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1. BACKGROUND

The history of the Salleri Chialsa Project began about 60 years ago, after the people's uprising in Tibet and its suppression by the Chinese. At that time, thousands of Tibetan refugees moved into eastern Nepal and settled in the district of Solukhumbu. With aid from various international organizations, Government of Nepal started a program in 1960 to help resettle the refugees and founded (among others) the Tibetan Community of Chialsa. Most of Tibetan families in the community were economically dependent on handicrafts. The handicraft center, with its carpet factory, where the raw wool was preprocessed, washed, spun, dyed and woven into carpets, was the most important source of income for these Tibetans.

The first studies were made by the Swiss Association for Technical Assistance (SATA) in 1960. The small hydro power station was constructed in 1982 on the Solukhola River, with Swiss Aid, designated as Salleri Chialsa Hydropower Project. Government of Nepal and the Swiss Development Cooperation (SDC) agreed to bring into existence a shareholder company, Salleri Chialsa Electricity Company Ltd (SCECO), through the Salleri Electricity Utilization Project (SELUP).

The electricity supply system was designed and implemented by ITECO/Switzerland. The power plant, situated on the Solukhola (Solu), is a classical run-of river scheme designed for 400kW hydraulic gross capacity.

In many respects, SCECO is a pioneer project. Many of the political concepts in the new Hydro Power Development Policy 1992 of Government of Nepal were prepared and first confirmed through the setting-up SCECO (shareholder company, foreign share holding, tariff authority, operation mode, staffing etc.).

2. ESTABLISHMENT

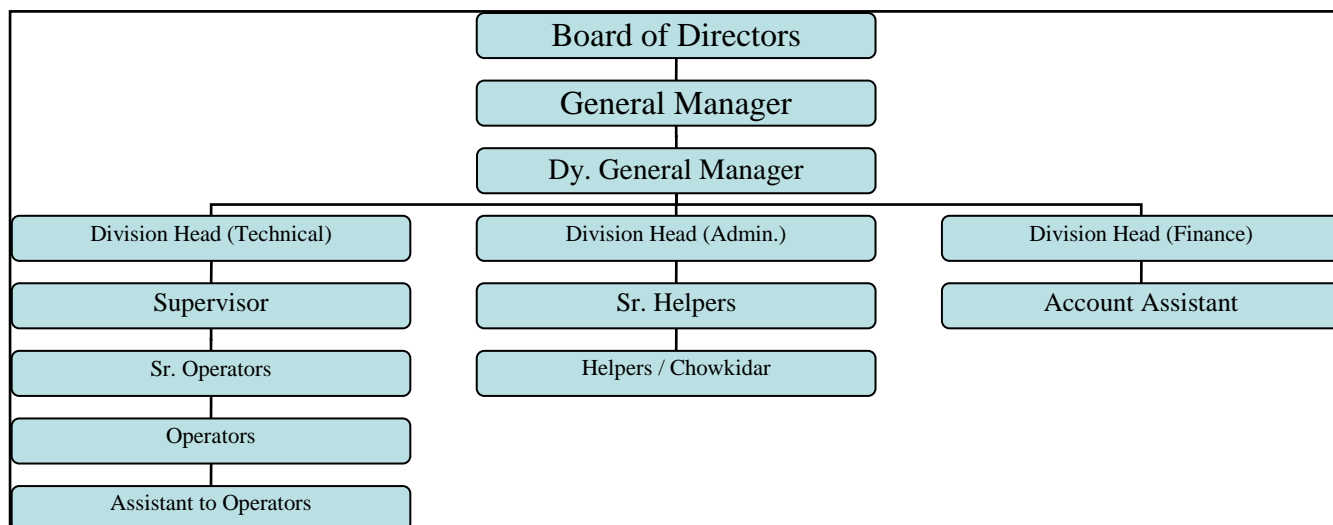
Salleri Chialsa Electricity Company Limited (SCECO) at Salleri, Solukhumbu was registered in Falgun 2047 (February 1991) as a public share holder's company. Swiss Development Co-operation (SDC) and Nepal Electricity Authority (NEA) have equal preference (investment) share. The ordinary share holder representing the decision making body of the company are local people 34%, SDC and NEA with 33% each.

3. CAPITAL STRUCTURE

Project cost (I Phase & II Phase) (2* 180 kW):	NRs.226, 123000.00
Capital Investment:	85% SDC and 15% NEA during construction period
Share distribution (At present)	
Preference share: - 50% SDC and 50% NEA	
Ordinary share: - 33% SDC, 33% NEA and 34% DHH	
SDC Contribution III Project (273 kW) for Electromechanical equipments	NRs. 47,588,735.74
Investment by SCECO Itself for Construction of III Project	NRs. 28,534,264.26

4. MANAGEMENT AND OPERATION

SCECO has a lean management with 12 competent staffs to manage and maintain the system to required standard. The holders of ordinary shares-representing the decision-making body of the company - are the local people, so-called "domiciled householders", who hold 34%, and the Nepal Electricity Authority (NEA) and the Swiss Development Co-operation (SDC) with 33% each. The preference shares (investment) are held equally by NEA and SDC. SCECO has an active Board. There are altogether 9 members of which 3 are elected from the local electricity users, 3 represent NEA and 3 are from SDC. General Manager acts as the member secretary to the Board.



5. TARIFF, SUBSIDIES AND FINANCIAL ARRANGEMENT

The SCECO tariff is mainly based on the fact that a considerable part of the connections are not metered and that individual Load Control Switches (LCS) limit the off take of power as per tariff levels. These Load Control Switches (LCS) automatically cutout when the permissible power off take is exceeded. Reconnection is possible by the SCECO staff and reconnectors nominated by the local ad-hoc committee.

Levels 1, 2, 3/1 and 3/2 are grouped in the “domestic” category, with maximum possible power consumption of 0.1kW, 0.5kW, 1kW and 2kW; level 4/1 and 4/2, known as the “Service” category, covers connections to schools, hospitals, hotels and lodge, government offices, cottage industries, with a maximum power off-take of 4kW (level4/1) or 8kW (level 4/2); Level 5, the “Industry” category, is specially designed to promote day consumption, by low unit prices with a permissible off-peak power off-take of some 20kW (or even more), which is drastically curtailed by a timer-relay device during peak hours.

Category	Level	Admitted Power (kW)	Exempted Unit/Month (kWh)	Remarks
Domestic (Residential)	1	0.1	-	Single Phase/Non metering
	2	0.5	-	Single Phase/Non

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					metering
	3(1)	1		75	Single Phase
	3(2)	2		75	Single Phase
Service (School, Hospitals, hotel & Lodges, offices)	4(1)	4		100	Single Phase
	4(2)	8		120	Three Phase
		Off Peak	Peak		
Industry (Small industries e.g. saw mill, grinding mill, electricity user committee)	5(1)	>10.0	0.1	80	Three Phase
	5(2)	>10.0	0.2	80	Three Phase
	5(3)	>10.0	2	120	Three Phase
11 kV		>20	4		Three Phase/Tr- er
Peak Hour		Morning (6:00 AM to 10:00 AM)			
		Evening (5:00 PM to 9:00 PM)			
Off Peak Hour		Others than Peak Hours			

To get a line, as per connection policy, the house wiring must meet the SCECO technical standards and the relevant customer has got to get the wiring checked by SCECO or SCECO certified wireman.

Every tariff level has to pay a fixed rate, which reflects partly the cost of stand-by power and partly the fixed cost of investment related to every connection. Level 1 and 2 pay a fixed rate only and are not equipped with meters. Level 3, 4 and 5 are metered and have to pay a fixed rate as well as a differentiated, digressive price per consumed unit (kWh) as per given tariff structure below:

Level	Admitted Power (kW)	Exempted Unit (kWh)	Fixed Rate (NRs/Month)	Per Unit Rate (NRs/kWh)
1	0.1	-	130.00	-
2	0.5	-	400.00	-
3(1)	1	75	475.00	9.00
3(2)	2	75	650.00	9.00

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4(1)	4		100	980.00	9.00
4(2)	8		120	1800.00	9.00
	Off peak hour (kW)	Peak hour (kW)			
5(1)	>10.0	0.1	80	475.00	7.00
5(2)	>10.0	0.5	80	650.00	7.00
5(3)	>10.0	2.0	120	1200.00	7.00
11 kV	>20	4		300.00 per kW (Demand Charge)	9.00

6. METERING, BILLING AND COLLECTION

The energy meter must be read each month by the operators and fill the meter reading in the customer card and additionally in his own log book. The customer card itself is the bill and has to be presented by the customer on the pay-day at the counter of the company. Billing data are directly entered in the statistical computer records. This record is of great importance as a tool of management of the company and as motivation for the staff.

The consumer has to pay his electricity bill and any other charges (e.g. reconnection fees and late payment surcharges, etc) during the first 15 days of the next month. Otherwise SCECO will charge a late payment fee, which increases with time.

7. CONSUMER INFORMATION

Every detail information of each customer since the day he is being connected to the grid is maintained in individual (personal) file. This information covers all technical (cable length, size, meter size, number and manufacture, power consumption) and financial aspects (initial cost participation, billing amount and so on).

8. GENERATION AND CONSUMPTION

Generation per year in FY 2075/76 (kWh)

2646160

Consumption per year in FY 2075/76 (kWh)	2479533
Supply availability	99.6 % in average
Supply Service	24 hrs
Load Factor	53.9 in average
Station Factor	60.4 in average
Total Domestic consumer in FY 2075/76(including 10 consumer committee)	2242 HH
Type of system	isolated grid

9. COMMUNITY DETAILS AND REGION OF ELECTRIFICATION

Total number of household covered by SCECO electricity distribution line till date is 2242 including households of 10 electricity user committee. The type of electricity demand are cooking, lighting and grinding and payment structure is willingness to pay.

10. GENERAL INFORMATION OF PROJECT

Project Name:	Salleri Chialsa Electricity Company Limited (SCECO)
Location of Office:	Dudhkunda Municipality, Ward No.5, Salleri, Solukhumbu, Nepal
Location of PowerStation:	Dudhkunda Municipality ward No. 6 Chhulyamu, Solukhola, Solukhumbu, Nepal
Coverage of Area:	Few parts of Salleri VDC and few parts of Garma VDC
River:	Solu Khola
Type of source:	Water source
Start of project:	1982
End of Project:	2003 (BS 2050) I and II phase
Start of Project	2008
End of Project	2014 (BS 2071) III phase
Year of conceptualization of the project:	His Majesty's Government of Nepal and Swiss Association for Technical Assistance (SATA) were started first phase

on 1960 But, it could not success due to big and heavy landslide. Second phase was on 1982 under Swiss Aid.

Year of Commissioning: I phase in 1986, II phase in 1993 and III phase in 2015.

Name of project developer/owner/promoter: Public Utility Company with share holders (SDC, NEA and DHH).

11. LAYOUT, DESIGN AND TECHNICAL STATUS

The power plant is a classical run off river scheme, designed for 400 kW gross capacity in two machine sets equipped with two turbine alternator groups (the turbine with a nominal power out-put of 261*2 HP or 192*2 kW (hydraulic) and the generators of 210*2 kVA/180 *2kW) and 273 kW net capacity in one machine set with one turbine alternator group(the turbine with a nominal power out-put of 372 HP or 273 kW (hydraulic) and the generators of 321 kVA/273 kW (electric) nominal output capacity). Map of power plant and corresponding civil structure are attached in Annex.

The maximum, theoretical, firm electricity generation is $(360+273=633 \text{ kW} * 8760 \text{ hrs} = 5545080 \text{ kWh})$ about 5.55 million kWh per ye

12. CIVIL STRUCTURES

Intake weir	RCC-Bolder Construction
Feeder and baypass	Cement Mortar masonry and RCC/PCC
Twin sandtrap	
Headrace canal	
Forebay	
Spillway No.1	
Power-house	
Tailrace	Gabion wall and PCC Concrete
Spillway No.2 and 3	

13. HORIZONTAL LENGTHS OF ARTIFICIAL STRUCTURE

Intake Section 24.20 m

Feeder Canal	19.05 m	
Sandtrap	53.00 m	
Headrace canal (section 1)	199.50 m	448.75 m
Headrace canal (section 2)	115.00 m	
Headrace canal (section 3)	134.25 m	
Forebay	8.20 m	
Penstock No. 1 and 2	30.09 m	
Penstock No. 3	110.00 m	
Power-house No.1	6.70 m	
Power-house No. 2	8.60 m	
Tailrace No. 1:	34.00 m	
Tailrace No. 2:m	
Canal Section (trapezoid):	262.5/100cm (slope1.75:1)	
Nominal Volume of the forebay:	105'000 liters (105 m ³)	

14. TECHNICAL DATA OF EQUIPMENT OF THE SCECO PLANT

Hydraulic Steel Structures

Tube Section of headrace canal: TUBOSIDER ITALINA
Asti, ITALIA
Circular Pipe Structure

- Diameter: 2.30 m
- Inner section: 4.00 m²
- Thickness: 2.50 m

Three Steel Penstock

- Design Capacity: $2 \times 1.75 + 1.35 \text{ m}^3/\text{s} = 4.85 \text{ m}^3/\text{s}$
- Length: 37.45 and 110.00 m

- Internal Diameter: 900 mm
- Material thickness: 5 mm
- Generation Station: 2 Powerhouses

15. ELECTROMECHANICAL EQUIPMENT

Power generation technology:	Swiss Technology
Installed Capacity:	633 kW
Transient electrical out of the plant:	685 kW (15 Minute)
Firm electrical output capacity:	633 kW
3 turbines:	OSSBERGER GERMANY
Type:	Cross flow /one cell (SH 62/12/IG)+(SH6.060/121g)
Head	19.6 m and 24.6 m
Nominal water consumption :	1250 l/sec 1350 l/sec
Permanent output: (275 kW)	261 HP (192 kW) and 371 HP
Speed of turbine:	309 RPM and 319 RPM
Run away speed:	557 RPM and 710 RPM
Runner diameter:	600 mm and 640 mm
Power factor:	0.8 Cos Ø
Base frame:	Closed
Draft tube:	1.8 m
Transient speed variation	
- Load change:	25% 50% 100%
- Speed variation:	3% 7% 14%
3 gear boxes:	KISSLING & CO. SWITZERLAND SIEMENS

Type:	ER 255 B AND H1 SH 07 B
Power transmission:	261 HP (192 kW) AND 371 HP (275 kW)
Ratio:	309, 1000 RPM and 319, 1000 RPM
2 flywheels:	FAG GERMANY
GD ² :	404 and 650 kpm ²
Weight:	720 kg and 1000 kg
Diameter:	1100 × 95 and 1150x120 mm Ø
Materials:	Steel
2 Generators:	A VAN KAICK GERMANY
Type:	DKBN 80/230 – 6 TS (Prot. IP 23) 3 phase synchronous, brush less 303 A, 3 × 400 (231) V 210 kVA, 50 Hz
Power factor:	0.8 cos Ø
Voltage regulation:	COSIMAT N
Speed:	1000 RPM
Run away speed:	1800 RPM
1 Generator:	AEM (Anhaltische Elektromotorenwerk Germany) SE400 S6 3 KGen IP 23, Excitation 69 VDC 3 phase synchronous, brushless 452 A, 3 x 400 (231) V 313 kVA, 50 Hz
Power factor:	0.8 cos Ø
Voltage Regulation:	Electronic Voltage Regulator (AVR) R-16 C
Speed:	1000 RPM

Run away speed:	2222 RPM
Type of construction:	IMB 3 (301300046)
3 governors:	OSSBERGER GERMANY
Type:	Electro hydraulic
16. SWITCHYARD	
2 power transformers :	ABB SWITZERLAND
Type:	E 250 K
Rated output:	250 kVA each
Rated voltage:	$3 \times 400 (231) V/3 \times 11'000 V$ yd 5 (Dyn 5)
Cooling:	Oil immersed, Self cooled "ONAN"
1 Power transformer:	JAYESH ELECTRICALS LTD
	UNIT-3, SERVE NO 47-48, RAMANGAMDI, POR, DIST. VADODARA, INDIA
Transformer No:	315 11 001
Rated output:	315 kVA
Rated voltage:	$3 \times 400 (231) V/3 \times 11'000 V$ yd 5 (Dyn 5)
Cooling:	Oil immersed, Self cooled "ONAN"
HT Switchyard:	PEYER SWITZERLAND
	3 feeders, 2 transformer fields

	1 measuring field
	IEC 265, Cat B
Type:	Vacuum = 24 kV
	U (imp withstand) = 125 kV
	I (n) = 63 A
	I (ohmic br cap) = 400 A
	I (capacitive) = 16 A
	I (max transformer) = 40 A

Vacuum Circuit Breaker (VCB)

Sales Ref.

3AHO VCB

EXPEL PROSYS, MANJUSAR, INDIA

EP/M-13/FEB/EP053, 11 kV EP PLUS-

Load Break Switch (LBS):

M.D. INDUSTRIES, INDIA

11kV, 630 A. LBS, PANEL

3 HT Cables:

BRUGG resp STUDER SWITZERLAND

Length:

35 m

3 HT Cables:

Length :

108 m

17. TRANSMISSION LINE AND DISTRIBUTION GRID

11 kV HT Lines

Contractor

1986

NEPAL ELECTRICITY INDUSTRIES (NEI),

1987

NEPAL ELECTRICITY INDUSTRIES (NEI)

“Extension 1993”

UNITED ENGINEERS, (UE), KATHMANDU

“Extension 2008”

SCECO SELF

“Extension 2010”

SCECO SELF

Length of the line (1986-1993) from Project :

20.0km

Length of the line (2008-2010) from SCECO:	3.2km (total 23.2 km).
Construction:	Tubular steel pole, IS 2713 1980
Type:	410 SP-31 & 410 SP-54
Conductor:	Rabbit & Weasel resp (Diameter 61.70 mm ² & 36.88 mm ³)
Circuit diagram:	Triangle, floating system”
Lightning arresters at out-door:	BBC (ABB), SWITZERLAND
Side of HT cables at power-house:	Type HML 12/MWA 12 Rating 15 kV
Lightning arresters at distribution:	ASEA, SWEDEN
Transformers :	Type
Transformers Protection	
Line separators:	SPRECHER & SCHUH, SWITZERLAND
(Load Breaker Switch)	Type TRRF 1/12/630/UH with hand Operating mechanism CBA 8-10 (12 kV, 630 A In, break loads and no load type as per specific equipment).
Line separator:	
Isolate Switch:	KUMANICALINDUSTRIAL AUTOMATION Type KW 9-10W/15 kV 400 A with hand Operating mechanism.
“CUT OUT” devices	McGRAW-EDISON USA
(For step down transformers) :	8.7/15 kV, 95 kV B. I. I 100 / 200 A

Distribution transformers (including spares)

Total number in operation:	32
Manufacturer:	ELECTRO BAU AG LINZ
1 pcs:	100 kVA, 11'000 / 0.4 kV, Dyn 5
5 pcs:	50 kVA, 11'000 / 0.4 kV, Dyn 5
Manufacturer :	TYREE POWER CONSTRUCTION LTD
2 pcs:	WELLINGTO AUCKLAND, AUSTRALIA 75 kVA, & 50 kVA respectively, 11'000 / 0.4 kV, Dyn 11
Manufacturer:	EKARAT ENGINEERING, THAILAND
9 pcs (1 as spare):	50 kVA, 11'000 / 0.4 kV, Dyn 11
12 pcs:	25 kVA, 11'000 / 0.4 kV, Dyn 11
Manufacturer	NEPAL EKARAT ENGINEERING Co. Pvt. Ltd.,
3 pcs:	KATHMANDU 100 kVA, 11'000/0.4 kV, Dyn 11 25 kVA, 11'000/0.4kV, Dyn 11

18. DISTRIBUTION MAIN DISTRIBUTION BOX (MDB) & SUB DISTRIBUTION BOX (SDB)

Total Main Distribution Boxes (MDB) installation:	31 pcs
Manufacturer	SWITZERLAND
Total Sub Distribution Box (SDB) Installation :	213 pcs
Manufacturer:	SWITZERLAND NEPAL YENTRA SHALA, LALITPUR, NEPAL

Overhead Line

Construction:	Tubler steel pole, IS 2713 1980
Type:	410 SP-31
Conductor:	Rabbit, Weasel resp (Copper equivalent 50, 35 mm ²) 380 / 230 VAC supply.
Manufacturer:	SWADESHI CABLE INDUSTRIES PIONEER ELECTROCABLES (P) LTD., BIRATNAGAR, NEPAL
Laid in ground (Main Cables):	4x35, mm ² , 3½x25 mm ² , 4x16 mm ² & 4x10mm ² IS 1554 PVC insulated Heavy duty armoured/unarmoured 660/1100 V.
Manufacturer:	SWADESHI CABLE INDUSTRIES PIONEER ELECTROCABLES (P) LTD., BIRATNAGAR, NEPAL
Connection from Transformer to Main Distribution Boxes:	39 mm ² and 50mm ² double insulated copper cable
Laid in ground Main and Branch cable for Sub Distribution Boxes:	4x50mm ² , 4x35, 4x25, 3½x25mm ² , 4x16mm ² , 4x10mm ² , 2x25mm ² armoured/unarmoured and concentric cables.
Laid in ground (service drop) cable for individual houses:	4x16 mm ² & 4x10 mm ² IS 1554, PVC Insulated Heavy duty armored/unarmored 600/1100 V. 2x25 mm ² concentric

2x6 mm² concentric

2x4 mm² concentric

Supply voltage:

380 / 230 VAC

Total street lights of 2x11 watts installation :

29 pcs

19. TECHNICAL ASPECTS

Swiss government nominated a Swiss consultant as torn key basis and the consultant is fully responsible for designing, selecting, sizing and procurement of technologies and system to complete the project because the project has to be completed as fast as possible and quality control. The consultant itself was designed, supplier and for selecting technology. The vendor was the manufactures companies themselves.

20. INSTITUTIONAL SUPPORT FROM EXTERNAL SOURCES

SDC was supported from external sources. But now this institution is fully independent to manage all systems and the sources are from selling electricity, investment in other commercial banks and finance companies

21. IMPLEMENTATION AND MONITORING ASPECTS

Every organization must monitor each and every electromechanical part during operation to avoid from, rust and dust and temperature. The allocated technical staff record the present reports. A staff should make schedule for maintaining structures and system regularly and yearly.

22. ANNEX