SCHEMA
COMPLEX USAGE OF PANJ THE RIVER

The area of basin Panj river makes 113,6 thousand km^2, from which one in a submontane part there is only 5,7 %, remaining part in mining. About 73 % (82,9 thousand km^2) watercollection of the area 27 % (30,6 thousand km^2) in Afghanistan is placed in terrain of Tajikistan.

Average much year a sink Panj river from 7,0 milliard m^3 in a source to an ostium is augmented up to 39,8 milliard m^3. By reference for a water relationships Panj river is the transit of high waters in June - July, less often in August. It is conditioned glacial –snow by a feed Panj. The norm Average year of peak discharges of water Panj river is peer 3670 ì3 per second.

The minimum water discharges are watched in the season lowest water level in December - February. The minimum monthly average consumption in an ostium Panj river - 193 m^3 per second.

On a sink of fluidized detrital deposits Panj river takes one of the maiden places on ground.. An annual sink of fluidized detrital deposits in an ostium Panj river makes 113 mil.tonn at an opacity of 3,3 kg on cubic metre. The water resourcess Panj river estimate in 39,8 milliard m^3; below than ostium Vakhsh river the sink of Amu Darya makes 54,5 milliard m^3 An energy potential Panj river is certain in 119 milliard kWt.h, and its basin exceeds 150 milliard kWt.h The energy potential of a boundary site of Amu Darya makes 11 milliard kWt.h

Despite of enourmous wealths Panj river until recently was not studied at all.

In 1970 by the Central Asian separation of the Hydroproject by him n.S.Y.Juk the Scheme of complex usage of the river Panj and river of Amu Darya on a boundary site between USSR and Afghanistan " was executed.

The scheme has passed expertise and was approved by head institute the Hydroproject of a name S.Y.Juk.

The composite attitudes between former USSR and Afghanistan, apparently were by the main cause of waiving of consideration of seriously offered "Scheme".

In the given time as a result of executed calculations the version of usage considered water a current by the stage from thirteen hydranodes on river is offered. Panj and one Upper – Amudaray on r. Amudaray, with waterpower plants by a general installed power 18,7 million kWt and development of the electric power 86,3 milliard kWt.h

All Panj hydronodes can be sectioned into three groups: upper from Barshor up to Khorog mean from Rushan up to Khostav and lower from **Dashtijum up to Koksha..**

Barshor, Anderob, Pish and Horog of a step of the cascade of hydronodes on Panj are in hard-to-reach high-mountainous region (in 450-600 kms from the nearest railway), have rather small powers Hydroelectric station; under rather composite conditions of a conclusion of these powers to a power system of station are characterized to large specific scopes of work and are effective in the working conditions on not regulated creek insufficiently sink, differ by rather large and at the same time composite conditions of organization and effecting of activities. On these causes from further consideration these hydro nodes are eliminated.

Yzgulem, « Granite gates» and Shirgovat of a step of the cascade are characterized by unfavorable overall economics, the water storage basins at them have small capacitances and can not render noticeable influencing on regulation of a sink.

Hostav, Djumar and Moscow hydrostations it will be more expedient to use in the hydropower purposes. The stations are characterized, as high-performance, situatedas a whole in favourable Seismic-tektonic and engineering -geological conditions, are more accessible in transport attitude in matching with the arranged above steps of the cascade. The lower step of the cascade – Kokchinskaya HPP differs by high specific investments and can be effective only if there is large adjusting capacitance in mean or upper parts of the stage.
Rushan a hydrounit. The technical scheme of facilities Rushan of a hydrounit envisions usage of dip Panj river on a site from Horog city up to an creek Rovkharv of in-leak. From a general head of 395 m - 102 m Create dam remaining part of 293 m - derivation.

Fold of dam is situated villages. Shids. Directly through Fold of a site on a right coast there passes a highway Dushanbe-Horog. Spacing interval from fold up to Dushanbe - 452 kms and up to Horog - 110 kms.
The water storage basin Rushan of a hydrounit floods broad apron plain from fold of the weir up to Horog. Administratively this terrain concerns: a right coast to a Mining – Badahshan Autonomous Region of Republic of Tajikistan, and left-hand - to Badahshan of a province Afghanistan. In a flood zone fall:

- 15 small villages on territory of Afghanistan and 31 on territory of Tajikistan, largest of which one district center Rushan

- Masterred basically under grain, Corn bob and gardens of land Including, area 2462 hectare, including on territory of Tajikistan - 1572 hectare.
- Site of a car road Dushanbe-Horog, distance of 200 kms.

The total capacity of water storage basin makes 5,5 milliard m^3, including useful 4,1 milliard m^3, area of a mirror 71,0 km^2. On a site fold the gorge has the asymmetrical form with round sides, altitude up to 400 m. Width of valley on bottom forms approximately 300 m.
The sides of apron plain are combined biotitovymi by gneisses with closed-grained aplitovidnymi by granites. The massif of rocks composing gorge, is broken on units by numerous large opening of discissions.

By floor of apron plain is combined morennoy large glybovyi of a structure. Directly under a channel it is supposed deepenning of the order of 80 m executed a large - glybovyi stuff particulate . - morennoy, particulate . of alluvial genesis.

The route of a derivation passes in gneisses breached by granite intrusions, and also in marble chalkstones.

At designing of facilities of a hydrounit the following predicted data are adopted:

Computational seismicity - 8 balls
Mark NBL - 2060,0 m

Mark dead a volume - 2000,0 m

Expenses of water:
Average much year - 529 m^3/s
Suply 0,01 % - 4660 m^3/s
Suply 1,0 % - 2850 m^3/s

Pressures:
Maximum - 395 m
Calculation - 384 m

Production of the electric power - 14,8 milliard kWt.h

Installed power - 3,0 million kWt.

Structure of facilities of a hydrounit following:

1. Dam from stone sketch with a screen with apron from loamy sand.
Dam from stone sketch general length dams on a ridge - 704 m, maximum building height - 125 m, Pawning upstream slope ratio of 2,5 m, downstream slop 1,75 m.
On sidebar of screen and apron one's head is provided deep, up to 150 m, cementation cover.
2. Two building tunnels on the left-hand coast box of section 12x14 m, in spacing interval 1015 and 1070 m.

3. Disastrous spillway one plutonic and other of a trench type,
Mated with building tunnels.

4. Two thread a ducted derivation, the line by which one passes on a dextral coast and is finished by leveling mines. An spacing interval of each of two thread of tunnels of 15,8 kms, diameter - 12 m.

5. Building HPP of a underground type on 12 aggregates by power ,each.
on 297 thousand kilowatt.

Bulks of activities:

The open extraction - 6100 thousand m^3

Underground to fractureка - 6563 thousand m^3

Banka - 16500 thousand m^3

Concrete and reinforced concrete - 2950 thousand m^3

Cemention of activity - 1250 thousand m^3

Metallic structures - 27390 tonn
The basic power equipment - 25610 tonn

The estimate of cost of building - 2,4 milliard.$ USA

Rushansky the hydrounit with capacious water storage basin can be esteemed, as object of complex energy-irrigation assigning, which one can render essential influencing on regulation of a sink Amy-Dary. The volume of water storage basin allows conduct seasonal regulation of a sink Panj river and essentially enriches operational mode below arranged hydroelectric station.

DASHTIJUM THE HYDROUNIT. The site Dashtijum a hydrounit places at the end of vast intermining hollow extended from an ostium Obi-minoy up to perilune Anjiroy-Poen, the basic terrain by which one is placed on the left-hand (Afghani) coast.
At afflux in 300 m in a flood zone the not run in grounds Moscow and Khalaihumb of regions Republic Tajikistan and Badahshan of a province Afghanistan fall mahlo lived-in and almost. In terrain of Tajikistan 14 pieces and in terrain of Afghanistan - 13 pieces are flooded of small perilune in quantity.

On the left-hand coast there are grounds which have been run in under grain crops and cotton, general area 860 h. On a dextral coast are flooded basically not watering grounds used under grassed and haymakings, area 1110 h.

The total capacity of water storage basin makes 17,6 milliard m^3, useful - 10,2 milliard m^3, area of a mirror - 135 km^2

Fold of dam ir is placed in 1 km above the left-hand beach of in-leak Zarrinob. From Kulob sity to region fold there passes a ground motorway, with grit by cover finishing for villages Parvar. From Parvar directly to fold to a site there is only a track by an spacing interval of 12 kms.

On a site fold width of gorge on a floor of 120-150 m declines rather flat, with mean steepness 38-40^o. The sides of gorge are combined by bedrocks of the Perm system, introduced strata of an interbedding of sandstones, aleurolites and chalkstones of a different stability.

The computational seismicity of a site estimates in 9-balls.

The channel of the river has considerable recess (up to 50 м). A structure of deposits in a channel - large boulder beds with boulders.

The ingenering-geological conditions of a site are composite, but as a whole reasonable for facility of the high-head weir.

The basic predicted data:

Mark NBL - 1055,0 m
Mark Mark dead a volume - 965,0 m

The consumptions:

Average much year - 767 м3/sec;

By Suply 0,01 % - 7060 м3/sec;

By Suply 1,0 % - 4320 м3/sec;

Pressures:
maximum - 300 m
Calculation - 265 m

Installed power of hydroelectric power Station - 4,0 million kWt

Development of the electric power - 15,6 billion rWt.h

In a structure of facilities of a hydrounit enter:

1. Weir from immovable sketches with a loamy core and transition zones from boulder bed. Length of the weir on a ridge - 1075 m, greatest building altitude of 320 m.

2. Building tunnels two threads 1 circle placing on the left-hand coast. Sectionof tunnels 12x14 m, spacing interval till 1965 m.

The second and third circles of building tunnels are hooked up to the lower inclined workings. IV the circle consisting of one tunnel, same section, places on the right I protect and in operation period will be used for reset of disastrous high waters. An spacing interval it1375 m.

3. Disastrous spillway, in appendix to the indicated building tunnel IV of a circle, consists of two ниток of tunnels box of section 12x14 m, spacing interval of 2630 m.

4. Three threads of turbine culverts of round sectiona dia of 12 m, with levelling mines a dia of 21 m and altitude of 135 m.

5. The open building of hydroelectric power Station is equipped with 12 aggregates.

Bulks of activities:

Open extraction - 14150 thousand m3

Underground to fractureка - 2860 thousand m3

Banka - 98300 thousand м3

Concrete and reinforced concrete - 1750 thousand m3

Metallic structure - 125490 tonn

Estimate of cost of building - 3,2 milliard.$ USA

Topographic condition of apron plain Panj r. in the greater part are unfavorable for creation of capacious water storage basins. From this point of view the greatest attention was attracted by sites Panj river for perilune Rushan, in region Dashtijum of a cavity, and also in region of coalescence Panj and Vakhsh, where on morphological conditions of their apron plain could be utilised in quality of enough capacious cups of water storage basins.

On conditions of possible afflux the total capacitance of water storage basins three гидроузлов, intended in these regions, was defined in 38,3 km3, including:

The hydrounits intended in folds **Uperamudarya, Dashtijum and Rushan**, were by reference for the scheme and largely have defined nature and entirety of usage water-energy of resources of the rivers Panj and Amu Darya.

Is most preferential is **Dashtijum** fold. Three were reviewed fold of a site: upper, mean and lower. On set of natural environments for further designing the lower site was selected.

. From among many factors defining selection fold of a site, it is necessary to call two basic:

1. Relative remoteness from regional faults Darvaz-Karakul of a zone.
2. Availability among the sharply split sides of apron plain Panj river of a site of a sufficient distance and moderate dismember on morphological conditions accepting facility of the high pressure dam..

Brought technician-economic factors on about workes confirm high energy efficiency **Dashtijum HPP**. And also consideration of a solution of a problem with work Sarez of lake and usage of water in bulk 12 km^3 for filling of water storage basin **Dashtijum HPP.**

Outgoing from adjusting capacity of water storage basin, his arrangement in the cascade Panj of hydrounits, engineering-geological, transport and general building of conditions, and also technician-economic factors. **Dashtijum** the hydrounit is necessary to esteem, as possible prime object of complex energy-irrigation assigning.

With building **Dashtijum HPP** the broad capabilities to power usage below than arranged steps of the cascade are opened.

Usage of a basilar site Panj river it is envisioned **Kokcha** by a hydrounit. The hydrounit low-pressure, is arranged in the run in region. The creation of capacious water storage basin is connected to splashing down of a plenty of cultural grounds and settlements

River mouth Panj, the same as and Vakhsh, it is envisioned to use by the upper - Amudariya hydrounit.

Site of a hydrounit is intended on Amu-Dariya, in 4 kms the coalescences of the rivers Panj and Vakhsh are lower. The water storage basin at afflux in 30 m floods amplate sites of apron plain Panj and Vakhsh and is diffused: on apron plain Vakhsh on 75 kms up to Jilikul, and on apron plain Panj on 115 kms up to district center Panj. Total capacity of water storage basin 15,2 billion m3, usable storage capacity - 11,4 billion m3.

The main predicted data of a hydrounit:

Altitude of afflux - 30 m
Mark NBL - 345,0 m
Mark DLV - 332,0 m.

In a structure of facilities of a hydrounit enter:

1. Earthen weir from of sand with upper and basilar persistent prisms from a lacerated rock.
   Length of the weir on a ridge of 2975 m, maximum building altitude of 44 m. On a ridge of the weir are made an iron and automobile road.
2. Concrete overflow dam and building Hydroelectric Station place on a right coast and are paired to a channel by delivering and assigning channels. Length of pressure head front of a building Hydroelectric Station and overflow dam of 274 m. overflow dam has 4 spillway of flyover till 16 m.

   In a building the hydroelectric station is stipulated 6 aggregates, power on 167 thousand kW each.

The cost of building makes 800 million dollar