



## The Italian Multi-Regional Electricity Sector

Evasio Lavagno, Maurizio Gargiulo, Rocco De Miglio  
Dipartimento di Energetica, Politecnico di Torino  
Corso Duca degli Abruzzi 24, 10129 Torino, Italia

Kyoto - July 4<sup>th</sup>, 2005



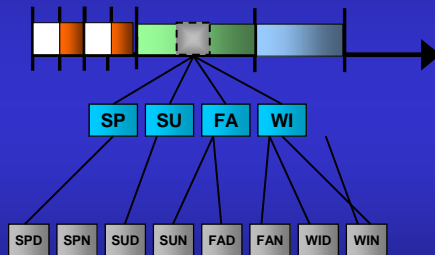
The TIMES model for the Italian Electricity Sector has been developed by the ETSAP team at the Energy Department of Politecnico di Torino in the framework of a national Research Programme, promoted by CESI with the aim of analysing the behaviour of the electricity sector (production, transport & distribution and demand) under different scenario options.

The model is **multi regional** (20 regions) and **multi grid** (4 technologies)

The Italian Association of Energy Economists (AIEE) is cooperating to the Research Programme for the production of mid- and long-term scenarios.



← Model horizon →



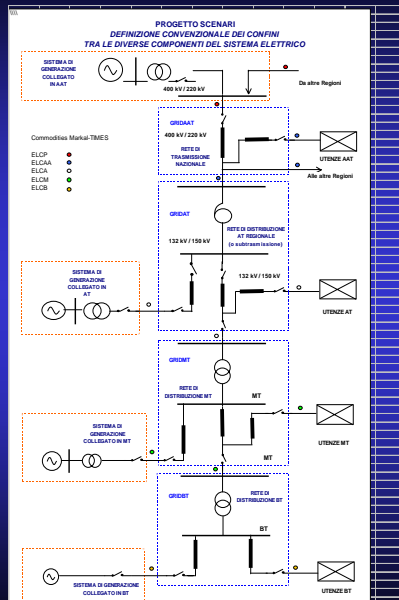
- Variable period length
- Two level TimeSlice

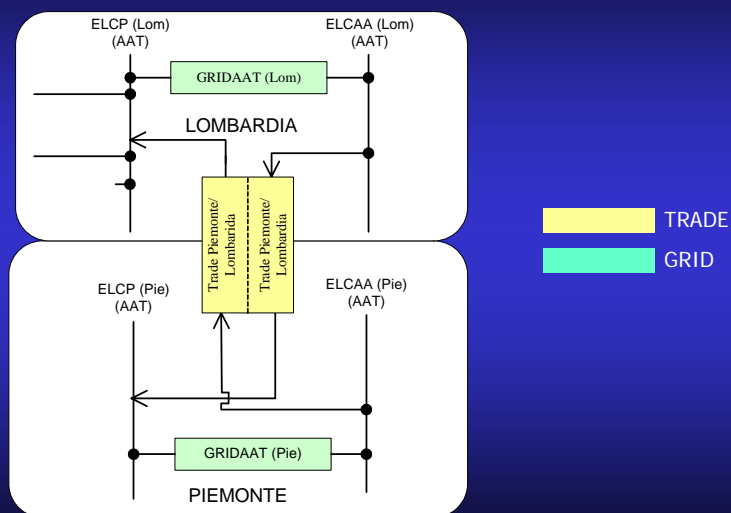
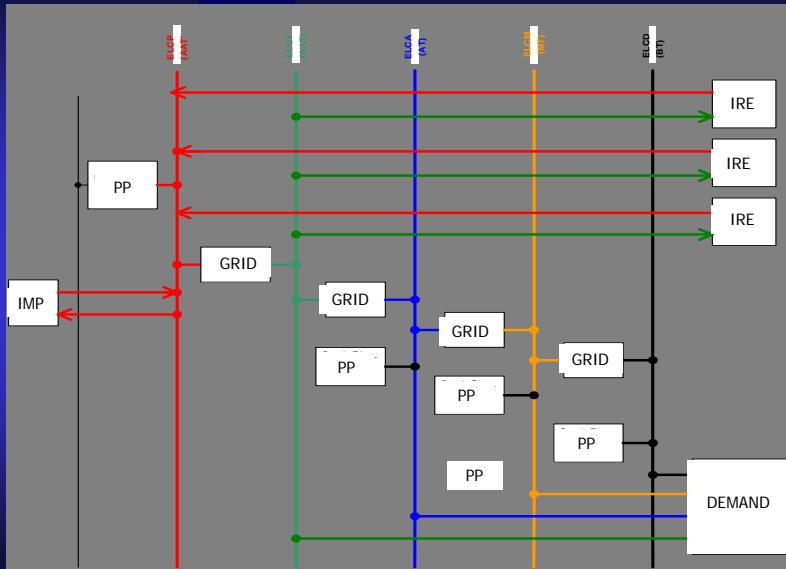
Seasons

D/N



- 5 voltage levels
  - AAT produced & imported
  - AAT national grid
  - AT
  - MT
  - BT distribution
- 5 electricity commodities
  - ELCP
  - ECLAA
  - ECLA
  - ECLM
  - ELCD
- 4 GRID technologies
  - GRIDAAT
  - GRIDAT
  - GRIDMT
  - GRIDBT

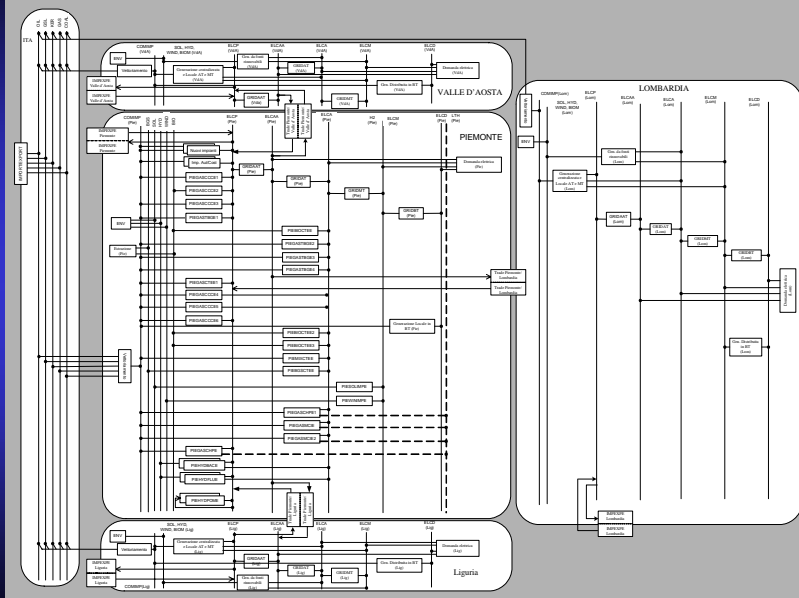






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RES - electricity



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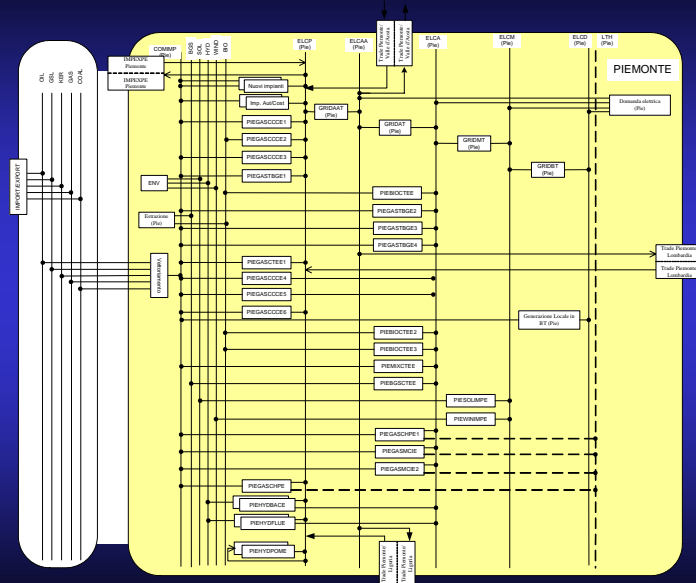
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RES-el: single region



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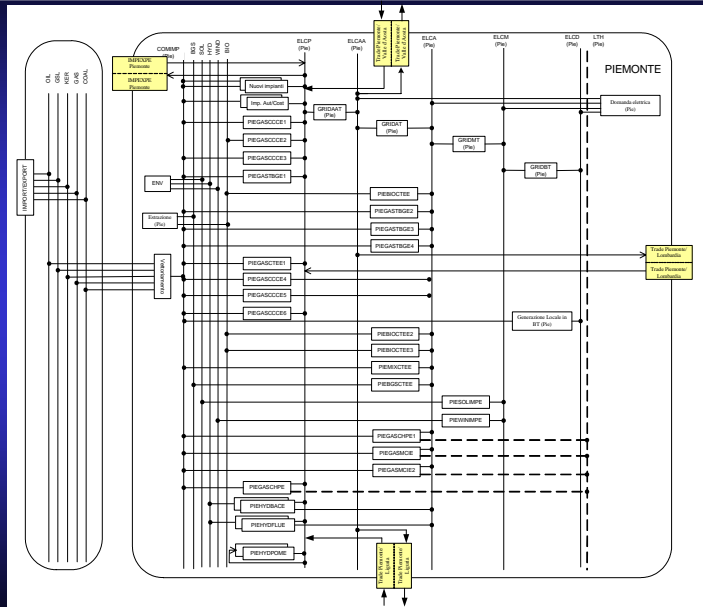
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RES-el: the inter-regional trade



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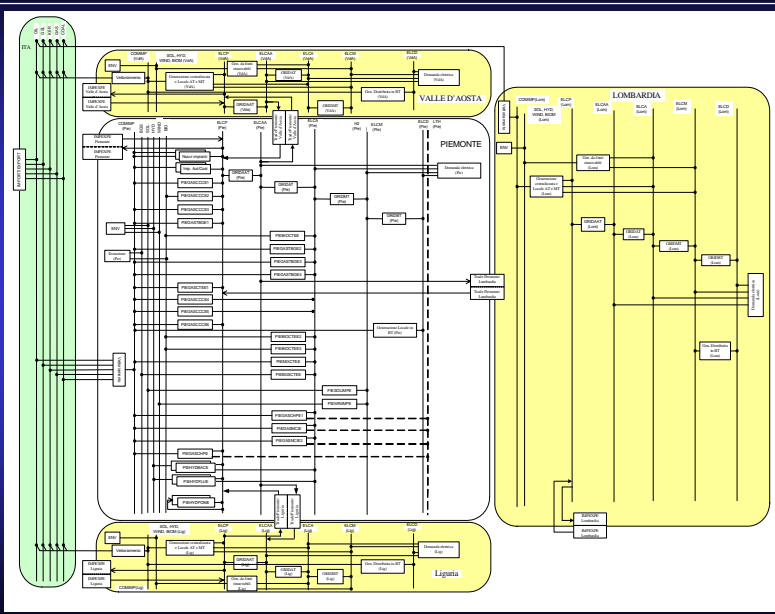
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RES-el: the Regions



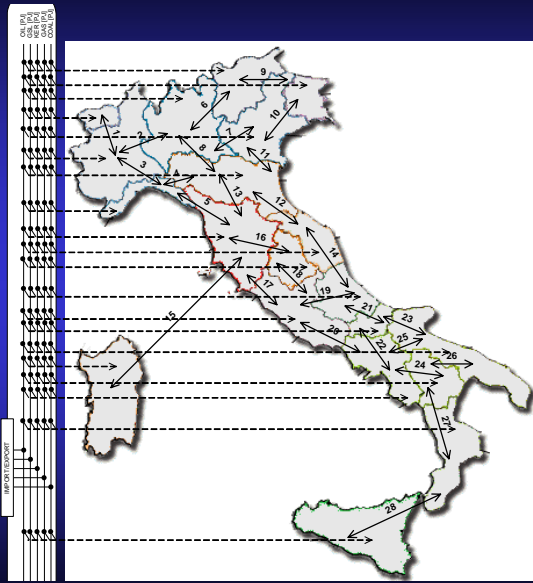
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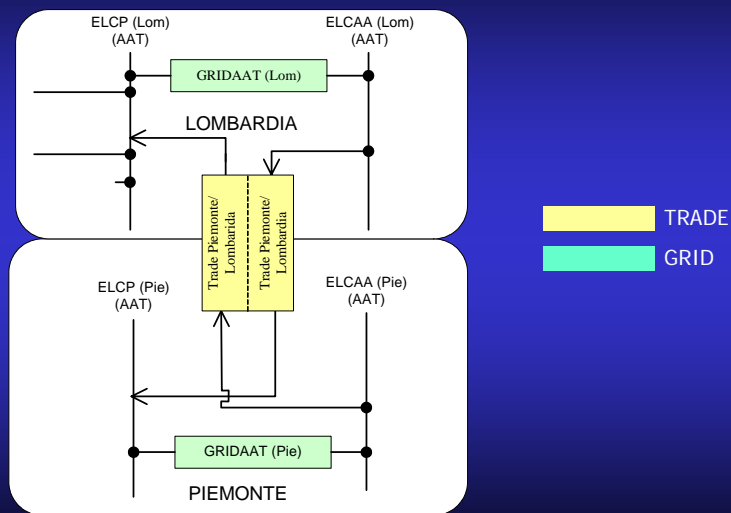
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inter-regional trade



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Regione	VDA	PIE	LIG	LOM	TAA	VEN	FVZ	EMR	TOS	UMB	MAR	LAZ	ABR	MOL	CAM	PUG	BAS	CAL	SIC	SAR	Saldo
Valle d'Aosta	0	-5481																			-5481,2
Piemonte	5481	0	-11347																		-5865,3
Liguria			0					-636	-6374												-7010,2
Lombardia				0	200	500		-195													11852,1
Trentino Alto Adige			11347																		-1473,1
Veneto				-200	0	-1273															2850,8
Friuli Venezia Giulia				-500	1273	0	2853	-775													-2852,8
Emilia Romagna							-2853	0													4325,8
Toscana			636	195		775		0	2795		-76										2687,4
Umbria			6374					-2795	0	-1660		646								122,4	1660,8
Marche								1660	0			0									4518,6
Lazio								76			0	4442									-6283,5
Abruzzo											-646	0	-4442	0	-900						2378,7
Molise														900	0	1479					307,3
Campania															-1479	0	100	1686			14276,5
Puglia														296		-100	9123	4958			-11649,6
Basilicata																-1686	-9123	0	-840		1547
Calabria																	-4958	840	0	5665	-2794,9
Sicilia																		-5665	0	2870	-2870,1
Sardegna																			-2870	0	-122,4



## Supply

Existing power plants:

333 units (spatially referenced) [see: [VT\\_Ita\\_ELC\\_V6p0](#)]

New capacity available:

54 types [see: [Subres\\_B-NEWTECHS](#)]

## Demand

the demand for electrical services (49 items) has been organised in 5 sectors and differentiated for the 20 regions [see: [VT\\_Ita\\_EUD\\_V6p0](#)]



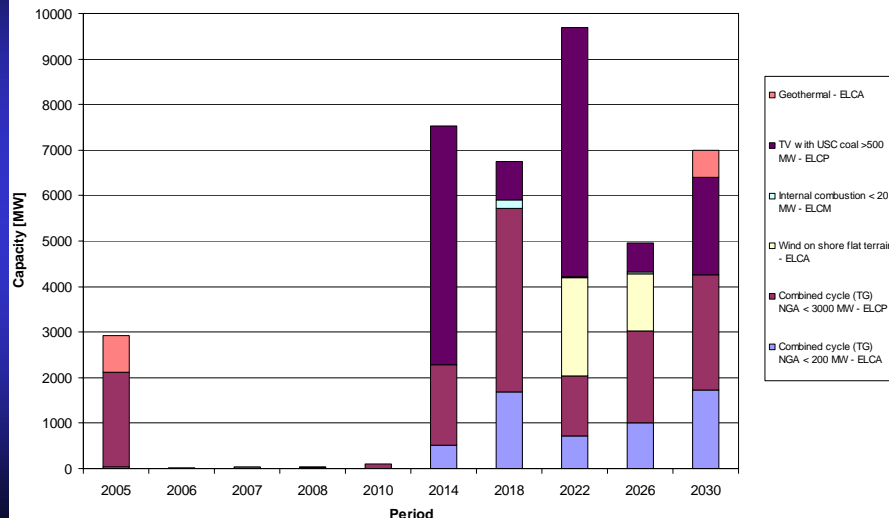
### Import and Inter Regional Exchange for two regions

Region	Attribute	Process	Commodi	2004	2005	2006	2007	2008	2010	2014	2018	2022	2026	2030
LOM	VAR_Fin	LOMEMRCAA	ELCAA	8791.819	8958.944	9000.425	14654.59	12962.2	19469.86	21900	21900	14358.19	0	0
LOM	VAR_Fin	LOMTAACAA	ELCAA	633.663	0	0	0	0	0	0	18.55188	58.40983	0	0
LOM	VAR_Fin	LOMVENCAA	ELCAA	7617.42	14540.36	15189	18400.03	21024	0	0	239.373	0	0	0
LOM	VAR_FOut	EMRLOMCAA	ELCP	0	0	0	0	0	0	0	0	0	0	8973.924
LOM	VAR_FOut	PIELOMCAA	ELCP	10386.86	11914.44	9091.457	11434.93	10867.01	7235.387	12485.44	8777.849	7615.921	10148.32	5276.338
PIE	VAR_Fin	PIELGCAA	ELCAA	0	5269.746	8536.966	8648.999	8532.271	8862.902	196.4498	0	0	0	0
PIE	VAR_Fin	PIELOMCAA	ELCAA	10386.86	11914.44	9091.457	11434.93	10867.01	7235.387	12485.44	8777.849	7615.921	10148.32	5276.338
PIE	VAR_FOut	LIGPIECAA	ELCP	0	0	0	0	0	0	0	772.2912	0	5110.193	4069.453
PIE	VAR_FOut	VDAPIECAA	ELCP	4191.803	5256	5256	5256	5256	5256	5256	5256	5256	5256	5256

### Inter Regional Exchange Matrix



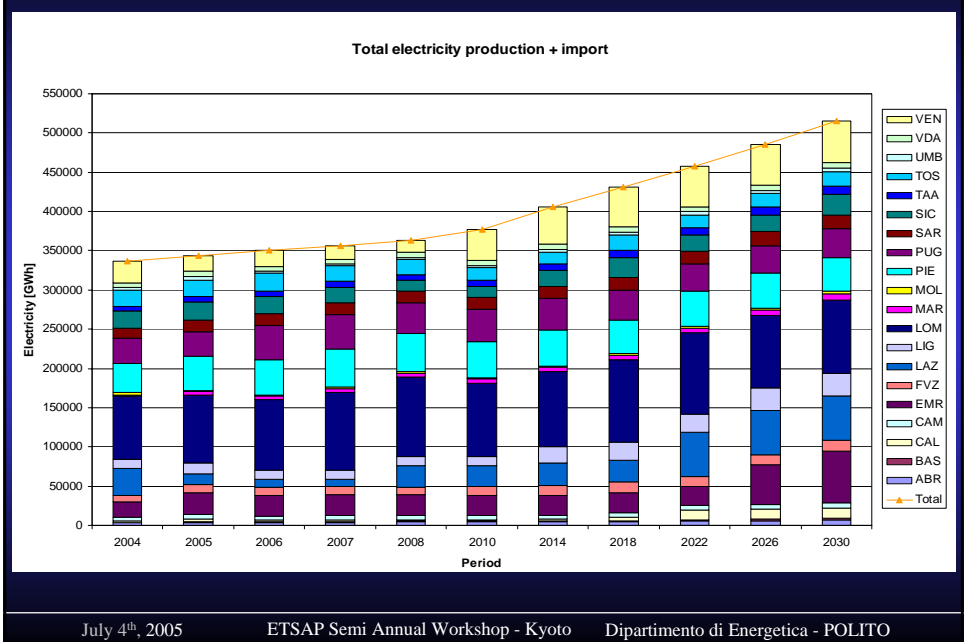
### Installation of new capacity







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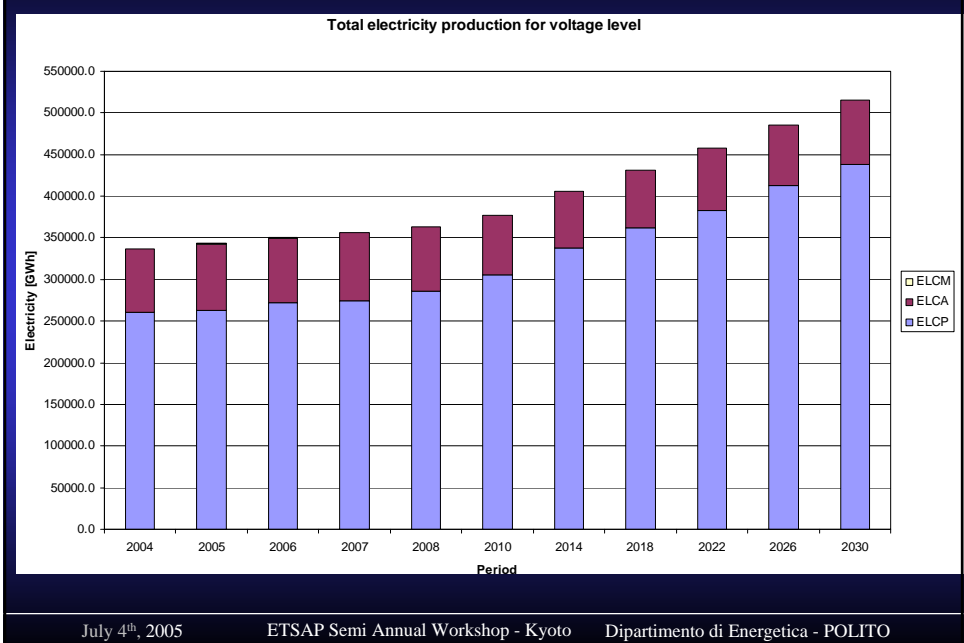
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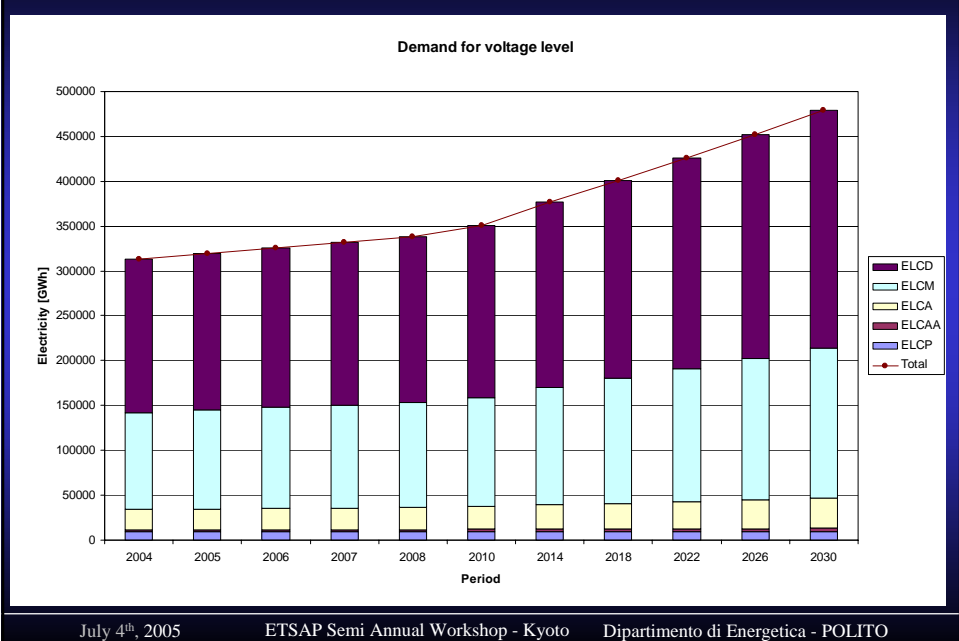
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Major needs for improvement:

peak/reserve requirement management, able to interact with multi-grid situations

lumpy investment approach

More warning message  
(e.g. TS → Annual, demand excess, ....)



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Thanks to Amit and Uwe