

PRIORITIES OF NATURAL GAS UTILIZATION ACCORDING TO ITS VALUE ADDED

“Egypt Case vs World; OECD as Best Practices”

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Introduction

- ♦ Egypt depends mainly on Petroleum Energy (Oil & Gas) to meet its energy needs for sustainable development.
- ♦ Petroleum Energy represents more than 95% of the Total Primary Energy Supply (TPES).
- ♦ Natural Gas has its growing role in the Energy Mix in Egypt with more than 50% of the TPES.
- ♦ Now, Priorities of Natural Gas Utilization has its Strategic Direction to be reviewed. The decision aims to allow spare more gas for the other categories of consumers that cannot shift away from gas for either technical or economic reasons.

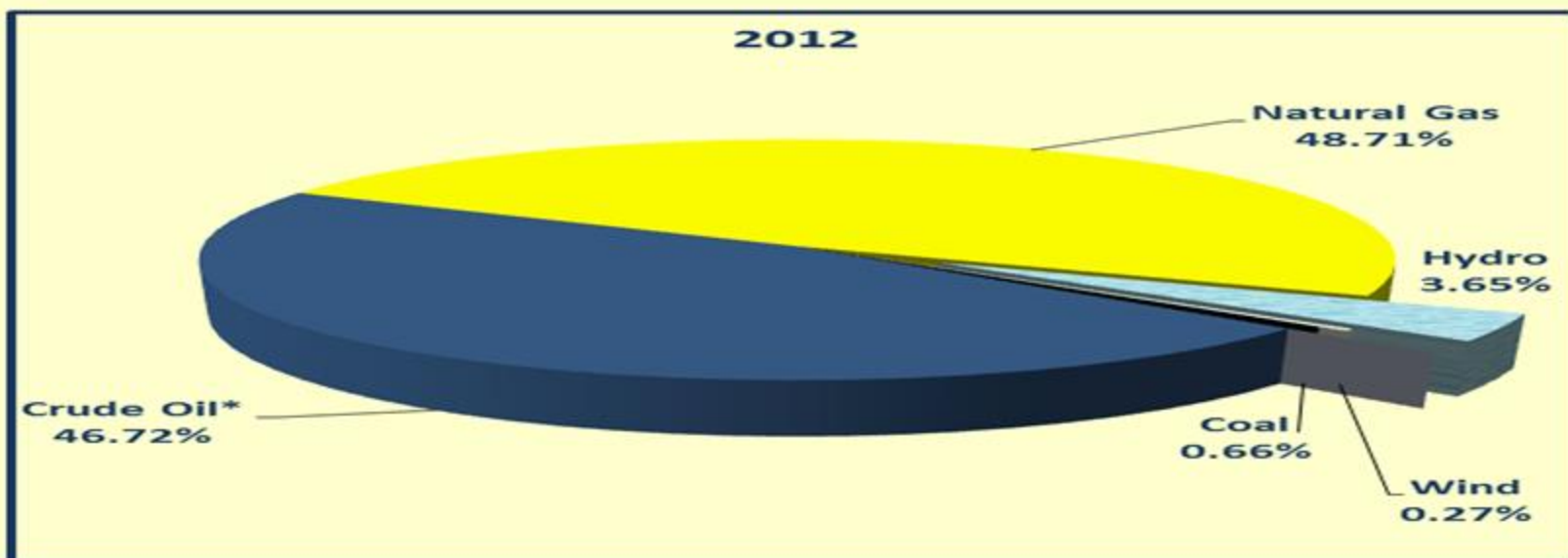
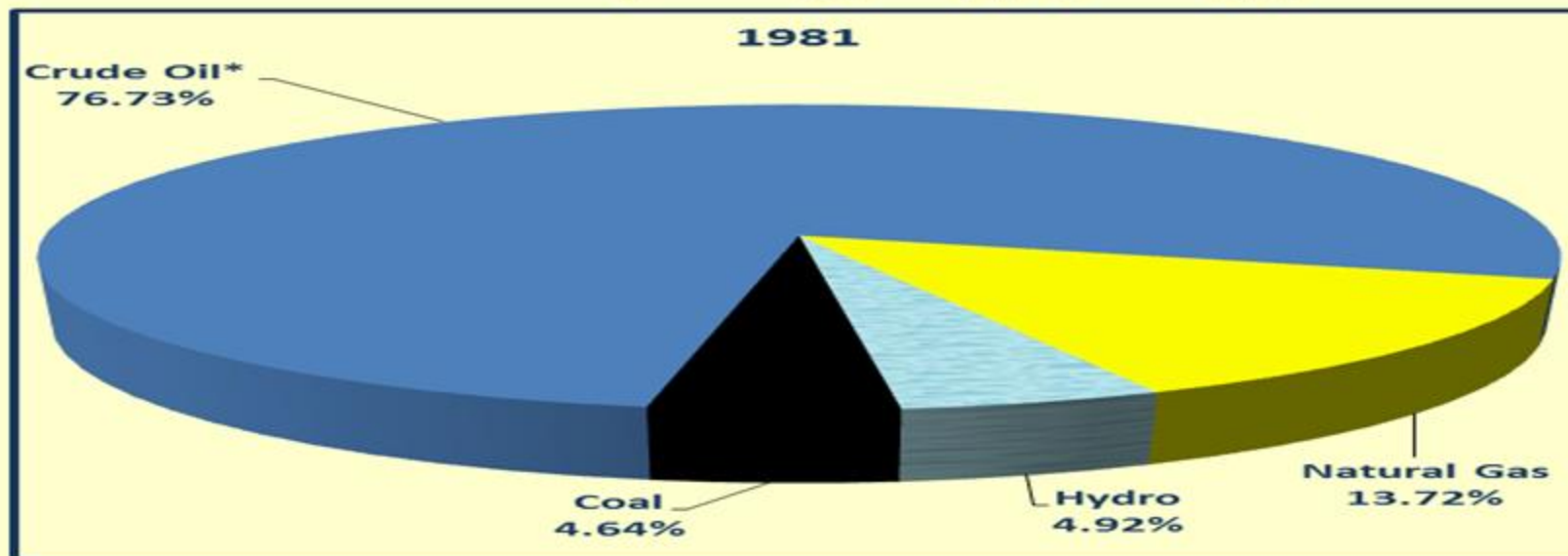
Introduction (Cont.)

- ◆ Energy Security is one of the most important milestones of National Security which depends on diversifying and optimizing the use of energy sources.
- ◆ One of the Strategic Direction for Egypt is to diversify the energy sources (Energy Mix) to achieve the energy security for the future sustainable energy and development.
- ◆ We have excellent examples world-wide which represent Best Practices (BP) in Energy Security and Energy Usage Optimization especially in OECD and IEA Members.

Energy Security - Energy Mix

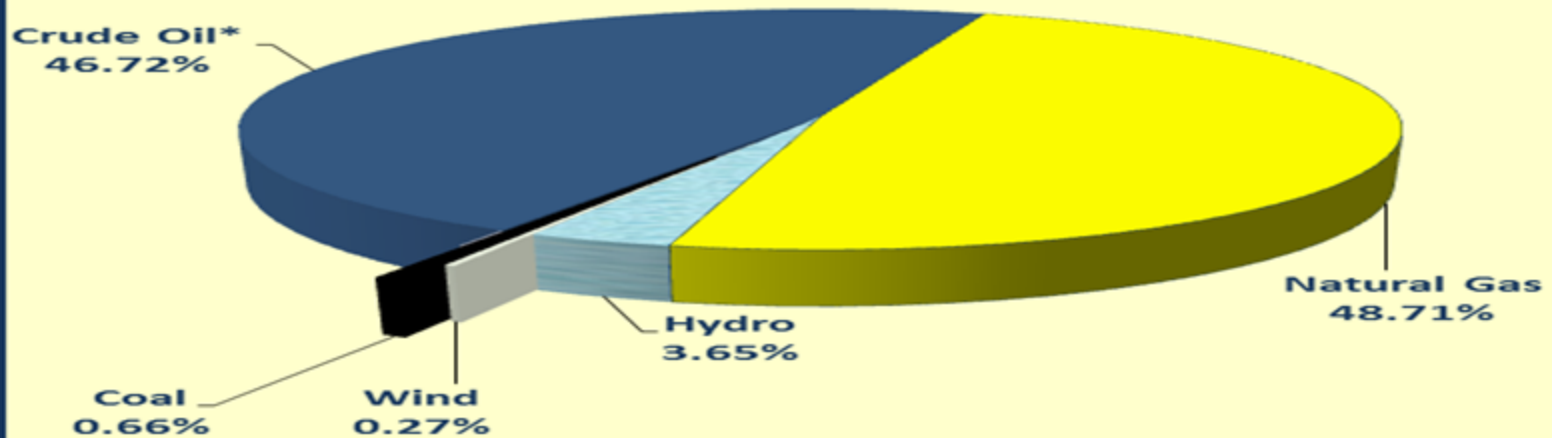
Egypt vs World

Total Primary Energy Supply in Egypt



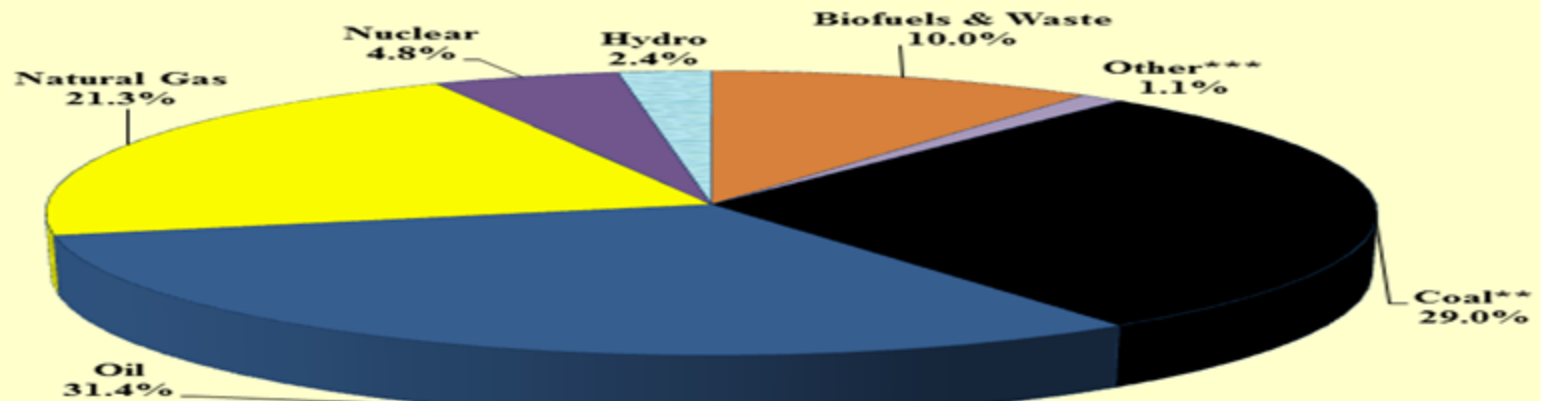
* Including LPG and Condensates.

Total Primary Energy Supply in Egypt 2012



* Including LPG and Condensates.

Fuel Share of TPES Worldwide 2013



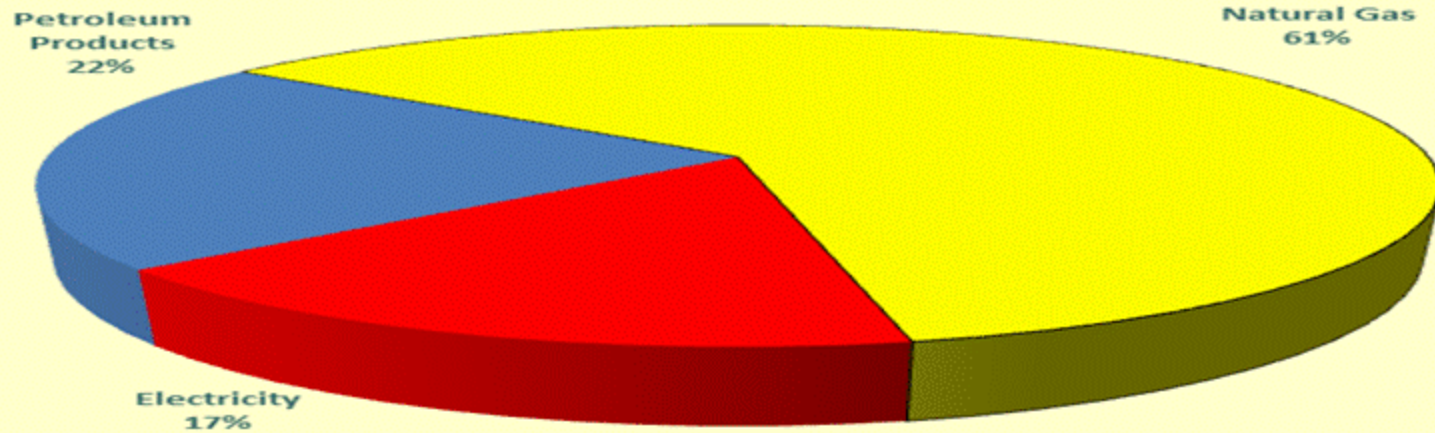
*World includes international aviation and international marine bunkers.

**In these graphs, peat and oil shale are aggregated with coal.

***Includes geothermal, solar, wind, heat, etc.

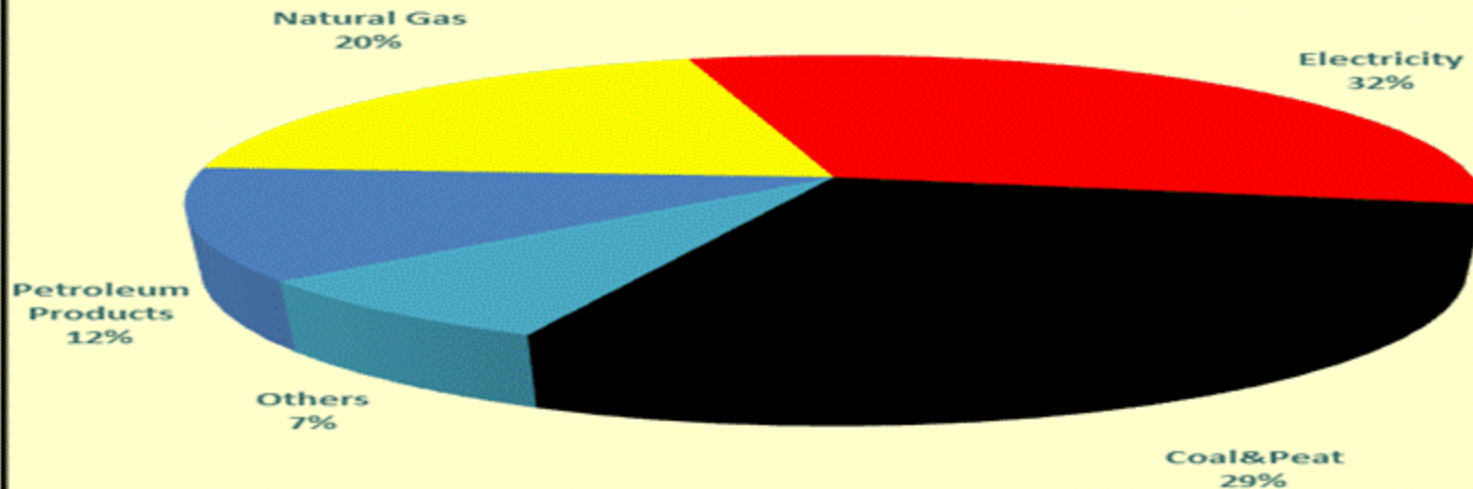
Energy Mix in Industry Sector in Egypt

2012/13



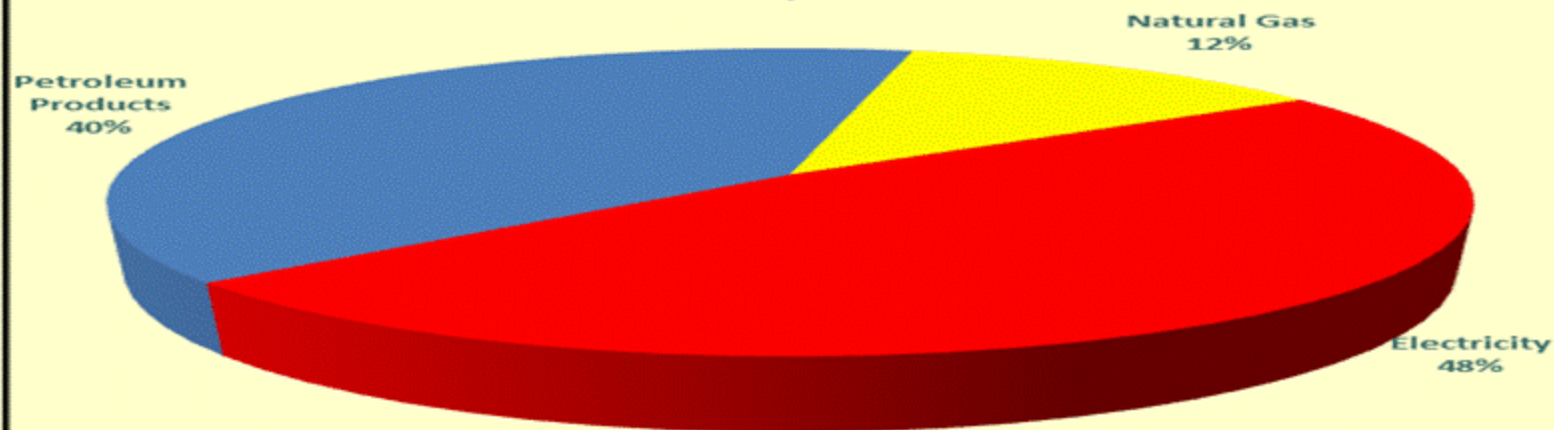
Energy Mix in Industry Sector Worldwide

2012



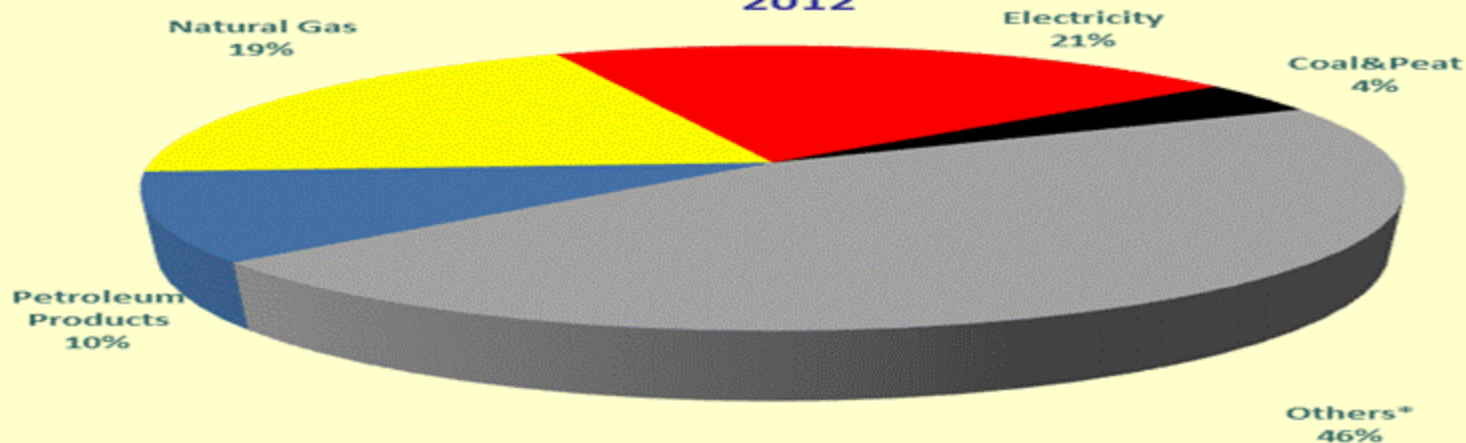
Energy Mix in Residential Sector in Egypt

2012/13



Energy Mix in Residential Sector Worldwide

2012



* includes Geothermal, solar, biofuels, waste and heat.

Natural Gas Utilization in Residential and Commercial Sector in Egypt till June 2014

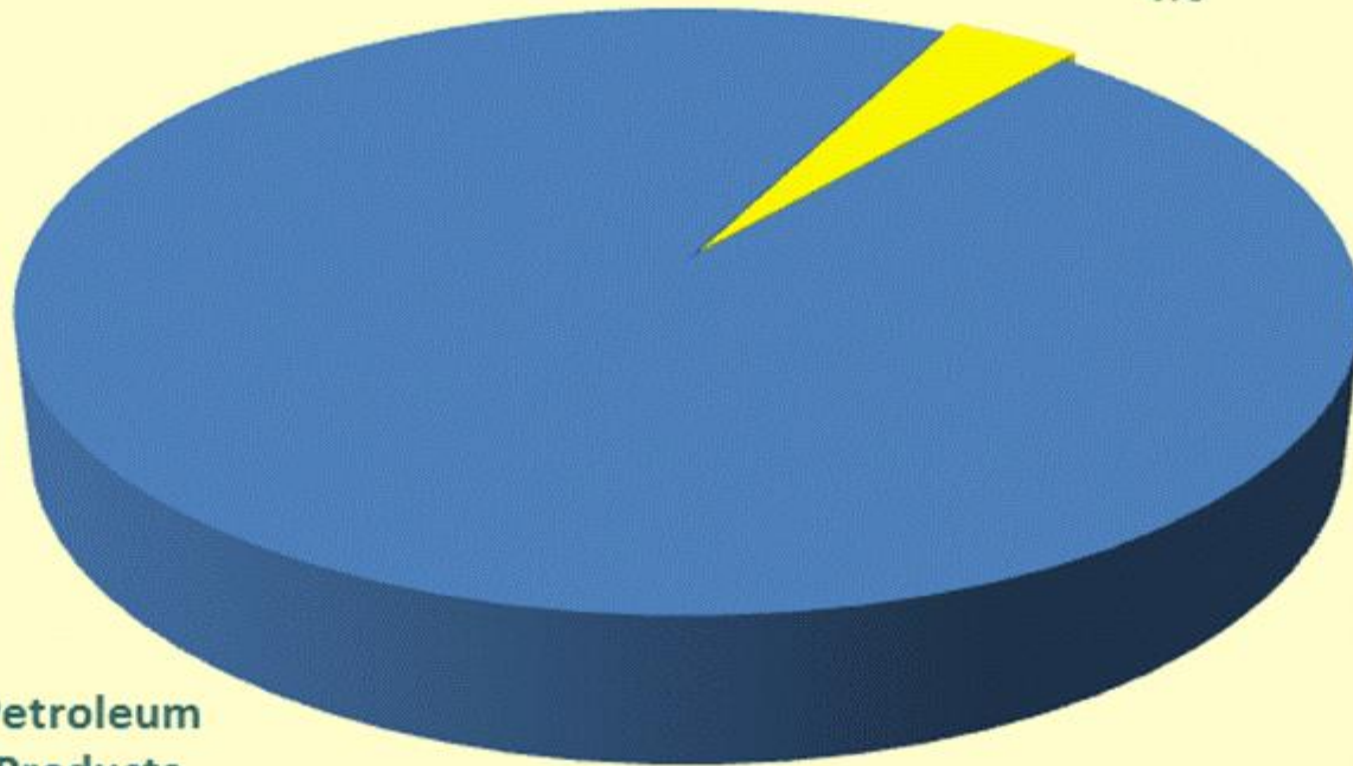
Item	Unit	Number of unit
Household	Million	6.6
Commercial	Thousand	13.543
of which Bakers		5.753
Governorates		25 out of 27
%		93%

Energy Mix in Transport Sector in Egypt

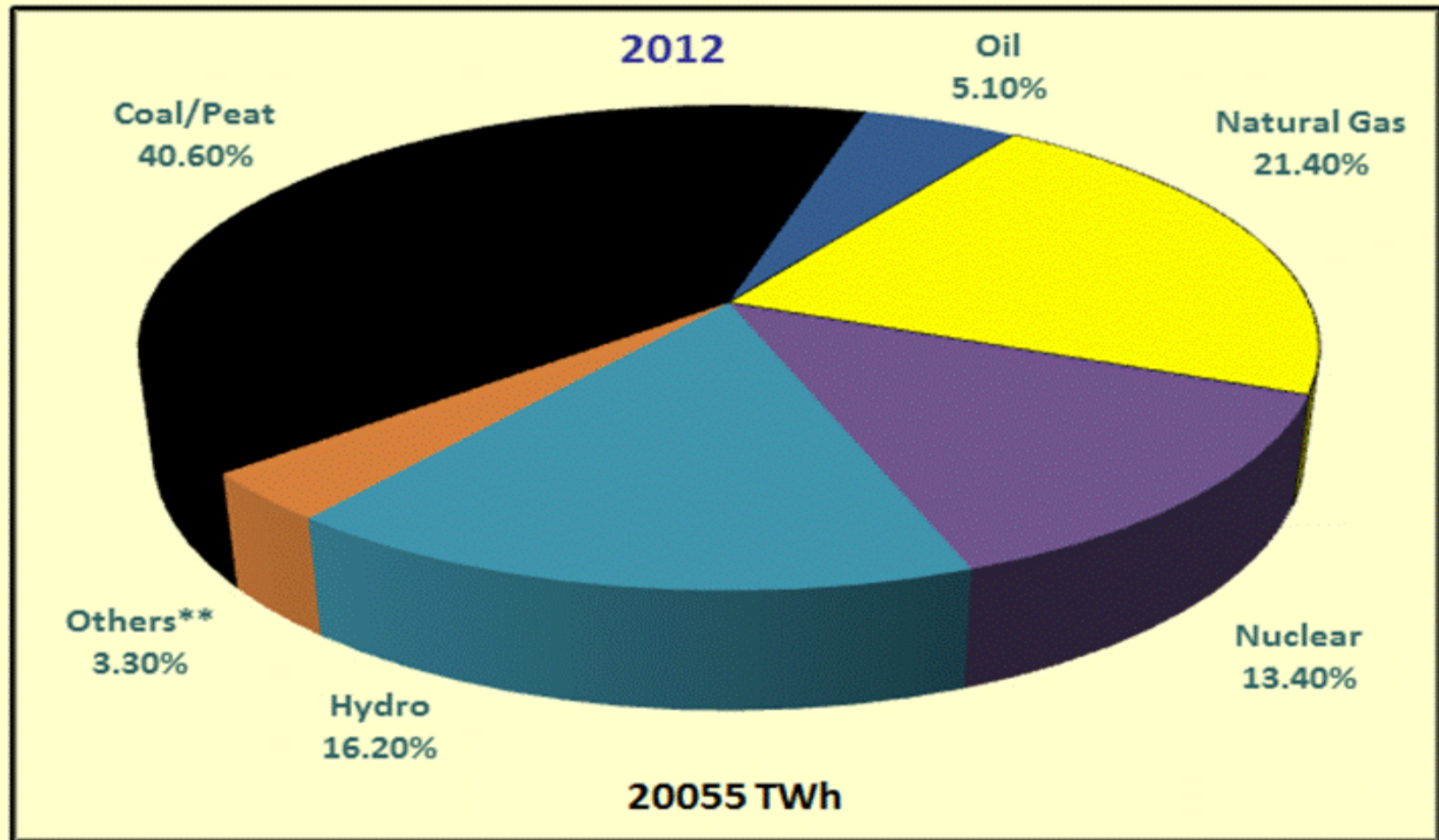
2012/13

Natural Gas
4%

Petroleum
Products
96%



Electricity Generation By Fuel*-Worldwide

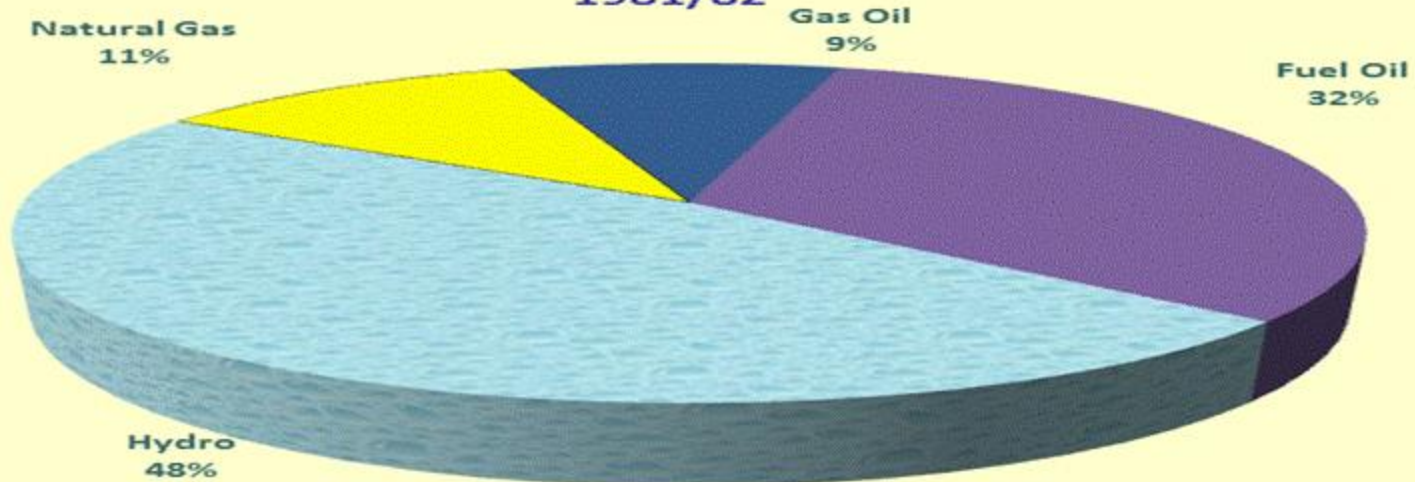


* Excludes pumped storage.

** other includes geothermal, solar, wind, biofuels , waste and heat

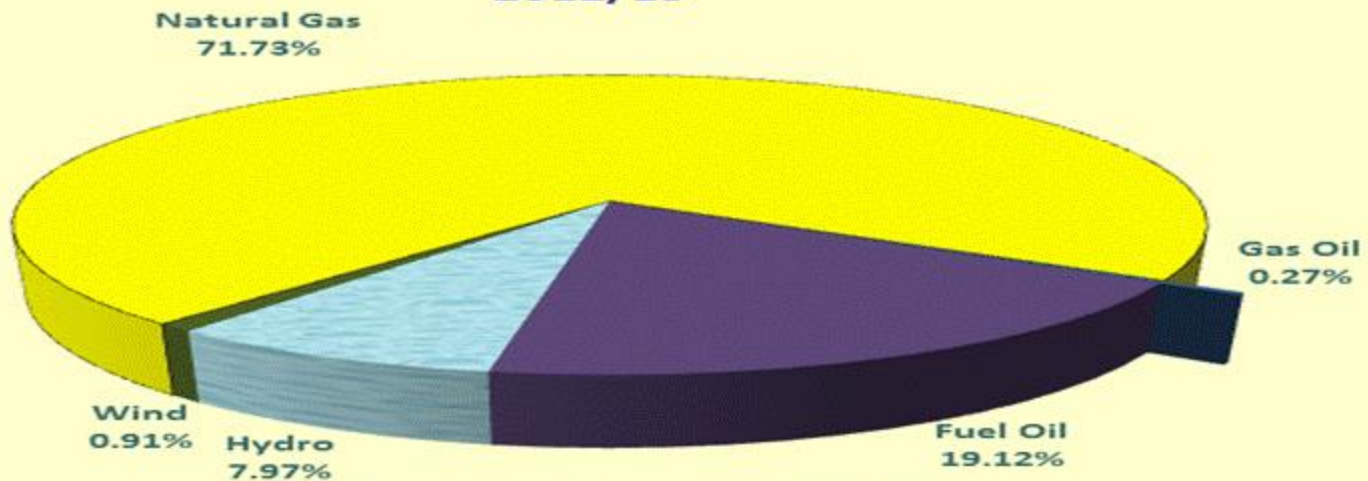
Development of Electricity Generation in Egypt

1981/82



Total Electricity Generation 21.9 TWh

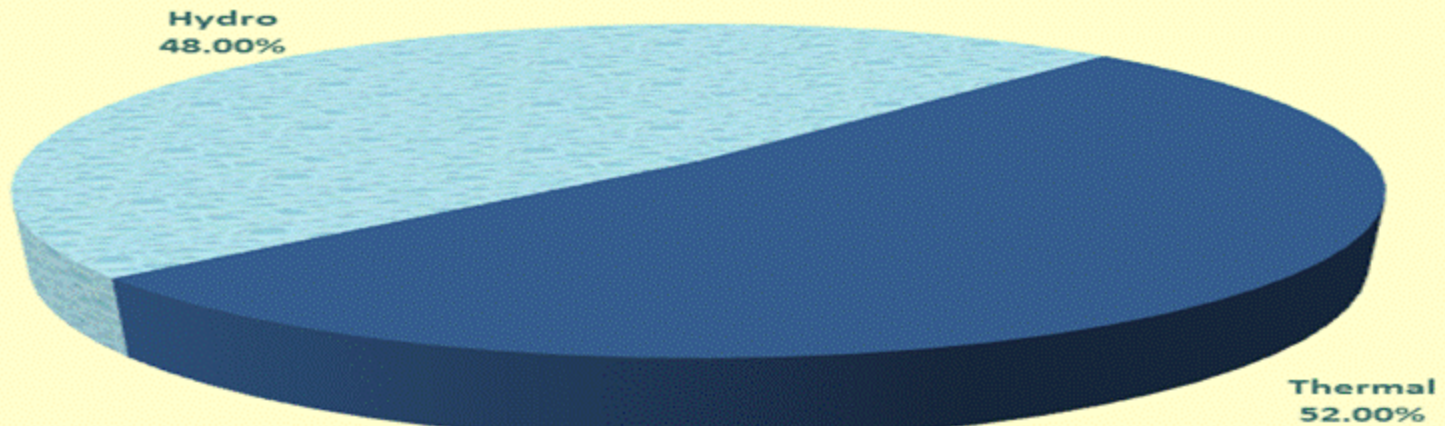
2012/13



Total Electricity Generation 164 TWh

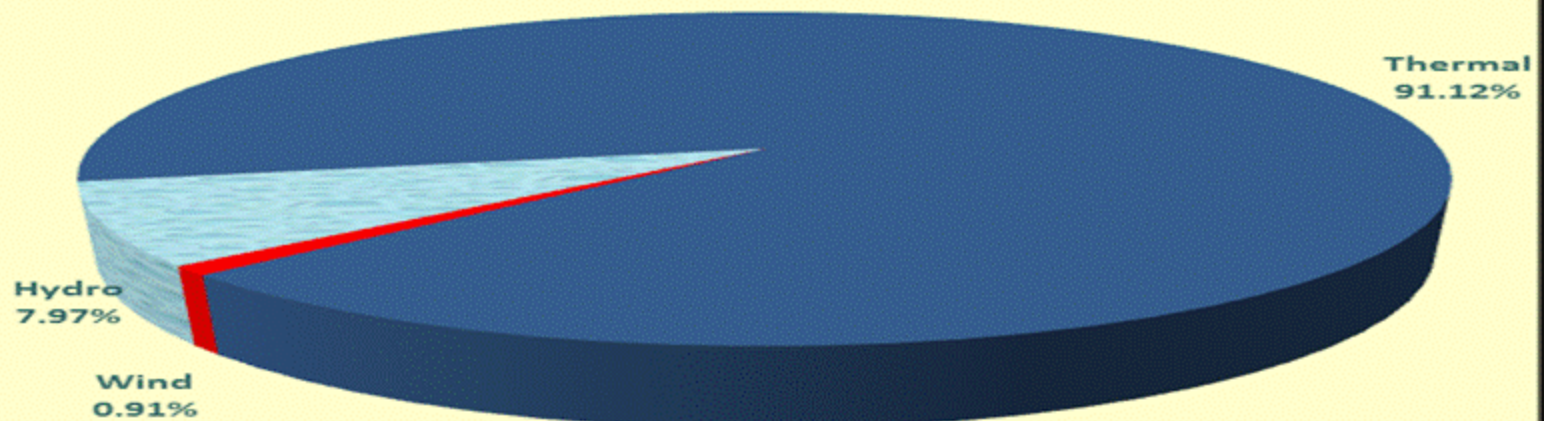
Development of Electricity Generation in Egypt

1981/82



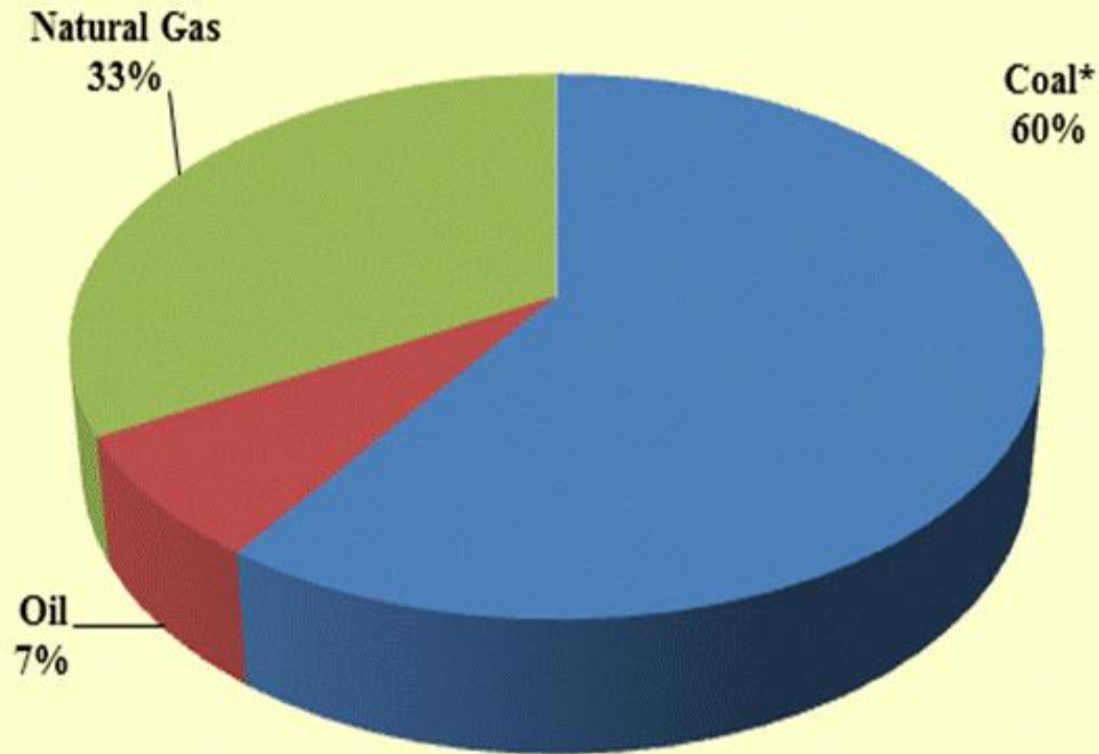
Total Electricity Generation 21.9 TWh

2012/13



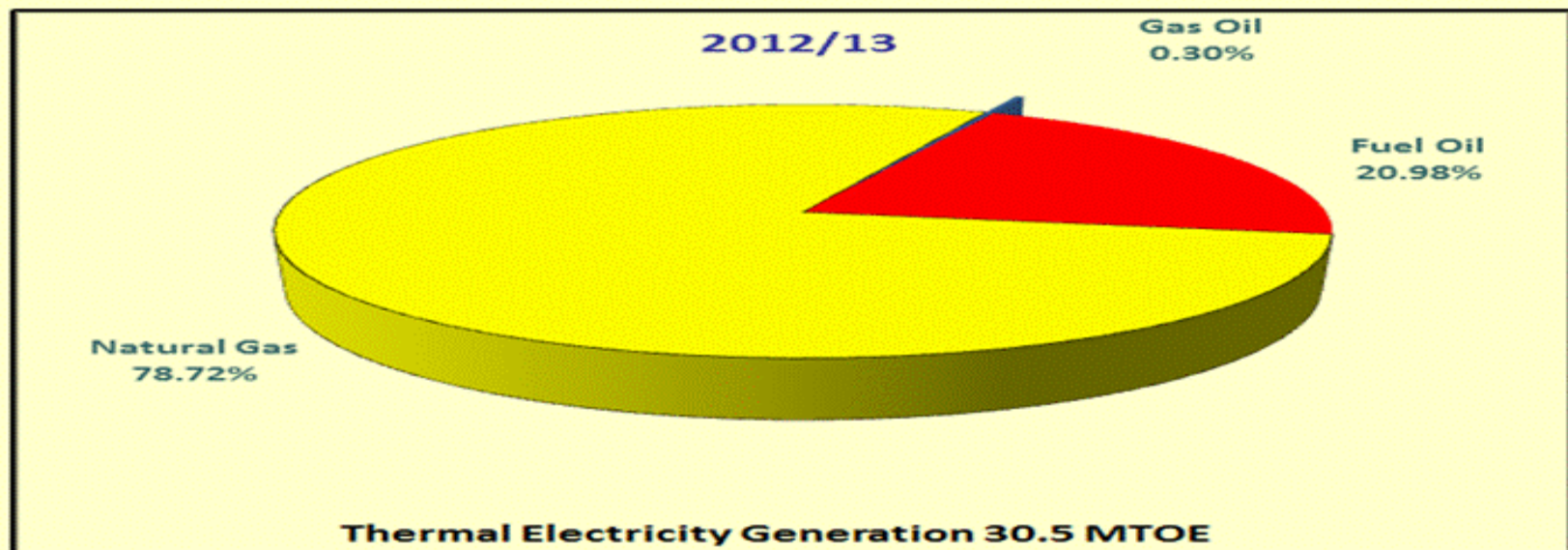
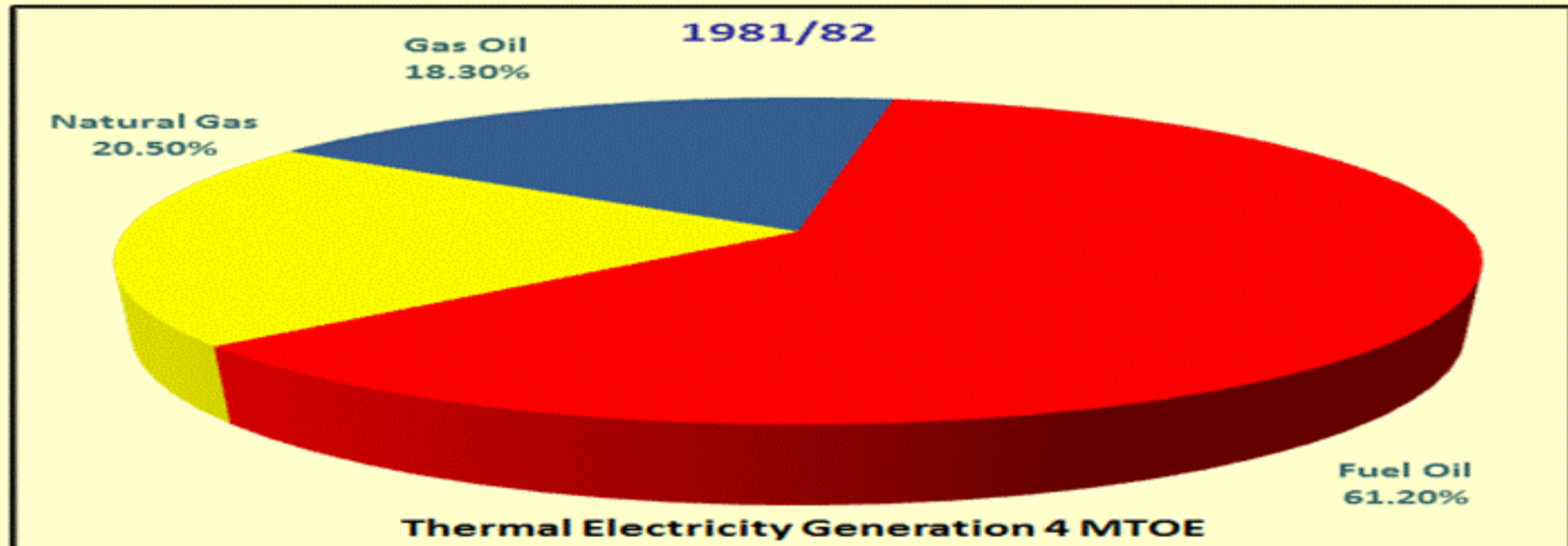
Total Electricity Generation 164 TWh

Electricity Production from fossil fuels Worldwide 2012



* including peat and oil shale .

Development of Thermal Electricity Generation Mix in Egypt



Main Points

- Egypt has its Energy Strategy to match with World Energy Mix through Energy Sources Diversification (Coal, Nuclear and Renewables especially Wind and Solar).
- Natural Gas represents about 50% in TPES, 72% in Electricity generation energy mix (57% of the total gas consumption), 61% in Industry energy mix, 12% in Household energy mix and 3% in Transport Sectors energy mix.
- Natural gas Consumption in Industry Sector (28% of the total gas consumption) is mainly by Energy Intensive Industrial activities (Cement, Fertilizer, Iron & Steel and Refractories.

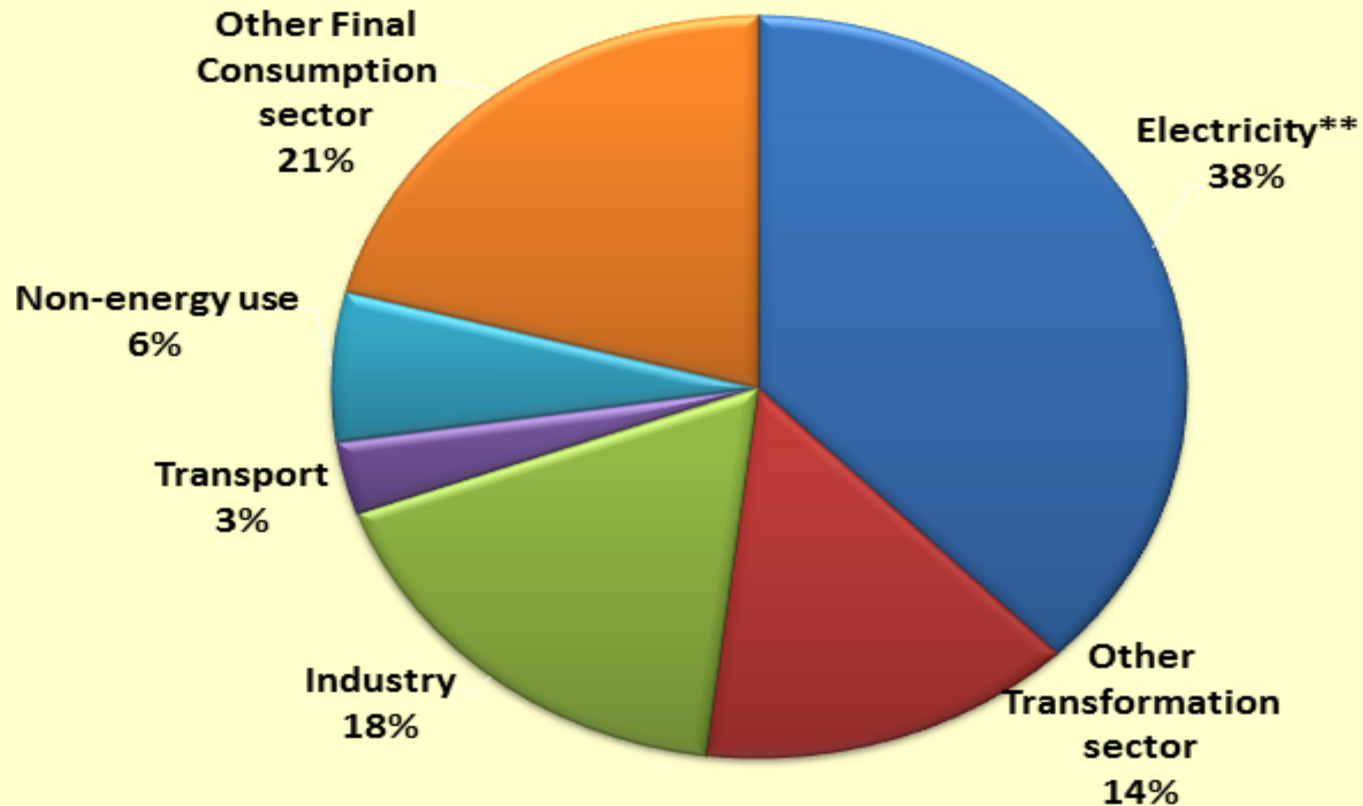
Main Points (Cont.)

- Egypt is working on using Coal instead of Natural Gas in Electricity Generation and Cement Industries.
- Nuclear is another source for Electricity Generation in the Future Expansion Plan.
- Renewable Energy Sources especially Wind with a good potential is considered for Electricity generation.
- Solar Energy is considered in the Future Energy Mix in all Electricity, Industry and Household Sectors.
- Hydro is totally exploited except for some mini-hydro or pump storage

Energy Security Priorities of NG Utilization

Egypt vs World

World Natural Gas Consumption by sector* 2012



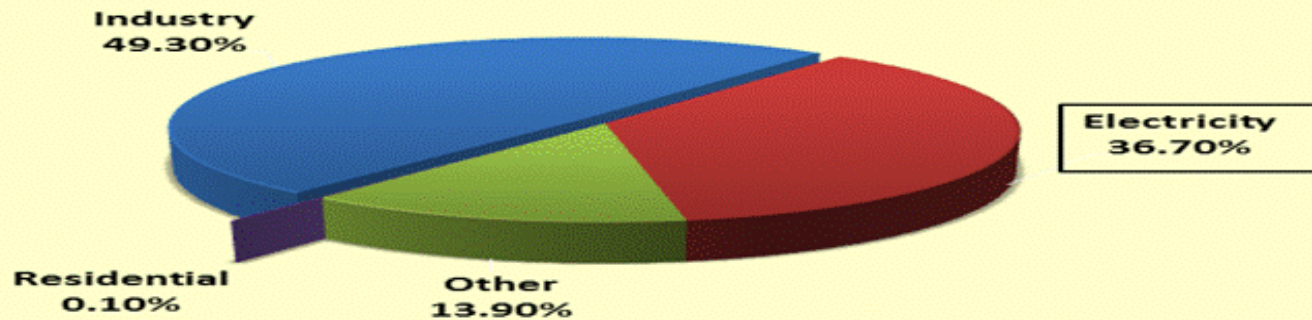
* including CHP Plants.

Source: Key World Energy STATISTICS, IEA, 2014

** 48% of Natural for final energy consumption.

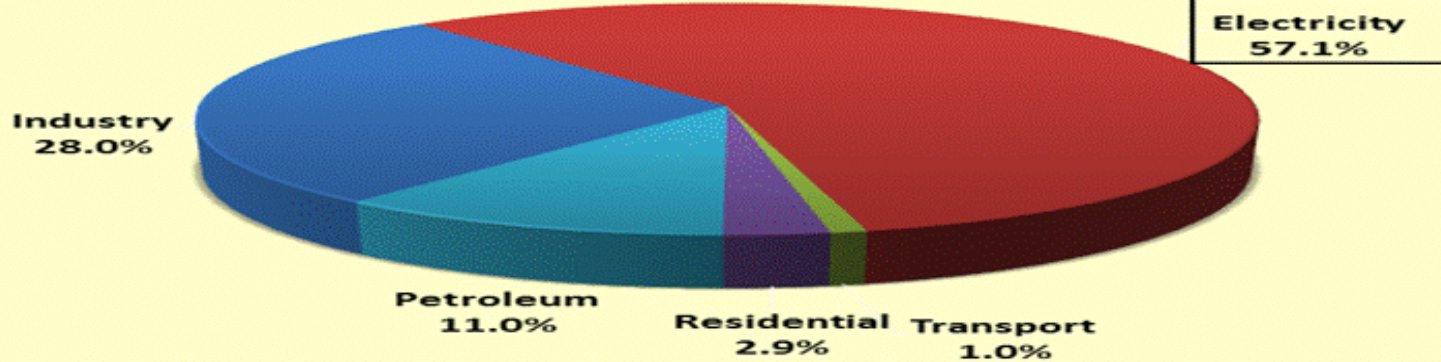
Natural Gas Uses in Egypt

1981/82



Natural Gas Consumption 2.1 MTOE

2012/13

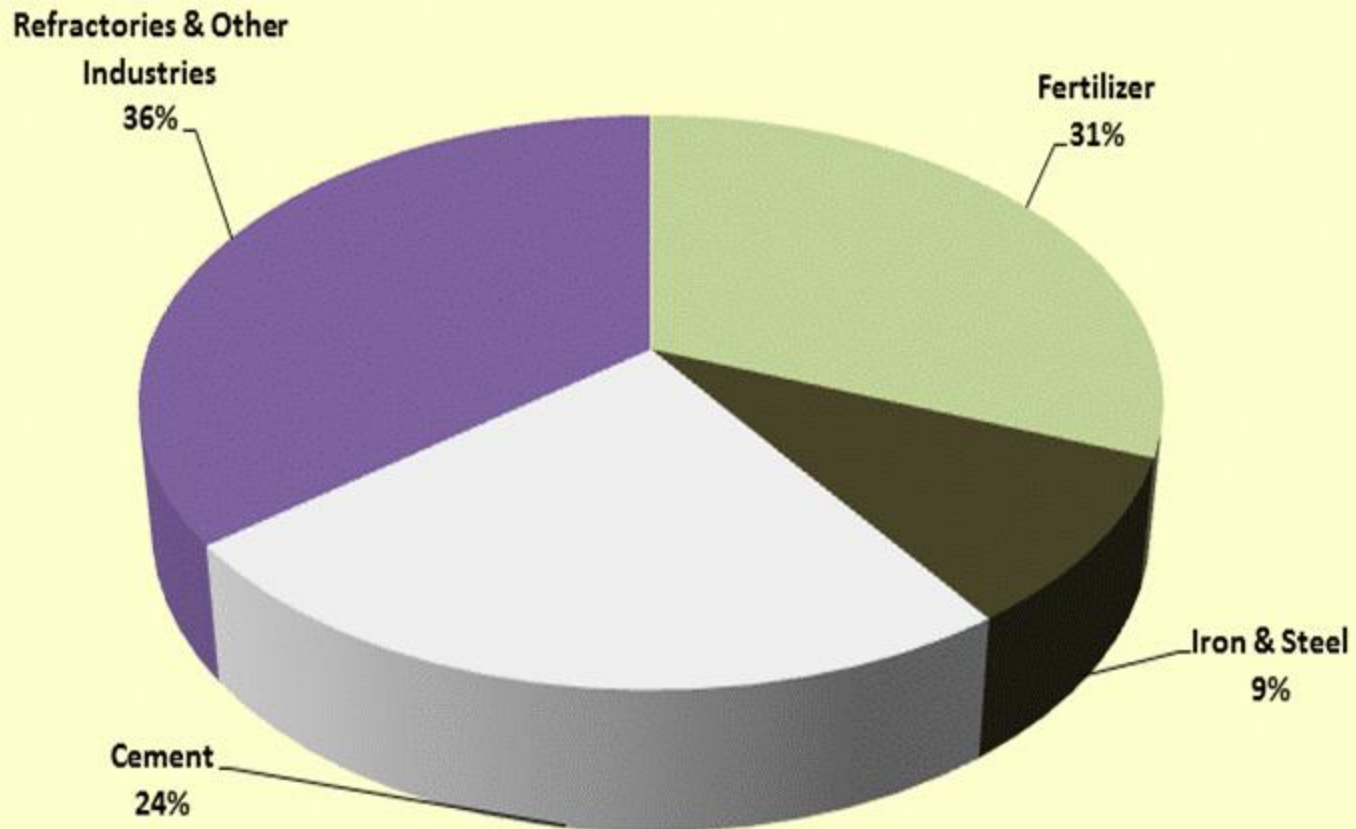


Natural Gas Consumption 46.3 MTOE

Priorities of Natural Gas Utilitization by sector in Egypt 2012/13

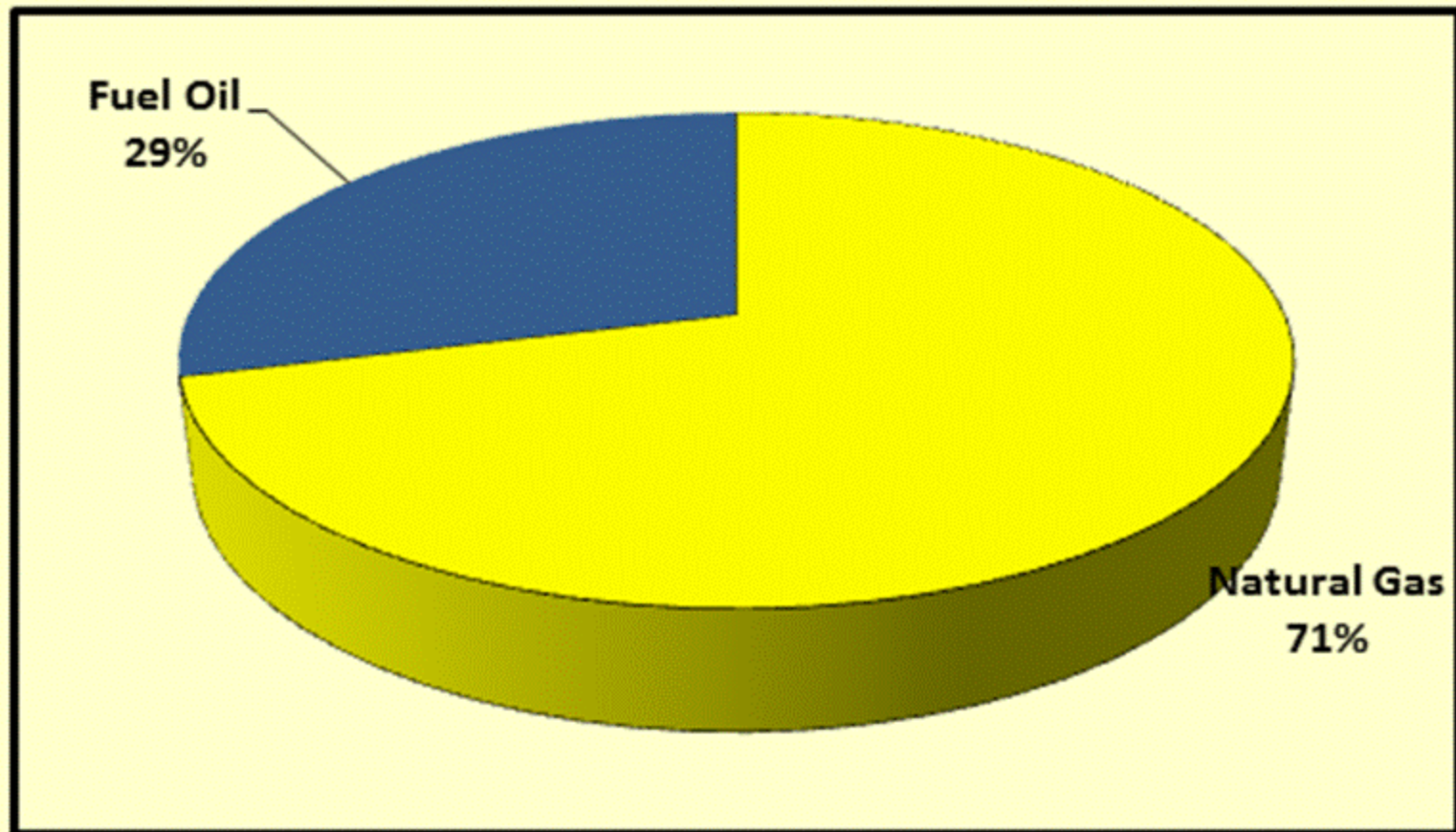
Sectors	% Share
- Electricity	57%
- Industry of which	28%
* Refractories and other Industries	10.10%
* Fertilizer	8.70%
* Cement	6.70%
* Iron and steel	2.50%
- Petroleum Sector	11%
- Household	3%
- Transport	1%
Total	100%

Natural Gas consumption in Industrial Sector in Egypt 2012/13

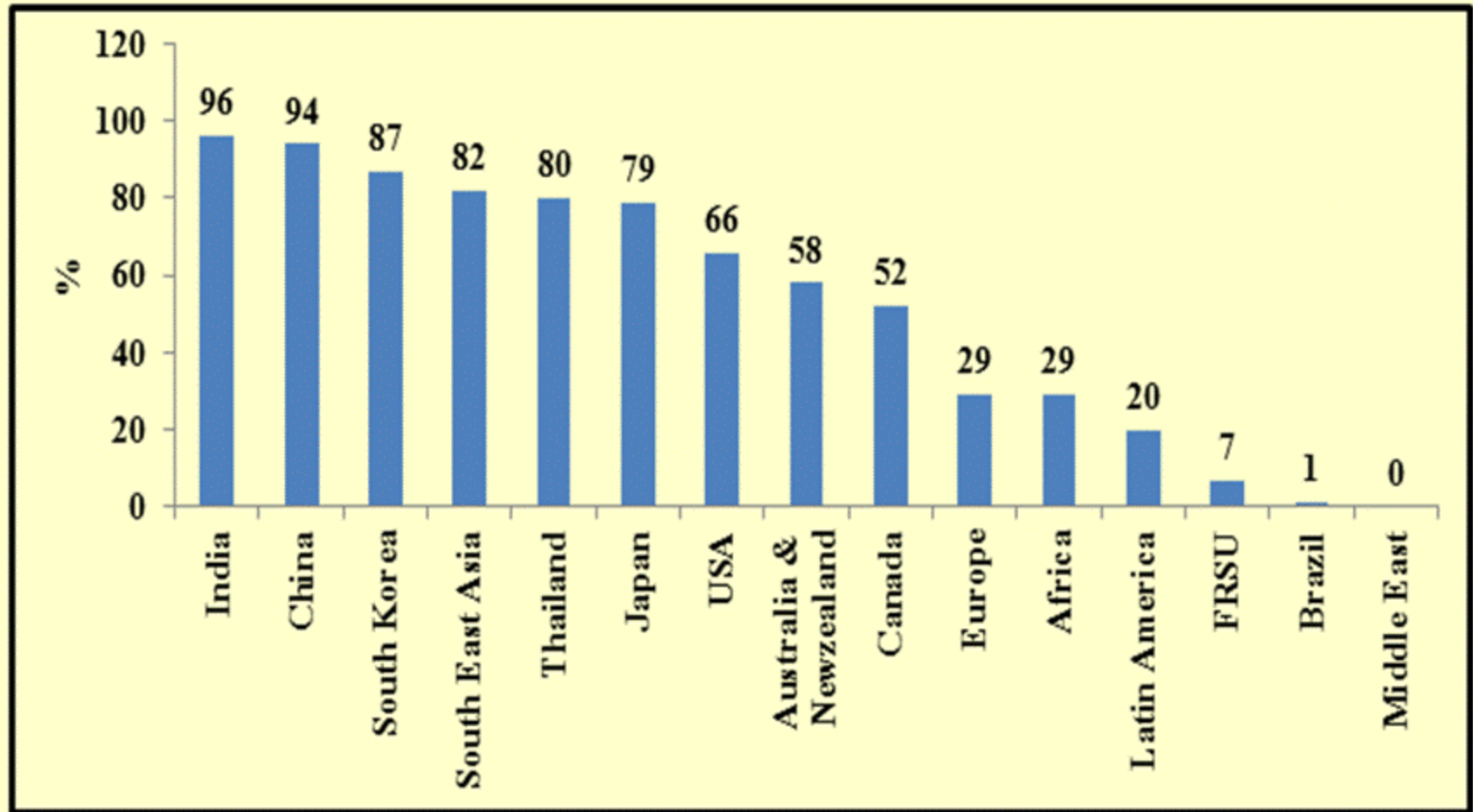


Natural Gas Consumption in Industrial Sector 12.3 MTOE

Petroleum Energy Mix in Cement Industry in Egypt in 2012

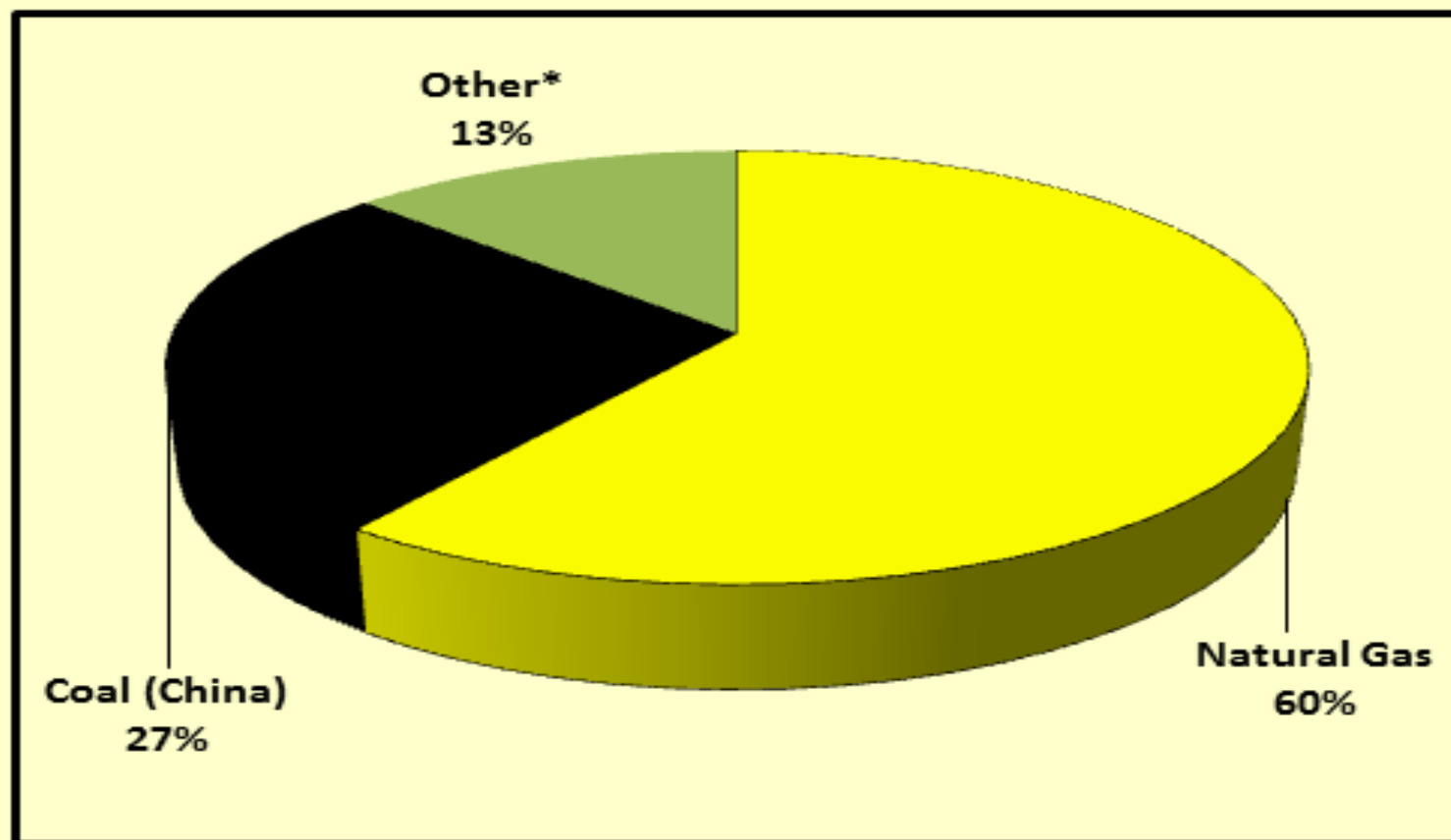


Percent share of Coal in Cement Industries in some countries in 2006



Source : International Energy Agency, IEA, 2007.

World Fossil Fuel Pattern in Fertilizer Production in 2012



Source : Urea Outlook 2014/02- www.fertecon.com

* Other represents Petroleum Products.

Comparison of Natural Gas Consumption Pattern in Egypt Vs. World

Sector	World	Egypt	Difference
Transformation Sector	52%	68%	16%
- Electricity	38%	57%	19%
- Other Transformation	14%	11%	-3%
Final Consumption	48%	32%	-16%
Industry*	18%	19.50%	1.5%
Non Energy Use*	6%	8.50%	2.5%
Transport	3%	1%	-2.0%
Other Final Consumption	21%	3%	-18.0%

* Industry sector represents 28% including non-energy use for fertilizer in Egypt.

OECD and IEA as BEST PRACTICES

OECD & IEA Members



OECD Heavy Importer Countries from Fossil Energy 2012

Energy Source	World Imports 2012	Imports of OECD Countries		
		Number of OECD Countries	Imports	%
Crude Oil* (Mt)	2051	8	1090	53%
Natural Gas** (bcm)	836	9	508	61%
Coal*** (Mt)	1270	6	470	37%
Oil Products*** (Mt)	460	5	114	25%

Source: Key World Energy Statistics 2014 , IEA.

*United States, People's Rep. of China , India ,Japan , Korea, Germany, Italy , Spain ,Netherlands,France.

**Japan, Germany, Italy, Korea, People's Rep. of China, Turkey, France, United States,Spain.

***People's Rep. of China , Japan ,India, Korea, Chinese Taipei, Germany , United Kingdom,Turkey , Malaysia, Italy.

****Japan, Indonesia, People's Rep. of China, Mexico,France, Brazil, Singapore , Australia,Germany.

**Energy Mix in OECD Countries* Vs Egypt
for Total Primary Energy Supply (TPES) in 2011**

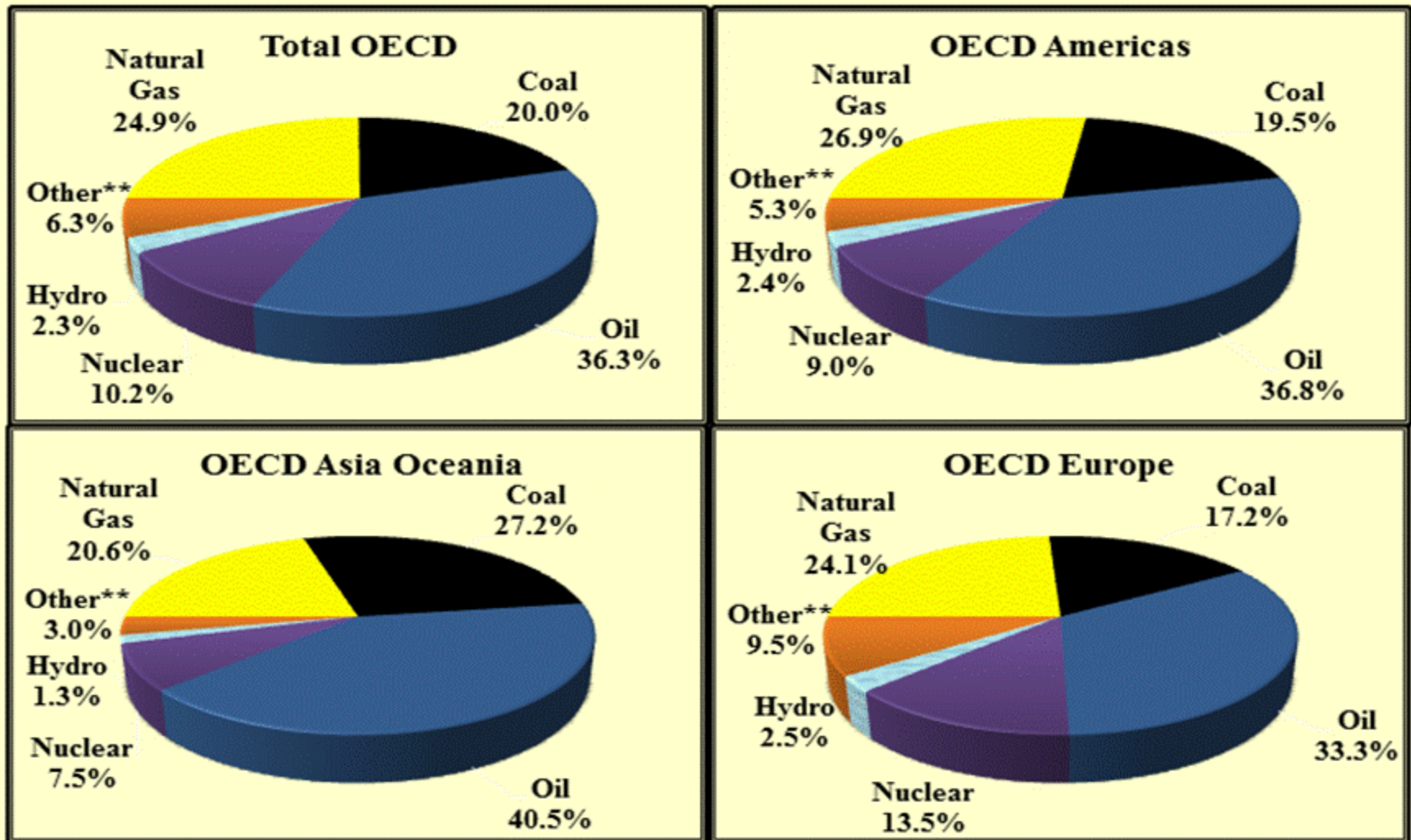
Item	OECD				Egypt
	Total	Americas	Asia Oceania	Europe	
Natural Gas	24.90%	26.90%	20.6%	24.1%	49.0%
Coal	20%	19.5%	27.2%	17.2%	0.7%
Oil	36.30%	36.8%	40.5%	33.3%	47.0%
Nuclear	10.20%	9%	7.5%	13.5%	
Hydro	2.30%	2.4%	1.3%	2.5%	3.7%
Other**	6.30%	5.3%	3.0%	9.5%	0.3%
Total MTOE	5305	2678	878	1749	87.1

* Includes 34 Country

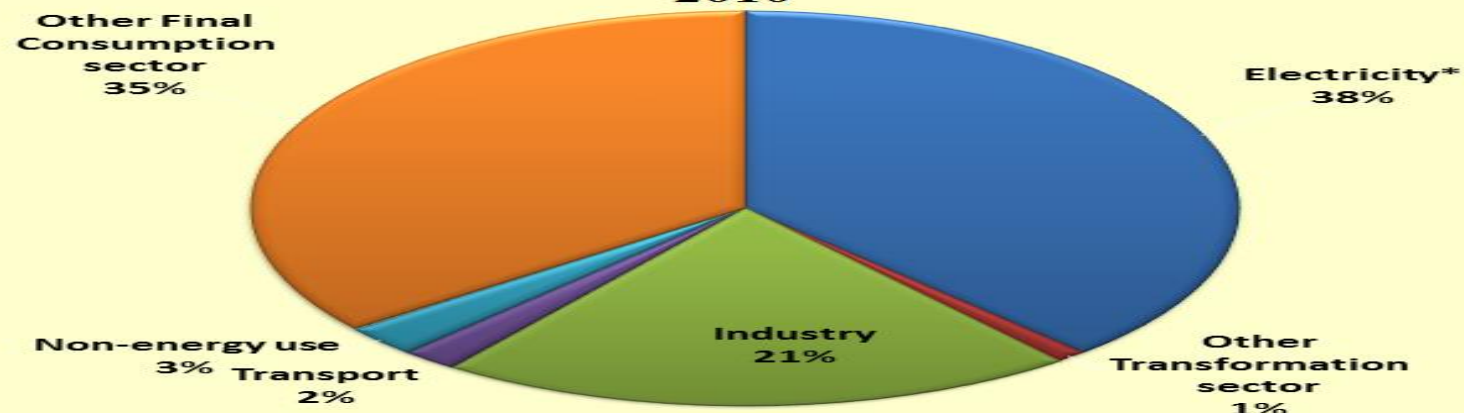
** Includes Geothermal, Solar, Wind, Electricity&Heat & Waste.

Sources : Natural Gas Information,IEA, 2012

Energy Mix in OECD Countries* for Total Primary Energy Supply (TPES) in 2011



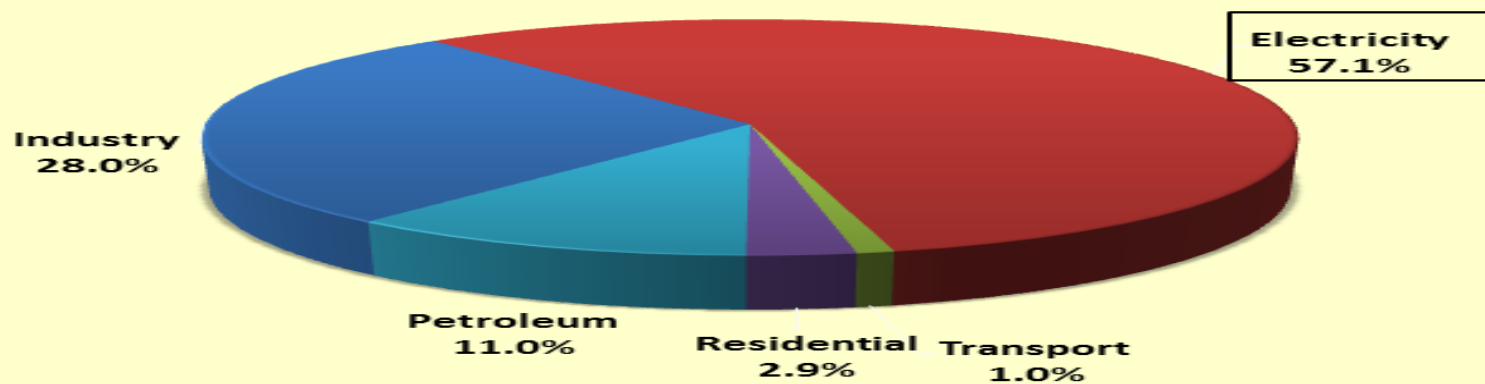
Natural Gas consumption by sector in OECD Countries 2010



* including CHP Plants.

Source: Natural Gas Information, IEA, 2012

Natural Gas Uses in Egypt 2012/13



Natural Gas Consumption 46.3 MTOE

**Energy Mix in IEA Members* Vs Egypt
for Total Primary Energy Supply (TPES) in 2011**

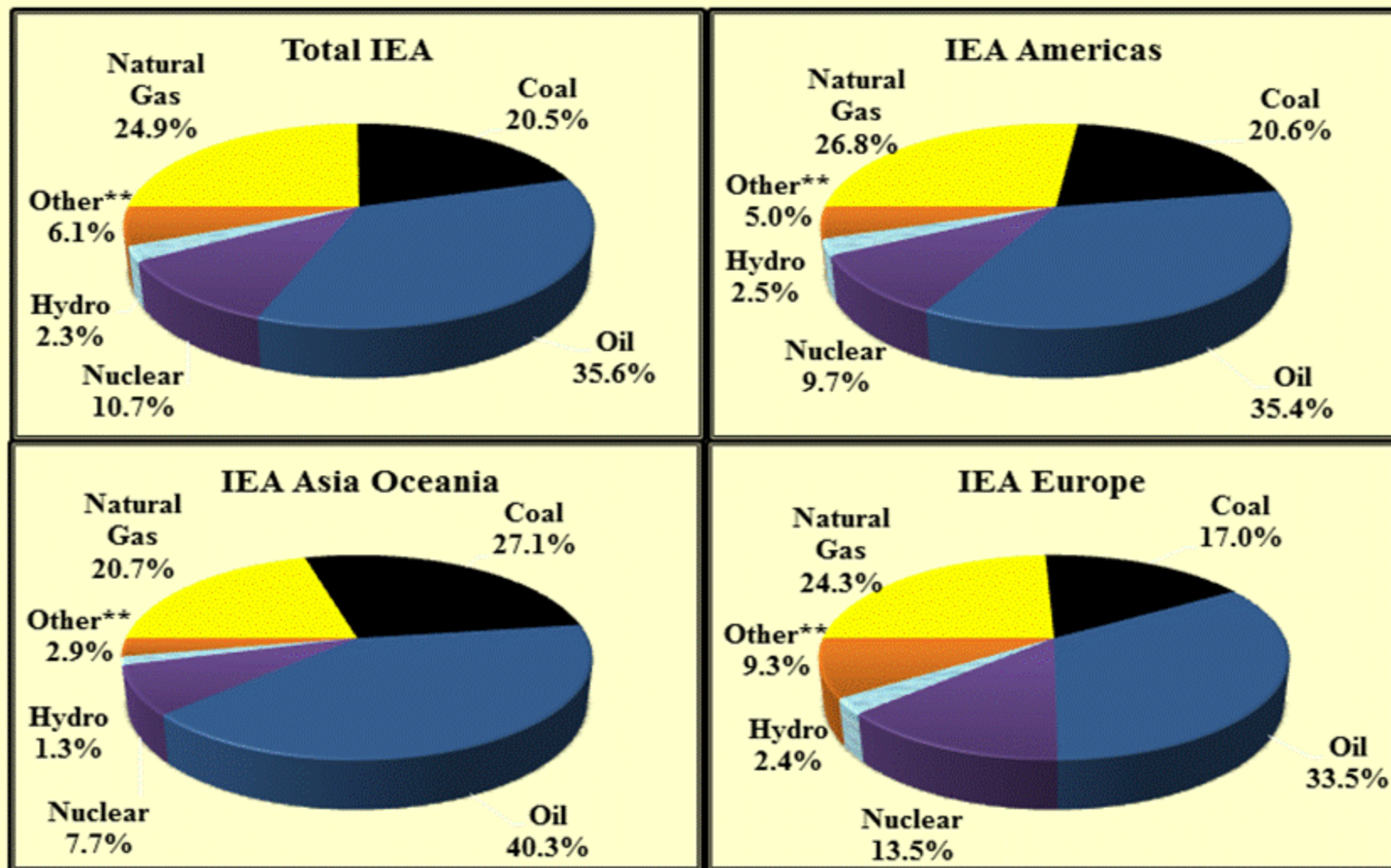
Item	IEA				Egypt
	Total	Americas	Asia Oceania	Europe	
Natural Gas	24.90%	26.80%	20.7%	24.3%	49.0%
Coal	21%	20.6%	27.1%	17.0%	0.7%
Oil	35.60%	35.4%	40.3%	33.5%	47.0%
Nuclear	10.70%	10%	7.7%	13.5%	
Hydro	2.30%	2.5%	1.3%	2.4%	3.7%
Other**	6.10%	5.0%	2.9%	9.3%	0.3%
Total MTOE	5043	2459	854	1730	87.1

* Includes 29 Country

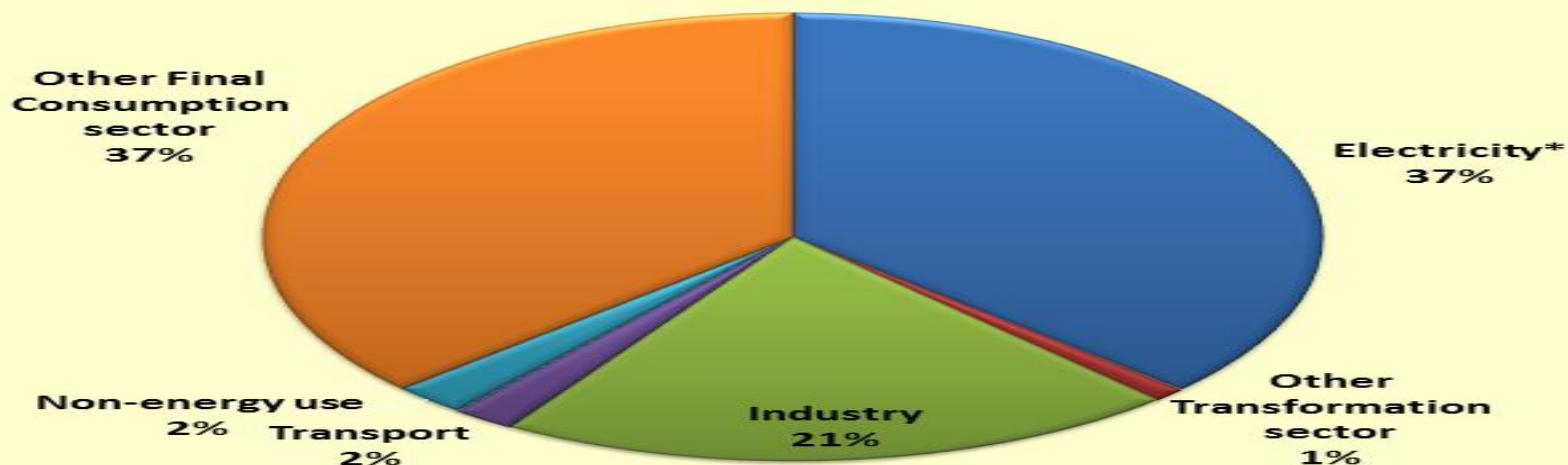
** Includes Geothermal, Solar, Wind, Electricity&Heat & Waste.

Sources : Natural Gas Information,IEA, 2012

Energy Mix in IEA Members for Total Primary Energy Supply (TPES) in 2011



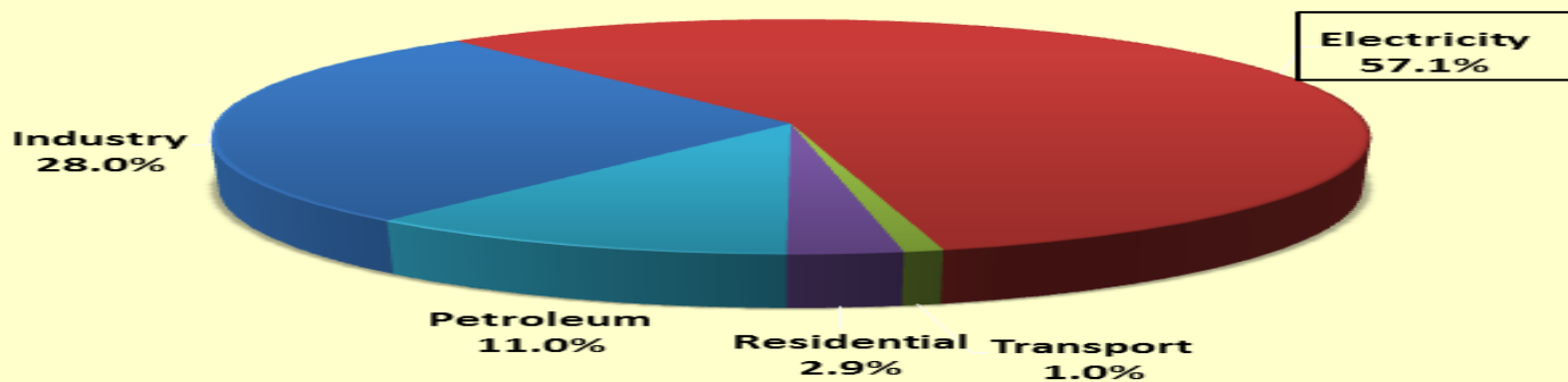
Natural Gas consumption by sector in IEA Members Countries 2010



* including CHP Plants.

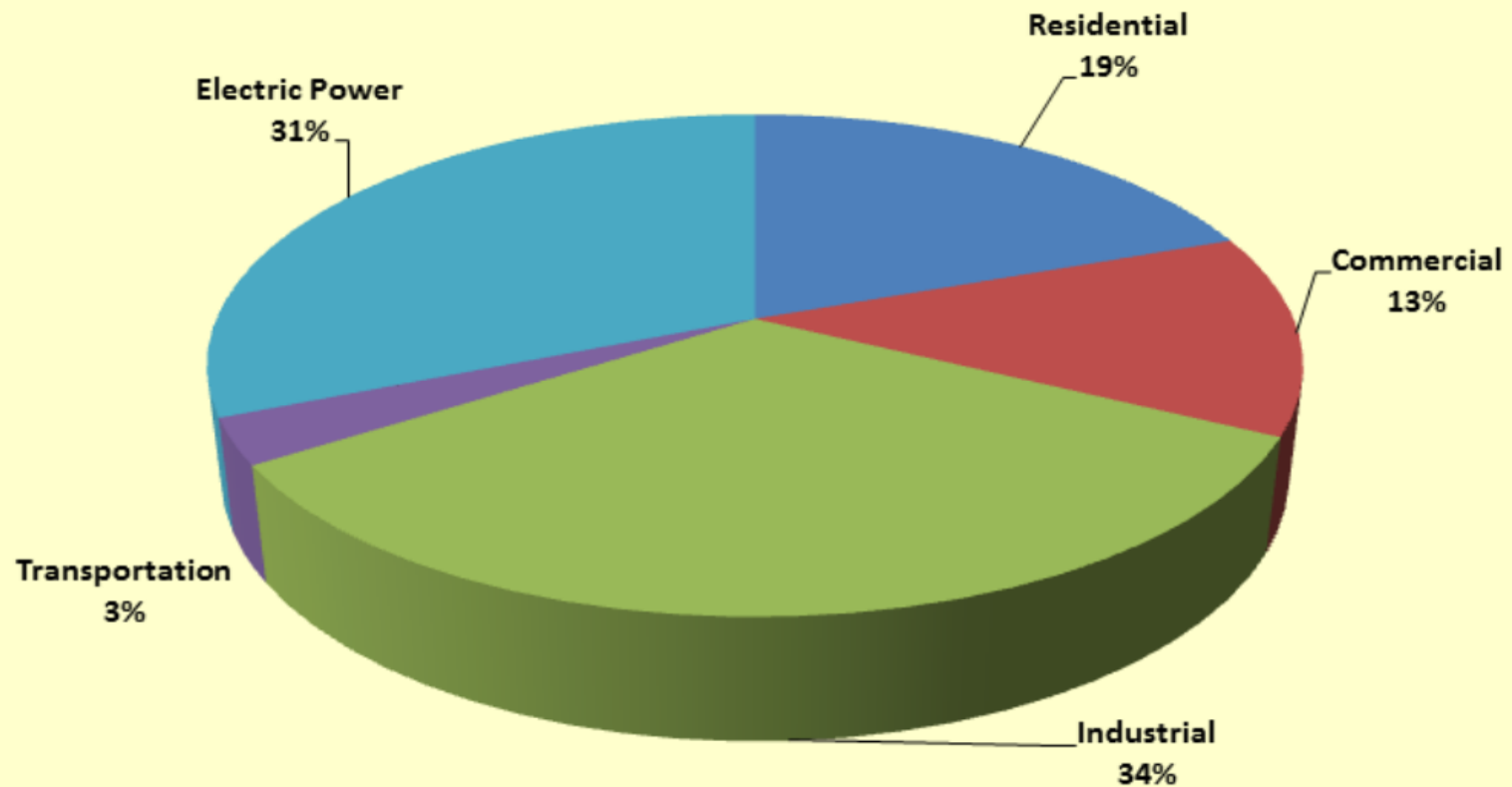
Source: Natural Gas Information, IEA, 2012

Natural Gas Uses in Egypt 2012/13



Natural Gas Consumption 46.3 MTOE

US Natural Gas consumption by sector 2011



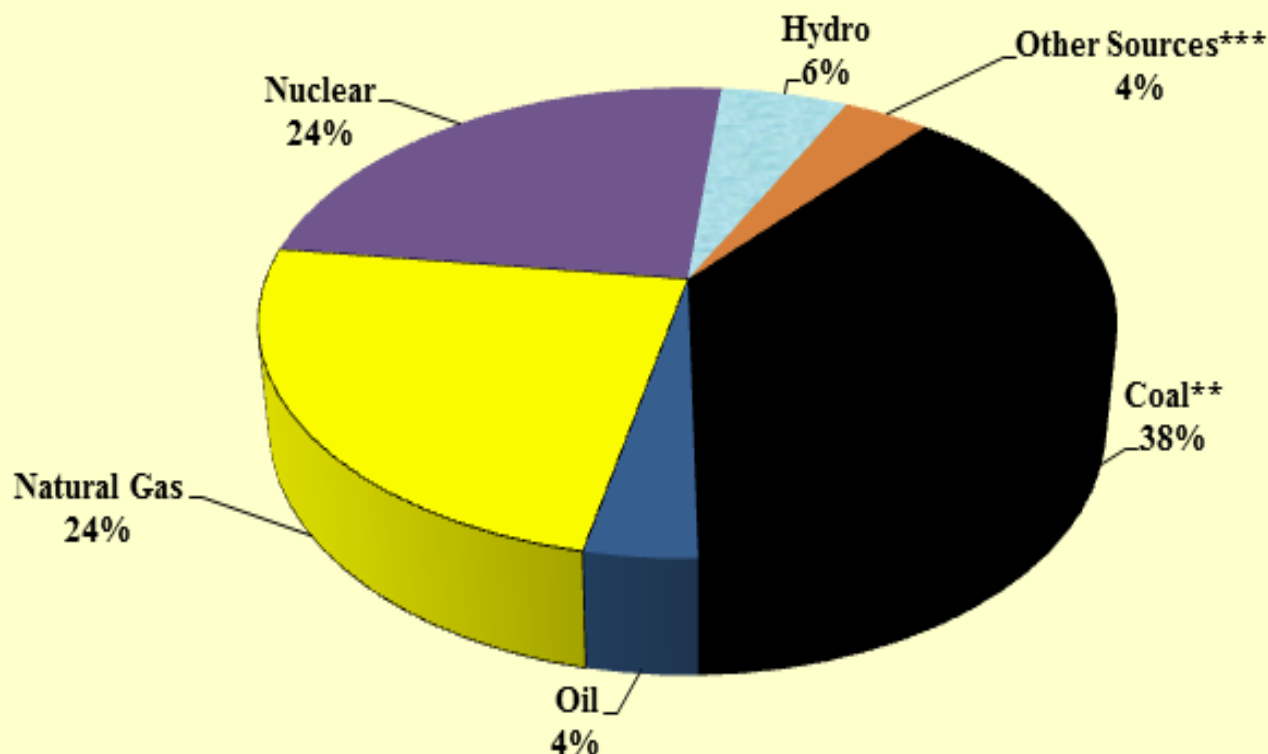
Source : Annual Energy Review 2011, DOE/EIA-0384(2011) | September 2012, www.eia.gov/aer

OECD vs Egypt

Electricity Generation

BEST PRACTICES

Electricity Generation by Fuel Type in OECD Countries 2012*



* Calculated.

** includes peat and oil shale .

*** includes biomass, waste, geothermal, solar thermal, wind, tide and others.

Natural Gas Technical Losses in Thermal Electricity Generation world wide 2012

Item	Unit	2012/13
(1) Natural Gas Consumption	MTOE	1167
(2) Total Thermal Electricity Generation	TWh	5100
	MTOE	439
(3) Efficiency	%	38%
(4) Technical Losses* (1) - (2)	MTOE	729
(5) Value of Natural Gas Losses	Billion \$	
Value of Natural Gas Losses**		355
Value of Natural Gas Losses***		304
Value of Natural Gas Losses****		89
Value of Natural Gas Losses*****		73

*Total OECD Gas Imports 649 MTOE in 2011- Natural Gas Information 2012.

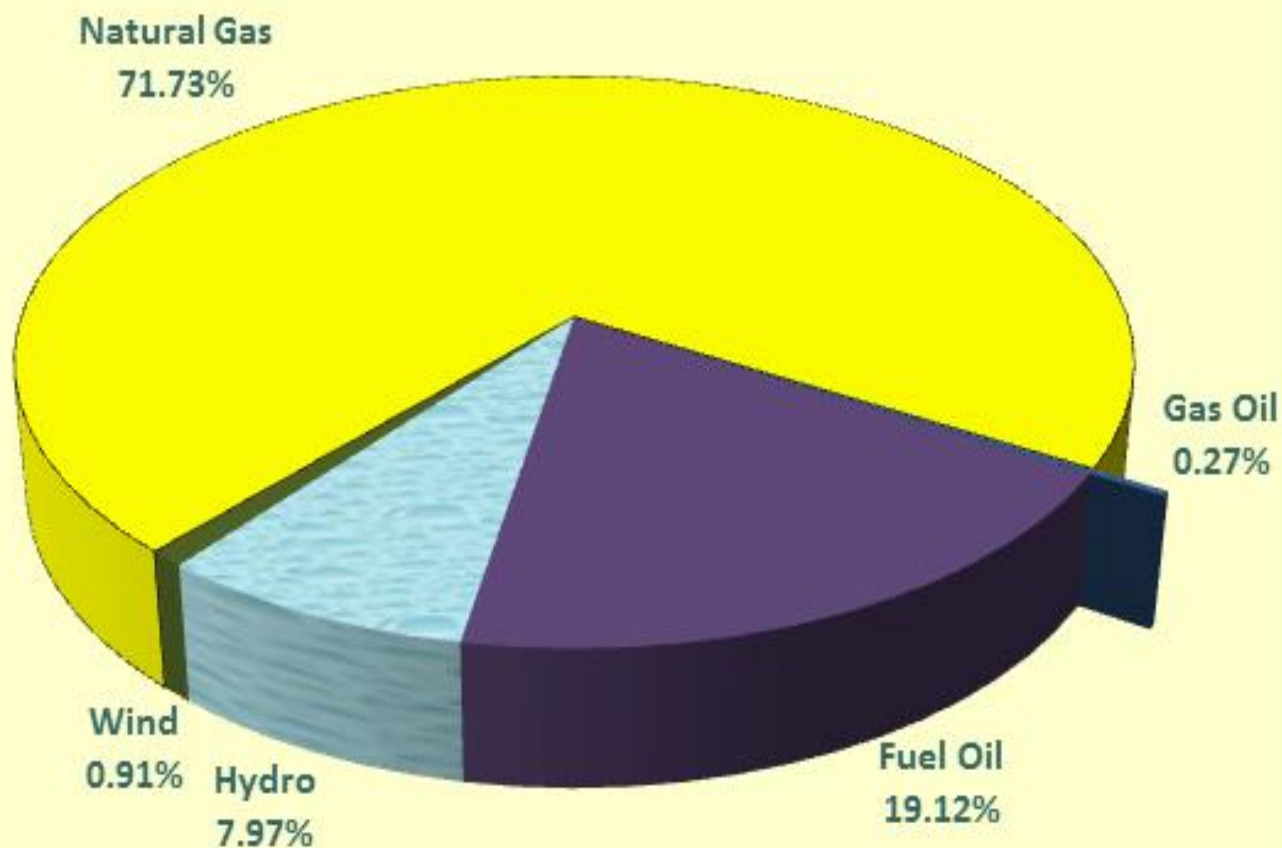
** According to Average German Import Price 11.03\$/MMBtu

*** According to UK NBP Price 9.46\$/MMBtu

**** According to US Henry Hub Price 2.76\$/MMBtu

***** According to Canada Alberta Price 2.27\$/MMBtu

Electricity Generation in Egypt 2012/13



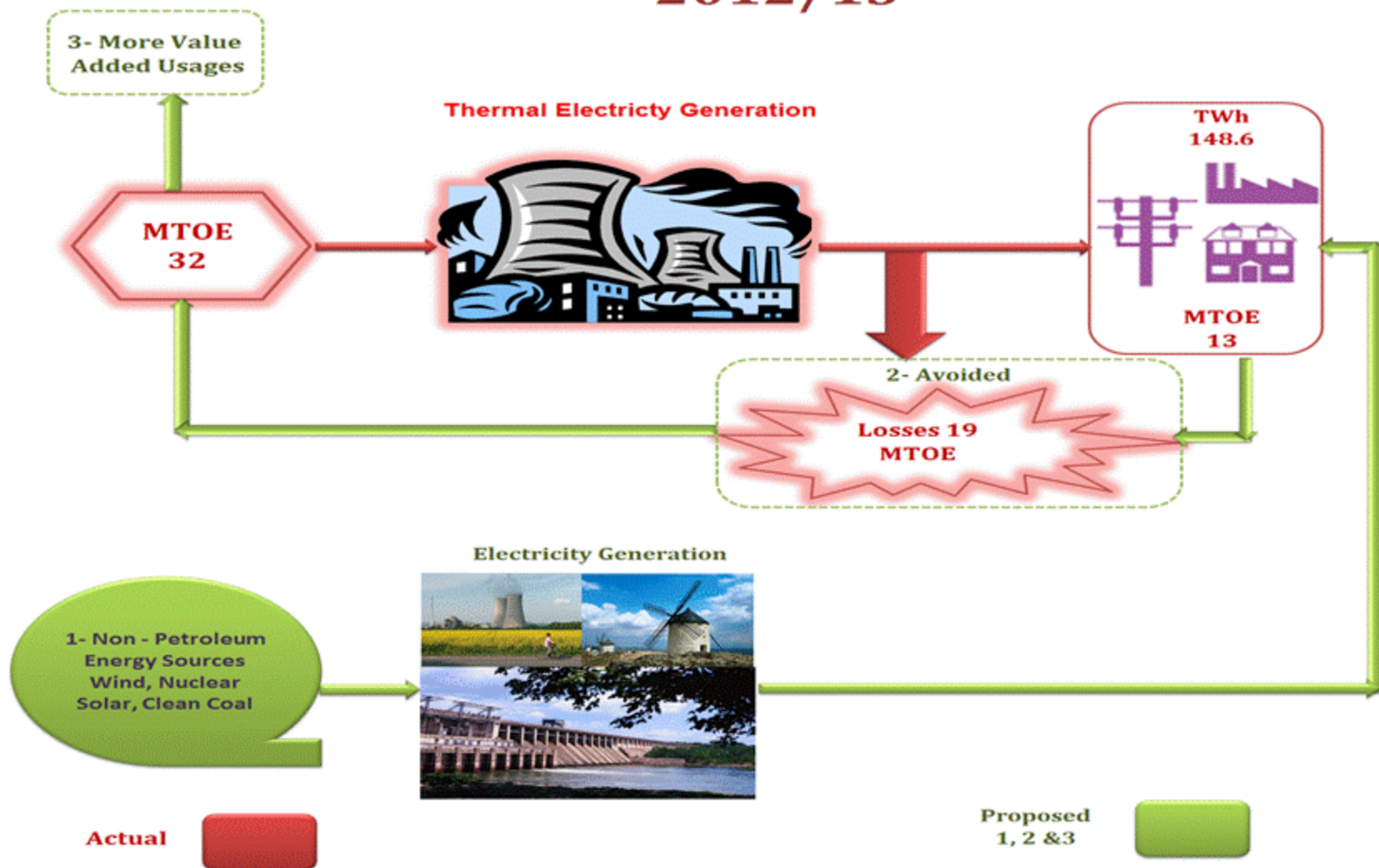
Total Electricity Generation 164 TWh

Technical Losses in Thermal Electricity Generation 2012/13

Item	Unit	2012/13
(1) Fuel Consumption		31.75
- Petroleum Products	MTOE	6.649
- Natural Gas		25.101
- Share %		
- Petroleum Products	%	21%
- Natural Gas		79%
(2) Total Thermal Electricity Generation	TWh	148.58
	MTOE	12.78
(3) Efficiency	%	40%
(4) Technical Losses (1) - (2)		19
Petroleum Products (21%)	MTOE	4
Natural Gas (79%)		15
(5) Value of Natural Gas Losses*	MS	3306

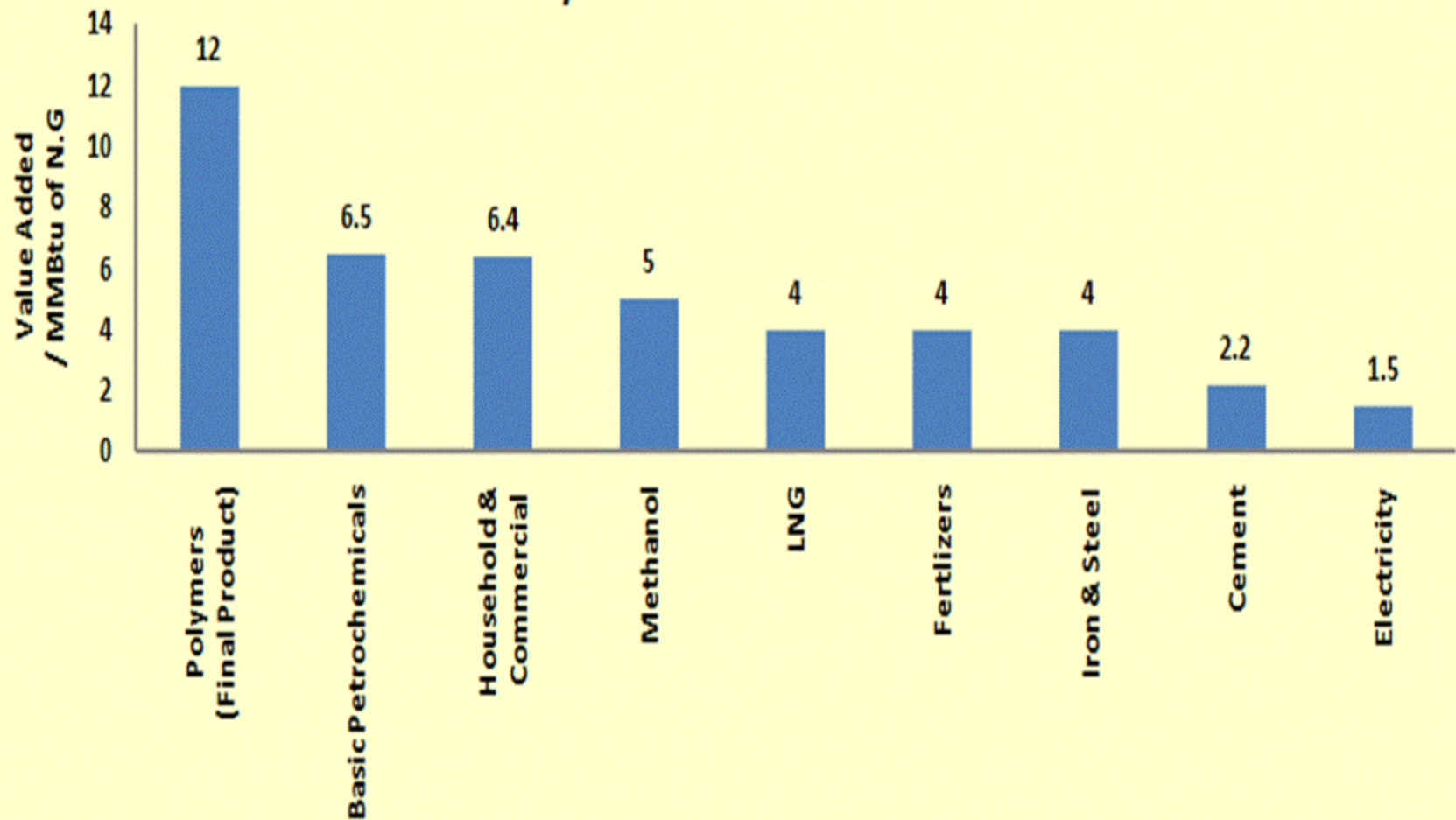
* Estimated by the author 5S/MMBtu

Thermal Electricity Generation Using Petroleum Energy 2012/13

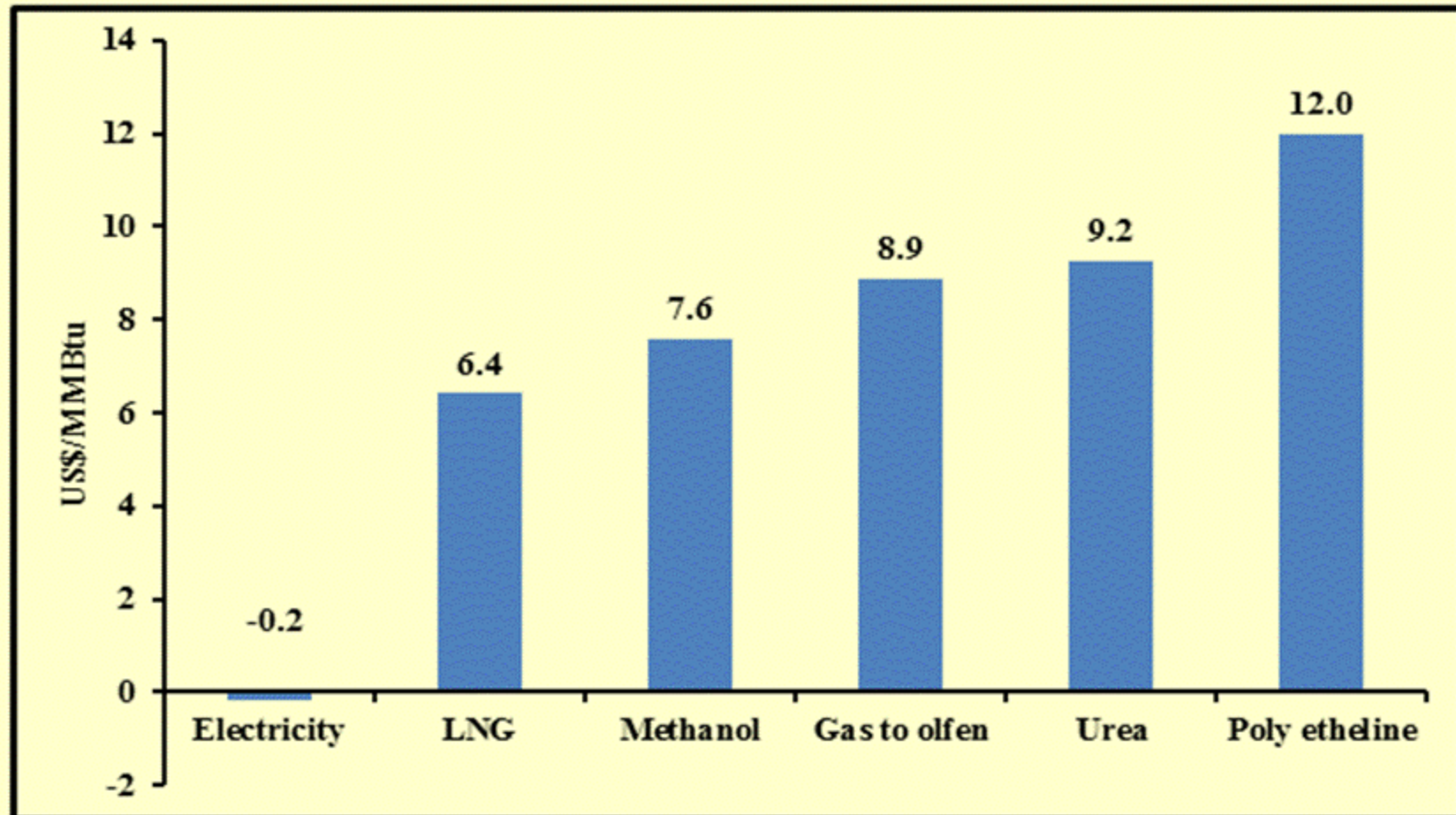


Value Added of Natural Gas Usage in Different Activities

Value Added/ Million BTU of Natural Gas



Value Added of Natural Gas Usage Different Activities
Value Added / Million BTU of Natural Gas
in 2014



Conclusion

- ♦ Egypt has its strategy for Energy Security depending mainly on Best Practices World-wide:
 - 1) Diversifying Energy Sources.
 - 2) Revisit the Priorities of Natural Gas Utilization.
- ♦ Natural gas is more valuable to be burned in electricity generation because the value of NG technical losses is higher than the cost of using an alternative energy source instead of NG.
- ♦ Natural Gas should be replaced by other alternative energy sources as much as it is viable technically and economically according to its Value Added.

Conclusion (Cont.)

- ◆ Now, Priorities of Natural Gas Utilization has its Strategic Direction to be reviewed. The decision aims to allow spare more gas for the other categories of consumers that cannot shift away from gas for either technical or economic reasons which should be allocated according to its Value Added.

Recommendations

Work to be Undertaken:

- ◆ Consideration of this topic at the annual sessions of the Working Party on Gas.
- ◆ Exchange information, experience, technical and economic knowledge and preparation of reports and studies on such specific issue world-wise and country - wise.

Thanks