake weir is started upon completion of the Arroyo Colorado diversion tunnel. River diversion, foundation excavation, concrete placing and grouting works will be perfomed in the same manner as applied for the construction of intake weirs under El Torito dam plan.

5) Powerhouse and Generating Equipment:

A powerhouse of reinforced concrete structure (16.5 m in length, 14.5 m in width and 26.5 m in height) is constructed to accommodate 7.2 MW Francis type turbine and 8,000 kVA generator. It is located at the same place as the powerhouse proposed for El Torito dam plan.

Excavation of foundation, concrete works in two stages, installation of draft-tube liners, turbine and generator, and the related construction works will be carried out in the same manner as proposed for the construction of the Yuna No. 1 power station under El Torito dam plan. All the construction works in the field will take about 15 months.

H.2.3 Pino de Yuna (T-4) Weir Plan

Pino de Yuna (T-4) weir plan is an alternative to El Torito (T-1 & T-2) weir plan. Major structures proposed for this alternative plan are programmed to be constructed in such manners as explained hereunder.

1) Pino de Yuna (T-4) Intake Weir:

The intake weir at Pino de Yuna is 21 m in height, 74 m in crest length and 8,740 m^3 in concrete volume. Construction method of T-4 weir, as well as type of construction equipment to be mobilized, is similar to the method applied to the construction of weirs at T-1 and T-2 sites. The construction period of T-4 weir is scheduled to be around 21 months.

2) Headrace Tunnel (No. 1-3):

The headrace tunnel (No. 1-3) of 2.0 m in diameter and 4.4 km in length is driven in the left abutment. In order to shorten construction period, No. 1-3 headrace tunnel is planned to be excavated in 4 tunnel sections by No. 1, No. 2 and No.3 work adits. In addition, No. 4 work

adit is planned to be branched from No. 3 work adit for excavation of Arroyo Colorado diversion tunnel, as in the case of headrace tunnel No. 1-2 for T-1 and T-2 weir plan. The whole construction period of the headrace tunnel, including adits and grouting, is planned to be about 2.5 years.

As in the case of No. 1-2 tunnel for T-1 and T-2 weir plan, a full-face attack method and arch-then-invert method are recommended for the work adit construction, and a full-circle method is applied for concrete lining.

3) Surge Tank and Penstock:

Construction of a vertical shaft surge tank (4 m in diameter and 32 m in height) is planned to be constructed in 4 months. A shaft sinking method is applied for the shaft excavation. Concrete lining is practised in the same manner as proposed for the surge tank construction for T-1 and T-2 weir plan.

A steel penstock (2.0-1.0 m in diameter and 460 m in length) is installed, in the same manner as proposed for T-1 and T-2 weir plan. The construction work will take about 11 months.

4) Arroyo Colorado Intake Weir:

Construction of the intake weir is started upon completion of the Arroyo Colorado diversion tunnel. River diversion, foundation excavation, concrete placing and grouting works will be perfomed in the same manner as applied for the construction of intake weir under T-1 and T-2 weir plan.

5) Powerhouse and Generating Equipment:

A powerhouse of reinforced concrete structure (22.0 m in length, 18.5 m in width and 27.0 m in height) is constructed to accommodate 6.3 MW Francis type turbine and 7,500 kVA generator. It is located at the same place as the powerhouse proposed for El Torito dam or weir plan, and the same construction method will be applied for excavation, concreting, and installation. All the construction works in the field will take about 15 months.

H.2.4 Los Veganos (V-3) Weir Plan

Los Veganos weir plan involves construction of intake weir at V-3 site, waterway in the right abutment and power station. Access to the construction sites will be made from Boca de Tirco, where a road to the Rio Blanco project will pass nearby. Major structures proposed for Los Veganos weir plan are planned to be constructed in the following manner:

1) Los Veganos Intake Weir:

The intake weir at V-3 site is 32 m in height, 68 m in crest length and 18, 140 m^3 in concrete volume. River diversion during construction is made by diversion conduits in the weir body. Foundation excavation is performed by 32-ton bulldozer with ripper, 2.3 m^3 tractor shovel and 11-ton dump trucks. Consolidation and curtain grouting works will be executed by drilling grout holes and injecting cement by 7.5 KW grout pump.

One batcher plant with 0.75 m^3 x 2 mixer will be installed at the weir site for concrete works. Concrete will be transported by 3.2 m^3 agitator, handled by 30-ton truck crane with 1.5 m^3 bucket, and placed by 45 m^3/h concrete pump car. Concrete works will take around 1.5 years. Inclusive of foundation excavation and other works, construction of Los Veganos intake weir will be scheduled for 2 years.

2) Headrace Tunnel (No. 2):

One concrete-lined tunnel (2.0 m in diameter and 3.3 km in length) will be driven in the right abutment. In order to shorten the construction period, No. 2 headrace tunnel is planned to be divided into three tunnel sections by No. 5 and No. 6 work adits. The construction period including work adit and grouting works is planned to be about 2.5 years.

Two work adits of 3.0 m in diameter and 550 m in total length are planned to be located at the point of 250 m and 1,350 m in distance apart from the downstream portal. No. 5 and No. 6 work adit excavation is scheduled to be started simultaneously. No. 6 work adit concrete-lining work is scheduled to be completed prior to the commencement of No. 2 headrace tunnel excavation. Full-face attack method and arch-then-invert method are recommended to be applied for the work adit construction. The

tunnel excavation, concrete-lining and grouting works will be performed in the same manner as applied for the No. 1 headrace tunnel construction. The driving progress and concrete-lining progress speeds are planned to be 90 m and 150 m per month respectively.

No. 2 headrace tunnel excavation is scheduled to be perfomed in 17 months. A full-face attack method is recommended to be applied for the excavation and the hauling is to be made by the rail method. Two tunnel faces are planned to be attacked simultaneously by using 2 sets of construction equipment. Drilling will be carried out by using leg hammer and the broken rock will be hauled by using 0.4 m^3 muck car with 6-ton battery locomotive. The driving progress speed of the headrace tunnel is planned to be 110 m per month.

A full-circle method is applied for concrete-lining work. Concrete is transported by 3.2 m^3 agitator, discharged into 2 m^3 pneumatic placer with 4-ton battery locomotive, and placed behind the sliding form of 12 m in span by means of pneumatic placer. The concrete lining progress is planned to be around 180 m per month. Backfill grout will also be carried out by using 11 kW low pressure grout pump.

3) Surge Tank and Penstock:

A vertical shaft (4 m in diameter and 40 m in height) is to be constructed at the downstream end of No. 2 headrace tunnel. A shaft sinking method is also recommended for the shaft excavation. Drilling will be performed with sinker drill, and shaft mucking will be done by using 0.4 m^3 loader, truck crane with muck skip. The construction of a surge tank will take about 4 months.

A steel penstock (2.0-1.0 m in diameter and 200 m in length) consists of the upper horizontal tunnel portion and inclined open portion. The horizontal tunnel portion will be constructed in a similar way to the headrace tunnel construction. Open cut excavation will be carried out by using 21-ton bulldozer, 2.3 m^3 tractor shovel and 11-ton dump truck. Steel penstock will be fabricated in 6 m long units at the contractor's work shop and transported to site by 20-ton trailer. The unit pipes will be installed by using truck crane and rail mounted carrier with winch. Circumference

edge of unit pipes will be welded and inspected by X-ray test. All the installation works are scheduled to be completed one month before the final tests of generating equipment.

4) Powerhouse and Generating Equipment:

The powerhouse (Yuna No. 2) of reinforced concrete structure (17.0 m in length, 140 m in width and 27.0 in height) is constructed to accommodate one 8.8 MW Francis type turbine and 10,000 kVA generator in case of combination with El Torito dam plan, and 7.7 MW turbine and 9,000 kVA generator in case of combination with El Torito weir plan or Pino de Yuna weir plan.

Foundation excavation will be carried out, in two months, by using 21-ton bulldozer and 32-ton bulldozer with ripper. The excavated materials will be loaded by 2.3 m^3 tractor shovel into 11-ton dump truck for hauling to the disposal area. Immediately after the foundation excavation, the concrete work will be performed from the substructure, which will be completed before the installation of overhead crane. The draft-tube liners embedded in the substructure concrete will be installed after installing the overhead crane. Subsequently, the installation of turbine and generator will be carried out. The second stage concrete around the draft-tube liners and the remaining concrete will be placed thereafter. The substructure concrete will be transported by 3.2 m^3 agitator from the bather plant and placed by 45 m^3/h concrete pump car and 20-ton truck crane with 1 m^3 bucket. The second concrete and the remaining concrete will be placed by 45 m^3/h concrete pump car. Following the substructure construction the superstructure construction including minor concrete work, building finish work and all accommodation will be started in parallel with the installation of turbine and generator.

In the light of the construction method and plan contemplated as explained hereinabove, the capacity and required number of major construction equipment respectively envisaged for each alternative plan is listed up on Table H-01.

H.3 CONSTRUCTION SCHEDULE

H.3.1 Pre-construction Stage

The construction schedule is programmed for the implementation of El Torito dam - Los Veganos weir complex and for the alternative implementation of El Torito/Pino de Yuna - Los Veganos weir complex. In any case, the pre-construction works are to be scheduled under the overall view to complete the complex at the earliest possible time.

The pre-construction works will include the following:

a) Preparation of tender document, including additional survey for design,
b) Preparation of construction design,
c) Pre-qualification, tendering, evaluation, negotiation and contracting,
d) Construction of access road and extension of transmission line for construction power supply, and
e) Detailed study, planning and implementation of resettlement plan, in addition to land acquisition of reservoir and construction sites.

Preparation of tender documents is scheduled to be initiated as soon as the feasibility study is finalized. Since a part of additional drilling survey has been executed in parallel to the finalization of feasibility study, the preparation of tender documents is scheduled to be completed by the end of 1984 by the consultants to be retained by CDE. Preparation of the tender documents is followed continuously by the preparation of construction design by the consultants. The consultant will also assist CDE in pre-qualification of contractors. Tendering, evaluation and contracting are scheduled to be executed in 6 months. In case the feasibility report is finalized by the end of June 1984, mobilization of the selected contractor is scheduled to start at the beginning of July 1985.

Construction of access road and extension of transmission line for construction power supply are scheduled to be completed by CDE by the time of mobilization of the contractor. Construction of such preparatory works

is therefore recommended to be initiated as quickly as possible. Further, the financial arrangement for the construction works is to be concluded by the time of contract award in June 1985, at the latest.

H.3.2 El Torito Dam - Los Veganos Weir Complex

The alternative to construct El Torito dam - Los Veganos weir complex is scheduled to be implemented in the shortest possible time and in the most economical manner, in the light of the construction work quantity estimated on the basis of the preliminary design, as well as under the combined study on the construction plan.

In view of the access to the work sites and the work volume involved in each scheme, construction of Los Veganos weir will be accorded with priority in scheduling. In case that the construction contracts are finalized by the end of June 1985, a target for El Torito dam - Los Veganos weir is scheduled as summarized hereunder.

Commencement of construction:	July 1985
Commissioning of commercial operation:	
No. 2 power station (Los Veganos)	June 1988
No. 1 power station (El Torito)	September 1989

Construction schedule for Los Veganos weir scheme will not be changed, even in case the El Torito dam scheme is not contemplated for implementation.

Construction schedule after mobilization by the contractors is illustrated on Fig. H-01 and briefly summarized hereunder.

(First Year)

Immediately after concluding the contracts, all the preparatory works are started for El Torito dam and Los Veganos weir schemes, inclusive of mobilization, procurement and transportation of construction materials, construction of access feeder roads in the work site, temporary buildings and other facilities.

For Los Veganos weir scheme, excavation of weir foundation and tunnel

adits (No. 5 and No. 6) is started, and it is followed by excavation of the No. 2 headrace tunnel. For El Torito dam scheme, portal excavation of two diversion tunnels, as well as No. 1 headrace tunnel, is started. It is followed by excavation of adits (No. 3 and No. 4) for No. 1 headrace tunnel. Design and manufacturing of electro-mechanical works will also be initiated.

(Second Year)

At V-3 weir, grouting and concreting of weir is started in the 2nd year, and it will last until the middle of the 3rd year. No. 2 headrace tunnel excavation will be nearly completed by the end of the 2nd year, and tunnel concrete-lining work will be executed in parallel. No. 2 surge tank is constructed in this year. Excavation of No. 2 powerhouse will also be initiated towards the end of 2nd year.

For El Torito dam scheme, excavation and concrete-lining of the connecting tunnel is completed by the middle of the 2nd year. It is followed by cofferdam embankment and excavation of dam foundation. Excavation of Arroyo Colorado diversion tunnel is initiated at the beginning of the 2nd year. Excavation of adit No. 2 is to be completed. Design and manufacturing of electro-mechanical works will also be started at the beginning of the 2nd year.

(Third year)

No. 2 headrace tunnel is to be completed by the middle of the 3rd year. Concrete works for No. 2 power station are also scheduled to complete by that time. Installation of penstock, gates, turbine and generator for No. 1 power station is to be completed two months before the end of the 3rd year, and the last two months are scheduled for operation tests. No. 2 power station of Los Veganos scheme is scheduled to be completed by the end of the 3rd year.

For El Torito dam scheme, embankment of T-1 and T-2 dam is initiated, and it will be continued until the middle of the 4th year. Excavation of Arroyo Colorado connecting tunnel is completed, and excavation of No. 1 headrace tunnel is initiated at the beginning of the 3rd year, or immediately after completion of excavation of No.2 headrace tunnel for Los Veganos weir scheme.

(Fourth Year)

All the construction works are concentrated for the completion of El Torito dam scheme. Embankment of T-1 and T-2 dams, as well as No. 1 head-race tunnel excavation, concrete-lining and grouting, concrete work for No. 1 power station and Arroyo Colorado intake weir, is to be completed by the 4th year. Installation of penstock, gates, turbine and generators is also scheduled to be nearly completed by the end of the 4th year.

(Fifth Year)

By the end of the first month of the 5th year, all the electro-mechanical works are to be completed, and the following two months are scheduled for operation tests. The commercial operation of the No. 1 power station is scheduled to be started within 51 months from the mobilization by the contractor.

H.3.3 El Torito (T-1 & T-2) Weir - Los Veganos (V-3) Weir Complex

The alternative to construct El Torito (T-1 & T-2) weir - Los Veganos weir complex is also scheduled in the light of the construction work quantity and construction plan. It is scheduled to be completed in the shortest possible time and in the most economical manner.

As in the case of El Torito dam - Los Veganos weir complex, construction of Los Veganos weir scheme will be accorded with priority in scheduling, in view of the access to the work site and tunnel excavation schedule. In case that the construction contracts are finalized by the end of June 1985, a target for El Torito (T-1 & T-2) weir - Los Veganos weir construction is scheduled as summarized hereunder.

Commencement of construction:	July 1985
Commissioning of commercial operation:	
No. 2 power station (Los Veganos)	June 1988
No. 1 power station (El Torito)	September 1989

Construction schedule for Los Veganos weir scheme will not be changed, even in case that El Torito (T-1 & T-2) weir scheme is not contemplated for implementation.

Construction schedule after mobilization by the contractors is illustrated on Fig. H-02 and briefly summarized hereunder.

(First Year)

Preparatory works for El Torito (T-1 & T-2) weir scheme and Los Veganos weir scheme are commenced immediately after concluding the construction contracts. For Los Veganos weir scheme, excavation of weir foundation and tunnel adits (No. 5 and No. 6) is to be completed by the end of the 1st year. For El Torito weir scheme, excavation and concrete-lining of adits No. 3 and No. 4 is also scheduled to be completed in this year.

Design and manufacturing of electro-mechanical works for the No. 2 power station is initiated at the beginning of the 1st year. Design of electo-mechanical works for the No. 1 power station is also scheduled to start by the end of the 1st year.

(Second Year)

At V-3 weir, grouting and concreting of weir is started. Excavation of No. 2 headrace tunnel is advanced, and it will be nearly completed at the end of the 2nd year. Tunnel concrete-lining is also advanced in parallel. Excavation and concreting of substructure at the No. 2 power station are also executed in this year.

For El Torito (T-1 & T-2) weir scheme, field works are concentrated to the excavation of Arroyo Colorado diversion tunnel and construction of adits No. 1 and No. 2. Design and manufacturing of electro-mechanical works for the No. 1 power station are advanced in the 2nd year.

(Third Year)

Construction of Los Veganos weir, as well as concrete-lining of No. 2 headrace tunnel, is scheduled to be completed by the middle of the 3rd year. Installation of penstock, electro-mechanical equipment is also advanced. All the construction works for Los Veganos scheme, including test operation of No. 2 power station, are scheduled to be completed by the end of the 3rd year.

Upon completion of the No. 2 headrace tunnel excavation and Arroyo Colorado diversion tunnel excavation, equipments are shifted to excavation of the No. 1 headrace tunnel. Grouting and concreting of El Torito (T-1 & T-2) weir are advanced. Construction of surge tank and excavation of No. 1 power station will also be carried out.

(Fourth Year)

Construction is concentrated to El Torito (T-1 & T-2) weir scheme. Construction of the T-1 and T-2 weir and Arroyo Colorado intake weir is scheduled to be completed by the middle of the 4th year. The construction and installation works of the No. 1 headrace tunnel, penstock, power house building and switchgear are scheduled to be nearly completed at the end of 4th year. Installation of penstock, gates, turbine and generator is also advansed towards the end of the 4th year.

(Fifth Year)

Construction and installation of all works for No. 1 power station will be completed at the beginning of the 5th year, and it will be followed by the operation tests. The commercial operation is scheduled to be started within 51 months from the commencement of construction works.

H.3.4 Pino de Yuna (T-4) Weir - Los Veganos (V-3) Weir Complex

The alternative to construct the Pino de Yuna (T-4) weir - Los Veganos (V-3) weir complex is also scheduled to be implemented in a similar manner to that proposed for El Torito (T-1 & T-2) weir - Los Veganos (V-3) weir complex.

As in the case of El Torito weir - Los Veganos weir complex, construction of Los Veganos weir scheme will be accorded with priority in scheduling. In case that the construction contracts are finalized by the end of June 1985, a target for the Pino de Yuna (T-4) weir - Los Veganos (V-3) weir construction is scheduled as summarized hereunder.

Commencement of construction:	July 1985
Commissioning of commercial operation:	
No. 2 power station (Los Veganos)	June 1988
No. 1 power station (Pino de Yuna)	July 1989

Construction schedule for Los Veganos weir scheme will not be changed, even in case that the Pino de Yuna weir scheme is not contemplated for implementation.

Construction schedule after mobilization by the contractors is illustrated on Fig. H-03. The schedule is almost the same as proposed for El Torito (T-1 & T-2) weir - Los Veganos (V-3) weir complex. However, the tunnel work and weir construction work are less in volume, and those works can be completed about two (2) months ahead of schedule contemplated for the complex with El Torito (T-1 & T-2) weir. Consequently, all the civil works and installation of electro-mechanical works are completed before the end of the 4th year. The test operation will be scheduled to complete in the 1st month of the 5th year, and the No. 1 power station is put into commercial operation in the 2nd month of the 5th year.

H.4 ORGANIZATION FOR IMPLEMENTATION

H.4.1 Organization during Construction

CDE, as an autonomous corporation, will have overall responsibility for the implementation, including financial arrangement, pre-construction engineering and construction. Department of Hydroelectric Development (DDH), on behalf of CDE, is to be in charge of pre-construction engineering and supervision of the project.

DDH will appoint a project supervisor for the project, who will be assisted by the consultants to be retained by CDE. The expatriate/local consultants are retained for preparation of tender documents, assistance in tendering and evaluation, preparation or review of construction and/or shop drawings, as well as supervision of the construction works. For tendering, CDE has a tender committee, and its practices and rules will be applied. Construction works are carried out by contractors to be selected by international/local competitive biddings, depending on the conditions of external and internal loans. Package of contracts will be decided in the course of preparation of tender documents.

A chart of organization during the construction stage is illustrated, in a simplified form, on Fig. H-04.

H.4.2 Organization for Operation

After the completion of construction works, commercial operation of power station is shifted to the Department of Production, which is currently responsible for operation and maintenance of all the CDE power plants, including hydro-power stations. For the smooth operation of the plants, it is desirable that the Department of Production will assign some of its staff to the project during the period of the installation and test operation of the power plants.

Operation of El Torito power station (Yuna No. 1) and Los Veganos power station (Yuna No. 2), if evaluated to be economically and financially feasible, have to be executed as a complex. Further, they are desirably

operated in close coordination with the Rio Blanco power station (completion scheduled for 1987), to which a transmission line from Los Veganos power station is connected. Such a coordination is organizable at the Rio Blanco power station.

At the time when the Piedra Gorda dam and power station is implemented, a center for operation of El Torito, Los Veganos and Rio Blanco power stations is desirably shifted to the Piedra Gorda power station. The Piedra Gorda station will possibly integrate the operation of the Rincon power station and Hatillo power station, if it is evaluated appropriate under the study for the implementation of the Piedra Gorda project. Such an integration will enable efficient use of limited water available in the upper Yuna river basin, and will economize the operation and maintenance cost of the power stations.

H.5 ASSOCIATED PROGRAM FOR RESETTLEMENT

H.5.1 General

By the construction of the project, some land and people are affected directly and indirectly. The area affected by the project involves the land to be submerged under the reservoir by construction of dams or diversion weir, borrow areas, area for construction facilities and power house, access roads, etc.

For El Torito - Los Veganos hydroelectric complex, a preliminary inventory survey in the submergible area has been conducted in the course of field investigation. This survey has been followed by the office of Resettlement (ORA), CDE. The survey of ORA covered a socio-economic study of the families to be affected in El Torito area and a preliminary plan for resettlement of the affected families. The result of survey was reported in January 1984. (Ref. Bib. 1)

The land to be submerged under the reservoir to be constructed by T-1 and T-2 combined dams is below the high water level designed at El. 755.0 m. Alternatively, the high water level is set at EL. 726.0 m for T-1 and T-2 weir plan. By the construction of diversion weir at T-4 site (Pino de Yuna), the high water level rises up to EL. 680.0 m. By considering indirect effects, the survey has been conducted in the area below EL. 770 m in T-1 and T-2 reservoir area, and below EL. 690 m in T-4 storage area. At V-3 weir site in Los Veganos, the families living in the land below EL. 500 m are considered to be affected by the storage, though the high water level at V-3 is designed at EL. 493.0 m.

A plan studied so far is preliminary in nature, and further studies and planning are to be executed for implementation of the project. It is, however, considered that the survey by ORA is satisfactory for the evaluation of economic and financial feasibility of El Torito - Los Veganos hydroelectric complex.

H.5.2 Socio-economic Situation in El Torito Area

El Torito village is administratively located in La Salvia Section, Municipality of Bonao, Monsenor Nouel Province. The village initiated to

properly develop in the era of R. L. Trujillo, who introduced criteria to distribute 10 tareas (about 0.625 ha.) of land to small farmers.

At the time of socio-economic census conducted by ORA in September 1983, some 64 families with a total population of 359 were living on the land to be directly and indirectly affected by T-1 and T-2 combined reservoir (below EL. 770 m). About 52% of population are aged below 14 years. In the alternative site for construction of T-4 weir, a total of 11 families (pop. 65) were living in the storage area (below EL. 690 m). A classification of population by age group and sex is shown on Table H-02.

A majority of families living in El Torito area, both T1-T2 reservoir area and T4 storage area, are settlers came from San Jose de Ocoa Province, as shown on Table H-03. The settlers came from the Cibao region represent only 12% of total censused families. (This demonstrates a social demarcation from Los Veganos village where a majority of settlers are originated from the Cibao region.) About 76% of settlers have been living in the area for a period of over 12 years. (Refer to Table H-03)

The educational level of the head of family and sons are relatively low. About 40% are non-educated and some 54% have background of primary education. (Refer to Table H-04) In view of a larger proportion of the low aged group, it appears that the educational aspects should draw specific attention in programming a resettlement plan in future.

Houses in El Torito area are used for family living. Most of the houses are owned by families, and the number of houses borrowed or rented is quite limited. Houses are mostly made of wood or nippa, and nearly a half of houses have cemented or wooden floor. (Refer to Table H-05)

Most of land are owned by families, with or without titles. They have been bought or inherited, but some are communal land. The borrowed land is limited, and the state-owned land is not existent in the surveyed area. (Refer to Table H-06) Settlers are mostly engaged in agriculture. Coffee has been cultivated since the initial stage of settlement. Beans, maize and cassava are planted by shifting cultivation on the slopes. Cultivation of paddy is practised in a few river terrace along the Yuna mainstream.

(Refer to Table H-07) About a third of settlers are engaged complementarily in occasional or daily waged works. (Refer to Table H-08) In most cases, the wage ranges RD$4.0-7.0 per day. The settlers, in general, are economically in subsistence level in and around the surveyed area.

H.5.3 Preliminary Plan for Resettlement

For the implementation of El Torito dam and reservoir at T-1 and T-2 site, or alternatively Pino de Yuna diversion weir at T-4 site, it is necessary to acquire the land submergible in the reservoir or storage, as well as other land directly affected by the construction. In general, such a land acquisition is financially estimated for the evaluation of the project. Although the cost for resettlement and its development is usually precluded from the economic evaluation, such a resettlement program should not be disregarded from the implementation program and financial arrangement for the project.

In case El Torito dam and reservoir plan is selected as recommendable, it is required to plan resettlement of families affected by the construction of El Torito reservoir. The land-owned families are estimated at around 50. Alternatively, about 15 families in El Torito area or 11 families in Pino de Yuna area are to be resettled, in case diversion weir plan is selected.

In view of the fact that the families are mostly natives of San Jose de Ocoa, it is preferable to find a possible site for resettlement in San Jose de Ocoa Province. ORA has preliminarily selected 6 candidate locations in the Province, as shown on Table H-09 and Fig. H-05. They are situated within the distance of 40 km from San Jose de Ocoa, and the land is presently owned by private land owners. Some of the candidate locations are relatively close to El Torito village, and similar in natural conditions.

Location of resettlement for Los Veganos scheme has not been investigated yet, in view of the limited number of families (around 6 families) to be relocated in V-3 weir site. It is noted that a resettlement place is to be found in Cibao region due to its social inherence.

For financial evaluation, the cost for land acquisition is estimated, together with compensation for houses and other properties. As shown on Table H-10, a total of RD$676,300 is to be estimated for El Torito dam - Los Veganos weir complex, about RD$243,200 for El Torito weir - Los Veganos weir complex, and about RD$202,700 for Pino de Yuna diversion weir - Los Veganoe weir complex.

The financial cost of resettlement program is estimated at RD$1.5 million for El Torito dam and reservoir scheme and RD$0.4-0.45 million for the alternative diversion weir plans, as shown on Table H-11. Such a cost is not included in the evaluation by means of economic and financial internal rate of return, but a fund is to be secured for the implementation of the project.

The resettlement plan is to be further elaborated, as soon as the final development plan is defined through the feasibility study. Through detailed socio-economic and technical survey, location of resettlement should be decided, and it is followed by land acquisition, land preparation and integrated program for resettlement, including social infrastructures for rural development. Construction of such facilities for resettlement is to be completed well in advance to the construction and/or impounding of reservoir or storage for the project.

H.6 ASSOCIATED PROGRAM FOR REFORESTATION

H.6.1 Vegetation and Land Use in Watershed

The Yuna river drains the watershed of 62.9 km^2 at the downstream intake site (V-3 site). The existing situation of land use in this watershed is studied in Annex C, Table C-44. Although the area of about 50% is still covered with forests, the remaining 50% consists of the meadows, upland fields, barren lands, naked lands and collapsed areas, etc. Such deforested lands are increasing because of cutting trees or prevailing shifting cultivation in which the forests are burned.

For cutting trees, the Government has legally prohibited to cut the trees younger than 4 years in age. However, it is substantially ineffectual, since such young trees are actually burned in the shifting cultivation.

The remarkable deforestation as noted above would seriously affect the watershed to increasingly accelerate the erosion in the basin and also cause various environmental problems.

H.6.2 Watershed Management

The following problems are considered to occur if the deforestation will continue without any control:

a) The flood magnitude will be increased due to decrease of water retention capacity in the basin. It will not only effect on the planning of the Project but also lead to disasters in the downstream area.

b) The firm river discharge will be reduced due to the decrease of water retention capacity in the basin. It will lead to an adverse effect on the expected dependable power output of the Project. Since the Project is planned as a run-of-river type, the reduction of the firm river discharge will directly effect on the dependable power output of the Project.

c) The present sediment transport in the basin is estimated to be substantially high, or about 2,000 to 2,300 m^3/km^2/year as discussed in Annex C.

This sediment transport will be further aggravated due to the accelerated erosion in the basin. Since the development at Pino de Yuna and Los Veganos is designed in consideration of immediate filling up with sediments up to weir crest level, there will not be so serious problem in this aspect. However, the increase of the sediment transport will seriously effect on the storage type project, like El Torito dam plan, because of shortening of the project life.

d) A remarkable increase in the sediment transport will result in various troubles for the Project, such as acceleration of abrasion of turbine blade, frequent interruption of power generation during high sediment transportation, or increase of damages of spillway structures.

e) Deterioration of water quality due to the eutrophication of reservoir arises in various countries in recent years. If such a large amount of sediment transport will be allowed, similar problems are anticipated to occur especially in the storage type projects, resulting in a serious pollution and disputes.

f) It should also be worried that muddy condition of the river water which is caused during flooding would be continuous after flooding.

If the present extensive deforestation can be controlled and the reforestation is promoted in the watershed, the following favorable effects can be expected:

a) The flood magnitude will be suppressed to some extent. The present forest area is about 50% of the total basin. Assuming that a half of the remaining 50%, i.e., 25% of the total basin area is reforested, the flood magnitude is expected to reduce by 2.5 to 5% since the run-off coefficient in about 25% area is considered to decrease by about 10 to 20%.

b) The firm river discharge will be increased. Although its quantitative estimate of increase is difficult because various factors such as evaporation, geological condition or slope of the basin, etc., are concerned.

c) The estimated basin erosion depth in accordance with the classification of land use is also shown on Table C-38. As seen in the Table, the erosion depth in the collapsed area, barren land or naked area, etc., are 100 to 500 times larger than the depth in the forested area. Notwithstanding, the area occupied by collapsed area, barren land and naked land are still limited in the project area, i.e., about 4.5% (3.2 km^2), the sediment yield from these areas amounts to approximately 40 to 50% of the total sediment yield. Thus, the sediment transport is expected to be reduced to 50 to 60% if such collapsed, barren or naked areas are provided with reforestation or some sediment protective measures.

d) Troubles such as early abrasion of turbine blade, serious damages of spillway structures, deterioration of water quality due to eutrophication or serious effect on the project life of the storage type project schemes in the downstream, etc. can be avoided.

Such being the situation, the following measures for watershed management is proposed to be taken under El Torito - Los Veganos hydroelectric complex:

a) The shifting cultivation should be restricted as much as possible, in the watershed of the hydroelectric project. It is desirable to change the shifting cultivation to the agriculture in the fixed land, or to the agriculture such as fruit or coffee production which will not require the shifting cultivation.

b) Reforestation should be intensively promoted in the barren lands, naked lands and meadows, etc.

c) Some protective measures to prevent the collapsed areas from its further extension and erosion should be provided.

H.6.3 Pilot Program

As seen in Fig. C-38, the devastated barren lands are mostly concentrated in Arroyo Colorado basin of about 15 km^2. The collapsed areas are also remarkable along the river course of Arroyo Colorado. Besides, the scale of Arroyo Colorado basin of about 15 km^2 is considered as appropriate for the pilot program. With this in view, Arroyo Colorado basin is proposed for implementation of the pilot program of watershed management.

In the pilot basin, it is preliminarily planned to execute the programs as proposed hereunder.

a) Prohibition of shifting cultivation:

The shifting cultivation should be tried to be prohibited in the pilot basin. As a substitute for the above, the agricultural production will be converted, to the maximum extent, to fruits or coffee production, which will not require the shifting cultivation. In this context, it is recommended that detailed socio-economic survey planned for the associated resettlement program will be extended to the Arroyo Colorado basin, to investigate the human activities in the basin, land terrace, possibility of resettlement, etc.

b) Promotion of reforestation:

The reforestation should intensively be promoted on the barren lands, naked lands and meadows in the pilot basin, by planting proper trees. It is recommendable to create the fruit or coffee fields where suitable.

c) Protection of the collapsed areas from further erosion:

The erosion in the collapsed areas will be accelerated if the areas are left without any protection. Although their details are to be respectively examined in accordance with each situation, the recommendable protective measures will include the following:

- To provide drains in the upper area of the collapsed area so that the collapsed area will be protected from inflow of precipitation.

- To provide the cribwork at the immediate downstream of the collapsed area so that further collapse can be mitigated by checking discharge out of the collapsed materials.

- To plant the fern in the collapsed area so that the soil in the area is solidified.

It is premature to estimate the required cost for implementation of the pilot program. However, a preliminary estimate of the cost is made by assuming the conditions as follows:

a) Approximately a half of the meadow and 80% of barren land and naked land will be converted to the forest, coffee land or fruit land. The cost necessary for this program will amount to about RD$1,000/ha.

b) A half of the existing farm land will remain as land for fixed land farming. The remaining half will be converted to coffee or fruit land. The necessary subsidy for the fixed land farming will mainly consist of the cost for fertilizer, which is estimated at about RD$50/ha. The cost necessary for the conversion from the farm land to coffee or fruit land will be about RD$900/ha.

c) The protective measures will approximately cost RD$50,000 per one collapsed area on an average.

Based on the above assumptions, the cost required for the pilot program of the basin management is preliminarily estimated to amount to an order of RD$1.6 million as calculated on Table H-12.

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TABLES

Table H-01 MAJOR CONSTRUCCION EQUIPMENT
(EQUIPOS PRINCIPALES DE CONSTRUCCION)

Description	Spec.	Total Required Number		
		T1&T2 Dam + V3 Weir	T-1&T-2 Weir + V 3 Weir	T-4 Weir + V3 Weir
Bulldozer w/ripper	32 ton	4	2	2
Bulldozer w/ripper	21 ton	2	2	2
Bulldozer (tractor)	16 ton	2	1	-
Bulldozer	11 ton	5	2	1
Tractor shovel	3.2 m^3	3	2	1
Tractor shovel	2.3 m^3	10	4	3
Tractor shovel	1.2 m^3	3	3	3
Backhoe	0.6 m^3	2	2	1
Dump truck	20 ton	8	4	3
Dump truck	11 ton	24	13	13
Dump truck	6 ton	6	6	6
Tamping roller	13.5 ton	2	-	-
Vibrating roller	5 ton	2	-	-
Vibrating roller	8 ton	2	-	-
Crawler drill	10 m^3/min	9	5	4
Air compressor	14 m^3/min	9	5	4
Concrete plant	0.75 m^3x2	2	2	2
Crushing plant	60 ton/h	-	-	-
Crushing plant	100 ton/h	1	1	1
Agitator truck	3.2 m^3	11	9	9
Concrete bucket	1.5 m^3	4	4	4
Concrete pump car	45 m^3/h	2	1	1
Boring machine	5.5 kW	9	5	5
Grout pump	7.5 kW	13	4	3
Grout mixer	200 ℓ x 2	13	4	3
Truck crane	32 ton	2	2	2
Truck crane	20 ton	1	1	1
Motor grader	3.7 m	2	1	1
Water sprinkler	6 kℓ	2	1	1

- Continued -

Description	Spec.	Total Required Number		
		T1&T2 Dam + V3 Weir	T1&T2 Weir + V3 Weir	T-4 Weir + V3 Weir
Leg hammer	30 kg	12	12	12
Sinker	24 kg	3	3	3
Muck loader	0.4 m^3	3	3	3
Side muck loader	0.7 m^3	3	-	-
Train loader	200 t/h	3	3	3
Tractor shovel	0.3 m^3	1	1	1
Muck car	3 m^3	18	18	18
Battery locomotive	6 ton	3	3	3
Fan	400 m^3	2	-	-
Fan	300 m^3	3	-	-
Fan	150 m^3	18	18	18
Fan	100 m^3	6	6	6
Air compressor	14 m^3/min	1	1	1
Air compressor	27 m^3/min	3	3	3
Air compressor	33 m^3/min	2	-	-
Jumbo (work adit)	5-boom	3	3	3
Jumbo (headrace)	4-boom	3	2	2
Jumbo (T1 diversion)	7-boom	1	-	-
Jumbo (T2 diversion)	7-boom	1	-	-
Crawler drill	7 m^3/min	2	2	-
Air compressor	10 m^3/min	2	2	-
Battery locomotive	4 ton	3	3	3
Concrete placer	2 m^3	3	3	3
Aditator car	2 m^3	2	2	2
Needle beam type sliding form	12 m	3	3	3
Sliding form (work adit)	10 m	1	1	1
Sliding form (T1 diversion)	12 m	1	-	-
Sliding form (T2 diversion)	12 m	1	-	-
Grout pump	11 km	2	2	2
Grout mixer	300ℓ x 2	2	2	2

Table H-02 POPULATION IN EL TORITO AREA
(POBLACION EN EL AREA EL TORITO)

	El Torito (T1-T2 Reservoir Area)			Pino de Yuna (T4 Storage Area)		
	Total	Male	Female	Total	Male	Female
0 - 14	187 (52.1%)	97	90	28 (43.1%)	16	12
15 - 24	59 (16.4%)	30	29	18 (27.7%)	12	6
25 - 34	47 (13.1%)	29	18	7 (10.8%)	5	2
35 - 44	28 (7.8%)	18	10	5 (7.7%)	3	2
45 - 54	19 (5.3%)	7	12	5 (7.7%)	2	3
55 - 64	9 (2.5%)	7	2	1 (1.5%)	-	1
65 over	10 (2.8%)	6	4	1 (1.5%)	1	-
Total	359 (100.0%)	194 (54.0%)	165 (46.0%)	65 (100.0%)	39 (60.0%)	26 (40.0%)
Total Household	64			11		

Table H-03 DURATION OF LIVING IN EL TORITO AREA
(TIEMPO DE RESIDENCIA EN EL AREA EL TORITO)

Year	El Torito (T1-T2 Reservoir Area)		Pino de Yuna (T4 Storage Area)	
DURATION				
Less than 5	8	(12.5%)	-	(-)
6 - 11	10	(15.6%)	-	(-)
12 - 20	13	(20.3%)	1	(9.1%)
21 - 29	15	(23.4%)	6	(54.5%)
30 - 45	16	(25.0%)	3	(27.3%)
Over 45	2	(3.2%)	1	(9.1%)
Total	64	(100.0%)	11	(100.0%)
NATIVE PLACE				
S. J. de Ocoa	56	(87.5%)	10	(90.9%)
Bonao	5	(7.8%)	-	(-)
Santiago	2	(3.1%)	-	(-)
La Vega	1	(1.6%)	1	(9.1%)
Total	64	(100.0%)	11	(100.0%)

Table H-04 EDUCATION LEVEL OF POPULATION
(NIVEL ESCOLAR DE POBLACION)

	El Torito (T1-T2 Reservoir Area)			Pino de Yuna (T4 Storage Area)		
	Total	Chief	Sons	Total	Chief	Sons
Non-education	120 (40.1%)	74	106	24 (41.4%)	6	18
Primary	168 (56.2%)	48	120	24 (41.4%)	3	21
Intermediate	5 (1.7%)	-	5	7 (12.1%)	2	5
Secondary	6 (2.0%)	2	4	3 (5.1%)	-	3
University	- (-)	-	-	- (-)	-	-
Commercial	- (-)	-	-	- (-)	-	-
Total	299 (100.0%)	64	235	58 (100.0%)	11	47

Table H-05 HOUSES IN EL TORITO AREA
(VIVIENDAS EN EL AREA EL TORITO)

	El Torito (T1-T2 Reservoir Area)	Pino de Yuna (T4 Storage Area)
USE		
Family use	64	11
Owned	(59)	(10)
Rented	(1)	(-)
Borrowed	(4)	(1)
Closed/seasonal	4	-
Warehouse	3	-
Schools	1	-
Under construction	2	-
Total	74	11
HOUSING MATERIALS		
Block & concrete	1	-
Block & wooden	4	1
Wooden	36	9
Nippa	23	1
Total	64	11
HOUSE FLOOR		
Cemented	22	4
Wooden	11	3
Earth	31	4
Total	64	11

Table H-06 LAND TENURE IN EL TORITO AREA
(TENENCIA DE TIERRA EN EL TORITO)

	El Torito (T1-T2 Reservoir Area)	Pino de Yuna (T4 Storage Area)
TENURE		
Owned with title	17	2
without title	31	9
in process	1	-
Rented	-	-
Borrowed	6	-
State-owned	-	-
n.a	9	-
Total	64	11
MODE OF ACQUISITION		
Bought	13	-
Inherited	10	1
Communal	22	9
Others	10	1
n.a	9	-
Total	64	11

Table H-07 CULTIVATION IN EL TORITO AREA
(CULTIVOS EN EL AREA EL TORITO)

	El Torito (T1-T2 Reservoir Area)	Pino de Yuna (T4 Storage Area)
Major Crops		
Coffee	12	4
Coffee & beans	13	2
Beans	13	2
Beans, maize, coffee	7	1
Beans, cassava, paddy	3	-
Beans, potato	3	-
n.a	13	2
Total	64	11

Table H-08 EMPLOYMENT SITUATION IN EL TORITO AREA
(SITUACION DE EMPLEO EN EL TORITO)

	El Torito (T1-T2 Reservoir Area)	Pino de Yuna (T4 Storage Area)
EMPLOYMENT		
Employer	4	-
Proper worker	46	11
Waged worker	10	-
Family worker	3	-
Occasional worker	1	
Total	64	11
COMPLEMENTARY WORKS		
No work	42	9
Daily waged work	10	2
Occasional employment	5	-
Carpenter	3	-
Others and n.a	4	-
Total	64	11

Table H-09 POSSIBLE LOCATION FOR RESETTLEMENT
(UBICACION POSIBLE DE REASENTAMIENTO)

	Banilejo in Rancho Arriba	El Callejon Nizao	Sabana Grande	Loma Cagueyes	Estrechura y Monte Negro	Arroyo Cana Font Gamundi
Adm. location	Banilejo village in R.Arriba Sec.	Collejon village in Nizao Section	Sabana Grande Village in Ocoa	La Vigia Village	Estrechura village in R.Arriba Sec.	Font.Gamundi in R.Arriba Sec.
Distance from San Jose de Ocoa	30 km	15 km	3 km	35 km	40 km	35 km
Population (families)	2,000	500	28	5	150	150
Cadastral value	$150	100	150	100	100	150
Land tenure	Private	Private	Private	Private	Private	Private
Ecology	bh-s	n.a	bmh-s	bs-s	n.a	n.a
Climate	Semi-humid	Semi-humid	dry	humid	Semi-humid	Semi-humid
Rainfall	1,510 mm	n.a	1,330 mm	1,500-1,600 mm	n.a	n.a
Soil classification	Class V	n.a	Class V	Class III	n.a	n.a
Cultivation	Paddy, pasture, coffee, beans	Coffee, livestock, peanuts, horticulture	Pasture, beans	Coffee, pasture, beans	Beans, potatoes, peanuts, pasture	Coffee, pasture, paddy, beans

Table H-10 LAND ACQUISITION
(ADQUISICION DE LA TIERRA)

Amount in RD$1,000

	Unit Rate	El Torito (T1-T2 Dams)		El Torito (T1-T2 Weir)		Pino de Yuna (T4 Weir)		Los Veganos (V3 Weir)	
		Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount
1. Land submergible under reservoir	2.4/ha	39.5 (below EL.755)	94.8	4.8 (below EL.726)	11.5	5.6 (below EL.680)	13.4	4.3 (below EL.493)	10.3
2. Land affected by construction									
a) land adjacente to reservoir	2.4/ha	40.8 (EL.770-775)	97.9	6.9 (EL.735-726)	16.6	8.9 (EL.690-680)	21.4	3.2 (EL.500-493)	7.7
b) dam/weir site, plant site, spoil bank, temporary facilities	2.4/ha	60.2	144.5	22.1	53.0	10.8	25.8	16.1	38.6
c) access road	1.6/ha	18.3	29.3	18.3	29.3	13.3	21.3	5.1	8.2
d) power house	2.4/ha	1.0	2.4	1.0	2.4	1.0	2.4	1.1	2.6
3. Houses and other properties	3.0/unit	74	222.0	15	45.0	11	33.0	6	18.0
Total			590.9		157.8		117.3		85.4

Table H-11 PRELIMINARY ESTIMATE OF RESETTLEMENT COST

(ESTIMADO DEL COSTO PRELIMINAR DE REASENTAMIENTO)

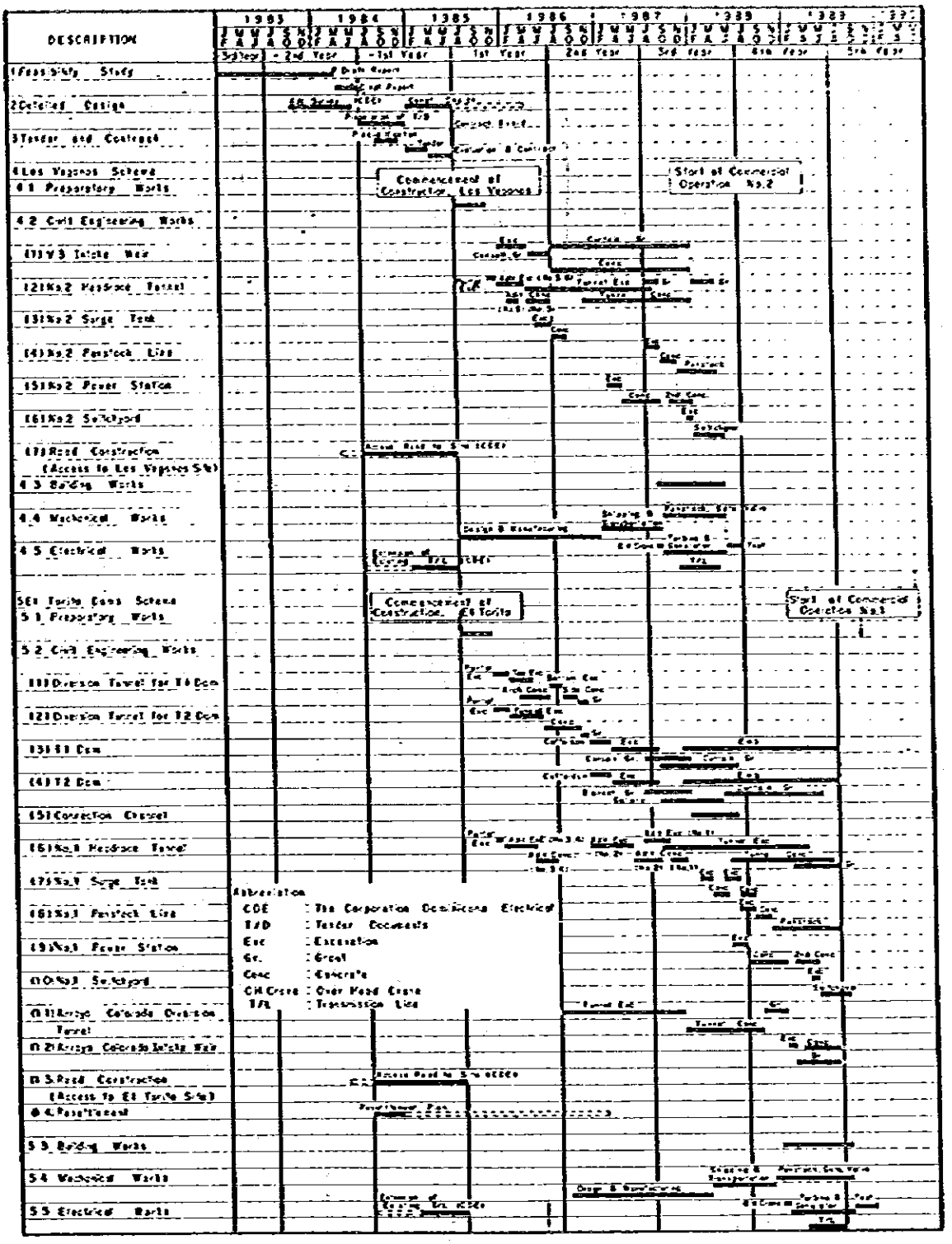
Amount in RD$1,000

	Unit Rate	El Torito (T1-T2 Reservoir)		El Torito (T1-T2 Weir)		Pino de Yuna (T4 Weir)		Los Veganos (V3 Weir)	
		Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount
1. Land procurement (for resettlement of land owned families : at 3.125 ha/family)	3.2/ha	50	500	15	150	11	110	6	60
2. Housing	7.0/unit	50	350	15	105	11	77	6	42
3. Infrastructures	5.0/unit	50	250	15	75	11	55	6	30
4. Land preparation		1.s	50	1.s	15	1.s	20	1.s	10
5. Integrated social program		1.s	100	1.s	30	1.s	50	1.s	20
6. Access road for indirectly affected		1.s	100	1.s	30	1.s	50	1.s	20
7. Contingencies		10%	140	10%	45	10%	38	10%	18
Total			1,490		450		400		200

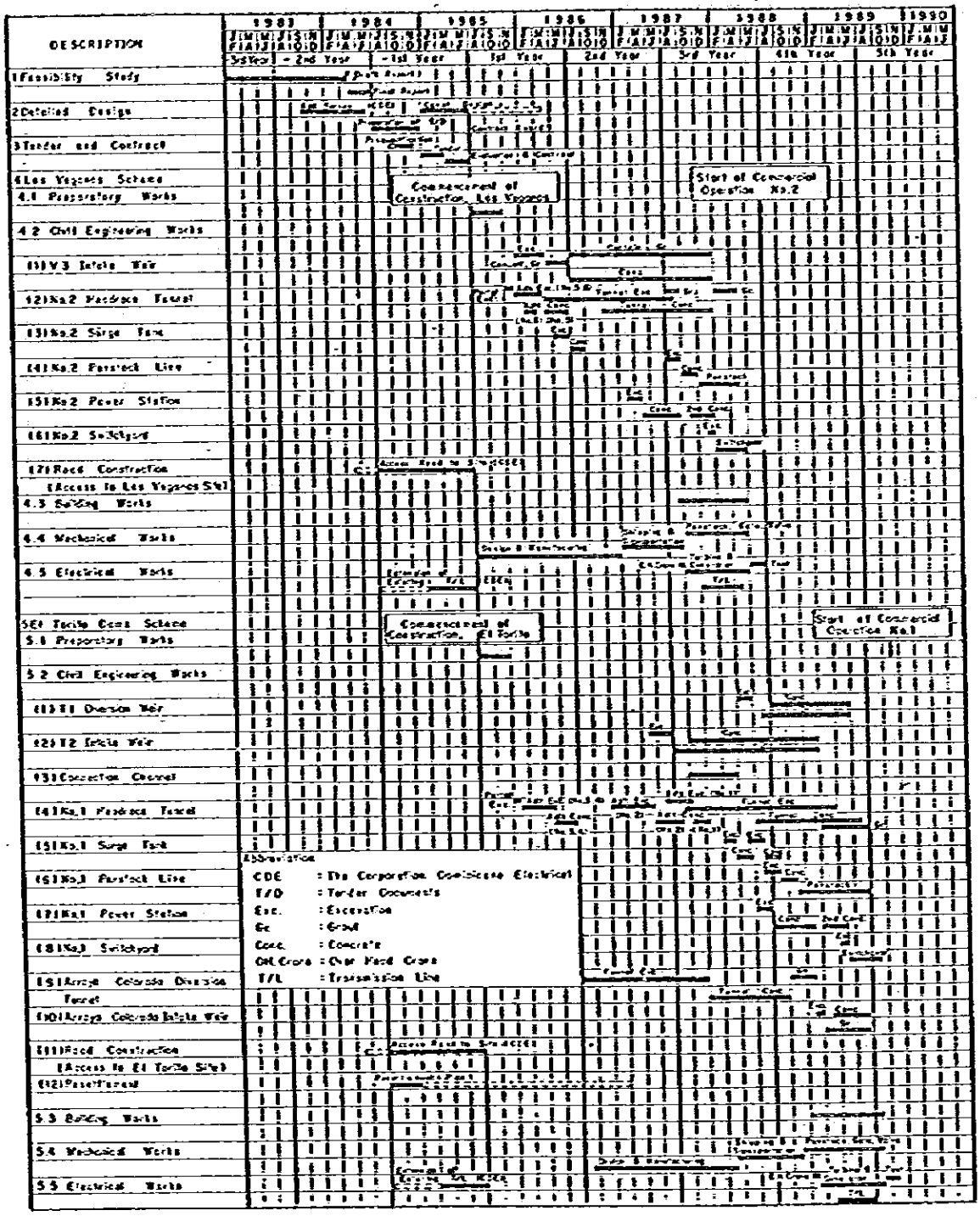
Table H-12 PRELIMINARY ESTIMATE OF PILOT REFORESTATION PROGRAM
(ESTIMADO PRELIMINAR DEL PROGRAMA PILOTO DE REPOBLAMIENTO FORESTAL)

Land Use in Arroyo Colorado Basin		Assumed Reforestation or Protective Works	Unit Price (RD$/ha)	Amount (RD$)
Classification	Area (km^2)			
- Forest	6,220	-	-	-
- Meadow	6,172	Reforestation of 3.0 km^2 (including conversion to coffee or fruit land where suitable)	1,000	300,000
- Coffee	1,282	-	-	-
- Cultivated land	0.010	Conversion of 0.005 km^2 to coffee or fruit land	900	450
		Conversion of 0.005 km^2 to fixed land farming	50	25
- Barren land	1,056	Reforestation of 0.8 km^2 (including conversion to coffee or fruit land)	1,000	80,000
- Naked land	0.009	Reforestation of 0.007 km^2 or conversion to coffee or fruit land	1,000	700
- Collapsed	0.081 (about 20 areas)	Protection with cribwork, drain ditches and fern	50,000 /area	1,000,000
- Village & rivers	0.170	-	-	-
Total	15.0			1,381,175
Engineering & government administration (15%)				207,175
Grand Total				1,588,350 (RD$ 1,600,000)

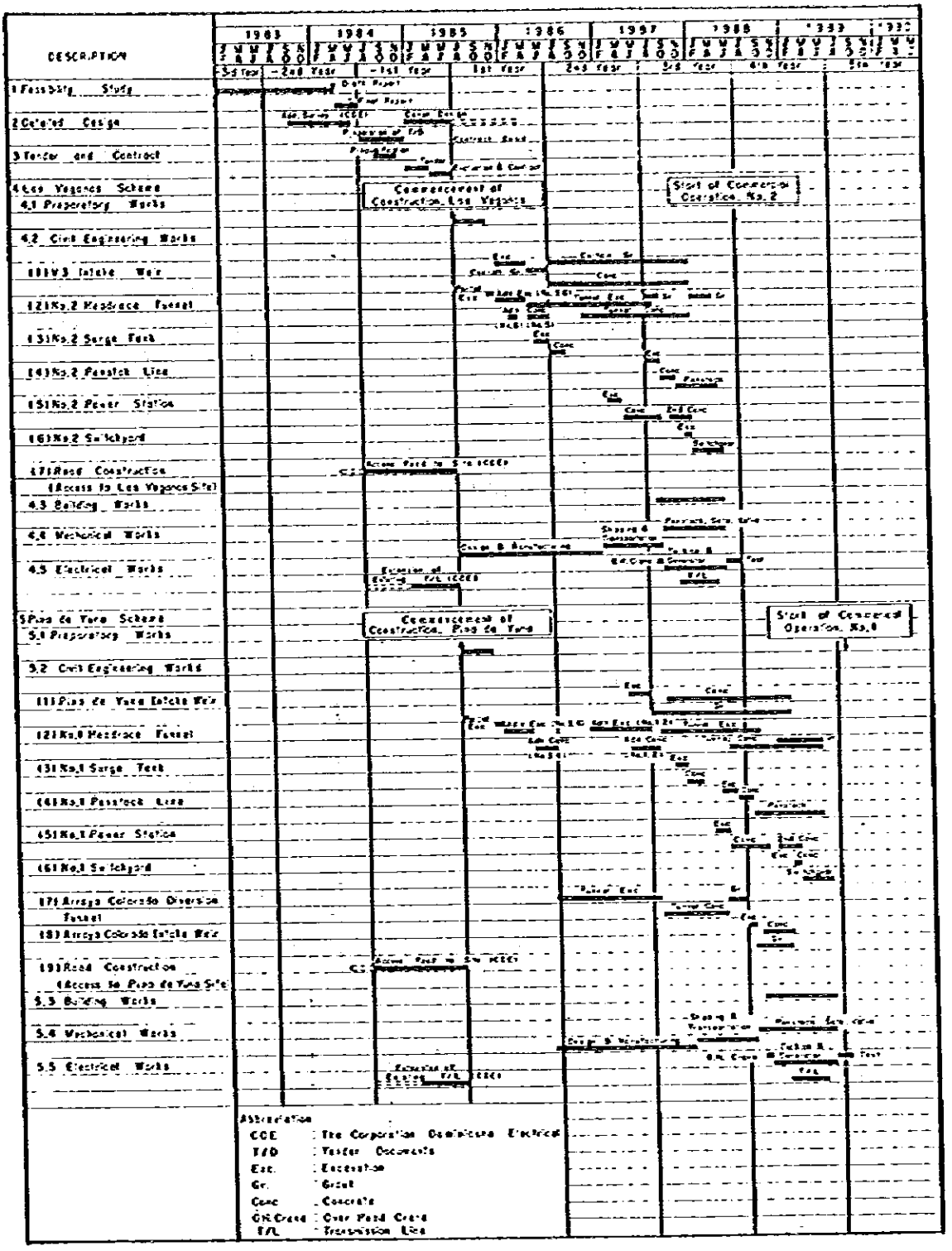
FIGURES



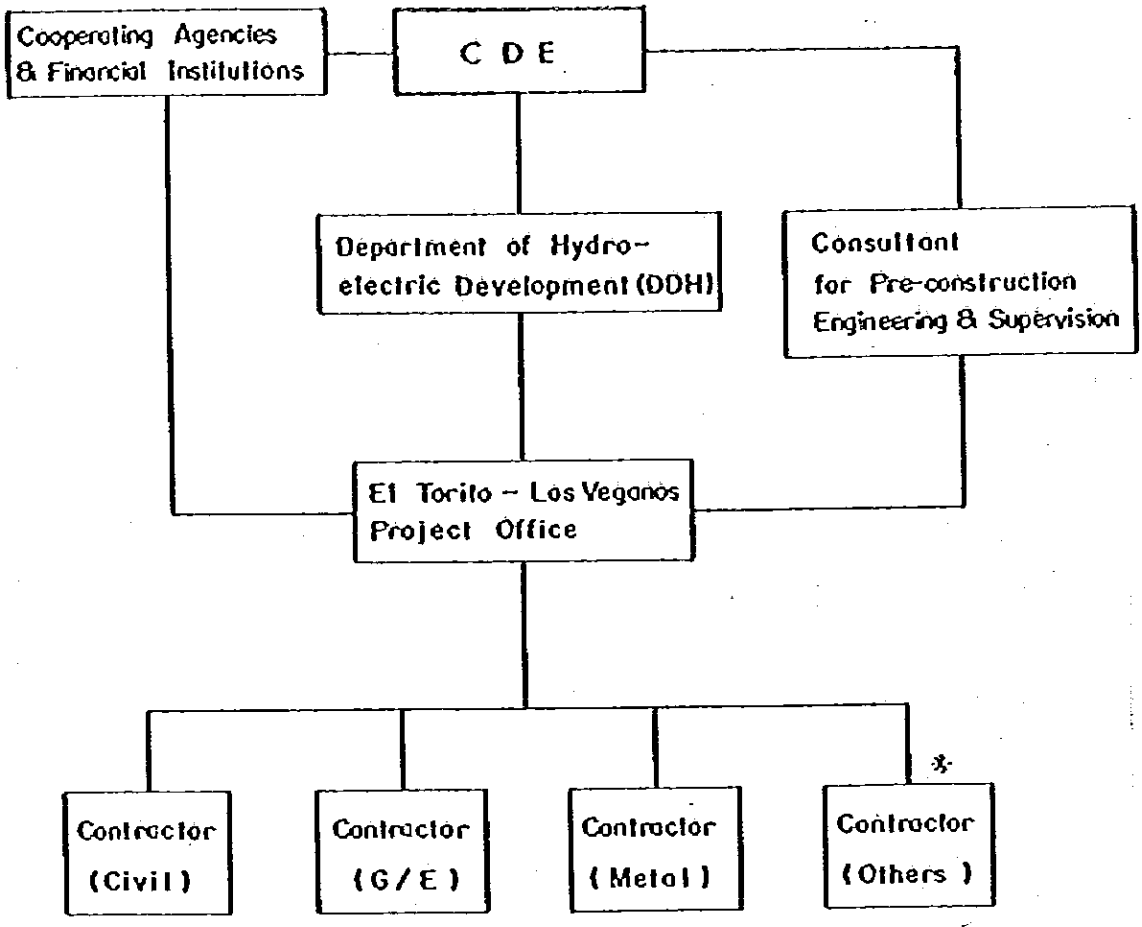
CORPORACIÓN DOMINICANA DE ELECTRICIDAD	Fig.	Construction Schedule For El Torito Doms- Los Vegonos Weir Complex
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORITO-LOS VEGANOS	H-01	*Programa de Construcción : Complejo Presa El Torito-Derivadora Los Veganos*
JAPAN INTERNATIONAL COOPERATION AGENCY		



CORPORACION DOMINICANA DE ELECTRICIDAD	Fig. H-02
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORITO-LOS VEGANOS	Construction Schedule For El Torito Weirs - Los Vegonos Weir Complex *Programa de Construcción : Complejo Derivadora El Torito-Derivadora Los Vegonos*
JAPAN INTERNATIONAL COOPERATION AGENCY	

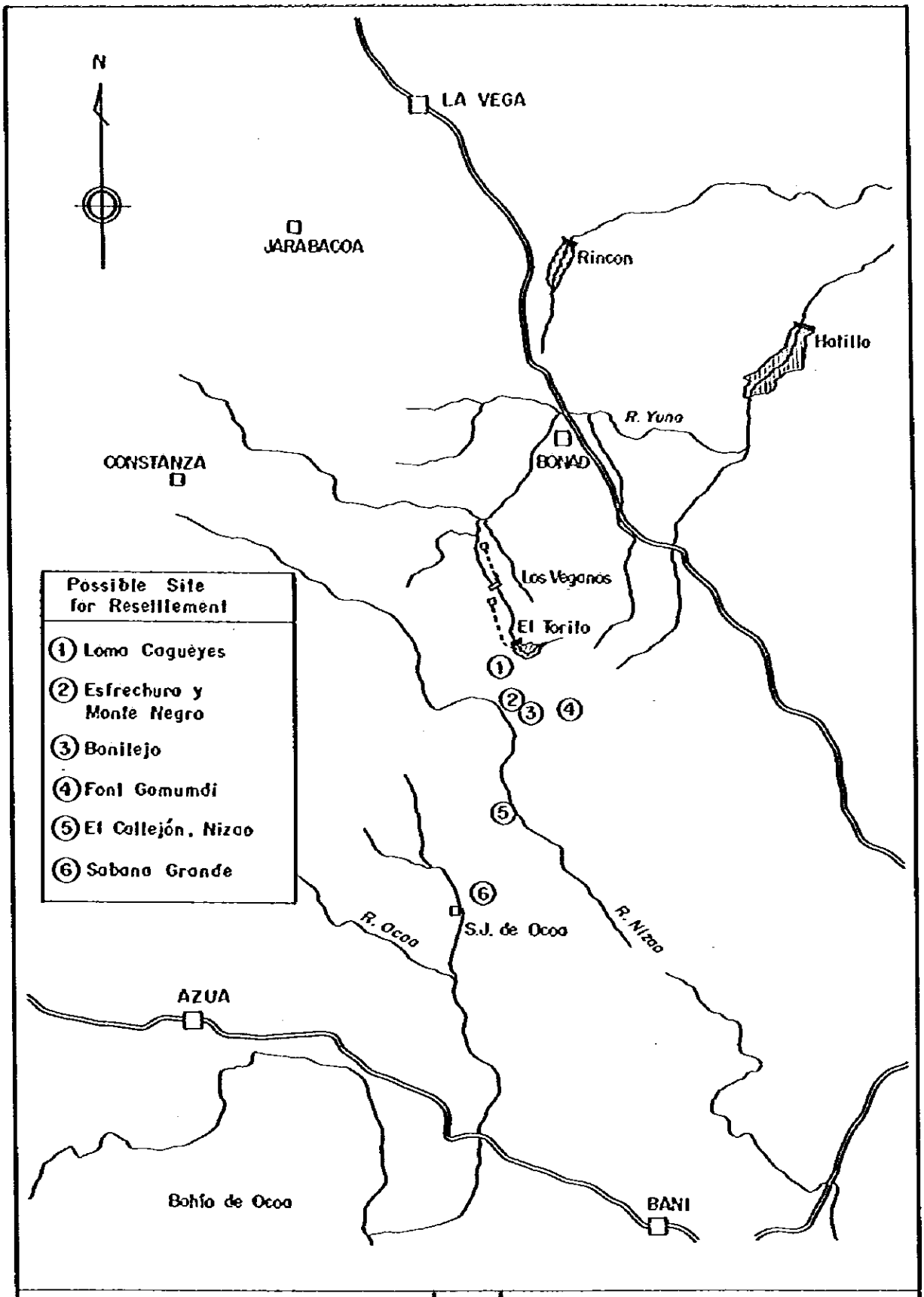


CORPORACION DOMINICANA DE ELECTRICIDAD	Fig.	Construction Schedule For Pino de Yuna Weir-Los Veganos Weir Complex
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORITO-LOS VEGANOS	H-03	*Programa de Construcción: Complejo Derivadora Pino de Yuna-Derivadora Los Veganos*
JAPAN INTERNATIONAL COOPERATION AGENCY		



* Number of contractor package is to be decided at the stage of tender document preparation.

CORPORACION DOMINICANA DE ELECTRICIDAD	Fig.	Organization for Implementation
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORITO-LOS VEGANOS	H-04	*Organización para Ejecución*
JAPAN INTERNATIONAL COOPERATION AGENCY		



CORPORACION DOMINICANA DE ELECTRICIDAD	Fig.	Candidate Location for Resettlement
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ANNEX I

ANNEX - I

PROJECT EVALUATION

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I. PROJECT EVALUATION

I.1 GENERAL

Through the study on alternative plans for the hydroelectric development along the Yuna mainstream, three plans have been selected for detailed comparative study, i.e. El Torito dam - Los Veganos weir complex, El Torito weir - Los Veganos weir complex and the Pino de Yuna weir - Los Veganos weir complex. Outline of the three alternatives is summarized on Table I-01.

On the basis of the preliminary design prepared for each complex as explained in Annex G, as well as in the light of construction plan and schedule as presented in Annex H, the cost of construction works is estimated by calculating the quantity of works and their unit prices. The prices prevailing in the middle of 1983 are adopted in the estimate of construction cost. The construction cost is divided into the cost to be incurred in foreign currency and in local currency. The basis for cost estimate is explained in Chapter I.2.

Although the three schemes have been found to be advantageous out of all the conceivable alternatives, it should be confirmed whether the selected schemes will be economically and financially viable. Therefore, the selected schemes are evaluated from economic and financial points of view. The procedure and result of economic evaluation are presented in Chapter I.3, and the financial evaluation is made as explained in Chapter I.4.

In the economic evaluation, the economic advantageousness of the complex is evaluated from the viewpoint of national economy. In the financial evaluation, the financial viability and soundness are evaluated from the financial standpoint of the administrative agency of the project. It is noted that the economic and financial cost, as well as benefit, are estimated on the basis of prices prevailing in the middle of 1983.

I.2 CONSTRUCTION COST ESTIMATE

I.2.1 Basis of Estimate

The construction cost is estimated on the basis of work quantities measured through the preliminary design and the unit prices estimated for each item of work. The basis of estimate is explained in more detail hereunder.

1) Civil Works:

The unit prices include the direct cost such as labour, materials and equipment, as well as indirect cost such as contractor's overhead and profit. They are estimated in the following manner:

a) Labor Cost:

The labor cost is estimated on the basis of the daily wage rate of labor as listed up on Table I-02. The working days a week and daily working hours are assumed to be 6 days and 8 hours, respectively.

b) Material Cost:

The cost of construction materials includes fuel, lubricants, cement, hardwares, shape steels, explosives, wooden materials, etc. The unit prices of major materials are shown on Table I-03, dividing them into the foreign and local currency portions. The division into the foreign and local currency portion is duly made in the light of local availability of each material. For instance, cement is locally available in sufficient quality and quantity, and it is estimated to be incurred in local currency. The unit price of the materials to be imported from abroad is estimated at CIF prices.

c) Equipment Cost:

The equipment cost includes the depreciation, maintenance and repair, as well as administration costs. The equipment to be required for each work item were examined based on the construction time schedule and each work quantity. Table I-04 indicates the

purchase price of major construction equipment contemplated under the construction plan programmed in Annex H.2. The maintenance and repair cost is assessed at the amount, ranging from 90% to 105% of the purchase price. The administration cost is also assessed at 5 to 7 % of the purchase price, which is the percentage to be usually required.

d) Indirect Cost:

The indirect cost, such as contractor's overhead and profit, is estimated at 30% of the direct cost consisting of the labor, materials and equipment costs.

2) Metal Works:

Metal works include the works such as gates, stoplogs, trashracks, steel penstocks, valves and drain pipes, etc. The cost estimate for these metal works is made on the basis of unit price per ton estimated in the light of the current contract prices for similar works. The local currency portion will cover the local labor cost in erection work and inland transportation cost.

3) Electrical Works:

The cost for the electrical works includes the generating equipment, switching station equipment, transmission line, substation, etc. It is also estimated on the basis of the current international contract prices per ton of similar projects. The erection cost of the electrical works as estimated at 60% of the FOB price of equipment, which is the usual percentage required for the similar works. The local currency portion is estimated at 20% of the erection cost.

4) Land Acquisition:

The cost is estimated for land acquisition and compensation of residential houses and facilities that will be submerged by the reservoir or storage. The necessary cost for the acquisition is estimated in Annex H, Table H-10.

5) Engineering Service and Administration:

The cost of engineering service is estimated to cover the fee of consultants to be retained for construction design and supervision of the complex. The cost of field office for supervision by CDE is also included. The cost is estimated at the rate of 7.5% of the direct construction cost for El Torito dam - Los Veganos weir complex and 10% for El Torito/Pino de Yuna weir - Los Veganos weir complex, in view of the work quantity involved in each complex.

6) Physical Contingency:

The cost estimate is made on the basis of the information available through the feasibility level investigation up to date. Therefore, some allowance should be prepared for such unknown factors as:

- Changes in items and quantities during detailed design stage,
- Change in the assumed geological conditions to be encountered during construction, and
- Degree of accuracy in topographic map at some places.

In view of such uncertainties involved, 10% of the direct construction cost is estimated as physical contingency.

7) Cost of Associated Program:

The cost of such associated programs as resettlement plan and watershed control, is preliminarily estimated in Annex H, Table H-11 and H-12. Although these costs will not be counted in the economic evaluation, they will be included in the estimate of required fund and in the evaluation of financial repayability.

I.2.2 Construction Cost

In accordance with the condition of estimate as explained in the foregoing Section, the total construction cost of El Torito dam - Los Veganos weir complex is estimated at around RD$80.3 million, as shown on Table I-05(1). Likewise, the construction cost of El Torito weir - Los Veganos

weir complex is estimated at RD$44.0 million in total, as shown on Table I-05(2), and the construction cost of the Pino de Yuna weir - Los Veganos weir complex at RD$40.0 million as shown on Table I-05(3). It is noted that the price contingency is not estimated in the construction cost.

Details of the construction cost of civil works for each complex is elaborated on Table I-06. Likewise, the breakdown of the construction and erection cost of the metal works and electrical works is also shown on Table I-07 and Table I-08.

I.3 ECONOMIC EVALUATION

I.3.1 Economic Cost

Economic evaluation is made on the basis of the economic cost estimated for the implementation of the complex. The economic cost is the cost to be required by the Project from the viewpoint of national economy. There are some costs which are not considered to be counted as costs from the standpoint of national economy, even if those costs are financially required for the implementation of the complex.

1) Economic Construction Cost:

The economic cost is estimated in terms of local currency. In the economic cost, such transfer payments as tax and subsidies are to be excluded. Likewise, a shadow rate is to be assessed to evaluate the economic value of labor, foreign exchange, etc., from the standpoint of national economy.

a) Taxes:

Taxes to be imposed in the Dominican Republic are considered as the transfer payment which is only transferred within the national economy and should be excluded in the economic cost. As noted in Annex A.2.5, 5% tax is usually applicable in the local purchase under the law No. 346. Consequently, such an amount of tax is deducted in estimating the local purchase of materials.

b) Shadow Wage Rate:

The skilled labors are relatively in shortage, and their wages appear to reflect the market mechanism. Therefore, the wages to be paid to the skilled labors are deemed to be economic cost. On the contrary, the unskilled labors are in excess of the actual demand, and unemployment and under-employment rate is substantially high as reviewed in Annex A.1.2. In such a case, the opportunity cost of unskilled labor, which is defined as the production value of unskilled labor to be sacrificed in other fields by engaging in the Project, is considered to be the economic cost of the unskilled labor. As noted in Annex A.1.2, the opportunity cost of unskilled

labor is evaluated at 0.745 of the wage to be actually paid to the unskilled labor in the northern region of the country. Thus, the shadow wage rate of unskilled labor is determined to be 0.745.

c) Shadow Exchange Rate:

The equipment, plants and materials, etc. to be imported from foreign countries will be estimated at a higher rate if they are valued in local currency, in view of the official exchange rate and the actual exchange rate. As noted in Annex A.2.4, the Dominican Republic has applied an extra-bank market rate of foreign exchange and this parallel rate ascended to 1.60 of the official rate in mid 1983. Although the parallel rate is not a shadow exchange rate in a true sense, it affects commodity pricing in the same way as a tax and subsidy would affect in determining the exchange rate. Consequently, the shadow exchange rate of 1.60 is to be applied in estimating the economic cost of the imported equipment, plant, materials, services, etc.

In the estimate of costs to be incurred in local currency, the taxes to be imposed on local purchase and the shadow wage rate of unskilled labor will amount to approximately 10% of the cost financially estimated at market prices. On the other hand, the cost to be incurred in foreign currency will be economically valued at 1.6 time of the prices estimated financially.

The economic construction cost of El Torito dam - Los Veganos weir complex, El Torito weir - Los Veganos weir complex, and the Pino de Yuna weir - Los Veganos weir complex is respectively estimated as shown on Table I-09. In total, El Torito dam - Los Veganos weir complex will amount to around RD$105.6 million, El Torito weir - Los Veganos weir complex at RD$58.5 million, and the Pino de Yuna weir - Los Veganos weir complex at about RD$53.3 million.

2) Operation, Maintenance and Replacement Cost:

The economic cost of the Project comprises the operation and maintenance cost (O & M cost) and required replacement cost, in addition to the above estimated construction cost. They are estimated as follows:

a) O & M Cost:

The O & M cost covers salaries and wages of staff, regular maintenance cost and minor repair cost. The annual O & M cost is estimated as shown on Table I-10, by referring to the past experience in operation and maintenance by CDE. The annual O & M cost is estimated at about 0.5% of the total construction cost.

The annual O & M cost is estimated at RD$527,700 for El Torito dam - Los Veganos weir complex, at RD$292,300 for El Torito weir - Los Veganos weir complex, and at RD$266,300 for the Pino de Yuna weir - Los Veganos weir complex.

b) Replacement Cost:

The economic life of the facilities is assumed to be 35 years for the metal work, generating equipment, transformers and transmission line, and 50 years for the civil works. Thus, the Project life is assumed to be 50 years. Consequently, the replacement cost will be required for the metal work, generating equipment, transformers and transmission lines after their useful life of 35 years. A salvage value of about 10% is assumed in estimating the replacement cost.

3) Flow of Annual Economic Cost:

The economic construction cost is to be disbursed in accordance with the construction schedule discussed in Annex H.3. The annual disbursement of the construction cost is estimated as shown on Table I-11 to I-13.

By incorporating the O & M cost and the replacement cost, the flow of annual economic cost of the three complex is summarized on Table I-14 to I-16.

I.3.2 Economic Benefit

The economic benefit of the hydroelectric complex is considered to be the cost of the most competitive alternative thermal plant, since the cost of the alternative, which has to be substituted to meet the power demand in the absence of the Project, can be saved by the Project. Therefore, the

economic benefit of the complex is measured by estimating the cost of the most competitive alternative power source which is suitable to cover the deficit of power generation in the light of the forecasted load duration curve as shown in Annex B, Fig. B-07.

According to the power balance, the power deficit is forecasted to occure during the peak time of less than 2,000 hours per annum. The most competitive alternative to cover such a peak demand will be a gas turbine generator. The gas turbine power has readiness for quick start and stop and easiness for construction. Therefore the gas turbine plant is selected as the alternative in estimating the capacity value and the primary energy value. As for the unit size, a 10 MW unit which generally corresponds to the unit size of the complex is to be applied.

On the other hand, the secondary energy to be generated by the complex will be served, in general, for the base load demand. The base load, as reviewed in Annex B.2, is principally fed by thermal power plants at present. By the time when El Torito - Los Veganos complex is completed, it is planned that coal-fired plants will be put into commercial operation, and gas turbine plants will be shifted to cover the peak load supplementing the hydropower after operation of new coal-fired plants. Then, both of coal-fired and oil-fired steam plant will be served in parallel to meet the base load. Therefore, the alternative source of the secondary energy is presumed to be both coal-fired and oil-fired steam power.

The cost of coal-fired and oil-fired steam plant varies in accordance with their unit size. The unit size suitable for such alternative power sources is 65 MW for the steam power unit and 130 MW for the coal fired thermal unit, in the light of the existing standard unit size in the country. The base load power supply will be made by such a unit size in the absence of the secondary energy to be generated by the complex.

The cost of the alternative power sources consists of the installation cost, fuel cost, O & M cost and replacement cost. Each cost is assessed in the following manner:

1) Capacity Value:

Capacity value is calculated on the basis of installation cost of 10 MW class gas turbine which is estimated at US$346.5/kW. By applying a shadow exchange rate to foreign currency portion (90%), the installation cost is equivalent to RD$533.5/kW. For adjustment of transmission loss, forced outage, station service and overhaul between the gas turbine power and hydro-power, a value of 1.026 will be applied as a capacity adjustment factor. Consequently, the unit installation cost is estimated at RD$547.38/kW, as shown on Table I-17.

By applying the unit installation cost calculated above, the installation cost of gas turbine with the installed capacity contemplated under the complex is estimated as summarized hereunder.

	Installed Capacity (MW)	Installation Cost (RD$10^3)
El Torito dam - Los Veganos weir	19.1	10,455.0
El Torito weir - Los Veganos weir	14.9	8,156.0
Pino de Yuna weir - Los Veganos weir	14.0	7,663.3

The construction period of gas turbine is presumed to be two years, and 50% of the installation cost is disbursed in the first and second year.

2) Primary Energy Value:

Value of the primary energy generated by the complex is assessed on the basis of the fuel cost to be required for the operation of 10 MW class gas turbine unit. The financial price of fuel cost is presumed at RD$44.50/bbl which was the average price of gas oil purchased by CDE in January - June 1983 (Refer to Annex B, Table B-13). On the basis of the heating value and heating rate, as well as by applying a factor for adjustment between hydro and gas power, the primary energy value is estimated at RD$0.1626/kWh, as shown on Table I-18.

3) Secondary Energy Value:

Value of the secondary energy generated by the complex is assessed on the basis of fuel cost to be required for 65 MW class oil-fired steam plant and 130 MW class coal-fired steam plant. The financial fuel price is presumed at RD$26.00/bbl for Bunker-C and RD$78.5/ton for imported coal. As in the case of gas turbine unit, the energy value is estimated at RD$0.074/kWh for oil-fired steam plant and RD$0.0485/kWh for coal-fired steam plant, as shown on Table I-19 and I-20. By applying an average value on fuel cost of oil-fired and coal-fired steam power, it is presumed that the secondary energy value is RD$0.06125/kWh.

4) Annual Energy Value:

On the basis of the unit value of the energy estimated hereinabove, the annual primary and secondary energy value of El Torito dam - Los Veganos weir complex is estimated at RD$6,682,900 and RD$2,364,300, respectively. For El Torito weir - Los Veganos weir complex, the annual primary energy is estimated at RD$5,138,200 and the secondary energy at RD$2,198,900. For the Pino de Yuna weir - Los Veganos weir complex, the annual primary and secondary energy is estimated RD$4,731,700 and RD$2,002,900. (Refer to Table I-21).

5) Other Costs:

In addition to the installation cost and the fuel cost, the alternative thermal will require the annual O & M cost and replacement cost.

The annual O & M cost comprises the cost related to the installed capacity (fixed O & M cost) and the cost related to the fuel for generating energy (variable O & M cost). The annual fixed O & M cost is considered to be proportional to the installed capacity. It is presumed that a foreign currency portion of the fixed O & M cost is 90% for gas turbine and 80% for oil-fired and coal-fired steam plants. By referring to the report reported by CDE, the fixed and variable O & M cost is estimated as follows:

	Fixed O & M (RD$/kW)	Variable O & M (RD mill/kWh)
10 MW Gas turbine unit	11.55	3.08
65 MW Oil-fired steam unit	25.16	2.96
130 MW Coal-fired steam unit	23.60	2.96

The annual fixed and variable O & M cost is estimated as shown on Table I-22.

The economic life of the selected alternatives is considered to be 17 years. Therefore, the alternatives will require its replacement cost after 17 years. The cost required for the replacement is assumed to be 90% of the installation cost, by accounting the salvage value of 10%. The disbursement will be made in 2 years.

6) Flow of Annual Economic Benefit:

On the basis of the capacity value, primary and secondary energy value, fixed and variable O & M value, the total annual economic benefit of the complex is estimated as shown on the accrual flow in Table I-23 to I-25.

I.3.3 Economic Evaluation

Economic evaluation is made on the basis of the accrual flow of the economic cost and economic benefit as estimated in the foregoing Chapter.

1) Economic Internal Rate of Return:

The economic analysis is made by assessing the economic internal rate of return (EIRR), which is the discount rate at which the sum of the economic cost becomes equivalent to that of the economic benefit in terms of the present worth.

Under the condition of estimate as calculated in Chapter I.3.2, EIRR is calculated as shown on Table I-26 to Table I-33 and as summarized hereunder:

	EIRR (%)
El Torito dam - Los Veganos weir complex	8.7
El Torito weir - Los Veganos weir complex	12.9
Pino de Yuna weir - Los Veganos weir complex	12.8
El Torito dam only	5.2
El Torito weir only	10.4
Pino de Yuna weir only	10.0
Los Veganos weir only (with El Torito dam)	17.3
Los Veganos weir only (with upstream weir)	15.6

Through the evaluation in terms of economic internal rate of return, it becomes clear that El Torito weir - Los Veganos weir complex is more beneficial than the Pino de Yuna weir - Los Veganos weir complex, through the difference is relatively marginal. It is also noted that the economic surplus (benefit minus cost) is larger in El Torito weir - Los Veganos weir complex than in the Pino de Yuna weir - Los Veganos weir complex. Consequently, it is concluded that El Torito weir - Los Veganos weir complex is prefered to the Pino de Yuna weir - Los Veganos weir complex.

2) Sensitivity Analysis:

In view of various uncertainties involved in the condition assumed in the assessment of the cost and benefit, the sensitivity tests of the EIRR are made as follows:

	EIRR (%)
El Torito dam - Los Veganos weir complex :	8.7
- Total cost 5% up	8.2
- Total cost 10% up	7.8
- Total cost 15% up	7.3
- Total benefit 5% down	8.2
- Total benefit 10% down	7.7
- Total benefit 15% down	7.2
- Oil and coal prices 10% up	9.6
- Oil and coal prices 20% up	10.4
- Available discharge 20% up	11.0
- No consideration of shadow exchange rate of 1.6	7.2
El Torito weir - Los Veganos weir complex :	12.9
- Total cost 5% up	12.2
- Total cost 10% up	11.6
- Total cost 15% up	11.1
- Total benefit 5% down	12.2
- Total benefit 10% down	11.5
- Total benefit 15% down	10.8
- Oil and coal prices 10% up	13.9
- Oil and coal prices 20% up	15.0
- Available discharge 10% down	11.6
- No consideration of shadow exchange rate of 1.6	11.0

	EIRR (%)
Pino de Yuna weir - Los Veganos weir complex:	12.8
- Total cost 5% up	12.2
- Total cost 10% up	11.6
- Total cost 15% up	11.1
- Total benefit 5% down	12.2
- Total benefit 10% down	11.5
- Total benefit 15% down	10.8

Aiming to find the EIRR for the combinations of various cases, the sensitivity of the EIRR is graphically shown in Fig. I-01 and I-03.

In case that El Torito dam is constructed, an effect of water regulation by El Torito reservoir is expectable on the power generation at the Piedra Gorda power station. As reviewed in Appendix-I, Chapter 3.5, an installed capacity at the Piedra Gorda power station may be increased by 2 MW, and the annual energy output is increased by 0.9 GWh. Under such a condition, the benefit attributable to El Torito dam plan is increased, and EIRR of El Torito dam - Los Veganos weir complex is calculated at 9.3%.

3) Evaluation

As seen in the result of EIRR under normal condition, El Torito weir - Los Veganos weir complex scheme, for which the EIRR is calculated at 12.9%, is considered to be economically feasible in the light of the opportunity cost of capital investment estimated at 12.0% in the Dominican Republic as reviewed in Annex A.2.2.

Even in case that the cost is increased by 5% or the benefit is reduced by 5%, EIRR is still over the opportunity cost of capital and the implementation of the complex is economically justifiable. The complex can expect to be more beneficial if the imported oil prices are increased in future.

On the other hand, the economical merit of El Torito dam - Los Veganos weir complex scheme, for which EIRR is calculated at 8.7%, is not found to be expected. The expensive construction cost of El Torito dams

(T-1 dam and T-2 dam) is the main reason for the less economic merit. This is apparent in the calculation that EIRR of El Torito dam scheme is as low as 5.2%. Even in case that the oil price is assumed to be higher by 20% or that the discharge is available at larger volume (benefit increased by 17% and cost increased by 1%), El Torito dam scheme will not turn out to be economically justifiable.

I.4 FINANCIAL EVALUATION

To assess the project feasibility from the financial viewpoint, the financial internal rate of return (FIRR) and the loan repayability are examined as explained hereunder.

I.4.1 Financial Internal Rate of Return

The financial analysis by means of financial internal rate of return (FIRR) is made on the basis of financial cost to be incurred for the implementation of the complex and financial revenue to accrue from the project.

1) Financial Construction Cost:

The financial construction cost is the cost to be actually required by CDE for the implementation of the complex. The escalation of market price is to be duly counted. In the light of the trend of price index, as reviewed in Annex A.2.6, the annual escalation of prices for purchase of local material and services is presumed at 8.0% per annum on an average. Price escalation of imported equipment, materials and services is estimated at 6.0% in view of the world trend in recent years. It is noted that the cost estimated for the associated programs of resettlement and reforestation is precluded in FIRR analysis. It will be reviewed under the analysis of repayability of fund in the subsequent Chapter.

The financial construction cost of El Torito dam - Los Veganos weir complex is estimated as shown on Table I-34, and summarized as follows:

Year	Foreign	Local	Total
1984	1,434.4	1,660.8	3,095.2
1985	3,445.7	2,438.0	5,883.7
1986	9,519.6	7,650.6	17,170.2
1987	17,783.1	12,024.4	29,807.5
1988	20,074.3	14,617.5	34,691.8
1989	7,639.9	7,822.0	15,461.9
Total	59,897.0 (56%)	46,213.3 (44%)	106,110.3 (100%)

On the other hand, the financial construction cost of El Torito weir - Los Veganos weir complex is estimated as shown on Table I-35 and summarized as follows:

Year	Foreign	Local	Total
1984	900.4	1,012.8	1,913.2
1985	2,504.4	1,472.3	3,976.7
1986	5,281.5	3,632.4	8,913.9
1987	16,584.7	7,220.5	23,805.2
1988	6,691.1	7,473.2	14,164.3
1989	1,828.7	2,506.7	4,335.4
Total	33,790.8 (59%)	23,317.9 (41%)	57,108.7 (100%)

Further, the financial construction cost of the Pino de Yuna weir - Los Veganos weir complex is estimated as shown on Table I-36 and summarized as follows:

Year	Foreign	Local	Total
1984	876.2	976.6	1,852.8
1985	2,408.3	1,416.2	3,824.5
1986	5,180.6	3,522.4	8,703.0
1987	15,665.1	6,579.4	22,244.5
1988	5,906.1	6,605.1	12,511.2
1989	836.0	1,505.7	2,341.7
Total	30,872.3 (60%)	20,605.4 (40%)	51,477.7 (100%)

2) Financial Operation Cost:

For the operation of the complex, costs are required for operation and maintenance, replacement of electro-mechanical facilities, and sales of electric power. These expenses are estimated in the following manner:

a) O & M Expenses:

The expense for operation and maintenance for power generation will cover salaries and wages of staff, regular maintenance cost and

minor repair cost, etc. These expenses are annually estimated at about 0.5% of the total installation cost, as follows:

	Financial Annual O & M Expenses (RD$10^3)
El Torito dam - Los Veganos weir	530.6
El Torito wear - Los Veganos weir	285.5
Pino de Yuna weir - Los Veganos weir	242.8

b) Energy Sales Expenses:

Expenses are incurred for energy sales, accounting and administration, as well as for operation and maintenance of transmission line and distribution systems. These expenses were RD$0.017/kWh in 1982, as noted in Annex B.6.2. Assuming a price escalation during 7 years up to the completion of the complex, such expenses are estimated as follows:

- El Torito dam - Los Veganos weir complex:

  Annual energy output: 79.7 GWh

  Price escalation: $(1+0.08)^7$

  Annual sales expenses:

  $$79.7 \times 10^6 \times 0.017 \times (1+0.08)^7 = RD\$2,322.1 \times 10^3$$

- El Torito weir - Los Veganos weir complex:

  Annual energy output: 67.5 GWh

  Price escalation: $(1+0.08)^7$

  Annual sales expenses:

  $$67.5 \times 10^6 \times 0.017 \times (1+0.08)^7 = RD\$1,966.6 \times 10^3$$

- Pino de Yuna weir - Los Veganos weir complex:

  Annual energy output: 61.8 GWh

  Price escalation: $(1+0.08)^7$

  Annual sales expenses:

  $$61.8 \times 10^6 \times 0.017 \times (1+0.08)^7 = RD\$1,800.5 \times 10^3$$

c) Replacement Cost:

Electro-mechanical facilities are to be replaced after their economic life of 35 years. 90% of the financial installation cost is estimated as replacement cost. Under such conditions, the replacement cost is calculated as shown on Table I-37.

3) Flow of Total Financial Cost:

Total financial cost required for the implementation of the complex is summarized in the form of accrual flow on Table I-38 to I-40.

4) Energy Sales Revenue:

The average power revenue of CDE was RD$0.1332/kWh (sold energy) in 1982, as explained in Annex B.6.1, and it had been increased in 1978-82 at the average rate of about 27%. Consequently, the average revenue is presumed at RD$0.16916/kWh (0.1332 x 1.27). Further, power loss in transmission and distribution is presumed at 23.5% of generated energy. Consequently, the revenue by sale of the primary energy is estimated as follows:

El Torito dam - Los Veganos weir complex:

Primary energy output:	41,100 x 10^3 kWh
Energy loss (23.5%):	9,659 x 10^3 kWh
Sold energy:	31,441 x 10^3 kWh
Revenue (0.16916/kWh):	RD$5,318.6 x 10^3

El Torito weir - Los Veganos weir complex:

Primary energy output:	31,600 x 10^3 kWh
Energy loss (23.5%):	7,426 x 10^3 kWh
Sold energy:	24,174 x 10^3 kWh
Revenue (0.16916/kWh):	RD$4,089.3 x 10^3

Pino de Yuna weir - Los Veganos weir complex:

Primary energy output:	29,100 x 10^3 kWh
Energy loss (23.5%):	6,838 x 10^3 kWh
Sold energy:	22,262 x 10^3 kWh
Revenue (0.16916/kWh):	RD$3,765.8 x 10^3

The secondary energy is sometimes valued at a lower rate than the primary value. However, there is little difference between the sale of the primary energy and the secondary energy in the Republic where power in both peak load and base load is in shortage. The average price of energy consumed by the industrial sector principally in the off-peak hour is higher than the average price of consumption in the residential sector due mainly to the basic fuel adjustment tariff applied by CDE. Since the unit price of RD$0.1332/kWh is the average revenue of peak load and base load, as well as the average of energy consumed in all the sectors, it is assumed that the revenue from the sale of secondary energy is also valued at RD$0.16916/kWh. The revenue from the secondary energy sale is therefore calculated as follows:

El Torito dam - Los Veganos weir complex:

Secondary energy output:	$38,600 \times 10^3$ kWh
Energy loss (23.5%):	$9,071 \times 10^3$ kWh
Sold energy:	$29,529 \times 10^3$ kWh
Fuel saving (0.16916/kWh):	RD$$4,995.1 \times 10^3$

El Torito weir - Los Veganos weir complex:

Secondary energy output:	$35,900 \times 10^3$ kWh
Energy loss (23.5%):	$8,436 \times 10^3$ kWh
Sold energy:	$27,464 \times 10^3$ kWh
Fuel saving (0.16916/kWh):	RD$$4,645.7 \times 10^3$

Pino de Yuna weir - Los Veganos weir complex:

Secondary energy output:	$32,700 \times 10^3$ kWh
Energy loss (23.5%):	$7,684 \times 10^3$ kWh
Sold energy:	$25,016 \times 10^3$ kWh
Fuel saving (0.16916/kWh):	RD$$4,231.6 \times 10^3$

5) Financial IRR:

On the basis of estimated financial construction cost, operation cost and energy sales revenue, FIRR of the complex and each scheme is calculated as shown on Table I-38 to I-45, and summarized as follows:

	FIRR (%)
El Torito dam - Los Veganos weir complex:	6.1
El Torito weir - Los Veganos weir complex:	10.1
Pino de Yuna weir - Los Veganos weir complex:	10.1
El Torito dam scheme (single):	2.7
El Torito weir scheme (single):	7.9
Pino de Yuna weir scheme (single):	7.5
Los Veganos weir scheme (single) (with dam):	14.2
Los Veganos weir scheme (single) (with weir):	13.0

The financial internal rate of return of El Torito weir scheme is slightly higher than the Pino de Yuna Weir scheme, as in the case of evaluation by the economic internal rate of return. Consequently, in the case of weir complex, combination of El Torito weir - Los Veganos weir will be recommended.

6) Sensitivity Analysis:

Sensitivity to the variation of some factors presumed in estimating the cost and revenue is analyzed as summarized hereunder. It is also illustrated graphically on Fig. I-04 and I-06 so that FIRR can be found for all the combination of the variables.

	FIRR (%)
El Torito dam - Los Veganos weir complex:	6.1
- Total cost 5% up:	5.6
- Total cost 10% up:	5.1
- Total cost 15% up:	4.7
- Total benefit 5% down:	5.6
- Total benefit 10% down:	5.1
- Total benefit 15% down:	4.5

	FIRR (%)
El Torito weir - Los Veganos weir complex:	10.1
- Total cost 5% up:	9.4
- Total cost 10% up:	8.9
- Total cost 15% up:	8.3
- Total benefit 5% down:	9.4
- Total benefit 10% down:	8.7
- Total benefit 15% down:	8.0
Pino de Yuna weir - Los Veganos weir complex:	10.1
- Total cost 5% up:	9.4
- Total cost 10% up:	8.9
- Total cost 15% up:	8.3
- Total benefit 5% down:	9.4
- Total benefit 10% down:	8.8
- Total benefit 15% down:	8.1

I.4.2 Analysis on Repayability

For the implementation of the complex, CDE will count on the external financial cooperation to cover, in principle, the construction cost of the complex to be incurred in foreign currency. It will also have to manage to raise a fund to cover the cost to be required in local currency. By assuming conditions of such external and internal financing, repayability of loan and fund will be analysed herein.

1) Financial Plan:

It is planned that the construction cost to be incurred in foreign currency will be financed by an international financial agency, and that the cost in local currency portion will be financed by issuing a bond in the Republic. It is presumed that the conditions of external loan will be as follows:

	Case-1	Case-2
Interest rate	3.5%	8.0%
Grace period	10 years	10 years
Repayment period	20 years	20 years

On the other hand, it is presumed that a bond will be issued under the following conditions:

Interest rate	10.0%
Maturity period	10 years

It is noted that the bond will be issued in such an amount that the interest payable during the construction period will be covered by the bond to be issued in the subsequent year. It is also noted that the bond will be issued to cover the cost to be required for the implementation of the associated programs for resettlement and watershed control.

2) Repayability:

On the basis of the financial cash flow of cost and revenue, as well as under the presumed repayment conditions, the analysis of repayability is made as shown on Table I-46 to I-48. In the case of El Torito dam - Los Veganos weir complex, it might be possible to manage under Case-1 (interest rate of 3.5%) to ultimately repay the loan and bond. However, it will be required to issue again the bond to cover the deficit in the halfway of project operation for 50 years (Refer to Table I-46). Financial surplus by operation is unexpectable for nearly 35 years. The loan and bond can hardly be repaid under Case-2 (interest rate of 8.0%).

On the other hand, the loan and bond for El Torito weir - Los Veganos weir complex are repayable in a relatively easy way, and it is possible to expect that a financial surplus will be credited in a relatively short period (after around 10 years) under Case-1 (Refer to Table I-47). Even in Case-2, the loan and bond will be repayable (Refer to Table I-48).

I.4.3 Evaluation

Through the analysis of EIRR and repayability, the implementation of the complex is financially evaluated as summarized hereunder.

a) Implementation of El Torito weir - Los Veganos weir complex will be financially viable and the external and internal funds raised for the complex will be repayable if they are extended on concessional terms.

b) Financial viability of El Torito dam scheme is doubtful. The scheme appears to be an over-investment.

c) Financial viability of El Torito dam - Los Veganos weir complex is evaluated to be marginal, due to the overinvestment in El Torito dam scheme. The repayability is substantially hard even if the funds are made available on concessional terms.

Financially, it is recommended that CDE will implement El Torito weir - Los Veganos weir complex and that it will secure the external and internal fund on such terms as concessionary as possible.

TABLES

Table I-01 SELECTED COMPLEX
COMPLEJOS ALTERNATIVOS

		El Torito Dam - Los Veganos Weir Complex		El Torito Weir - Los Veganos Weir Complex		Pino de Yuna Weir - Los Veganos Weir Complex	
		El Torito	Los Veganos	El Torito	Los Veganos	Pino de Yuna	Los Veganos
Firm Discharge	(m^3/s)	1.23	1.96	0.93	1.72	1.01	1.72
Max. Discharge	(m^3/s)	4.92	7.84	3.72	6.88	4.04	6.88
Effective Head	(m)	250.3	134.0	229.2	134.0	184.3	134.0
Installed Capacity	(MW)	10.3	8.8	7.2	7.7	6.3	7.7
Energy Output	(GWh)						
Primary		22.2	18.9	15.2	16.4	12.7	16.4
Secondary		15.8	22.8	16.9	19.0	13.7	19.0
Total		38.0	41.7	32.1	35.4	26.4	35.4

Table I-02 LABOR COST
COSTO DE LA MANO DE OBRA

Category	Unit	Foreign Currency (US$)	Local Currency (RD$)
Foreman A	M/D	-	20.0
Foreman B	M/D	-	17.6
Operator A	M/D	-	17.6
Operator B	M/D	-	16.0
Assistant Operator	M/D	-	12.8
Driver	M/D	-	16.0
Mechanic A	M/D	-	16.0
Mechanic B	M/D	-	12.8
Electrician A	M/D	-	14.4
Electrician B	M/D	-	12.8
Welder A	M/D	-	14.4
Welder B	M/D	-	9.6
Rigger A	M/D	-	14.4
Rigger B	M/D	-	9.6
Carpenter A	M/D	-	14.4
Carpenter B	M/D	-	9.6
Mason	M/D	-	12.8
Plaster	M/D	-	12.8
Boring Worker A	M/D	-	16.0
Boring Worker B	M/D	-	9.6
Concrete Worker A	M/D	-	14.4
Concrete Worker B	M/D	-	9.6
Driller A	M/D	-	14.4
Driller B	M/D	-	9.6
Tunnel Worker A	M/D	-	16.0
Tunnel Worker B	M/D	-	12.8
Black Smith	M/D	-	14.4
Plumber	M/D	-	12.8
Pipe Fitter	M/D	-	12.8
Painter	M/D	-	12.8
Powder Operator	M/D	-	16.0
Steel Str. Worker A	M/D	-	14.4
Steel Str. Worker B	M/D	-	9.6
Reinforcement Worker	M/D	-	14.4
Grout Worker A	M/D	-	16.0
Grout Worker B	M/D	-	9.6
Pavement Worker	M/D	-	12.8
Skilled Labor	M/D	-	14.4
Common Labor	M/D	-	8.0
Foreman	M/D	145.0	-
Mechanical	M/D	125.0	-
Electrical	M/D	125.0	-
Tunnel Worker	M/D	125.0	-
Operator	M/D	125.0	-

Table I-03 MARKET PRICE OF CONSTRUCTION MATERIALS
PRECIOS DE LAS MATERIALES DE CONSTRUCCION

Material	Specification	Unit	Foreign Currency (US$)	Local Currency (RD$)
Gasoline		ℓ	-	0.60
Light oil		ℓ	-	0.31
Electric		kWh	-	0.08
Lubricant		ℓ	-	1.94
Grease		kg	-	2.50
Portland cement	ordinary	ton	-	87.00
Air-entraining agent		kg	1.8	-
Water-reducing agent		kg	1.8	-
Air-bubble agent		kg	2.5	-
Deformed bar	D-13	ton	350.0	-
Deformed bar		ton	350.0	-
Channel steel	A = 75 ÷ 200	ton	1,080.0	-
Channel steel		kg	1,080.0	-
Dynamite	in open	kg	3.2	-
Dynamite	in tunnel	kg	3.2	-
AN-FO powder		kg	1.6	-
Detonator	ordinary	no.	1.5	-
Detonator	delay, DS	no.	1.5	-
Timber, plank		m^3	340.0	-
Timber, square		m^3	340.0	-
Timber, log		m^3	340.0	-
Metal form	300 x 1500	no.	14.4	-
Metal form	200 x 1500	no.	13.2	-
Metal form	150 x 1500	no.	10.8	-
Metal form	100 x 1500	no.	9.6	-
Hunch form	150	no.	13.2	-
Hunch form	200	no.	19.2	-
Plywood		m^3	530.0	-
Separator	8 - 10 mm	m	0.1	-
Cone		no.	0.15	-
Form oil		ℓ	1.7	-
Pipe support	48.6 mm	m	1.5	-
Portal frame		no.	15.0	-
Cast iron pipe	75 mm	m	12.0	-
Gas pipe	40 mm	m	10.0	-
Gas pipe	65 mm	m	20.0	-
Galvanized pipe	100 mm	m	30.0	-
Galvanized pipe	150 mm	m	36.0	-
Galvanized pipe	200 mm	m	43.0	-
P.V.C. pipe	40 mm	m	1.1	-
Vinyl vent pipe	400 mm	m	5.1	-
Vinyl vent pipe	600 mm	m	7.7	-
Vinyl vent pipe	800 mm	m	10.2	-
Annealed iron wire		kg	1.3	-
Nail		kg	1.1	-
Lozenge-shaped net	10 mesh	m^2	2.1	-

- Continued -

Material	Specification	Unit	Forein Currency (US$)	Local Currency (RD$)
Cross bit	36 mm	no.	36.0	-
Cross bit	44 mm	no.	51.0	-
Cross bit	50 mm	no.	76.0	-
Cross bit	55 mm	no.	85.0	-
Cross bit	65 mm	no.	115.0	-
Insert bit 22 mm	L = 1.7 m	no.	78.0	-
Insert bit 22 mm	L = 2.3 m	no.	90.0	-
Taper rod 22 mm	L = 1.4 m	no.	39.0	-
Taper rod 22 mm	L = 2.0 m	no.	50.0	-
Taper rod 25 mm	L = 2.0 m	no.	87.0	-
Rod, c. drill 35 D	L = 3 m	no.	125.0	-
Rod, c. drill 35 D	sleeve	no.	38.0	-
Rod, c. drill 35 D	shank rod	no.	85.0	-
Rod, c. drill 795 D	L = 3 m	no.	150.0	-
Rod, c. drill 795 D	sleeve	no.	40.0	-
Rod, c. drill 795 D	shank rod	no.	110.0	-
Rod, c. drill M 110	L = 3 m	no.	125.0	-
Rod, c. drill M 110	sleeve	no.	38.0	-
Rod, c. drill M 110	shank rod	no.	85.0	-
Boring rod	40.5 mm	m	60.0	-
Metal bit	46 mm	no.	17.0	-
Tube core barrel (S)	46 mm	no.	75.0	-
Diamond bit	diamond	carat	49.0	-
Diamond reamer	diamond	carat	45.0	-
Concrete aggregate	fine	m^3	14.77	5.5
Concrete aggregate	coarse	m^3	14.77	5.5
Crusher-run		m^3	14.77	5.5
Sand		m^3	14.77	5.5
Asphalt mixture		ton	9.04	3.44
Asphalt emulsion		ℓ	-	0.28
Bentonite		kg	0.12	-
Packer	46 mm	no.	385.0	-
Elastic packin		no.	18.0	-
Outer tube		no.	50.0	-
Injection tube		no.	42.0	-
Packer holder		no.	300.0	-
Injection branch		no.	175.0	-
Injection hose		m	17.0	-
Return hose		m	7.0	-
Fresh concrete	mixing	m^3	3.86	2.83

Table I-04 PRICE OF MAJOR CONSTRUCTION EQUIPMENT
PRESIOS DE LOS EQUIPOS DE CONSTRUCCION

Equipment	Capacity	CIF Price (US$)
Bulldozer w/ripper	32 ton	207,000
Bulldozer	21 ton	121,000
Bulldozer	11 ton	60,000
Tractor shovel	3.2 m^3	155,000
Tractor shovel	2.3 m^3	102,000
Tractor shovel	1.2 m^3	56,800
Backhoe	0.6 m^3	79,000
Dump truck	20 ton	131,000
Dump truck	11 ton	42,200
Dump truck	6 ton	20,600
Tamping roller	13.5 ton	52,500
Vibrating roller	8 ton	40,000
Crawler drill	10 m^3/min	41,000
Agitator truck	3.2 m^3	12,500
Concrete pump car	45 m^3/h	82,500
Truck crane	32 ton	197,000
Motor grader	3.7 m	62,500
Train loader	200 t/h	76,500
Battery locomotive	6 ton	80,500
Jumbo (headrace)	4-boom	150,000

Table I-05(1) ESTIMATED CONSTRUCTION COST
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)
COSTO ESTIMADO DE CONSTRUCCION
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$$10^3$

Item	FC	LC	Total
1. General	1,507.6	1,234.4	2,742.0
2. Civil Works			
2.1 PS-1			
(1) Dam & Intake Weir	17,069.3	13,841.7	30,911.0
(2) Power Facilities	6,435.6	4,821.3	11,256.9
Sub-total (2.1)	23,504.9	18,663.0	42,167.9
2.2 PS-2			
(1) Intake Weir	1,603.6	1,700.3	3,303.9
(2) Power Facilities	3,503.8	2,680.3	6,184.1
Sub-total (2.2)	5,107.4	4,380.6	9,488.0
Sub-Total (2)	28,612.3	23,043.6	51,655.9
3. Building Works			
3.1 PS-1	123.9	68.3	192.2
3.2 PS-2	123.9	68.3	192.2
Sub-Total (3)	247.8	136.6	384.4
4. Metal Works			
4.1 PS-1	656.2	393.5	1,049.7
4.2 PS-2	1,561.0	649.7	2,210.7
Sub-Total (4)	2,217.2	1,043.2	3,260.4
5. Generating Equipment and Transmission Line			
5.1 PS-1	2,771.5	254.6	3,026.1
5.2 PS-2	2,758.0	225.2	2,983.2
Sub-Total (5)	5,529.5	479.8	6,009.3
6. Road Construction	1,535.1	1,645.5	3,180.6
7. Land Acquisition	0.0	676.3	676.3
8. Engineering Service and Administration	2,973.6	2,119.5	5,093.1
9. Physical Contingency	4,262.2	3,037.9	7,300.1
Total (1-9)	46,885.3	33,416.8	80,302.1
10. Price Contingency	13,011.9	12,796.1	25,808.0
TOTAL (1-10)	59,897.2	46,212.9	106,110.1

Table I-05(2) ESTIMATED CONSTRUCTION COST
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)
COSTO ESTIMADO DE CONSTRUCCION
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Item	FC	LC	Total
1. General	680.4	579.2	1,259.6
2. Civil Works			
2.1 PS-1			
(1) Intake Weir	1,826.1	1,954.9	3,781.0
(2) Power Facilities	5,890.6	4,413.0	10,303.6
Sub-total(2.1)	7,716.7	6,367.9	14,084.6
2.2 PS-2			
(1) Intake Weir	1,359.3	1,422.0	2,781.3
(2) Power Facilities	3,467.5	2,652.9	6,120.4
Sub-total (2.2)	4,826.8	4,074.9	8,901.7
Sub-Total (2)	12,543.5	10,442.8	22,986.3
3. Building Works			
3.1 PS-1	123.9	68.3	192.2
3.2 PS-2	123.9	68.3	192.2
Sub-Total (3)	247.8	136.6	384.4
4. Metal Works			
4.1 PS-1	1,299.5	549.5	1,849.0
4.2 PS-2	1,412.2	580.5	1,992.7
Sub-Total (4)	2,711.7	1,130.0	3,841.7
5. Generating Equipment and Transmission Line			
5.1 PS-1	2,427.2	213.9	2,641.1
5.2 PS-2	2,588.8	211.5	2,800.3
Sub-Total (5)	5,016.0	425.4	5,441.4
6. Road Construction	1,063.9	1,138.9	2,202.8
7. Land Acquisition		243.2	243.2
8. Engineering Service and Administration	2,226.3	1,409.6	3,635.9
9. Physical Contingency	2,448.8	1,550.8	3,999.6
Total	26,938.4	17,056.5	43,994.9
10. Price Contingency	6,852.4	6,261.4	13,113.8
TOTAL	33,790.8	23,317.9	57,108.7

Table I-05(3) ESTIMATED CONSTRUCTION COST
(PINO DE YUNA WEIR - LOS VEGANOS WEIR COMPLEX)
COSTO ESTIMADO DE CONSTRUCCION (DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Item	FC	LC	Total
1. General	598.5	509.9	1,108.4
2. Civil Works			
2.1 PS-1			
(1) Intake Weir	1,073.1	1,118.6	2,191.7
(2) Power Facilities	5,116.0	3,844.4	8,960.4
Sub-total (2.1)	6,189.1	4,963.0	11,152.1
2.2 PS-2			
(1) Intake Weir	1,359.2	1,422.1	2,781.3
(2) Power Facilities	3,467.1	2,672.8	6,139.9
Sub-total (2.2)	4,826.3	4,094.9	8,921.2
Sub-Total (2)	11,015.4	9,057.9	20,073.3
3. Building Works			
3.1 PS-1	123.9	68.3	192.2
3.2 PS-2	123.9	68.3	192.2
Sub-Total (3)	247.8	136.6	384.4
4. Metal Works			
4.1 PS-1	1,299.5	549.5	1,849.0
4.2 PS-2	1,412.2	580.5	1,992.7
Sub-Total (4)	2,711.7	1,130.0	3,841.7
5. Generating Equipment and Transmission Line			
5.1 PS-1	2,312.5	200.7	2,513.2
5.2 PS-2	2,588.8	211.5	2,800.3
Sub-Total (5)	4,901.3	412.2	5,313.5
6. Road Construction	1,063.9	1,138.9	2,202.8
7. Land Acquisition	0.0	152.1	152.1
8. Engineering Service and Administration	1,995.1	1,257.8	3,252.9
9. Physical Contingency	2,194.6	1,383.6	3,578.2
Total	24,728.3	15,179.0	39,907.3
10. Price Contingency	6,144.1	5,426.4	11,570.5
TOTAL	30,872.4	20,605.4	51,477.8

Table I-06(1) CONSTRUCTION COST OF CIVIL WORKS
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)

COSTO ESTIMADO DE OBRAS CIVILES
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
1. Diversion Tunnel						
Excavation, common	m^3	9,951	2.50	24.9	3.00	29.9
do , weathered rock	m^3	9,951	3.60	35.8	3.80	37.8
do , rock	m^3	14,229	8.90	126.6	6.20	88.2
do , all classes in tunnel	m^3	29,946	26.20	784.6	23.00	688.8
Permanent steel support	ton	158	2,059.00	325.5	908.00	143.6
Concrete, portal	m^3	2,697	44.80	120.8	52.60	141.9
do , tunnel	m^3	9,672	51.00	493.3	55.70	538.7
do , tunnel plug	m^3	1,860	43.90	81.7	49.50	92.1
Form, portal and structure concrete	m^2	2,697	4.30	11.6	6.00	16.2
do , tunnel	m^2	10,323	11.50	118.7	6.30	65.0
Reinforcing bar	ton	465	492.00	228.8	230.00	107.0
Backfill grouting	m^3	465	34.40	16.0	32.50	15.1
Consolidation grouting	m	1,116	33.30	37.2	56.00	62.5
Curtain grouting	m	837	74.80	62.6	87.00	72.8
Slope protection	m^2	1,395	10.40	14.5	13.40	18.7
Sub-total				2,482.6		2,118.3
2. Coffer Dam						
Excavation, common	m^3	36,084	2.50	90.2	3.00	108.3
do , weathered rock	m^3	8,928	3.60	32.1	3.80	33.9
Embankment, impervious earth	m^3	19,344	3.00	58.0	2.90	56.1
do , sand & gravel	m^3	14,880	17.50	260.4	8.30	123.5
do , random rock	m^3	33,666	4.10	138.0	4.30	144.8
do , selected rock (riprap)	m^3	6,603	11.00	72.6	4.70	31.0
Sub-total				651.3		497.6

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
3. T-1 Dam & Spillway						
Excavation, common	m^3	102,300	2.50	255.8	3.00	306.9
do, weathered rock	m^3	28,830	3.60	103.8	3.80	109.6
do, rock	m^3	51,150	8.90	455.2	6.20	317.1
Form, dam & spillway	m^2	12,462	4.10	51.1	6.70	83.5
Reinforcing bar	ton	270	492.00	132.7	230.00	62.0
Consolidation grouting	m	8,556	70.60	604.1	62.70	536.5
Curtain grouting	m	18,972	71.40	1,354.6	66.60	1,263.5
Slope protection	m^2	12,090	10.40	125.7	13.40	162.0
Excavation, all classes, shaft	m^3	4,743	65.70	311.6	24.70	117.2
Concrete, lining, shaft	m^3	1,395	44.80	62.5	52.60	73.4
Concrete, side spillway	m^3	10,695	45.40	485.6	47.80	511.2
Permanent steel support	ton	28	2,059.00	57.4	908.00	25.3
Embankment, impervious earth	m^3	44,640	3.00	133.9	2.90	129.5
do, filter	m^3	34,410	17.50	602.2	8.30	285.6
do, rock	m^3	179,490	4.10	735.9	4.30	771.8
do, selected rock	m^3	84,630	11.00	930.9	4.70	397.8
Back fill grouting	m^3	186	34.40	6.4	32.50	6.0
Sub-total				6,409.4		5,158.9
4. T-2 Dam						
Excavation, common	m^3	127,410	2.50	318.5	3.00	382.2
do, weathered rock	m^3	35,340	3.60	127.2	3.80	134.3
Embankment, impervious earth	m^3	69,750	3.00	209.3	2.90	202.3
do, filter	m^3	53,940	17.50	944.0	8.30	447.7
do, rock	m^3	225,060	4.10	922.7	4.30	967.8
do, selected rock	m^3	163,680	11.00	1,800.5	4.70	769.3
Blanket grouting	m	16,601	33.90	562.8	35.40	587.7
Curtain grouting	m	23,808	71.40	1,699.9	66.60	1,585.6
Slope protection	m^2	11,160	10.40	116.1	13.40	149.5
Sub-total				6,701.0		5,226.4
5. Connecting Channel						
Excavation, common	m^3	25,110	2.50	62.8	3.00	75.3
do, weathered rock	m^3	4,836	3.60	17.4	3.80	18.4
Slope protection	m^2	4,185	10.40	43.5	13.40	56.1
Sub-total				123.7		149.8

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
6. Headrace Tunnel No. 1						
Excavation, common	m^3	3,906	2.50	9.8	3.00	11.7
do , weathered rock	m^3	1,953	3.60	7.0	3.80	7.4
do , rock	m^3	1,116	8.90	9.9	6.20	6.9
do , all classes in work adit	m^3	13,950	41.80	583.1	26.00	362.7
do , all classes in intake shaft	m^3	279	65.70	18.3	24.70	6.9
do , all classes in tunnel	m^3	31,620	45.60	1,441.9	39.50	1,249.0
Permanent steel support	ton	605	2,059.00	1,244.7	908.00	548.9
Backfilling, portal & work adit	m^3	558	3.00	1.7	2.90	1.6
Concrete, portal	m^3	1,860	44.80	83.3	52.60	97.8
do , intake shaft	m^3	186	44.80	8.3	52.60	9.8
do , tunnel	m^3	11,439	60.00	686.3	62.40	713.8
do , plug	m^3	558	43.90	24.5	49.50	27.6
Form, portal & structure	m^2	1,860	4.30	8.0	6.00	11.2
do , tunnel	m^2	31,620	11.50	363.6	6.30	199.2
do , shaft	m^2	186	23.40	4.4	10.40	1.9
Reinforcing bar	ton	381	492.00	187.6	230.00	87.7
Backfill grouting	m^3	1,674	34.40	57.6	32.50	54.4
Consolidation grouting	m	828	33.30	27.6	56.00	46.4
Slope protection	m^2	1,395	10.40	14.5	13.40	18.7
Sub-total				4,782.1		3,463.6
7. Colorado Intake						
Excavation, common	m^3	9,579	2.50	23.9	3.00	28.7
do , weathered rock	m^3	93	3.60	0.3	3.80	0.4
Concrete, weir	m^3	1,116	45.40	50.7	47.80	53.3
do , structure	m^3	1,302	44.80	58.3	52.60	68.5
Form, weir	m^2	465	4.10	1.9	6.70	3.1
do , structure	m^2	1,209	4.30	5.2	6.00	7.3
Reinforcing bar	ton	26	492.00	12.8	230.00	6.0
Consolidation grouting	m	930	70.60	65.7	62.70	58.3
Curtain grouting	m	6,138	71.40	438.3	66.60	408.8
Slope protection	m^2	4,092	10.40	42.6	13.40	54.8
Fill & backfill	m^3	558	3.00	1.7	2.90	1.6
Sub-total				701.4		690.8

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
8. Colorado Diversion Tunnel						
Excavation, all classes in tunnel	m^3	10,230	46.70	477.7	39.40	403.1
do , all classes in intake shaft	m^3	344	8.90	3.1	6.20	2.1
Permanent steel support	ton	93	2,059.00	191.5	908.00	84.4
Backfill, portal	m^3	186	3.00	0.6	2.90	0.5
Concrete, tunnel	m^3	2,511	63.70	160.0	62.80	157.7
do , intake shaft	m^3	112	44.80	5.0	52.60	5.9
Form, tunnel	m^2	9,486	11.50	109.1	6.30	59.8
do , shaft	m^2	344	4.30	1.5	6.00	2.1
Reinforcing bar	ton	84	492.00	41.2	230.00	19.3
Backfill grouting	m^3	502	34.40	17.3	32.50	16.3
Consolidation grouting	m	279	33.30	9.3	56.00	15.6
Excavation, all classes in work adit	L.S.	1	99,880.00	92.9	67,490.00	62.8
Sub-total				1,109.2		829.6
9. Surge Tank No. 1						
Excavation, common	m^3	1,581	2.50	4.0	3.00	4.7
do , weathered rock	m^3	744	3.60	2.7	3.80	2.8
do , rock	m^3	465	8.90	4.1	6.20	2.9
do , all classes in shaft	m^3	837	65.70	55.0	24.70	20.7
Permanent steel support	ton	14	2,059.00	28.7	908.00	12.7
Concrete, upper chamber	m^3	93	44.80	4.2	52.60	4.9
do , shaft	m^3	558	44.80	25.0	52.60	29.4
Form	m^2	465	23.40	10.9	10.40	4.8
Reinforcing bar	ton	37	492.00	18.3	230.00	8.6
Consolidation grouting	m	84	33.30	2.8	56.00	4.7
Slope protection	m^2	1,860	10.40	19.3	13.40	24.9
Sub-total				175.0		121.1

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
10. Penstock No. 1						
Excavation, common	m^3	32,643	2.50	81.6	3.00	97.9
do , weathered rock	m^3	930	3.60	3.3	3.80	3.5
do , rock	m^3	2,790	8.90	24.8	6.20	17.3
Fill and backfill	m^3	279	3.00	0.8	2.90	0.8
Concrete	m^3	651	44.80	29.2	52.60	34.2
Form	m^2	1,302	4.30	5.6	6.00	7.8
Reinforcing bar	ton	9	492.00	4.6	230.00	2.1
Slope protection	m^2	5,580	10.40	58.0	13.40	74.8
Sub-total				207.9		238.4
11. Power Station No. 1						
Excavation, common	m^3	2,883	2.50	7.2	3.00	8.6
do , weathered rock	m^3	1,163	3.60	4.2	3.80	4.4
do , rock	m^3	474	8.90	4.2	6.20	2.9
Fill and backfill	m^3	698	3.00	2.1	2.90	2.0
Concrete, wall & slab	m^3	1,302	45.30	59.0	56.60	73.7
do , 2nd stage	m^3	28	45.30	1.3	56.60	1.6
Form	m^2	1,237	4.30	5.3	6.00	7.4
Reinforcing bar	ton	68	492.00	33.4	230.00	15.6
Slope protection	m^2	884	10.40	9.2	13.40	11.8
Sub-total				125.9		128.0
12. Switchyard No. 1						
Excavation, common	m^3	2,604	2.50	6.5	3.00	7.8
do , weathered rock	m^3	1,302	3.60	4.7	3.80	4.9
do , rock	m^3	670	3.00	2.0	2.90	1.9
Fill and backfill	m^3	186	44.80	8.3	52.60	9.8
Concrete	m^3	558	4.30	2.4	6.00	3.3
Form	m^2	5	492.00	2.3	230.00	1.1
Reinforcing bar	ton	800	10.40	8.3	13.40	10.7
Slope protection	m^2	121	8.90	1.1	6.20	0.7
Sub-total				35.6		40.2

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
13. Los Veganos Intake Weir (V-3)						
Excavation, common	m^3	27,469	2.50	68.7	3.00	82.4
do , weathered rock	m^3	58,234	3.60	209.6	3.80	221.3
Concrete, weir	m^3	13,185	45.40	598.6	47.80	630.2
do , structure	m^3	8,241	44.80	369.2	52.60	433.5
Form, weir	m^2	4,395	4.30	18.9	6.00	26.4
do , structure	m^2	3,956	4.10	16.2	6.70	26.5
Reinforcing bar	ton	165	492.00	81.2	230.00	38.0
Consolidation grouting	m	761	70.60	53.7	62.70	47.7
Curtain grouting	m	1,538	71.40	109.8	66.60	102.4
Slope protection	m^2	5,054	10.40	52.6	13.40	67.7
Fill and backfill	m^3	8,350	3.00	25.1	2.90	24.2
Sub-total				1,603.6		1,700.3
14. Headrace Tunnel No. 2						
Excavation, common	m^3	930	2.50	2.3	3.00	2.3
do , weathered rock	m^3	465	3.60	1.7	3.80	1.8
do , rock	m^3	186	8.90	1.7	6.20	1.2
do , all classes in work adit	m^3	6,510	41.80	272.1	26.00	169.3
do , all classes in tunnel	m^3	19,530	45.60	890.6	39.50	771.4
Permanent steel support	ton	372	2,059.00	765.9	908.00	337.8
Backfilling, portal & work adit	m^3	558	3.00	1.7	2.90	1.6
Concrete, portal	m^3	744	44.80	33.3	52.60	39.1
do , tunnel	m^3	7,068	60.00	424.1	62.40	441.0
do , plug	m^3	372	43.90	16.3	49.50	18.4
Form, portal & structure	m^2	744	4.30	3.2	6.00	4.5
do , tunnel	m^2	19,530	11.50	224.6	6.30	123.0
Reinforcing bar	ton	260	492.00	128.1	230.00	59.9
Backfill grouting	m^3	1,023	34.40	35.2	32.50	33.2
Consolidation grouting	m	753	33.30	25.1	56.00	42.2
Slope protection	m^2	930	10.40	9.7	13.40	12.5
Sub-total				2,835.6		2,059.7

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
15. Surge Tank No. 2						
Excavation, common	m^3	1,581	2.50	4.0	3.00	4.7
do , weathered rock	m^3	744	3.60	2.7	3.80	2.8
do , rock	m^3	465	8.90	4.1	6.20	2.9
do , all classes in shaft	m^3	716	65.70	47.0	24.70	17.7
Permanent steel support	ton	16	2,059.00	32.9	908.00	14.5
Concrete, upper chamber	m^3	102	44.80	4.6	52.60	5.4
do , shaft	m^3	512	44.80	22.9	52.60	26.9
Form	m^2	724	23.40	16.9	10.40	7.5
Reinforcing bar	ton	41	492.00	20.2	230.00	9.4
Consolidation grouting	m	80	33.30	2.7	56.00	4.5
Slope protection	m^2	3,255	10.40	33.9	13.40	43.6
Sub-total				191.9		139.9
16. Penstock No. 2						
Excavation, common	m^3	14,995	2.50	37.4	3.00	44.9
do , weathered rock	m^3	2,804	3.60	10.1	3.80	10.7
do , rock	m^3	1,257	8.90	11.2	6.20	7.8
Fill and backfill	m^3	935	3.00	2.8	2.90	2.7
Concrete	m^3	282	44.80	12.6	52.60	14.8
Form	m^2	564	4.30	2.4	6.00	3.4
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m^2	2,524	10.40	26.2	13.40	33.8
Sub-total				104.2		118.3
17. Power Station No. 2						
Excavation, common	m^3	4,821	2.50	12.1	3.00	14.5
do , weathered rock	m^3	5,926	3.60	21.3	3.80	22.5
do , rock	m^3	7,834	8.90	69.7	6.20	48.6
Fill & backfill	m^3	402	3.00	1.2	2.90	1.2
Concrete, wall & slab	m^3	1,406	45.30	63.7	56.60	79.6
do , 2nd stage	m^3	30	45.30	1.4	56.60	1.7
Form	m^2	1,336	4.30	5.7	6.00	8.0
Reinforcing bar	ton	73	492.00	35.9	230.00	16.8
Slope protection	m^2	2,511	10.40	26.1	13.40	33.6
Sub-total				237.1		226.5

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
18. Switchyard No. 2						
Excavation, common	m^3	8,742	2.50	21.9	3.00	26.2
do , weathered rock	m^3	7,440	3.60	26.8	3.80	28.3
Fill and backfill	m^3	260	3.00	0.8	2.90	0.8
Concrete	m^3	186	44.80	8.3	52.60	9.8
Form	m^2	558	4.30	2.4	6.00	3.3
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m^2	2,511	10.40	26.1	13.40	33.6
Excavation, rock	m^3	5,208	8.90	46.4	6.20	32.3
Sub-total				135.0		135.4
19. Access Road						
Excavation, common and weathered rock	m^3	242,637	3.10	752.2	3.40	825.0
Embankment	m^3	175,026	4.10	717.6	4.30	752.6
Gravel metalling	m^3	14,229	4.10	58.3	4.30	61.2
Bridge, type III	No.	4	1,300.00	6.7	1,300.00	6.7
Sub-total				1,534.8		1,645.5
Total (1 - 19)				30,147.1		24,689.1

Table I-06(2) CONSTRUCTION COST OF CIVIL WORKS
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)

COSTO DE LAS OBRAS CIVILES
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
1. Rio Yuna Weir (T1)						
Excavation, common	m^3	13,570	2.50	33.9	3.00	40.7
do , rock	m^3	6,930	3.60	25.0	3.80	26.3
Concrete, weir	m^3	5,357	39.00	208.9	41.00	219.6
do , structure	m^3	1,147	44.80	51.4	52.60	60.3
Form, weir	m^2	1,018	4.10	4.2	6.70	6.8
do , structure	m^2	555	4.30	2.4	6.00	3.3
Reinforcing bar	ton	23	492.00	11.3	230.00	5.3
Consolidation grouting	m	230	70.60	16.2	62.70	14.4
Curtain grouting	m	620	71.40	44.3	66.60	41.3
Slope protection	m^2	2,760	10.40	28.7	13.40	37.0
Fill and backfill	m^3	300	3.00	0.9	2.90	0.9
Sub-total				427.2		455.9
2. Arroyo Blanco Weir (T2)						
Excavation, common	m^3	67,800	2.50	169.5	3.00	203.4
do , rock	m^3	17,950	3.60	64.6	3.80	68.2
Concrete, weir	m^3	6,510	45.40	295.6	47.30	311.2
do , structure	m^3	2,232	44.80	100.0	52.60	117.4
Form, weir	m^2	1,860	4.10	7.6	6.70	12.5
do , structure	m^2	1,953	4.30	8.4	6.00	11.7
Reinforcing bar	ton	47	492.00	23.1	230.00	10.8
Consolidation grouting	m	372	70.60	26.3	62.70	23.3
Curtain grouting	m	679	71.40	48.5	66.60	45.2
Slope protection	m^2	6,400	10.40	66.6	13.40	85.3
Fill and backfill	m^3	2,232	3.00	6.7	2.90	6.5
Sub-total				816.9		896.0
3. Diversion Channel						
Excavation, common	m^3	43,400	2.50	108.5	3.00	130.2
do , rock	m^3	39,324	3.60	141.6	3.80	149.4
Sub-total				250.1		279.6

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
4. Headrace Tunnel						
Excavation, common	m^3	930	2.50	2.3	3.00	2.8
do , weathered rock	m^3	550	3.60	2.0	3.80	2.1
do , rock	m^3	220	8.90	2.0	6.20	1.4
do , all classes in work adit	m^3	9,300	41.80	388.7	26.00	241.8
do , all classes in tunnel	m^3	30,770	45.60	1,403.1	39.50	1,215.4
Permanent steel support	ton	550	2,059.00	1,132.5	908.00	499.4
Backfilling portal & work adit	m^3	558	3.00	1.7	2.90	1.6
Concrete, portal	m^3	744	44.80	33.3	52.60	39.1
do , tunnel	m^3	11,100	60.00	666.0	62.40	692.6
do , plug	m^3	440	44.00	19.4	49.50	21.8
Form, portal & structure	m^2	744	4.30	3.2	6.00	4.5
do, tunnel	m^2	30,770	11.50	353.9	6.30	193.9
Reinforcing bar	ton	474	492.00	233.2	230.00	109.0
Backfill grouting	m^3	1,649	34.40	56.7	32.50	53.6
Consolidation grouting	m	813	33.30	27.1	56.00	45.5
Slope protection	m^2	930	10.30	9.6	13.40	12.5
Sub-total				4,334.7		3,137.0
5. Colorado Intake Weir						
Excavation, common	m^3	1,674	2.50	4.2	3.00	5.0
do , rock	m^3	47	3.60	0.2	3.80	0.2
Concrete, weir	m^3	1,060	45.40	48.1	47.80	50.7
do , structure	m^3	530	44.80	23.7	52.60	27.9
Form, weir	m^2	442	4.10	1.8	6.70	3.0
do , structure	m^2	619	4.30	2.7	6.00	3.7
Reinforcing bar	ton	11	492.00	5.4	230.00	2.5
Consolidation grouting	m	442	70.60	31.2	62.70	27.7
Curtain grouting	m	2,918	71.40	208.4	66.60	194.3
Slope protection	m^2	619	10.40	6.4	13.40	8.3
Sub-total				332.1		323.3

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
6. Colorado Diversion Tunnel						
Excavation, all classes in tunnel	m^3	9,025	46.10	416.1	39.00	352.0
do , all classes in intake shaft	m^3	214	8.90	1.9	6.20	1.3
do , all classes in work adit	m	L.S.	120,180.00	111.8	80,370.00	74.7
Permanent steel support	ton	94	2,059.00	193.6	908.00	85.4
Backfilling, portal	m^3	93	3.00	0.3	2.90	0.3
Concrete, tunnel	m^3	2,282	62.30	142.2	62.20	141.9
do , intake shaft	m^3	65	44.80	2.9	52.60	3.4
Form, tunnel	m^2	8,610	11.50	99.0	6.30	54.2
do , intake shaft	m^2	214	4.30	0.9	6.00	1.3
Reinforcing bar	ton	94	492.00	46.3	230.00	21.6
Backfill grouting	m^3	456	34.40	15.7	32.50	14.8
Consolidation grouting	m	249	33.30	8.3	56.00	13.9
Sub-total				1,039.0		764.8
7. Surge Tank						
Excavation, common	m^3	3,767	2.50	9.4	3.00	11.3
do , weathered rock	m^3	720	3.60	2.6	3.80	2.7
do , rock	m^3	432	8.90	3.8	6.20	2.7
do , all classes in shaft	m^3	766	65.70	50.3	24.70	18.9
Permanent steel support	ton	14	2,059.00	28.8	908.00	12.7
Concrete, upper chamber	m^3	390	44.80	17.5	52.60	20.5
Form	m^2	565	23.40	13.2	10.40	5.9
Reinforcing bar	ton	20	492.00	9.8	230.00	4.6
Consolidation grouting	m	87	333.30	2.9	56.00	4.9
Slope protection	m^2	3,215	10.40	33.4	13.40	43.1
				171.7		127.3
8. Penstock						
Excavation, common	m^3	29,769	2.50	74.4	3.00	89.3
do , weathered rock	m^3	1,225	3.60	4.4	3.80	4.7
do , rock	m^3	1,225	8.90	10.9	6.20	7.6
Fill and Backfill	m^3	1,960	3.00	5.9	2.90	5.7
Concrete	m^3	613	44.80	27.5	52.60	32.2
Form	m^2	1,470	4.30	6.3	6.00	8.8
Reinforcing bar	ton	7	492.00	3.4	230.00	1.6
Slope protection	m^2	4,900	10.40	51.0	13.40	65.7
Sub-total				183.8		215.6

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
9. Power Station No.1						
Excavation, common	m^3	2,383	2.50	7.2	3.00	3.6
do , weathered rock	m^3	1,163	3.60	4.2	3.30	4.1
do , rock	m^3	474	3.90	4.2	6.20	2.9
Fill and back fill	m^3	698	3.00	2.1	2.90	2.0
Concrete, wall and slab	m^3	1,302	45.30	59.0	56.60	73.7
do , 2nd stage	m^3	28	45.30	1.3	56.60	1.6
Form	m^2	1,237	4.30	5.3	6.00	7.4
Reinforcing bar	ton	68	492.00	33.4	230.00	15.6
Slope protection	m^2	384	10.40	9.2	13.40	11.3
Sub-total				125.3		128.0
10. Switchyard No.1						
Excavation, common	m^3	2,604	2.50	6.5	3.00	7.8
do , weathered rock	m^3	1,302	3.60	4.7	3.80	4.9
Fill and back fill	m^3	670	3.00	2.0	2.90	1.9
Concrete	m^3	186	44.80	8.3	52.60	9.8
Form	m^2	558	4.30	2.4	6.00	3.3
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m^2	800	10.40	8.3	13.40	10.7
Excavation, rock	m^3	121	8.90	1.1	6.20	0.7
Sub-total				35.6		40.2
11. Los Vegenos Intake Weir (V-3)						
Excavation, common	m^3	23,250	2.50	58.1	3.00	69.8
do , weathered rock	m^3	49,290	3.60	177.4	3.80	187.3
Concrete, weir	m^3	11,160	45.40	506.7	47.80	533.4
do , structure	m^3	6,975	44.80	312.5	52.60	366.9
Form, weir	m^2	3,720	4.30	16.0	6.00	22.3
do , structure	m^2	3,720	4.10	15.3	6.70	24.9
Reinforcing bar	ton	140	492.00	68.6	230.00	32.1
Consolidation grouting	m	651	70.60	46.0	62.70	40.8
Curtain grouting	m	1,302	71.40	93.0	66.60	86.7
Slope protection	m^2	4,278	10.40	44.5	13.40	57.3
Fill and backfill	m^3	7,068	3.00	21.2	2.90	20.5
Sub-total				1,359.3		1,442.0

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
12. Headrace Tunnel No.2						
Excavation, common	m^3	930	2.50	2.3	3.00	2.8
do , weathered rock	m^3	465	3.60	1.7	3.80	1.8
do , rock	m^3	186	8.90	1.7	6.20	1.2
do , all classes in work adit	m^3	6,510	41.80	272.1	26.00	169.3
do , all classes in tunnel	m^3	19,530	45.60	890.6	39.50	771.4
Permanent steel support	ton	372	2,059.00	765.9	908.00	337.8
Backfilling, portal & work adit	m^3	558	3.00	1.7	2.90	1.6
Concrete, portal	m^3	744	44.80	33.3	52.60	39.1
do , tunnel	m^3	7,068	60.00	424.1	62.40	441.0
do , plug	m^3	372	43.90	16.3	49.50	18.4
Form, portal & structure	m^2	744	4.30	3.2	6.00	4.5
do , tunnel	m^2	19,530	11.50	224.6	6.30	123.0
Reinforcing bar	ton	260	492.00	128.1	230.00	59.8
Backfill grouting	m^3	1,023	34.40	35.2	32.50	33.2
Consolidation grouting	m	753	33.30	25.1	56.00	42.2
Slope protection	m^2	330	10.40	9.7	13.40	12.5
Sub-total				2,835.6		2,059.7
13. Surge Tank No.2						
Excavation, common	m^3	1,581	2.50	4.0	3.00	4.7
do , weathered rock	m^3	744	3.60	2.7	3.30	2.3
do , rock	m^3	465	8.90	4.1	6.20	2.9
do , all classes in shaft	m^3	651	65.70	42.8	24.70	16.1
Permanent steel support	ton	14	2,059.00	28.7	908.00	12.7
Concrete, upper chamber	m^3	93	44.30	4.2	52.60	4.9
do , shaft	m^3	465	44.30	20.3	52.60	24.5
Form	m^2	465	23.40	10.9	10.40	4.8
Reinforcing bar	ton	37	492.00	18.3	230.00	8.6
Consolidation grouting	m	74	33.30	2.5	56.00	4.2
Slope protection	m^2	3,255	10.40	33.9	13.40	43.6
Sub-total				172.9		129.8

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
14. Penstock No.2						
Excavation, common	m	14,380	2.50	37.2	3.00	44.6
do , weathered rock	m	2,790	3.60	10.0	3.80	10.6
do , rock	m	1,209	8.90	10.8	6.20	7.5
Fill and backfill	m	930	3.00	2.8	2.90	2.7
Concrete	m	279	44.80	12.5	52.60	14.7
Form	m	558	4.30	2.4	6.00	3.3
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m	2,511	10.40	26.1	13.40	33.6
Sub-total				104.1		118.1
15. Power Station No.2						
Excavation, common	m	4,464	2.50	11.2	3.00	13.4
do , weathered rock	m	5,487	3.60	19.8	3.80	20.9
do , rock	m	7,254	8.90	64.6	6.20	45.0
Fill & backfill	m	372	3.00	1.1	2.90	1.1
Concrete, wall & slab	m	1,302	45.30	59.0	56.60	73.7
do , 2nd stage	m	28	45.30	1.3	56.60	1.6
Form	m	1,237	4.30	5.3	6.00	7.4
Reinforcing bar	ton	68	492.00	33.4	230.00	15.6
Slope protection	m	2,325	10.40	24.2	13.40	31.2
Sub-total				219.9		209.9
16. Switchyard No.2						
Excavation, common	m	8,742	2.50	21.9	3.00	26.2
do , weathered rock	m	7,440	3.60	26.8	3.80	28.3
Fill and backfill	m	260	3.00	0.8	2.90	0.8
Concrete	m	186	44.80	8.3	52.60	9.8
Form	m	558	4.30	2.4	6.00	3.3
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m	2,511	10.40	26.1	13.40	33.6
Excavation, rock	m	5,208	8.90	46.4	6.20	32.3
Sub-total				135.0		135.4

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
17. Access Road						
Excavation, common and weathered rock	m	156,891	3.10	486.4	3.40	533.4
Embankment	m	128,391	4.10	528.9	4.30	554.7
Gravel metalling	m	10,220	4.10	41.9	4.30	44.0
Bridge, type III	No.	4	1,800.00	6.7	1,800.00	6.7
Sub-total				1,063.9		1,138.9
Total (1 - 17)				13,617.7		11,601.5

Table I-06(3) CONSTRUCTION COST OF CIVIL WORKS
(PINO DE YUNA WEIR - LOS VEGANOS WEIR COMPLES)
COSTO DE LAS OBRAS CIVILES
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
1. Pino de Yuna Intake Weir						
Excavation, common	m^3	30,383	2.50	75.9	3.00	91.2
do , weathered rock	m^3	26,700	3.60	96.1	3.80	101.5
Concrete, weir	m^3	6,445	45.40	292.6	47.80	308.1
do , structure	m^3	2,210	44.80	99.0	52.60	116.2
Form, weir	m^2	1,841	4.10	7.5	6.70	12.4
do , structure	m^2	1,933	4.30	8.3	6.00	11.6
Reinforcing bar	ton	47	492.00	22.7	230.00	10.6
Consolidation grouting	m	368	70.60	26.0	62.70	23.1
Curtain grouting	m	672	71.40	48.0	66.60	44.7
Slope protection	m^2	3,959	10.40	41.2	13.40	53.1
Fill and backfill	m^3	2,210	3.00	6.6	2.90	6.4
Sub-total				724.1		778.8
2. Headrace Tunnel No. 1						
Excavation, common	m^3	930	2.50	2.3	3.00	2.8
do , weathered rock	m^3	465	3.60	1.7	3.80	1.8
do , rock	m^3	186	8.90	1.7	6.20	1.2
do , all classes in work adit	m^3	9,300	41.80	388.7	26.00	241.8
do , all classes in tunnel	m^3	26,040	45.60	1,187.4	39.50	1,028.6
Permanent steel support	ton	465	2,059.00	957.4	908.00	422.2
Backfilling portal & work adit	m^3	558	3.00	1.7	2.90	1.6
Concrete, portal	m^3	744	44.80	33.3	52.60	39.1
do , tunnel	m^3	9,393	60.00	563.6	62.40	586.1
do , plug	m^3	372	44.00	16.4	49.50	18.4
Form, portal & structure	m^2	744	4.30	3.2	6.00	4.5
do , tunnel	m^2	26,040	11.50	299.5	6.30	164.1
Backfill grouting	m^3	1,395	34.40	48.0	32.50	45.3
Reinforcing bar	ton	344	492.00	169.3	230.00	79.1
Consolidation grouting	m	688	33.30	22.9	56.00	38.5
Slope protection	m^2	930	10.30	9.6	13.40	12.5
Sub-total				3,706.7		2,687.6

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
3. Colorado Intake Weir						
Excavation, common	m^3	1,674	2.50	4.2	3.00	5.0
do, weathered rock	m^3	47	3.60	0.2	3.80	0.2
Concrete,weir	m^3	1,116	45.40	50.7	47.80	53.3
do, structure	m^3	558	44.80	25.0	52.60	29.4
Form, weir	m^2	465	4.10	1.9	6.70	3.1
do, structure	m^2	651	4.30	2.8	6.00	3.9
Reinforcing bar	ton	11	492.00	5.5	230.00	2.6
Consolidation grouting	m	465	70.60	32.8	62.70	29.2
Curtain grouting	m	3,069	71.40	219.1	66.60	204.4
Slope protection	m^2	651	10.40	6.8	13.40	8.7
Sub-total				349.0		339.8
4. Colorado Diversion Tunnel						
Excavation, all classes in tunnel	m^3	8,091	46.10	373.0	39.00	315.5
do, all classes in intake shaft	m^3	214	8.90	1.9	6.20	1.3
Permanent steel support	ton	84	2,059.00	172.3	908.00	76.0
Backfilling, portal	m^3	93	3.00	0.3	2.90	0.3
Concrete, tunnel	m^3	2,046	62.30	127.5	62.20	127.3
do, intake shaft	m^3	65	44.80	2.9	52.60	3.4
Form, tunnel	m^2	7,719	11.50	88.8	6.30	48.6
do, shaft	m^2	214	4.30	0.9	6.00	1.3
Reinforcing bar	ton	84	492.00	41.2	230.00	19.3
Backfilling grouting	m^3	409	34.40	14.1	32.50	13.3
Consolidation grouting	m	223	33.30	7.4	56.00	12.5
Excavation, all classes in work adit	L.S.	1	120,180.00	111.8	80,370.00	74.7
Sub-total				942.1		693.5

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
5. Surge Tank						
Excavation, common	m^3	3,813	2.50	9.5	3.00	11.4
do, weathered rock	m^3	1,860	3.60	6.7	3.80	7.1
do, rock	m^3	1,116	8,90	9.9	6.20	6.9
do, all classes in shaft	m^3	558	65.70	36.7	24.70	13.8
Permanent steel support	ton	9	2,059.00	18.1	908.00	8.0
Concrete, upper chamber	m^3	88	44.80	4.0	52.60	4.7
do , shaft	m^3	353	44.80	15.9	52.60	18.6
Form	m^2	353	23.40	8.3	10.40	3.7
Reinforcing bar	ton	45	492.00	21.8	230.00	10.2
Consolidation grouting	m	56	33.30	1.9	56.00	3.1
Slope protection	m^2	3,255	10.40	33.9	13.40	43.6
Sub-total				166.7		131.1
6. Penstock						
Excavation, common	m^3	22,599	2.50	56.5	3.00	67.8
do, weathered rock	m^3	930	3.60	3.3	3.80	3.5
do, rock	m^3	930	8.90	8.3	6.20	5.8
Fill and backfill	m^3	1,488	3.00	4.5	2.90	4.3
Concrete	m^3	465	44.80	20.8	52.60	24.5
Form	m^2	1,116	4.30	4.8	6.00	6.7
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m^2	3,720	10.40	38.7	13.40	49.8
Sub-total				139.2		163.5

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
7. Power Station No. 1						
Excavation, common	m^3	2,883	2.50	7.2	3.00	8.6
do, weathered rock	m^3	1,163	3.60	4.2	3.80	4.4
do, rock	m^3	474	8.90	4.2	6.20	2.9
Fill and back fill	m^3	698	3.00	2.1	2.90	2.0
Concrete, wall and slab	m^3	1,302	45.30	59.0	56.60	73.7
do, 2nd stage	m^3	28	45.30	1.3	56.60	1.6
Form	m^2	1,237	4.30	5.3	6.00	7.4
Reinforcing bar	ton	68	492.00	33.4	230.00	15.6
Slope protection	m^2	884	10.40	9.2	13.40	11.8
Sub-total				125.9		128.0
8. Switchyard No. 1						
Excavation, common	m^3	2,604	2.50	6.5	3.00	7.8
do, weathered rock	m^3	1,302	3.60	4.7	3.80	4.9
Fill and back fill	m^3	670	3.00	2.0	2.90	1.9
Concrete	m^3	186	44.80	8.3	52.60	9.8
Form	m^2	558	4.30	2.4	6.00	3.3
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m^2	800	10.40	8.3	13.40	10.7
Excavation, rock	m^3	121	8.90	1.1	6.20	0.7
Sub-total				35.6		40.2

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
9. Los Veganos Intake Weir (V-3)						
Excavation, common	m^3	23,250	2.50	58.1	3.00	69.8
do , weathered rock	m^3	49,290	3.60	177.4	3.80	187.3
Concrete, weir	m^3	11,160	45.40	506.7	47.80	533.4
do , structure	m^3	6,975	44.80	312.5	52.60	366.9
Form, weir	m^2	3,720	4.30	16.0	6.00	22.3
do , structure	m^2	3,720	4.10	15.3	6.70	24.9
Reinforcing bar	ton	140	492.00	68.6	230.00	32.1
Consolidation grouting	m	651	70.60	46.0	62.70	40.8
Curtain grouting	m	1,302	71.40	93.0	66.60	86.7
Slope protection	m^2	4,278	10.40	44.5	13.40	57.3
Fill and backfill	m^3	7,068	3.00	21.2	2.90	20.5
Sub-total				1,359.3		1,442.0
10. Headrace Tunnel No. 2						
Excavation, common	m^3	930	2.50	2.3	3.00	2.8
do , weathered rock	m^3	465	3.60	1.7	3.80	1.8
do , rock	m^3	186	8.90	1.7	6.20	1.2
do , all classes in work adit	m^3	6,510	41.80	272.1	26.00	169.3
do , all classes in tunnel	m^3	19,530	45.60	890.6	39.50	771.4
Permanent steel support	ton	372	2,059.00	765.9	908.00	337.8
Backfilling, portal & work adit	m^3	558	3.00	1.7	2.90	1.6
Concrete, portal	m^3	744	44.80	33.3	52.60	39.1
do , tunnel	m^3	7,068	60.00	424.1	62.40	441.0
do , plug	m^3	372	43.90	16.3	49.50	18.4
Form, portal & structure	m^2	744	4.30	3.2	6.00	4.5
do , tunnel	m^2	19,530	11.50	224.6	6.30	123.0
Reinforcing bar	ton	260	492.00	128.1	230.00	59.9
Backfill grouting	m^3	1,023	34.40	35.2	32.50	33.2
Consolidation grouting	m	753	33.30	25.1	56.00	42.2
Slope protection	m^2	930	10.40	9.7	13.40	12.5
Sub-total				2,835.6		2,059.7

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
11. Surge Tank No. 2						
Excavation, common	m^3	1,581	2.50	4.0	3.00	4.7
do , weathered rock	m^3	744	3.60	2.7	3.80	2.8
do , rock	m^3	465	8.90	4.1	6.20	2.9
do , all classes in shaft	m^3	651	65.70	42.8	24.70	16.1
Permanent steel support	ton	14	2,059.00	28.7	908.00	12.7
Concrete, upper chamber	m^3	93	44.80	4.2	52.60	4.9
do , shaft	m^3	465	44.80	20.8	52.60	24.5
Form	m^2	465	23.40	10.9	10.40	4.8
Reinforcing bar	ton	37	492.00	18.3	230.00	8.6
Consolidation grouting	m	74	33.30	2.5	56.00	4.2
Slope protection	m^2	3,255	10.40	33.9	13.40	43.6
Sub-total				172.9		129.8
12. Penstock No. 2						
Excavation, common	m^3	14,880	2.50	37.2	3.00	44.6
do , weathered rock	m^3	2,790	3.60	10.0	3.80	10.6
do , rock	m^3	1,209	8.90	10.8	6.20	7.5
Fill and backfill	m^3	930	3.00	2.8	2.90	2.7
Concrete	m^3	279	44.80	12.5	52.60	14.7
Form	m^2	558	4.30	2.4	6.00	3.3
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m^2	2,511	10.40	26.1	13.40	33.6
Sub-total				104.1		118.1
13. Power Station No. 2						
Excavation, common	m^3	4,464	2.50	11.2	3.00	13.4
do , weathered rock	m^3	5,487	3.60	19.8	3.80	20.9
do , rock	m^3	7,254	8.90	64.6	6.20	45.0
Fill & backfill	m^3	372	3.00	1.1	2.90	1.1
Concrete, wall & slab	m^3	1,302	45.30	59.0	56.60	73.7
do , 2nd stage	m^3	28	45.30	1.3	56.60	1.6
Form	m^2	1,237	4.30	5.3	6.00	7.4
Reinforcing bar	ton	68	492.00	33.4	230.00	15.6
Slope protection	m^2	2,325	10.40	24.2	13.40	31.2
Sub-total				219.9		209.9

- Continued -

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
14. Switchyard No. 2						
Excavation, common	m^3	8,742	2.50	21.9	3.00	26.2
do , weathered rock	m^3	7,440	3.60	26.8	3.80	28.3
Fill and backfill	m^3	260	3.00	0.8	2.90	0.8
Concrete	m^3	186	44.80	8.3	52.60	9.8
Form	m^2	558	4.30	2.4	6.00	3.3
Reinforcing bar	ton	5	492.00	2.3	230.00	1.1
Slope protection	m^2	2,511	10.40	26.1	13.40	33.6
Excavation, rock	m^3	5,208	8.90	46.4	6.20	32.3
Sub-total				135.0		135.4
15. Access Road						
Excavation, common & weathered rock	m^3	156,891	3.10	486.4	3.40	533.4
Embankment	m^3	128,991	4.10	528.9	4.30	554.7
Gravel metalling	m^3	10,230	4.10	41.9	4.30	44.0
Bridge, type III	No.	4	1,800.00	6.7	1,800.00	6.7
Sub-total				1,063.9		1,138.8
Total (1 - 15)				12,080.0		10,196.5

Table I-07(1) CONSTRUCTION COST OF METAL WORKS
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)
COSTO DE LAS OBRAS METALICAS
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
(PS-1)						
1. Diversion gate (T-1 dam) 1 set	ton	54.8	2,800	153.4	1,200	65.8
2. Diversion gate (T-2 dam) 1 set	"	20.4	2,600	57.1	1,200	24.5
3. Intake gate 1 set	"	6.5	4,745	30.8	1,755	11.4
4. Intake trashrack 1 set	"	1.4	2,170	3.0	1,330	1.9
5. Drain pipe & valves	"	65.1	1,200	78.1	800	52.1
6. Penstock, steel pipe	"	166.4	1,100	183.0	900	149.8
, butterfly valve	"	18.6	3,300	61.4	2,700	50.3
7. Tailrace gate 1 set	"	1.9	4,125	7.8	1,375	2.7
8. A. Colorado metal works	"	23.3	3,500	81.6	1,500	35.0
Sub-total				656.2		393.5
(PS-2)						
1. Diversion gate 1 set	ton	9.3	2,800	26.0	1,200	11.2
2. Spillway gate 2 sets	"	221.3	3,650	807.9	1,350	298.8
3. Spillway stoplog 1 set	"	121.4	3,400	412.7	900	109.7
4. Sandflush gate 1 set	"	9.3	3,150	29.3	1,350	12.6
5. Intake gate 1 set	"	3.7	3,650	13.5	1,350	5.0
6. Intake trashrack 1 set	"	1.4	2,170	3.0	1,330	1.9
7. Drain pipe & valves	"	30.7	1,200	36.8	800	24.6
8. Penstock, steel pipe	"	135.7	1,100	149.3	900	122.2
, butterfly valve	"	22.6	3,300	74.7	2,700	61.1
9. Tailrace gate 1 set	"	1.9	4,125	7.8	1,375	2.6
Sub-total				1,561.0		649.7
Total				2,217.2		1,043.2

Table I-07(2) CONSTRUCTION COST OF METAL WORKS
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)
COSTO DE LAS OBRAS METALICAS
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
(PS-1)						
1. Spillway gate 2 sets	ton	173.0	3,650	631.4	1,350	233.6
2. Spillway stoplog 1 set	"	98.4	3,400	334.6	900	88.6
3. Sandflush gate 1 set	"	9.3	3,150	29.3	1,350	12.6
4. Intake gate 1 set	"	3.3	3,870	12.8	1,430	4.8
5. Intake trashrack 1 set	"	1.4	2,170	3.0	1,330	1.9
6. Drain pipe & valves	"	46.5	1,200	55.8	800	37.2
7. Penstock, steel pipe	"	111.6	1,100	122.8	900	100.5
, butterfly valve	"	18.6	3,300	61.4	2,700	50.3
8. Tailrace gate 1 set	"	1.9	4,125	7.8	1,375	2.6
9. A. Colorado metal works	"	11.6	3,500	40.6	1,500	17.4
Sub-total				1,299.5		549.5
(PS-2)						
1. Diversion gate 1 set	ton	9.3	2,800	26.0	1,200	11.2
2. Spillway gate 2 sets	"	202.7	3,650	739.8	1,350	273.7
3. Spillway stoplog 1 set	"	109.7	3,400	372.9	900	98.8
4. Sandflush gate 1 set	"	9.3	3,150	29.3	1,350	12.6
5. Intake gate 1 set	"	3.7	3,650	13.5	1,350	5.0
6. Intake trashrack 1 set	"	1.4	2,170	3.0	1,330	1.9
7. Drain pipe & valves	"	29.8	1,200	35.8	800	23.9
8. Penstock, steel pipe	"	111.6	1,100	122.7	900	100.5
, butterfly valve	"	18.6	3,300	61.4	2,700	50.3
9. Tailrace gate 1 set	"	1.9	4,125	7.8	1,375	2.6
Sub-total				1,412.2		580.5
Total				2,711.7		1,130.0

Table I-07(3) CONSTRUCTION COST OF METAL WORKS
(PINO DE YUNA WEIR - LOS VEGANOS WEIR COMPLEX)

COSTO DE LAS OBRAS METALICAS
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Work Items	Unit	Quantity	Foreign Unit Price (US$)	Foreign Amount (10^3US$)	Local Unit Price (US$)	Local Amount (10^3US$)
(PS-1)						
1. Spillway gate 2 sets	ton	173.0	3,650	631.4	1,350	233.6
2. Spillway stoplog 1 set	"	98.4	3,400	334.6	900	88.6
3. Sandflush gate 1 set	"	9.3	3,150	29.3	1,350	12.6
4. Intake gate 1 set	"	3.3	3,870	12.8	1,430	4.8
5. Intake trashrack 1 set	"	1.4	2,170	3.0	1,330	1.9
6. Drain pipe & valves	"	46.5	1,200	55.8	800	37.2
7. Penstock, steel pipe	"	111.6	1,100	122.8	900	100.5
, butterfly valve	"	18.6	3,300	61.4	2,700	50.3
8. Tailrace gate 1 set	"	1.9	4,125	7.8	1,375	2.6
9. A. Colorado metal works	"	11.6	3,500	40.6	1,500	17.4
Sub-total				1,299.5		549.5
(PS-2)						
1. Diversion gate 1 set	ton	9.3	2,800	26.0	1,200	11.2
2. Spillway gate 2 sets	"	202.7	3,650	739.8	1,350	273.7
3. Spillway stoplog 1 set	"	109.7	3,400	372.9	900	98.8
4. Sandflush gate 1 set	"	9.3	3,150	29.3	1,350	12.6
5. Intake gate 1 set	"	3.7	3,650	13.5	1,350	5.0
6. Intake trashrack 1 set	"	1.4	2,170	3.0	1,330	1.9
7. Drain pipe & valves	"	29.8	1,200	35.8	800	23.9
8. Penstock, steel pipe	"	111.6	1,100	122.7	900	100.5
, butterfly valve	"	18.6	3,300	61.4	2,700	50.3
9. Tailrace gate 1 set	"	1.9	4,125	7.8	1,375	2.6
Sub-total				1,412.2		580.5
Total				2,711.7		1,130.0

Table I-08(1) CONSTRUCTION COST OF ELECTRICAL WORKS
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)
COSTO DE LAS OBRAS ELECTROMECANICAS
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: US$ 10^3

Work Items	Power Station No. 1			Power Station No. 2		
	F.C.	L.C.	Total	F.C.	L.C.	Total
Turbine	456.7	42.4	499.1	464.0	37.8	501.8
Generator	408.3	37.7	446	407.5	33.2	440.7
Main transformer	130.9	12.1	143	101.2	8.1	109.3
Station transformer	1.8	0.2	2	1.9	0.2	2.1
Switchgear for Generator	140	13	153	151.7	12.4	164.1
Ancillary equipment	80.5	7.5	88	87.4	7.0	94.3
Miscella. materials	43	4	47	46.6	3.8	50.4
Telecom. & protection	46.7	4.3	51	50.5	4.2	54.7
Outdoor switchgear	115.2	10.8	126	124.4	10.7	135.1
Sub-total	1,423.1	132	1,555.1	1,435.1	117.5	1,552.8
Others	1,074.4	98.6	1,173	1,083.9	86.7	1,170.6
Transmission line	274	24	298	239	21	260
Total	2,771.5	254.6	3,026.1	2,758.0	225.2	2,983.2

Table I-08(2) CONSTRUCTION COST OF ELECTRICAL WORKS
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)
COSTO DE LAS OBRAS ELECTROMECANICAS
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: US$ 10^3

Work Items	Power Station No. 1			Power Station No. 2		
	F.C.	L.C.	Total	F.C.	L.C.	Total
Turbine	383.4	33.8	417.2	432.8	35.3	468.1
Generator	325.2	28.6	353.8	380.1	31	411.1
Main transformer	97.4	8.6	106	94.4	7.6	102
Station transformer	1.8	0.2	2	1.8	0.2	2
Switchgear for Generator	140	13	153	141.5	11.6	153.1
Ancillar- equipment	73.8	6.5	80.3	81.5	6.5	88
Miscella. materials	43	4	47	43.5	3.5	47
Telecom. & protection	46.7	4.3	51	47.1	3.9	51
Outdoor switchgear	116	10	126	116	10	126
Sub-total	1,227.3	109	1,336.3	1,338.7	109.6	1,448.3
Others	925.9	80.9	1,006.8	1,011.1	80.9	1,092
Transmission line	274	24	298	239	21	260
Total	2,427.2	213.9	2,641.1	2,588.8	211.5	2,800.3

Table I-08(3) CONSTRUCTION COST OF ELECTRICAL WORKS
(PINO DE YUNA WEIR - LOS VEGANOS WEIR COMPLEX)
COSTO DE LAS OBRAS ELECTROMECANICAS
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: US$ 10^3

Work Items	Power Station No. 1			Power Station No. 2		
	F.C.	L.C.	Total	F.C.	L.C.	Total
Turbine	353.0	30.7	383.7	432.8	35.3	468.1
Generator	296.2	25.7	321.9	380.1	31	411.1
Main transformer	87.4	7.6	95	94.4	7.6	102
Station transformer	1.7	0.2	1.9	1.8	0.2	2
Switchgear for generator	133.7	11.5	195.2	141.5	11.6	153.1
Ancirally equipment	69.0	5.9	74.9	81.5	6.5	88
Miscella. materials	40.8	3.8	44.6	43.5	3.5	47
Telecom. & protection	44.5	3.8	48.3	47.1	3.9	51
Outdoor switchgear	110.2	9.5	119.7	116	10	126
Sub-total	1,136.5	98.7	1,235.2	1,338.7	109.6	1,448.3
Others	902	78	980	1,011.1	80.9	1,092
Transmission line	274	24	298	239	21	260
Total	2,312.5	200.7	2,513.2	2,588.8	211.5	2,800.3

Table I-09(1) ESTIMATED ECONOMIC CONSTRUCTION COST
(EL TORITO DAM-LOS VEGANOS WEIR COMPLEX)
COST ECONOMICO DE CONSTRUCCION
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Work Item	Foreign Currency Portion	Local Currency Portion	Total
1. General	2,412.2	1,111.0	3,523.2
2. Civil Works			
2.1 PS-1			
(1) Dam Intake Weir	27,310.9	12,457.5	39,768.4
(2) Power Facilities	10,297.0	4,339.2	14,636.2
Sub-total (2.1)	37,607.8	16,796.7	54,405.5
2.2 PS-2			
(1) Intake Weir	2,565.8	1,530.3	4,096.1
(2) Power Facilities	5,606.1	2,412.3	8,018.4
Sub-total (2.2)	8,171.8	3,942.5	12,114.3
Sub-total (2)	45,779.7	20,739.2	66,518.9
3. Building Works			
3.1 PS-1	198.2	61.5	259.7
3.2 PS-2	198.2	61.5	259.7
Sub-total (3)	396.5	122.9	519.4
4. Metal Works			
4.1 PS-1	1,049.9	354.2	1,404.1
4.2 PS-2	2,497.6	584.7	3,082.3
Sub-total (4)	3,547.5	938.9	4,486.4
5. Generating Equipment and Transmission Line			
5.1 PS-1	4,434.4	229.1	4,663.5
5.2 PS-2	4,412.8	202.7	4,615.5
Sub-total (5)	8,847.2	431.8	9,279.0
6. Road Construction	2,456.2	1,481.0	3,937.2
7. Land Acquisition	0.0	608.7	608.7
8. Engineering Service and Administration	4,784.1	1,887.9	6,672.0
9. Physical Contingency	7,226.3	2,779.2	10,005.5
Total	75,449.7	30,100.6	105,550.3

Table I-09(2) ESTIMATED ECONOMIC CONSTRUCTION COST
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)
COSTO ECONÓMICO DE CONSTRUCCION
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$ 10^3

Work Item	Foreign Currency Portion	Local Currency Portion	Total
1. General	1,088.6	521.2	1,609.8
2. Civil Works			
2.1 PS-1			
(1) Intake Weir	2,921.8	1,759.4	4,681.2
(2) Power Facilities	9,425.0	3,971.7	13,396.7
Sub-total (2.1)	12,346.8	5,731.1	18,077.9
2.2 PS-2			
(1) Intake Weir	2,174.9	1,279.8	3,454.7
(2) Power Facilities	5,548.0	2,387.6	7,935.6
Sub-total (2.2)	7,722.9	3,667.4	11,390.3
Sub-Total (2)	20,069.7	9,398.5	29,468.2
3. Building Works			
3.1 PS-1	198.2	61.5	259.7
3.2 PS-2	198.2	61.5	259.7
Sub-Total (3)	396.4	123.0	519.4
4. Metal Works			
4.1 PS-1	2,079.2	494.6	2,573.8
4.2 PS-2	2,259.5	522.6	2,782.1
Sub-Total (4)	4,338.7	1,017.2	5,355.9
5. Generating Equipment and Transmission Line			
5.1 PS-1	3,883.5	192.5	4,076.0
5.2 PS-2	4,142.1	190.4	4,332.5
Sub-Total (5)	8,025.6	382.9	8,408.5
6. Road Construction	1,702.2	1,025.0	2,727.2
7. Land Acquisition		218.8	218.8
8. Engineering Service and Administration	3,562.0	1,268.8	4,830.8
9. Physical Contingency	3,918.5	1,395.6	5,314.1
Total	43,101.7	15,351.0	58,452.7

Table I-09(3) ESTIMATED ECONOMIC CONSTRUCTION COST
(PINO DE YUNA WEIR - LOS VEGANOS WEIR COMPLEX
COSTO ECONOMICO DE CONSTRUCCION
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Work Item	Foreign Currency Portion	Local Currency Portion	Total
1. General	957.6	458.9	1,416.5
2. Civil Works			
2.1 PS-1			
(1) Dam Intake Weir	1,717.0	1,006.7	2,723.7
(2) Power Facilities	8,185.6	3,460.0	11,645.6
Sub-total (2.1)	9,902.6	4,466.7	14,369.3
2.2 PS-2			
(1) Intake Weir	2,174.7	1,279.9	3,454.6
(2) Power Facilities	5,547.4	2,405.5	7,952.9
Sub-total (2.2)	7,722.1	3,685.4	11,407.5
Sub-total (2)	17,624.7	8,152.1	18,066.0
3. Building Works			
3.1 PS-1	198.2	61.5	259.7
3.2 PS-2	198.2	61.5	259.7
Sub-total (3)	396.5	122.9	519.4
4. Metal Works			
4.1 PS-1	2,079.2	494.6	2,543.8
4.2 PS-2	2,259.5	522.5	2,782.0
Sub-total (4)	4,338.7	1,017.0	5,355.7
5. Generating Equipment and Transmission Line			
5.1 PS-1	3,700.0	180.6	3,880.6
5.2 PS-2	4,142.1	190.4	4,332.5
Sub-total (5)	7,842.1	371.0	8,213.1
6. Road Construction	1,702.2	1,025.0	2,727.2
7. Land Acquisition	0.0	182.4	182.4
8. Engineering Service and Administration	3,192.2	1,132.0	4,324.2
9. Physical Contingency	3,511.4	1,245.2	4,756.6
Total	39,565.3	13,706.4	53,271.7

Table I-10 ESTIMATE OF ANNUAL O&M COST

COST ANUAL DE OPERACION Y MANTENIMIENTO

A) Estimate of Annual O&M Cost

1. Personnel expense — RD$151,000

	No. of Personnel P.S.1	P.S.2	Wage (RD$)	Amount (RD$)
(Administration)				
1) Manager	1	1	900	1,800
2) Clerk	1	1	400	800
3) Driver	1	1	300	600
4) Janitor	1	1	225	450
5) Watchman	2	2	275	1,100
(Operation)				
6) Operator (electric)	2	2	700	2,800
7) " (mechanic)	1	1	700	1,400
8) " (gate)	2	2	300	1,200
(Maintenance crew)				
9) Crew	3	3	400	2,400

Total — RD$ 12,550/month

Annual personnel expense 12,550 x 12 = RD$151,000

2. Maintenance and repair cost — RD$120,000

1) Intake weir and waterway — 40,000
2) Powerstation — 80,000

3. Other expenses — RD$ 20,000

Insurance, office consumables, etc. — 20,000

Summary of O&M Cost — RD$291,000

1. Personnel expense — 151,000
2. Maintenance and repair cost — 120,000
3. Other expenses — 20,000

B) Percentage of estimated annual O&M cost for the total construction cost: (10^3 RD$)

$$291/58,452 \times 100 \fallingdotseq 0.5\ (\%)$$

C) Annual O&M Cost:

1. El Torito dam - Los Veganos weir complex RD$105,550.3 x 10^3 x 0.5(%) = RD$527.7 x 10^3
2. El Torito weir - Los Veganos weir complex RD$58,452.7 x 10^3 x 0.5(%) = RD$292.3 x 10^3
3. Pino de Yuna weir - Los Veganos weir complex RD$53,271.7 x 10^3 x 0.5(%) = RD$266.3 x 10^3

Table I-11 DISBURSED ECONOMIC CONSTRUCTION COST
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)

DESEMBOLSO DEL COSTO ECONOMICO
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Item	Total		1984		1985		1986		1987		1988		1989	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. General	2,412.2	1,111.0	603.0	277.7	603.0	277.7	603.0	277.7	603.0	277.7	0.0	0.0	0.0	0.0
2. Civil Works														
2.1 PS-1														
(1) Dam & Intake Weir	27,310.9	12,457.5	0.0	0.0	198.6	95.3	4,304.5	2,029.2	6,612.0	2,955.6	10,312.0	4,649.0	5,083.7	2,720.4
(2) Power Facilities	10,297.0	4,339.2	0.0	0.0	302.6	155.9	1,200.8	490.3	2,328.8	959.4	5,131.8	2,198.6	1,245.1	527.0
Sub-total (2.1)	37,607.8	16,796.7	0.0	0.0	501.1	251.2	5,513.3	2,527.6	8,940.8	3,915.0	15,443.8	6,847.7	7,128.8	3,255.3
2.2 PS-2														
(1) Intake Weir	2,565.8	1,530.3	0.0	0.0	128.3	76.5	1,026.2	612.1	1,411.2	841.7	0.0	0.0	0.0	0.0
(2) Power Facilities	5,606.1	2,412.3	0.0	0.0	226.9	92.7	2,575.5	1,052.8	2,468.8	1,113.2	334.9	153.6	0.0	0.0
Sub-total (2.2)	8,171.8	3,942.5	0.0	0.0	355.2	169.2	3,601.8	1,664.9	3,880.0	1,954.9	334.9	153.6	0.0	0.0
Sub-total (2)	45,779.7	20,739.2	0.0	0.0	936.3	420.4	9,115.0	4,192.5	12,820.8	5,869.9	15,778.7	7,001.3	7,128.8	3,255.3
3. Building Works														
3.1 PS-1	190.2	61.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.7	12.2	150.6	49.2
3.2 PS-2	198.2	61.5	0.0	0.0	0.0	0.0	0.0	0.0	107.0	33.2	91.0	28.4	0.0	0.0
Sub-total (3)	396.5	122.9	0.0	0.0	0.0	0.0	0.0	0.0	107.0	33.2	130.7	40.6	150.6	49.2
4. Metal Works														
4.1 PS-1	1,049.9	354.2	0.0	0.0	0.0	0.0	209.9	0.0	0.0	0.0	840.0	106.3	0.0	248.0
4.2 PS-2	2,497.6	584.7	0.0	0.0	499.5	0.0	0.0	0.0	1,998.1	292.4	0.0	292.4	0.0	0.0
Sub-total (4)	3,547.5	938.9	0.0	0.0	499.5	0.0	209.9	0.0	1,998.1	292.4	840.0	398.7	0.0	248.0
5. Generating Equipment and Transmission Line														
5.1 PS-1	4,434.4	229.1	0.0	0.0	0.0	0.0	886.9	0.0	0.0	0.0	3,547.5	29.0	0.0	199.4
5.2 PS-2	4,412.8	202.7	0.0	0.0	882.6	0.0	0.0	0.0	3,530.2	101.3	0.0	101.3	0.0	0.0
Sub-total (5)	8,847.2	431.8	0.0	0.0	882.6	0.0	886.9	0.0	3,530.2	101.3	3,547.5	131.1	0.0	199.4
6. Road Construction	2,456.2	1,481.0	1,228.0	740.5	1,228.0	740.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. Land Acquisition	0.0	608.7	0.0	152.2	0.0	152.2	0.0	152.2	0.0	152.2	0.0	0.0	0.0	0.0
8. Engineering Service and Administration	4,784.1	1,887.9	137.0	87.6	311.2	119.3	811.1	335.3	1,429.4	493.1	1,549.8	567.9	545.6	284.7
9 Physical Contingency	7,226.3	2,779.2	196.0	125.4	446.1	169.9	1,162.6	495.8	2,048.8	722.0	2,588.3	814.0	784.3	452.1
Total	75,449.7	30,100.6	2,158.4	1,300.2	4,906.7	1,868.6	12,788.5	5,453.4	22,537.4	7,941.8	24,435.0	8,953.5	8,617.3	4,488.7

Table I-12 DISBURSED ECONOMIC CONSTRUCTION COST
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)

DESEMBOLSO DEL COSTO ECONOMICO
(DERIVADORA EL TORITO - DEDIRVAODR LOS VEGANOS)

Unit: RD$10^3

Item	Total		1984		1985		1986		1987		1988		1989	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. General	1,000.6	521.2	272.2	130.3	272.2	130.3	272.1	130.3	272.1	130.3	0.0	0.0	0.0	0.0
2. Civil Works														
2.1 PS-1														
(1) Intake Weir	2,921.8	1,759.4	0.0	0.0	0.0	0.0	0.0	0.0	7.7.1	440.5	1,726.6	1,025.2	478.1	293.7
(2) Power Facilities	9,425.0	3,971.7	0.0	0.0	208.0	84.7	984.0	404.2	2,743.7	1,124.5	4,371.0	1,887.2	1,117.5	471.1
Sub-total (2.1)	12,346.8	5,731.1	0.0	0.0	208.0	84.7	984.0	404.2	3,460.8	1,565.0	6,098.4	2,912.4	1,595.6	764.8
2.2 PS-2														
(1) Intake Weir	2,174.9	1,279.8	0.0	0.0	108.8	64.0	869.9	511.9	1,196.2	703.9	0.0	0.0	0.0	0.0
(2) Power Facilities	5,548.0	2,387.6	0.0	0.0	226.9	92.7	2,545.1	1,043.7	2,441.1	1,097.6	334.9	153.6	0.0	0.0
Sub-total (2.2)	7,722.9	3,667.4	0.0	0.0	335.7	156.7	3,415.0	1,555.6	3,637.3	1,801.5	334.9	153.6	0.0	0.0
Sub-total (2)	20,069.7	9,398.5	0.0	0.0	543.7	241.4	4,399.0	1,959.8	7,098.1	3,366.5	6,433.3	3,066.0	1,595.6	764.8
3. Building Works														
3.1 PS-1	198.2	61.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.1	27.7	109.1	33.8
3.2 PS-2	198.2	61.5	0.0	0.0	0.0	0.0	0.0	0.0	109.1	33.8	89.1	27.7	0.0	0.0
Sub-total (3)	396.4	123.0	0.0	0.0	0.0	0.0	0.0	0.0	109.1	33.8	178.2	55.4	109.1	33.8
4. Metal Works														
4.1 PS-1	2,079.2	494.6	0.0	0.0	0.0	0.0	415.8	0.0	1,663.4	0.0	0.0	247.3	0.0	247.3
4.2 PS-2	4,330.7	1,017.2	0.0	0.0	451.8	0.0	0.0	0.0	1,807.7	261.3	0.0	261.3	0.0	0.0
Sub-total (4)	4,330.7	1,017.2	0.0	0.0	451.8	0.0	415.8	0.0	3,471.1	261.3	0.0	508.6	0.0	247.3
5. Generating Equipment and Transmission Line														
5.1 PS-1	3,883.5	192.5	0.0	0.0	0.0	0.0	776.7	0.0	3,106.8	0.0	0.0	63.5	0.0	129.0
5.2 PS-2	4,142.1	190.4	0.0	0.0	828.5	0.0	0.0	0.0	3,313.6	100.9	0.0	89.5	0.0	0.0
Sub-total (5)	8,025.6	382.9	0.0	0.0	828.5	0.0	776.7	0.0	6,420.4	100.9	0.0	153.0	0.0	129.0
6. Road Construction	1,702.2	1,025.0	851.1	512.5	851.1	512.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. Land Acquisition	0.0	210.8	0.0	54.7	0.0	54.7	0.0	54.7	0.0	54.7	0.0	0.0	0.0	0.0
8. Engineering Service and Administration	3,562.0	1,260.8	112.3	69.8	294.7	93.9	586.4	214.5	1,737.1	394.0	661.1	370.3	170.4	117.5
9. Physical Contingency	3,918.5	1,395.6	123.6	76.7	324.2	103.3	645.1	235.9	1,910.8	434.2	727.3	416.2	187.5	129.3
Total	43,101.7	15,351.0	1,359.2	844.0	3,566.2	1,136.1	7,095.1	2,595.2	21,018.7	4,776.5	7,999.9	4,577.5	2,062.6	1,421.7

Table I-13 ESTIMATED ECONOMIC CONSTRUCTION COST
(PINO DE YUNA - LOS VEGANOS WEIR COMPLEX)

DESEMBOLSO DEL COSTO ECONOMICO
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Item	Total		1984		1985		1986		1987		1988		1989	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. General	957.6	450.9	241.8	114.8	241.8	114.8	241.8	114.8	232.2	114.1	0.0	0.0	0.0	0.0
2. Civil Works														
2.1 PS-1														
(1) Intake Weir	1,717.0	1,006.7	0.0	0.0	0.0	0.0	0.0	0.0	456.7	276.1	1,260.3	730.5	0.0	0.0
(2) Power Facilities	8,185.6	3,460.0	0.0	0.0	177.9	72.5	867.4	356.6	2,407.3	993.0	4,062.4	1,748.3	670.2	289.7
Sub-total (2.1)	9,902.6	4,466.7	0.0	0.0	177.9	72.5	867.4	356.6	2,864.4	1,269.1	5,322.7	2,478.8	670.2	289.7
2.2 PS-2														
(1) Intake Weir	2,174.7	1,279.9	0.0	0.0	108.8	64.9	869.9	519.1	1,196.2	713.8	0.0	0.0	0.0	0.0
(2) Power Facilities	5,547.4	2,405.5	0.0	0.0	226.9	92.7	2,545.0	1,043.6	2,440.8	1,097.6	334.9	153.6	0.0	0.0
Sub-total (2.2)	7,722.1	3,685.4	0.0	0.0	335.5	157.6	3,414.9	1,562.8	3,637.0	1,811.4	334.9	153.6	0.0	0.0
Sub-total (2)	17,624.7	8,152.1	0.0	0.0	513.4	230.1	4,282.1	1,919.3	6,501.2	3,080.5	5,657.6	2,632.3	670.2	289.7
3. Building Works														
3.1 PS-1	198.2	61.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89.1	27.7	109.1	33.8
3.2 PS-2	198.2	61.5	0.0	0.0	0.0	0.0	0.0	0.0	109.1	33.8	89.1	27.7	0.0	0.0
Sub-total (3)	396.5	122.9	0.0	0.0	0.0	0.0	0.0	0.0	109.1	33.8	178.2	55.4	109.1	33.8
4. Metal Works														
4.1 PS-1	2,079.2	494.6	0.0	0.0	0.0	0.0	415.8	0.0	1,663.4	0.0	0.0	247.3	0.0	247.3
4.2 PS-2	2,259.5	522.5	0.0	0.0	451.8	0.0	0.0	0.0	1,807.7	261.3	0.0	261.3	0.0	0.0
Sub-total (4)	4,338.7	1,017.0	0.0	0.0	451.8	0.0	415.8	0.0	3,471.0	261.3	0.0	508.6	0.0	247.3
5. Generating Equipment and Transmission Line														
5.1 PS-1	3,700.0	180.6	0.0	0.0	0.0	0.0	759.2	0.0	2,940.8	0.0	0.0	56.2	0.0	124.4
5.2 PS-2	4,142.1	190.4	0.0	0.0	828.5	0.0	0.0	0.0	3,313.6	100.9	0.0	89.5	0.0	0.0
Sub-total	7,842.1	371.0	0.0	0.0	828.5	0.0	759.2	0.0	6,254.5	100.9	0.0	145.8	0.0	124.4
6. Road Construction	1,702.2	1,025.0	851.2	512.5	851.2	512.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. Land Acquisition	0.0	182.4	0.0	45.6	0.0	45.6	0.0	45.6	0.0	45.6	0.0	0.0	0.0	0.0
8. Engineering Service and Administration	3,192.2	1,132.0	109.4	67.3	283.5	90.3	575.0	208.0	1,562.7	361.2	583.5	334.6	77.9	70.6
9. Physical Contingency	3,511.4	1,245.2	120.1	74.0	259.2	99.5	685.6	228.9	1,718.7	387.2	642.0	367.5	85.8	88.1
Total	39,565.3	13,706.4	1,322.5	814.2	3,429.4	1,092.8	6,959.5	2,516.6	19,849.4	4,384.6	7,061.3	4,044.1	943.0	853.9

Table I-14 FLOW OF ECONOMIC COST
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)
FLUJO DEL COSTO ECONOMICO
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Construction Cost		Replacement Cost		O & M Cost	Total		
	F.C.	L.C.	F.C.	L.C.	L.C.	F.C.	L.C.	Total
1	2,158.4	1,380.2	-	-	-	2,158.4	1,380.2	3,538.6
2	4,906.7	1,868.6	-	-	-	4,906.7	1,868.6	6,775.3
3	12,788.5	5,453.4	-	-	-	12,788.5	5,453.4	18,241.9
4	22,537.4	7,941.8	-	-	-	22,537.4	7,941.8	30,479.2
5	24,435.0	8,953.5	-	-	131.9	24,435.0	9,085.4	33,520.4
6	8,617.3	4,488.7	-	-	395.7	8,617.3	4,884.4	13,501.7
7	-	-	-	-	527.7	-	527.7	527.7
⋮					⋮		⋮	⋮
20	-	-	-	-	527.7	-	527.7	527.7
21	-	-	-	-	527.7	-	527.7	527.7
22	-	-	-	-	527.7	-	527.7	527.7
23	-	-	-	-	527.7	-	527.7	527.7
⋮					⋮		⋮	⋮
36					527.7		527.7	527.7
37	-	-	1,470.9	-	527.7	1,470.9	527.7	1,998.6
38	-	-	1,167.3	-	527.7	1,167.3	527.7	1,695.0
39	-	-	5,883.5	419.0	527.7	5,883.5	946.7	6,830.2
40	-	-	4,669.4	563.8	527.7	4,669.4	1,091.5	5,760.9
41	-	-	-	476.1	527.7	-	1,003.8	1,003.8
42	-	-	-	-	527.7	-	527.7	527.7
⋮					⋮		⋮	⋮
50	-	-	-	-	527.7	-	527.7	527.7

Table I-15 FLOW OF ECONOMIC COST
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)
FLUJO DEL COSTO ECONOMICO
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Construction Cost		Replacement Cost		O & M Cost	Total		
	F.C.	L.C.	F.C.	L.C.	L.C.	F.C.	L.C.	Total
1	1,359.2	844.0	-	-	-	1,359.2	844.0	2,203.2
2	3,566.2	1,136.1	-	-	-	3,566.2	1,136.1	4,702.3
3	7,095.1	2,595.2	-	-	-	7,095.1	2,595.2	9,690.3
4	21,018.7	4,776.5	-	-	-	21,018.7	4,776.5	25,795.2
5	7,999.9	4,577.5	-	-	73.1	7,999.9	4,650.6	12,650.5
6	2,062.6	1,421.7	-	-	219.2	2,062.6	1,640.9	3,703.5
7	-	-	-	-	292.3	-	292.3	292.3
.					.		.	.
.					.		.	.
.					.		.	.
20	-	-	-	-	292.3	-	292.3	292.3
21	-	-	-	-	292.3	-	292.3	292.3
22	-	-	-	-	292.3	-	292.3	292.3
23	-	-	-	-	292.3	-	292.3	292.3
.					.		.	.
.					.		.	.
.					.		.	.
36					292.3		292.3	292.3
37	-	-	1,112.8	-	292.3	1,112.8	292.3	1,405.1
38	-	-	1,112.8	-	292.3	1,112.8	292.3	1,405.1
39	-	-	8,902.3	326.0	292.3	8,902.3	618.3	9,520.6
40	-	-	-	595.4	292.3		887.7	887.7
41	-	-	-	338.7	292.3		631.0	631.0
42	-	-	-		292.3		292.3	292.3
.					.		.	.
.					.		.	.
.					.		.	.
50					292.3		292.3	292.3

Table I-16 FLOW OF ECONOMIC COST
(PINO DE YONO WEIR - LOS VEGANOS WEIR COMPLEX)
FLUJO DEL COSTO ECONOMICO
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Construction Cost		Replacement Cost		O & M Cost	Total		
	F.C.	L.C.	F.C.	L.C.	L.C.	F.C.	L.C.	Total
1	1,322.5	814.2	-	-	-	1,322.5	814.2	2,136.7
2	3,429.4	1,092.8	-	-	-	3,429.4	1,092.8	4,522.2
3	6,959.5	2,516.6	-	-	-	6,959.5	2,516.6	9,476.1
4	19,849.4	4,384.6	-	-	-	19,849.4	4,384.6	24,234.0
5	7,061.3	4,044.1	-	-	67.0	7,061.3	4,116.1	11,172.4
6	943.0	853.9	-	-	199.7	943.0	1,055.0	1,996.6
7	-	-	-	-	266.3	-	266.3	266.3
.	-	-	-	-	.	-	.	.
.	-	-	-	-	.	-	.	.
.	-	-	-	-	.	-	.	.
20	-	-	-	-	266.3	-	266.3	266.3
21	-	-	-	-	266.3	-	266.3	266.3
22	-	-	-	-	266.3	-	266.3	266.3
23	-	-	-	-	266.3	-	266.3	266.3
.	-	-	-	-	.	-	.	.
.	-	-	-	-	.	-	.	.
.	-	-	-	-	.	-	.	.
36	-	-	-	-	266.3	-	266.3	266.3
37	-	-	1,105.0	-	266.3	1,105.0	266.3	1,371.3
38	-	-	1,105.0	-	266.3	1,105.0	266.3	1,371.3
39	-	-	8,839.3	316.8	266.3	8,839.3	583.1	9,422.4
40	-	-	-	592.9	266.3	-	859.2	859.2
41	-	-	-	344.0	266.3	-	610.3	610.3
42	-	-	-	-	266.3	-	266.3	266.3
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
50	-	-	-	-	266.3	-	266.3	266.3

Table I-17 ESTIMATE OF CAPACITY VALUE
(10 MW GAS TURBINE UNIT)
ESTIMADO DEL VALOR DE CAPACIDAD
(TURBINA DE GAS DE 10 MW)

Item				Value/Factor
1) Installation Cost				US$346.5/kW
Foreign portion (90%)	311.85 x 1.6		=	RD$498.9
Local portion (10%)	34.65 x 1.0		=	RD$ 34.6
Total				RD$533.5/kW
2) Adjustment Factor	(Hydro)	(Gas)		
T/L loss	15.0	10.0		
Forced outage	0.5	4.0		
Station service	0.5	2.1		
Overhaul	2.0	5.0		
Factor				
$= \frac{(1 - 0.15)(1 - 0.005)(1 - 0.005)(1 - 0.02)}{(1 - 0.10)(1 - 0.04)(1 - 0.021)(1 - 0.05)}$			=	1.026
3) Capacity Value	533.5 x 1.026		=	RD$547.38/kW

Table I-18 ESTIMATE OF ENERGY VALUE
(10 MW GAS TURBINE UNIT)
ESTIMADO DEL VALOR DE ENERGIA
(TURBINA DE GAS DE 10 MW)

Item	Value
1) Fuel Type	Gas-oil
2) Fuel Cost:	
Financial	RD$44.50/bbl
Economic (x 1.6/1)	RD$71.20/bbl
3) Heating Value	1.556×10^6 kcal/bbl/2
4) Heat Rate (Specific fuel consumption)	3,702 kcal/kWh/3
5) Energy Value (Before adjustment) Item (4)/(3) x (2)	RD$0.1694/kWh
6) Adjustment Factor	

	(Hydro)	(Gas)
T/L loss	15.0	10.0
Station service	0.5	2.1

$$\text{Factor} = \frac{(1-0.15)(1-0.005)}{(1-0.10)(1-0.021)} = 0.960$$

7) Energy Value (After adjustment) Item (5) x (6)	= RD$0.1626/kWh

Note: /1: Shadow Exchange Rate

/2: Based on actual record

/3: According to Clause 3.2.1 of CDE report in October 1983. The specific consumption for gas turbine is adjusted for 5% lower in efficiency, referring to actual record, i.e., 3,526 x 1.05 ≒ 3,702 (kcal/kWh)

Table I-19 ESTIMATE OF ENERGY VALUE
(65 MW OIL-FIRED UNIT)
ESTIMADO DEL VALOR DE ENERGIA
(PLANTA DE VAPOR DE 65 MW)

Item			Value
1) Fuel Type			Bunker C
2) Fuel Cost:			
Financial			RD$26.00/bbl
Economic (x 1.6)			RD$41.60/bbl
3) Heating Value			1.556×10^6 kcal/bbl
4) Heat Rate (Specific fuel consumption)			2,590 kcal/kWh
5) Energy Value (Before adjustment)			RD$0.07/kWh
Item (4)/(3) x (2)			
6) Adjustment Factor	(Hydro)	(Gas)	
T/L loss	15.0	10.0	
Station service	0.5	10.0	
Factor = $\frac{(1-0.15)(1-0.005)}{(1-0.10)(1-0.010)}$			= 1.044
7) Energy Value (After adjustment)			RD$0.074/kWh

Table I-20 ESTIMATE OF ENERGY VALUE
(130 MW COAL-FIRED UNIT)
ESTIMADO DEL VALOR DE ENERGIA
(PLANTA DE QUEMA DE CARBON DE 130 MW)

Item			Value
1) Fuel Type			Coal
2) Fuel Cost			
Financial			RD$ 78.5/ton
Economic (x 1.6)			RD$126.0/ton
3) Heating Value			6.638×10^6 kcal/ton
4) Heat Rate (Specific fuel consumption)			2,450 kcal/kWh
5) Energy Value (Before adjustment)			RD$0.0465/kWh
Item (4)/(3) x (2)			
6) Adjustment Factor	(Hydro)	(Gas)	
T/L loss	15.0	10.0	
Station service	0.5	10.0	
Factor = $\frac{(1-0.15)(1-0.005)}{(1-0.10)(1-0.10)}$			= 1.044
7) Energy Value (After adjustment)			RD$0.0485/kWh

Table I-21 ANNUAL ENERGY VALUE
VALOR ANUAL DE ENERGIA

Power Stations	Annual Energy Output (GWh)		Energy Value (RD$/kWh)		Annual Energy Benefit (RD$10³)	
	Primary	Secondary	Primary/1	Secondary/2	Primary	Secondary
El Torito Dam - Los Vaganos Weir Complex						
El Torito Dam	22.2	15.8	0.1626	0.06125	3,609.8	967.8
Los Vaganos Weir	18.9	22.8	0.1626	0.06125	3,073.1	1,396.5
Total	41.1	38.6			6,682.9	2,364.3
El Torito Weir - Los Veganos Weir Complex						
El Torito Weir	15.2	16.9	0.1626	0.06125	2,471.5	1,035.1
Los Veganos Weir	16.4	19.0	0.1626	0.06125	2,666.7	1,163.8
Total	31.6	35.9			5,138.2	2,198.9
Pino de Yuno - Los Veganos Weir Complex						
Pino de Yuna Weir	12.7	13.7	0.1626	0.06125	2,065.0	839.1
Los Veganos Weir	16.4	19.0	0.1626	0.06125	2,666.7	1,163.8
Total	29.1	32.7			4,731.7	2,002.9

Note: /1: Refer to Table I-18.
/2: Average of value estimated in Table I-19 and I-20.

Table I-22 ANNUAL O & M VALUE
VALOR ANUAL DE OPERACION Y MANTENIMIENTO

	Installed Capacity (MW)	Energy Output (GWh)	Fixed O & M Rate (RD$/kW)	Fixed O & M Amount (RD$10^3)	Variable O & M Rate (RD mill/kWh)	Variable O & M Amount (RD$10^3)
El Torito Dam - Los Veganos Weir Complex						
El Torito Dam	10.3	-	11.55	119.0	-	-
Primary	-	22.2	-	-	3.08	68.3
Secondary	-	15.8	-	-	2.96	46.8
Los Veganos	8.8	-	11.55	101.6	-	-
Primary	-	18.9	-	-	3.08	58.2
Secondary	-	22.8	-	-	2.96	67.5
Total	19.1			220.6		240.8
El Torito Weir - Los Veganos Weir Complex						
El Torito Weir	7.2	-	11.55	83.2	-	-
Primary	-	15.2	-	-	3.08	46.8
Secondary	-	16.9	-	-	2.96	50.0
Los Veganos	7.7	-	11.55	88.9	-	-
Primary	-	16.4	-	-	3.08	50.5
Secondary	-	19.0	-	-	3.96	56.3
Total	14.9			172.1		203.6
Pino de Yuna - Los Veganos Weir Complex						
Pino de Yuna	6.3	-	11.55	72.8	-	-
Primary	-	12.7	-	-	3.08	39.1
Secondary	-	13.7	-	-	2.96	40.6
Los Veganos	7.7	-	11.55	88.9	-	-
Primary	-	16.4	-	-	3.08	50.5
Secondary	-	19.0	-	-	2.96	56.3
Total	14.0			161.7		186.5

Table I-23 FLOW OF ECONOMIC BENEFIT
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)
FLUJO DEL BENEFICIO ECONOMICO
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Capacity Value/1	Primary Energy/2	Secondary Energy/2	Fixed O&M/3	Variable O&M /3	Total
1						
2						
3						
4	5,227.5	-	-	-	-	5,227.5
5	5,227.5	1,536.6	698.3	50.8	62.9	7,576.1
6	-	4,878.0	1,880.4	161.1	183.3	7,102.8
7	-	6,682.9	2,364.3	220.6	240.8	9,508.6
.		.	.	.	.	.
.		.	.	.	.	.
.		.	.	.	.	.
20	-	6,682.9	2,364.3	220.6	240.8	9,508.6
21	4,704.7	6,682.9	2,364.3	220.6	240.8	14,213.3
22	4,704.7	6,682.9	2,364.3	220.6	240.8	14,213.3
23	-	6,682.9	2,364.3	220.6	240.8	9,508.6
.		.	.	.	.	.
.		.	.	.	.	.
.		.	.	.	.	.
36	-	6,682.9	2,364.3	220.6	240.8	9,508.6
37	-	6,682.9	2,364.3	220.6	240.8	9,508.6
38	4,704.7	6,682.9	2,364.3	220.6	240.8	14,213.3
39	4,704.7	6,682.9	2,364.3	220.6	240.8	14,213.3
40	-	6,682.9	2,364.3	220.6	240.8	9,508.6
41	-	6,682.9	2,364.3	220.6	240.8	9,508.6
42	-	6,682.9	2,364.3	220.6	240.8	9,508.6
.		.	.	.	.	.
.		.	.	.	.	.
.		.	.	.	.	.
50	-	6,682.9	2,364.3	220.6	240.8	9,508.6

Note: /1 : Refer to Table I-17.
/2: Refer to Table I-21.
/3: Refer to Table I-22.

Table I-24 FLOW OF ECONOMIC BENEFIT
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)

FLUJO DEL BENEFICIO ECONOMICO
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Capacity Value/1	Primary Energy/2	Secondary Energy/2	Fixed O&M/3	Variable O&M/3	Total
1						
2						
3						
4	4,078.0	-				4,078.0
5	4,078.0	1,333.3	581.9	44.5	53.4	6,091.0
6	-	3,902.4	1,681.3	130.5	155.2	5,869.4
7	-	5,138.2	2,198.9	172.1	203.6	7,712.7
⋮		⋮	⋮	⋮	⋮	⋮
20	-	5,138.2	2,198.9	172.1	203.6	7,712.7
21	3,670.2	5,138.2	2,198.9	172.1	203.6	11,382.9
22	3,670.2	5,138.2	2,198.9	172.1	203.6	11,382.9
23	-	5,138.2	2,198.9	172.1	203.6	7,712.7
⋮		⋮	⋮	⋮	⋮	⋮
36	-	5,138.2	2,198.9	172.1	203.6	7,712.7
37	-	5,138.2	2,198.9	172.1	203.6	7,712.7
38	3,670.2	5,138.2	2,198.9	172.1	203.6	11,382.9
39	3,670.2	5,138.2	2,198.9	172.1	203.6	11,382.9
40	-	5,138.2	2,198.9	172.1	203.6	7,712.7
41	-	5,138.2	2,198.9	172.1	203.6	7,712.7
42	-	5,138.2	2,198.9	172.1	203.6	7,712.7
⋮		⋮	⋮	⋮	⋮	⋮
50	-	5,138.2	2,198.9	172.1	203.6	7,712.7

Note: /1: Refer to Table I-17.
/2: Refer to Table I-21.
/3: Refer to Table I-22.

Table I-25 FLOW OF ECONOMIC BENEFIT
(PINO DE YUNA WEIR -
LOS VEGANOS WEIR COMPLEX)
FLUJO DEL BENEFICIO ECONOMICO
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Capacity Value/1	Primary Energy/2	Secondary Energy/2	Fixed O&M/3	Variable O&M/3	Total
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	3,831.7	-	-	-	-	3,831.7
5	3,831.7	1,333.3	581.9	44.5	53.4	5,844.7
6	-	3,699.2	1,583.3	125.3	146.6	5,554.4
7	-	4,731.7	2,002.9	161.7	186.4	7,082.7
⋮		⋮	⋮	⋮	⋮	⋮
20	-	4,731.7	2,002.9	161.7	186.4	7,082.7
21	3,448.5	4,731.7	2,002.9	161.7	186.4	10,531.2
22	3,448.5	4,731.7	2,002.9	161.7	186.4	10,531.2
23	-	4,731.7	2,002.9	161.7	186.4	7,082.7
⋮		⋮	⋮	⋮	⋮	⋮
36	-	4,731.7	2,002.9	161.7	186.4	7,082.7
37	-	4,731.7	2,002.9	161.7	186.4	7,082.7
38	3,448.5	4,731.7	2,002.9	161.7	186.4	10,531.2
39	3,448.5	4,731.7	2,002.9	161.7	186.4	10,531.2
40	-	4,731.7	2,002.9	161.7	186.4	7,082.7
⋮		⋮	⋮	⋮	⋮	⋮
50	-	4,731.7	2,002.9	161.7	186.4	7,082.7

Note: /1: Refer to Table I-17
/2: Refer to Table I-21
/3: Refer to Table I-22

Table I-26 ECONOMIC INTERNAL RATE OF RETURN
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)
TASA INTERNA DE RETORNO ECONOMICO
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Costs/1				Benefit/2						Surplus
	Capital										
	F.C.	L.C.	O & M	Total	Capacity Value	Primary Energy	Secondary Energy	Fixed O & M	Variable O & M	Total	
1	2,158.4	1,380.2		3,538.6							-3,538.6
2	4,906.7	1,868.6		6,775.3							-6,775.3
3	12,788.5	5,453.4		18,241.9							-18,241.9
4	22,537.4	7,941.8		30,479.2	5,227.5					5,227.5	-25,251.7
5	24,435.0	8,953.5	131.9	33,520.4	5,227.5	1,536.6	698.3	50.8	62.9	7,576.1	-25,944.3
6	8,617.3	4,488.7	395.7	13,501.7		4,878.0	1,880.4	161.1	183.3	7,102.8	-6,398.9
7-20			527.7	527.7		6,682.9	2,364.3	220.6	240.8	9,508.6	8,980.9
21-22			527.7	527.7	4,704.7	6,682.9	2,364.3	220.6	240.8	14,213.3	13,685.6
23-36			527.7	527.7		6,682.9	2,364.3	220.6	240.8	9,508.6	8,980.9
37	1,470.9		527.7	1,998.6		6,682.9	2,364.3	220.6	240.8	9,508.6	7,510.0
38	1,167.3		527.7	1,695.0	4,704.7	6,682.9	2,364.3	220.6	240.8	14,213.3	12,518.3
39	5,883.5	419.0	527.7	6,830.2	4,704.7	6,682.9	2,364.3	220.6	240.8	14,213.3	7,383.1
40	4,669.4	563.8	527.7	5,760.9		6,682.9	2,364.3	220.6	240.8	9,508.6	3,747.7
41		476.1	527.7	1,003.8		6,682.9	2,364.3	220.6	240.8	9,508.6	8,504.8
42-50			527.7	527.7		6,682.9	2,364.3	220.6	240.8	9,508.6	8,980.9

Economic Internal Rate of Return: 8.7%

Note: /1: Refer to Table I- 14
/2: Refer to Table I- 23

Table I-27 ECONOMIC INTERNAL RATE OF RETURN
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)
TASA INTERNA DE RETORNO ECONOMICO
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Costs/1				Benefits/2						Surplus
	Capital										
	F.C.	L.C.	O & M	Total	Capacity Value	Primary Energy	Secondary Energy	Fixed O & M	Variable O & M	Total	
1	1,359.2	844.0		2,203.2							-2,203.2
2	3,566.2	1,136.1		4,702.3							-4,702.3
3	7,095.1	2,595.2		9,690.3							-9,690.3
4	21,018.7	4,776.5		25,795.2	4,078.0					4,078.0	-21,717.2
5	7,999.9	4,577.5	73.1	12,650.5	4,078.0	1,333.3	581.9	44.5	53.4	6,091.0	-6,559.5
6	2,062.6	1,421.7	219.2	3,703.5		3,902.4	1,681.3	130.5	155.2	5,869.4	2,165.9
7 - 20			292.3	292.3		5,138.2	2,198.9	172.1	203.6	7,712.7	7,420.5
21 - 22			292.3	292.3	3,670.2	5,138.2	2,198.9	172.1	203.6	11,382.9	11,090.6
23 - 36			292.3	292.3		5,138.2	2,198.9	172.1	203.6	7,712.7	7,420.5
37	1,112.8		292.3	1,405.1		5,138.2	2,198.9	172.1	203.6	7,712.7	6,307.7
38	1,112.8		292.3	1,405.1	3,670.2	5,138.2	2,198.9	172.1	203.6	11,382.9	9,977.8
39	8,902.3	326.0	292.3	9,520.6	3,670.2	5,138.2	2,198.9	172.1	203.6	11,382.9	1,862.3
40		595.4	292.3	887.7		5,138.2	2,198.9	172.1	203.6	7,712.7	6,825.1
41		338.7	292.3	631.0		5,138.2	2,198.9	172.1	203.6	7,712.7	7,081.5
42 - 50			292.3	292.3		5,138.2	2,198.9	172.1	203.6	7,712.7	7,420.5

Economic Internal Rate of Return: 12.9%

Note: /1: Refer to Table I- 15
/2: Refer to Table I- 24

Table I- 28 ECONOMIC INTERNAL RATE OF RETURN
(PINO DE YUNA WEIR - LOS VEGANOS WEIR COMPLEX)
TASA INTERNA DE RETORNO ECONOMICO
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Costs/1				Benefit/2						Surplus
	Capital										
	F.C.	L.C.	O & M	Total	Capacity Value	Primary Energy	Secondary Energy	Fixed O & M	Variable O & M	Total	
1	1,322.5	814.2		2,136.7							-2,136.7
2	3,429.4	1,092.8		4,522.2							-4,522.2
3	6,959.5	2,516.6		9,476.1							-9,476.1
4	19,849.4	4,384.6		24,234.0	3,831.7					3,831.7	-20,402.3
5	7,061.3	4,044.1	67.0	11,172.4	3,831.7	1,333.3	581.9	44.5	53.4	5,844.7	-5,327.7
6	943.0	853.9	199.7	1,996.6		3,699.2	1,583.3	125.3	146.6	5,554.4	3,558.2
7 - 20			266.3	266.3		4,731.7	2,002.9	161.7	186.4	7,082.7	6,816.4
21 - 22			266.3	266.3	3,448.5	4,731.7	2,002.9	161.7	186.4	10,531.2	10,264.9
23 - 36			266.3	266.3		4,731.7	2,002.9	161.7	186.4	7,082.7	6,816.4
37	1,105.0		266.3	1,371.3		4,731.7	2,002.9	161.7	186.4	7,082.7	5,711.4
38	1,105.0		266.3	1,371.3	3,448.5	4,731.7	2,002.9	161.7	186.4	10,531.2	9,159.9
39	8,839.3	316.8	266.3	9,422.4	3,448.5	4,731.7	2,002.9	161.7	186.4	10,531.2	1,108.8
40		592.9	266.3	859.2		4,731.7	2,002.9	161.7	186.4	7,082.7	6,223.5
41		344.0	266.3	610.3		4,731.7	2,002.9	161.7	186.4	7,082.7	6,472.4
42 - 50			266.3	266.3		4,731.7	2,002.9	161.7	186.4	7,082.7	6,816.4

Economic Internal Rate of Return: 12.8%

Note: /1: Refer to Table I- 16
/2: Refer to Table I- 25

Table I-29 ECONOMIC INTERNAL RATE OF RETURN
(EL TORITO DAM: SINGLE)
TASA INTERNA DE RETORNO ECONOMICO
(PRESA EL TORITO SOLO)

Unit: RD$10^3

Year	Costs				Benefit						Surplus
	Capital		O & M	Total	Capacity Value	Primary Energy	Secondary Energy	Fixed O & M	Variable O & M	Total	
	F.C.	L.C.									
1	1,576.5	1,011.3		2,587.8							-2,587.8
2	2,263.5	1,308.4		3,571.9							-3,571.9
3	8,397.3	3,399.8		11,797.1							-11,797.1
4	11,153.3	5,040.5		16,193.8							-16,193.8
5	23,497.4	8,272.7		31,770.1	2,819.1					2,819.1	-28,951.0
6	8,617.3	4,488.7	98.8	13,204.8	2,819.1	914.6	242.0	30.0	28.8	4,034.5	-9,170.3
7 - 21			395.1	395.1		3,658.5	967.8	119.0	115.1	4,860.4	4,465.3
22 - 23			395.1	395.1	2,537.1	3,658.5	967.8	119.0	115.1	7,397.5	7,002.4
24 - 37			395.1	395.1		3,658.5	967.8	119.0	115.1	4,860.4	4,465.3
38	1,167.3		395.1	1,562.4		3,658.5	967.8	119.0	115.1	4,860.4	3,298.0
39			395.1	395.1	2,537.1	3,658.5	967.8	119.0	115.1	7,397.5	7,002.4
40	4,669.4	144.8	395.1	5,209.3	2,537.1	3,658.5	967.8	119.0	115.1	7,397.5	2,188.2
41		476.1	395.1	871.2		3,658.5	967.8	119.0	115.1	4,860.4	3,989.2
42 - 50			395.1	395.1		3,658.5	967.8	119.0	115.1	4,860.4	4,465.3

Economic Internal Rate of Return: 5.2%

Table I-30 ECONOMIC INTERNAL RATE OF RETURN
(EL TORITO WEIR: SINGLE)
TASA INTERNA DE RETORNO ECONOMICO
(DERIVADORA EL TORITO SOLO)

Unit: RD$10^3

Year	Costs				Benefit						Surplus
	Capital										
	F.C.	L.C.	O&M	Total	Capacity Value	Primary Energy	Secondary Energy	Fixed O&M	Variable O & M	Total	
1	763.4	479.6		1,243.0							-1,243.0
2	1,015.2	581.1		1,596.3							-1,596.3
3	2,771.1	616.7		3,387.8							-3,387.8
4	10,161.1	2,030.2		12,191.3						0.0	-12,191.3
5	7,486.9	3,934.6		11,421.5	1,970.6					1,970.6	-9,450.9
6	2,062.6	1,421.7	83.3	3,567.6	1,970.6	1,235.8	517.6	41.6	48.4	3,814.0	246.4
7-21			166.6	166.6		2,471.5	1,035.1	83.2	96.8	3,686.6	3,520.0
22-23			166.6	166.6	1,773.5	2,471.5	1,035.1	83.2	96.8	5,460.1	5,293.5
24-37			166.6	166.6		2,471.5	1,035.1	83.2	96.8	3,686.6	3,520.0
38	1,073.3		166.6	1,239.9		2,471.5	1,035.1	83.2	96.8	3,686.6	2,446.7
39	4,293.2		166.6	4,459.8	1,773.5	2,471.5	1,035.1	83.2	96.8	5,460.1	1,000.3
40		279.7	166.6	446.3	1,773.5	2,471.5	1,035.1	83.2	96.8	5,460.1	5,013.8
41		338.7	166.6	505.3		2,471.5	1,035.1	83.2	96.8	3,686.6	3,181.3
42-50			166.6	166.6		2,471.5	1,035.1	83.2	96.8	3,686.6	3,520.0

Economic Internal Rate of Return: 10.4%

Table I-31 ECONOMIC INTERNAL RATE OF RETURN
(PINO DE YUNA WEIR: SINGLE)
TASA INTERNA DE RETORNO ECONOMICO
(DERIVADORA PINO DE YUNA SOLO)

Unit: RD$10^3

Year	Cost				Benefit						Surplus
	Capital		O & M	Total	Capacity Value	Primary Energy	Secondary Energy	Fixed O & M	Variable O & M	Total	
	F.C.	L.C.									
1	726.7	449.8		1,176.5							-1,176.5
2	878.4	537.8		1,416.2							-1,416.2
3	2,635.5	538.1		3,173.6							-3,173.6
4	8,991.8	1,638.3		10,630.1							-10,630.1
5	6,548.3	3,401.2		9,949.5	1,724.3					1,724.3	-8,225.2
6	943.0	853.9	71.3	1,868.2	1,724.3	1,032.5	419.6	36.4	39.8	3,252.5	1,385.4
7 - 21	21,069.8	7,439.0	141.5	141.5		2,065.0	839.1	72.8	79.7	3,056.6	2,915.0
22 - 23			141.5	141.5	1,551.8	2,065.0	839.1	72.8	79.7	4,608.4	4,466.9
24 - 37			141.5	141.5		2,065.0	839.1	72.8	79.7	3,056.6	2,915.0
38	1,279.6		141.5	1,421.1		2,065.0	839.1	72.8	79.7	3,056.6	1,635.4
39	5,118.7		141.5	5,260.1	1,551.8	2,065.0	839.1	72.8	79.7	4,608.4	-651.8
40		336.1	141.5	477.6	1,551.8	2,065.0	839.1	72.8	79.7	4,608.4	4,129.8
41		404.8	141.5	546.3		2,065.0	839.1	72.8	79.7	3,056.6	2,500.2
42 - 50			141.5	141.5		2,065.0	839.1	72.8	79.7	3,056.6	2,915.0

Economic Internal Rate of Return: 10.0%

Table I-32 ECONOMIC INTERNAL RATE OF RETURN
(LOS VEGANOS WEIR: SINGLE WITH DAM)

TASA INTERNA DE RETORNO ECONOMICO
(DERIVADORA LOS VEGANOS SOLO CON PRESA)

Unit: RD$10^3

Year	Costs				Benefit						Surplus
	Capital										
	F.C.	L.C.	O&M	Total	Capacity Value	Primary Energy	Secondary Energy	Fixed O&M	Variable O & M	Total	
1	581.9	368.9		950.8							-950.8
2	2,643.2	560.2		3,203.4							-3,203.4
3	4,391.2	2,053.6		6,444.8							-6,444.8
4	11,384.1	2,901.3		14,285.4	2,408.5					2,408.5	-11,876.9
5	937.6	680.8	66.3	1,684.7	2,408.5	1,536.6	698.3	50.8	52.9	4,757.1	3,072.4
6-20			132.5	132.5		3,073.1	1,396.5	101.6	125.7	4,696.9	4,564.4
21			132.5	132.5	2,167.7	3,073.1	1,396.5	101.6	125.7	6,864.6	6,732.1
22			132.5	132.5	2,167.7	3,073.1	1,396.5	101.6	125.7	6,864.6	6,732.1
23-36			132.5	132.5		3,073.1	1,396.5	101.6	125.7	4,696.9	4,564.4
37	1,470.9		132.5	1,603.4		3,073.1	1,396.5	101.6	125.7	4,696.9	3,093.5
38			132.4	132.5	2,167.7	3,073.1	1,396.5	101.6	125.7	6,864.6	6,732.1
39	5,883.5	419.0	132.5	6,435.0	2,167.7	3,073.1	1,396.5	101.6	125.7	6,864.6	429.6
40		419.0	132.5	551.5		3,073.1	1,396.5	101.6	125.7	4,696.9	4,145.4
41-50			132.5	132.5		3,073.1	1,396.5	101.6	125.7	4,696.9	4,564.4

Economic Internal Rate of Return: 17.3%

Table I-33 ECONOMIC INTERNAL RATE OF RETURN
(LOS VEGANOS WEIR: SINGLE WITH WEIR)

TASA INTERNA DE RETORNO ECONOMICO
(DERIVADORA LOS VEGANOS SOLO CON DERIVADORA)

Unit: RD$10^3

Year	Costs				Benefit						Surplus
	Capital										
	F.C.	L.C.	O & M	Total	Capacity Value	Primary Energy	Secondary Energy	Fixed O & M	Variable O & M	Total	
1	595.8	364.4		960.2							-960.2
2	2,551.0	555.0		3,106.0							-3,106.0
3	4,324.0	1,978.5		6,302.5							-6,302.5
4	10,857.6	2,746.3		13,603.9	2,107.4					2,107.4	-11,496.5
5	513.0	642.9	62.8	1,218.7	2,107.4	1,333.3	581.9	44.5	53.4	4,120.5	2,901.8
6 - 20			125.6	125.6		2,666.6	1,163.8	88.9	106.8	4,026.1	3,900.5
21 - 22			125.6	125.6	1,896.7	2,666.6	1,163.8	88.9	106.8	5,922.8	5,797.2
23 - 36			125.6	125.6		2,666.6	1,163.8	88.9	106.8	4,026.1	3,900.5
37	1,394.2		125.6	1,519.8		2,666.6	1,163.8	88.9	106.8	4,026.1	2,506.3
38	0		125.6	125.6	1,896.7	2,666.6	1,163.8	88.9	106.8	5,922.8	5,797.2
39	5,577.1	388.2	125.6	6,090.9	1,896.7	2,666.6	1,163.8	88.9	106.8	5,922.8	-168.1
40		388.2	125.6	513.8		2,666.6	1,163.8	88.9	106.8	4,026.1	3,512.3
41 - 50			125.6	125.6		2,666.6	1,163.8	88.9	106.8	4,026.1	3,900.5

Economic Internal Rate of Return: 15.6%

Table I-34 DISBURSED FINANCIAL CONSTRUCCION COST
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)

REEMBOLSO DEL COSTO FINANCIERO
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Item	Total		1984		1985		1986		1987		1988		1989	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. General														
2. Civil Works	1,507.6	1,234.4	376.9	308.6	376.9	308.6	376.9	308.6	376.9	308.6	0.0	0.0	0.0	0.0
2.1 PS-1														
(1) Dam Intake Weir	17,069.3	13,841.7	0.0	0.0	124.1	105.9	2,690.3	2,254.7	4,132.5	3,284.0	6,445.0	5,165.6	3,677.3	3,031.5
(2) Power Facilities	6,435.6	4,821.3	0.0	0.0	239.1	173.2	755.5	553.7	1,455.5	1,066.0	3,207.4	2,442.9	778.2	585.5
Sub-total (2.1)	23,504.9	18,663.0	0.0	0.0	363.2	279.1	3,445.8	2,808.4	5,588.0	4,350.9	9,652.3	7,608.5	4,455.5	3,617.0
2.2 PS-2														
(1) Intake Weir	1,603.6	1,700.3	0.0	0.0	80.2	85.0	641.4	680.1	882.0	935.2	0.0	0.0	0.0	0.0
(2) Power Facilities	3,503.8	2,680.3	0.0	0.0	141.8	103.0	1,609.7	1,169.8	1,543.0	1,236.9	209.3	170.7	0.0	0.0
Sub-total (2.2)	5,107.4	4,380.6	0.0	0.0	222.0	188.0	2,251.1	1,849.9	2,425.0	2,172.1	209.3	170.0	0.0	0.0
Sub-total (2)	28,612.3	23,043.6	0.0	0.0	585.2	467.1	5,696.9	4,658.3	8,013.0	6,522.1	9,861.7	7,779.2	4,455.5	3,617.0
3. Building Works														
3.1 PS-1	123.9	68.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.8	13.6	99.1	54.7
3.2 PS-2	123.9	68.3	0.0	0.0	0.0	0.0	0.0	0.0	66.9	36.9	56.9	31.5	0.0	0.0
Sub-total (3)	247.8	136.6	0.0	0.0	0.0	0.0	0.0	0.0	66.9	36.9	81.7	45.1	99.1	54.7
4. Metal Works														
4.1 PS-1	656.2	393.5	0.0	0.0	0.0	0.0	131.2	0.0	0.0	0.0	525.0	118.1	0.0	275.5
4.2 PS-2	1,561.0	649.7	0.0	0.0	312.0	0.0	0.0	0.0	1,248.8	324.9	0.0	324.9	0.0	0.0
Sub-total (4)	2,217.2	1,043.2	0.0	0.0	312.0	0.0	131.2	0.0	1,248.8	324.9	525.0	443.0	0.0	275.5
5. Generating Equipment and Transmission Line														
5.1 PS-1	2,771.5	254.6	0.0	0.0	0.0	0.0	554.3	0.0	0.0	0.0	2,217.2	33.1	0.0	221.5
5.2 PS-2	2,758.0	225.2	0.0	0.0	551.6	0.0	0.0	0.0	2,206.4	112.6	0.0	112.6	0.0	0.0
Sub-total (5)	5,529.5	479.8	0.0	0.0	551.6	0.0	554.3	0.0	2,206.4	112.6	2,217.2	145.7	0.0	221.5
6. Road Construction	1,535.1	1,645.5	767.5	822.8	767.5	822.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. Land Acquisition	0.0	676.3	0.0	169.1	0.0	169.1	0.0	169.1	0.0	169.1	0.0	0.0	0.0	0.0
8. Engineering Service and Administration	2,973.6	2,119.5	85.0	97.5	194.5	132.6	506.9	385.2	893.4	560.0	951.4	631.0	341.6	312.6
9. Physical Contingency	4,262.2	3,037.9	123.9	139.8	278.8	190.0	726.6	552.1	1,200.5	803.5	1,363.7	904.4	489.6	448.1
10. Price Contingency	13,011.9	12,796.1	81.2	123.0	379.0	347.8	1,526.0	1,577.3	3,697.2	3,106.1	5,073.6	4,669.1	2,254.1	2,892.8
Total	59,897.2	46,212.9	1,434.4	1,660.8	3,445.7	2,430.0	9,519.6	7,650.6	17,283.1	12,826.4	20,074.3	14,617.5	7,639.9	7,822.0

Table I-35 DISBURSED FINANCIAL CONSTRUCTION COST
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)

REEMBOLSO DEL COSTO FINANCIERO
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Item	Total		1984		1985		1986		1987		1988		1989	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. General	680.4	579.2	170.1	144.8	170.1	144.8	170.1	144.8	170.1	144.8				
2. Civil Works														
2.1 PS-1														
(1) Intake Weir	1,026.1	1,954.9	0.0	0.0	0.0	0.0	0.0	0.0	440.2	489.5	1,079.1	1,139.1	298.8	326.3
(2) Power Facilities	5,090.6	4,413.0	0.0	0.0	130.0	94.1	615.0	449.1	1,714.0	1,249.4	2,732.4	2,096.9	698.4	523.5
Sub-total (2.1)	7,716.7	6,367.9	0.0	0.0	130.0	94.1	615.0	449.1	2,163.0	1,738.9	3,811.5	3,236.0	997.2	849.8
2.2 PS-2														
(1) Intake Weir	1,359.3	1,422.0	0.0	0.0	60.0	71.1	543.7	560.8	747.6	782.1	0.0	0.0	0.0	0.0
(2) Power Facilities	3,467.5	2,652.9	0.0	0.0	141.0	103.0	1,590.7	1,159.6	1,525.7	1,219.6	209.3	170.7	0.0	0.0
Sub-total (2.2)	4,826.8	4,074.9	0.0	0.0	209.0	174.1	2,134.4	1,720.4	2,273.3	2,001.7	209.3	170.7	0.0	0.0
Sub-total (2)	12,543.5	10,442.0	0.0	0.0	339.0	268.2	2,749.4	2,177.5	4,436.3	3,740.6	4,020.8	3,406.7	997.2	849.8
3. Building Works														
3.1 PS-1	123.9	68.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.7	30.8	68.2	37.5
3.2 PS-2	123.9	68.3	0.0	0.0	0.0	0.0	0.0	0.0	68.2	37.5	55.7	30.8	60.2	37.5
Sub-total (3)	247.8	136.6	0.0	0.0	0.0	0.0	0.0	0.0	68.2	37.5	111.4	61.6	0.0	0.0
4. Metal Works														
4.1 PS-1	1,299.5	549.5	0.0	0.0	0.0	0.0	259.9	0.0	1,039.6	0.0	0.0	274.8	0.0	274.7
4.2 PS-2	1,412.2	580.5	0.0	0.0	202.4	0.0	0.0	0.0	1,129.8	290.3	0.0	290.3	0.0	0.0
Sub-total (4)	2,711.7	1,130.0	0.0	0.0	202.4	0.0	259.9	0.0	2,169.4	290.3	0.0	565.1	0.0	274.7
5. Generating Equipment and Transmission Line														
5.1 PS-1	2,427.2	213.9	0.0	0.0	0.0	0.0	485.4	0.0	1,941.8	0.0	0.0	70.6	0.0	143.3
5.2 PS-2	2,588.8	211.5	0.0	0.0	517.8	0.0	0.0	0.0	2,071.0	112.1	0.0	99.4	0.0	0.0
Sub-total (5)	5,016.0	425.4	0.0	0.0	517.8	0.0	485.4	0.0	4,012.8	112.1	0.0	170.0	0.0	143.3
6. Road Construction	1,063.9	1,139.0	531.9	569.5	532.0	569.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. Land Acquisition	0.0	243.2	0.0	60.8	0.0	60.8	0.0	60.8	0.0	60.8	0.0	0.0	0.0	0.0
8. Engineering Service and Administration	2,226.3	1,409.6	70.2	77.5	184.2	104.3	366.5	238.3	1,005.7	430.6	413.2	420.3	106.5	130.6
9. Physical Contingency	2,448.8	1,550.8	77.2	85.2	202.6	114.8	403.1	262.1	1,194.2	482.5	454.5	462.5	117.2	143.6
10. Price Contingency	6,052.4	6,261.4	51.0	75.0	275.5	210.5	847.1	740.9	3,448.0	1,913.3	1,691.2	2,307.1	539.6	927.1
Total	33,790.0	23,317.9	900.4	1,012.8	2,504.4	1,472.3	5,201.5	3,632.4	16,504.7	7,220.5	6,691.1	7,473.2	1,828.7	2,506.7

Table I-36 DISBURSED FINANCIAL CONSTRUCTION COST
(PINO DE YUNA WEIR - LOS VEGANOS WEIR COMPLEX)

REEMBOLSO DEL COSTO FINANCIERO
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Item	Total		1984		1985		1986		1987		1988		1989	
	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.	F.C.	L.C.
1. General	590.5	509.9	151.1	127.6	151.1	127.6	151.1	127.6	145.1	127.1	0.0	0.0	0.0	0.0
2. Civil Works														
2.1 PS-1														
(1) Intake Weir	1,073.1	1,118.6	0.0	0.0	0.0	0.0	0.0	0.0	205.4	306.9	787.7	811.7	0.0	0.0
(2) Power Facilities	5,116.0	3,844.4	0.0	0.0	112.2	80.6	542.1	396.2	1,584.8	1,103.2	2,539.0	1,942.5	418.9	321.9
Sub-total (2.1)	6,189.1	4,963.0	0.0	0.0	112.2	80.6	542.1	396.2	1,790.2	1,410.1	3,326.7	2,754.2	418.9	321.9
2.2 PS-2														
(1) Intake Weir	1,359.2	1,422.1	0.0	0.0	60.0	72.1	543.7	576.8	747.6	793.1	0.0	0.0	0.0	0.0
(2) Power Facilities	3,467.1	2,672.8	0.0	0.0	141.0	103.0	1,590.6	1,159.6	1,525.5	1,219.6	209.3	170.7	0.0	0.0
Sub-total (2.2)	4,826.3	4,094.9	0.0	0.0	209.7	175.1	2,134.3	1,736.4	2,273.1	2,012.7	209.3	170.7	0.0	0.0
Sub-total (2)	11,015.4	9,057.9	0.0	0.0	320.9	255.7	2,676.3	2,132.6	4,063.2	3,422.8	3,536.0	2,924.8	418.9	321.9
3. Building Works														
3.1 PS-1	123.9	60.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.7	30.8	68.2	37.6
3.2 PS-2	123.9	60.3	0.0	0.0	0.0	0.0	0.0	0.0	60.2	37.6	55.7	30.8	0.0	0.0
Sub-total (3)	247.8	136.6	0.0	0.0	0.0	0.0	0.0	0.0	60.2	37.6	111.4	61.5	68.2	37.6
4. Metal Works														
4.1 PS-1	1,299.5	549.5	0.0	0.0	0.0	0.0	259.9	0.0	1,039.6	0.0	0.0	274.8	0.0	274.8
4.2 PS-2	1,412.2	500.5	0.0	0.0	282.4	0.0	0.0	0.0	1,129.8	290.3	0.0	290.3	0.0	0.0
Sub-total (4)	2,711.7	1,130.0	0.0	0.0	282.4	0.0	259.9	0.0	2,169.4	290.3	0.0	565.1	0.0	274.8
5. Generating Equipment and Transmission Line														
5.1 PS-1	2,312.5	200.7	0.0	0.0	0.0	0.0	474.5	0.0	1,838.0	0.0	0.0	62.5	0.0	138.2
5.2 PS-2	2,588.8	211.5	0.0	0.0	517.0	0.0	0.0	0.0	2,071.0	112.1	0.0	79.4	0.0	0.0
Sub-total (5)	4,901.3	412.2	0.0	0.0	517.0	0.0	474.5	0.0	3,909.0	112.1	0.0	161.9	0.0	138.2
6. Road Construction	1,063.9	1,138.9	532.0	569.4	532.0	569.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7. Land Acquisition	0.0	152.1	0.0	50.7	0.0	50.7	0.0	50.7	0.0	0.0	0.0	0.0	0.0	0.0
8. Engineering Service and Administration	1,995.1	1,257.8	68.4	74.8	172.2	100.3	359.4	231.1	976.7	401.4	364.7	371.8	40.7	70.4
9. Physical Contingency	2,194.6	1,303.6	75.2	82.3	194.9	110.4	395.4	254.2	1,074.3	441.4	401.2	409.0	53.6	86.3
10. Price Contingency	6,144.1	5,426.4	49.6	71.9	232.0	202.1	864.0	726.2	3,259.2	1,746.7	1,492.8	2,111.0	246.6	568.5
Total	30,872.4	20,605.4	876.2	976.6	2,400.3	1,416.2	5,180.6	3,522.4	15,665.1	6,579.4	5,906.1	6,605.1	836.0	1,505.7

Table I-37 FINANCIAL REPLACEMENT COST

COSTO FINANCIERO DE REPOSICION

Unit: RD$10³

Year	Direct Cost (Electro-mechanic) F/C	Direct Cost (Electro-mechanic) L/C	Including E/S & Physical Cont. F/C	Including E/S & Physical Cont. L/C	Incl. Price Escalation F/C	Incl. Price Escalation L/C	90% of Total Investment F/C	90% of Total Investment L/C
PLAN-A (El Torito Dam - Los Veganos Weir)								
37th	863.8	0.0	1,021.4	0.0	1,147.6	0.0	1,032.8	0.0
38th	685.5	0.0	810.6	0.0	965.4	0.0	868.9	0.0
39th	3,455.2	437.5	4,085.8	517.3	5,158.2	703.8	4,642.4	633.4
40th	2,742.2	588.7	3,242.7	696.1	4,339.5	1,022.8	3,905.6	920.5
41st	0.0	497.0	0.0	587.7	0.0	932.6	0.0	839.3
Total	7,746.7	1,523.2	9,160.5	1,801.1	11,610.7	2,659.2	10,449.7	2,393.2
PLAN-B (El Torito Weir - Los Veganos Weir)								
37th	800.2	0.0	968.2	0.0	1,087.9	0.0	979.1	0.0
38th	745.3	0.0	901.8	0.0	1,074.1	0.0	966.7	0.0
39th	6,182.2	402.4	7,480.4	486.9	9,443.8	662.4	8,499.4	596.2
40th	0.0	735.1	0.0	889.5	0.0	1,307.0	0.0	1,176.3
41st	0.0	418.1	0.0	505.9	0.0	802.8	0.0	722.5
Total	7,727.7	1,555.6	9,350.4	1,882.3	11,605.8	2,771.9	10,445.2	2,495.0
PLAN-C (Pino de Yuna - Los Veganos Weir)								
37th	800.2	0.0	968.2	0.0	1,087.9	0.0	979.1	0.0
38th	734.4	0.0	888.6	0.0	1,058.3	0.0	952.5	0.0
39th	6,138.5	402.4	7,427.6	486.9	9,377.2	662.4	8,439.5	596.2
40th	0.0	732.6	0.0	886.4	0.0	1,302.4	0.0	1,172.2
41st	0.0	413.0	0.0	499.7	0.0	793.0	0.0	713.7
Total	7,673.1	1,548.0	9,284.4	1,873.0	11,523.4	2,757.8	10,371.1	2,482.1

Table I-38 FINANCIAL INTERNAL RATE OF RETURN (1)
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)
TASA INTERNA DE RETORNO FINANCIERO (1)
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Costs					Revenue			Surplus
	Capital/Replace. Cost(FC)	Cost(LC)	O&M Cost	Ener. Sales Cost	Total Costs	Primary Energy	Second-ary Ener.	Total Benefits	
1	1,434.4	1,660.8			3,095.2				-3,095.2
2	3,445.7	2,438.0			5,883.7				-5,883.7
3	9,519.6	7,650.6			17,170.2				-17,170.2
4	17,783.1	12,024.4			29,807.5				-29,807.5
5	20,074.3	14,617.5	132.6	607.5	35,431.9	1,222.9	1,475.2	2,698.1	-32,733.8
6	7,639.9	7,822.0	397.9	1,768.5	17,628.3	3,882.2	3,972.8	7,855.0	-9,773.3
7-36			530.6	2,322.1	2,852.7	5,318.6	4,995.1	10,313.7	7,461.0
37	1,032.8		530.6	2,322.1	3,885.5	5,318.6	4,995.1	10,313.7	6,428.2
38	868.9		530.6	2,322.1	3,721.6	5,318.6	4,995.1	10,313.7	6,592.1
39	4,642.4	633.4	530.6	2,322.1	8,128.5	5,318.6	4,995.1	10,313.7	2,185.2
40	3,905.6	920.5	530.6	2,322.1	7,678.8	5,318.6	4,995.1	10,313.7	2,634.9
41		839.3	530.6	2,322.1	3,692.0	5,318.6	4,995.1	10,313.7	6,621.7
42-50			530.6	2,322.1	2,852.7	5,318.6	4,995.1	10,313.7	7,461.0

Financial Internal Rate of Return: 6.1%

Table I-39 FINANCIAL INTERNAL RATE OF RETURN (2)
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)

TASA INTERNA DE RETORNO FINANCIERO (2)
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Costs					Revenue			Surplus
	Capital/Replace. Cost(FC)	Cost(LC)	O&M Cost	Ener.Sales Cost	Total Costs	Primary Energy	Second-ary Ener.	Total Benefits	
1	900.4	1,012.8			1,913.2				-1,913.2
2	2,504.4	1,472.3			3,976.7				-3,976.7
3	5,281.5	3,632.4			8,913.9				-8,913.9
4	16,584.7	7,220.5			23,805.2				-23,805.2
5	6,691.1	7,473.2	71.4	515.7	14,751.4	1,285.6	1,429.4	2,715.0	-12,036.4
6	1,828.7	2,506.7	214.2	1,499.0	6,064.4	3,958.3	4,465.8	8,424.2	2,359.8
7-36			285.5	1,966.6	2,252.1	4,089.3	4,645.7	8,735.0	6,482.9
37	979.1		285.5	1,966.6	3,231.2	4,089.3	4,645.7	8,735.0	5,503.8
38	966.7		285.5	1,966.6	3,218.8	4,089.3	4,645.7	8,735.0	5,516.2
39	8,499.4	596.2	285.5	1,966.6	11,347.7	4,089.3	4,645.7	8,735.0	-2,612.7
40		1,176.3	285.5	1,966.6	3,428.4	4,089.3	4,645.7	8,735.0	5,306.6
41		722.5	285.5	1,966.6	2,974.6	4,089.3	4,645.7	8,735.0	5,760.4
42-50			285.5	1,966.6	2,252.1	4,089.3	4,645.7	8,735.0	6,482.9

Financial Internal Rate of Return: 10.1%

Table I-40 FINANCIAL INTERNAL RATE OF RETURN (3)
(PINO DE YUNA - LOS VEGANOS WEIR COMPLEX)
TASA INTERNA DE RETORNO FINANCIERO (3)
(DERIVADORA PINO DE YUNA - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

Year	Costs					Revenue			Surplus
	Capital/Replace. Cost(FC)	Cost(LC)	O&M Cost	Ener. Sales Cost	Total Costs	Primary Energy	Secondary Ener.	Total Benefits	
1	876.2	976.6			1,852.8				-1,852.8
2	2,408.3	1,416.2			3,824.5				-3,824.5
3	5,180.6	3,522.4			8,703.0				-8,703.0
4	15,665.1	6,579.4			22,244.5				-22,244.5
5	5,906.1	6,605.1	60.7	515.7	13,087.6	1,069.1	1,229.4	2,290.5	-10,797.1
6	836.0	1,505.7	182.1	1,416.0	3,939.8	2,944.0	3,345.2	6,289.2	2,349.4
7-36			242.8	1,800.5	2,043.4	3,765.8	4,231.6	7,997.4	5,954.1
37	979.1		242.8	1,800.5	3,022.4	3,765.8	4,231.6	7,997.4	4,975.0
38	952.5		242.8	1,800.5	2,995.8	3,765.8	4,231.6	7,997.4	5,001.6
39	8,439.5	596.2	242.8	1,800.5	11,079.0	3,765.8	4,231.6	7,997.4	-3,080.7
40		1,172.2	242.8	1,800.5	3,215.5	3,765.8	4,231.6	7,997.4	4,781.[illegible]
41		713.7	242.8	1,800.5	2,757.0	3,765.8	4,231.6	7,997.4	5,240.3
42-50			242.8	1,800.5	2,043.3	3,765.8	4,231.6	7,997.4	5,954.1

Financial Internal Rate of Return: 10.1%

Table I-41 FINANCIAL INTERNAL RATE OF RETURN (4)

(EL TORITO DAM: SINGLE)

TASA INTERNA DE RETORNO FINANCIERO (4)

(PRESA EL TORITO SOLO)

Unit: RD$10^3

Year	Costs					Revenue			Surplus
	Capital/Replace. Cost(FC)	Cost(LC)	O&M Cost	Ener.Sales Cost	Total Costs	Primary Energy	Secondary Ener.	Total Benefits	
1	1,044.4	1,213.6			2,258.0				-2,258.0
2	1,590.0	1,695.7			3,285.7				-3,285.7
3	6,250.8	4,758.7			11,009.5				-11,009.5
4	8,800.5	7,619.4			16,419.9				-16,419.9
5	19,653.0	13,505.9			33,158.9				-33,158.9
6	7,369.8	7,828.8	101.7	276.8	15,577.1	718.2	511.2	1,229.4	-14,347.7
7-37			406.7	1,107.1	1,513.8	2,872.8	2,044.6	4,917.4	3,403.6
38	1,058.9		406.7	1,107.1	2,572.7	2,872.8	2,044.6	4,917.4	2,344.7
39			406.7	1,107.1	1,513.8	2,872.8	2,044.6	4,917.4	3,403.6
40	4,236.1	261.3	406.7	1,107.1	6,011.2	2,872.8	2,044.6	4,917.4	-1,093.8
41		858.9	406.7	1,107.1	2,372.7	2,872.8	2,044.6	4,917.4	2,544.7
42-50			406.7	1,107.1	1,513.8	2,872.8	2,044.6	4,917.4	3,403.6

Financial Internal Rate of Return: 2.7%

Table I-42 FINANCIAL INTERNAL RATE OF RETURN (5)
(EL TORITO WEIR: SINGLE)
TASA INTERNA DE RETORNO FINANCIERO (5)
(DERIVADORA EL TORITO SOLO)

Unit: RD$10^3

Year	Costs					Revenue			Surplus
	Capital/Replace. Cost(FC)	Cost(LC)	O&M Cost	Ener.Sales Cost	Total Costs	Primary Energy	Secondary Ener.	Total Benefits	
1	505.7	575.5			1,081.2				-1,081.2
2	712.9	753.0			1,465.9				-1,465.9
3	2,102.2	863.2			2,965.4				-2,965.4
4	8,017.6	3,057.9			11,075.5				-11,075.5
5	6,262.0	6,422.8			12,684.8				-12,684.8
6	1,828.7	2,506.7	84.0	467.6	4,887.0	983.5	1,093.5	2,077.0	-2,810.1
7-37			168.0	935.2	1,103.3	1,967.0	2,187.0	4,154.0	3,050.7
38	1,074.1		168.0	935.2	2,177.4	1,967.0	2,187.0	4,154.0	1,976.6
39	4,099.0		168.0	935.2	5,202.3	1,967.0	2,187.0	4,154.0	-1,048.2
40		552.7	168.0	935.2	1,656.0	1,967.0	2,187.0	4,154.0	2,498.0
41		722.5	168.0	935.2	1,825.8	1,967.0	2,187.0	4,154.0	2,328.2
42-50			168.0	935.2	1,103.3	1,967.0	2,187.0	4,154.0	3,050.7

Financial Internal Rate of Return: 7.9%

Table I-43 FINANCIAL INTERNAL RATE OF RETURN (6)
(PINO DE YUNA WEIR SINGLE)
TASA INTERNA DE RETORNO FINANCIERO (6)
(DERIVADORA PINO DE YUNA SOLO)

Unit: RD$10^3

Year	Costs					Revenue			Surplus
	Capital/Replace. Cost(FC)	Cost(LC)	O&M Cost	Ener. Sales Cost	Total Costs	Primary Energy	Secondary Ener.	Total Benefits	
1	481.5	534.0			1,015.5				-1,015.5
2	942.1	690.4			1,632.5				-1,632.5
3	1,961.8	753.2			2,715.0				-2,715.0
4	7,098.0	2,427.9			9,525.9				-9,525.9
5	5,477.0	5,555.5			11,032.5				11,032.5
6	836.0	1,505.7	71.5	384.6	2,797.8	821.7	886.4	1,708.1	-1,089.7
7-37			143.1	769.2	912.3	1,643.5	1,772.9	3,416.4	2,504.1
38	1,134.5		143.1	769.2	2,046.8	1,634.5	1,772.9	3,416.4	1,369.6
39	4,538.1		143.1	769.2	5,450.4	1,643.5	1,772.9	3,416.4	-2,034.0
40		592.6	143.1	769.2	1,504.9	1,643.5	1,772.9	3,416.4	1,911.5
41		713.7	143.1	769.2	1,626.0	1,643.5	1,772.9	3,416.4	1,790.4
42-50			143.1	769.2	912.3	1,643.5	1,772.9	3,416.9	2,504.1

Financial Internal Rate of Return: 7.58

Table I-44 FINANCIAL INTERNAL RATE OF RETURN (7)
(LOS VEGANOS WEIR: SINGLE WITH DAM)
TASA INTERNA DE RETORNO FINANCIERO (7)
(DERIVADORA LOS VEGANOS SOLO CON PRESA)

Unit: RD$10^3

Year	Costs					Revenue			Surplus
	Capital/Replace. Cost(FC)	Cost(LC)	O&M Cost	Ener. Sales Cost	Total Costs	Primary Energy	Secondary Ener.	Total Benefits	
1	390.0	447.2			837.2				-837.2
2	1,855.7	742.3			2,598.0				-2,598.0
3	3,268.8	2,891.9			6,160.7				-6,160.7
4	8,982.6	4,405.0			13,387.6				-13,387.6
5	421.3	1,111.6	61.3	607.5	2,201.7	1,222.9	1,475.2	2,698.1	496.4
6-36			122.6	1,214.9	1,337.5	2,445.8	2,950.5	5,396.3	4,058.8
37	1,057.0		122.6	1,214.9	2,394.5	2,445.8	2,950.5	5,396.3	3,001.8
38			122.6	1,214.9	1,337.5	2,445.8	2,950.5	5,396.3	4,058.8
39	4,750.4	648.2	122.6	1,214.9	6,736.1	2,445.8	2,950.5	5,396.3	-1,339.8
40		700.1	122.6	1,214.9	2.037.6	2,445.8	2,950.5	5,396.3	3,358.7
41-50				1,214.9	1,337.5	2,445.8	2,950.5	5,396.3	4,058.8

Financial Internal Rate of Return: 14.2%

Table I-45 FINANCIAL INTERNAL RATE OF RETURN (8)
(LOS VEGANOS WEIR: SINGLE WITH WEIR)
TASA INTERNA DE RETORNO FINANCIERO (8)
(DERIVADORA LOS VEGANOS SOLO CON DERIVADORA)

Unit: RD$ 10^3

Year	Costs					Revenue			Surplus
	Capital/Replace. Cost(FC)	Cost(LC)	O&M Cost	Ener.Sales Cost	Total Costs	Primary Energy	Secondary Ener.	Total Benefits	
1	394.7	437.3			832.0				-832.0
2	1,791.5	719.3			2,510.8				-2,510.8
3	3,179.3	2,769.2			5,948.5				-5,948.5
4	8,567.1	4,162.1			12,729.2				-12,729.2
5	429.1	1,050.4	58.8	477.5	2,015.8	1,061.2	1,229.4	2,290.6	274.8
6-36			117.5	955.0	1,072.5	2,122.3	2,458.7	4,581.0	3,508.5
37	1,166.2		117.5	955.0	2,238.7	2,122.3	2,458.7	4,581.0	2,342.3
38			117.5	955.0	1,072.5	2,122.3	2,458.7	4,581.0	3,508.5
39	4,664.6	633.8	117.5	955.0	6,370.9	2,122.3	2,458.7	4,581.0	-1,789.9
40		633.8	117.5	955.0	1,706.3	2,122.3	2,458.7	4,581.0	2,874.7
51-50			117.5	955.0	1,072.5	2,122.3	2,458.7	4,581.0	3,508.5

Financial Internal Rate of Return: 13.0% .

Table I-46 REPAYMENT ANALYSIS
(EL TORITO DAM - LOS VEGANOS WEIR COMPLEX)

ANALISIS DE CAPACIDAD DE REEMBOLSO
(PRESA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

S. No.	Year	Income: Int'l Loan for Const. Work/Δ	Income: Government Bond/Δ: For Const. Work	Income: Government Bond/Δ: For Associated Cost	Income: Government Bond/Δ: For Interest	Income: Power Revenue	Income: Gross Income (1)	Expenditure: Const. Work: F.C. Portion	Expenditure: Const. Work: L.C. Portion	Expenditure: Associated Cost	Expenditure: Loan Repayment/Δ	Expenditure: Redemption for Government Bond: For Interest	Expenditure: Redemption for Government Bond: For Principal	Expenditure: O & M Cost	Expenditure: Gross Expenditure(2)	Surplus (1)-(2)	Cumulative Surplus
1	1984	1,434.4	1,660.8				3,095.2	1,434.4	1,660.8						3,095.2	0	0
2	1985	3,445.7	2,438.8		166.1		6,050.6	3,445.7	2,438.8			166.1			6,050.6	0	0
3	1986	9,519.6	2,650.6	2,078.5	426.5		15,675.2	9,519.6	2,650.6	2,078.5		426.5			15,675.2	0	0
4	1987	17,783.1	12,024.4	2,244.0	1,442.1		33,494.4	17,783.1	12,024.4	2,244.0		1,442.1			33,494.4	0	0
5	1988	20,074.3	14,613.5		3,013.2		37,705.0	20,074.3	14,613.5			3,013.2			37,705.0	0	0
6	1989	7,639.9	7,822.0		2,210.7	2,698.1	20,370.7	7,639.9	7,822.0			4,726.2		132.6	20,370.7	0	0
7	1990					7,655.0	7,655.0					5,779.5	1,877.6	393.3	7,655.0	0	0
8	1991					10,313.0	10,313.0					5,611.8	4,171.4	530.6	10,313.0	0	0
9	1992					10,313.0	10,313.0					5,154.6	4,588.6	530.6	10,313.0	0	0
10	1993					10,313.0	10,313.0					4,735.0	5,047.4	530.6	10,313.0	0	0
11	1994					10,313.0	10,313.0				5,143.5	4,231.0	410.2	530.6	10,313.0	0	0
12	1995					10,313.0	10,313.0				5,143.5	4,150.0	451.7	530.6	10,313.0	0	0
13	1996					10,313.0	10,313.0				5,143.5	4,144.0	436.9	530.6	10,313.0	0	0
14	1997					10,313.0	10,313.0				5,143.5	4,095.1	546.6	530.6	10,313.0	0	0
15	1998					10,313.0	10,313.0				5,143.5	4,049.4	601.3	530.6	10,313.0	0	0
16	1999					10,313.0	10,313.0				5,143.5	3,949.3	663.4	530.6	10,313.0	0	0
17	2000					10,313.0	10,313.0				5,143.5	3,914.2	727.5	530.6	10,313.0	0	0
18	2001					10,313.0	10,313.0				5,143.5	3,841.4	800.3	530.6	10,313.0	0	0
19	2002				5,068.5	10,313.0	15,382.7				5,143.5	3,751.4	9,543.7	530.6	15,382.7	0	0
20	2003				16,047.2	10,313.0	26,576.0				5,143.5	3,633.3	17,439.6	530.6	26,576.0	0	0
21	2004				8,957.4	10,313.0	19,291.2				5,143.5	3,576.5	10,032.6	530.6	19,291.2	0	0
22	2005					10,313.0	10,313.0				5,143.5	3,430.0	1,371.2	530.6	10,313.0	0	0
23	2006					10,313.0	10,313.0				5,143.5	3,352.0	1,281.9	530.6	10,313.0	0	0
24	2007					10,313.0	10,313.0				5,143.5	3,223.0	1,411.8	530.6	10,313.0	0	0
25	2008					10,313.0	10,313.0				5,143.5	3,082.2	1,559.5	530.6	10,313.0	0	0
26	2009					10,313.0	10,313.0				5,143.5	2,936.2	1,715.5	530.6	10,313.0	0	0
27	2010					10,313.0	10,313.0				5,143.5	2,754.6	1,887.3	530.6	10,313.0	0	0
28	2011					10,313.0	10,313.0				5,143.5	2,545.9	2,075.8	530.6	10,313.0	0	0
29	2012					10,313.0	10,313.0				5,143.5	2,358.4	2,283.3	530.6	10,313.0	0	0
30	2013					10,313.0	10,313.0				5,143.5	2,330.0	2,511.7	530.6	10,313.0	0	0
31	2014					10,313.0	10,313.0					1,879.9	7,904.3	530.6	10,313.0	0	0
32	2015					10,313.0	10,313.0					1,668.4	8,114.0	530.6	10,313.0	0	0
33	2016					10,313.0	10,313.0					213.0	7,189.5	530.6	7,939.3	2,374.3	2,374.3
34	2017					10,313.0	10,313.0							530.6	530.6	9,783.2	12,157.9
35	2018					10,313.0	10,313.0							530.6	530.6	9,783.2	26,941.1
36	2019					10,313.0	10,313.0							530.6	530.6	9,783.2	36,724.3
37	2020					10,313.0	10,313.0	1,032.8						530.6	1,563.4	8,750.4	45,474.7
38	2021					10,313.0	10,313.0	852.9						530.6	1,383.5	8,914.3	54,383.0
39	2022					10,313.0	10,313.0	4,042.8	833.8					530.6	5,406.8	4,907.4	58,835.4
40	2023					10,313.0	10,313.0	3,905.6	329.5					530.6	4,765.7	5,547.3	63,853.5
41	2024					10,313.0	10,313.0		839.3					530.6	1,369.9	8,943.9	72,797.4
42	2025					10,313.0	10,313.0							530.6	530.6	9,783.2	82,580.6
43	2026					10,313.0	10,313.0							530.6	530.6	9,783.2	92,363.8
44	2027					10,313.0	10,313.0							530.6	530.6	9,783.2	102,147.0
45	2028					10,313.0	10,313.0							530.6	530.6	9,783.2	111,930.2
46	2029					10,313.0	10,313.0							530.6	530.6	9,783.2	121,713.4
47	2030					10,313.0	10,313.0							530.6	530.6	9,783.2	131,496.6
48	2031					10,313.0	10,313.0							530.6	530.6	9,783.2	141,279.8
49	2032					10,313.0	10,313.0							530.6	530.6	9,783.2	151,063.0
50	2033					10,313.0	10,313.0							530.6	530.6	9,783.2	160,845.2

Δ: International Loan Interest : 3.5%/annum
Grace period : 10 years
Repayment period: 20 years

Δ: Government Bond: Interest : 10%/annum
Repayment period: 15 years

Δ: Repayment of interest and principal calculated by a capital recovery factor.

Table I-47 REPAYMENT ANALYSIS
(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)

ANALISIS DE CAPACIDAD DE REEMBOLSO
(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

S. No.	Year	Income: Int'l Loan for Const. Work/1	Income: Government Bond/2 For Const. Work	Income: Government Bond/2 For Associated Cost	Income: Government Bond/2 For Interest	Income: Power Revenue	Income: Gross Income (I)	Expenditure: Const. Work F.C. Portion	Expenditure: Const. Work L.C. Portion	Expenditure: Associated Cost	Expenditure: Loan Repayment/3	Expenditure: Relaxation for Government Bond For Interest	Expenditure: Relaxation for Government Bond For Principal	Expenditure: O & M Cost	Expenditure: Gross Expenditure (2)	Surplus (1)-(2)	Cumulative Surplus
1	1984	900.4	1,012.8				1,913.2	900.4	1,012.8						1,913.2	0	0
2	1985	2,504.4	1,472.3		101.1		4,078.6	2,504.4	1,472.1			101.3			4,078.6	0	0
3	1986	5,291.5	3,632.4	1,354.2	258.6		10,526.7	5,291.5	3,632.4	1,354.2		258.6			10,526.7	0	0
4	1987	16,584.3	3,220.5	1,452.5	283.2		26,650.9	16,584.3	3,220.5	1,452.5		283.2			26,650.9	0	0
5	1988	6,691.1	3,473.2		1,329.8		15,034.1	6,691.1	3,473.2			1,329.8			15,034.1	0	0
6	1989	1,028.7	2,506.7		431.4	2,693.5	7,658.9	1,028.7	2,506.7			2,650.1		71.4	7,658.9	0	0
7	1990					6,658.0	6,658.0					2,543.9	3,439.9	214.2	6,658.0	0	0
8	1991					8,735.0	8,735.0					2,591.9	5,855.6	265.5	8,735.0	0	0
9	1992					8,735.0	8,735.0					2,608.3	6,441.2	265.5	8,735.0	0	0
10	1993					8,735.0	8,735.0					2,364.2	7,065.3	265.5	8,735.0	0	0
11	1994					8,735.0	8,735.0				2,932.4	655.6	4,851.5	265.5	8,735.0	0	0
12	1995					8,735.0	8,735.0				2,932.4	149.5	1,695.0	265.5	5,042.4	3,692.6	3,692.6
13	1996					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	9,169.7
14	1997					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	14,686.8
15	1998					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	20,203.9
16	1999					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	25,721.0
17	2000					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	31,238.1
18	2001					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	36,755.2
19	2002					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	42,272.3
20	2003					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	47,789.4
21	2004					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	53,306.5
22	2005					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	58,823.6
23	2006					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	64,340.7
24	2007					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	69,857.8
25	2008					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	75,374.9
26	2009					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	80,892.0
27	2010					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	86,409.1
28	2011					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	91,926.2
29	2012					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	97,443.3
30	2013					8,735.0	8,735.0				2,932.4			265.5	3,217.9	5,517.1	102,960.4
31	2014					8,735.0	8,735.0							265.5	265.5	8,469.5	111,429.9
32	2015					8,735.0	8,735.0							265.5	265.5	8,469.5	119,859.4
33	2016					8,735.0	8,735.0							265.5	265.5	8,469.5	128,328.9
34	2017					8,735.0	8,735.0							265.5	265.5	8,469.5	136,798.4
35	2018					8,735.0	8,735.0							265.5	265.5	8,469.5	145,267.9
36	2019					8,735.0	8,735.0							265.5	265.5	8,469.5	153,737.4
37	2020					8,735.0	8,735.0	979.1						265.5	1,244.6	7,490.4	161,227.8
38	2021					8,735.0	8,735.0	566.7						265.5	832.2	7,902.8	169,630.6
39	2022					8,735.0	8,735.0	8,459.4	536.2					265.5	9,261.1	-526.1	167,554.5
40	2023					8,735.0	8,735.0		1,876.3					265.5	2,141.8	6,593.2	175,227.7
41	2024					8,735.0	8,735.0		222.5					265.5	488.0	8,247.0	182,954.7
42	2025					8,735.0	8,735.0							265.5	265.5	8,469.5	191,424.2
43	2026					8,735.0	8,735.0							265.5	265.5	8,469.5	199,893.7
44	2027					8,735.0	8,735.0							265.5	265.5	8,469.5	208,363.2
45	2028					8,735.0	8,735.0							265.5	265.5	8,469.5	216,832.7
46	2029					8,735.0	8,735.0							265.5	265.5	8,469.5	225,292.2
47	2030					8,735.0	8,735.0							265.5	265.5	8,469.5	233,691.7
48	2031					8,735.0	8,735.0							265.5	265.5	8,469.5	242,181.2
49	2032					8,735.0	8,735.0							265.5	265.5	8,469.5	250,650.7
50	2033					8,735.0	8,735.0							265.5	265.5	8,469.5	259,000.2

/1: International Loan Interest : 3.5%/annum
Grace period : 10 years
Repayment period: 20 years

/2: Government Bond: Interest : 10%/annum
Repayment period: 15 years

/3: Repayment of interest and principal calculated by a capital recovery factor.

Table I - 48 REPAYMENT ANALYSIS

(EL TORITO WEIR - LOS VEGANOS WEIR COMPLEX)

ANALISIS DE CAPACIDAD DE REEMBOLSO

(DERIVADORA EL TORITO - DERIVADORA LOS VEGANOS)

Unit: RD$10^3

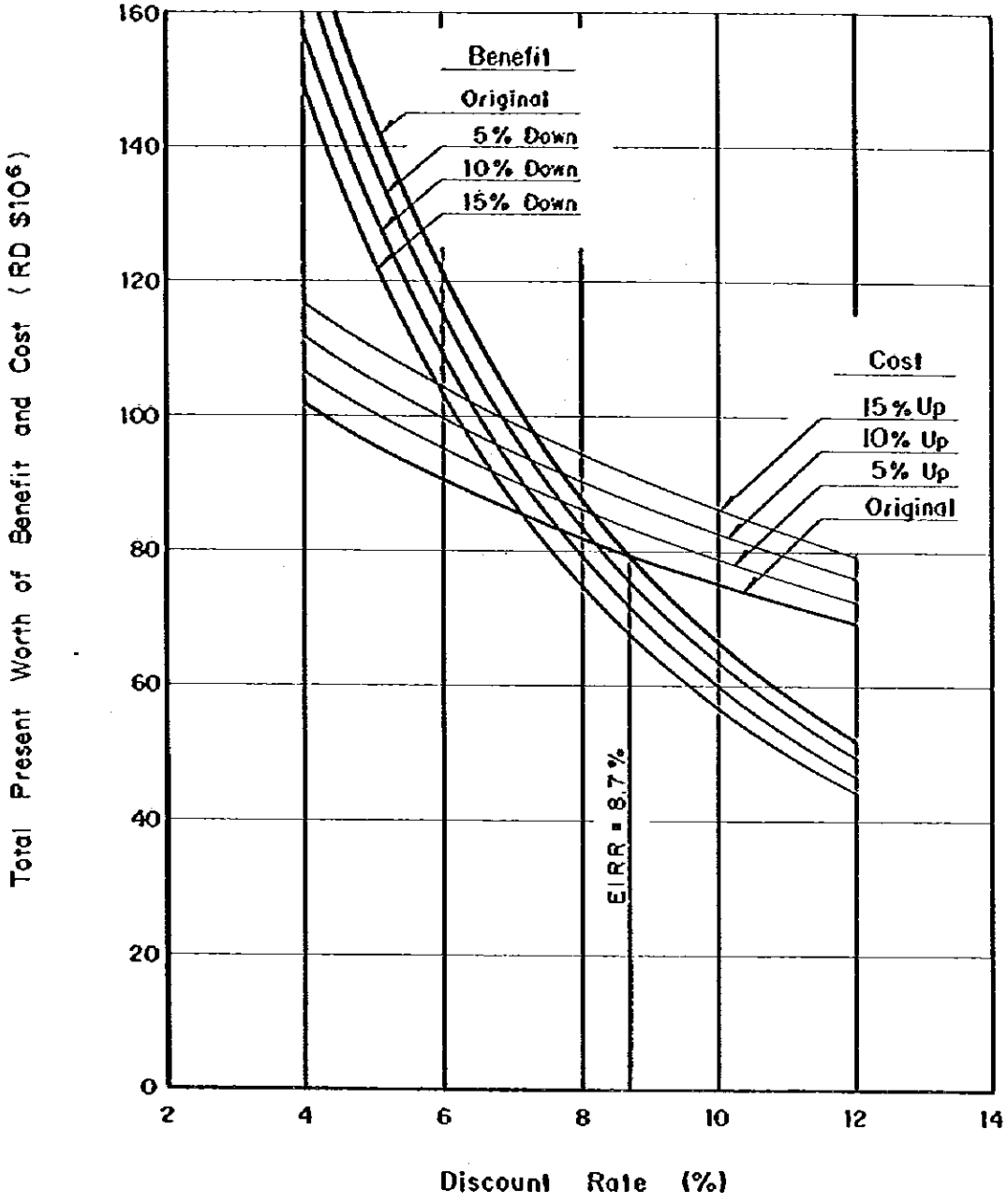
S. No.	Year	Income: Int'l Loan for Const. Work/1	Income: Government Bond/2 For Const. Work	Income: Government Bond/2 For Associated Cost	Income: Government Bond/2 For Interest	Income: Power Revenue	Income: Gross Income (1)	Expenditure: Const. Work F.C. Portion	Expenditure: Const. Work L.C. Portion	Expenditure: Associated Cost	Expenditure: Loan Repayment/3	Expenditure: Subsidies for Government Bond For Interest	Expenditure: Subsidies for Government Bond For Principal	Expenditure: O & M Cost	Expenditure: Gross Expenditure(2)	Surplus (1)-(2)	Cumulative Surplus
1	1954	990.4	1,012.4				1,913.2	990.4	1,012.8						1,913.2	0	0
2	1955	2,564.4	1,472.3		181.3		4,078.0	2,564.4	1,472.3			181.3			4,078.0	0	0
3	1956	5,281.5	3,632.3	1,354.2	258.6		10,526.7	5,281.5	3,632.4	1,354.2		258.6			10,526.7	0	0
4	1957	16,584.7	7,220.5	1,452.5	783.2		26,050.9	16,584.7	7,220.5	1,452.5		783.2			26,050.9	0	0
5	1958	6,631.1	7,473.2		1,729.8		15,834.1	6,631.1	7,473.2			1,729.8			15,834.1	0	0
6	1959	1,828.7	2,506.7		431.0	2,292.5	7,056.9	1,828.7	2,506.7			2,650.1		71.4	7,056.9	0	0
7	1990					6,658.0	6,658.0					2,913.9	3,493.9	210.2	6,658.0	0	0
8	1991					8,735.0	8,735.0					2,533.9	5,855.6	265.5	8,735.0	0	0
9	1992					8,735.0	8,735.0					2,058.3	6,441.2	265.5	8,735.0	0	0
10	1993					8,735.0	8,735.0					1,384.2	7,085.3	265.5	8,735.0	0	0
11	1994					8,735.0	8,735.0				5,512.7	655.6	2,281.2	265.5	8,735.0	0	0
12	1995					8,735.0	8,735.0				5,512.7	427.5	2,509.3	265.5	8,735.0	0	0
13	1996					8,735.0	8,735.0				5,512.7	176.6	1,756.0	265.5	7,710.8	954.2	954.2
14	1997					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	3,911.0
15	1998					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	6,867.8
16	1999					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	9,824.6
17	2000					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	12,781.4
18	2001					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	15,678.2
19	2002					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	18,615.0
20	2003					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	21,551.8
21	2004					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	24,488.6
22	2005					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	27,425.4
23	2006					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	30,362.2
24	2007					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	33,299.0
25	2008					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	36,235.8
26	2009					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	39,172.6
27	2010					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	42,109.4
28	2011					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	45,046.2
29	2012					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	47,983.0
30	2013					8,735.0	8,735.0				5,512.7			265.5	5,778.2	2,956.8	50,919.8
31	2014					8,735.0	8,735.0							265.5	265.5	8,469.5	59,389.3
32	2015					8,735.0	8,735.0							265.5	265.5	8,469.5	67,858.8
33	2016					8,735.0	8,735.0							265.5	265.5	8,469.5	76,328.3
34	2017					8,735.0	8,735.0							265.5	265.5	8,469.5	84,797.8
35	2018					8,735.0	8,735.0							265.5	265.5	8,469.5	93,267.3
36	2019					8,735.0	8,735.0							265.5	265.5	8,469.5	101,736.8
37	2020					8,735.0	8,735.0	979.1						265.5	1,244.6	7,490.4	109,227.2
38	2021					8,735.0	8,735.0	955.1						265.5	1,220.6	7,514.4	116,741.6
39	2022					8,735.0	8,735.0	8,439.6	595.2					265.5	9,301.1	-565.1	116,176.5
40	2023					8,735.0	8,735.0		1,179.3					265.5	1,444.8	7,290.2	123,466.7
41	2024					8,735.0	8,735.0		727.5					265.5	1,000.0	7,735.0	131,201.7
42	2025					8,735.0	8,735.0							265.5	265.5	8,469.5	139,671.2
43	2026					8,735.0	8,735.0							265.5	265.5	8,469.5	148,140.7
44	2027					8,735.0	8,735.0							265.5	265.5	8,469.5	156,610.2
45	2028					8,735.0	8,735.0							265.5	265.5	8,469.5	165,079.7
46	2029					8,735.0	8,735.0							265.5	265.5	8,469.5	173,549.2
47	2030					8,735.0	8,735.0							265.5	265.5	8,469.5	182,018.7
48	2031					8,735.0	8,735.0							265.5	265.5	8,469.5	190,488.2
49	2032					8,735.0	8,735.0							265.5	265.5	8,469.5	198,957.7
50	2033					8,735.0	8,735.0							265.5	265.5	8,469.5	207,427.2

/1: International loan: Interest : 8.5%/annum
Grace period : 10 years
Repayment period: 22 years

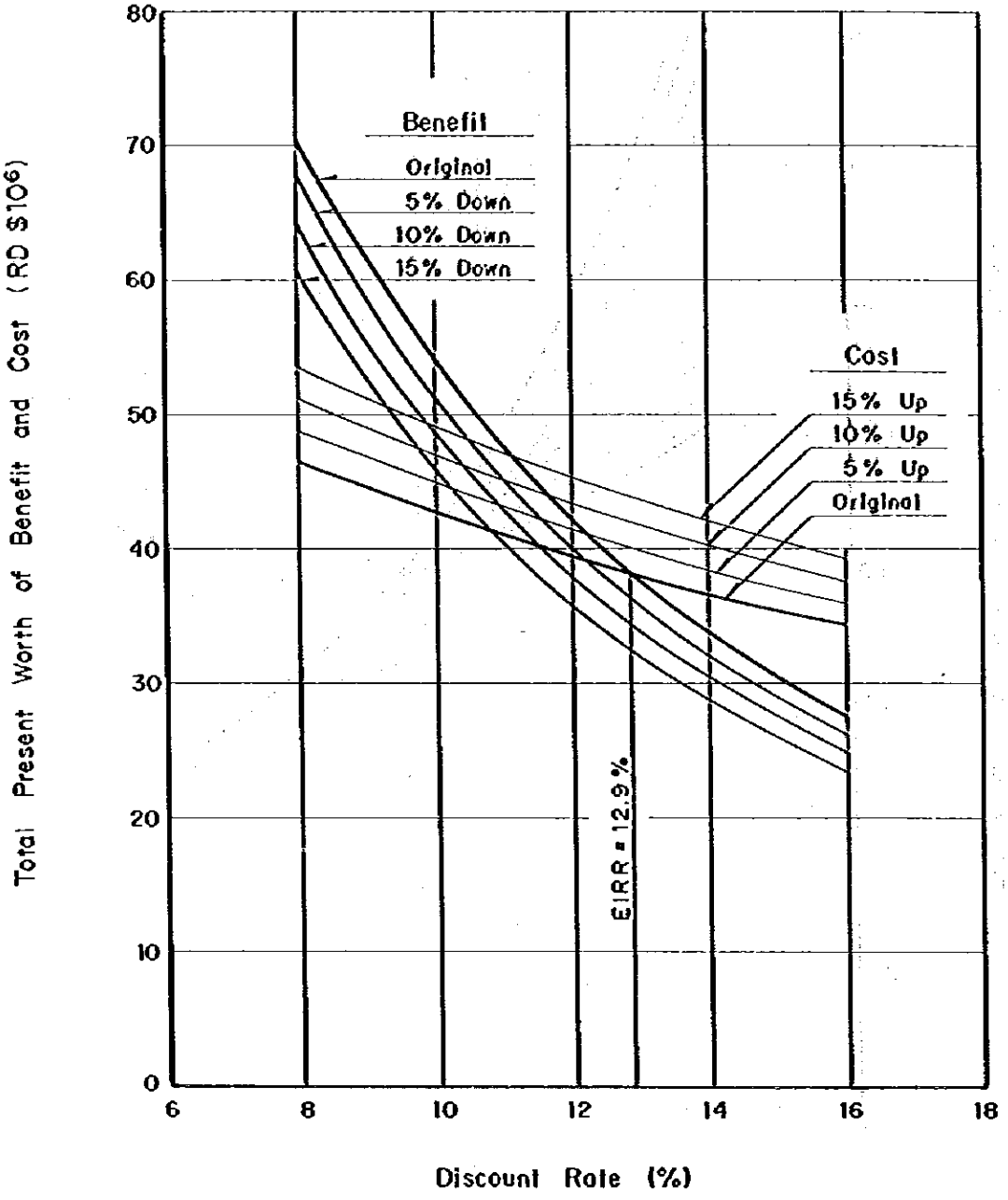
/2: Government Bond: Interest : 11%/annum
Repayment period: 15 years

/3: Repayment of interest and principal calculated by a capital recovery factor.

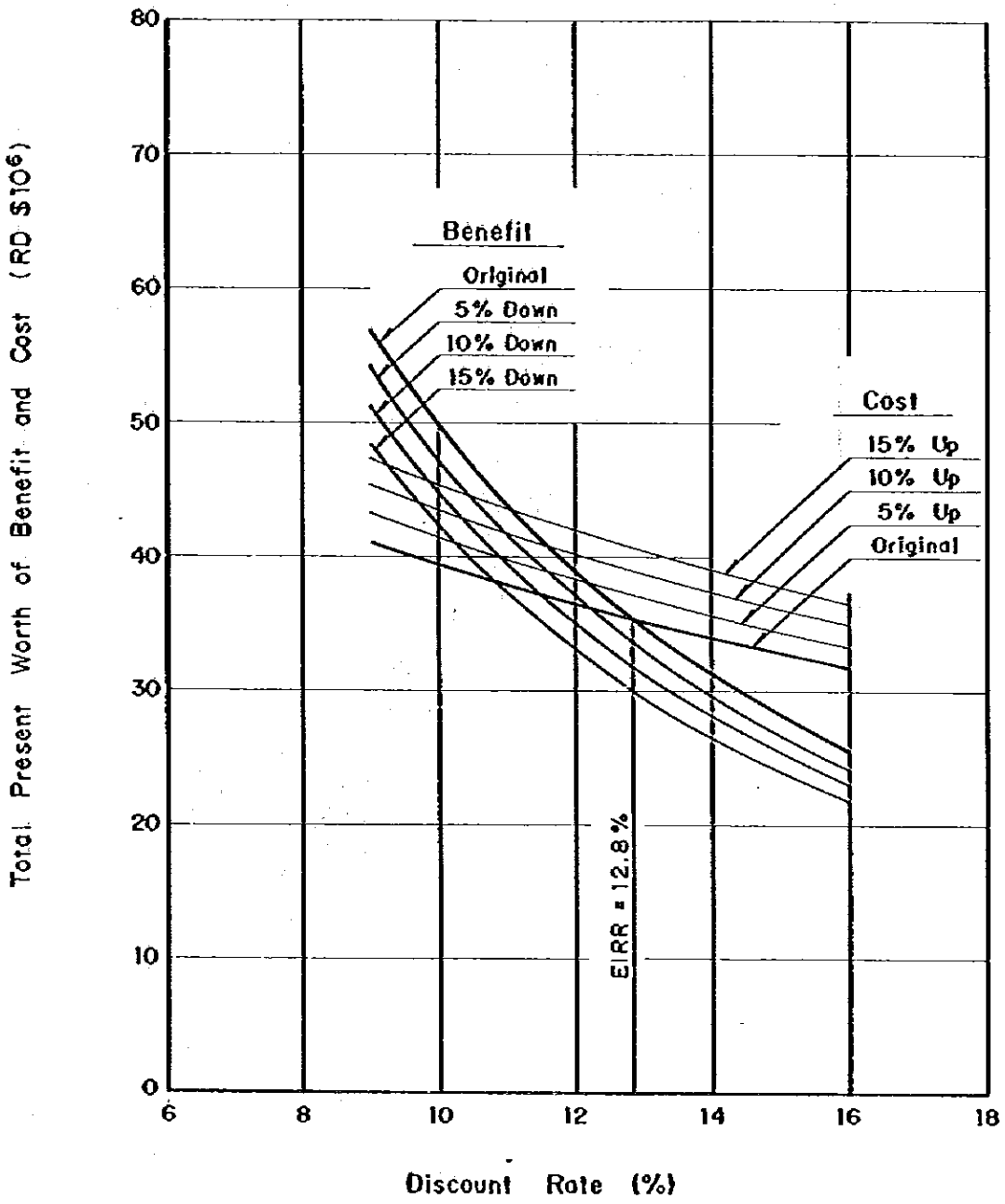
FIGURES



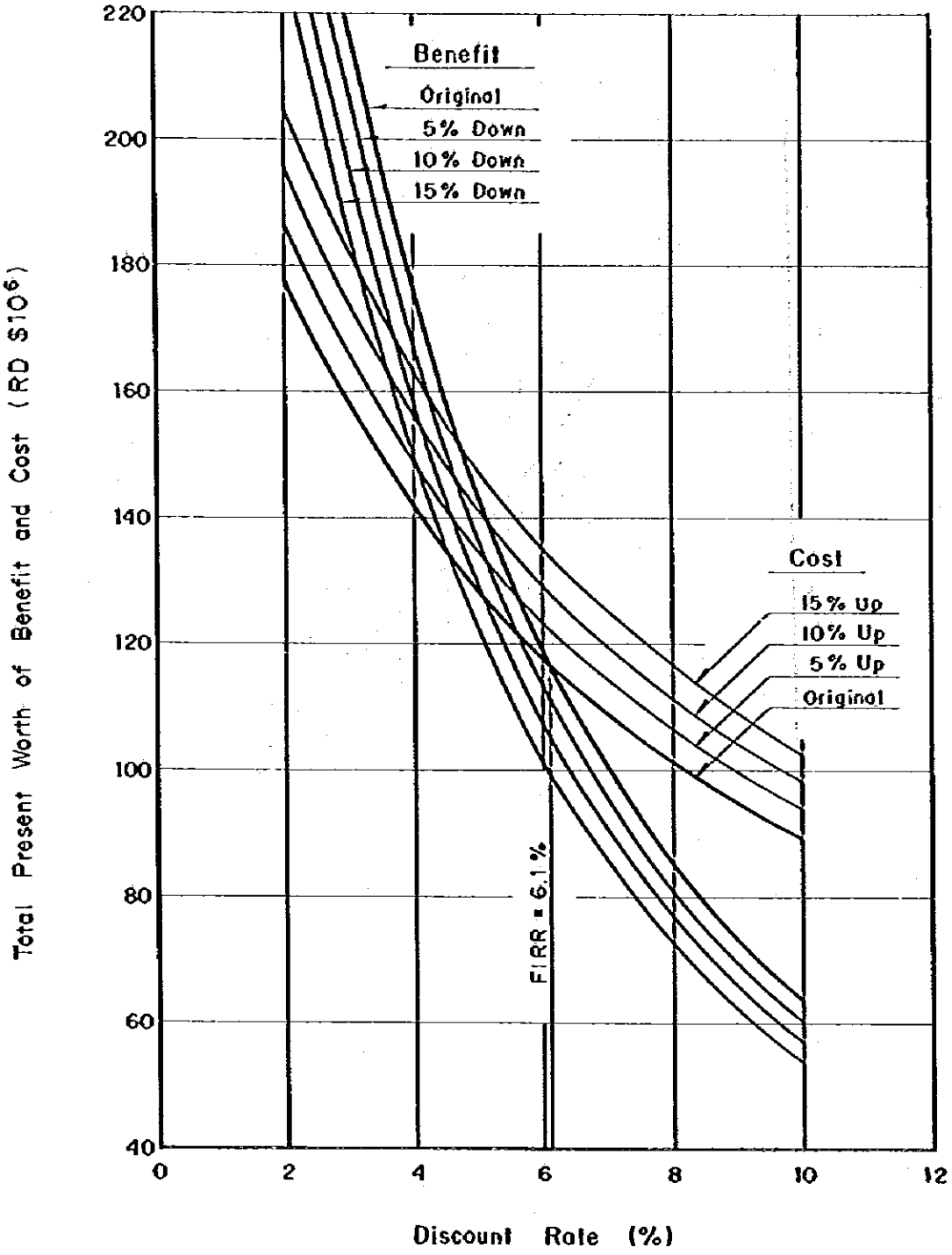
CORPORACION DOMINICANA DE ELECTRICIDAD	Fig.	Sensitivity of E.I.R.R. (El Torito Dam-Los Veganos Weir Complex Plan)
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORITO-LOS VEGANOS	I-01	*Sensibilidad de T.I.R.E. (Presa El Torito - Derivadora Los Veganos)*
JAPAN INTERNATIONAL COOPERATION AGENCY		



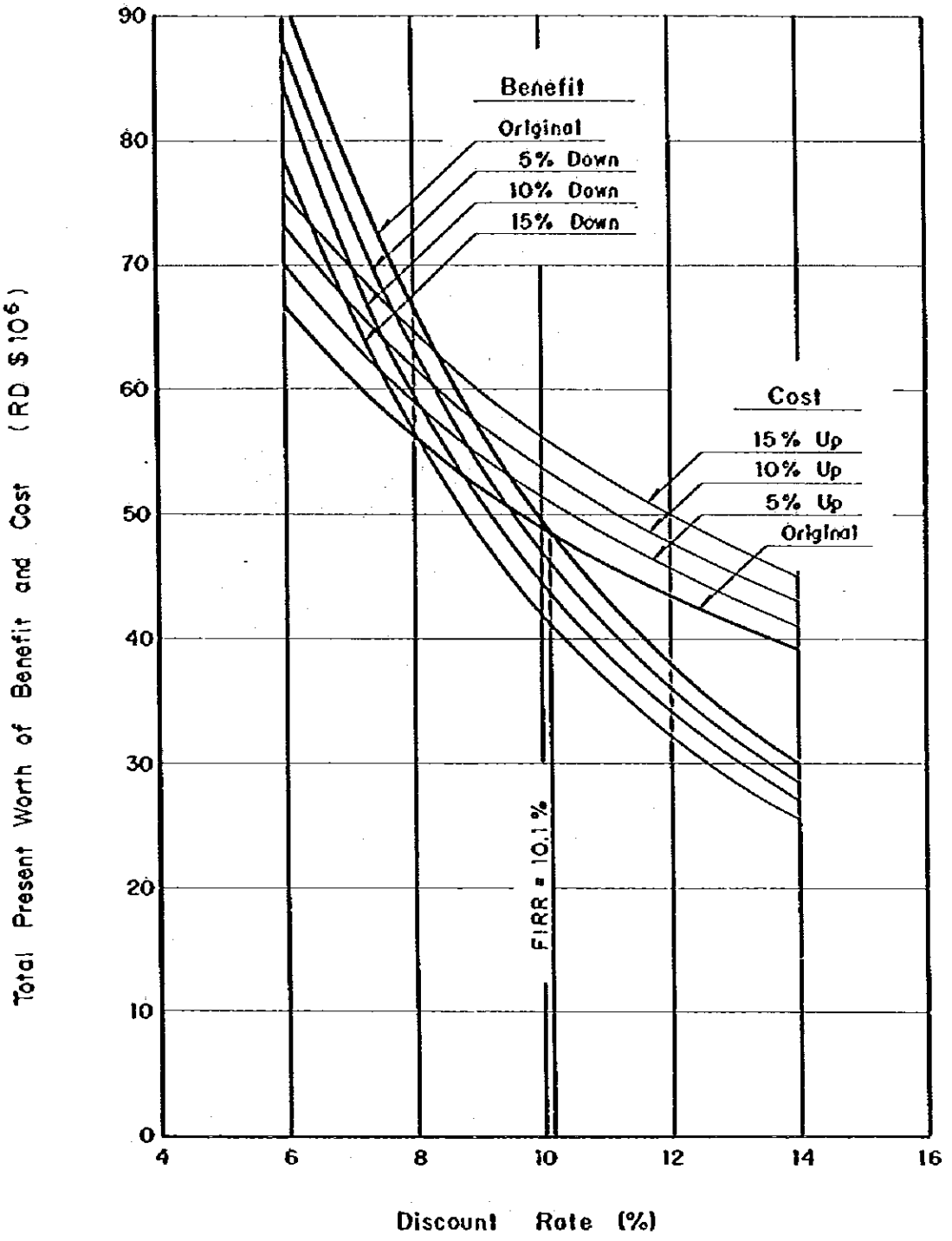
CORPORACION DOMINICANA DE ELECTRICIDAD	Fig.	Sensitivity of E.I.R.R. (El Torito Weir-Los Veganos Weir Complex Plan)
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEXO HIDROELECTRICO EL TORITO-LOS VEGANOS	I-02	*Sensibilidad de T.I.R.E. (Derivadora El Torito - Derivadora Los Veganos)*
JAPAN INTERNATIONAL COOPERATION AGENCY		



CORPORACION DOMINICANA DE ELECTRICIDAD	Fig.	Sensitivity of E.I.R.R.(Pino de Yuna Weir-Los Veganos Weir Complex Plan)
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORITO-LOS VEGANOS	1-03	*Sensibilidad de T.I.R.E. (Derivadora Pino de Yuna-Derivadora Los Veganos)*
JAPAN INTERNATIONAL COOPERATION AGENCY		



CORPORACION DOMINICANA DE ELECTRICIDAD	Fig.	Sensitivity of F.I.R.R. (El Torito Dam-Los Veganos Weir Complex Plan)
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORITO LOS VEGANOS	1-04	*Sensibilidad de T.I.R.F. (Presa El Torito - Derivadora Los Veganos)*
JAPAN INTERNATIONAL COOPERATION AGENCY		



CORPORACION DOMINICANA DE ELECTRICIDAD	Fig.	Sensitivity of F.I.R.R (El Torito Weir-Los Veganos Weir Complex Plan)
EL TORITO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORITO-LOS VEGANOS	I-05	*Sensibilidad de T.I.R.F. (Derivadora El Torito - Derivadora Los Veganos)*
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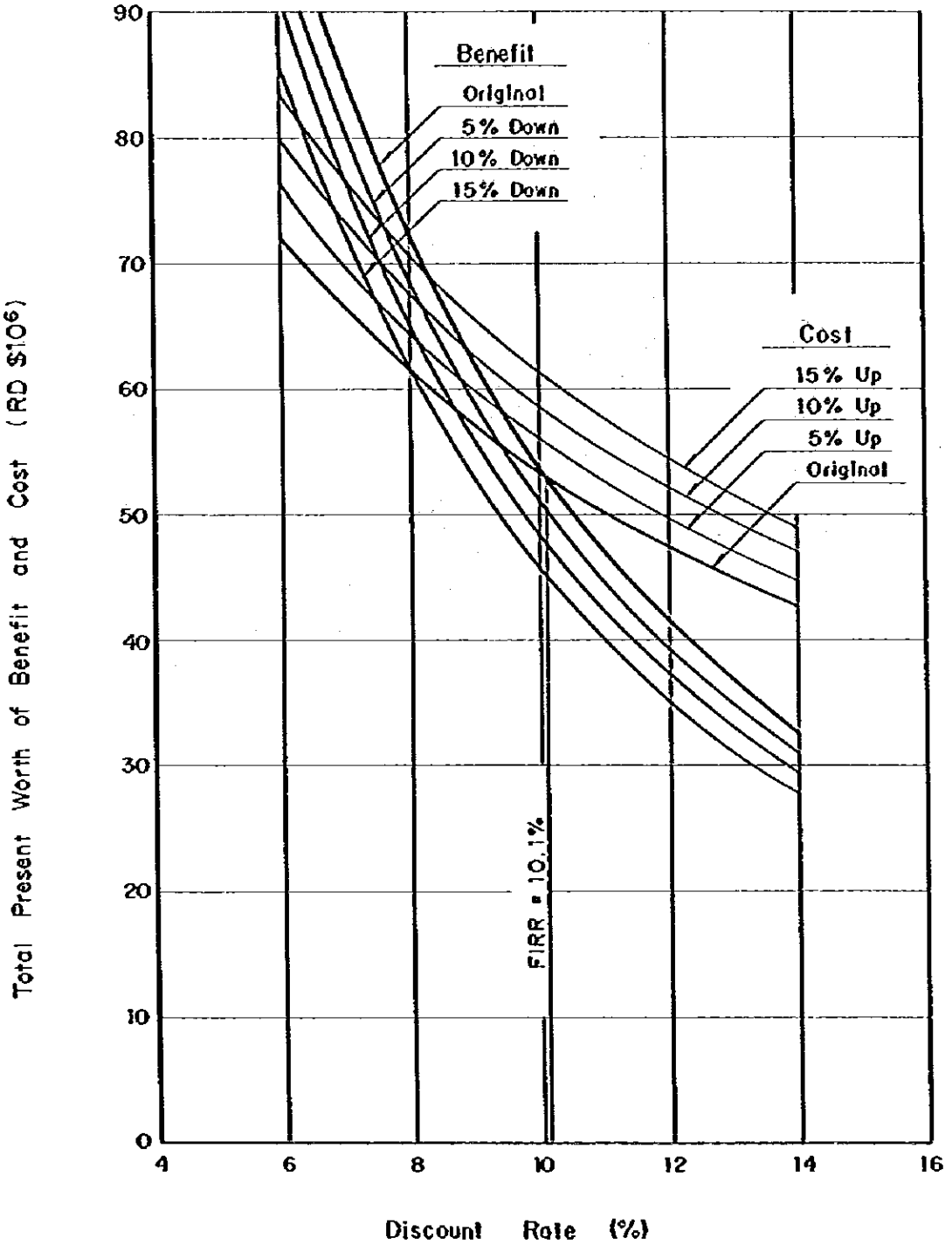

CORPORACION DOMINICANA DE ELECTRICIDAD EL TORTO-LOS VEGANOS HYDROELECTRIC COMPLEX COMPLEJO HIDROELECTRICO EL TORTO-LOS VEGANOS JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. I-06	Sensitivity of F.I.R.R. (Pino de Yuna Weir-Los Veganos Weir Complex Plan) *Sensibilidad de T.I.R.F. (Derivadora Pino de Yuna-Derivadora Los Veganos)*