SHEMA
POWER USAGE OF ZERAVSHAN THE RIVER

The river Zeravshan rises in Zeravshanskay a glacier (mark 2800-5500 m), passes in latitudinal direction from east on west between ridjer runer
Turkistan (mark 4500 m) in a north and Zeravshanskay (mark 5500 m) in the south, in west leaves in vast apron plain, where is disassembled on a spraying and is finished in saline drying up lake Dengiekul.

The mining part of basin of the river, most power saturated area catchments, places in terrain Sugd of area of Republic of Tajikistan, valley a part, dispersion area of a sink - in terrain of the Samarkand area of Republic of Uzbekistan.

Largest amounting and in-leaks are the rivers: a match, Fandariy, Ygnob, Iskandariy, Kshtut andMagiandariy.

The river Zeravshan ice a snow of a feed, average perennial the consumption of the river on escaping of mountains in apron plain is peer 190 m3/s, sink of 6,0 kms / years. Potential power resources of the rivers of basin Zeravshan river. Zeravshan makes more than 20,0 billion.kWt.h. Overall length of the river (with r. Matches) the energy 17,6 billion.kWt.h is peer 826 kms, dip of 2010 m, fair annual.

River Iskandariy, left-hand, component **Fandariy r.**, follows from small picturesque mining lake Iskanderkul, the lake has length of 3,26 kms, extreme breadth of 2,9 kms, area 3,392 km^2 and volume 230 mln.m^3, altitude of a level of lake of 2187,6 m. The lake in the main waters of the rivers Saritag and Hazirmech feeds.

Expansion of the river Iskandariy 20 kms, catchment the area of basin 945 km^2, the consumption in an ostium 21 м3/с, dip of 544 m, potential power 270 mWt , fair annual energy 2364 mln.kWt /years.

On output from lake, Iskanderdariy river represents during the maiden 350 m a precipitant flow, further on following 330 m the river current continuously and slowly on broad, then there is a narrowing of a channel and from point called « the lone rock » starts rough, almost cascade site of flow of the river, at the end of which one the river flows in narrow washtub figurative a channel and apart 1,26 kms from a source drop water to fall from an altitude more than 40 m. On a extent about 10 kms from a source the dip of the river makes of the order of 39 m on km and on remaining 10 kms - 16,2 m on km.

The apron plain of the river in the beginning is narrowed down, its width on a floor does not exceed 50 m. The declines of apron plain rocky, are aweigh lowered to a water boundary. Below apron plain extends and about an ostium width on a floor of 300-350 m a little. The prevailing form of apron plain - figurative. Flood plain on all a extent of the river misses.

Along the river from an ostium up to lake on a dextral coast the motorway runs.

The dip of the Iskanderdariy river from lake up to an ostium on a basic version is planned to be used by one stage. In a structure of facilities by this Hydroelectric Station enter: the weir from local stuffs by an altitude of 50 m, supporting elevation of water in lake (mark.2187,6 м) on 73 m up to a mark NBL 2260 m. The capacitance, created at it, in bulk full 0,663 and useful 0,45 km3, (at DVL 2187,0 м), will allow to ensure perennial regulation of a sink.

From lake, along the left-hand beach, pressure head tunnel of length 18 kms, the water moves to a building of station, and then short assigning channel is dumped in the river, on a mark of 1640 m.

Possible parameters Iskandariy,Hydroelectric Station following:

- head, computational - 560 m;
- consumption, fair much year - 18,5 m3/s;
- consumption, computational Hydroelectric Station - 25-42 m3/s;

- installed power - 120-200 mWt;
- fair much year development energy - 0,77-0,77 billion.kWt.h.

Was reviewed small Iskanderkul Hydroelectric Station operating initial 1,5 kms a site of the river, with the main parameters: NBL 2213 m, DVL 2187,6 m, afflux of lake of 30 m, usable storage capacity of water storage basin 140 млн.м3, sufficient for seasonal regulation of a sink, design head of 130 m, theoretical consumption 25 m3/s, installed power Hydroelectric Station 28 mWt, среднемноголетняя development(manufacture) of the electric power
126 bil.kWt.h.

In a structure of facilities Hydroelectric Station have come: the weir from morennix of soils with a polyethylene screen, operational spillway, on the consumption 40 m3/s, turret water intake the delivering tunnel, building of station on two aggregates and short assigning channel. It is necessary to note, that the seasonal adjusting capacitance of water storage basin is necessary for increase of winter guaranteed power Hydroelectric Station, otherwise winter power small Iskanderkul Hydroelectric Station will be peer 5,5 mWt at established 28 mWt.

Subsequent, second, diversion Iskanderkul HPP-2 will use dip of the river from lower tail water Hydroelectric Station № 1 up to an ostium of the river, its main specifications can be following: used dip of the river of 440 m, design head of 425 m, theoretical consumption 25 m3/s, installed power 90 mWt , average much year developmentof the electric power 400 million.kWt.h/year.

River Ygnob- dextral component Fandariy river , outflows from a fuselage spine fairing of a small glacier located at the altitude 3650 m. Upper current of the river Ygnob on outlines resemble a vast circus having size in a diameter about 20 kms, where river fed by snows and glaciers flow off on radius in a channel of the river Ygnob. Further on west the apron plain of the river, reduced up to 8 kms in the beginning, step-by-step extends, however and on the average flow the apron plain mostly narrow and quite often represents steep gorge. On all a extent of the river the narrowity of basin of large inflow no.

From perilune Anzob down-river up to an ostium Fandariy river and perilune Aine , there passes a highway of a channel Dushanbe-Hujand , carry by which one, even of sites, practically is impossible.

Catchment the area of the river Ygnob 1654 км2, length of the river of 115,4 kms, dip of the river 2098м, fair annual the consumption in an ostium 40 m3/s, fair annual power 430 mWt , energy 3368 mln.kWt.h.

On the river Ygnob it is planned to create the upper water storage basin by a usable storage capacity 300 mln/m^3, intended for seasonal power regulation of a sink of the river. Sait of the weir of a head unit the hydroelectric station places in 2,5 kms above than perilune Anzob, where the elevations of water are possible for increasing on 150 m, up to a mark of 2200 m. From water storage basin right coast, tunnel of length 16 kms, the water moves to a underground building Ygnob-hydroelectric station arranged in 4 kms and higher of perilune Такфон and the short assigning tunnel is dumped in the river, on a mark of 1740 m.

Possible parameters Ygnob-hydroelectric station following:

Head, computational - 415 m;
Consumption, среднемноголетний in the river - 32 m 3/s;
The consumption, computational hydroelectric station - 43-72 m3/s;
Installed power hydroelectric station - 150-250 mWt;
Fair much year development of the electric power - 0,97-1,0 bill.kWt.h.

By following stage on the river Ygnob is possible Ravat hydroelectric station. Sait of the weir places in 1,5 kms above than cross-section Ravat, the afflux of household elevations of

water in the river is possible of the order on 40-45 m, up to отм.1740 m. On the pressure head tunnel of length 4,5 kms made along dextral beaches, the water moves to hydroelectric station and then is dumped in Fandariy river on a mark of
1640 m.

Possible parameters Ravat hydroelectric station following:

Head, computational	- 92 m3/s;
The consumption, fair much year	- 42,9 m3/s;
The consumption, computational hydroelectric station	- 64-128 m3/s;
Installed power hydroelectric station	- 50-100 mWt;
Fair much year development	
The electric power	- 0,3-0,34bill.kWt.h.

The river Fandariy left-hand component of the river Zeravshan, will be derivated by coalescence of the rivers Ygnob and Iskandariy.

Catchment the area of basin with allowance for components of the rivers 3230 км2, expansion of the river of 24,5 kms, dip of 270,7 m, specific dip of 11 m on km, fair annual the consumption in an ostium 61,4 м3/с, fair annual power 869 МВт energy 7482 mln.kWt.h/years.

Energy use of the river **Fandariya** the hydroelectric station is possible by one stage - **Fandariy**, which one in the long term will work on adjusted a sink in Iskandariy and Ygnob water storage basins. Site of the weir places in 6 kms from item. Aini.

The weir increases elevations of water up to a mark of 1610 m, at which one the motorway going on gorge is not flooded but in case of splashing down the carry of a road is possible. From the weir, left coast by the tunnel of length 5 kms the water moves to a building hydroelectric station allocated below Aini of tilting and a short assigning channel is dumped in Zeravshan river on a mark of 1370 m.

Possible parameters Fandariy hydroelectric station following:

Head, computational, net, m	- 200 m;
The consumption, fair much year	- 61,4 m3/s;
The consumption, computational hydroelectric station	- 180 m3/s;
Installed power	- 300 mWt
fair much year development of the electric power	- 1,8bill.kWt.h.

The river Zeravshan on a site from sources before coalescence with **Fandariy** sometimes has a title - river of a Match.

The river of a Match - rises from the largest glacier of basin - Zeravshan. A mark of a river head (fuselage spine fairing Zeravshan of a glacier) 2775 m.

Catchment the area of basin of the river of 4798 kms, expansion of 194,4 kms, dip - 1396 m, fair annual the consumption in an ostium 81,15 m3/s, fair annual power 1140mWt, potential energy 9996mln.kWt.h/years.

The top of the river represents extended apron plain which was gobed up between Turkistan and Zeravshan mountain range, is broad glacial with a flat ground and rather small slopes. The river flows here in low beaches, often displacing among detrital deposits the channel. The declines of apron plain drop by abrupt breakaways.

On the average and lower sites the river of a Match flows among terraces of small width (up to 1,5 kms for one seconds. Aini) at the bottom of steep canyon with vertical walls. It is the representative mining river with precipitant and rough flow, with dip up to 9 m on km.

The apron plain is stocked with large number small-sized perilune arranged on terraces and flat declines along the river up to a mark of 2500 m.

The breakdown of the river on a stage energy use is possible under the scheme:

1) head, with high afflux reservoir hydroelectric station executing seasonal power regulation of a sink and large number fair pressure under dam hydroelectric station with affluxs within the limits of a canyon

2) head, reservoir hydroelectric station and 4 stages basically derivation hydroelectric station, only 5 step:Matcha, Riomut, **Oburdon**, **Darg, Sangistan**.

Site of the weir Matcha of a hydrounit it is planned above than perilune of a Matcha, the household elevations of water in the river are increased on 160 m up to mark.2320, the net volume of water storage basin will make of the order 800 mln. m3.

In a flood zone fall little made habitable of terrace and declines of apron plain, perilune Valgon, Istoshon and Tobushi will probably will be flooded.

Right coast by the pressure head tunnel of length about 10 kms the water moves to a building hydroelectric station allocated above of an ostium r.c.. The strand Rukhif and then short assigning channel m is dumped in the river onmark.2055.

Possible parameters Matcha HPP following:

Head, computational	- 220 m;
The consumption, fair much year	- 35 m3/s;
The consumption, computational HPP	- 48-80 m3/s;
Installed power	- 90-150 mWt;
Fair much year development of the electric power	-0,56-0,58bill.kWt.h /years.

Site Riomut of a hydrounit is placed in 25 kms below Matcha. The weir by an altitude 120м can be derivated water storage basin by a usable storage capacity about 350 млн.м3.

In a flood zone fall a little lived on of terrace and declines of apron plain, and also places a motorway of local value on length of 30 kms. Waterlogging perilune Isiz-Poen is possible.

Right coast by the pressure head tunnel of length 11 kms the water moves to a building of station allocated in 3,5 kms higher of an ostium right coast of in-leak Kallahona river on fringe seconds.Rogif, and short assigning channel is dumped in the river on a mark of 1850 m.

Possible parameters Riomut HPP following:

Head, computational	- 185 m;
The consumption, fair much year	- 38 m3/s;
The consumption, computational HPP	- 54-83 m3/s;
Installed power	- 75-120 mWt;
Fair much year development of the electric power	- 0,46-0,52 bill.kWt.h/years.

The stayed site of the river will be used in three stages -Oburdon, Darg and Sangistan HPPs.

In a structure of facilities of three hydroelectric stations enter water intake of the weir with rise of water on an altitude of a canyon, derivation tunnels by a large expansion and building hydroelectric station.

The weir Oburdon HPP by an altitude up to 190м places in 2,5 kms above than in-leak Oburdon. A mark NBL 1850 m. The ducted derivation, expansion of 0,8 kms is made on a dextral coast. The building of station places above than perilune Oburdon. The discharge water with hydroelectric station is dumped on a mark of 1780 m.

Site of the weir Darg the hydroelectric station is planned in 3 kms above than perilune Veshab, the altitude of the weir of 90 m, afflux on 85 m a mark NBL1730 m, length left coast of the tunnel of 13 kms, building of station places on the left-hand coast of perilune Похут and dumps water on mark. 1540 m.

Site of the weir Sangistan the hydroelectric station places in 3 kms below than periluneRars, altitude of the weir about 85 m, afflux of water in the river on 80 m up to a mark NBL 1540 m. Derivation the tunnel, expansion of 14 kms is made on the left-hand coast of the river. The building of station places on coalescence of the rivers of a Match and Fandariy. The discharge water with hydroelectric station is dumped in the river on a mark of 1370 m.

The possible parameters these hydroelectric station are accordingly peer:

Head, computational 6 m	- 180;	170;	150;
The consumption, fair much year, m3/s	- 25;	65;	80;
The consumption, computationalHPP, m3/s	- 80;	30-140;	110-197;
Installed powerHPP,mWt	- 120;	190-200;	140-250;
fair much year development			
The electric powerbill.kWt.h	.- 0,72;	0,75-0,78;	0,9-0,95;

The river Zeravshan on a site from coalescence of the rivers of a Match and Fandariy up to Pervomaiskoi of the weir, expansion of 130 kms, flows past basically on narrow V-figurative apron plain with interleavednarrow and dilatings. So width of apron plain on a floor oscillates in very broad limits -10÷ 30 m up to 7 kms.

In places of narrow. dated for burial of firm rocky rocks, the river flows past through теснины with vertical native born sides by an altitude of 20-50 m, is higher теснин are watched representative озеровидные of dilating, where the river flows quietly, being crushed on the hose and derivating I shall realize. Most considerable dilatings of apron plain are available in 1 km below to.Urmitan, in 1 km is lower to.Yaron, for villages Dashtikozee, Mindana and for Dupuli.

Declines of apron plain mostly domed, abrupt and abrupt, hardly settled by lateral gorges both оврагами of lateral inflow and саев. The largest in-leaksare the rivers Kshtut andMagiandariy.

On a floor of apron plain there passes a motorway - Aini- Pendjikent-Samarkand.

Alone river Zeravshan on a considered site from an ostiumr. Fandariy up to Pervomaiskoy of the weir the hydroelectric station will be used in six stages:Bishkent, **Yavan,** Dupuli and Pendjikent HPPs № 1,№ 2 and 3.

Dupuli HPP under dam, with water storage basin of seasonal irrigation regulation of a sink, remaining hydroelectric station of a blended type, on which one a head the hydroelectric station forms by afflux of the weir within the limits of an altitude of a canyon a plus by an extended derivation.

Site Vishkent of a hydrounit is arranged in 5 kms below than perilune Aini, between settlements Hushikat and Iskatar, the household elevations of water mount on 35-40 m up to a mark of 1350 m, on 20 m the marks downstream Sangistan HPP on are lower. A Matcha and **Fandaryi HPP** on Fandaryi river, because of fear of waterlogging Aini of an aerodrome.

By the pressure head tunnel of length 10,5 kms on the left-hand coast the water is made to a building of station allocated on the other coast of perilune Vishkent and through the hydroelectric station is dumped in the river on a mark of 1240 m in headwaters **Yavan HPP.**

Possible parameters Ainee HPP following:

Head, computational	- 100 m
The consumption, fair much year	- 140 m3/s
The consumption, computational HPP	- 190-250 m3/s
Installed power	- 160-210 mWt
fair much year development	

The electric power - 0,95-1,04 bill.kWt.h

Site Yavan the hydroelectric station places in 17 kms above than lockin left coast of in-leak Kshtut river. On conditions not flooding of the settled places the rise of household elevations of water up to mark.1240 m is possible. Left coast derivation by the tunnel of length 8,5 kms the water moves to a building of station allocated at the end of a large river bend behind perilune Yavan and then is dumped in the river on mark 1155.

Possible parameters Yavan HPP following:

Head, computational - 80 m
The consumption, fair much year - 140 m3/s
The consumption, computational HPP - 250 m3/s
Installed power - 160mWt
fair much year development
The electric power - 0,96bill.kWt.h.

Site Dupuli of a hydrounit places in region of periluneEree , in 2,5 kms is higher Dupuli of a hydrometric post in 40 kms above on the river from Pervomaiskoy of the weir. At rise of household elevations of water in the river on 90 m up to отм.1155 m, at the weir will be derivated water storage basin by total capacity 2600, useful 1600 млн.м3 (LDV 1120 m.) with the area of a mirror 60km^2. In a flood zone 4 perilune with 350-400 court yard by manors МТО, ПТФ and other objects (periluneGusar, Beshist,Margidar) fall lived-in region with dabbled grounds on the area up to 1000 ha .

The weir by an altitude of 100 m from local stuffs with a loamy core. At the weir the hydroelectric station with the short delivering tunnel is planned. From hydroelectric station the water is dumped on a mark of 1055 m.

Possible parameters Dupulli following:

Head, computational - 85 m
The consumption fair much year - 155 m3/s
The consumption, computational HPP - 280 m3/s
Installed power - 200 mWt
fair much year development(manufacture) of the electric power - 1,0bill.kWt.h.

The site of the river from Dupulinskiy of a hydrounit up to Pervomaiskoy of the weir can be utilised by the stage Pendjikent HPPs proposed by three stages on derivation a channel by a general expansion 33 kms, which one is sited on left coast to terrace of stocked apron plain of the river, therefore conditions of a paving the way of a line of a channel will be rather high-gravity.

Possible parameters Pendjikent HPP following:

Head, computational, m	- 49	46	49
The consumption, fair much year, m3/s	- 115	115	115
The consumption, computational HPP, m3/s	- 120	115	110
Installed power, mWt	- 50	45	65
Fair much year development			
The electric power,bill.kWt.h.	- 0,27	0,25	0,38

Power usage of the rivers of a Matcha and Zeravshan, having rather small dip from 3 up to 9,8 m on km, under the scheme, intended in a working hypothesis, by afflux by the weir on an altitude of a canyon of the river because of impossibility of splashing down of stocked apron plain, with extended ducted derivations, (the alternative versions no, as the paving the way outside tubular, either open chutes or channels, derivations on narrow hardly intercepted and quite often to run in terraces is impossible) according to design studies of the similar

schemes on the rivers Kokomeren and Obihingou, now can appear economically not effective. The more detail and steep design studies at the stage of the scheme are necessary.

It is more expedient to use dips: on escaping of lake Iskanderkul, rivers Iskanderdariy, Ygnob and Fandariy.

The basic overall economics perspective hydroelectric station are adduced in the table.

Energia these hydroelectric station can be transferred to region Khydjand on LET-220 kV by an expansion about 200 kms through a saddle-point Shahristan, отм.3378 m, in adjacent Samarkand area of Uzbekistan on LET-220 kV by an expansion of 150 kms, to be used on places for development Anzob of surima-mercury centre, opening of a deposit high-quality Fan-Ygnob coked coal and for full electrification down to electroheating settlements of apron plain Matches, Zeravshan and Ygnob, and also for other perspective building.

For an effective utilization r. Zeravshan both in power, and in water economic the purposes the perennial regulation of a sink is required at the expense of building the high weir with water storage basin.

On preliminary approximate calculations for guaranteed exception from r. Zeravshan in its mean flow of a volume of a sink 500-800 mln.m3 the water storage basin by a volume about 1,5 bill.m3 is required. For its formation building the weir, altitude of 170-190 m is necessary.

For complex usage Zeravshan river the project envisions building in region Oburdon creek., on a site arranged vice-versa Ura-Tube of a zone a irrigation -power hydrounit in a structure which one enters:

- Weir with water storage basin of perennial regulation;
- Irrigation pressure head tunnel feeding water through Turkictan хребет in Ura-Tube apron plain;
- Under dam a waterpower plant by power 120 mWt

On an output of the tunnel to a Ura-Tube zone are constructed:

- Main and distributive channels;
- Stage derivation small HPP total by power 192,16 mWt

The basic facilities of a hydrounit envision water retaining facility - weir and spillway the tunnel.

The typeselection water retaining of facility is largely determined by remoteness of region from building bases and industrial centres, and also restricted range of local building stuffs.

Is unique reasonable and most economic in the data conditions is riprap the weir with a thin screen from an asphalt concrete or rolled away of concrete. Due to the plasticity, he is least subject rift to formation in a consequent stowages of a body of the weir. Besides the asphalt concrete is characterized by rather simple technology of stowagesю

Spillway the tunnel is sited on port side of the river. An expansion of 600 m, theoretical consumption - 517 m3/s, (maximum 0,1 % of security).

Water admission a tunnel in a Ura-Tube zone of length 23 kms a dia of 4,5 m with the passing of the consumption 48 m3/s.

The project envisions maintenance by the electric power of Northern locale of Tajikistan. Hydroeconomic the effect will allow to supply a spraying 100,0 тыс.га of new grounds, and will increase water supply of existing grounds on 30 thousand hectare. Is favorable will influence social development of locale, will supply labor seizure of the population, as the approximately 450 labor places will appear.

Tajikistan will receive a potent momentum of economical development and source for development of the main resource - hydraulic power. In turn it will allow country to decide its main problems - to increase seizure of the population, to reduce labor migration and to lower a level of poverty of the population.