SEERMAP

South-East Europe Electricity Roadmap

Greek Grid Essentials

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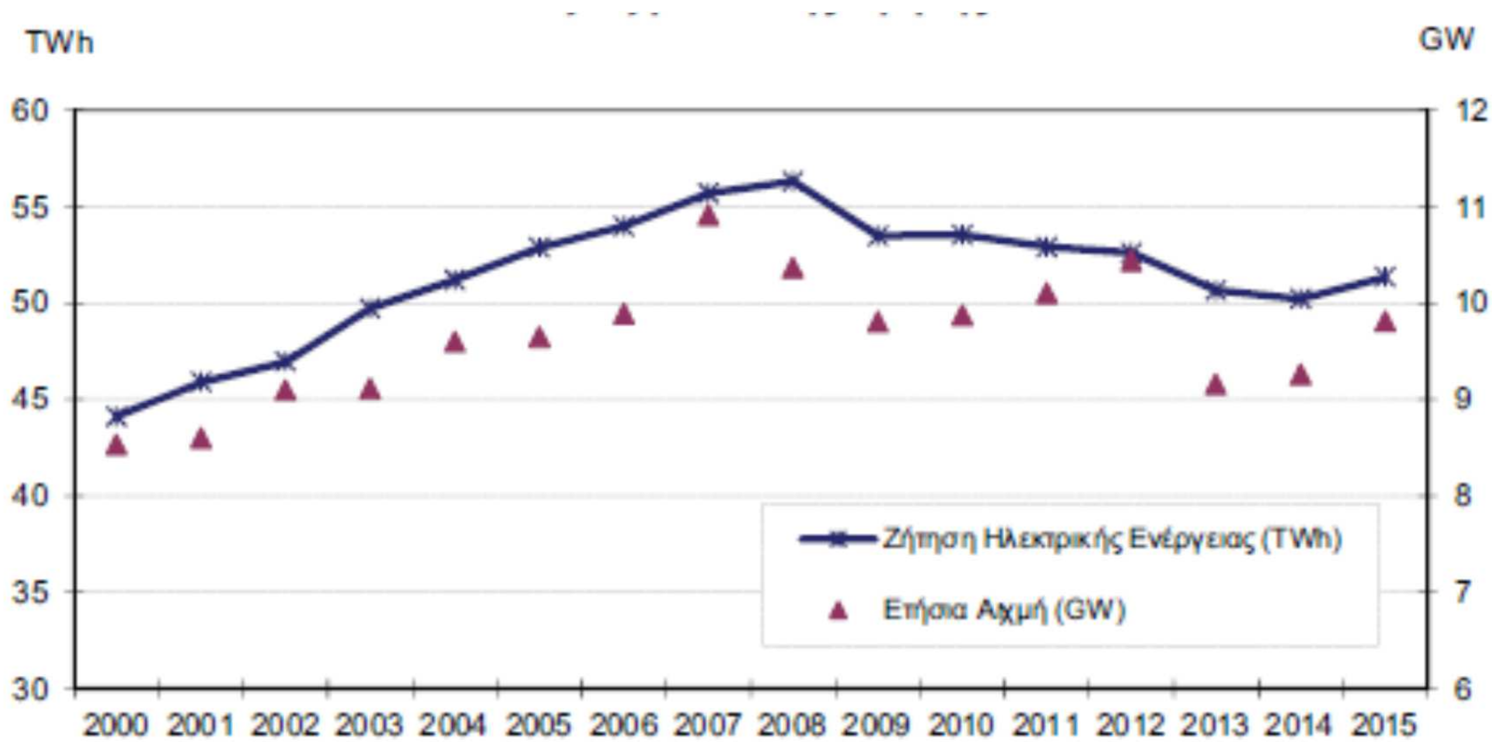
face3ts S.A.

Athens 6-8 March 2017

Annual Mean and Peak National Electricity Demand



Total and RES Production

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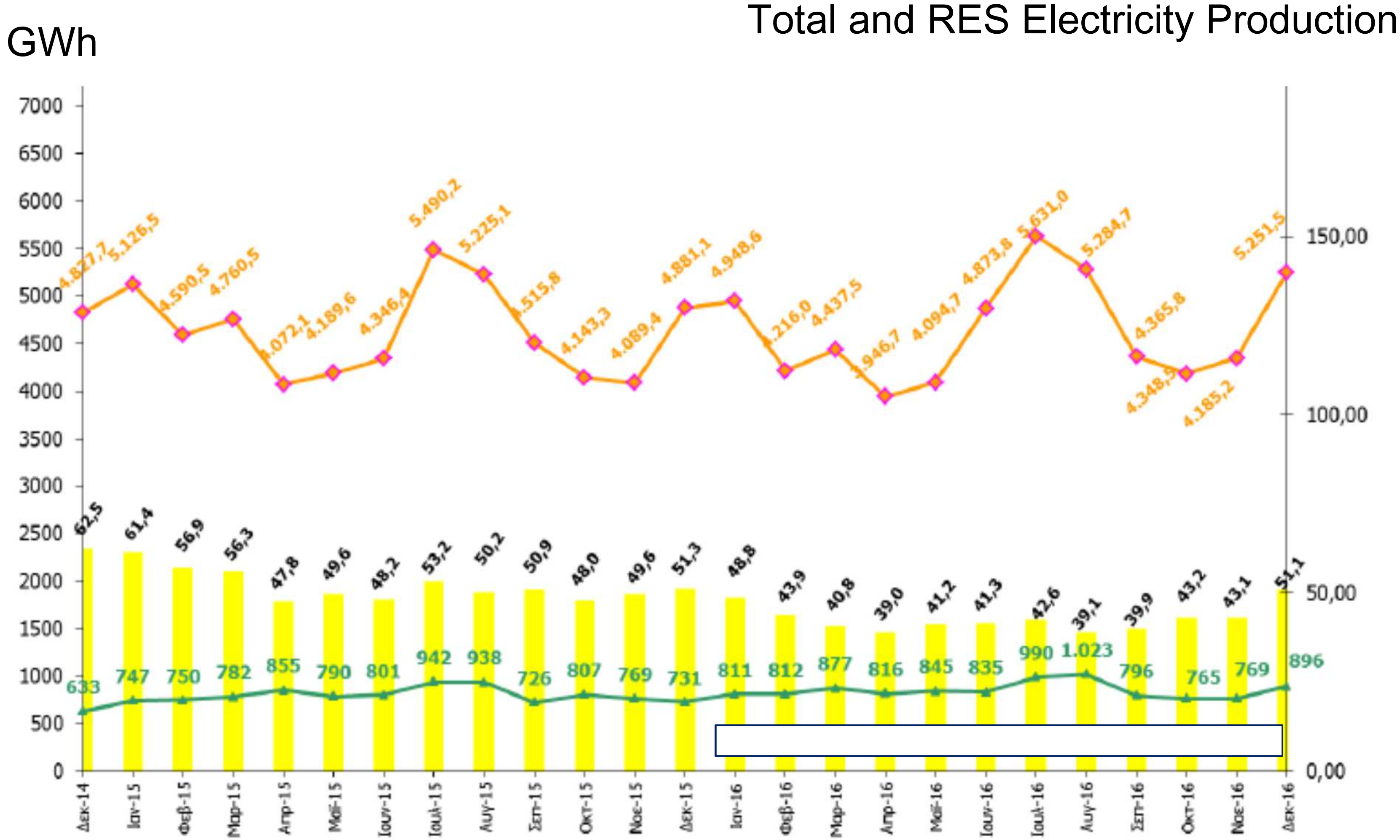

2015 29%
(16147/51156)

Monthly Peak Demand

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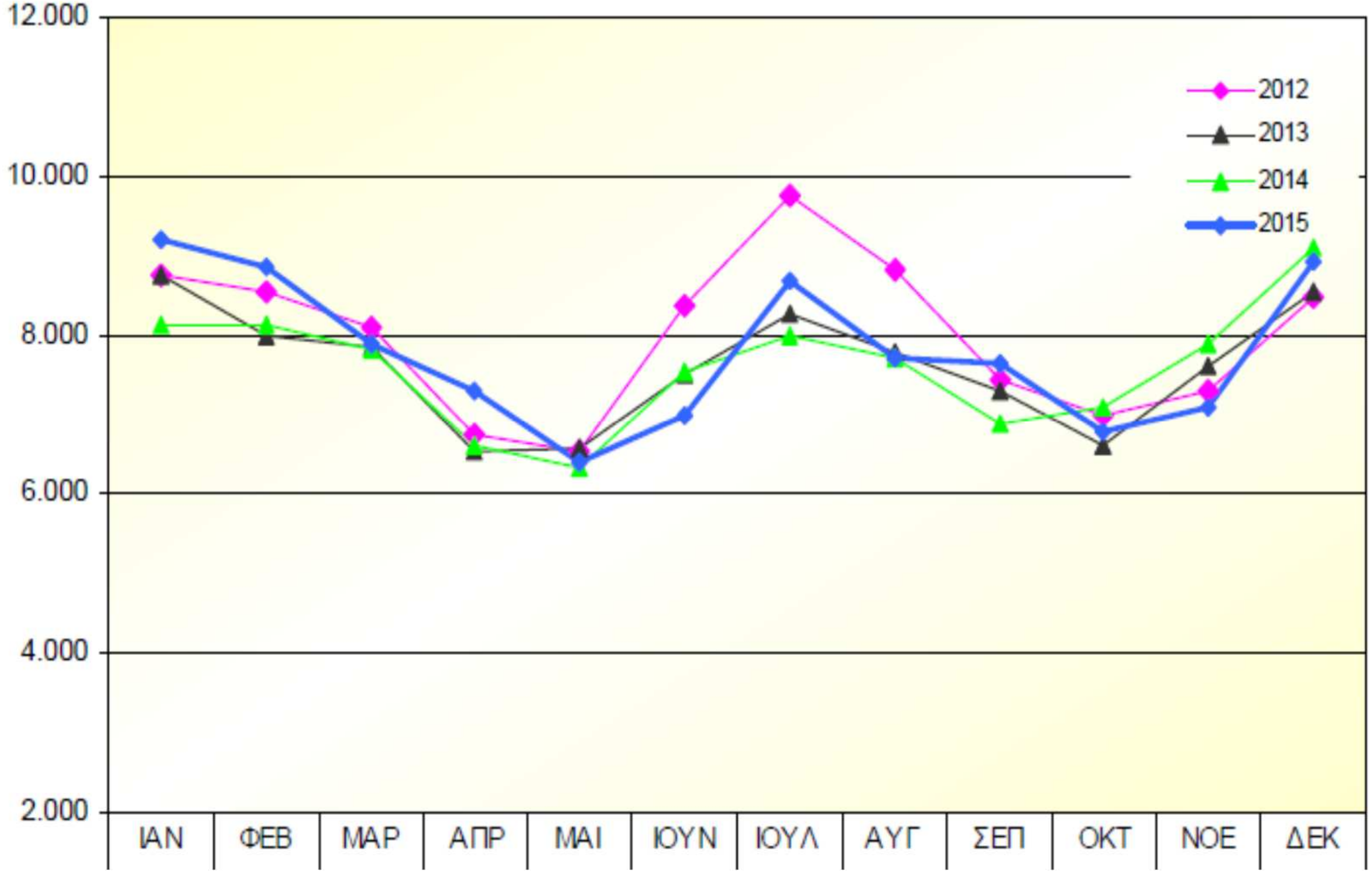

National Electricity Demand

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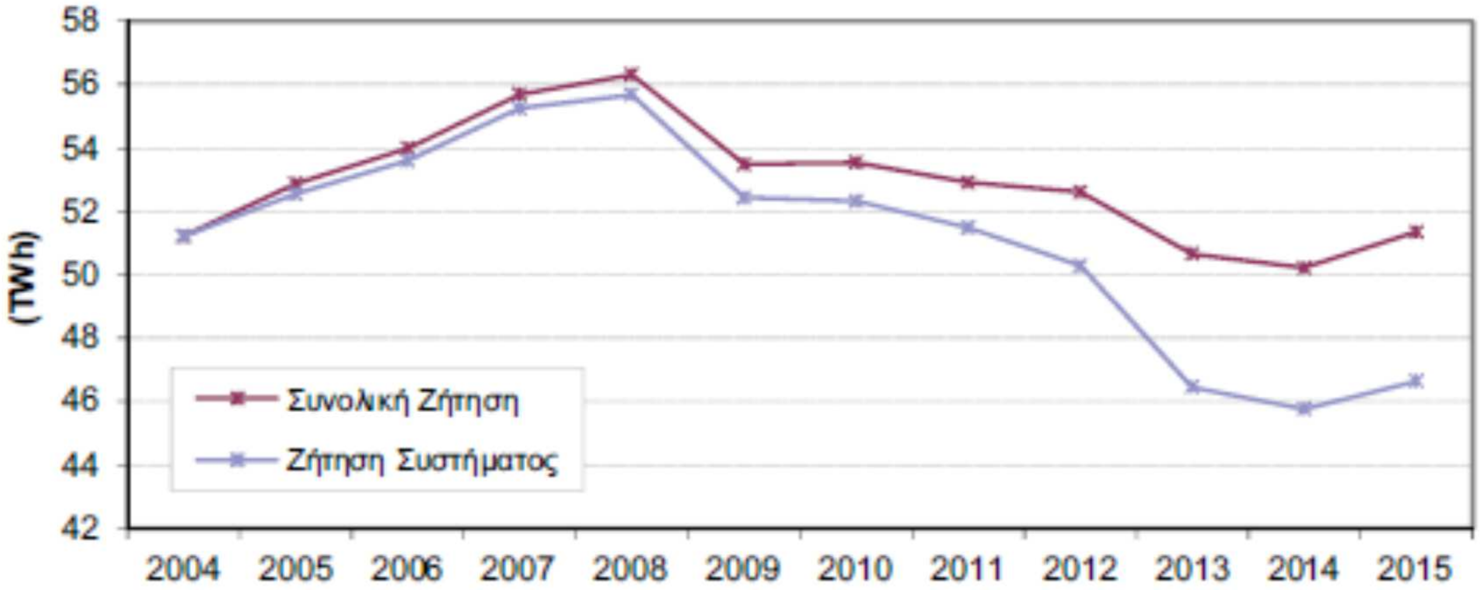

Total demand
System demand

The Greek Grid

National Grid Parameters

kV	Kind of lines	Total lenths (km)
66	Εναέριες	39
	Υποβρύχιες	15
150	Εναέριες	8157
	Υπόγειες	161
	Υποβρύχιες	208
400	Εναέριες	2647
	Υπόγειες	31
	Εναέριες Σ.Ρ.	107
	Υποβρύχιες Σ.Ρ.	160[6]

Balkan 400kV interconnectors

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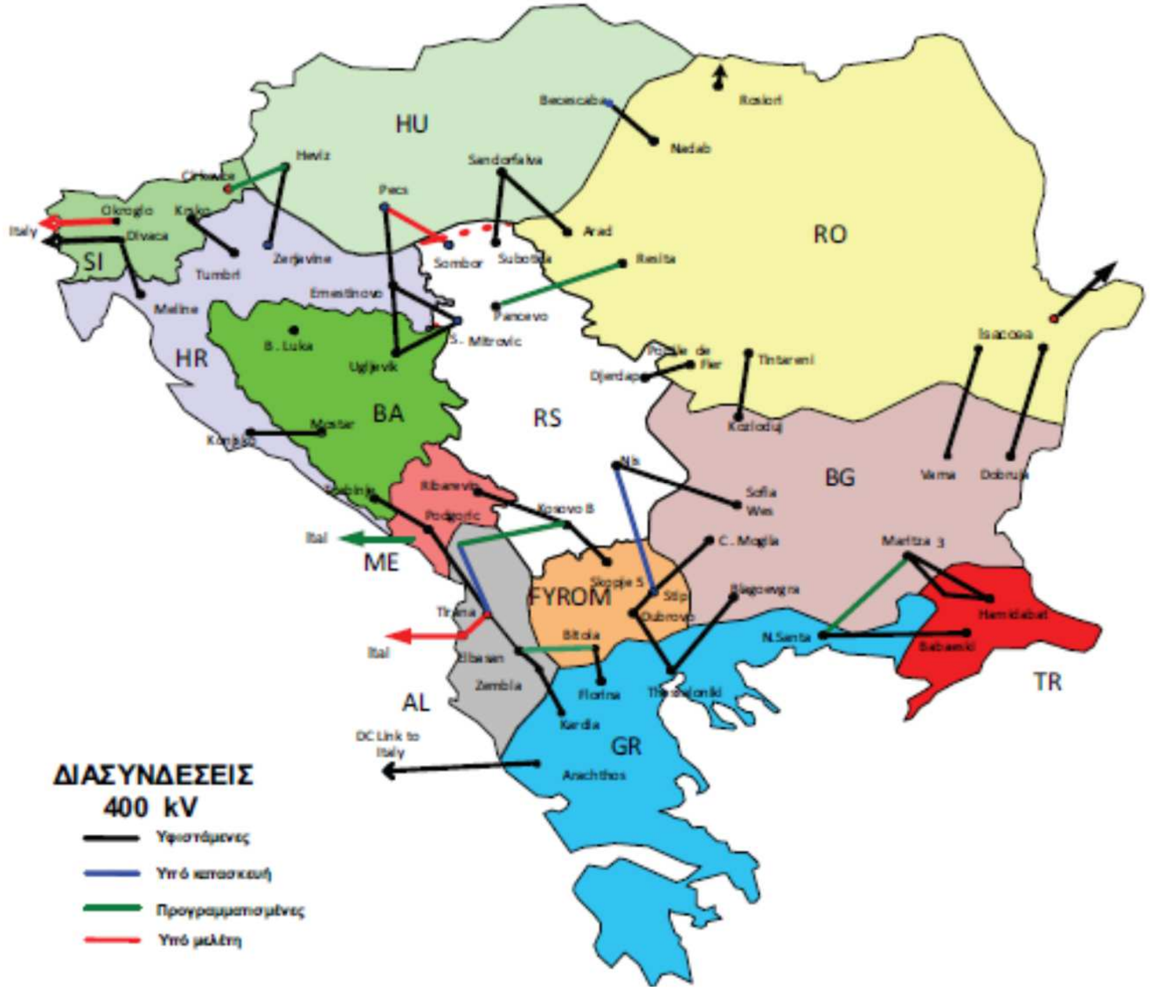

Greek Interconnections

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Interconnector	Line Length (km)	kV	Thermal limit
ΚΥΤ ΚΑΡΔΙΑΣ – ZEMBLAK (Αλβανία)	75(GR) + 69 (AL)	400	1100-1400MVA
ΚΥΤ ΜΕΛΙΤΗΣ – BITOLA (ΠΓΔΜ)	18(GR) + 18 (FYR)	400	1100-1400MVA
ΚΥΤ ΘΕΣΣ/ΝΙΚΗΣ-DUBROVO (ΠΓΔΜ)	61(GR) + 54(FYR)	400	1100-1400MVA
ΚΥΤ ΘΕΣΣ/ΝΙΚΗΣ-BLAGOEVGRAD (Βουλγαρία)	103(GR) + 80(BG)	400	1100-1400MVA
ΚΥΤ Ν. ΣΑΝΤΑΣ-BABAESKI (Τουρκία)	69(GR) + 60(TR)	400	1600-2000MVA
ΜΟΥΡΤΟΣ-BISTRICA (Αλβανία)	17(GR) + 30(AL)	150	120-140 MVA
ΚΥΤ ΑΡΑΧΘΟΥ-ΙΤΑΛΙΑ (Ιταλία)	107OHL(GR) + 160SUBC + 4UGC(IT) + 45OHL (IT)	400(dc)	500MW

Interconnector Availability 2015

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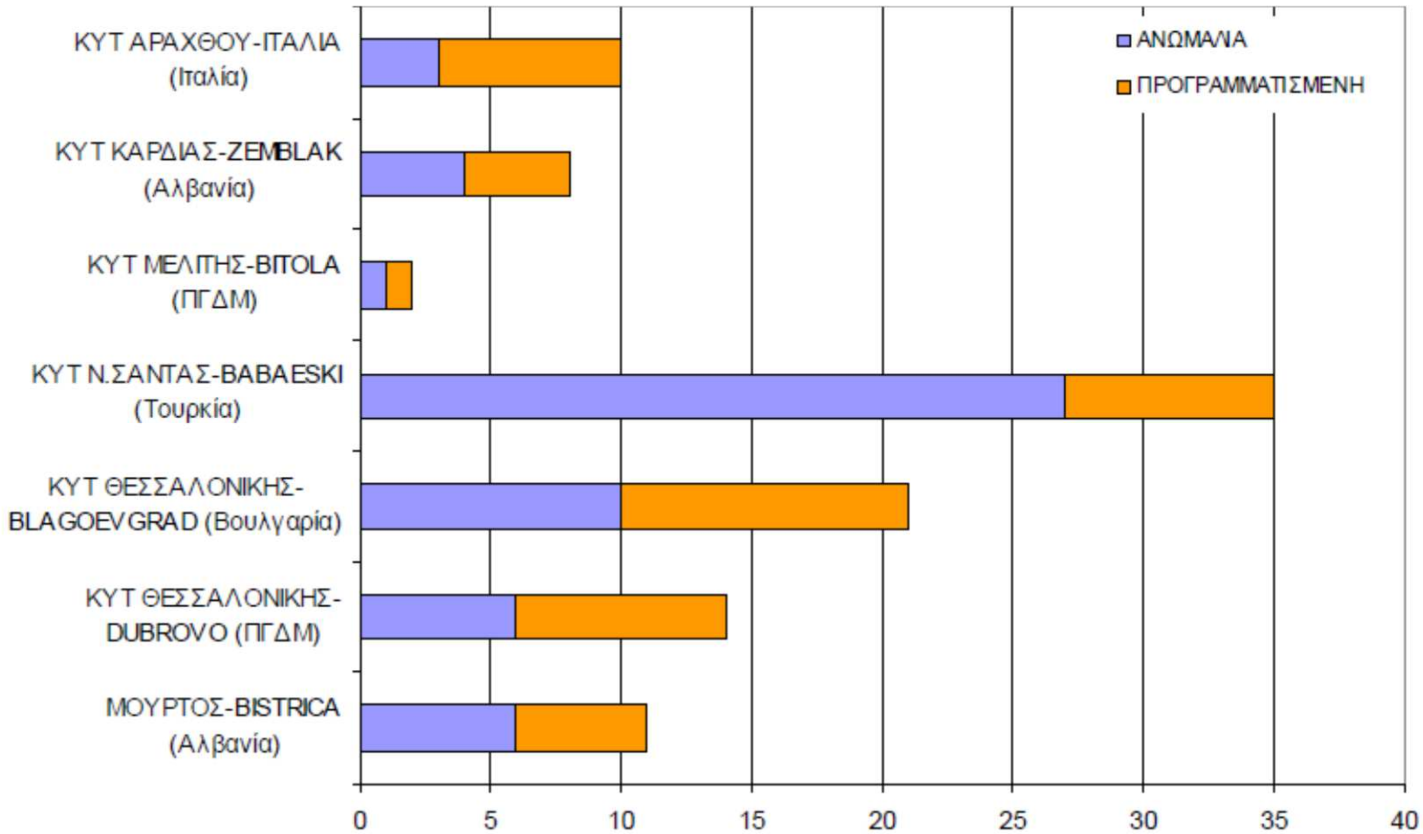
ΚΥΤ ΑΡΑΧΘΟΥ-ΙΤΑΛΙΑ (Ιταλία):	72,91% *(45,99% το 2014)*
ΚΥΤ ΚΑΡΔΙΑΣ-ZEMBLAK (Αλβανία):	99,05% *(99,80% το 2014)*
ΚΥΤ ΜΕΛΙΤΗΣ-BITOLA (ΠΓΔΜ):	98,84% *(98,20% το 2014)*
ΚΥΤ Ν ΣΑΝΤΑΣ-BABAESKI (Τουρκία):	96,96% *(98,63% το 2014)*
ΚΥΤ ΘΕΣΣΑΛΟΝΙΚΗΣ-BLAGOEVGRAD (Βουλγαρία):	98,54% *(98,75% το 2014)*
ΚΥΤ ΘΕΣΣΑΛΟΝΙΚΗΣ-DUBROVO (ΠΓΔΜ):	99,34% *(99,24% το 2014)*
ΜΟΥΡΤΟΣ-BISTRICA (Αλβανία):	99,27% *(99,47% το 2014)*

Interconnector Service Disconnects 2015



Typical Net Flows and Long Term Nominations

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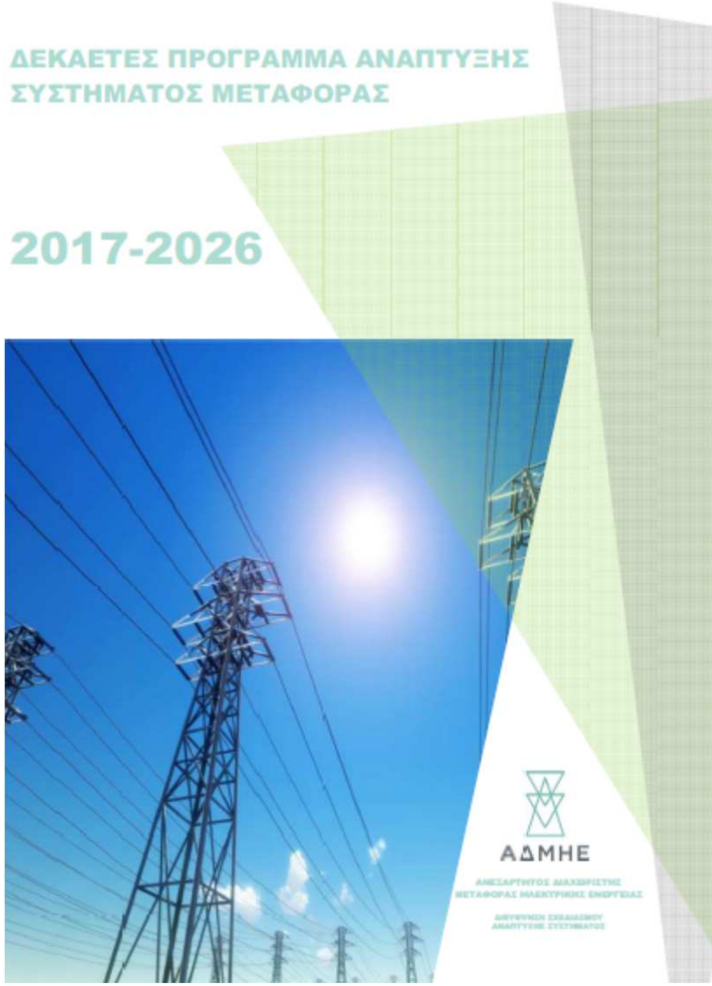
Interconnections NET Flows: SCADA Real-Time and Scheduling Figures Comparison for Κυριακή, Φεβρουάριος 26, 2017

		01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
ALBANIA	**Scheduled NET (MWh)**	-195	-240	-246	-245	-246	-246	-246	-246	-250	-250	-250	-250	-247	-247	-250	-250	-250	-250	-250	-247	-250	-247	-247	-247	
	Real Time NET (MWh)																									
FYROM	**Scheduled NET (MWh)**	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-336	-335	-335	-350	-350	-350	
	Real Time NET (MWh)																									
BULGARIA	**Scheduled NET (MWh)**	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	-350	
	Real Time NET (MWh)																									
TURKEY	**Scheduled NET (MWh)**	-50	-50	-50	-50	-50	-50	-50	-50	-40	-50	-50	-43	-43	-46	-47	-47	-50	-50	-50	-50	-50	-50	-50	-40	
	Real Time NET (MWh)																									
ITALY	**Scheduled NET (MWh)**	137	127	-35.63	7	126.35	121.34	96.132	23.736	-271	-306	-368	-425	-435	-414	-420	-424	-349	-283	-116	390	455	199.49	70.254	36	
	Real Time NET (MWh)																									
TOTAL	**Scheduled NET (MWh)**	-808	-863	-1032	-988	-869.6	-874.7	-899.9	-972.3	-1261	-1306	-1368	-1418	-1425	-1407	-1417	-1421	-1349	-1283	-1102	-592	-530	-797.5	-926.7	-951	
	Real Time NET (MWh)																									

NOMINATIONS OF LONG TERM PTRS PER INTERCONNECTION: 08/03/2017

	Data Area	CET Hour	Hr01	Hr02	Hr03	Hr04	Hr05	Hr06	Hr07	Hr08	Hr09	Hr10	Hr11	Hr12	Hr13	Hr14	Hr15	Hr16	Hr17	Hr18	Hr19	Hr20	Hr21	Hr22	Hr23	Hr24	Hr25
IMPORTS	**Nominations of Long-Term PTRs**	ALBANIA	75	75	75	75	75	75	90	85	85	85	85	85	85	85	90	90	90	85	85	85	90	80	75	75	0
		FYROM	191	191	191	191	191	191	193	153	148	148	161	161	161	181	181	181	181	168	148	148	196	206	206	206	0
		BULGARIA	404	404	404	404	404	397	387	367	367	367	372	377	382	382	382	382	382	379	379	389	389	404	404	404	0
		ITALY	0	0	0	0	0	0	0	0	0	0	130	130	130	130	130	130	0	0	0	0	0	0	0	0	0
		TURKEY	25	25	25	25	0	15	15	0	0	0	10	0	0	5	5	25	25	25	25	25	25	25	25	25	0
		Sum	**695**	**695**	**695**	**695**	**670**	**678**	**685**	**605**	**600**	**600**	**758**	**753**	**758**	**783**	**788**	**808**	**678**	**657**	**637**	**647**	**700**	**715**	**710**	**710**	**0**
EXPORTS	**Nominations of Long-Term PTRs**	ALBANIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FYROM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		BULGARIA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		ITALY	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		TURKEY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Sum	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
NET	**Nominations of Long-Term PTRs**	ALBANIA	-75	-75	-75	-75	-75	-75	-90	-85	-85	-85	-85	-85	-85	-85	-90	-90	-90	-85	-85	-85	-90	-80	-75	-75	0
		FYROM	-191	-191	-191	-191	-191	-191	-193	-153	-148	-148	-161	-161	-161	-181	-181	-181	-181	-168	-148	-148	-196	-206	-206	-206	0
		BULGARIA	-404	-404	-404	-404	-404	-397	-387	-367	-367	-367	-372	-377	-382	-382	-382	-382	-382	-379	-379	-389	-389	-404	-404	-404	0
		ITALY	5	0	0	0	0	0	0	0	0	0	-130	-130	-130	-130	-130	-130	0	0	0	0	0	0	0	0	0
		TURKEY	-25	-25	-25	-25	0	-15	-15	0	0	0	-10	0	0	-5	-5	-25	-25	-25	-25	-25	-25	-25	-25	-25	0
		Sum	-690	-695	-695	-695	-670	-678	-685	-605	-600	-600	-758	-753	-758	-783	-788	-808	-678	-657	-637	-647	-700	-715	-710	-710	0

TSO 19Yr Plan 2017-2026



Approved
16 Aug 2016
Budget 1808M€
(vs 980M€ net worth !!)

TSO Electricity Demand Projections

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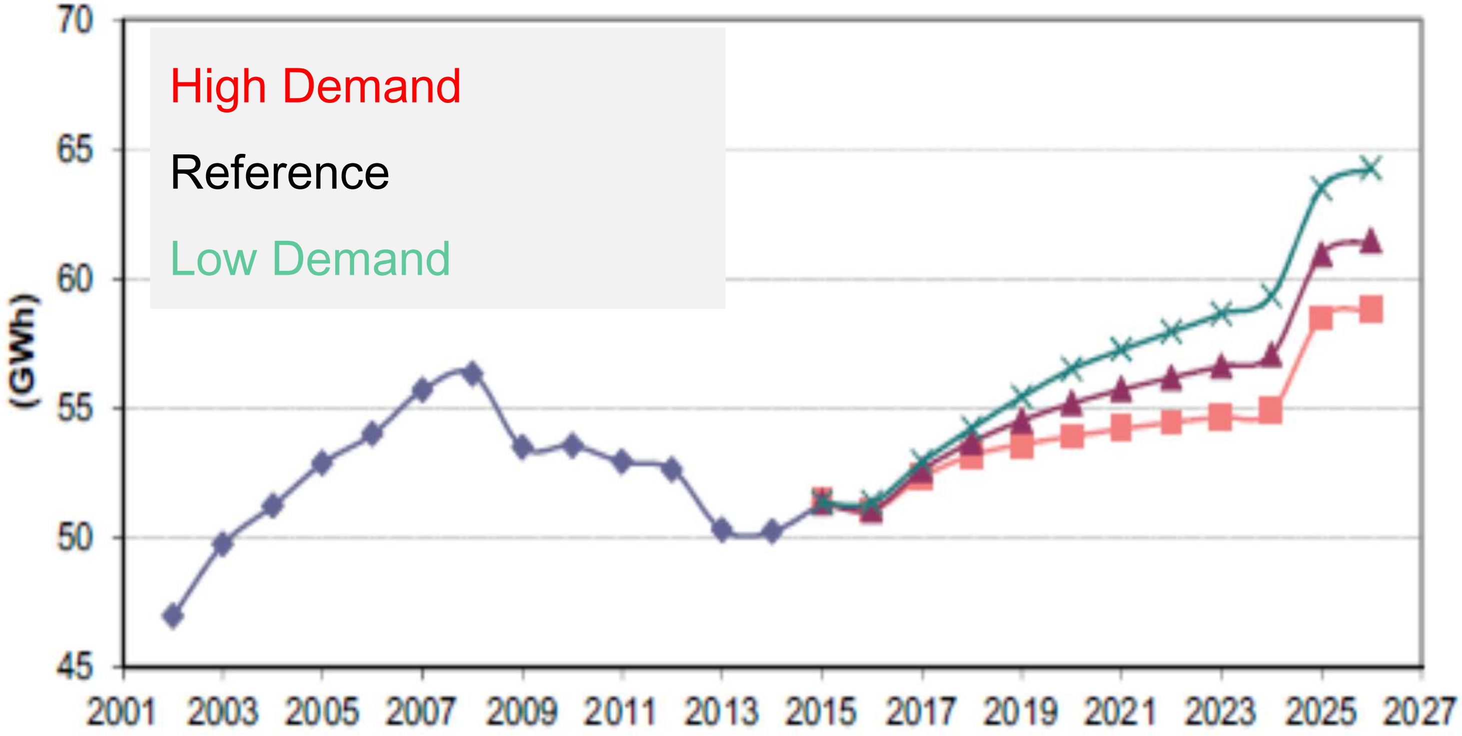

TSO capacity requirement projections

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2016
9278MW thermal
(4028 Lignite)
3018MW Hydro
(696 pumped)
4595MW RES

	Low	Reference	High
Έτος	(MW)		
2017	9875	9930	9985
2018	10030	10130	10230
2019	10110	10285	10460
2020	10170	10410	10660
2021	10230	10515	10800
2022	10270	10600	10935
2023	10310	10680	11070
2024	10355	10770	11200
2025	11040	11500	11980
2026	11090	11600	12120

Basic Priorities of the TSO 10Yr Plan

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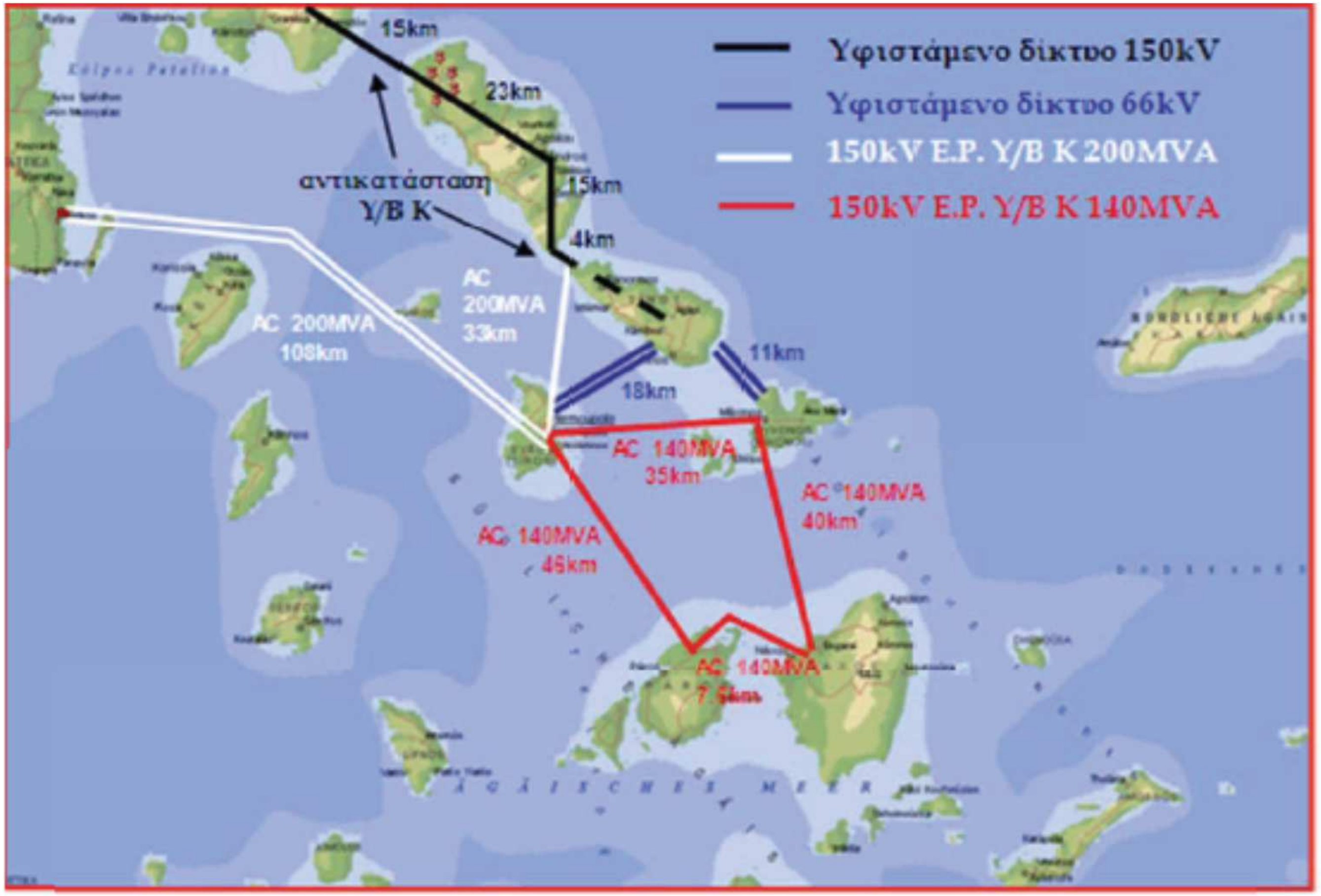
South-East Europe Electricity Roadmap

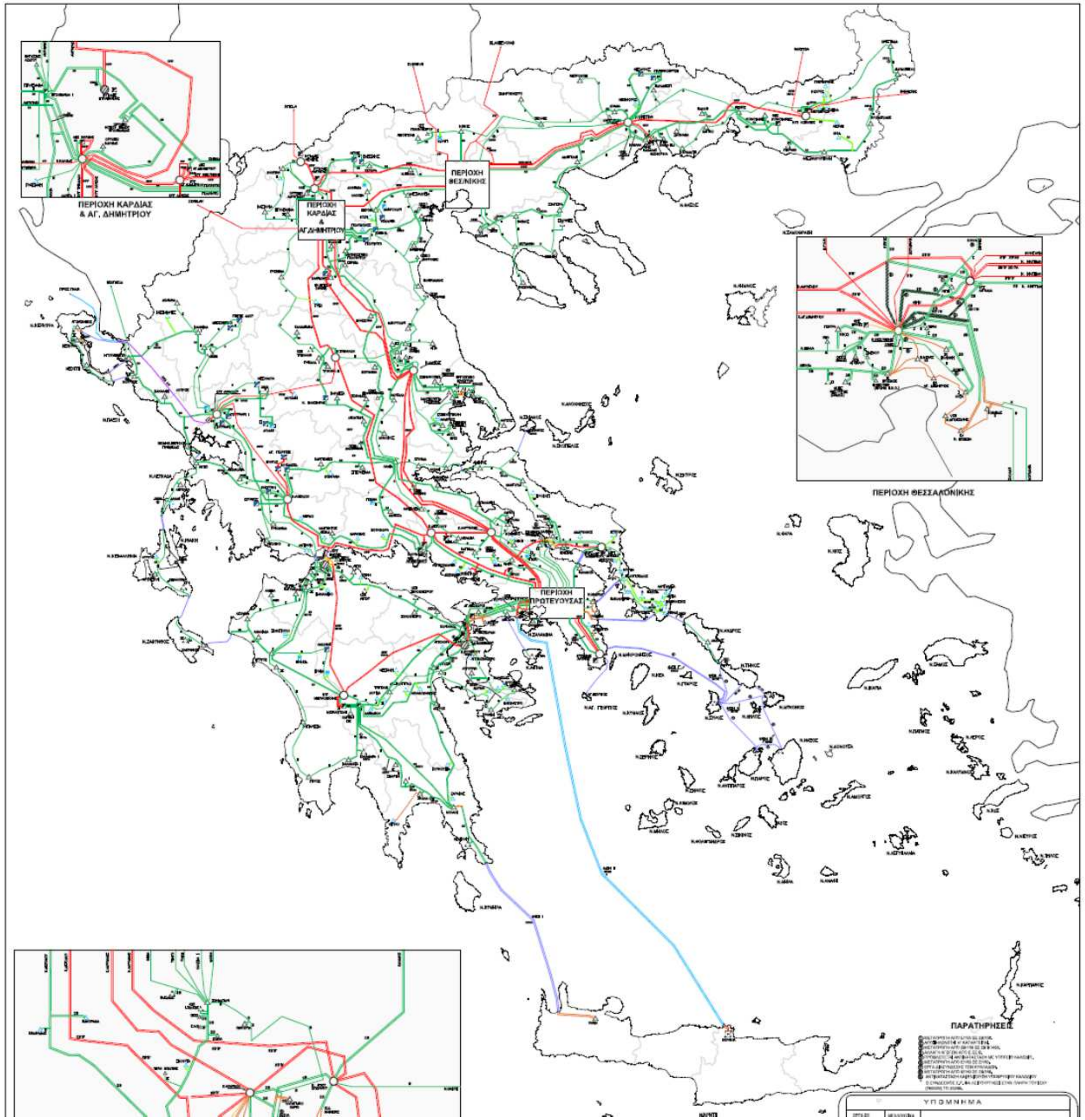
- Connecting the Cycladic islands to the Mainland Grid
- Connecting Crete to the Mainland Grid
- Extending the 400kV lines in Peloponnese
- Expanding and enhancing the Grid capabilities to enable RES development including pumped storage

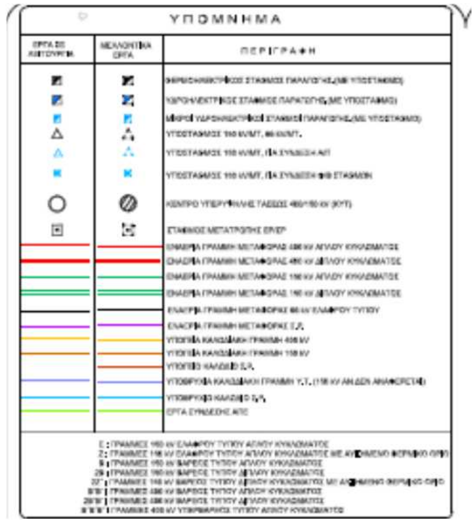
Cyclades Islands Planned Connections



Budget 170M€

Crete connection





Basic Priorities of the TSO 10Yr Plan

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South-East Europe Electricity Roadmap

Interconnector planning

- The Nea Santa-Babaeski connector started operating on April 2015
- The Nea Santa- Maritsa East 400MW interconnector is well advanced in its planning (the border crossing has been agreed). The Greek side length is about 30km. It is a PCI and is included in the TYNDP of ENTSO-E. The Filippoi-Nea Santa line is now doupled.
- The Israel-Cyprus-Crete-Mainland 2000MW interconnector has been given PCI status (310+880+310km)

Thank you for your attention

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further action on climate, environment, energy, economy, technology & sustainability