Energy for everyone

PUBLIC POWER CORPORATION S.A. OF GREECE

HYDROELECTRIC GENERATION DEPARTMENT

DEVELOPMENT OF HYDROELECTRIC PROJECTS

The Hydroelectric development from 1950 up to date

- Greece is an over 80 % mountainous country with a complicated rugged relief and a variety of climates
- Hydroelectric Power Plants are situated in the northwestern part, where most of the mountains are located

GENERAL

The development of hydroelectric projects is carried out by the Design Branch and the Construction Branch of the Directory.

Head of the Design Branch is the Assistant Director responsible for the design of the works.

Head of the Construction Branch is the Assistant Director responsible for the construction and supervision of the works.

DESIGN BRANCH

The Design Branch includes six Sectors:

- The Hydrology Sector
- The Hydrodynamic, Preliminary Design and Licensing Sector
- The Surveying, Expropriation and Road Construction studies Sector
- The Geotechnical and Geological Design Sector
- The Civil Engineering Design Sector
- The Electro-Mechanical Design Sector

CONSTRUCTION BRANCH

The Construction Branch includes two Sectors and four site Supervision of Construction Works Departments (SCWD):

- The Civil Engineering Construction Supervision Sector
- The Electro-Mechanical Construction Supervision Sector and
- The SCWD of Western Macedonia
- The SCWD of Central and Eastern Macedonia
- The SCWD of Thessaly
- The SCWD of Piges Aoos

DESIGN AND CONSTRUCTION SUPERVISION EXPERIENCE

PPC, with the Hydroelectric Generation Department, has a lot of experience in planning, design, construction and commissioning of Hydroelectric Projects by using its own human resources consisting of more than 132 full time employees.

Additionally the Department is supplying technical consultancy services to third parties in Greece and abroad.

The projects that were designed, constructed and commissioned by the Department are as follows.

The Department has designed, supervised the construction and completed the following Large and Small Hydroelectric Projects.

LARGE HYDROELECTRIC PROJECTS

- POURNARI I (3X100 MW)
- SFIKIA (3X105 MW)
- ASSOMATA (2X54 MW)
- STRATOS I (2X75 MW)
- PIGAI AOOS (2X105 MW)
- THISSAVROS (3X127 MW)
- POURNARI II (2X16 MW + !X1.6 MW)
- PLATANOVRISSI (2X54 MW)
- ILARION (2X76.5 MW) (recently completed)

LARGE HYDROELECTRIC PROJECTS

Arachthos Hydropower Group

Pournari_I HPP

Location: Epirus,
Arta prefecture
Purpose: hydropower,
irrigation,
flood control
Commercial operat.: 1981
Installed power: 300 MW
(3x100)
Francis type turbines
Mean an. Product.: 235 GWH
Dam: earthfill, 87 m height
Reserv. net cap.: 303 m.c.m.

It is the first hydro project fully planned & designed by the PPC's local staff

LARGE HYDROELECTRIC PROJECTS

Aliakmon Hydropower Group

Sfikia HPP (pump-storage)

Location: Central Macedonia, Imathia prefecture

Purpose: hydropower

Commercial operat.: 1985/86

Installed power: 315 MW (3x105) Francis type pumb turbines

Mean an. Product.: 380 GWH (incl. 200 GWH due to pumping)

Dam: earthfill, 82 m height

Reserv. net cap.: 18 m.c.m.

LARGE HYDROELECTRIC PROJECTS

Aliakmon Hydropower Group

Assomata HPP

Location: Central Macedonia, Imathia prefecture
Purpose: hydropower, irrigation
Commercial operat.: 1985
Installed power: 108 MW (2x54) Francis type turbines
Mean an. Product.: 130 GWH
Dam: earthfill, 52 m height
Reserv. net cap.: 10 m.c.m.

LARGE HYDROELECTRIC PROJECTS

Acheloos Hydropower Group

Stratos_I HPP &
Stratos_II small HPP

Location: West. Cont. Greece, Aetoloakarnania pref.
Purpose: hydropower, irrigation
Commercial operat.: 1989
Installed power: 150 MW
Francis type turb.
6,2 MW
Tube-S type turb.
Mean an. Product.: 237 GWH
Dam: earthfill, 26 m height
Reserv. net cap.: 11 m.c.m.

LARGE HYDROELECTRIC PROJECTS

Arachthos Hydropower Group

Pigai Aoos HPP

Location: Epirus, Ioannina prefecture

Purpose: hydropower

Commercial operat.: 1990/1

Installed power: 210 MW (2x105) Pelton type turbines

Mean an. Product.: 165 GWH

Dam: earthfill, 78 m height

Reserv. net cap.: 144,3 m.c.m.

LARGE HYDROELECTRIC PROJECTS

Nestos Hydropower Group

Thissavros HPP (pump-storage)

Location: Eastern Macedonia, Drama prefecture

Purpose: hydropower, irrigation, flood control

Commercial operat.: 1998

Installed power: 384 MW (3x128) Francis type pump turbines

Mean an. Product.: 440 GWH (incl. GWH due to pumping)

Dam: rockfill, 172 m height

Reserv. net cap.: 565 m.c.m.

LARGE HYDROELECTRIC PROJECTS

Arachthos Hydropower Group

Pournari_II HPP

Location: Epirus, Arta prefecture
Purpose: hydropower, irrigation
Commercial operat.: 1998/9
Installed power: 33,6 MW (2x16) bulb & (1x1,6) S units
Mean an. Product.: 45 GWH
Dam: earthfill, 15 m height
Reserv. net cap.: 4 m.c.m.

LARGE HYDROELECTRIC PROJECTS

It is the **first RCC dam** in the construction of which the fly ash of the Ptolemais thermal plant was utilized as basic cement, achieving thus big financial benefits & reducing the construction expenses

Nestos Hydropower Group

Platanovryssi HPP

Location: Eastern Macedonia, Drama prefecture
Purpose: hydropower, irrigation
Commercial operat.: 1999
Installed power: 116 MW (2x58)
Francis type turbines
Mean an. Product.: 240 GWH
Dam: Roller Compacted Concrete, 95 m height
Reserv. net cap.: 57 m.c.m.

LARGE HYDROELECTRIC PROJECTS

Aliakmon Hydropower Group

Ilarion HPP

Location: Western Macedonia, Kozani prefecture
Purpose: hydropower, irrigation
Commercial operat.: 2016
Installed power: 153 MW (2x76.5)
Francis type turbines
Mean an. Product.: 330 GWH
Dam: earthfill, 130 m height
Reserv. net cap.: 320 m.c.m.

SMALL HYDROELECTRIC PROJECTS

- SMOKOVO (1X7.13 MW+1X3.24 MW)
- AGIA VARVARA (1X920 kW)
- MAKROCHORI (3X3.6 MW)
- STRATOS II (2X3 MW)
- GHIONA (1X8.5 MW)
- PAPADIA (1Xk00 kW)
- ILARION (1X4.2 MW) (recently completed)

SMALL HYDROELECTRIC PROJECTS

Aliakmon Hydropower Group

Reregulation Reservoir & New Reregulation Aghia Varvara Small HPP

Location: Western Macedonia, Imathia prefecture
Purpose: hydropower, water supply, irrigation,
Commercial operat.: 2008
Installed power: 0.92 MW
Kaplan axial flow S-type turbine of horizontal shaft
Mean an. Product.: 4.5 GWH
Dam: earthfill, 15.5 m height, 2400m length
Reserv. net cap.: 3.0 m.c.m.

SMALL HYDROELECTRIC PROJECTS

Aliakmon Hydropower Group

Makrochori small HPP

Location: Central Macedonia, Imathia prefecture

Purpose: hydropower, irrigation, water supply

Commercial operat.: 1992

Installed power: 10,8 MW (3x3,6) Caplan tubular S-type turb.

Mean an. Product.: 30 GWH

SMALL HYDROELECTRIC PROJECTS

Acheloos Hydropower Group

Ghiona small HPP

Location: East Continental Greece, Fokis prefecture
Purpose: hydropower, water supply
Commercial operat.: 1988
Installed power: 8,5 MW (1x8,5) Francis type turbine
Mean an. Product.: 40 GWH

UNDER CONSTRUCTION HYDROELECTRIC PROJECTS

- MESSOCHORA (2X80 MW+1X1.6 MW)
- METSOVITIKO (2X14.5 MW)

UNDER CONSTRUCTION HYDROELECTRIC PROJECTS

MESSOCHORA HYDROELECTRIC PROJECT

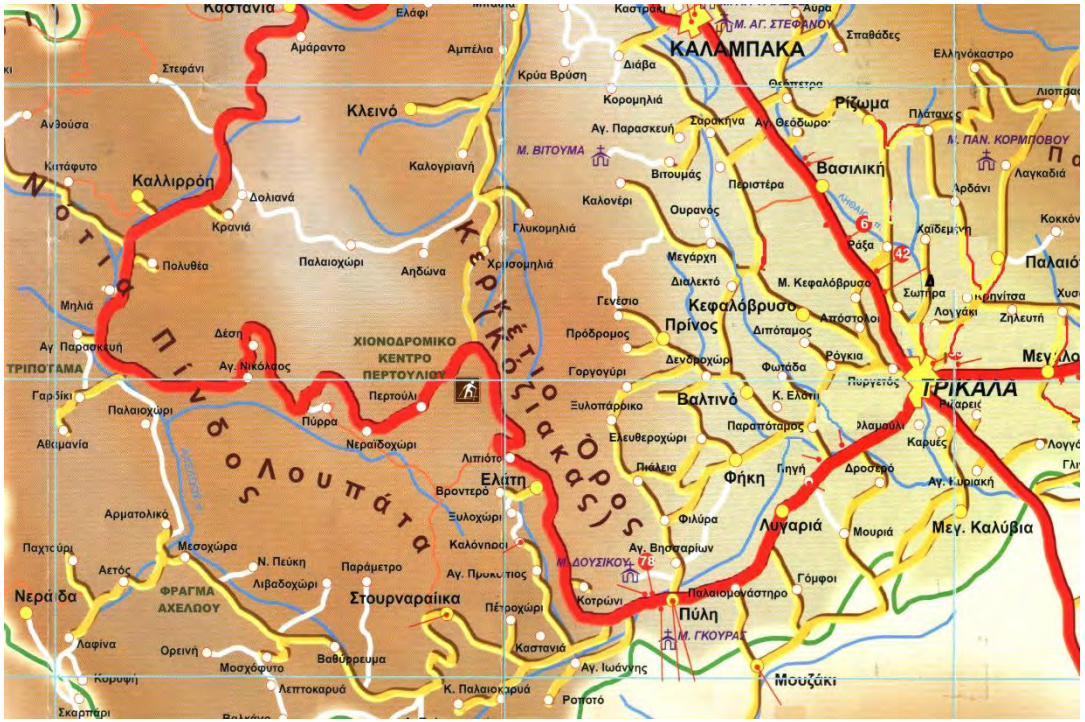
(2X80 MW+1X1.6 MW)

Acheloos Hydropower Group

Location: Thessaly,
Trikala prefecture
Purpose: hydropower,.
Mean an. Production: 362 GWH
Dam: concrete face rockfill dam,
150 m height
Reservoir net capacity: 228 m.c.m.

MESSOCHORA HYDROELECTRIC PROJECT

LOCATION OF MESSOCHORA HEP



MESSOCHORA HYDROELECTRIC PROJECT

GENERAL ARRANGEMENT

MESSOCHORA HYDROELECTRIC PROJECT

DAM

- Type: Concrete Face Rockfill Dam (CFRD)
- Height: 150 m
- Concrete face area: 52.000 m^2

MESSOCHORA HYDROELECTRIC PROJECT

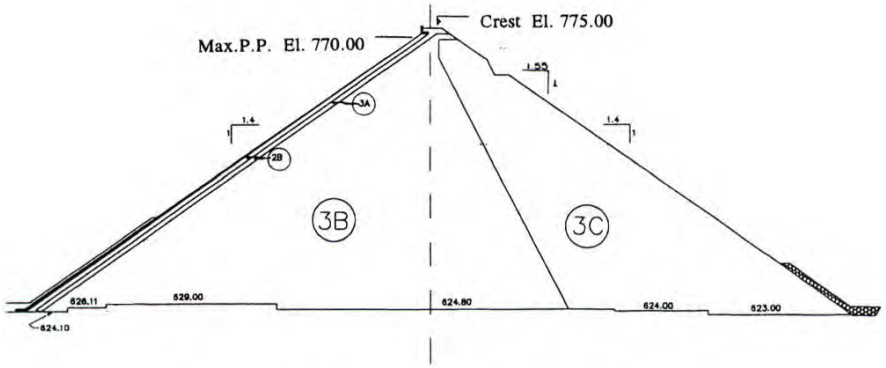


Figure 2. .Messochora Dam. Cross Section. 3B, 3C, 3A Rockfill Zones. 2B Transition Zones.

DAM SECTION

DAM UPSTREAM FACE

MESSOCHORA HYDROELECTRIC PROJECT

SPILLWAY

- Open with gate structure, inclined channel, flip bucket and plunge pool
- The gate structure has two (2) steel radial gates with dimensions: height 13.45 m and width 12,5 m
- Maximum flow Q_{max}=3.300 m^3/sec

MESSOCHORA HYDROELECTRIC PROJECT

POWER INTAKE

- Vertical with steel Trashracks

POWER TUNNEL

- Length 7.500 m
- Circular section with internal diameter 5,30 m
- Concrete lining except for the part near the Powerhouse witch has steel lining

MESSOCHORA HYDROELECTRIC PROJECT

SURGE SHAFT

- Vertical with concrete lining and a narrow opening at the bottom
- Height: 130 m
- Internal diameter: 12.5 m

MESSOCHORA HYDROELECTRIC PROJECT

POWERHOUSE

UNDER CONSTRUCTION HYDROELECTRIC PROJECTS

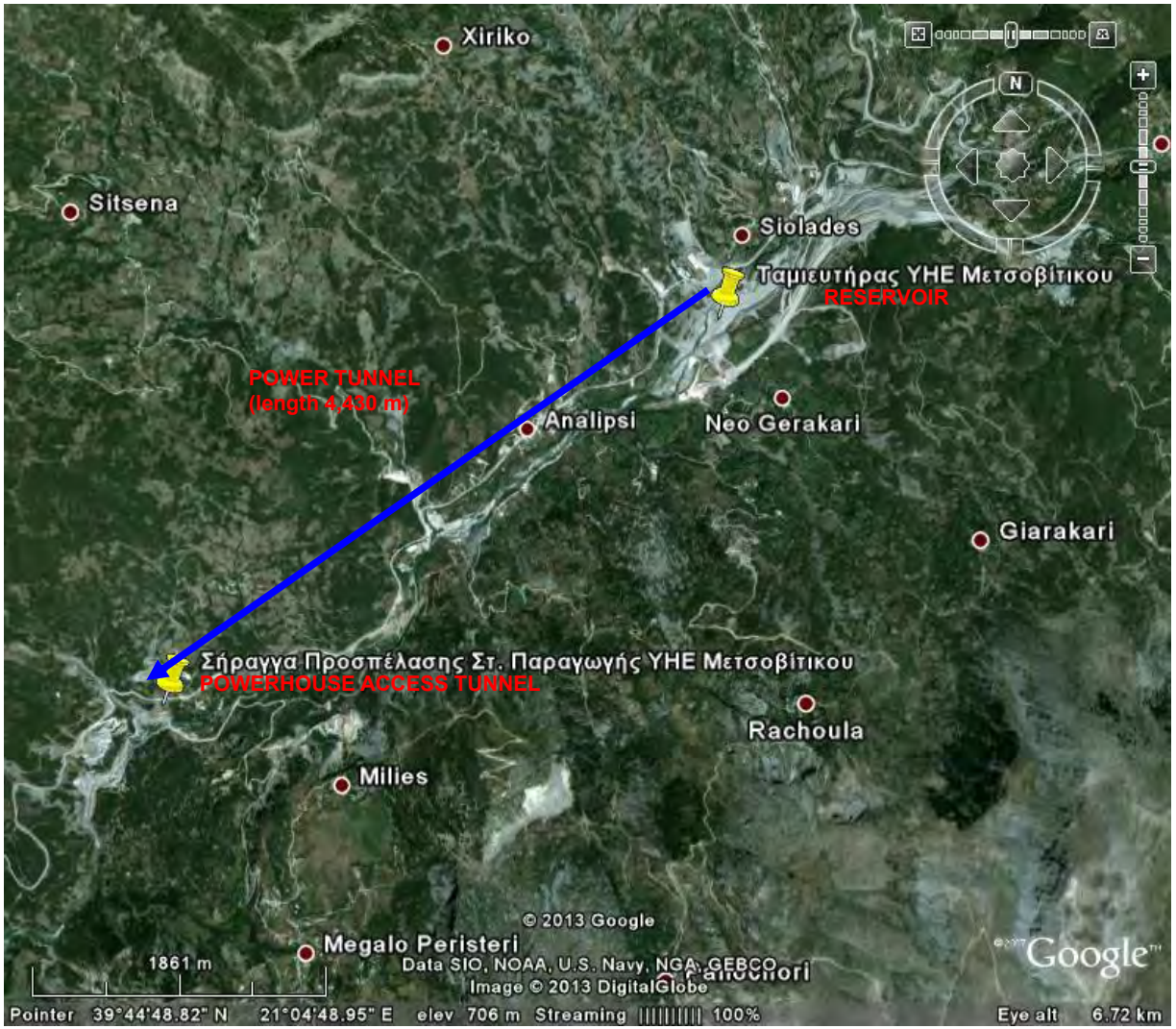
METSOVITIKO HYDROELECTRIC PROJECT

(2X14.5 MW)

Arachthos Hydropower Group

Location: Epirus,
Ioannina prefecture
Purpose: hydropower
Mean an. Product.: 46 GWH
Dam: earthfill, 11 m height
Reserv. net cap.: 260,000 c.m.

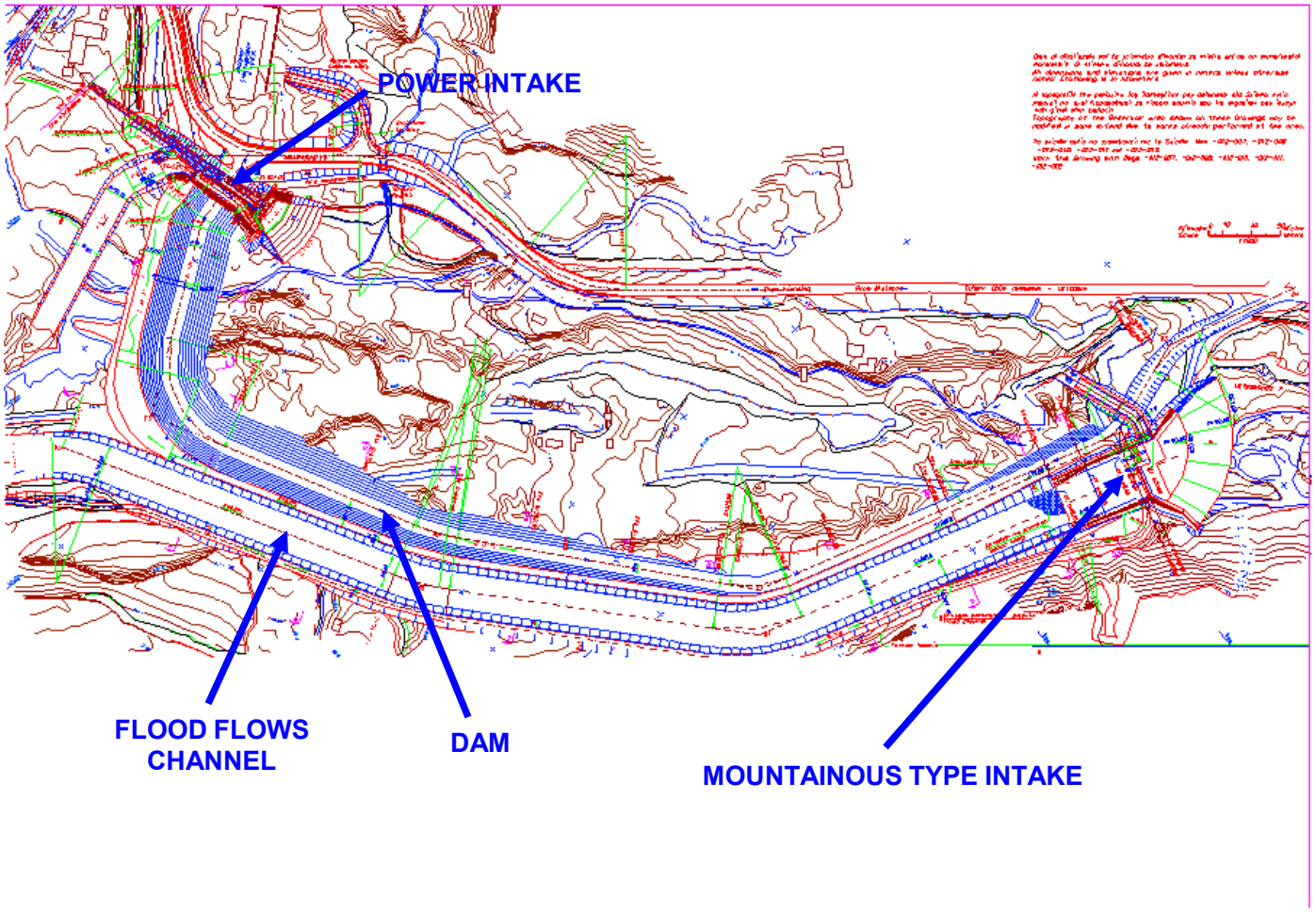
• METSOVITIKO HYDROELECTRIC PROJECT



GENERAL ARRANGEMENT

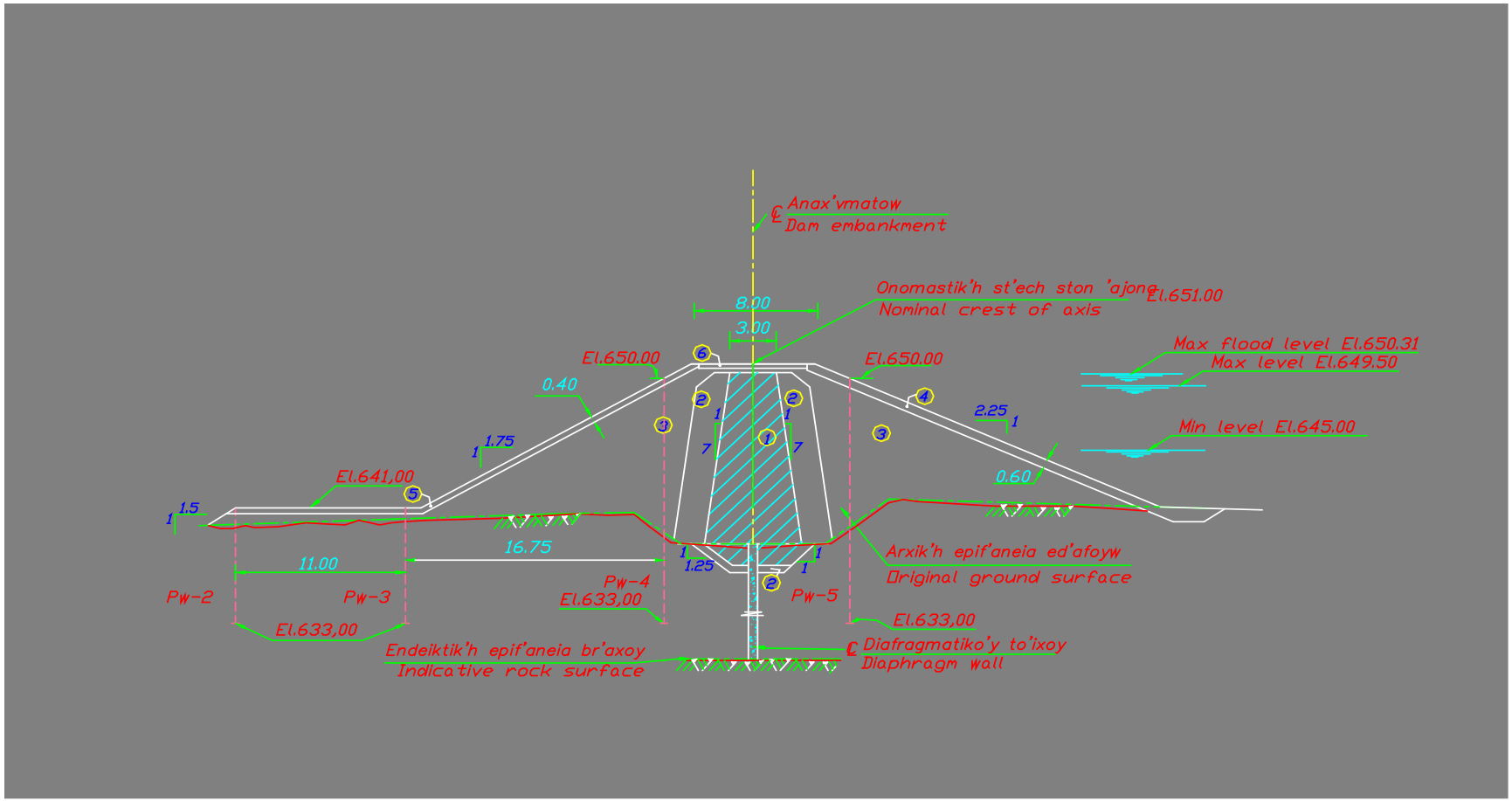
METSOVITIKO HYDROELECTRIC PROJECT

GENERAL ARRANGEMENT OF DAM AREA



METSOVITIKO HYDROELECTRIC PROJECT

TYPICAL DAM SECTION



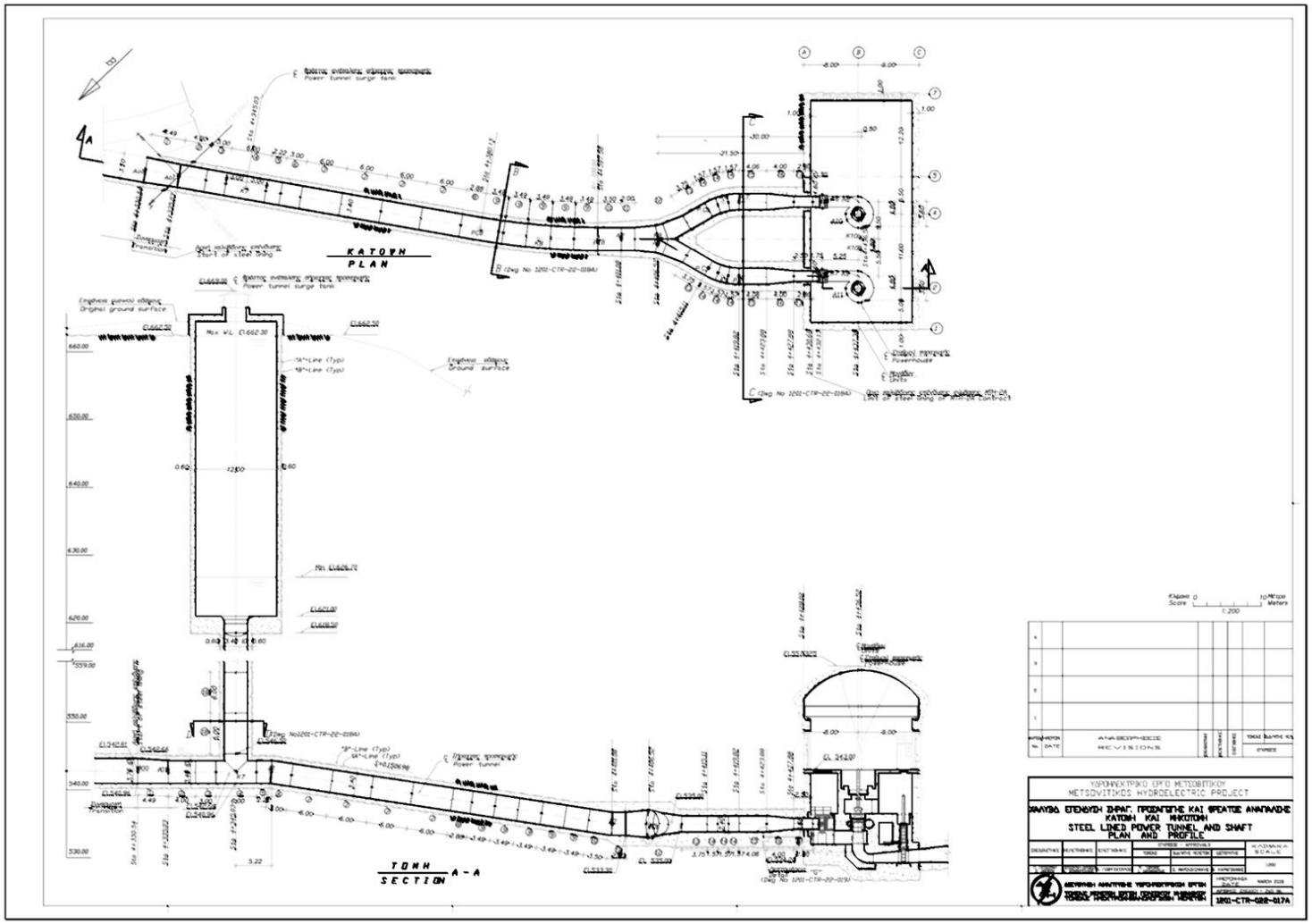
METSOVITIKO HYDROELECTRIC PROJECT

UNDERGROUND STRUCTURES OF POWER PLANT COMPLEX

- **POWER TUNNEL AND BRANCHES (length 4,430m and excavation diameter 4.9m)**
- **POWERHOUSE ACCESS AND VENTILATION TUNNEL (length 265 m)**
- **CABLE AND ESCAPE INCLINED TUNNEL (length 78m)**
- **POWERHOUSE (excavation dimensions: height 35 m, length 35,5m and width 17m)**
- **SURGE CHAMBER (excavation dimensions: diameter14,2 m, ύψος 28 m)**
- **SURGE SHAFT (total height 119 m, excavation diameter 14m to the top 40 meters and 5 m to the lower part)**
- **TAILRACE TUNNEL AND BRANCHES (length 692m)**

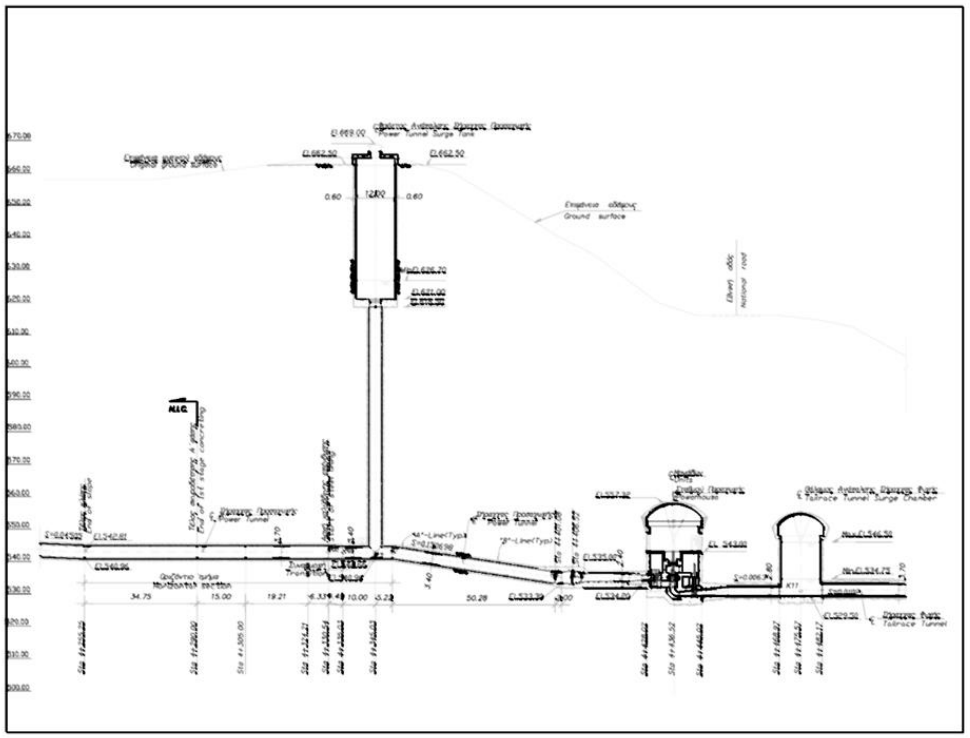
METSOVITIKO HYDROELECTRIC PROJECT

POWER TUNNEL STEEL LINER



METSOVITIKO HYDROELECTRIC PROJECT

POWER PLANT LONGITUDINAL SECTION



ΗΗΚΟΤΟΗΗ

PROFILE

ΥΔΡΟΗΛΕΚΤΡΙΚΟ ΕΡΓΟ ΜΕΤΣΟΒΙΤΙΚΟΥ
METSOVITIKOS HYDROELECTRIC PROJECT

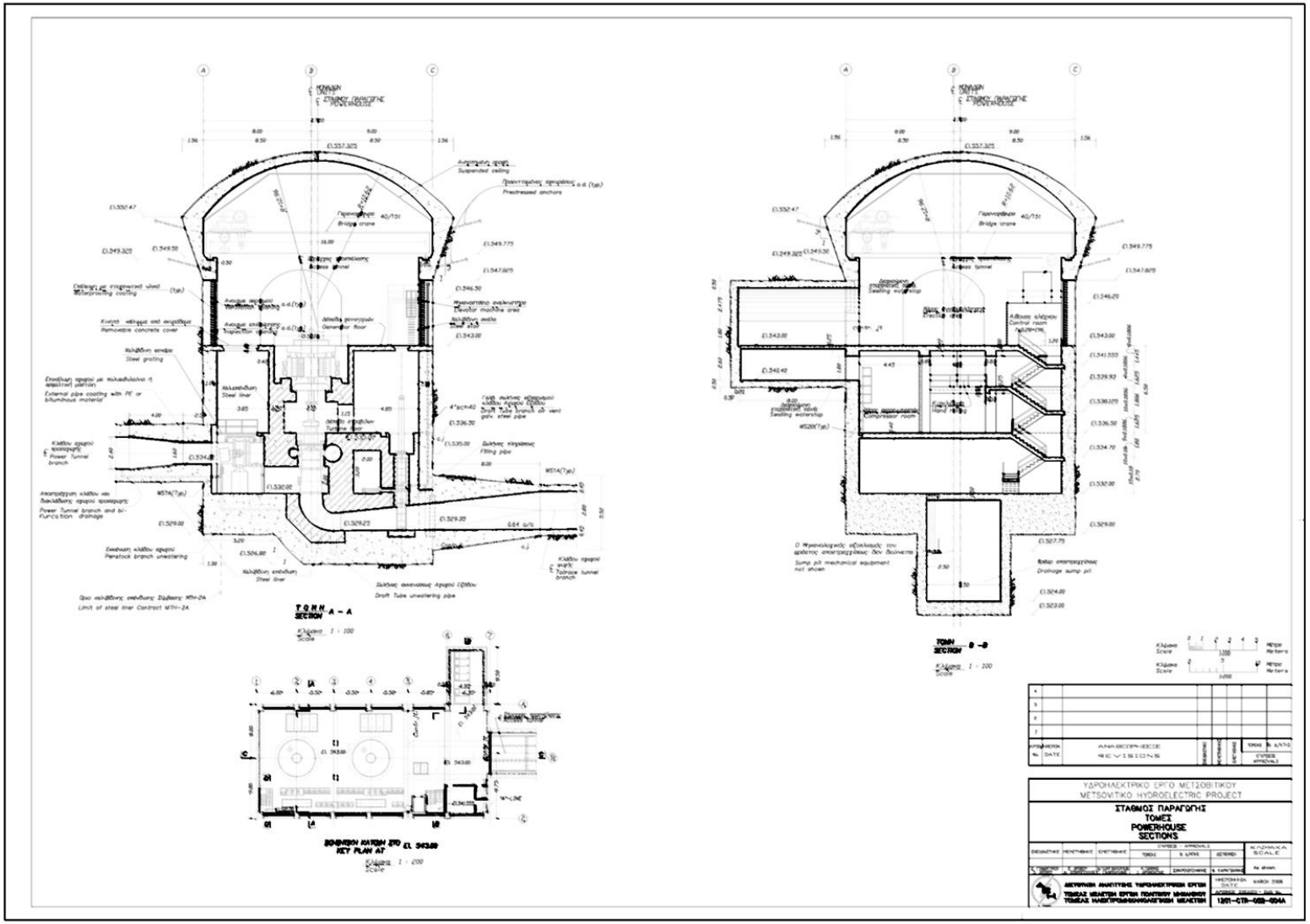
ΣΥΓΚΡΟΤΗΜΑ ΠΑΡΑΓΩΓΗΣ - Η/Κ ΟΤΟΗ

POWERPLANT - LONGITUDINAL SECTION

1867-CTR-GSE-GGEA

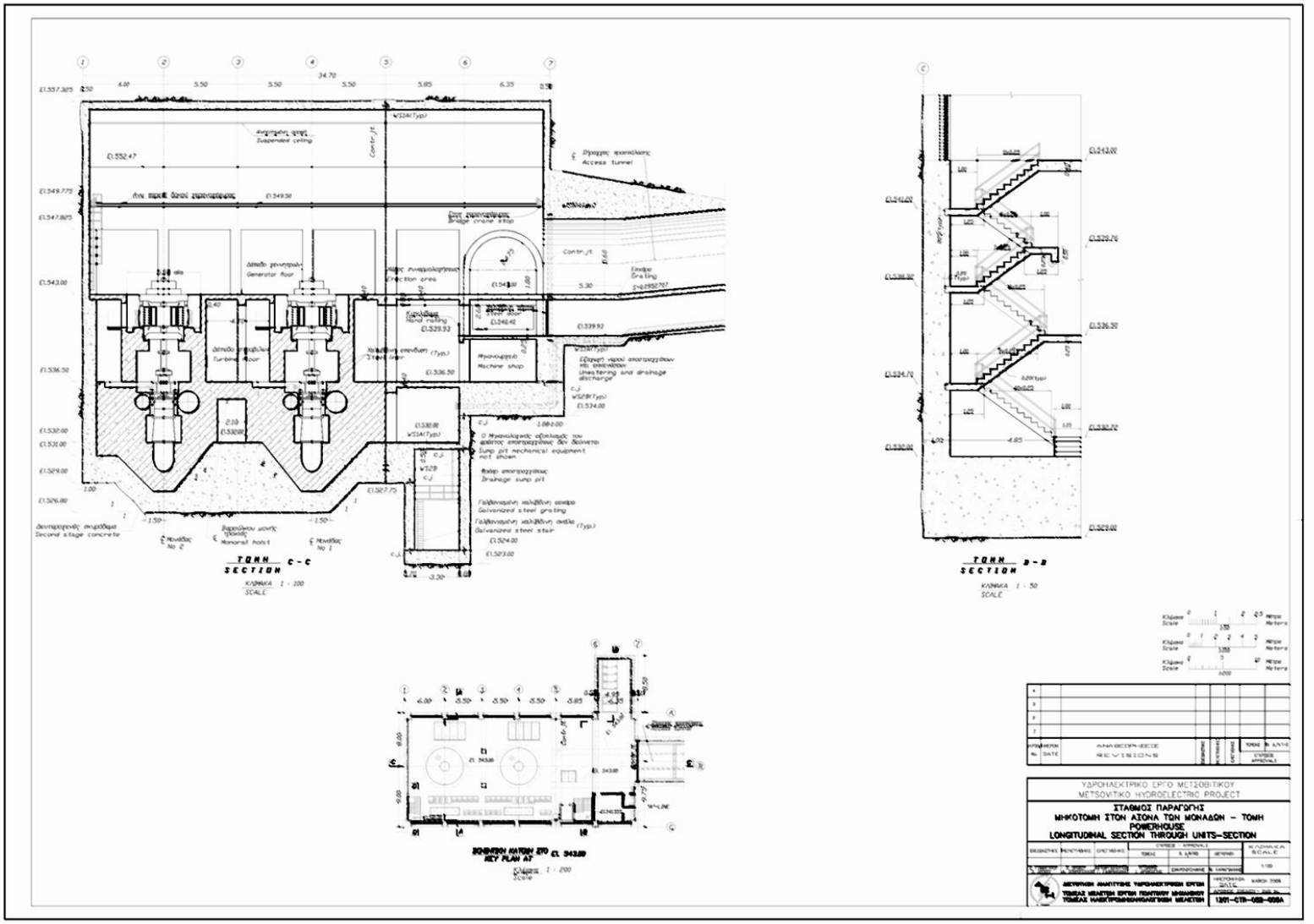
METSOVITIKO HYDROELECTRIC PROJECT

POWERHOUSE CROSS SECTIONS



METSOVITIKO HYDROELECTRIC PROJECT

POWERHOUSE LONGITUDINAL SECTION



UNDER DESIGN HYDROELECTRIC PROJECTS

- SYKIA (2X60 MW+1X6.5 MW
- PEFKOPHYTO (2X80 MW)
- TEMENOS (3X6.3 MW)

PROVIDING TECHNICAL CONSULTANCY SERVICES TO OTHER AGENCIES

Consultant for the Design and Supervision of Works	
Projects (indicatively)	**Client**
Finished	
Sykia Dam on Acheloos River	Ministry of Public Works
Pramoritsa Dam	Prefecture of Cozani
Amari Dam	Organization for the Development of West Crete
Longa Dam	Prefecture of Trikala
Livadi Dam	Prefecture of Larissa
Panagiotiko Dam in Magnissia Prefect.	Region of Thessaly
Patara Dam	Public Corporation for Water Supply of Alexandroupoli
Agioneri Dam in Larissa Prefecture	Region of Thessaly
Valsamiotis Dam	Organization for the Development of Crete

PROVIDING TECHNICAL CONSULTANCY SERVICES TO OTHER AGENCIES

Consultant for the Design and Supervision of Works	
Projects (indicatively)	**Client**
Finished	
Kamares Dam in Sifnos Island	Prefecture of Cyclades
Vaketa Dam in Tinos Island	Prefecture of Cyclades
Anafi Island Dam	Prefecture of Cyclades
Neochoriti Dam	Region of Thessaly
Under Development	
Embankment for Protection of Saint George MYROPHILLO Monastery in Sykia Dam Reservoir	Ministry of Public Works
Pili Dam	Region of Thessaly

PROVIDING TECHNICAL CONSULTANCY SERVICES TO OTHER AGENCIES

Consultant for the Design and Supervision of Works		
Projects (indicatively)	**Client**	
Preparation of Preliminary Designs (in cooperation with the Institute of Geology and Mineral Exploration)		
Saint John Dam	Prefecture of Lassithi	(finished)
Katharo Dam	Prefecture of Lassithi	(finished)
Chochlakies Artificial Lake	Prefecture of Lassithi	(finished)
Schinokapsala Artificial Lake	Prefecture of Lassithi	(finished)
Tsikalaria Artificial Lake	Prefecture of Lassithi	(finished)
Lapathos Artificial Lake	Prefecture of Lassithi	(finished)
Fourni Artificial Lake	Prefecture of Lassithi	

PROVIDING TECHNICAL CONSULTANCY SERVICES TO OTHER AGENCIES

Consultant for the Design and Supervision of Works	
Projects (indicatively)	**Client**
Preparation of Preliminary Studies	
Seta-Manikia Dam (completion)	Prefecture of Efvia (finished)
Istiea Dam	Prefecture of Efvia
Mandoudi Dam	Prefecture of Efvia
Steni Dam	Prefecture of Efvia
Komitos SHEP	Prefecture of Efvia
Platanovrissi Dam	Aristomenous Municipality, Messinia Pref.. (finished)
Kombona Dam	Megalopoli Municipality
Tropeouchos Dam	Prefecture of Florina
Inachos Dam	Inachos Municipality, Prefecture of Etoloakarnania

PROVIDING TECHNICAL CONSULTANCY SERVICES TO OTHER AGENCIES

Consultant for the Design and Supervision of Works	
Projects (indicatively)	**Client**
Preparation of Final Designs	
Megaplatanos Dam	Prefecture of Fthiotida
Myloi Dam	Prefecture of Fthiotida
Smokovo I SHEP	PPC RENEWABLES S.A. (finished)
Ikaria Hybrid Energy Project	PPC RENEWABLES S.A.
Smokovo IV SHEP	PPC RENEWABLES S.A.

Thank you!