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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT  
INTERNATIONAL DEVELOPMENT ASSOCIATION

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APPRAISAL OF BURFELL POWER PROJECT  
LANDSVIRKJUN (NATIONAL POWER COMPANY)  
ICELAND

August 30, 1966

Projects Department

CURRENCY EQUIVALENTS

US \$1 00	=	43 Kronur
10 Kronur	=	US \$0 23
1 Krona	=	100 Aura
10 Aura	=	2 3 US mills
1 million Kronur	=	US \$23, 255

ICELAND

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LANDSVIRKJUN (NATIONAL POWER COMPANY)

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This report is based on the findings of missions  
in April 1965 and January 1966 to Iceland composed  
of Messrs. D. King and R. Whyte of the Bank.

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MAP

ICELAND

APPRAISAL OF BURFELL POWER PROJECT

Landsvirkjun (National Power Company)

SUMMARY

i This report covers the appraisal of a Project in Iceland comprising the construction of the Burfell hydroelectric power station and associated substation and transmission facilities. A Bank loan of US\$18.0 million equivalent has been requested to finance the bulk of the foreign exchange component of the Project, including interest during construction. The total cost of the Project is estimated at the equivalent of US\$34.5 million. This would be the second loan made to Iceland for hydroelectric power.

ii The Project would be built in conjunction with the establishment of an aluminum smelting plant to be financed and built by Swiss Aluminium Limited (Alusuisse), which would purchase more than 50 percent of the power produced.

iii The Borrower would be Landsvirkjun (National Power Company) which is an autonomous corporation established in 1965 and owned jointly by the State and the city of Reykjavik.

iv The Burfell hydroelectric station would include three 35 MW units, the plant would be built for an ultimate installation of six. Transmission would comprise about 130 kilometers of 220 kv circuit and associated substation facilities. The Project is technically sound.

v The agreements between Iceland and Alusuisse are satisfactory and there is assurance of a market for the output of the Project.

vi The financing plan for the Project is sound. It includes, in addition to the proposed Bank loan, interim financing by the Government from loans from New York banks which will be refinanced by long term loans from the Equitable Life Assurance Society and other lenders. Landsvirkjun's contributions from retained earnings should be adequate and further equity will be provided by the partners and the State.

vii Landsvirkjun has agreed to effect a tariff increase of about 10.5 percent on January 1, 1967 and by January 1, 1968 to effect such further increase as may be required to ensure that a satisfactory return is achieved after completion of the Project.

viii Having regard to the calculated return on the investment in Burfell and other non-quantifiable benefits, the Project is economically justified. It is deemed suitable for a Bank loan of US\$18 million for a 25 year term including a 4-1/2 year grace period.

## ICELAND

### APPRAISAL OF BURFELL POWER PROJECT

#### LANDSVIRKJUN (NATIONAL POWER COMPANY)

## I INTRODUCTION

1 The Republic of Iceland has asked the Bank for a loan to finance the Burfell hydroelectric power project which in addition to supplying the normal load growth would furnish power to an aluminum smelter that would be built, financed and controlled by the Swiss Aluminium Limited (Alusuisse). The loan would be made to Landsvirkjun, (National Power Company), a publicly owned utility, which was established in 1965. The project would comprise the construction of a power station at Burfell on the Thjorsa River with three 35 MW units, and associated transmission facilities, the station would be built to accommodate six units with an ultimate capacity of 210 MW. The cost of the project is estimated at the equivalent of US\$34.5 million including interest financed during construction. A loan of US\$18 million equivalent has been requested to cover the bulk of the foreign exchange expenditures. This would be the second loan to Iceland for power development, a loan of the equivalent of US\$2.45 million was made in 1951. This report is based on the findings of missions in April 1965 and January 1966 to Iceland composed of Messrs D. King and A. R. Whyte of the Bank.

2 The economy of Iceland is based primarily on the fishing industry which accounts for over 40 percent of the national product and the bulk of exports and foreign exchange earnings. In view of this concentration on one industry the Icelandic authorities have long felt that some diversification of the economy is desirable. Iceland has comparatively few assets which would help to diversify the economy in view of its small market - a population of less than 200,000 - and lack of natural resources. Emphasis has therefore been concentrated on the large scale development of hydroelectric power which is the main natural resource other than fishing, with an estimated potential of over four million kilowatts. For several years the Government has accordingly investigated the possibility of attracting power intensive industries to the Island. This has culminated in an agreement with Alusuisse for the construction of an aluminum smelter which would be financed by Alusuisse contingent upon the construction of the Burfell power station to provide low cost power. The Government envisages that a substantial portion of the hydroelectric output would be used to supply the normal growth requirements of the country which would thus be afforded the benefit of low cost power.

## II INDUSTRY ORGANIZATION

3 At the present time electric power in Iceland is generated, transmitted and distributed by several publicly owned utilities under the provisions of the Electric Power Act of 1946. The main utilities are those of the larger municipalities, particularly Reykjavik, the State Electric Power Works and Landsvirkjun. The State Electric Power Works is an agency of the State Government responsible mainly for rural

distribution and the expansion of the rural distribution systems Landsvirkjun is a bulk power generation/transmission company in the southwest jointly owned, 50/50, by the State and the City of Reykjavik, which the Government of Iceland established by legislation in May 1965 for the purpose of constructing Burfell

4 Landsvirkjun acquired the assets of Sogsvirkjunin, a company jointly owned by the State and the City of Reykjavik, which include three hydroelectric plants located on the Sog river about 50 kilometers from Reykjavik, with a total capacity of 89 MW It also acquired the 19 MW Ellidaar thermal station which was previously owned by the City of Reykjavik The City of Reykjavik in addition to owning the distribution network in the City, retains a small amount of generating capacity

5 In 1964, the electric energy production of Iceland was about 670 million kwh of which about 80 percent was produced and utilized in the southwest This area includes the City of Reykjavik, the chief population center of the Island

6 The Republic of Iceland was the recipient of a Bank loan of the equivalent of US \$2 45 million in 1951 which was relented to Sogsvirkjunin and Laxavirkjun (a joint state-municipally owned utility) for the construction of hydroelectric facilities The facilities were constructed successfully and their operation has been satisfactory

### III THE BORROWER

7 Landsvirkjun is now the main generation and transmission entity in the country with a total generating capacity of 108 MW It will construct Burfell and, likely, any future major power projects It will sell power only at the wholesale level The proposed ownership and capital structure arrangements are described in paragraphs 49 to 54.

8 The organizing of Landsvirkjun was completed in 1965 and it commenced operations on January 1, 1966 The Government issued regulations relating to the functions and powers of the company early in 1966

9 Landsvirkjun is an autonomous, independent legal entity headed by a Board of Directors of seven, of which three are appointees of the State, three of the City of Reykjavik and of which the seventh, the Chairman, is appointed by the first six or, in the event of disagreement, by the Supreme Court The Board of Directors is empowered to direct the affairs of the utility, subject, in the case of plans for major expansion, to approval of the Minister in charge of electric power affairs (presently the Minister of Agriculture) The Board is empowered to set rates for the sale of power to yield a reasonable return on the investment The company has the power to raise funds by borrowing The present Board is representative of the political and business community and is satisfactory

10 The company is headed by a full time General Manager in charge of operations who is responsible to the Board and permitted to attend Board meetings. It is organized in three departments, namely Administrative/Financial, Operational and Engineering. It has about 60 employees, including those operating the stations acquired by Landsvirkjun. The technical activities and engineering staff are to be kept to a minimum and the intention is to make use of consulting firms.

11 Landsvirkjun is properly organized and provided with an adequate management. The General Manager was formerly the Director of the State Electric Power Works and has extensive administrative and technical experience.

#### IV THE POWER MARKET

12 Landsvirkjun supplies the southwest area of Iceland which includes Reykjavik and the bulk of the population of the country. Its main customers are the City of Reykjavik with a demand of about 50 MW in 1965, the State Electric Power Works with a demand of about 23 MW, of which 6 MW was supplied to the North Atlantic Treaty Organization (NATO) base at Keflavik, and a fertilizer plant taking 3 MW. Secondary (surplus) energy is sold to the fertilizer plant.

13 The per capita use of electricity in Iceland has doubled in the last decade and is at present about 3,000 kwh, placing it among the leading countries in the world in this respect. Electric power which at the domestic consumer level costs about one IKr/kwh (23 cents U.S.) and is not expensive, is widely used for cooking. It is used to a lesser extent for space and water heating since natural hot water heating is available in most districts of Reykjavik. The main commercial-industrial use of power is in dairying and fish products factories and the fertilizer plant.

14 Annex 1 shows actual demand and energy sales for 1961-65 and forecasts for the years 1966-73. Annex 2 shows in chart form the system demand and the present and planned capacity. Load growth in recent years has been at an average rate of about 6.5 percent per year. As the result of studies made both by Iceland and by its consultants, Harza Engineering Company International, a growth rate of 6 percent per annum has been estimated for the forecast period, exclusive of power supplied to the aluminum smelter. The estimate appears well founded.

#### The Aluminum Smelter

15 Alusuisse is to build a smelter on the eastern shore at Straumsvik in the township of Hafnarfjordur, which is located about 10 kilometers from Reykjavik. The smelter would have an ultimate capacity of 60,000 metric tons of aluminum per year, of which 30,000 tons, representing one potline, is planned initially. The first potline with an effective demand of 60 MW, a minimum annual energy consumption of 450 million kwh and an estimated average consumption of 500 million kwh, would begin operation in mid-1969, when the Burfell project comprising installation of the first three generators, is completed.

16 The agreement between Iceland and Alusuisse provides that the first half of the second potline, taking 30 MW, would be installed and commence operation within three years after the start of the first potline, and the second half of it, representing an additional 30 MW, would commence operation within three years of the start of the first half. Timing, within these limits, would be subject to the mutual agreement of the two parties. However, Alusuisse anticipates, subject to the agreement of Iceland, that the second potline would be completely installed and placed in operation, taking the full 60 MW, in mid-1972, three years after the start of the first potline. The forecast of load growth, the timing of the installation of the remaining generators at Burfell, the forecast of revenue and the financial statements have been prepared on this assumption.

17 Annex 3 summarizes the terms of the power contract between Landsvirkjun and the Icelandic Aluminium Company (ISAL), the Alusuisse subsidiary which would be established in Iceland to build, own and operate the smelter. The contract stipulates a minimum annual payment for 450 million kwh for each potline whether or not this amount of energy is used. The maximum allowable annual energy consumption is 530 million kwh for each potline. The price of power is 2.5 mills/kwh, payment is specified in U.S. currency. However, during the period from the start of the first potline until the start of the second half of the second potline, the price is specified at 3 mills per kwh, during this period the tax on the smelter's output will be reduced by an amount offsetting the increase in the tariff.

18 The agreement stipulates that only one consolidated annual tax, based on production, will be paid by ISAL. This tax is stipulated as \$20 per metric ton of aluminum per year during the first 15 years and increasing thereafter to \$35 per ton when the smelter has been fully depreciated, subject to certain provisions, described in Annex 4. This corresponds to about a 33-1/3 percent profits tax, the normal rate in Iceland at present. The tax of \$20 per ton represents the equivalent of US 1.2 mills for each kilowatt hour used in the manufacture of one ton of aluminum. During the period the tariff is increased from 2.5 to 3 mills, as noted in paragraph 17, the tax will be reduced to \$12.50 per ton, that is, in effect from the equivalent of 1.2 to 0.7 mills. This reflects the understanding between Iceland and Alusuisse that the combined power and tax revenues should approximate the equivalent of 3.7 mills per kwh used by the smelter prior to its full depreciation.

19 The power contract is for a period of 25 years from the start of the first potline with an option for two additional terms of ten years each subject to revision of the price for power and the tax regime on each occasion. The base price for power of 2.5 mills will also be subject to adjustment for the variable components of power costs, mainly reflected in wages and materials, 15 years after the start of the first potline and thereafter every five years. In no event, however, will the price for power be reduced below 2.5 mills. Power accounts are payable monthly. Delivery of power is specified at 220 kv at the switchyard of the aluminum plant.

20 The power contract stipulates that Landsvirkjun will operate and maintain the power supply so that in the event of emergency it would be able to make available to the smelter a minimum amount of power of 28 MW, in the case of one potline, and 56 MW in the case of two potlines. To meet this undertaking Landsvirkjun plans to install a gas turbine of 20 MW capacity at or near the smelter site and provide two transmission circuits from the main substation near Reykjavik to the smelter. The major difficulty foreseen in maintaining full supply of power to the smelter is the possible reduction of the output of Burfell due to the action of ice. This is discussed in paragraphs 35-37.

21 The price of power and the tax rates were the subject of prolonged negotiation and represent a compromise by the parties. The economic return to Iceland of the project is discussed in paragraphs 80 to 84.

22 The Master Agreement (Annex 4) contains the basic agreements between the Government of Iceland and Alusuisse. It provides for the construction of the Burfell facilities, the organization and financing of ISAL, the construction and operation of the smelter and the provision of various services thereto and fiscal arrangements applicable to the smelter operation concerning customs duties, taxes and transfers of foreign exchange. A number of schedules are annexed to the Master Agreement as follows: the Power Contract, the Smelter Site and Harbor Agreement (whereby Iceland undertakes to provide suitable harbor facilities at the smelter site), the Assistance Agreements, the Performance Guaranty Agreement and the memorandum of Association and Statutes of ISAL.

23 In addition to guaranteeing a minimum payment for power and the payment of taxes by ISAL, Alusuisse guarantees the construction of the smelter in the Performance Guaranty Agreement, since the start of construction of Burfell would precede that of the smelter by 1 1/2 to 2 years. Pursuant to this agreement Alusuisse has made an arrangement with the Swiss Credit Bank whereby the latter undertakes to pay to the Government of Iceland an amount of up to 20 million Swiss Francs in the event of failure by ISAL to construct the smelter. The actual amount which Iceland would be entitled to collect would be determined by the cumulative expenditure on Burfell. After the start of the construction of the smelter the amounts which Iceland would be entitled to collect in case of default would be reduced in accordance with the cumulative expenditure made by ISAL on the smelter.

24 The Master Agreement was signed by the Government and Iceland in March 1966 and approved by the Althing in April. The Master Agreement and schedules appear adequate as a basis for Iceland and Alusuisse to construct Burfell and the smelter and to meet their mutual obligations thereafter, and to provide appropriate procedures for the handling of any contingencies which might arise thereto.

Swiss Aluminium Limited (Alusuisse)

25 Alusuisse is one of the world's important integrated aluminum firms. Based in Switzerland, it functions mainly through the medium of subsidiary or associated companies engaged in the mining of bauxite, the production of primary aluminum, rolled shapes and fabricated products and the production of power. The Iceland smelter will use alumina produced at several Alusuisse plants in Europe, supplemented by alumina which will become available from a major new facility in Australia. Alusuisse is presently a net purchaser of aluminum that is the amount of raw aluminum it needs to supply its rolling and fabricating mills to produce finished shapes exceeds the amount of primary aluminum it manufactures. Alusuisse does not release consolidated statements of its assets, but from information it has made available to the Bank it is estimated that the assets owned or controlled by it amount to about US \$500 million equivalent.

26 In 1966 Alusuisse will produce about 300,000 tons of primary aluminum. It has had a growth rate of about 5-6 percent or 15,000 tons per year. The capacity of all Europe in 1966 should be about 1.5 million tons, and of Europe and America combined 5 million tons. The growth of the latter is some 300,000 tons annually or about 6 percent. It appears reasonable to believe that Alusuisse should continue to be able to maintain its share of the market and grow according to the rate it forecasts. This would indicate that it should have an adequate market for the 60,000 tons of primary aluminum which would be produced by the smelter in Iceland.

V THE PROJECT

27 The project proposed for Bank financing would consist of the first stage of the Burfell hydroelectric station on the Thjorsa river, a 220 kv transmission system connecting Burfell to Reykjavik and the smelter, and substation capacity of 210 MVA. The location of the main features are shown on the map at the back of this report.

28 The capacity installed at Burfell in the first stage would be 105 MW. It would be increased to 210 MW ultimately. The estimated initial average annual output is 900 million kwh and the ultimate 1,720 million kwh, giving a plant factor of 90 percent.

29 Burfell would be a run of the river scheme without storage although a small reservoir is proposed ultimately. The Thjorsa river, which has a drainage area of about 6,400 square kilometers, rises in two glaciers, one of which is the largest in Europe, and as a result the flow in the river is comparatively steady.

30 The generating station would have a head of about 118 meters and would utilize an average flow of 112 cubic meters per second initially and 224 cubic meters per second ultimately. The consulting engineers estimated that the average flow of the river is 340 cubic meters per second and that the flow will be equal to or in excess of 224 cubic meters per second 75 percent of the year.

31. The Thjorsa river winds round the Burfell mountain over a distance of 13 kilometers, dropping 120 meters in gradual stages. The station would take advantage of this topography which lends itself to a low unit cost hydroelectric installation. A low concrete dam, through which surplus water would be sluiced through gates, would divert the river water through a diversion structure and then through a channel into a pond. From the pond the water would flow through a tunnel some 1,040 meters in length through the Burfell mountain. The tunnel would connect with two penstocks which would each divide at the power station level into three conduits, one for each generating unit.

32. The power station, which would be of the conventional enclosed type, would be located above ground at the foot of the Burfell mountain. The station would house three Francis turbine-driven alternators each of 35 MW capacity. Space would be provided for the installation of three similar additional units. The water discharged from the station would flow through a tailrace channel about 125 meters in length into the Fossa river which drains into the Thjorsa river.

33. The site of the scheme has been the subject of extensive geological investigation over several years and conditions have been well defined.

34. The transmission system would consist of a 94 kilometer - 220 kv single circuit line from Burfell to Geithals substation near Reykjavik and two 220 kv single circuit lines, each 17 kilometers in length, from there to the smelter at Straumsvik. The Geithals substation, with a transformer capacity of 140 MVA, would provide the main connection to the existing system. An emergency connection would also be provided at Irafoss, near the existing hydroelectric plants on the Sog river. Switching facilities would be provided at Straumsvik.

#### The Ice Problem

35. While no unusual difficulties are expected in the construction of the scheme, one operating problem, that of ice, is foreseen. The climate of Iceland is comparatively mild over a large part of the country. Thus, while temperatures in the winter are frequently below freezing, no prolonged cold spells occur in the Burfell area sufficient to form an ice cover over large areas of the surface of the river. Large quantities of ice are, however, formed in the river during cold periods by the action of the wind on the surface of the open water and from snow blown into the river. The Thjorsa river is noted for the large quantities of ice flowing downstream in such circumstances.

36. As the production of power from Burfell could be reduced by such ice flow the diversion structure at the dam (paragraph 31) would be designed so that water would enter the diversion channel well below the surface of the river thus preventing ice on or near the surface of the river flowing into the channel. Ice accumulating at the dam and diversion structure would be sluiced downstream through the gates of the dam, which would be designed so that the minimum amount of water would be used for this purpose.

37 In view of the facilities incorporated in the design, ice is not expected to be a major operating problem. However, to safeguard against the curtailment of production due to ice or other temporary emergency, and to enable the provision in the Power Contract described in paragraph 20 to be met, a 20 MW gas turbine generating unit to provide standby power under emergency conditions would be installed near the smelter in 1969 at an estimated cost of US\$1.4 million. The provision of this unit is not included in the proposed project for Bank financing. The installation of a second gas turbine is tentatively planned when the second potline is started.

Status of Engineering and Construction

38 The design and supervision of the project is being carried out by the Harza Engineering Company International which made extensive site investigations and prepared the feasibility report. Detailed design work has been largely completed. The awards for the construction contract and the supply of the generators and turbines were made in the spring of 1966 following international bidding. These three contracts represent about 60 percent of the total estimated cost of the project. The aggregate amount of the awards was close to the amount allowed in the cost estimate. Construction was started in June. Assurances have been received that consultants satisfactory to the Bank would continue to be used to design and supervise construction of the project, and that construction would continue to be carried out by contractors satisfactory to the Bank.

Cost Estimate

39 A summary of the estimated cost of the project is as follows (a more detailed breakdown of costs is given in Annex 5)

	Foreign Exchange	Local Cost	Total Cost
(Thousands US\$ Equiv )			
<u>POWER PLANT</u>			
Civil Construction	9,220	6,400	15,620
Equipment	3,200	370	3,570
Engineering and Overhead	1,400	750	2,150
Miscellaneous and Contingencies	1,730	2,810	4,540
Total	15,550	10,330	25,880
<u>TRANSMISSION</u>			
Transmission Lines and Substations	3,130	1,220	4,350
Engineering Supervision and Contingencies	820	450	1,270
Total	3,950	1,670	5,620
TOTAL	19,500	12,000	31,500
Interest during construction	3,000	-	3,000
GRAND TOTAL	22,500	12,000	34,500

40 An amount of approximately US\$3.7 million equivalent is included for contingencies. Of this, approximately US\$2.0 million equivalent is included for contingencies on the foreign exchange component of the project, this represents about 11.5 percent of which 2 percent is for possible increases in the price of labor and equipment and the remaining 9.5 percent for the cost of any increase in the physical content of the work. Approximately US\$1.7 million has been allocated for contingencies on the local currency component representing 16.5 percent, of which about 7 percent is for increase in prices and 10 percent for the cost of any physical increase in the work. The relatively large amount for local price increases results from the substantial allowance included for increases in Icelandic wage scales. This is advisable considering the markedly rising labor costs which have been experienced in recent years in Iceland.

41 The contracts awarded to date aggregate approximately the provision contained in the cost estimate as noted in paragraph 38. The construction contract allows price escalation only for the cost of Icelandic labor and is otherwise subject to increase only for the actual amount of physical work. The contract prices for the generators and turbines are firm. In view of this, the contingency allowance for the foreign exchange component of the project should be adequate.

42 Iceland has experienced a marked increase in prices in recent years and this is likely to continue, at least to some degree. While some provision for escalation of labor costs is included in the contingency item (paragraphs 40 and 41), the cost of the project could be substantially increased in the event of large price increases. Such increases would represent requirements beyond those considered in the proposed financing plan (paragraph 63) but the Government has undertaken that funds will be provided as and when required to carry out the project.

#### Unit Cost

43 The estimated cost of the first stage of the Burfell power station with an installed capacity of 105 MW, including transmission but excluding interest during construction, is US\$31.5 million. The estimated cost of the ultimate station with an installed capacity of 210 MW is US\$38.6 million, which is equal to a unit cost of US\$184 per kW. This is reasonable and would place Burfell in the category of low cost hydroelectric power development.

#### Bank Financing

44 The goods and services to be financed by the proposed Bank loan of US\$18 million are as follows:

	(in Thousands of US \$ equivalent)
Generating Station - Civil Works	5,170
- Equipment	3,200
Transmission Lines & Substations	3,130
Engineering & Supervision	1,600
Contingencies	1,900
Interest during construction	<u>3,000</u>
Total	<u>18,000</u>

The proposed loan represents about 80 percent of the foreign exchange cost of the project and about 52 percent of the total cost

#### The Labor Situation

45 The labor situation could affect the construction schedule as the labor force in Iceland is small and there is virtually no unemployment. Estimates of manpower requirements in connection with the construction of Burfell and the smelter have been made by the Government. These estimates indicate that if the housing and public investment programs remain within the levels foreseen by the Government, sufficient labor should be available for the construction of Burfell and the smelter. The Government has stated that in planning the public investment program it will take full account of the manpower demand for Burfell and the smelter. In addition, with the approval of the Government, provision has been made in the construction contract for the importation of labor.

#### Scheduled Completion Dates

46 The first generating unit is scheduled to be in operation by November 1968 and the second and third units early in 1969.

### VI THE FUTURE EXPANSION PROGRAM

47 It is expected that the second potline of the aluminum smelter would commence operations in mid-1972. This would entail the installation of the fourth and fifth generating units at Burfell to commence service in 1972. The increase in domestic and commercial load would necessitate the installation of the sixth generator one year later. As noted in paragraph 37 the installation of a second 20 MW gas turbine is tentatively planned for 1972. Provision of these facilities is estimated to cost the equivalent of US\$8.5 million and is incorporated in the Statement of Estimated Sources and Applications of Funds (Annex 9).

48. It is expected that Burfell power would be fully utilized by about 1976, necessitating the construction of a generating station beginning 1974. There are a number of possibilities in this respect including several hydro stations of small size and comparatively high unit cost, a thermal station making use of the natural low pressure steam which is found near Reykjavik, and large hydro stations. It is not expected that the transmission system would require significant expansion until new generating stations are constructed although there is the possibility of building a transmission line of about 200 kilometers to interconnect Landsvirkjun with Laxavirkjun in the north.

## VII FINANCIAL ASPECTS

### Acquisition of Sogsvirkjunin

49. The present organization of the power industry and the establishment of Landsvirkjun have been described in Chapters II and III. As stated, Landsvirkjun took over on January 1, 1966 the operations, assets and liabilities of Sogsvirkjunin.

50. Sogsvirkjunin's expansion was financed almost entirely by long-term debt and the debt/equity ratio at December 31, 1965 was about 80/20. Most of the debt is on U. S. aid terms at low interest rates, the average on all debt being about 4%. All existing debt is unsecured. Details of Sogsvirkjunin's balance sheets for the five years to December 31, 1965 and of its estimated outstanding debt as at this date are given in Annex 6. Summary income statements for the five years are shown in Annex 7.

51. The value of Icelandic currency depreciated considerably in the last fifteen years. The value of the krona was reduced from IKr. 6.5 per US dollar in 1949 to the present value of IKr. 43 per US dollar in four stages, the most recent being in 1961. At each devaluation Sogsvirkjunin revalued its assets to the extent they were represented by foreign currency loans but the local currency component was not increased. Consequently it was recognized that the value of Sogsvirkjunin's assets was understated and that they should be revalued when taken over by the new company. The revaluation resulted in an increase of approximately 20% in the net book value after depreciation. The revaluation also improved the debt/equity ratio to 54/46.

52. Sogsvirkjunin's income statements show that the rate of return on net fixed assets was about 7% between 1962 and 1964, but if currency depreciation is taken into account the real rate of return was probably nearer 5%. Because of the tariff formula described in paragraph 55, Sogsvirkjunin was unable to build up adequate cash for future expansion though its capital requirements were low for several years and no dividends were paid. As at December 31, 1965 current assets totalled about IKr. 77 million. Current liabilities totalled about IKr. 53 million including an amount of IKr. 49 million in respect of a Price Regulation Fund which represented the excess of past sales revenues over those legally permitted.

Sogsvirkjunin retained such excess as part of its working capital but on liquidation it had to be paid to the partners and this was done in early 1966. As a result Landsvirkjun began operations with little cash working capital.

53. In addition to Sogsvirkjunin's undertaking, Landsvirkjun took over the thermal plant at Ellidaar formerly owned by the city of Reykjavik, and the land and water rights of the Thjorsa River owned by the State, together with the work in progress on the Burfell scheme and an extension to the Ellidaar plant. The additional fixed assets were contributed equally by the partners so that they maintained their 50/50 ownership of the new undertaking.

54. Details of Landsvirkjun's opening balance sheet at January 1, 1966 are given in Annex 10, and the composition of fixed assets, work-in-progress and capital are given in the footnotes to the Annex. A summary follows

	<u>(Millions of IKr.)</u>	<u>(Equivalent in millions of US\$)</u>
<u>ASSETS</u>		
Fixed assets at valuation	694.9	16.2
Work-in-progress	174.4	4.0
Loan to Reykjavik Municipal Power Department	30.7	0.7
Net current assets cash	15.1	0.4
other	<u>9.5</u>	<u>0.2</u>
Total Assets	<u>924.6</u>	<u>21.5</u>
<u>LIABILITIES</u>		
Opening capital	422.8	9.8
Long-term debt	<u>501.8</u>	<u>11.7</u>
Total Liabilities	<u>924.6</u>	<u>21.5</u>
Debt/equity ratio	54/46	

#### Tariffs

55. The law governing Sogsvirkjunin limited the tariff level to production cost plus 5%. The tariffs in force from 1962 to the beginning of 1966 comprised a demand charge of IKr. 850 (US\$ 19.8) per kw per annum and a relatively low energy charge of 5.31 auras (1.2 mills) per kwh.

56. Landsvirkjun has power to set its own tariffs. The Act establishing Landsvirkjun provides that tariffs shall "yield a reasonable return on the capital committed" and that "the concern shall create such

surplus as will enable it to secure to its customers at all times a sufficient supply of energy".

57. The question of Landsvirkjun's tariffs was discussed between the Bank and Iceland's representatives a number of times and was one of the main problems in negotiating the loan. It was agreed that Landsvirkjun should earn an adequate return on its net fixed assets in operation and the loan documents contain provisions to this effect. The minimum rate of return stipulated is 8% per annum which is to be calculated by relating net income, after deducting operating and maintenance expenses and straight-line depreciation at agreed rates, to net fixed assets in operation at the beginning of each year. However, in view of the large initial investment in the Project which will not be fully utilized until the whole scheme is completed, the required rate of return is reduced to 6% for the years in which the first stage of the smelter is in operation and to 7% in the years in which the first and second stages are in operation. It is also provided that assets shall be revalued to reflect any change in the par value of Iceland's currency or significant changes in prices.

58. With effect from February 1, 1966 tariffs were increased by about 11% as a result of an increase in the energy charge to distribution companies from 5.3 to 8 auras per kwh. On the same date the State imposed a tax on sales of energy. This tax, which is collected by Landsvirkjun and paid to the Government is planned to raise IKr. 35 million annually and results in an increase over present tariffs of about 25%. However, with increasing sales the percentage required to bring in the same amount annually will decrease. The tax will be used to subsidize the operations of the State Electric Power Works (see paragraph 3).

59. During negotiations it was agreed that existing tariffs, after taking into account the increase on February 1, 1966 would be insufficient to achieve the required rates of return. Assurances have therefore been received that the following steps will be taken to provide these rates of return

- a) On January 1, 1967 the price of power to distribution companies will be increased by an amount equal to a rise from 8 auras to 10.75 auras per kwh in the energy charges and from IKr. 850 to IKr. 860 per kw per annum in the demand charges. This increase is equivalent to about 10.5% on existing prices, and
- b) by August 31, 1967 Landsvirkjun will submit to the Bank specific proposals to increase its revenues and on or before January 1, 1968 will take such action, satisfactory to the Bank, to increase its revenues as shall be necessary.

60. The financial forecasts are based on the assumption that the first stage of the smelter will come into operation in mid 1969 and the second and third stages in mid 1972. Thus the rates of return required are 8% until the end of 1969, 6% for 1970 through 1972 and 8% thereafter. It is

estimated that the increase necessary on January 1, 1967 to achieve the required returns in the early years of operation of the scheme will be about 5% and this amount has been assumed in the attached forecasts of income statements, sources and applications of funds and balance sheets (Annexes 8, 9 and 10).

61. The price for power supplied to the smelter will be in accordance with the power contract, details of which are given in Annex 3. The price per kwh will be 3 mills (12.9 auras) per kwh until the third stage of the smelter comes into operation and 2.5 mills (10.7 auras) thereafter.

#### Accounts and Audit

62. The accounting system will not be complex and the staff which has been engaged should be capable of efficiently administering the Landsvirkjun's financial affairs. A reputable chartered accountant has been appointed as auditor. Assurances have been received that the audit arrangements will continue to be satisfactory to the Bank and that copies of the audited annual financial statements and the auditor's report will be submitted to the Bank.

#### Financing Plan - Proposed Project

63. The financing plan for the Project is based on the proposed Bank loan, interim Government loans which will be refinanced by long-term loans from U. S. institutions, equity contributions from the city of Reykjavik and the State, a further contribution from the State which will be quasi-equity, and retained earnings. It is assumed that the gas turbine reserve station will be financed by a supplier's credit. The following is a summary of the statement of estimated sources and applications of funds for 1966-70 which is shown in detail in Annex 9

	<u>(millions of IKr.)</u>	<u>(Equivalent in millions of US\$)</u>
<u>SOURCES</u>		
Cash earnings	637.5	14.8
Less Debt service		
Interest payable <u>1/</u>	157.2	3.7
Amortization	<u>214.4</u>	<u>5.0</u>
Net Cash Earnings	<u>265.9</u>	<u>6.1</u>
New equity		
Partners' contributions	60.0	1.4
State contributions <u>2/</u>	<u>251.0</u>	<u>5.8</u>
Total New Equity	<u>311.0</u>	<u>7.2</u>
Loan repayments from Reykjavik Power	<u>16.5</u>	<u>0.4</u>
Borrowings		
Proposed IBRD loan	774.0	18.0
External bonds	252.0	5.9
Government loans	258.0	6.0
Less repaid	<u>258.0</u>	<u>6.0</u>
Suppliers credit	43.0	1.0
Total Borrowings	<u>1,069.0</u>	<u>24.9</u>
 TOTAL SOURCES	 <u>1,662.4</u>	 <u>38.6</u>
<u>APPLICATIONS</u>		
Construction expenditures		
Burfell Project - Stage I	1,267.9	29.5
- Stage II	43.0	1.0
Gas turbine	60.2	1.4
Other works	32.0	0.7
Total Construction Expenditure	<u>1,403.1</u>	<u>32.6</u>
Interest financed during construction	<u>180.0</u>	<u>4.2</u>
Increase in receivables	<u>14.2</u>	<u>0.3</u>
 TOTAL APPLICATIONS	 <u>1,597.3</u>	 <u>37.1</u>
Cash surplus	65.1	1.5
Percentage of construction, excluding interest, financed from earnings		$\frac{265.9}{1,403.1} = 19.0\%$

1/ Including commitment fees and financing charges.

2/ Including capitalized interest of IKr. 51 million.

64. The partners' contributions of IKr. 60 million is the balance of a total cash contribution of IKr. 100 million provided for in the Act establishing Landsvirkjun, IKr. 40 million having been subscribed already.

65. The State's contribution of IKr. 200 million excluding capitalized interest will be made available as may be required on the following terms

- a) Interest shall not be payable before April 1, 1971 but may be accrued and capitalized annually at a rate not exceeding 8%,
- b) after April 1, 1971 interest shall not exceed 8% and shall be payable only out of annual net revenue remaining after covering debt service requirements for the respective fiscal year,
- c) the principal shall be repayable only with the prior approval of the Bank unless such repayment together with interest on the contribution and debt service requirements, shall be covered not less than 1.5 times by net revenue for the preceding fiscal year.

66. These terms mean that the contribution may be regarded as equity until the required conditions exist for repayment to be made. It is therefore, shown as equity in the attached forecasts.

67. The proposed Bank loan of US\$ 18 million (IKr. 774 million) will amount to about 50% of total construction costs of the Project and other works including interest financed during the construction period. Debt service calculations are based on a term of 25 years including a grace period of 4-1/2 years and interest at 6%.

68. The provision of the amount of US\$ 6 million (IKr. 258 million) required to complete the financing plan was the subject of protracted negotiations between Iceland and possible lenders in the U. S. and elsewhere, with First Boston Corporation acting on Iceland's behalf in the U. S. The deterioration in the bond market made it increasingly difficult to raise the amount on reasonable terms but satisfactory financing is now assured.

69. Landsvirkjun has received commitments from institutions in the United States to take up bonds totalling US\$ 6 million. The principal subscribers will be Equitable Life Assurance Society for US\$ 3 million and the First National City Bank (acting for various pension trusts) for US\$ 1.5 million. The bonds will bear a coupon interest rate of 7% and will be repayable by 20 semi-annual sinking fund payments of US\$ 270,000 commencing on June 1, 1974. The purchase price of the bonds will be such as will result in a yield of 7.25% to maturity.

70. The Closing Date for subscription of the bonds is the date of PDD I, but the bonds may be purchased earlier after 60 days notice to Landsvirkjun. Equitable has intimated that it will not take up its share prior to the Closing Date and, although part of the remainder may be taken up earlier this would not affect significantly the financial projections

for the purpose of which it is assumed that the full US\$ 6 million will be subscribed on June 1, 1969, the estimated date of PDD I. On this assumption the purchase price of the bonds would be 97.75% and the proceeds to Landsvirkjun would total US\$ 5,865,000 (IKr. 252 million). The forecasts also allow for financing charges of US\$ 150,000 (IKr. 6.5 million) in 1967.

71. To provide the interim financing required until the bonds are taken up, the Government has obtained a commitment from First National City Bank of New York and Manufacturers Hanover Trust Company to lend up to US\$ 6 million prior to April 30, 1969. This sum will be made available in June 1967, June 1968 and April 1969 not exceeding US\$ 2 million on each date. The note representing each disbursement will be payable five years from its date and will bear interest at 1% to 1.5% above the prime rate on ninety-day loans. Interest will be payable quarterly. There will be a commitment fee of 1/2%. The Government will relend the proceeds of these loans to Landsvirkjun on the same terms as pertain to the original loans, and Landsvirkjun will repay them from the proceeds of the external bonds. An interest rate of 7% has been assumed for the purpose of the financial projections.

72. It is assumed that the gas turbine reserve station will be financed by a suppliers' credit at 7% interest and repayable over 10 years. There should be no difficulty in obtaining such financing.

73. The foregoing table shows that about 19% of construction expenditures through 1970 will be provided by cash earnings which is not unreasonable in view of the size of the Project in relation to existing plant.

74. The estimated cash accumulation of IKr. 65.1 million (US\$ 1.5 million) should be adequate for working capital requirements. However, there could be temporary difficulties due to delays in obtaining funds and a bank overdraft facility has been arranged to cover such short-term requirements.

#### Financing Plan - Further Expansion

75. It is assumed in the forecasts that the second stage of the Burfell Project will be constructed from 1970 to 1972 and that it will come into operation in mid-1972. From the financing viewpoint this is a conservative assumption since it is the most advanced schedule possible and any delay would permit additional cash to be accumulated from the Company's resources

76. Total construction expenditures from 1971 to 1973 are estimated at IKr. 322 million (US\$ 7.5 million). The Company's net earnings after debt service and dividends would total IKr. 192 million (US\$ 4.5 million) equivalent to 60% of construction expenditures. It is assumed that IKr. 86 million (US\$ 2.0 million) would be financed by a further foreign loan and that the second gas turbine station would be financed like the first by suppliers' credits. In view of the relatively small amount of additional funds required and the fact that most of it will be for equipment, there should be no difficulty in financing the second stage of the scheme.

### Future Earnings and Financial Position

77. Forecast income statements are shown in Annex 8. They are based on sales to the smelter of 500 Gwh annually for each potline. They include reasonable estimates of operating expenses and adequate provision for maintenance and straight-line depreciation. The forecasts show that, after the proposed tariff increases (paragraphs 59 and 60), the estimated return on net fixed assets in operation at the beginning of year would increase from 6.3% in 1966 to 9.6% in 1968. The return would drop to 6.2% in 1970 but should increase to 7.9% in 1972.

78. Coverage of debt service would average about 1.7 times from 1966 to 1970. It would fall to 1.4 times in 1971 when amortization of the proposed Bank loan is assumed to begin, but would increase to 1.7 times in 1973. These coverages will not be materially affected if ISAL should pay for only the minimum amount of power of 450 Gwh a year.

79. The proportion of debt to total capitalization will be a maximum of 61% in 1969 thereafter decreasing to 53% by 1973. Assurances have been obtained that will prevent excessive borrowing by Landsvirkjun in future. Except by agreement with the Bank the Borrower shall not incur prior to the Closing Date of the loan (December 31, 1970) any short-term debt exceeding in the aggregate US\$ 600,000 (IKr. 24.8 million) or any long-term debt. After the Closing Date Landsvirkjun may not incur any debt in excess of US\$ 800,000 (IKr. 34.4 million) unless net revenue for the fiscal year next preceding such incurrence or for a later twelve-month period, whichever is the greater, shall be not less than 1.5 times the maximum debt service requirement for any succeeding fiscal year on all debt, including the debt to be incurred.

### VIII. ECONOMIC JUSTIFICATION

80. The return to Iceland's economy of the Burfell scheme has been estimated by calculating the present worth of the cash benefits to be received less the cash expenditures. The cash benefits comprise the revenues from power sales to the smelter, the tax revenues on smelter output (reduced by estimated notional tax revenues which might accrue from alternative employment of smelter personnel), net harbor dues and power sales to other customers. Such sales are valued at the same kwh rate as that paid by the smelter. Cash expenditures consist of the costs of constructing and operating Burfell and building the harbor.

81. The cash expenditures equal the benefits estimated as above at a discount rate of 8%. If the benefits are calculated using for the part of the Project's energy output to be sold to consumers other than the smelter, the tariffs Landsvirkjun is assumed to be charging at the time, the discount rate becomes about 10.75%. However, the receipts from other consumers are internal income transfers and they may in fact overstate the economic benefit of such power sales. Valuing these sales at the price paid by the smelter, which has alternative opportunities elsewhere, is probably too conservative

since the real value of power to the smelter includes at least part of the tax charge, but it is the more reasonable approach.

82. On this basis it is concluded that the quantifiable benefits to Iceland are a minimum of 8% annual return on the investment in Burfell and the harbor. There are in addition non-quantifiable benefits such as some broadening of skills and experience deriving from new employment opportunities in the smelter. Also, a few new jobs may result from aluminum fabricating for domestic needs. The foreign exchange earnings of approximately US\$ 3.7 million (with a minimum of US\$ 3.5 million) <sup>1/</sup> a year when both potlines are in operation will exceed the debt service payments estimated at about US\$ 3 million a year on the foreign debt which will be undertaken to finance Burfell.

83. Consideration has been given to Iceland's power expansion program if the Burfell scheme were not built in conjunction with the smelter. Additional power generating capacity would still be required in the south-west area of Iceland by 1969 to meet the growth expected in the domestic, commercial and industrial demand and this could be provided by constructing Burfell on a reduced scale with an initial installation of two units at a cost of about US\$ 27 million, or by a series of small plants, hydro and thermal. The latter would comprise mainly a 30 MW geo-thermal plant utilizing the natural steam deposits at Hvregardi, which is some distance from Reykjavik, and a 22 MW plant at Efstidalur which would be required in 1972. The foregoing alternatives are tentative and if in fact the smelter were not built, Iceland's power expansion plans would have to be reviewed.

84. The measurable return on the investment in the Burfell scheme is satisfactory and there is no other known project which would yield higher benefits or make a greater contribution to the diversification of the economy.

#### IX. CONCLUSIONS

85. The Project comprising the Burfell hydroelectric power station and related substation and transmission facilities is technically sound. The estimated cost and proposed completion schedule are reasonable.

86. The agreements concluded between the Government of Iceland and Alusuisse are satisfactory and the sale of the output of the Project is assured.

87. The financing plan for the Project is sound and Landsvirkjun should be able to contribute a reasonable proportion of its capital

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<sup>1/</sup> These amounts comprise only receipts for power and taxes and do not take into account other expenditures incurred locally by the smelter.

requirements out of earnings.

88. The proposed tariff increases should enable Landsvirkjun to earn an adequate return on its net fixed assets and cover its debt service with a reasonable margin.

89. The Burfell scheme is justified by its overall benefits to Iceland, including a calculated economic return on the Project itself of 8%, a substantial increase in the foreign exchange earnings of the country, and other non-quantifiable benefits. The Project forms a suitable basis for a Bank loan of US\$ 18 million equivalent for a 25 year term including a 4-1/2 year grace period.

August 30, 1966

MARCH 1966

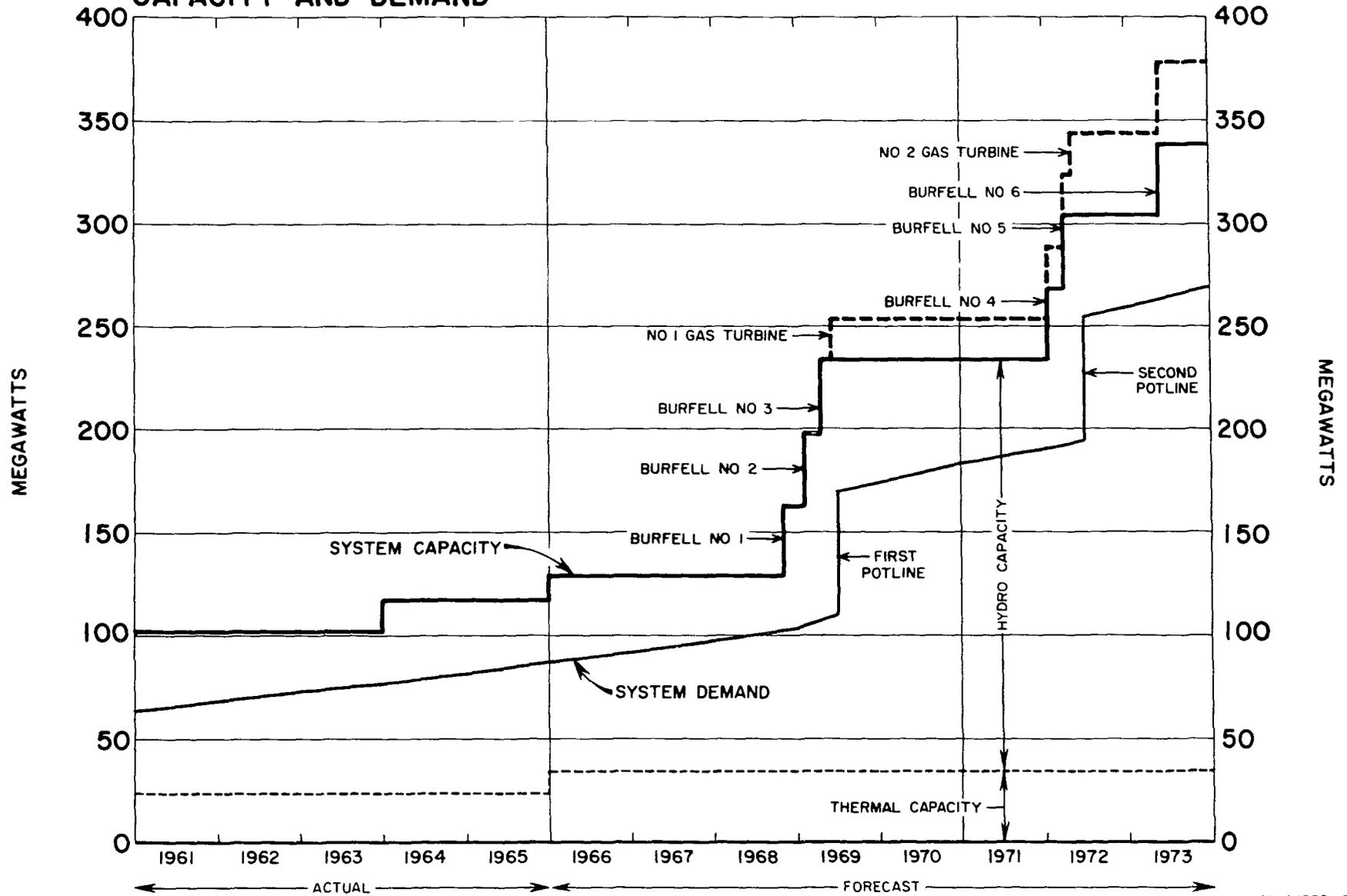
BURFELL POWER PROJECT  
ICELAND

POWER SALES

	<u>SOGSVIKJUNIN</u>					<u>LA DSVIKJUN (NATIC A. POWER COMPANY)</u>							
	1961-5 ACTUAL					1966-73 FORECAST							
	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>	<u>1973</u>
	<u>THOUSANDS OF KILOWATTS</u>												
City of Reykjavik	40.8	44.2	44.4	48.2	49.8	54.2	57.5	61.0	70.0	75.7	80.7	87.7	94.3
State Electric Power Works	16.7	18.4	20.1	21.5	22.6	24.4	25.8	27.4	30.0	33.7	35.8	37.0	38.2
Other Municipal Sales	5.7	5.6	5.6	6.1	5.7	6.1	6.3	6.5	6.7	6.9	7.1	7.5	7.7
Fertilizer Plant	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Sub-Total	66.3	71.3	73.2	78.9	81.2	87.8	92.7	98.0	109.8	119.4	126.7	135.3	144.3
Smelter	-	-	-	-	-	-	-	-	60.0	60.0	60.0	120.0	120.0
TOTAL (primary)	66.3	71.3	73.2	78.9	81.2	87.8	92.7	98.0	169.8	179.4	186.7	255.3	264.3
	<u>MILLIONS OF KILOWATT HOURS</u>												
City of Reykjavik	162	172	183	189	205	213	226	240	262	281	302	324	350
State Electric Power Works	84	93	105	108	120	123	130	138	146	159	170	181	192
Other Municipal Sales	27	28	29	30	30	32	33	34	35	36	37	39	40
Fertilizer Plant	27	27	27	27	27	27	27	27	27	27	27	27	27
Sub Total	300	320	344	354	382	395	416	439	470	503	536	571	609
Smelter	-	-	-	-	-	-	-	-	250	500	500	750	1000
TOTAL (primary)	300	320	344	354	382	395	416	439	720	1003	1036	1321	1609
Secondary Energy sales (or surplus)	115	98	101	106	67	88	70	49	104	104	104	104	104

ANNEX 4

# SOUTHWEST ICELAND POWER SYSTEM CAPACITY AND DEMAND



APPRAISAL OF BURFELL POWER PROJECT - ICELAND

Summary of the Power Contract

between

Landsvirkjun (National Power Company)

and

Icelandic Aluminium Company Limited (ISAL)

1 Landsvirkjun shall make available 60 MW to the first stage of the smelter not later than the first Power Delivery Date (PDD I), which date (as defined in the Master Agreement) shall be determined by Landsvirkjun but shall not be earlier than June 1, 1969 nor later than June 1, 1970 Landsvirkjun shall make available 90 MW to the second stage of the smelter on the second Power Delivery Date (PDD II) which date shall be not earlier than one year but not later than three years following PDD I, and 120 MW to the third stage of the smelter on the third Power Delivery Date (PDD III), which date shall be not earlier than one year following PDD I and not later than three years following PDD II PDD II and PDD III shall be determined by agreement of the parties and in the absence of such agreement PDD II is fixed as the third anniversary of PDD I, and PDD III as the third anniversary of PDD II

2 The amount of energy to be made available to the smelter per calendar year shall be 530 GWh for the first stage, 795 GWh for the second stage and 1060 GWh for the third stage Landsvirkjun shall make said energy available, subject to certain conditions, at a mean rate per hour of 70 MW, 105 MW and 140 MW respectively During periods of peak demand, ISAL shall on request limit the demand to a mean rate per hour of 60 MW, 90 MW and 120 MW respectively for periods totalling one hour during each twenty-four hours

3 Power shall be supplied to the smelter from the Burfell power facilities or from any other generating facility interconnected therewith Such power shall be supplied at 220 kv - 50 cycles to the switchyard located at the smelter It shall be supplied at a power factor which, on the average, shall not be less than 0.90 per calendar month The power price shall be increased, according to a formula, in any one month in which the average power factor falls below this value

4 Landsvirkjun shall at all times maintain reserve capacity on its system so that in the event of emergency conditions it will be able to make available to the smelter at least 28 MW for the first stage of the smelter, 42 MW for the second stage, and 56 MW for the third stage

5. The price for power supplied to the smelter shall be 3 US mills per kwh from the start of operations of the first stage of the smelter or from PDD I, whichever is earlier, until PDD III. Said price shall thereafter be 2.5 US mills per kwh, subject to increase 15 years after PDD I - and subsequently at 5-year intervals - to take account of changes in the variable component (labor and maintenance) of power costs. This power price may be revised at the request of Landsvirkjun or ISAL 25 years after PDD I, if the Power Contract is extended, in accordance with a formula reflecting the lower of (a) the increase of the power price to the aluminium smelter of Alusuisse's subsidiary in Norway since PDD I, or (b) a rate equivalent to 1 percent of the average world market price of aluminum during the preceding 3 years. The price for power to be paid by ISAL shall never be less than 2.5 US mills per kwh. Payments for power shall be made monthly by ISAL, in US dollars.

6. ISAL will pay for a minimum amount of energy made available to it in each calendar year, at the applicable contract price, even though the consumption of energy by ISAL in such calendar year may have been less than the applicable minimum amount. The minimum amounts of energy per calendar year specified are 450 GWh from PDD I to PDD II, 675 GWh from PDD II to PDD III, and 900 GWh after PDD III.

7. The term of the Power Contract shall coincide with that of the Master Agreement, that is, for a period of 25 years from PDD I and at the option of either the Government or Alusuisse for two additional terms of 10 years.

APPRAISAL OF BURFELL POWER PROJECT - ICELAND

Summary of the Master Agreement

between

The Government of Iceland

and

Swiss Aluminium Limited (Alusuisse)

1. Swiss Aluminium Limited (Alusuisse) shall organize a company in Iceland, the Icelandic Aluminium Company Limited (ISAL), to construct, own and operate an aluminum smelter. ISAL will be wholly owned by Alusuisse, although with the consent of the Government Alusuisse shall have the right to sell to others up to 49 percent of the ordinary shares of ISAL. The Government shall be represented on the Board of Directors of ISAL. The paid share capital of ISAL shall at no time be less than an amount equivalent to one-third of the book value of its fixed assets.

2. ISAL shall construct the smelter in three stages: in the first stage the smelter shall be equipped with one potline with a capacity of 60 MW, in the second stage with one and one half potlines with a capacity of 90 MW, and in the third stage with two potlines with a capacity of 120 MW. The smelter is to be situated on the eastern shore of Straumsvík, in the Township of Hafnarfjörður. The schedule of construction of the smelter is to be coordinated with that of the Burfell project.

3. Landsvirkjun (the National Power Company) shall construct the Burfell power facilities, which are to include a hydroelectric power plant at Burfell Mountain, on the River Thjorsa, and power transmission facilities connecting with the smelter. The power plant shall have a rated capacity in the initial stage of 105 MW and an eventual capacity of 210 MW.

4. The Township of Hafnarfjörður shall construct port facilities at Straumsvík next to the smelter site which are to be available for the commencement of smelter production. ISAL shall pay to the Township a fixed rental calculated on the basis of the capital costs of the port facilities. It shall install at its own expense, and operate, the loading and unloading facilities required for its operations.

5. The activities of ISAL shall be limited to the production of aluminum, and it will not be entitled to manufacture fabricated products without the consent of the Government.

6. ISAL shall at all times maintain, subject to an allowable deviation of 10 percent, a minimum annual production of aluminum of 30,000 metric tons with respect to the first stage of the smelter and 45,000 and 60,000 metric tons with respect to the second and third stages. It shall be entitled to reduce production below these levels only if Alusuisse and its other affiliates are affected by marketing problems or a general shortage of materials, and then only in the same proportion as the reduction made in the other smelters operated by Alusuisse and its affiliates.

7. The first, second and third Power Delivery Dates (PDD I, PDD II and PDD III) shall be the dates respectively on which Landsvirkjun shall be obligated to make the stipulated amounts of power (60 MW, 90 MW and 120 MW) available to the first, second and third stages of the smelter respectively and on which ISAL shall become obligated to purchase and pay for at least the minimum quantities of power applicable to the respective stages. PDD I shall be determined by Landsvirkjun but the date shall not be earlier than June 1, 1969 nor later than June 1, 1970. PDD II shall be not earlier than one year and not later than three years following PDD I and PDD III shall not be earlier than one year following PDD I and not later than three years following PDD II. PDD II and PDD III shall be determined by agreement of the parties and in the absence of such agreement PDD II is fixed as the third anniversary of PDD I, and PDD III as the third anniversary of PDD II.

8. ISAL shall pay a single consolidated tax levied on each metric ton of aluminum shipped from the smelter. Said tax shall be in the following amounts: US\$12.50 from the commencement of operations until PDD III (that is, during the period when ISAL will be paying to Landsvirkjun 3 US mills per kwh instead of 2.5); US\$20.00 from PDD III until the fifteenth anniversary of PDD I; US\$27.50 from the end of that period until the fifteenth anniversary of PDD II; US\$31.25 from the end of that period until the fifteenth anniversary of PDD III; and US\$35.00 thereafter. These amounts of the consolidated tax shall be increased by US\$7.00 per metric ton for every one US cent per pound by which the world market price of aluminum shall exceed 27 US cents per pound, and shall be decreased by US\$7.00 per metric ton for every one US cent per pound by which said world market price shall fall below US 22 cents per pound.

9. The consolidated tax to be paid by ISAL in any calendar year, however, shall not be less than US\$100,000 (US\$200,000 after the two potlines of the smelter are in operation), and shall not exceed 50 percent of the net profits of ISAL for that year. To the extent that in any year the consolidated tax exceeds 50 percent of said profits, ISAL will still pay the tax of US\$12.50 and subsequently US\$20.00, (paragraph 8 above) but will be given tax credits which could be used to offset taxes in subsequent years by the amount said taxes are in excess of US\$20.00 per metric ton (US\$12.50 until PDD III).

10. The consolidated tax shall be due upon each shipment of aluminum from the smelter, and ISAL shall make payment, in US dollars, 30 days thereafter. The consolidated tax may be revised upon the request of either the Government or Alusuisse after 25 and 35 years.
11. ISAL shall pay the consolidated tax in lieu of all taxes, including import and export duties, present or future, payable under Icelandic law, except for certain taxes specifically listed in the Master Agreement, like stamp duties, registration and licensing fees, and social security benefits for employees.
12. The occurrence of certain defined events of Force Majeure which the parties could not prevent or control, would suspend the performance of the obligations of the parties under the Master Agreement, the Power Contract, and the other scheduled contracts, but only those obligations that were directly affected by said events, and only as long as the effects thereof shall continue.
13. The Government unconditionally guarantees the performance of all the obligations of Landsvirkjun and the Township of Hafnarfjordur, and on the other hand Alusuisse unconditionally guarantees the performance of all the obligations of ISAL. Alusuisse's guarantee of the obligation of ISAL to construct the smelter is supplemented by a letter of guaranty issued by the Swiss Credit Bank to the Government in accordance with the Performance Guarantee Agreement signed by the Government and Alusuisse simultaneously with the Master Agreement.
14. The Master Agreement, the Power Contract, and the other scheduled contracts shall continue in force during 25 years after PDD I. Either the Government or Alusuisse may elect to extend that term for an additional 10-year period and subsequently for a further 10-year period.
15. There is provision for international arbitration for the settlement of disputes that may arise between the parties to these Agreements.

List of Schedules to the Master Agreement

Schedule A	Power Contract
Schedule B	Smelter Site and Harbor Agreement
Schedules C1, C2, C3	Assistance Agreements - Design and Construction - Operation - Sales
Schedule D	Performance Guaranty Agreement
Schedule E	Memorandum of Association and Statutes of ISAL

APPRAISAL OF BURFELL POWER PROJECT - ICELANDCost EstimatesBurfell Hydroelectric Station and Transmission

	<u>Foreign</u> <u>Currency</u> <u>Component</u> (thousands of US\$ equivalent)	<u>Local</u> <u>Currency</u> <u>Component</u> (thousands of US\$ equivalent)	<u>Total</u> <u>Cost</u>
<u>POWER PLANT</u>			
<u>Civil Construction</u>			
Powerhouse	1,620	1,330	2,950
Dam, Dikes, Weirs, Canals	4,810	3,090	7,900
Tunnels, Penstocks	2,670	1,910	4,580
Tailrace Canal	<u>120</u>	<u>70</u>	<u>190</u>
	9,220	6,400	15,620
<u>EQUIPMENT</u>			
Turbines	900	90	990
Generators	1,210	120	1,330
Switchgear, Miscellaneous	580	60	640
Mechanical	<u>510</u>	<u>100</u>	<u>610</u>
	3,200	370	3,570
Preliminary Costs, Roads, Access, General Plant	180	1,410	1,590
Engineering, Supervision, Overhead	1,400	750	2,150
Contingencies	<u>1,550</u>	<u>1,400</u>	<u>2,950</u>
TOTAL	3,130	3,560	6,690
<u>TRANSMISSION</u>			
Substations	1,950	430	2,380
Transmission Lines	1,180	790	1,970
Engineering Supervision	400	150	550
Contingencies	<u>420</u>	<u>300</u>	<u>720</u>
	3,950	1,670	5,620
<u>PROJECT TOTAL COST</u>			
(excluding interest during construction)	<u>19,500</u>	<u>12,000</u>	<u>31,500</u>

ICELAND

ANNEX 6

Sogsvirkjunin

Balance Sheets  
(in millions of Kronur)

As at December 31	1961	1962	1963	1964	1965
<b>ASSETS</b>					
Fixed assets	601.3	598.4	592.5	653.7	655.4
Less depreciation	66.9	84.7	101.9	121.6	140.3
Net Fixed Assets in Operation	534.4	513.7	490.6	532.1	515.1
Work-in-progress	0.2	4.1	56.4	0.4	
Loan to Reykjavik power	44.2	41.0	37.6	34.6	30.7
Current assets:					
Cash	15.9	14.3	26.3	34.8	12.6
Other	20.5	36.5	28.1	29.0	64.8
Total Current Assets	36.4	50.8	54.4	63.8	77.4
TOTAL ASSETS	615.2	609.6	639.0	630.9	623.2
<b>LIABILITIES</b>					
Retained earnings	51.7	66.1	82.5	98.4	114.4
Long-term debt	543.8	519.1	520.6	489.9	455.9
Current liabilities:					
Price Regulation Fund	13.3	18.8	28.0	37.0	49.0
Other	6.4	5.6	7.9	5.6	3.9
TOTAL LIABILITIES	615.2	609.6	639.0	630.9	623.2

Details of Outstanding Loans Taken Over

Sogsvirkjunin Loans	Date	Repayment period-years	Interest	Estimated Balance at Dec. 31, 1965 in millions of Kr.
6% Iceland bonds	1951	18	6%	2.4
IBRD Loan 46-IC	1952	18	4 3/8%	39.5
Counterpart funds	1952/3	18	5.5%	58.2
ECA	1951	28	2.5%	46.0
Manufacturers Trust	1963	5	5.5%	19.2
Central Bank	1963	20	7.5%	9.6
ICA	1957	17	3%	129.4
U. S. AID (PL 480)	1957-1964	17	3 1/5%	151.6
				455.9
<b>Loans for Reserve Plant at Ellidaar</b>				
National Bank of Iceland	1965	16	8.5%	15.0
Union Bank of Switzerland	1963/65	17	6%	14.9
U. S. AID (PL 480)	1960/65	17	4%	16.0
				45.9
Total Loans Taken Over				501.8

April 20, 1966

ICELANDANNEX 7SogsvirkjuninIncome Statements

	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>
<u>Power Sales</u>					
Primary power in MW	66.3	71.3	73.2	78.9	81.2
Primary energy in GWH	300.4	320.3	344.3	354.1	382.5
Secondary energy in GWH	114.6	97.7	100.8	106.0	67.0
Average primary revenue Kr/KW	680	839	848	850	850
Average primary revenue Au/KWH	4.2	5.3	5.3	5.3	5.3
Average secondary revenue Au/KWH	2.0	2.5	2.5	2.5	2.5
<u>Revenue Account (in millions of Kronur)</u>					
Income from primary power	45.1	59.8	62.2	67.1	69.0
Income from primary energy	12.8	17.0	18.3	18.8	20.3
Income from secondary energy	2.3	2.5	2.5	2.7	1.7
TOTAL INCOME	60.2	79.3	83.0	88.6	91.0
Transferred to/from Price Regulations Fund	+ 4.5	- 4.8	- 8.2	- 9.4	- 10.8
TOTAL SOG. INCOME	64.7	74.5	74.8	79.2	80.2
Operation administration and maintenance expenses	9.5	11.2	11.3	12.8	17.5
Contribution to reserve power	9.3	9.8	10.3	11.3	13.4
Depreciation	17.9	17.8	17.2	19.7	20.1
TOTAL EXPENSES	36.7	38.8	38.8	43.8	51.0
NET OPERATING INCOME	28.0	35.7	36.0	35.4	29.2
Total interest	22.5	23.6	24.1	22.9	17.8
Less: interest capitalized	-	0.4	0.9	-	-
interest income	4.1	3.4	3.6	3.4	2.5
Interest charged to operations	18.4	19.8	19.6	19.5	15.3
NET SURPLUS	9.6	15.9	16.4	15.9	13.9
Return on average net fixed assets in operation	5.4%	6.8%	7.2%	6.9%	5.6%

ARWhyte:al  
February 23, 1966

Landsvirkjun

Estimated Income Statements

	1966	1967	1968	1969	1970	1971	1972	1973
<b>Power sales</b>								
Primary power in MW	87.8	92.7	98.0	109.8	127.3	135.3	144.3	153.8
Primary energy in GWH	395	416	439	468	503	536	571	609
Secondary energy in GWH	88	70	49	104	104	104	104	104
Aluminum smelter in GWH				250	500	500	750	1,000
Average primary power price (Kr./Kw)	850	860	860	860	860	860	860	860
Average primary energy price (Av/Kwh)	7.8	10.75	12.25	12.25	12.25	12.25	12.25	12.25
Average secondary energy price (Av/Kwh)		3.50	3.50	3.50	3.50	3.50	3.50	3.50
Average smelter energy price (Av/Kwh)				12.90	12.90	12.90	11.80	10.75
<b>Revenue account (in millions of Kronur)</b>								
Income from primary power	74.6	79.7	84.3	94.4	102.7	109.5	116.4	124.1
Income from primary energy	30.7	44.7	53.8	57.3	61.6	65.7	69.9	74.6
Income from secondary energy	2.6	2.5	1.7	3.6	3.6	3.6	3.6	3.6
Income from smelter energy				32.3	64.5	64.5	88.5	107.5
<b>Total Income</b>	<b>107.9</b>	<b>126.9</b>	<b>139.8</b>	<b>187.6</b>	<b>232.4</b>	<b>243.3</b>	<b>278.4</b>	<b>309.8</b>
<b>Operating, administration and maintenance expenses</b>								
Fuel costs	22.0	22.0	22.0	35.3	36.0	36.7	40.9	42.7
Depreciation	3.0	5.0	9.0	1.3	1.5	1.8	4.0	8.5
	39.3	42.0	43.0	62.8	65.5	65.5	70.2	76.0
<b>Total Operating Expenses</b>	<b>64.3</b>	<b>69.0</b>	<b>74.0</b>	<b>99.4</b>	<b>103.0</b>	<b>104.0</b>	<b>115.1</b>	<b>127.2</b>
<b>Gross income before interest</b>	<b>43.6</b>	<b>57.9</b>	<b>65.8</b>	<b>88.2</b>	<b>129.4</b>	<b>139.3</b>	<b>163.3</b>	<b>182.6</b>
<b>Interest</b>								
Total Interest 2/	21.7	48.1	61.5	75.7	79.2	79.0	80.9	79.7
Less. interest capitalized	3.7	25.8	49.0	30.0		2.3	5.3	
<b>Interest Charged to Operations</b>	<b>18.0</b>	<b>22.3</b>	<b>12.5</b>	<b>45.7</b>	<b>79.2</b>	<b>76.7</b>	<b>75.6</b>	<b>79.7</b>
<b>Net income</b>	<b>25.6</b>	<b>35.6</b>	<b>53.3</b>	<b>42.5</b>	<b>50.2</b>	<b>62.6</b>	<b>87.7</b>	<b>102.9</b>
Surplus at beginning of year		25.6	61.2	114.5	157.0	207.2	294.3	321.5
<b>Total Surplus</b>	<b>25.6</b>	<b>61.2</b>	<b>114.5</b>	<b>157.0</b>	<b>207.2</b>	<b>269.8</b>	<b>342.0</b>	<b>424.4</b>
Interest payable on state contribution and dividends						15.5	20.5	28.5
<b>Surplus at End of Year Cumulative</b>	<b>25.6</b>	<b>61.2</b>	<b>114.5</b>	<b>157.0</b>	<b>207.2</b>	<b>254.3</b>	<b>321.5</b>	<b>395.9</b>
<b>Return on net fixed assets in operation</b>								
at beginning of year	6.3%	8.0%	9.6%	13.6% 1/	6.2%	6.5%	7.9%	8.9%
Interest coverage	2.0	1.2	1.1	1.2	1.6	1.8	2.0	2.3

**Assumptions**

- Power sales to smelter of 500 Gwh a year for each potline; other sales of primary energy based on increase of 6% per annum.
- Power price to smelter of 3 US mills initially falling to 2.5 US mills after 1972; power price to other consumers based on increases of about 10.5% on January 1, 1967, and of about 5% on January 1, 1968.
- Operating expenses based on Consultants estimates, straight-line depreciation at average of 3.3% on Sogsvirkjunin's assets, 25% on Ellidaar plant and 2.5% on Burfell.
- Interest charges include 6% on Bank loan, 7% on external bonds and 7% on interim financing.
- Interest payable on State contribution at 8% from 1971 and dividends of 8% on partners' cash contributions from 1973.

1/ This return is exceptional in that it results from including income from power sales to the smelter for half the year and not including the Burfell scheme in fixed assets in operation.

2/ Including commitment fees and financing charges.

ICELAND

ANNEX 9

Landvirkjun

Estimated Sources and Applications of Funds  
(in millions of Kronur)

	1966	1967	1968	1969	1970	1966-1970	1971	1972	1973	1971-1973
<b>SOURCES</b>										
Gross income before interest	43.6	57.9	65.8	88.2	129.4	384.9	139.3	163.3	182.6	485.2
Add: depreciation	39.3	42.0	43.0	62.8	65.5	252.6	65.5	70.2	76.0	211.7
Cash Earnings	82.9	99.9	108.8	151.0	194.9	617.5	204.8	233.5	258.6	696.9
New equity										
Partners' contributions	30.0	30.0				60.0				
State contribution	40.0	40.0	120.0		-	200.0				
Interest capitalised on State contribution	1.0	5.0	8.0	18.0	19.0	51.0	5.0			5.0
Total New Equity	71.0	75.0	128.0	18.0	19.0	311.0	5.0			5.0
Loan repayments	3.1	3.2	3.3	3.4	3.5	16.5	3.7	2.9	2.2	8.8
Borrowings:										
Proposed IBRD loan	100.0	380.0	170.0	60.0	64.0	774.0				
External bonds				258.0		258.0	66.0	20.0		86.0
Other long-term loans - (Stage II)		86.0	86.0	86.0		258.0	11.5	31.5		43.0
Interim financing										
Suppliers credits			11.5	31.5		43.0				
Total Borrowings	100.0	466.0	267.5	429.5	64.0	1,327.0	77.5	51.5		129.0
TOTAL SOURCES	257.0	644.1	507.6	601.9	281.4	2,292.0	291.0	287.9	260.8	839.7
<b>APPLICATIONS</b>										
Burfell Project 1/	161.8	524.1	415.8	70.0	96.2	1,267.9	154.8	64.5	43.0	262.3
Burfell - Second stage					43.0	43.0	17.2	43.0		60.2
Gas turbine stations			17.2	43.0		60.2				
Other works	26.0	3.0	3.0			32.0				
Total Construction	187.8	527.1	436.0	113.0	139.2	1,403.1	172.0	107.5	43.0	322.5
Repayment of interim financing				258.0		258.0				
Debt service:										
Amortization - Existing loans	41.3	43.0	45.2	41.5	39.1	210.1	41.2	38.3	35.5	115.0
- Proposed IBRD loan							20.1	21.3	22.6	64.0
- Other long-term loans							4.3	4.3	4.7	17.2
- Suppliers credits					4.3	4.3			8.6	17.2
* Total Amortization	41.3	43.0	45.2	41.5	43.4	214.4	65.6	63.9	71.4	200.9
Interest 2/- Existing loans	18.1	16.7	14.8	12.8	11.3	73.7	10.0	8.4	7.2	25.6
- Proposed IBRD loan	3.0	20.0	36.0	43.0	47.0	149.0	46.1	44.9	43.6	134.6
- (including interest financed)	(3.0)	(20.0)	(36.0)	(43.0)	(47.0)	(129.0)				
- External bonds	0.3	7.5	1.0	9.5	18.1	36.4	18.1	18.1	18.1	4.3
- Other long-term loans - (Stage II)							2.3	5.3	6.0	13.6
- Interim financing	0.3	3.9	9.7	8.5		22.4	2.5	4.2	4.8	11.5
- Suppliers credits				1.9	2.8	4.7				
Total Interest	21.7	48.1	61.5	74.7	79.2	286.2	79.0	80.9	79.7	239.6
Total Debt Service	63.0	91.1	106.7	117.2	122.6	500.6	144.6	144.8	151.1	440.5
Interest on state contributions and dividends (Including interest financed)	1.0	5.0	8.0	18.0	19.0	51.0	20.5	20.5	28.5	69.5
Increase in net receivables	(1.0)	(5.0)	(8.0)	(18.0)	(19.0)	(51.0)	(5.0)			(5.0)
	2.0	1.8	0.7	4.4	5.3	14.2	0.9	3.7	3.1	7.7
TOTAL APPLICATIONS	257.8	625.0	551.4	510.6	286.1	2,226.9	338.0	276.5	225.7	840.2
Cash accrual - annual	3.2	19.1	(43.8)	91.3	(4.7)	65.1	(47.0)	11.4	35.1	(0.5)
- cumulative	18.3	37.4	(6.4)	84.9	80.2		33.2	44.6	79.7	
Debt service coverage (excluding interest financed)	1.4	1.4	1.5	2.0	2.0		1.4	1.6	1.7	

1/ Excluding IKr 86.6 million spent prior to 1966 which is included in work-in-progress at January 1, 1966.  
2/ Including commitment fees and financing charges

ICELAND

ANNEX 10

Landsvirkjun

Estimated Balance Sheets  
(in millions of Kronur)

As at January 1, 1966	As At December 31	1966	1967	1968	1969	1970	1971	1972	1973
	<b>ASSETS</b>								
694.9 1/	Fixed assets at valuation plus additions at cost	766.5	769.5	772.5	2,273.7	2,388.9	2,388.9	2,449.1	2,745.0
-	Less: depreciation	39.3	81.3	124.3	187.1	252.6	318.1	388.3	461.3
694.9	Net Fixed Assets in Operation	727.2	688.2	648.2	2,086.6	2,136.3	2,070.8	2,060.8	2,280.7
174.4 2/	Work-in-progress	295.3	850.2	1,340.2		43.0	222.3	274.9	22.0
30.7	Loan to Reykjavik Power	27.6	24.4	21.1	17.7	14.2	10.5	7.6	5.4
	Net current assets								
15.1	Cash	18.3	37.4	(6.4)	84.9	80.2	33.2	44.6	79.1
9.5	Other - less current liabilities	11.5	13.3	14.0	18.4	23.7	24.6	28.3	31.4
24.6	Total Net Current Assets	29.8	50.7	7.6	103.3	103.9	57.8	72.9	111.1
924.6	TOTAL ASSETS	1,079.9	1,613.5	2,017.1	2,207.6	2,297.4	2,361.4	2,416.2	2,419.2
	<b>LIABILITIES</b>								
	Equity								
422.8 3/	Partners' contributions	452.8	482.8	482.8	482.8	482.8	482.8	482.8	482.8
	Earned surplus	25.6	61.2	114.5	157.0	207.2	254.3	321.5	395.4
	State contributions	41.0	86.0	214.0	232.0	251.0	256.0	256.0	256.0
422.8	Total Equity	519.4	630.0	811.3	871.8	941.0	993.1	1,060.3	1,134.7
	Debt:								
501.8	Existing loans	460.5	417.5	372.3	330.8	291.7	250.5	212.2	176.7
	Proposed IFRD loan	100.0	480.0	650.0	710.0	774.0	753.9	732.6	710.0
	External bonds				252.0	252.0	252.0	252.0	252.0
	Other long-term loans - (stage II)						66.0	86.0	81.3
	Interim financing		86.0	172.0					
	Suppliers credits			11.5	43.0	38.7	45.9	73.1	64.5
501.8	Total Debt	560.5	983.5	1,205.8	1,335.8	1,356.4	1,368.3	1,355.9	1,284.5
924.6	TOTAL LIABILITIES	1,079.9	1,613.5	2,017.1	2,207.6	2,297.4	2,361.4	2,416.2	2,419.2
54/46	Debt/equity ratio	52/48	61/39	60/40	61/39	59/41	58/42	56/44	53/47

1/ Fixed Assets  
Sogsvirkjunin hydropower plants at valuation 619.3  
Ellidaar thermal plant 74.9  
Vehicles, office equipment, etc. 0.7  
694.9

2/ Work-in-progress  
Ellidaar extension 45.6  
Burfell - land & water rights 42.2  
" - other costs 86.6  
174.4

3/ Opening capital:  
Sog. net worth at Dec. 31, 1965 114.4  
Revaluation of Sog. assets 104.9  
Partners' contributions (in equal shares)  
- cash 40.0  
- other assets 163.5  
422.8

August 25, 1966

