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The State Electric Power Works
Reykjavík
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Specifications
for different electrical projects
in Iceland.
25.3. 1955

SPECIFICATION FOR DIFFERENT ELECTRICAL
PROJECTS IN ICELAND.

General

a) The projects

Drawing no. 3193E6 shows the location of the different projects. The specifications call for materials and equipment for the following:

- I. 1250 kVA power station on river "Smyrlabjargaa"
- II. 33/11 kV transformerstation at farm "Skogar"
- III. Ditto at farm "Seljaland"
- IV. Ditto on island "Vestmannaeyjar"
- V. Ditto at village "Hvolsvollur"
- VI. Ditto at village "Hella"
- VII. Ditto at village "Selfoss"
- VIII. Ditto at town "Keflavik"
- IX. Ditto at town "Akranes", except 66/6 kV instead og
33/11 kV
- X. Ditto at village "Grundarfjordur"
- XI. Ditto at village "Stykkisholmur"
- XII. Ditto at farm "Kroksfjardarnes"
- XIII. Ditto at village "Hvammstangi"
- XIV. Ditto at valley "Vatnsdalur"
- XV. Ditto at existing power station "Laxarvatn"
- XVI. Ditto at village "Skagastromd"
- XVII. Ditto at existing power station "Gönguskardsa"
- XVIII. Ditto at existing power station "Skeiðsfoss"

- XIX. Ditto at village "Hjalteyri"
- XX. Ditto at town "Akureyri"
- XXI. Ditto at place "Kelduhverfi"
- XXII. Ditto at village "Kopasker"
- XXIII. Ditto at village "Thorshofn"
- XXIV. Ditto at village "Hofn"
- XXV. Special 66 kV transmission between power station "Laxa" and transformerstation "Egilsstadir"
- XXVI. Several 11/0,23 kV transformerstations for distribution inside villages.
- XXVII. Submarine cables for crossing of fjords "Hvalfjord", "Gilsfjord" and "Steingrimsfjord" and from the mainland to the islands "Hrisey" and Vestmannaeyjar".
- XXVIII. Several km of 11 kV and low tension underground cables for ditto, insulated wires etc.
- XXIX. Telephone communication systems.
- XXX. Miscellaneous.

The projects consist further of transmission lines, low tension overhead distribution lines etc. This equipment is however not included in these specifications.

b) The specifications

Attached are specifications for the different projects as described above. The specifications are not obligatory as they may be altered to the extent it may be desirable and/or necessary for better adaptability to the offered equipment, or where, from other reasons, alterations will be proposed.

The State Electric Power works, hereafter called "the

purchaser", reserves its rights, neither to have to accept the lowest tender, nor to have to accept any tender.

The following general conditions apply to all the specifications:

1. Weather conditions

The lowest and highest temperatures during winter and summer are normally -15°C and $+20^{\circ}\text{C}$. All outdoor equipment must however be able to stand -30°C and $+30^{\circ}\text{C}$ as the temperature occasionally can reach these values.

The climate is very salty and heavy and wet snowstorms mixed with salt occur frequently during winter time. All outdoor equipment insulation must be able to stand these conditions. Bushings for instance must either be of higher voltage class than the operating voltage specified or be specially designed with regard to salty climate.

Lightning occurs seldom, but it is however felt that lightning arresters should be used to some extent.

2. Transport facilities, weights etc.

Purchaser will arrange shipment from foreign harbour to Icelandic harbours and take care of all transport from Icelandic harbours to site. It is believed that transport problems will not be difficult (except for the submarine cables which will have to be discussed separately) but tenders should state the maximum shipping and transport weights and main dimensions of the heaviest and bulkiest equipment, separately for each piece.

3. Descriptions, drawings

Tenders should include descriptions, dimensions sketches and drawings, necessary for estimate of the offered equipment.

4. Materials, standards, guarantees, tests, inspection

All materials offered shall be of the best available quality for the purpose for which they are intended and all materials and equipment offered shall conform to applicably standard specifications officially recognized in the country of its manufacture.

In case of purchase, the manufacturer will be requested to give all usual guarantees and to make all usual shop tests and further to give such extra guarantees and to make such extra tests as might be mutually agreed upon. The purchaser will reserve himself the right to have his representative inspect the material and equipment during manufacture and assembly and to witness tests. The purchaser will further reserve himself the right to repeat, as mutually agreed upon, any such tests after the complete installation of the equipment on site.

5. Prices, delivery

All material and equipment is to be offered fob an export harbour having shipping facilities to Iceland.

Tenders should preferably give specific prices on the offered equipment. For main equipment such as cables, turbine, generator, transformers, metalclad switchgear units, power circuit breakers etc. price for each piece should be given.

All prices shall include first class export packing.

Time of delivery (from date of order to the date of delivery from workshop) should be specified to the same extent as the prices.

6. Erection

The purchaser himself will take care of the erection of all equipment. The outlay of the submarine cables will however have to be discussed separately.

7. Spare Parts

Where manufacturer is asked for his opinion as regards spare parts the great distance from manufacturer to the site of erection should be born in mind.

8. Contracts

In case of purchase, an agreement, regarding the manufacture and delivery of the equipment mentioned above and specified below, between the manufacturer and the purchaser shall be established in a contract in which prices, delivery time, terms of payment, all requirements etc. shall be fixed with such amendments as might be mutually agreed upon by the manufacturer and the purchaser.

Reykjavik, March, 1955

THE STATE ELECTRIC POWER WORKS

Eiríkur Briem
(sign)

I. POWER STATION "SMYRLABJARGAA"

Drwg. no. A1194 shows the proposed main arrangement of the station and drwg. no. 3194E2 the one line diagram, see also drwg. no. 4251E3. The head and tail water elevations are 130 m and 33 m respectively. Alternative I needs not to be considered as the difference between the two alternatives is only few per-cent.

a) Turbine with accessories

- Item 1. One horizontal shaft Francis turbine for direct coupling to a three phase electric generator, 50 cycles. Speed of turbine to be as recommended by turbine manufacturer. Full load output to be 1500 HP (1 HP = 75 kgm/sec.) at 97 m brutto head. Turbine to be complete with bearings, flywheel, suitable valve between penstock and turbine, all control and safety devices, cooling and lubricating system, drainage, gauges etc.

- Item 2. One hydraulic governor, complete with all accessories and with remote controlled speed adjustment and stroke limiter. Governor to be belt driven from the main shaft.
The governor to be suitable for both single and parallel operation.

- Item 3. One set of spare parts as recommended by manufacturer.

Manufacturer is requested to state in tender:

Efficiency of turbine at 1/4, 1/2, 3/4 and 1/1 load.

Runaway speed of turbine.

Prescribed flywheel effect.

Speed rise (drop) and pressure rise (drop) when 1/4, 1/2, 3/4 and 1/1 load thrown off (on).

Net and gross weight of the machinery including shipping and mounting weights and main dimensions of heaviest and bulkiest pieces.

Manufacturer is further requested to submit main arrangement drawings.

b) Penstock and valve

Item 1. An approx. tender on a suitable pressure penstock, as indicated on drawing no. All94. Penstock to be buried where possible and insulated elsewhere. The steel penstock to be placed on concrete foundations as mutually agreed upon between manufacturer and purchaser.

Item 2. A suitable automatic selfclosing valve at the upper end of the penstock, complete with air intake valve etc.

c) Generator with accessories (see drwg. no. 3194E2)

Item 1. One horizontally mounted 3-phase, 50 cycles, class B insulated generator, rated 1250 kVA at power factor 0,8, star connected, 6/6,6 kV, for

direct coupling to a horizontal Francis turbine.
Speed to be as recommended by turbine manufacturer.
Generator to be complete with automatic brake
system and all conventional accessories.

Item 2. Exciter, directly coupled on the main shaft.

Item 3. One complete automatic voltage regulator system,
suitable for single and parallel operation and
line drop compensation. Also suitable discharge
system for suppression of the exciter and gener-
ator field.

Item 4. One set of spare parts comprising:

1/6th set of stator windings.

1 set of linings for the bearings

3 sets of brushes for generator and exciter

3 brush holders of each type.

Other spare parts if and as recommended by
manufacturer.

All 6 terminals of the generator shall be brought out
and the stator windings shall be of the vacuumpressure im-
pregnated type, class B. Thermostats are required for the
bearings of the machine and the bearings are also to have
thermometers with alarm contacts and oil level gauges.

The generator shall be effectively insulated against
stray currents.

Manufacturer is requested to state in tender:

Efficiency at 1/4, 1/2, 3/4 and 1/1 load at unity

power factor and 0,8 power factor.

Maximum full load regulation at rated voltage and speed, in per cent of rated voltage.

Temperature guarantees.

Speed and flywheel effect as mutually agreed upon between turbine and generator manufacturers.

Also the runaway speed.

Short circuit ratio (not lower than unity).

Net and gross weights of the machinery including shipping and mounting weights and main dimensions of heaviest and bulkiest pieces.

Necessary capacity of powerhouse crane and necessary lifting height.

Manufacturer is further requested to submit main arrangement drawings.

d) Powerhouse crane

Item 1. One suitable powerhouse crane (handoperated)

e) Transformer and switchgear (see drwg. no. 3194E2)

It is proposed to have the station attended by one operator. Operator is supposed to visit the station once or twice a day. All control and supervising devices should be selected accordingly.

Item 1. One 1250 kVA outdoor transformer, oil immersed, self cooled, three phase, 50 cycles. Voltage ratio at no load 6300 volts delta to 30.000

volts wye (Yd 11) with the neutral point brought out through a fully insulated bushing for solid grounding. Transformer to have full capacity taps for 31500, 33000, 34500 and 36000 volts brought out from the H.V. winding to off load tap changing switches arranged for external operation. H.V. connections brought out through bushings and L.V. through a suitable cable box. Transformer to be complete with oil and all conventional accessories including Buchholz relay.

Item 2. One complete set of primary and secondary coils for one leg of the above specified transformer and one H.V. and one L.V. bushing (spare parts).

Item 3. One 150 kVA transformer, oil immersed, self cooled, three phase, 50 cycles. Voltage ratio at no load 6000 volts delta to 400 volts wye (Dy11) with the neutral point brought out through bushing for solid grounding.

Transformer to have full capacity taps for 6300 and 6600 volts brought out from the H.V. winding to off load tap changing switches arranged for external operation. H.V. and L.V. connections brought out through suitable cable boxes. Transformer to be complete with oil and all conventional accessories.

Manufacturer is requested to state in tender all the

usual information about the transformers such as losses, temperature guarantees, per cent impedance, net and gross weight etc.

- Item 4. One 33 kV, 3-pole, outdoor power circuit breaker, remote controlled from a 110 volts D.C. battery complete with necessary C.T:s for measuring and relaying. Also bushings for one phase (spare).
- Item 5. One 3-pole, 33 kV, outdoor mounted and manually operated disconnecting switch complete with operating mechanism and grounding devices. Also insulatores for one phase (spare).
- Item 6. Four (one as spare) 33 kV outdoor lightning arresters (solidly grounded neutral), one suitable outdoor C.T. for the main transformer neutral and two suitable outdoor P.T:s 33000/110 volts for measuring and sincronizing.
- Item 7. Suitable galvanized steel structure for the outdoor 33 kV switchgear including necessary support insulators, busbars etc.
- Item 8. Suitable grounding device for the generator and suitable C.T:s.
- Item 9. A metal clad cubicle for the generator H.T. side comprising suitable C.T:s, cable boxes for receiving incoming cables from the generator, the main transformer and the station supply trans-

former, H.T. fuses for the P.T:s and the station supply transformer, suitable P.T:s, busbars, wiring etc.

- Item 10. A suitable 110 volts Alkaline D.C. battery metal clad cubicle complete with an automatic rectifier, a suitable battery control panel, wiring etc.
- Item 11. A suitable low tension metal clad cubicle for station supply, complete as indicated on drwg.
- Item 12. One set of necessary relays, meters, signal, alarm, synchronizing and control equipment for the station in accordance with best modern practice. Relays meters etc. to be mounted on suitable panels and flush mounted on front side. It is felt that this equipment should not be specified in detail but drwg. no. 3194E2 indicates what purchaser has in mind.
- Item 13. One set of spare parts for the switchgear in general, as recommended by manufacturer.
- Item 14. It is felt that power and control cables etc. should not be specified until later but manufacturer is requested to estimate roughly the cost of these cables with accessories.

II. TRANSFORMERSTATION "SKOGAR"

Drwg. no. 4260E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation "Hvolsvollur" but otherwise the specifications are identical for both stations.

III. TRANSFORMERSTATION "SELJALAND"

Drwg. no. 4259E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation "Hvolsvollur" but otherwise the specifications are identical for both stations. The 250 kVA transformer should preferably be "pole mounted" in the steel structure.

IV. TRANSFORMERSTATION "VESTMANNAEYJAR"

Drwg. no. 4258E3 shows the one line diagram. The 6 kV side will be connected to the 6 kV busbars in the existing diesel electric power station. The capacity of this station is 3000 kVA.

- Item 1. One transformer similar to the 1250 kVA transformer for power station "Smyrlabjargaa" except 3000 kVA instead of 1250 kVA.
- Item 2. One 33 kV breaker similar to the 33 kV breakers for transformerstation "Hvolsvollur" including C.T:s.

- Item 3. One 33 kV disconnecting switch similar to the 33 kV switch for power station "Smyrlabjargaa".
 - Item 4. Three 33 kV outdoor lightning arresters (solidly grounded neutral).
 - Item 5. Suitable outdoor C.T. for transformer neutral.
 - Item 6. Relays and meters for the 33 kV switchgear as indicated on drwg., for mounting on an indoor panel.
 - Item 7. Suitable galvanized steel structure for the 33 kV switchgear with 33 kV supporting insulators, busbars etc.
 - Item 8. One suitable 32 volts alkaline D.C. battery metal clad cubicle complete with rectifier, suitable battery control panel, wiring etc.
 - Item 9. Spare parts as recommended by manufacturer.
- Note: See "note" under chapter V, transformerstation "Hvolsvollur".

V. TRANSFORMERSTATION "HVOLSVOLLUR"

Drwg. no. 3192E3 shows the one line diagram.

- Item 1. Three 33 kV, 3-phase, outdoor, remote controlled power circuit breakers each complete with tripping device for 32 volts D.C., closing device for 220

volts A.C. and necessary C.T:s for relaying.

Also reclosing features for one of the breakers.

- Item 2. Four, 3-pole, 33 kV, outdoor, manually operated disconnecting switches each complete with operating mechanism.
- Item 3. Three ditto with grounding devices.
- Item 4. Three, 33 kV, outdoor, lightning arresters (the system is solidly grounded only at "Sog" and "Vestmannaeyjar", and one has therefore probably to reckon with full phase voltage to ground in certain cases, see also "note" below). Three, 33 kV, arresters for use at "Kross-sandur" should also be offered under this item.
- Item 5. Three suitable H.R.C. outdoor fuse units for 1000 kVA transformer.
- Item 6. Two, 33 kV, outdoor P.T:s with H.R.C. fuses, for future use.
- Item 7. Suitable relays and meters for the 33 kV switchgear as indicated on drwg. This equipment to be mounted on the 11 kV metal clad switchgear specified below or on a separate panel.
- Item 8. Suitable galvanized steel structure for the outdoor 33 kV switchgear (land space for the outdoor switchyard is more than sufficient) including

necessary 33 kV supporting insulators, busbars etc. See "note" below.

Item 9. One 1000 kVA outdoor transformer, oil immersed, self cooled, three phase, 50 cycles. Voltage ratio at no load 30000 volts delta to 11000 volts wye (Dy11) with the neutral point brought out through a fully insulated bushing for impedance grounding. The transformer to have full capacity taps for 31500, 33000, and 34500 volts brought out from the H.V. winding to off load tap changing switches arranged for external operation. High voltage connections brought out through bushings and L.V. through a suitable cable box. Transformer to be complete with oil and all conventional accessories including Buchholz relay. Manufacturer is requested to state all usual information about the transformer such as losses, per cent impedance, gross weight etc.

Item 10. One suitable grounding impedance for the 11 kV neutral. For different reasons probable neither Peterson coil grounding nor solid grounding is suitable and this question has actually not been settled in general for the 11 kV systems in Iceland. The 11 kV networks (3 phase - 3 wire) are as a rule rather unbalanced, as often considerable parts of the networks consists of single phase lines and further they are often

sectionalized with powerbreakers. This matter will have to be discussed in detail with the manufacturer but manufacturer is requested to suggest a solution.

Item 11. An 11 kV, 3-phase indoor metal clad switchgear complete with two power circuit breakers with tripping device for 32 volts D.C. and closing device for 220 volts A.C. and three ditto with reclosing features, station supply cubicle, current and potential transformers, relays and meters, cable boxes, busbars, wiring, etc. all as indicated on drwg.

Item 12. One suitable 32 volts alkaline D.C. battery metal clad cubicle complete with rectifier, suitable battery control panel, wiring etc.

Item 13. Nine 11 kV outdoor lightning arresters (see item 10).

Item 14. Spare parts as recommended by manufacturer.

Note: Drwg. no. 3198E6 shows the main one line diagram of the system between "Sog" and "Vestmannaeyjar". The system is solidly grounded at these two points. Should it be considered adviceable, with regard to the submarine cable to Vestmannaeyjar, to ground the system closer to the cable this could be done with an autotransformer at trans-

formerstation "Hvolsvollur", which transformer in such case should be selected 6000 kVA and with on load regulation (31500 volts wye to 33000 volts wye plus/minus 10% in 32 steps) with regard to future.

A 66 kV line from "Sag" to "Hvolsvollur" will be erected later. Until then the 33 kV network can only deliver 1000 - 3000 kVA to "Vestmannaeyjar" depending on the load at other points in the network.

VI. TRANSFORMERSTATION "HELLA"

Drwg. no. 4257E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation "Hvolsvollur" but otherwise the specifications are identical for both stations.

VII. TRANSFORMERSTATION "SELFOSS"

See drwg. no. 4283E3. The material needed for this station (existing) is:

- Item 1. One 1000 kVA transformer similar to the 1000 kVA transformer for transformerstation "Hvolsvollur"
- Item 2. One 33 kV breaker similar to the 33 kV breakers in transformerstation "Hvolsvollur" inclusive relays and ammeter which are to be mounted on an existing indoor panel. Also necessary C.T:s

for both relaying and measuring.

- Item 3. One grounding impedance, similar to the grounding impedance for the 11 kV neutral in transformer-station "Hvolsvollur".
- Item 4. Spare parts as recommended by manufacturer.

VIII. TRANSFORMERSTATION "KEFLAVIK"

See drwg. no. 3195E3. The material needed for this station (existing) is:

- Item 1. An 11 kV (but rated 6,3 kV), 3-phase indoor metal clad switchgear complete with seven power circuit breakers each with tripping device for 32 volts D.C. and closing device for 220 volts A.C. and three ditto with reclosing features. Metal clad to be complete with station supply cubicle, current and potential transformers, relays and meters, cable boxes, busbars, wiring etc. all as indicated on drwg. no. 3195E3.
- Item 2. Nine 6,6 kV, outdoors lightning arresters, see item 4.
- Item 3. One suitable 32 volts alkaline D.C. battery metal clad cubicle complete with rectifier, suitable battery control panel, wiring etc.
- Item 4. One zig-zag coupled, 3-phase, outdoor grounding

transformer, 50 cycles, 6,3 kV, 5740 kVA (1578A in ground lead) for one minute, impedance approx. 92,5%. Transformer to be complete with oil and all conventional accessories including cable box for incoming cable from the "metal clad".

Item 5. Spare parts as recommended by manufacturer.

IX. TRANSFORMERSTATION "AKRANES"

Drwg. no. 4268E3 shows the one line diagram. The 6,3 kV side will be connected to the 6,3 kV busbars in an existing transformerstation.

Item 1. One transformer similar to the 1250 kVA transformer for power station "Smyrlabjargaa" except 5000 kVA instead of 1250 kVA and 60 + 3 x 5% kV on the H.T. side instead of 30 + 4 x 5% kV.

Item 2. One 66 kV breaker similar to the 33 kV breaker for power station "Smyrlabjargaa" except 66 kV instead of 33 kV. Also C.T:s as shown on drwg.

Item 3. One 66 kV disconnecting switch similar to the 33 kV switch for power station "Smyrlabjargaa" except 66 kV instead of 33 kV.

Item 4. Three 66 kV outdoor lightning arresters (solidly grounded neutral). Also six ditto for use at the ends of the 66 kV submarine cable over fjord "Hvalfjord". The 66 kV system in Reykjavik has

a solidly grounded neutral.

Item 5. Suitable outdoor C.T. for transformer neutral.

Item 6. Relays and meters for the 66 kV switchgear as indicated on drwg., for mounting on an indoor panel.

Item 7. Suitable galvanized steel structure for the 66 kV switchgear with 66 kV supporting insulators, bus-bars etc.

Item 8. Spare parts as recommended by manufacturer.

X. TRANSFORMERSTATION "GRUNDARFJORDUR"

Drwg. no. 4269E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation "Hvolsvollur" but otherwise the specifications are identical for both stations.

XI. TRANSFORMERSTATION "STYKKISHOLMUR"

Drwg. no. 4270E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation "Hvolsvollur" but otherwise the specifications are identical for both stations.

XII. TRANSFORMERSTATION "KROKSFJARDARNES"

Drwg. no. 4275E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation

"Hvolsvollur" but otherwise the specifications are identical for both stations. Nine extra lightning arresters should be offered here for the other end of the submarine cable over fjord "Gilsfjordur" and for the cable over fjord "Steingrimsfjordur".

XIII. TRANSFORMERSTATION "HVAMMSTANGI"

Drwg. no. 4277E3 shows the one line diagram. The drwg. shows the difference between this station and transformer-station "Hvolsvollur" but otherwise the specifications are identical for both stations.

XIV. TRANSFORMERSTATION "VATNSDALUR"

Drwg. no. 4278E3 shows the one line diagram. The drwg. shows the difference between this station and transformer-station "Hvolsvollur" but otherwise the specifications are identical for both stations. The 250 kVA transformer should preferable be "pole mounted" in the steel structure.

XV. TRANSFORMERSTATION "LAXARVATN"

Drwg. no. 4262E3 shows the one line diagram. The drwg. shows the difference between this station and transformer-station "Hvolsvollur" but otherwise the specifications are identical for both stations.

XVI. TRANSFORMERSTATION "SKAGASTROND"

Drwg. no. 4281E3 shows the one line diagram. The drwg. shows the difference between this station and transformer-

station "Hvolsvollur" but otherwise the specifications are identical for both stations.

XVII. TRANSFORMERSTATION "GONGUSKARDSA"

Drwg. no. 4282E3 shows the one line diagram. The 11 kV side will be connected to the 11 kV busbars in the existing hydroelectric power station.

- Item 1. One transformer similar to the 1250 kVA transformer for power station "Smyrlabjargaa" except 1000 kVA instead of 1250 kVA and 11 kV on the L.T. side instead of 6,3 kV.
- Item 2. One 33 kV disconnecting switch similar to the 33 kV switch for power station "Smyrlabjargaa".
- Item 3. Three 33 kV outdoor lightning arresters (solidly grounded neutral).
- Item 4. Suitable outdoor C.T. for transformer neutral.
- Item 5. Suitable galvanized steel structure for the 33 kV switchgear with 33 kV supporting insulators, busbars etc.
- Item 6. Spare parts as recommended by manufacturer.

XVIII. TRANSFORMERSTATION "SKEIDSF OSS"

Drwg. no. 4265E3 shows the one line diagram. The drwg. shows the difference between this station and transformer-

station "Hvolsvollur" but otherwise the specifications are identical for both stations. Note that the transformer is 22 kV instead of 33 kV.

XIX. TRANSFORMERSTATION "HJALTEYRI"

Drwg. no. 4261E3 shows the one line diagram. The drwg. shows the difference between this station and transformer-station "Hvolsvollur" but otherwise the specifications are identical for both stations. Six 11 kV lightning arresters for the submarine cable to the island "Hrisey" should be offered here as extra equipment.

XX. TRANSFORMERSTATION "AKUREYRI"

Drwg. no. 4264E3 shows the one line diagram. The drwg. shows the difference between this station and transformer-station "Hvolsvollur" but otherwise the specifications are identical for both stations.

XXI. TRANSFORMERSTATION "KELDUHVERFI"

Drwg. no. 4279E3 shows the one line diagram. The drwg. shows the difference between this station and transformer-station "Hvolsvollur" but otherwise the specifications are identical for both stations. The 250 kVA transformer should preferable be "pole mounted" in the steel structure.

XXII. TRANSFORMERSTATION "KOPASKER"

Drwg. no. 4272E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation "Hvolsvollur" but otherwise the specifications are identical for both stations.

XXIII. TRANSFORMERSTATION "THORSHOFN"

Drwg. no. 4276E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation "Hvolsvollur" but otherwise the specifications are identical for both stations.

XXIV. TRANSFORMERSTATION "HOFN"

Drwg. no. 4280E3 shows the one line diagram. The drwg. shows the difference between this station and transformerstation "Hvolsvollur" but otherwise the specifications are identical for both stations.

XXV. SPECIAL 66 kV TRANSMISSION BETWEEN

"LAXA" AND "EGILSSTADIR"

It is intended to build a 66 kV transmission line, 170 km long, from power station "Laxa" to transformerstation "Egilsstadir". The transmission which is intended for 10 MVA is to be 3-phase with two wires and ground as third conductor. This transmission has to be discussed further with

manufacturer but in order to form a base for such discussion and to get an approx. idea of the prices involved, manufacturer is requested to offer 66 kV breakers, 66 kV transformers, 66 kV disconnecting switches and a seriecondenser according to drwg. 4284E6.

It can be mentioned here that the ground resistance is 300-400 ohmmeter.

XXVI. 11/0,23 kV TRANSFORMERSTATIONS

It is intended to use three standard sizes or 300, 150 and 75 kVA stations. The equipment for the 300 and 150 kVA stations will be housed indoors in small concrete buildings whereas the 75 kVA stations will be pole mounted stations (H-pole) with the low tension equipment housed in a suitable shed placed between the two poles. In spite of this all the transformers should be designed for both indoor and outdoor operation.

Item 1. Nine 300 kVA stations according to drwg. 4228E4 and each comprising:

One H.T. metal clad cubicle complete with suitable switches, fuses, cable boxes, busbars, wiring etc.

One 300 kVA transformer, oil immersed, self cooled, three phase, 50 cycles. Voltage ratio at no load 10000 volts delta to 230 volts wye (Dy 11) with the neutral point brought out through a fully insulated bushing for solid grounding. Transformer to have full capacity taps for 9500 and 10500 volts brought out from the H.V. winding to off load tap changing switches arranged for external operation. High voltage and L.V. connections brought out in a suitable manner for busbar connection to the H.T. and L.T. cubicles. Transformer to be complete with oil and all con-

ventional accessories. Manufacturer is requested to state in tender all usual information about the transformer.

One L.T. metal clad cubicle complete with suitable C.T:s, fuse switches, street lighting equipment, meters, station supply outlets, cable boxes, busbars, wiring etc.

Two suitable busbar connections between H.T. and L.T. cubicles and transformer as indicated on drwg.

Item 2. Six 150 kVA stations according to drwg. 4227E4 but otherwise as item 1.

Item 3. Seven 75 kVA stations according to drwg. 4226E4 with drop-out fuses instead of H.T. cubicle but otherwise as item 1.

Item 4. Spare parts as recommended by manufacturer.

In certain cases it may become desirable to arrange the 75 kVA stations as indoor stations in similar manner to the 150 kVA stations and vice versa to arrange the 150 kVA stations as pole mounting stations in similar manner to the 75 kVA stations. The H.V. and L.V. windings of the 75 kVA transformers should therefore be brought out in the same manner as the windings of the 150 kVA transformers and be fitted with suitable cable boxes so that either cable boxes can be used for pole mounting arrangement according to drwg. 4226E4 or busbar mounting arrangement according to drwg. 4227E4. It should then also be

possible to fit such cable boxes to the 150 kVA transformers.

The specifications call for fuse switches on the L.T. side. Manufacturer is however requested to inform what the price difference would be for each station if automatic air break switches were used instead.

XXVII. SUBMARINE CABLES

The following drwgs. show the profile of the different cable crossings:

- Drwg. 4289E5, Hvalfjord, 66 kV
- " 4288E5, Vestmannaeyjar, 33 kV
- " 4290E5, Gilsfjord, 11 kV
- " 4291E5, Steingrimsfjord, 11 kV
- " 4292E5, Hrisey, 11 kV

The design, transport and layout of these cables will have to be discussed in detail with manufacturer but in order to form a basis for such a discussion manufacturer is requested to offer the following:

Item 1. 4,1 km, 3 core, stranded, 50 sq.mm copper, 66 kV oil filled, steel armoured, submarine cable for crossing of fjord "Hvalfjord". The cable should be designed according to strictest specifications and be armoured with one layer of galvanized round steel wires, 6 mm diameter. Suitable wires for measuring faults should be imbedded in cable. The cable should be offered in one length if possible.

Item 2. 0,4 km ditto as spare.

Item 3. 19,2 km, 3 core, stranded, 35 sq. mm copper, 33 kV, paper insulated, lead covered, steel armoured submarine cable for the crossing to "Vestmanna-

eyjar". The cable should be designed according to strictest specifications and be armoured with one layer of galvanized round steel wires, 6 mm diameter. Suitable wires for measuring faults should be imbedded in cable. The cable should be offered in one length if possible.

Item 4. 1,0 km ditto on suitable drum (spare)

Item 5. 3,3 km same as item 3, for crossing of fjord "Gilsfjordur" except 3 x 16 sq.mm copper and 11 kV instead of 3 x 35 sq.mm copper and 33 kV.

Item 6. 0,50 km ditto on suitable drum (spare).

Item 7. 1,95 km same as item 5, for crossing of fjord "Steingrimsfjord".

Item 8. 3,3 km same as item 5, for the crossing to "Hrisey".

Item 9. Necessary and suitable end boxes (pole mounting) for the above specified cables including all accessories and suitable spares.

XXVIII. UNDERGROUND CABLES, INSULATED WIRES ETC.

Item 1. 12 km, 3 core, stranded, 16 sq.mm copper, 11 kV, paper insulated, lead covered, double steel taped underground cable (according to VDE 1937) on suitable drums.

Item 2. 2 km, 3-core, stranded, 150 sq.mm copper, 1 kV, paper insulated, lead covered, double steel taped underground cable (according to VDE 1937) on suitable drums.

Item 3. 2 km ditto except 3 x 120 sq. mm

Item 4. 3 - - - 3 x 95 - -

Item 5. 6 - - - 3 x 70 - -

Item 6. 5 - - - 3 x 50 - -

Item 7. 2 - - - 3 x 35 - -

Item 8. 5 - - - 3 x 25 - -

Item 9. 6 - - - 3 x 16 - -

Item 10. 2 - - - 3 x 10 - -

Item 11. 8 - - - 2 x 10 - -

Item 12. 3 - hard drawn, stranded, 70 sq. mm., double braided and weather resisting compounded aerial copperwire on suitable drums.

Item 13. 3 km, ditto except 50 sq. mm

Item 14. 18 - - - 25 - -

Item 15. 30 - - - 16 - -

Item 16. 6 - soft drawn, stranded, 25 sq. mm plastic insulated copperwire (for low tension outdoor use) on suitable drums.

Item 17. 12 km ditto except 16 sq. mm

Item 18. 25 outdoor pole mounting cable boxes for item 1,
complete with all accessories.

Item 19. 15 ditto except for item 3.

Item 20. 50 ditto except for item 4

Item 21. 40 - - - - 5

Item 22. 60 - - - - 8

Item 23. 40 - - - - 10

Item 24. 15 underground "straight through" cable boxes
for item 1, complete with all accessories.

Item 25. 5 ditto except "T" instead of "straight through".

XXIX. TELEPHONE COMMUNICATION SYSTEMS

It is intended to install telephone communication system on the networks between "Laxarvatn" and "Saudarkrokur" and "Laxa" and "Thorshofn" see drwg. 3193E6. Manufacturer is therefore requested to offer:

Item 1. Telephone communication system on the 33 kV network between "Laxa" and "Thorshofn" for communication between "Laxa", "Husavik", "Kopasker" and "Thorshofn".

Item 2. Ditto on the network between "Laxarvatn" and "Saudarkrokur" for communication between "Laxarvatn", "Skagastrond" and "Saudarkrokur". In future a 33 kV line between "Laxarvatn" and "Skagastrond" will be built but during the first years these places will be connected over an 11 kV line.

XXX. MISCELLANEOUS

Manufacturer is here requested to offer:

- Item 1. 2500, outdoor, pole mounting, 11 kV, single pole "drop out" fuse holders as indicated on drwg. 4285E8 complete with crossarm brackets. The holders are to be used for 3-50 Amps fuse links mainly 3 and 5 Amps). Unit prices on different sizes of fuse links are to be given.
- Item 2. 150, outdoor, pole mounting, manually operated disconnecting switches, 2-pole, 11 kV, 200 A complete with operating mechanism, all as indicated on drawing 4286E8.
- Item 3. 50 ditto except 3-pole instead of 2-pole, see drwg. 4287E8.
- Item 4. Twenty 30 kVA pole mounting outdoor transformers, oil immersed, self cooled, three phase, 50 cycles. Voltage ratio at no load 10000 volts delta to 230 volts wye (Dy 11) with the neutral point brought out through a fully insulated bushing for solid grounding. Transformer to have full capacity taps for 9500 and 10500 volts brought out from the H.V. winding to off load tap changing switches arranged for external operation. High voltage and L.V. connections brought out through bushings. Transformer to be complete with oil and all con-

ventional accessories. Manufacturer is requested to state in tender all usual information about the transformers.

Item 5. Twenty ditto except 50 kVA instead of 30 kVA.

Item 6. Manufacturer is here requested to give unit prices for the following meters, assuming a purchase of several hundreds of each type.

- a) 25A, 220V, single phase kwh meter. The meter to be able to stand 100% overload.
- b) 15A, 220V, single phase "subtraktionsmeter" adjustable between 10 and 100%. The meter to be able to stand 200% overload.
- c) 25A ditto with 100% overload capacity.
- d) 50A ditto with 50% overload capacity and adjustable between 20 and 100%.

Item 7. Spare parts as recommended by manufacturer.