ERE OTOPRODÜKTÖR,
ELEKTRİK ÜRETİM, İLETİM ve
DAĞITIM SANAYİ ve TİCARET A.Ş.

TURKEY'S HYDROPOWER POTENTIAL and

REVIEW of ELECTRICITY GENERATION POLICIES from EU PERSPECTIVE

FEASIBILITY CRITERIA FOR HEPP

EXISTING CRITERIA (in use) :

1 - Firm Energy Benefit :

6.0 cent / kWh

2 - Secondary Energy Benefit :

3.3 cent / kWh

3 - Peak Power Benefit :

85 $ / kW

Based on a Sample Thermal Power Plants Group of (450 MW Import Coal + 150 MW NGas/LPG CCP)

(*) The Figures inside parentheses will be used, in case the external costs are taken into consideration

PROPOSED CRITERIA :

For HEPP with Dams

A) Firm/Peak Energy Benefit :

7.25 (8.75) cent / kWh (*), or

B) 1 - Firm Energy Benefit :

6.0 (7.5) cent / kWh (*)

2 - Secondary Energy Benefit :

4.75 (4.75) cent / kWh

3 - Peak Power Benefit :

250 $ / kW

For Run-of-River HEPP

1 - Firm Energy Benefit :

6.0 (7.5) cent / kWh (*)

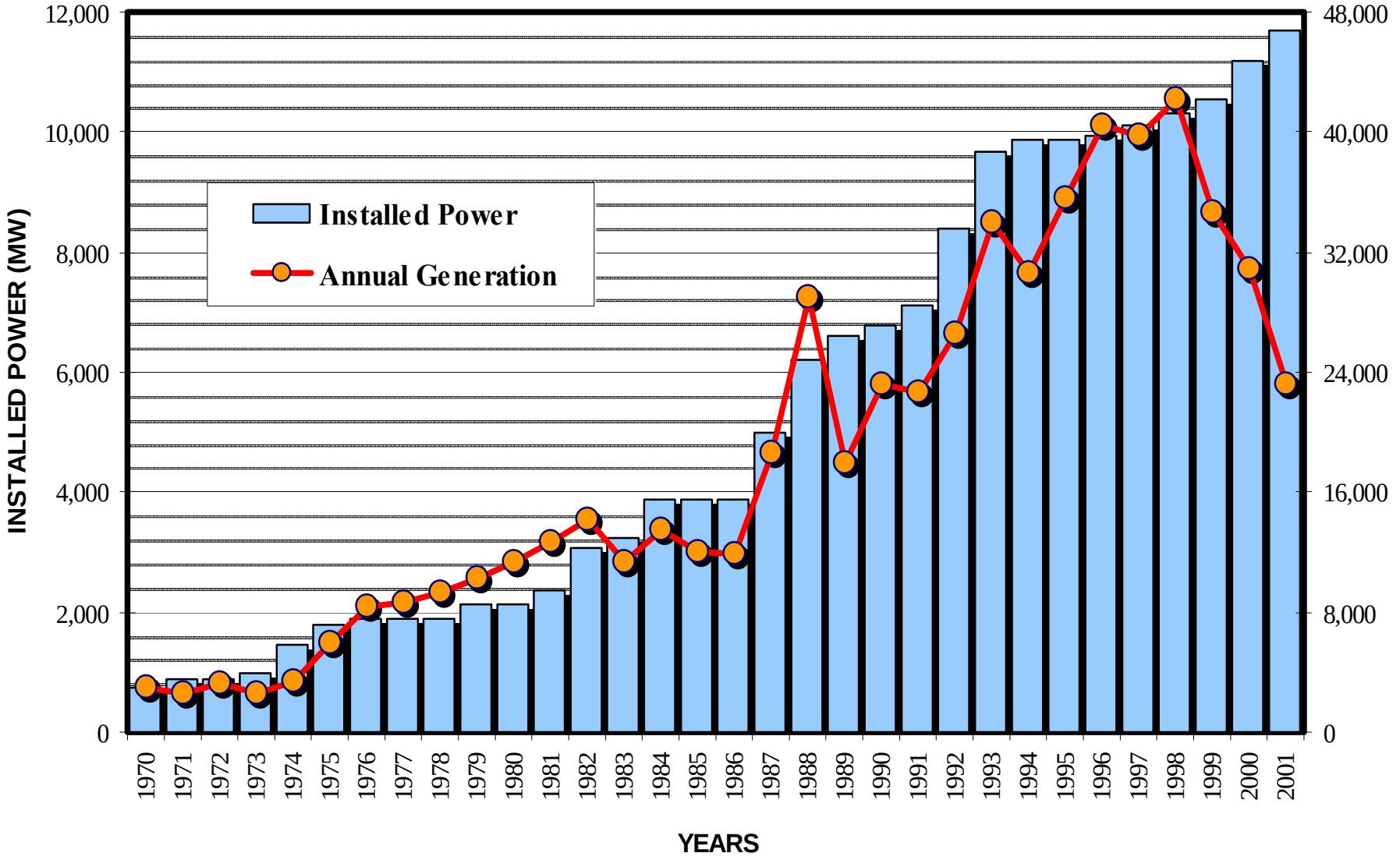
2 - Secondary Energy Benefit :

4.75 (4.75) cent / kWh

HYDROPOWER POTENTIALS of RIVER BASINS

Basin	Hydro Power Potential calculated by DSİ			Estimates acc. to New Criteria	
	Gross Gen. Pot. (GWh)	Econ. Feasb. Pot. (GWh)	Installed Power (MW)	Econ. Feasb. Pot. (GWh)	Installed Power (MW)
Fırat (Euphrates)	84 122	37 961	9 648	46 267	12 176
Dicle (Tigris)	48 706	16 751	5 051	24 353	7 610
Eastern Black Sea	48 478	11 062	3 037	24 239	6 925
Eastern Medit.	27 445	5 029	1 390	10 978	3 137
Antalya	23 079	5 163	1 433	9 232	2 638
Western Blck.Sea	17 914	2 176	624	7 166	2 108
Western Medit.	13 595	2 534	674	5 438	1 511
Seyhan	20 875	7 571	2 001	9 394	2 609
Ceyhan	22 163	4 652	1 413	8 865	2 860
Kızılırmak	19 552	6 320	2 094	7 821	2 697
Sakarya	11 335	2 373	1 096	3 967	1 984
Çoruh	22 601	10 540	3 134	12 431	3 825
Yeşilırmak	18 685	5 297	1 259	8 408	2 213
Susurluk	10 573	1 602	507	2 643	881
Aras	13 114	2 287	588	5 246	1 418
Others (total)	30 749	1 722	510	1 722	510
Total	432 981	123 040	34 459	188 169	55 099

INSTALLED HYDRO POWER and ANNUAL ELECTRICITY GENERATION in TURKEY



HYDROPOWER in TURKEY

- **Installed Power in Year 1993 : 9,682 MW**
- **Installed Power in Year 2001 : 11,643 MW**

In this rate of progress, it will take 100 years to develop the full capacity as calculated by DSI, and 175 years for the capacity estimated by the author.

According to TEAŞ Data and Generation Planning Study:

	in 1997	in 2010	in 2020
Hydropower Generation	% 38.5	% 24.6	% 16.6
Gen. by Imported Fuel	% 28.3	% 51	% 65
Green Electricity in EU	% 13.9	% 22.0	

WHY MUST HYDROELECTRIC POWER PLANTS BE SUPPORTED AND PROMOTED ?

1- ECONOMICAL REASONS:

- Local Expenditures Form the Major Portion of the Investment
- Minimum Foreign Dependency and Foreign Exchange in the Investment
- Longest Economical Life
- Lowest Operation Cost, No Fuel Cost
- Cheap and Competitive Electricity Gen.
- Flexibility in Operation, Vital Function for Load Compensation and Frequency Regulation in the Transmission System
- Export of Green Electricity

2- ENVIRONMENTAL :

- Lowest Emission, Lowest Pollution
- Prevention of Erosion (in Rivers)
- Support of Other Green (Renewable) Energy Sources

3- SOCIAL and STRATEGIC:

- Energy Storage
- Decreasing Foreign Dependency in Energy
- Social and Economical Benefits to Local Population
- Other Strategic Benefits

If Turkey Generates 190 TWh/Year (Hydro Power Capacity) in Thermal Plants :

Fuel Cost will be 4.5-5.0 Billion $/Year for either 86 Million Tons of Imported Coal or 41 Billion Cubic Meters of Natural Gas Needed to Generate the Same Electricity.

Total GHG Emissions to Atmosphere will be 257 Million Tons/Year.

EU DIRECTIVE 2001/77/EC

Justification:

- Promotion of RES is EU Priority
- The Potential is Underused
- Constitutes an Important Part of Compliance to Kyoto Protocol
- EU Member States Must Set National Indicative Targets Consistent with EU commitment to Kyoto Protocol
- Security and Diversification of Energy Supply, of Environmental Protection and of Social and Economic Cohesion

Purpose :

- To Promote Renewable Energy Sources in Electricity Production and to Create a Basis for a Future Community Framework Thereof.

Definitions :

- Wind, Solar, Geothermal, Wave, Tidal, Hydropower, Biomass, Landfill Gas, Sewage Treatment Plant Gas, and Biogasses Are Defined as Renewable Energy Sources.

Promotion Measures :

- Member States Will Determine How Effective the Direct and Indirect Support Measures Were (Green Certificates, Investment Grant, Tax Exemption or Reduction, Tax Refund and Direct Price Support) and Their Contribution to Achieving National Indicative Targets.
- The Promotions Must Be Effective, Simple and Efficient
- Reduce Regulatory and Non-Regulatory Barriers to Electricity Production from Renewable Energy Sources.

EU DIRECTIVE 2001/77/EC

Promotion Measures :

- **Streamline and Expedite Procedures at the Appropriate Administrative Level.**
- **Rules Must Be Objective, Transparent and Non-discriminatory, and Take Fully Into Account the Peculiarities of the Various RES Technologies.**
- **Transmission and Distribution of Green Electricity Must Be Guaranteed, and It Shall Be Given Access Priority.**
- **System Operators Shall Make Necessary Investments**
- **Transmission and Distribution Fees Shall not Discriminate Against Green Electricity, in Particular Electricity Produced in Peripheral Regions.**

The Directive Came Into Force on :

27 October 2001

The Member States Shall Bring Into Force the Laws, Regulations and Administrative Provisions to Comply With This Directive Not Later Than 27 October 2003.

EU Total of Additional Electricity to Be Produced (and/or Imported) From Renewable Energy Sources in 2010 Will Be About 200 TWh/Year.

NATIONAL INDICATIVE TARGETS OF EU COUNTRIES FOR THE SHARE OF ELECTRICITY PRODUCED FROM RES IN 2010

	Electricity Produced from Renewable Energy Sources		
Country	TWh in 1997	% in 1997	Target % in 2010
Austria	39.05	70.0 %	78.1 %
Sweden	72.03	49.1 %	60.0 %
Portugal	14.30	38.5 %	39.0 %
Finland	19.03	24.7 %	31.5 %
Spain	37.15	19.9 %	29.4 %
Denmark	3.21	8.7 %	29.0 %
Italy	46.46	16.0 %	25.0 %
France	66.00	15.0 %	21.0 %
Greece	3.94	8.6 %	20.1 %
Ireland	0.84	3.6 %	13.2 %
Germany	24.91	4.5 %	12.5 %
United Kingdom	7.04	1.7 %	10.0 %
Holland	3.45	3.5 %	9.0 %
Belgium	0.86	1.1 %	6.0 %
Luxembourg	0.14	2.1 %	5.7 %
Community Total	338.41	13.9 %	22.0 %
Hydroelectr. in Turkey	39.82	38.5 %	24.6 %

EXAMPLES OF GREEN ELECTRICITY PROMOTIONS IN MEMBER STATES OF EUROPEAN COMMUNITY

- **"Act on Granting Priority to Renewable Energy Sources" Enacted in Germany in 2000, Defines Minimum Prices To Be Paid to Green Energy :**

Type	Ins.Pwr.<500 kW	Ins.Pwr.<5 MW	Bigger
Hydropower	15.0 pf/kWh	13.0 pf/kWh	-----
Biomass	20.0 pf/kWh	18.0 pf/kWh	17.0 pf/kWh
Wind	First Five Years 17.8 pf/kWh (Will Decrease in Time)		
Solar	99.0 pf/kWh (Will Decrease in Time)		
Geothermal	17.5 pf/kWh (<20 MW)	14.0 pf/kWh (>20 MW)	

All Connection Expenses Will Be Paid By the System Operator.

- **Promotions for Wind and Small Hydro (<1.5 MW) in Sweden :**

  Supply Side : 1.54 cent/kWh Subsidy and 15% Investment Grant

  Demand Side : Wind Energy Consumers Enjoy 2.77 cent/kWh Envr.Discount

- **Green Energy is Exempted From The Tax Implemented on Electricity Consumed in The Netherlands. Implementation of "Green Energy Quota" Will Start Soon in Denmark, Sweden and Some Other EU Countries.**

CONNECTION TO EUROPE AND GREEN ELECTRICITY EQUILIBRIUM

- **Existing Bulgarian Connection :** **1,250 MW (400kV)**
- **Planned Greece Connection :** **750 MW**

Around 10-15 TWh Electricity Can Be Exported Each Year.

SHORTAGE OF GREEN ELECTRICITY IN EU COUNTRIES IN 2010 :

200 TWh/Year (300 TWh/Year in 2020)

TURKEY'S NOT YET DEVELOPED HYDROELECTRIC (GREEN) CAPACITY :

150 TWh/Year

(Economical Value At Least 9 Billion $)

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CONCLUSION and PROPOSALS

- **Developing The Hydropower Potential Fully Must Be The First Priority of Turkey's Electricity Generation Policies.**
- **Hydroelectricity Must Have Priority in Connection, Transmission and Distribution System. (*)**
- **Licence Fees Must Be Relatively Lower For Hydroelectric Power Plants. (*)**
- **Licence Periods Must Be At Least 49 Years. (*)**
- **Hydropower Generation Must Be Subsidised During The Payback Period of Financing (First 8-10 Years), and The Fund for This Subsidy Can Be Created By Implementing a Surcharge of 1.5-2.0 cent/kWh on Thermal Generation.**
- **Other Promotion Measures (Investment Grant, VAT Exemption, Tax Relief, etc.) Must Be Implemented in Compliance With EU Directive 2001/77/EC.**
- **Excess Supply in Hydropower and Green Electricity Export (Especially in Peak Hours) to EU Must Be Targeted.**
- **For Exporting Green Electricity to Europe, Transmission and Distribution System Must Be Brought to EU Standards and Capacity and Quality of Connection to Europe Must Be Improved.**

(*) "The Licence Directive" Published by EMRA in Sept.2002 Provides Some Support Measures For Green (Renewable) Energy Sources.

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CONCLUSION and PROPOSALS

FINALLY, MORE IMPORTANT THAN ALL THE PROPOSALS ABOVE ARE THE FACTS BELOW ;

THERE ARE MANY ECONOMICALLY FEASIBLE HYDROELECTRIC POWER PLANTS IN TURKEY, WHICH CAN BE DEVELOPED WITHOUT ANY PROMOTION OR SUPPORT.

THE ONLY THING NEEDED IS TO REMOVE ALL REGULATORY AND BUREAUCRATIC HURDLES AND TO EARN THE CONFIDENCE OF PRIVATE INVESTORS OF HYDROPOWER PROJECTS.