Specifications of Ghiz-Ghalasi H.P.P

1. Introduction

The Ghiz-Ghalasi regulation/diversion earthfill dam with clay core is being built on the Aras River. Hydroelectric power generation is considered a purpose of the dam project. The powerhouses of the Ghiz-Ghalasi dam are designed for the base load generation. As the powerhouses are going to be built in the dam body, most of their relevant civil work and construction of the dam body will be carried out simultaneously and only the concrete around the powerhouse equipment will remain to be placed. There is still considered to build the powerhouse and its relevant substation on the right bank. Based on the techno-economic analyses, it is considered to install a 40 MW (2×20 MW unit) powerhouse with a view to utilizing the existing potential on the right bank.

The general specifications of the Ghiz-Ghalasi dam are as follows:

Specifications of Ghiz-Ghalasi Regulation/Diversion Dam	
Type of Dam	Earthfill dam with clay core
Crest length	834 m
Height above foundation level	37 m
Volume of body	2.3 MCM
Crest level	253 masl
Normal water level	250 masl
Reservoir volume	62×10^6 m^3
Reservoir dead storage	7.5×10^6 m^3
Reservoir active storage	54.5×10^6 m^3
Right bank powerhouse capacity	2×20 = 40 MW
Mean annual hydropower generation of right bank powerhouse	135×10^6 KWh
Design flood (10,000 year)	3440 m^3/s

2. Dam Site

The Ghiz-Ghalasi dam is being built on the Aras River in province of East Azerbaijan.

✓ ساختگاه طرح خداآفرین بر روی
رودخانه ارس و در فاصله ۲۳۰
کیلومتری تبریز می‌باشد.

✓نزدیکترین شهرها:
خمارلو - اصلاندوز - کلیبر - منطقه خداآفرین

✓راه‌های دسترسی:
۱- تبریز، اهر،کلیبر، خداآفرین
۲- تبریز، جلفا، خداآفرین
۳- تبریز، اهر، مشکین شهر، اصلاندوز، خداآفرین

موقعیت جغرافیایی سد قیزقلعه‌سی

3. Access to Dam Site

Dam site is about 230 km far from city of Tabriz and accessible by:

- Tabriz-Ahar-Kalibar-Khoda Afarin
- Tabriz-Jolfa-Khoda Afarin

4. Powerhouse Mechanical Equipment

The main mechanical equipment to be installed in the powerhouse is as follows:

- Two 20-MW Kaplan turbines with vertical axis
- Two hydroelectric governors
- One overhead crane
- Mechanical and electrical installations

4.1. Turbines

4.1.1. Specifications of Units

The powerhouse will be equipped with two Kaplan turbines with vertical axis whose specifications are as follows:

- Nominal power: 20.7 MW
- Maximum head (Hmax): 29.3 m
- Minimum head (Hmin): 25.4 m
- Design head (Hd): 28.8 m
- Design flow (Qd): ~78.5 m^3/s
- Nominal speed: 214.3 rpm
- Rotation direction (the view from the generator side): clockwise
- Turbine axis level: El.216 masl

4.1.2. Governor

The turbine governors are of digital Electro-Hydraulic type with electronic speed control. The mechanisms for speed control, oil pumps, compressed air/oil tank and oil tank of a governor are considered a package.

4.2. Powerhouse Crane

An electric mobile overhead crane (capacity: 90 ton & bridge span: 13.5 m) is considered to install and maintain the turbines and generators as well as to move the other equipment.

The main hook will be used to move the heavier loads from the erection bay to the location of installation.

The capacity of the main hook is determined on the basis of the weight of the heaviest part to be moved in the powerhouse. The minor hook will have a lifting capacity of 5 ton.

5. Powerhouse Electrical Equipment

The powerhouse electrical equipment is as follows:

1. Generator (2 units)
2. Power transformer (2 units)
3. Control, measuring and protection equipment

5.1. Generators

5.1.1. General Information

Based on the manufacturers' experiences and design standards, there considered 2 generators with vertical axis as specified below.

- Type: synchronous generator with vertical axis
- Maximum capacity: 22.5 MVA
- Rotation speed: 214.3 rpm
- Power factor: 0.90
- Frequency: 50 Hz

5.1.2. Nominal Values

5.1.2.1.Nominal Voltage

The nominal output voltage is considered to be 10.5 KV, considering the capacities of units, economic aspects, main manufacturers' experiences and standard recommendation.

5.1.2.2.Nominal Power Factor

The power factor of a generator relies upon the connection type of units to the power system (voltage level, position in power transmission system, etc.). The power factor of the Ghiz Ghala Si powerhouse is considered to be 0.90.

5.1.2.3.Nominal Capacity

Based on the turbine design parameters and efficiency, the nominal capacity of generators is estimated to be 22.5 MVA.

5.2. Main Step-up Transformer

There shall be considered two 10.5 – 66 KV step-up transformers for each powerhouse to be installed out of a powerhouse building.

5.2.1. Transformer Type/Capacity

The transformer is of three-phase double-winding oil type which is able to be installed in open space. The capacity of the transformer is expected to be 22.5 MVA. The vector group of transformer is Ynd11 and the star center of the high voltage side will be grounded directly.

5.2.2. Power Grid Connection

Each powerhouse will be connected to the 132-KV power grid by the main transformer.

5.3. Control, Measuring and Protection Systems

5.3.1. Control System

Control, measuring and protection equipment for the main parts of the powerhouse, dam and 63-KV switchyard is as follows:

- Units
- 10.5 and 132 KV Boards
- Unit transformers and step-up transformers
- Powerhouse auxiliary electrical systems
- Powerhouse auxiliary mechanical systems
- Substation equipment
- Hydro-mechanical equipment for powerhouse, dam and reservoir data
- Other systems and equipment like central clock system and fire alarm system

The control levels are as follows:

- Local control: by local control board of equipment
- Remote control: by unit control boards adjacent to units and central control system in central control room

5.3.2. Measuring System

The measuring equipment is considered to measure and show the electrical and mechanical parameters of turbine, generator, transformer, powerhouse auxiliary systems and hydro-mechanical equipment, reservoir water level and tail water.

5.3.2.1.Description of Measuring System

All the values measured in different parts of powerhouse will be converted into 4 – 20 mA standard signals by convertors, so all the instruments to be installed on the control boards will be uniform and have uniform input signals.

The indicators which will directly be connected to the measuring transformers may be used at local control level.

5.3.3. Protection

5.3.3.1.General Basics

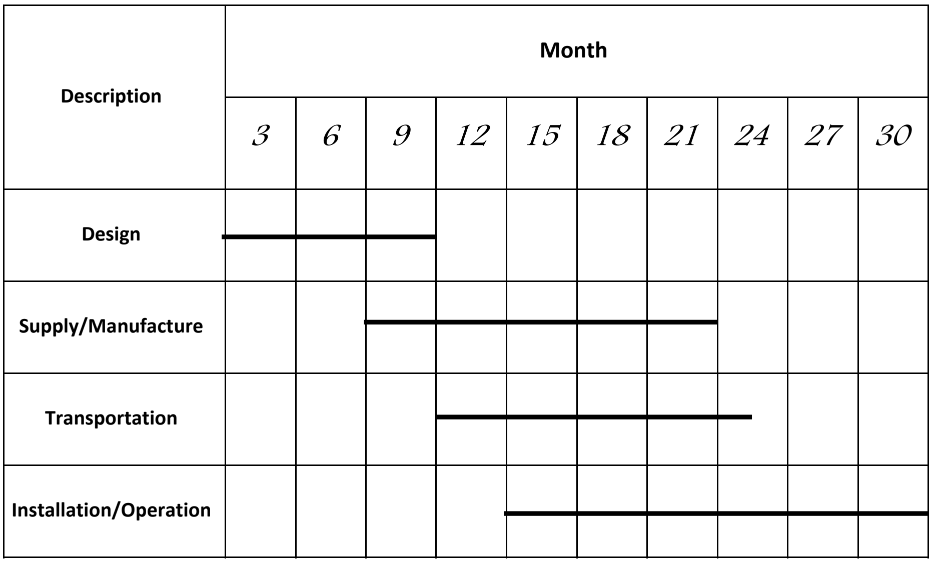
The protection system is selected in a manner that the other parts of powerhouse can be operated by tripping the power switch of defective equipment or device.

The protection system performs in a way that will prevent malfunction of the power switch as a result of transient phenomena which are not owing to failure of devices.

5.3.3.2.Specifications of Protection System

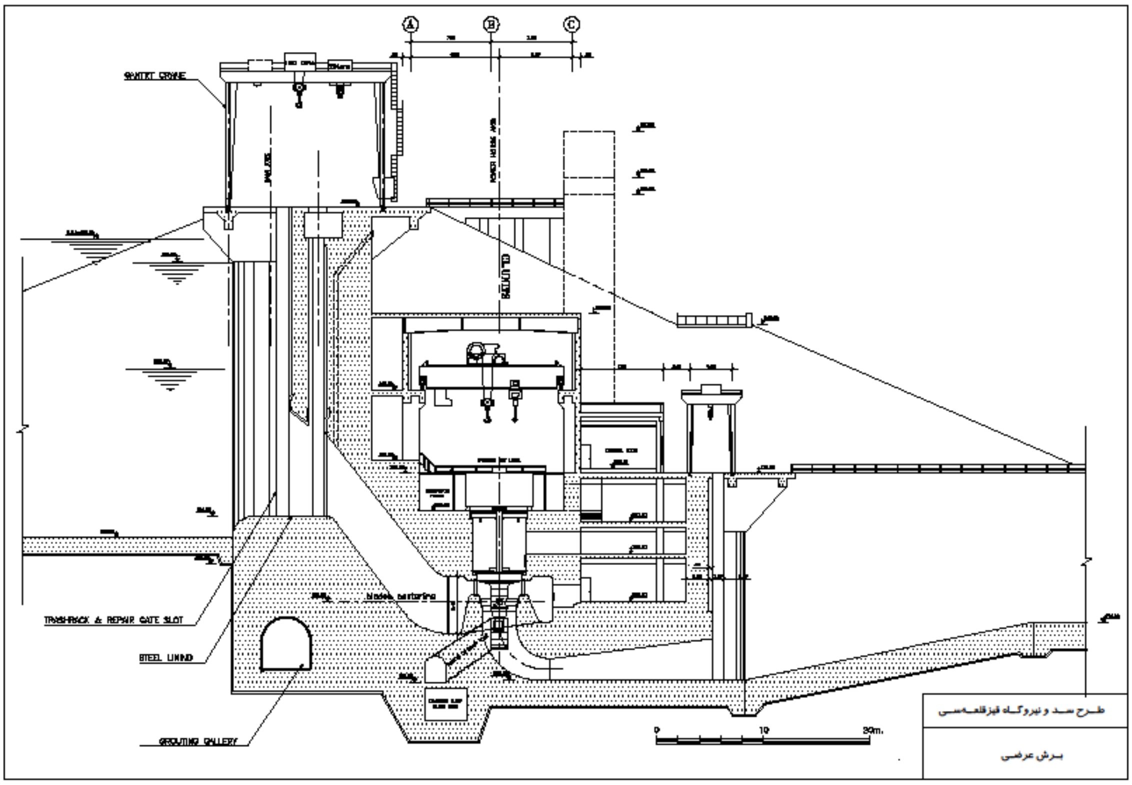
The protection system is designed by use of digital numerical relays which have modular structure with maximum reliability and efficiency. The protection system of units includes two independent systems for the first and second protections. All the relays will properly be protected from shock waves and/or malfunction of the protection equipment, and therefore the relays will not be damaged and work properly.

6. Schedule



7. Cost Estimate

Based on the price list in the year 2016, the cost of powerhouse equipment including supplying turbine, governor, generator, generator switch and excitation system from western European countries and crane, transformer, protection and control system and other mechanical/electrical equipment from Iranian manufacturers is estimated to be 20 million dollars plus 500 billion rials and the cost of the relevant substation is estimated to be about 50 billion rials.



GANTRY CRANE
TRASHRACK & REPAIR GATE SLOT
STEEL LINING
GROUTING GALLERY
blades centering
0
10
30m.
طـرح سـد و نیروگـاه قیزقلعـه‌سـی
بـرش عرضـی