



HEAD OFFICE: Alemdağ Cad. Masaldan İş Merkezi No:60 B-Blok Kat:5 34692
Üsküdar - İSTANBUL / TURKEY

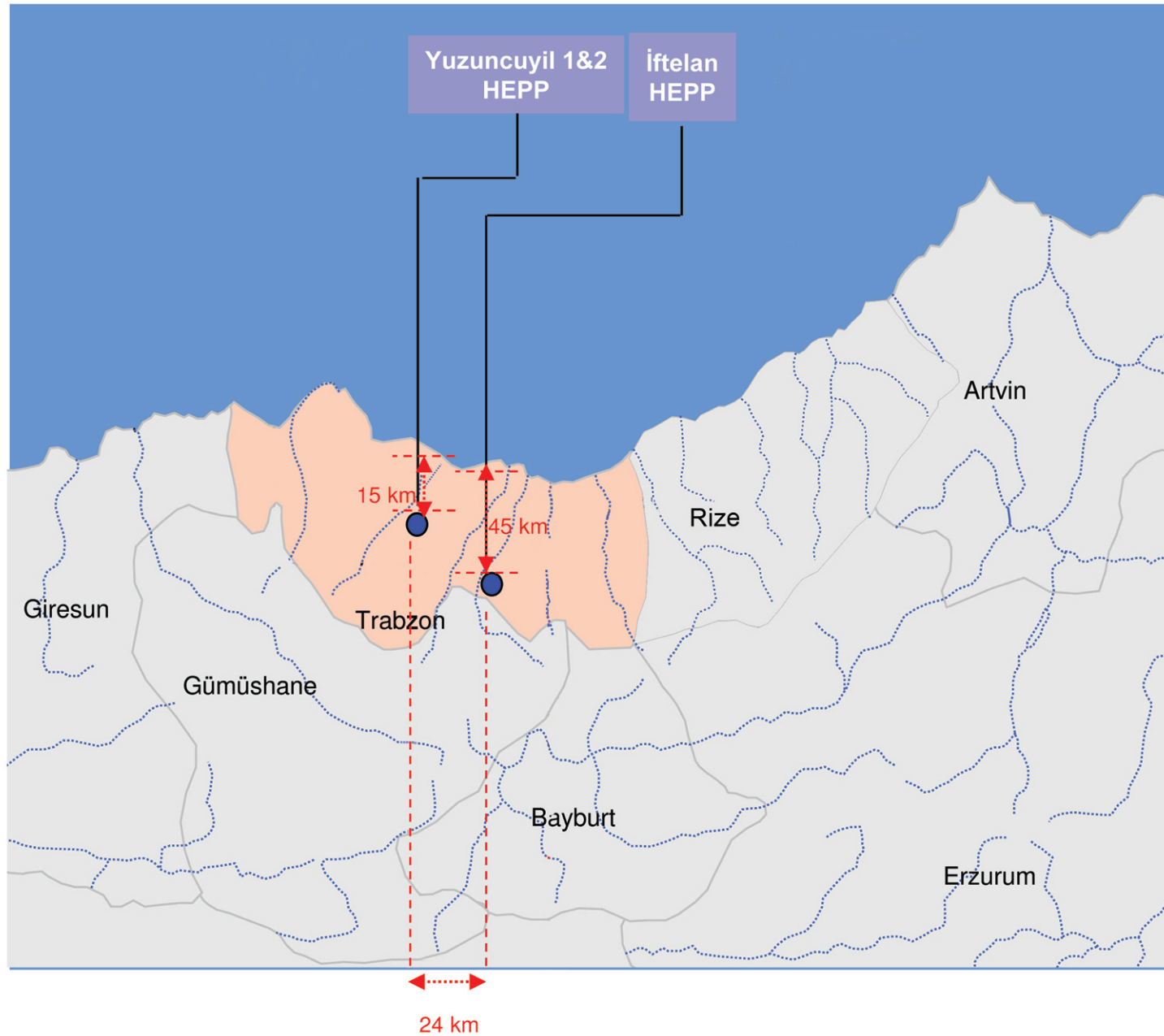
Section 1 – Çark Overview



The Portfolio								
Project	Region	River	Project Capacity (MW)	Annual Generation (GWh)	Capacity Factor (%)	Construction Start	Construction Period (months)	Operation Start
Yüzüncüyıl	Black Sea	Galyan	17,399	56,932	32.7%	Sep 2013	26	Oct 2015

Section 1 – Çark Overview

Location - Projects in the Black Sea Region



Power Plant Projects in the Black Sea Region

<u>Project</u>	<u>Project Capacity (MW)</u>	<u>River</u>
İftelan HEPP	17.65	Yanbolu River
100.Yıl HEPP	17.399	Galyan River

Section 2 – The Company

The Portfolio's Status

T U R K I Y E

	100.Yıl
State Hydraulics Works (DSI) approval for feasibility works	Completed
DSI tender for license awarded (exclusive water right)	Completed
DSI royalty fee (escalated to 2010)	0.03 kr/kWh 0.01 €/kWh
EMRA license application	On going
Consents for grid inter-connection	Completed
Sign water usage agreement with DSI	Completed
Issue of generation license by EMRA	On going
Detailed topographic works	Completed
Expropriation authority from EMRA & State Forestry Affairs	On going
Preliminary Environment Impact Assessment (“EIA”) sign off	On going

Section 3 – The Portfolio

Location - Projects in the Downstream and Upstream

River	Projects	Status
Galyan River	Kismet HEPP (Regulator)	Project Development
	Amastal HEPP (Regulator)	Project Development
	Yüzüncüyıl HEPP (Regulator)	Çark - Project Development
	Cinali HEPP (Regulator)	Damlapınar - Project Development
	Atasu Dam	Storing Water

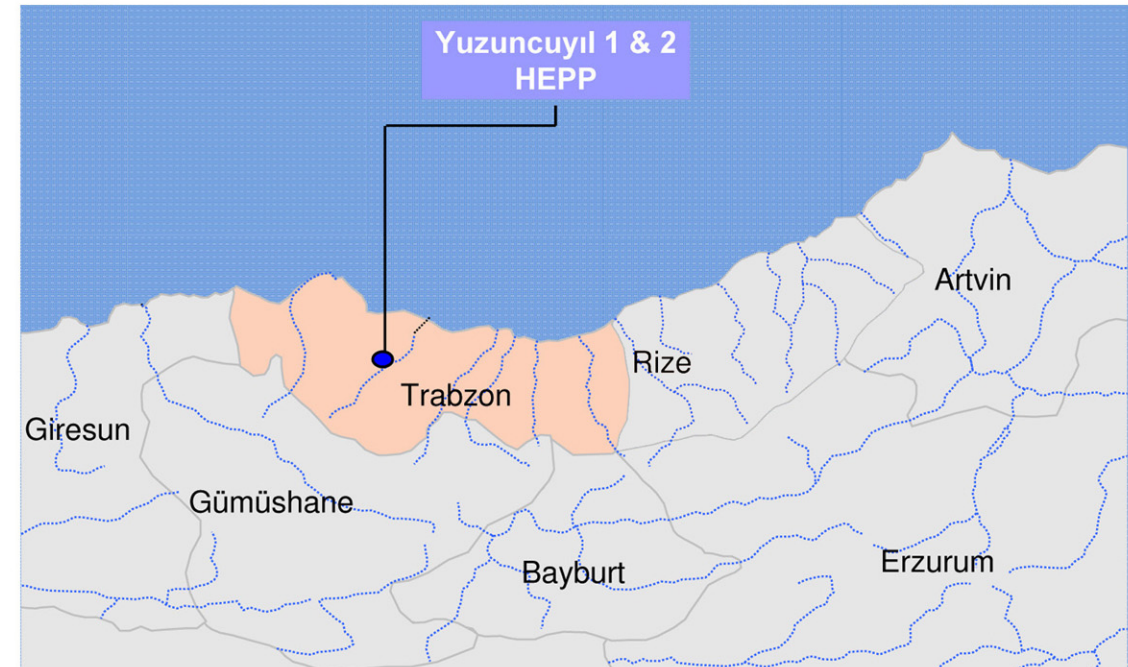
Section 3 – The Portfolio

YUZUNCUYIL HEPP

Overview

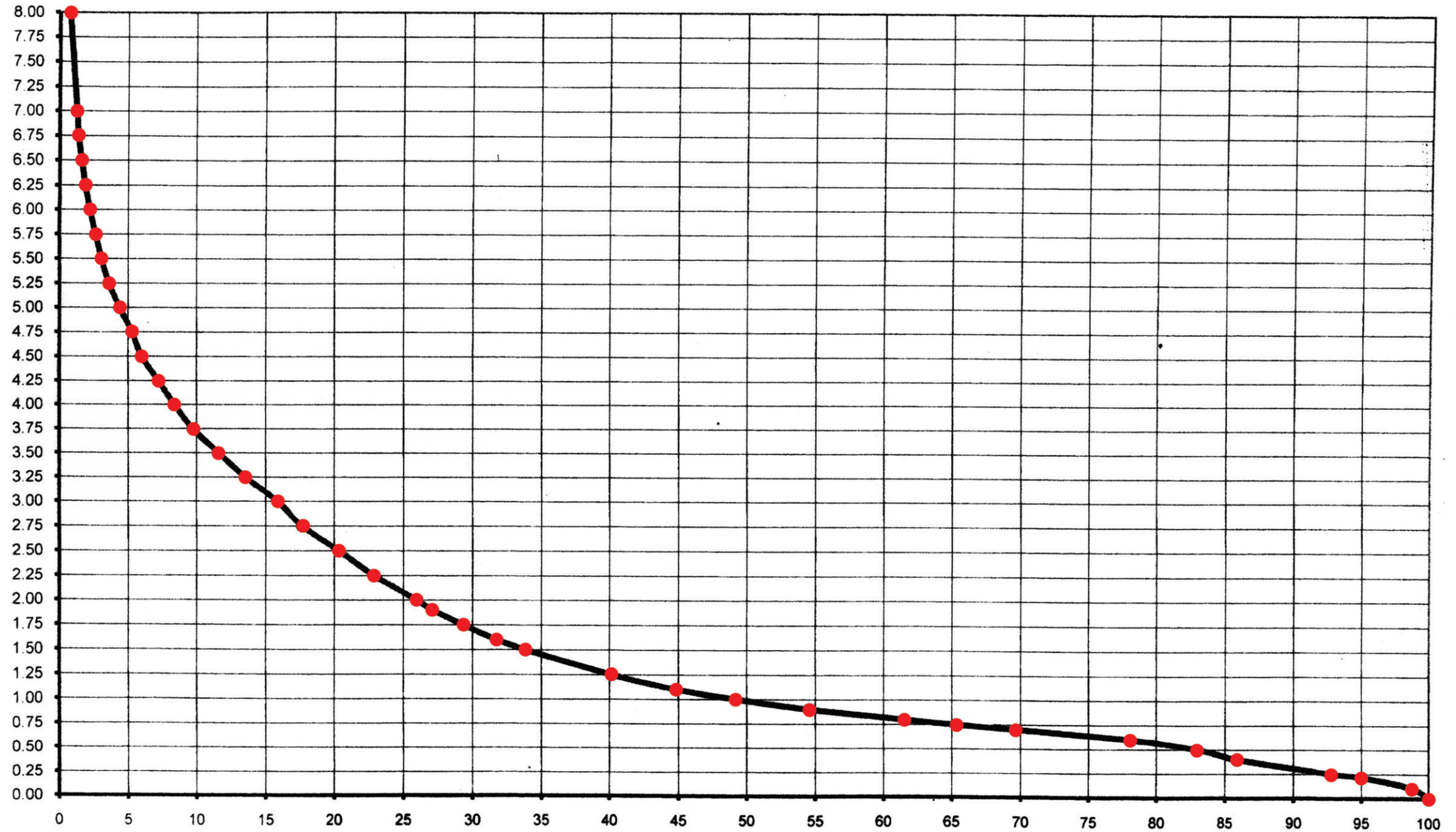
- **Capacity:** 17,399 MW
- **Net Generation:** Annual energy production of 56 GWh
- **Type:** Run-of-river
- **Location:** Over Galyan river in Maçka, Trabzon
- **Regulatory process:**
 - DSI contribution tender for Yüzüncüyıl project has been awarded to Damlapinar.
 - DSI royalty fee is 0.03 Kr/kWh (Tender date is 07.05.2009)
 - DSI water usage agreement has already been signed.
 - EMRA license procedure is on-going.

Geographical Location



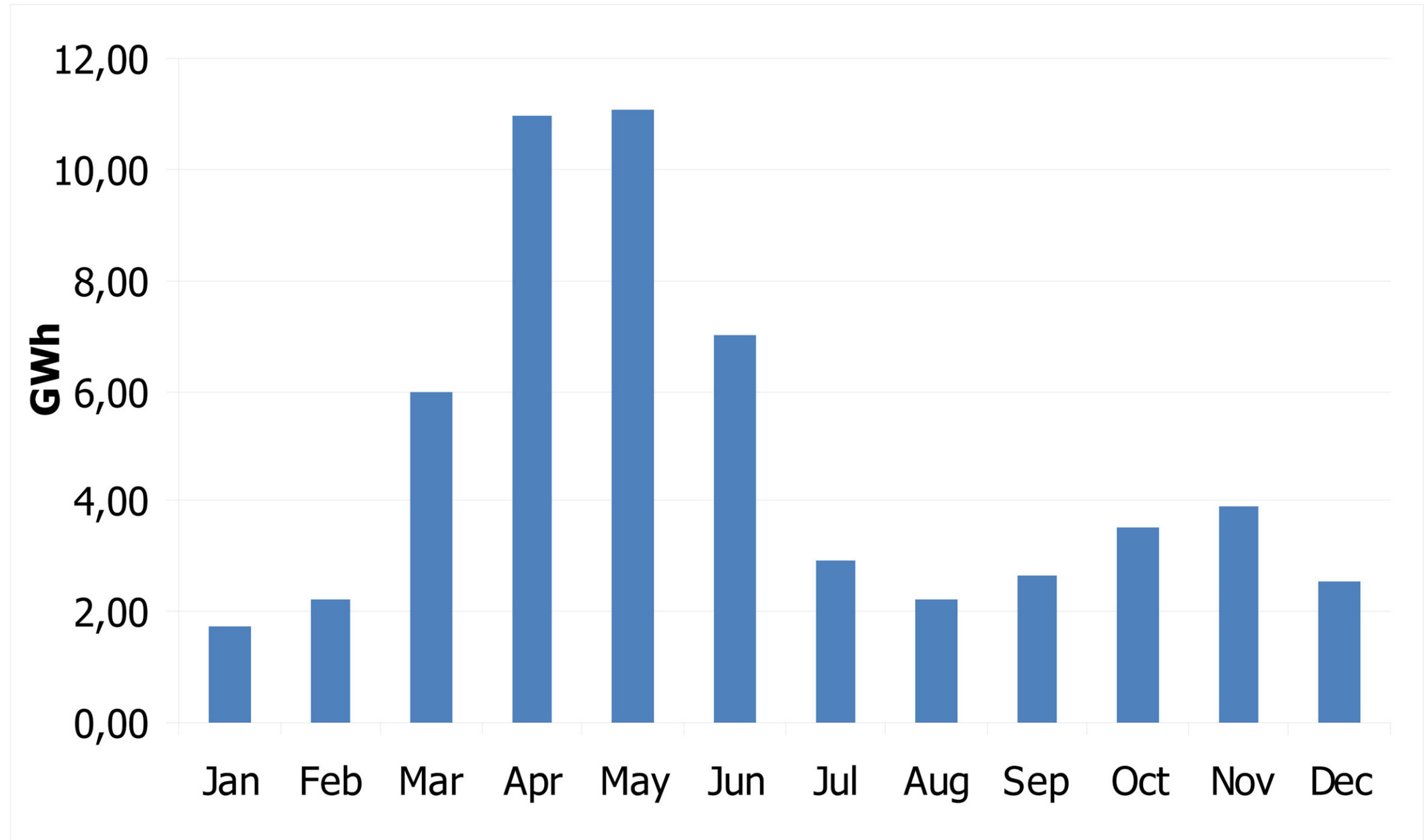
Section 3 – The Portfolio

YUZUNCUYIL HEPP - Hydrology (Natural Flow Rates)



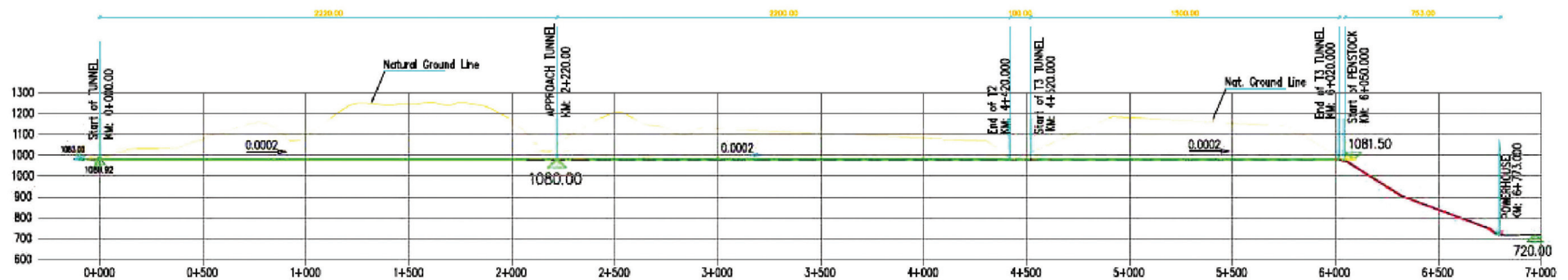
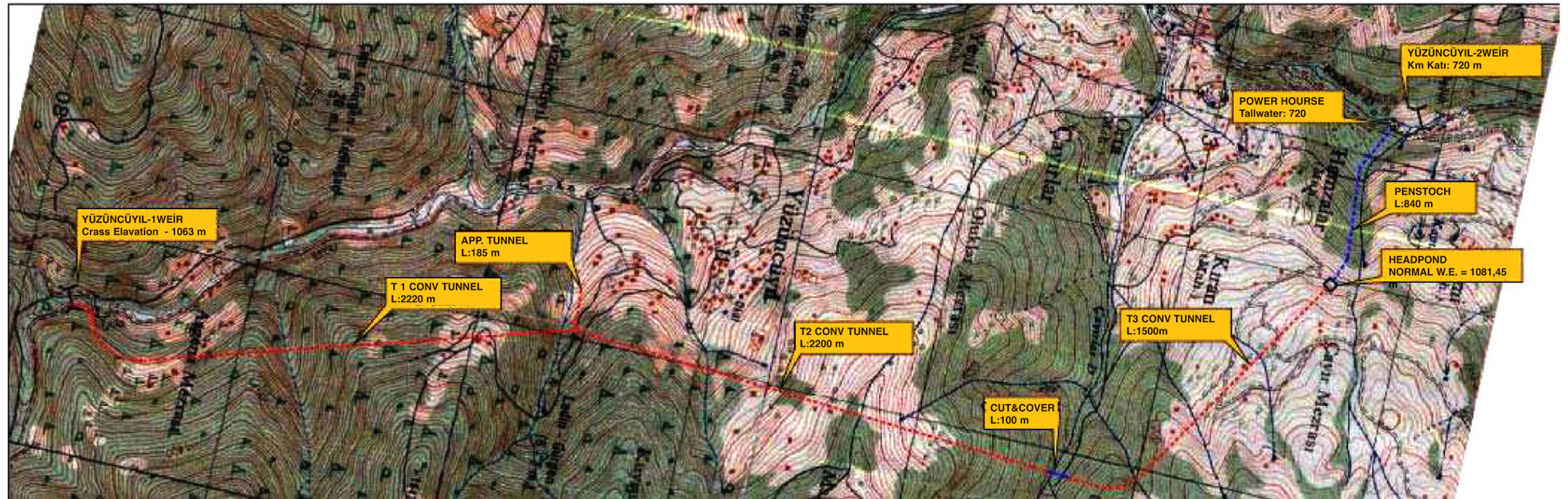
Section 3 – The Portfolio

YUZUNCUYIL HEPP - Monthly Dist. of Annual Generation



Section 3 – The Portfolio

YUZUNCUYIL 1 HEPP – Layout & Longitudinal Section



Section 3 – The Portfolio

YUZUNCUYIL 1 HEPP – Technical Information

Hydrology

Rain area	67,15 km ²
Average water flow rate	1,29 m ³ /s
Design flow	3,00 m ³ /s
Flood flow rate (Q ₁₀₀)	49,35 m ³ /s

Weir – Barrage

Type	Cement Body
Thalweg elevation	1,078.0 m
Crest elevation	1083,97.0 m
Crest length	30.0 m
Maximum water elevation (Q ₁₀₀)	1,086.0 m

Water Intake

Bottom elevation	1,080.3 m
Number of intake gates	2
Intake gate dimensions	2.5 x 2.5 m

Settling Basin

Number of boxes	1
Box width	4.5 m
Settling basin length	50.0 m
Settling basin bottom slope	0.015

Conveyance Tunnel

Type	Free surface flow
Tunnel excavation diameter	3,40 m
Tunnel length	4760 m
Slope	0.0002

Approach Tunnel

Section	Horse Shoe
Diameter	3,40 m
Length	175.0 m

Headpond

Normal water elevation	1,081.5 m
Minimum water elevation	1,078.5 m
Basin width	10.0 m
Basin length	20.0 m

Penstock

Pipe diameter	1,10 m
Length	500 m
Thickness	10-20 mm

Section 3 – The Portfolio

YUZUNCUYIL 1 HEPP – Technical Information

Powerhouse

Turbine axis elevation	813.0 m
Tailwater elevation	810.0 m
Plant length	35.0 m
Plant width	18.0 m
Plant height	16.0 m

Turbines

Type of turbines	Horizontal axis Pelton turbine
Number of turbines	2
Turbine Capacity	2 x 3,534 kW
Design Flow per Turbine	1,5 m ³ /s
Gross Head	273.0 m
Net Head	268,7 m
Efficiency at design flow	92.0%
Turbine speed	750 rpm

Internal Use Transformer

Type	Oil Transformer
Number of units	1
Capacity	250 kVA
Frequency	50 Hz.
Cooling	ONAN

Main Transformers

Type	Oil Transformer
Number of units	2
Capacity	2 x 4000 kVA
Nominal Voltage	6.3/34.5 kV
Frequency	50 Hz.
Cooling	ONAN

Generators

Number of generators	2
Generator capacity	2 x 3700 kVA
Voltage	6.3 kV
Frequency	50 Hz.
Number of turnovers	750 rpm
Power factor	0.95

Switch Area

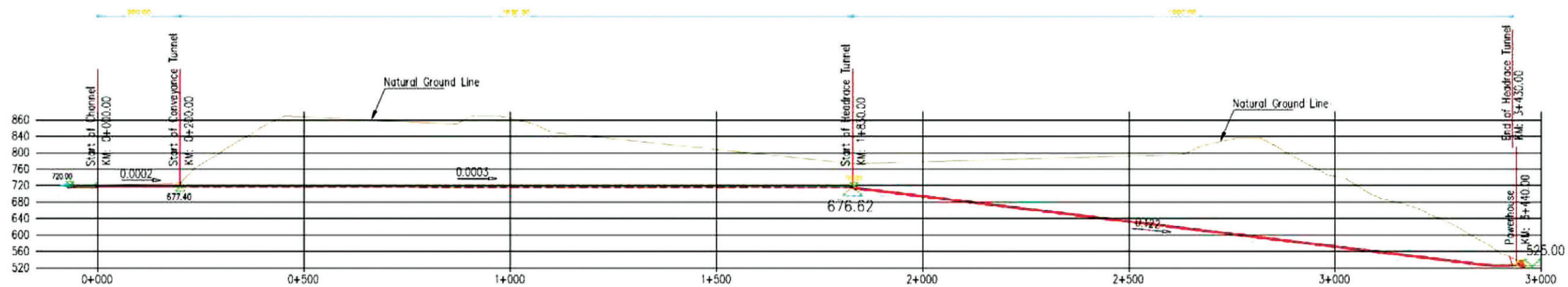
Located in the plant building in the form of 33 kV cubicles

Annual Energy Production

Total net energy production	23,805 GWh
-----------------------------	------------

Section 3 – The Portfolio

YUZUNCUYIL 2 HEPP – Layout & Longitudinal Section



Section 3 – The Portfolio

YUZUNCUYIL 2 HEPP – Technical Information

Hydrology

Rain area	83,78 km ²
Average water flow rate	1,6 m ³ /s
Design flow	4 m ³ /s
Flood flow rate (Q ₁₀₀)	57,25 m ³ /s

Weir – Barrage

Type	Cement Body
Thalweg elevation	805 m
Crest elevation	810 m
Crest length	25.0 m
Maximum water elevation (Q ₁₀₀)	810,92 m

Intake Structure

Bottom elevation	807 m
Number of intake gates	2
Intake gate dimensions	2.25 x 2.25 m

Settling Basin

Number of boxes	2
Box width	3.8 m
Settling basin length	50.0 m
Settling basin bottom slope	0.015

Conveyance Tunnel

Type	Free surface flow
Tunnel excavation diameter	3,90 m
Tunnel length	48,30 m
Slope	0.0002

Approach Tunnel

Section	U Shaped
Diameter	4.0 m
Length	200.0 m

Section 3 – The Portfolio

YUZUNCUYIL 2 HEPP – Technical Information

Powerhouse

Tailwater elevation	505 m
Plant length	35.0 m
Plant width	18.0 m
Plant height	16.0 m

Turbines

Type of turbines	Horizontal axis Francis turbine
Number of turbines	2
Turbine Capacity	2 x 5,166 kW
Design Flow per Turbine	2 m ³ /s
Gross Head	300 m
Net Head	295 m
Efficiency at design flow	91.5%
Turbine speed	1,000 rpm

Internal Use Transformer

Type	Oil Transformer
Number of units	1
Capacity	100 kVA
Frequency	50 Hz
Cooling	ONAN

Main Transformers

Type	Oil Transformer
Number of units	2
Capacity	2 x 5600 kVA
Nominal Voltage	6.3/34.5 kV
Frequency	50 Hz.
Cooling	ONAN

Generators

Number of generators	2
Generator capacity	2 x 5250 kVA
Voltage	6.3 kV
Frequency	50 Hz
Generator speed	1,000 rpm
Power factor	0.95

Switch Area

Located in the plant building in the form of 33 kV cubicles

Annual Energy Production

Total net energy production	33,127 GWh
-----------------------------	------------

Section 4 – Schedule

Total Investment Costs

No	Item	Yüzüncüyıl 1	Yüzüncüyıl 2	TOTAL
1	DIVERSION WEIR BODY & WATER INTAKE	338.712,8 €	390.000 €	728.712,8 €
2	CONVEYANCE CHANNEL			
3	HEADPOND			
4	CUT & COVER TUNNEL			
5	TUNNEL	6.281.682,9 €	3.919.106,9 €	10.200.789,8 €
6	APPROACH TUNNEL	141.481,4 €	158.571,1 €	300.052,5 €
7	VERTICAL SHAFT			
8	SURGE TANK			
9	VALVE CHAMBER			
10	PENSTOCK CIVIL WORKS	96.279,1 €		96.279,1 €
11	POWERHOUSE	280.000 €	280.000 €	560.000 €
12	SITE FACILITIES	68.181,8 €		68.181,8 €
13	ACCESS ROADS	136.000 €	34.000 €	170.000 €
14	HYDROMECHANIC EQUIPMENT	650.000 €	351.000 €	1.001.000 €
15	TOTAL OF CIVIL WORKS	7.907.338 €	5.132.768,9 €	13.125.016 €
16	ELECTROMECHANICAL EQUIPMENTS & EBOP	2.247.130,0 €	1.622.600,0 €	3.869.730,0 €
17	OTHER ELECTRICAL SYSTEMS	165.000,0 €	165.000,0 €	330.000,0 €
18	ENERGY TRANSMISSION LINE	500.000 €		500.000 €
19	TOTAL COST	10.819.468 €	6.920.368,9 €	17.824.746 €
20	CONTINGENCIES	440.499,1 €	270.000 €	710.530,5 €
21	COST of ALL FACILITIES	11.259.967 €	7.190.38,9 €	18.535.276,5 €
22	DESIGN, CONSULTANCY & MANAGEMENT COST	300.000 €	200.000 €	500.000 €
23	EXPROPRIATION & FOREST ADM. PERMIT			
24	INVESTMENT COST EXC. VAT	11.259.967 €	7.390.368,9 €	19.035.276,5 €
25	VAT	1.125.996,7 €	739.036,89 €	1.903.527,65 €
26	INVESTMENT COST inc. VAT	12.385.963,7 €	8.129.405,79 €	20.938.804,15 €

* EUR/TRY exchange rate is assumed as 2.20.

Section 5 – Cash Flow

Upside Potential - Greenhouse Gas Reduction

The portfolio is designed to benefit from voluntary carbon trading scheme

No	Plant	Applicable Standard	Comments	GHG Reduction Potential (tCO2/year)	Annual Carbon Reduction Income (Euro)
1	Yüzüncüyıl HEPP	VCS	Installed capacity is too large for GS	27.907	153.488

*GHG emission factor is taken as 0.55 tCO2/MWh. GHG Reduction Average Price is taken constant as 5.5 €/tCO2. Carbon revenue should be calculated for 15 years.