Country Report Presentation: Pakistan

Energy Crisis and Solution

By

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Pakistan's Capital: Islamabad

Faisal Mosque Islamabad

K-2: the second tallest peak

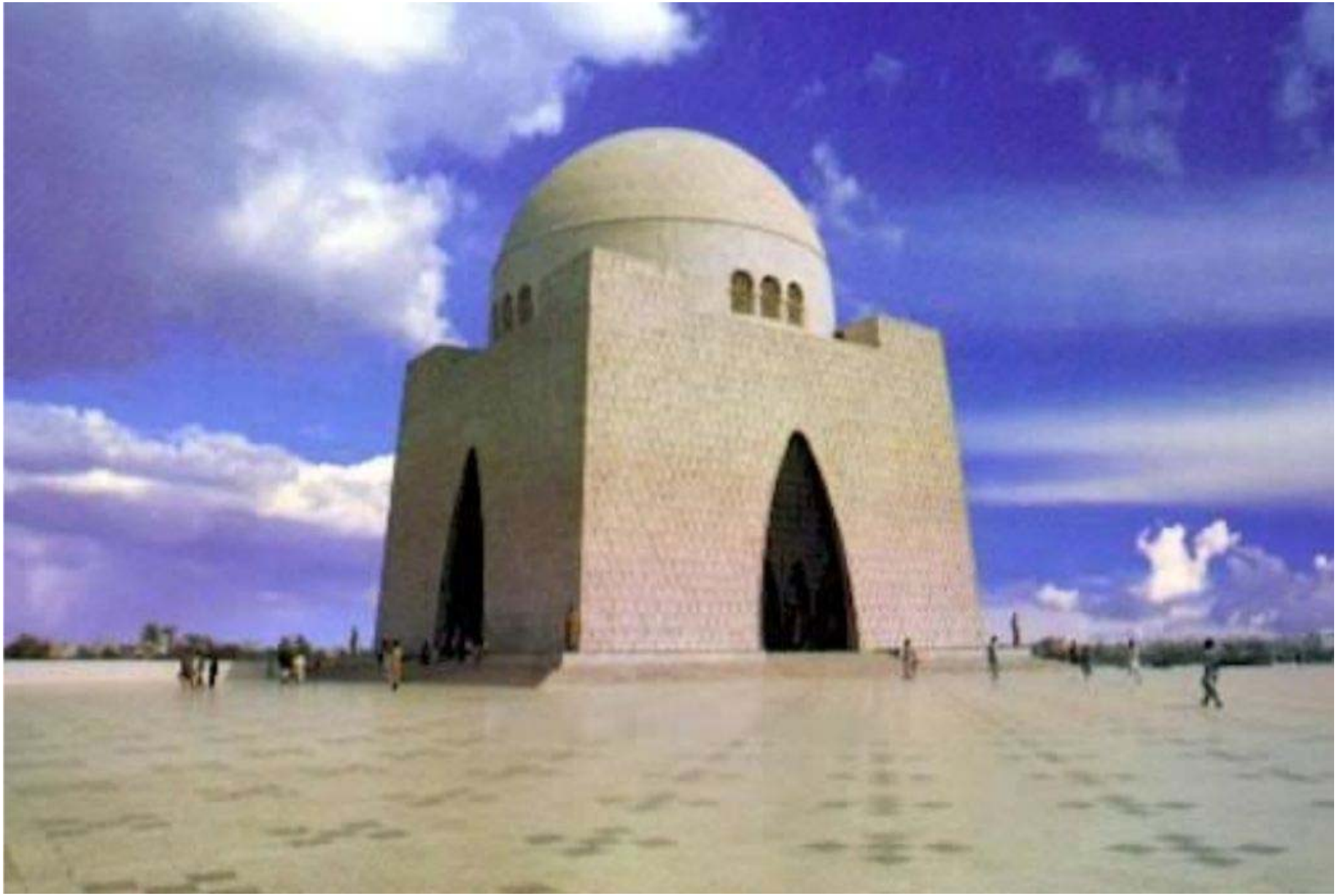
Karakuram mountains in North Pakistan

Mahdond Lake in Upper swat valley in north of Pakistan

The Kunar river in kaghan Valley North Pakistan

Spring time in Chitral, North Pakistan

Tomb of founder of Pakistan Quaid Azam M. Ali Jinnah in Karachi

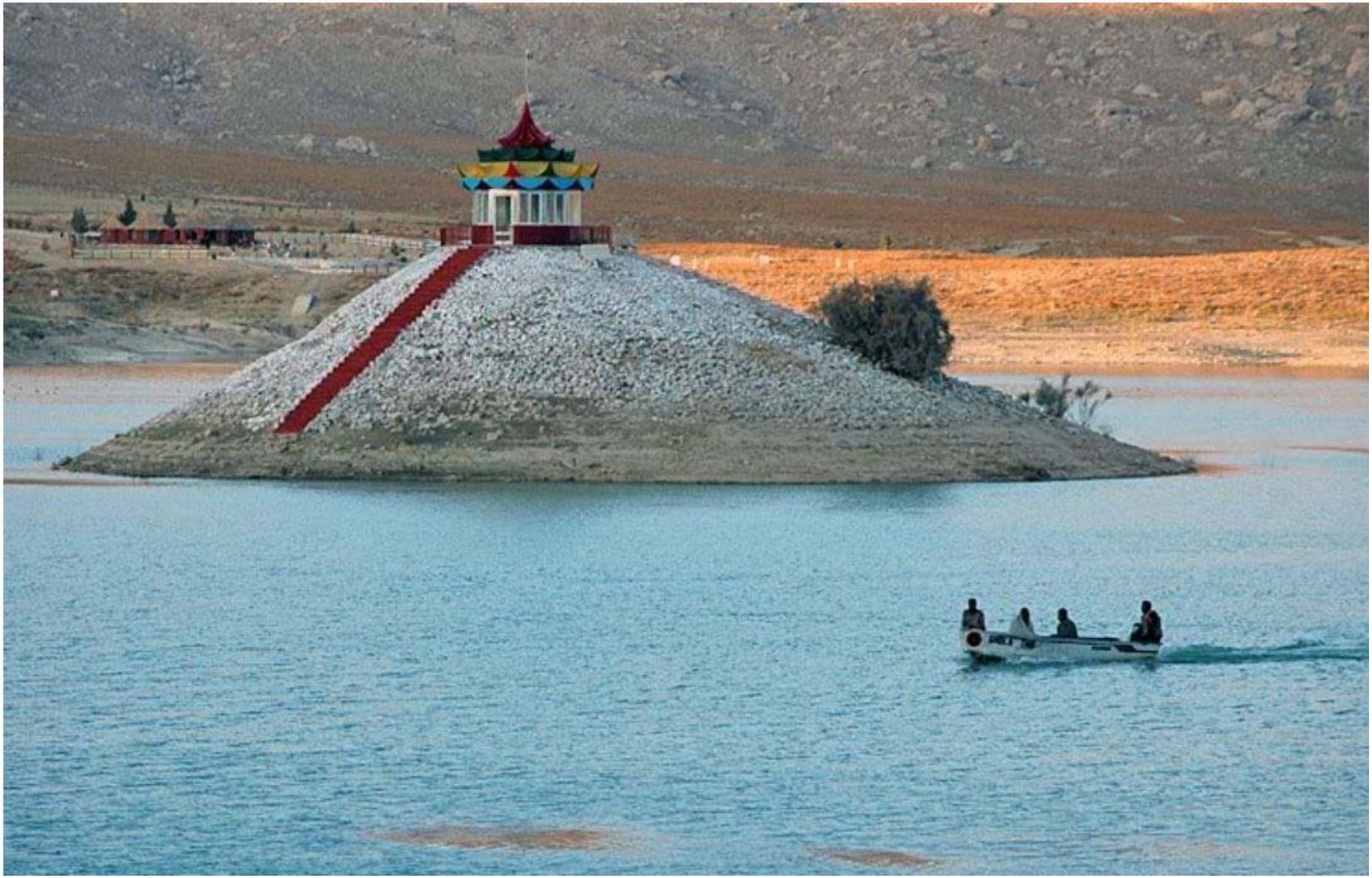


Sunset at Clifton Beach, Karachi

Pakistan Tower in Lahore

Badshahi mosque at night in Lahore

Hanna lake in quetta Balochistan



Tarbela Dam with 3,478 MW Generation Capacity

1000 MW Mangla Dam Hydel Plant

Thar desert in Sind possessing 175 billion tonne of Lignite

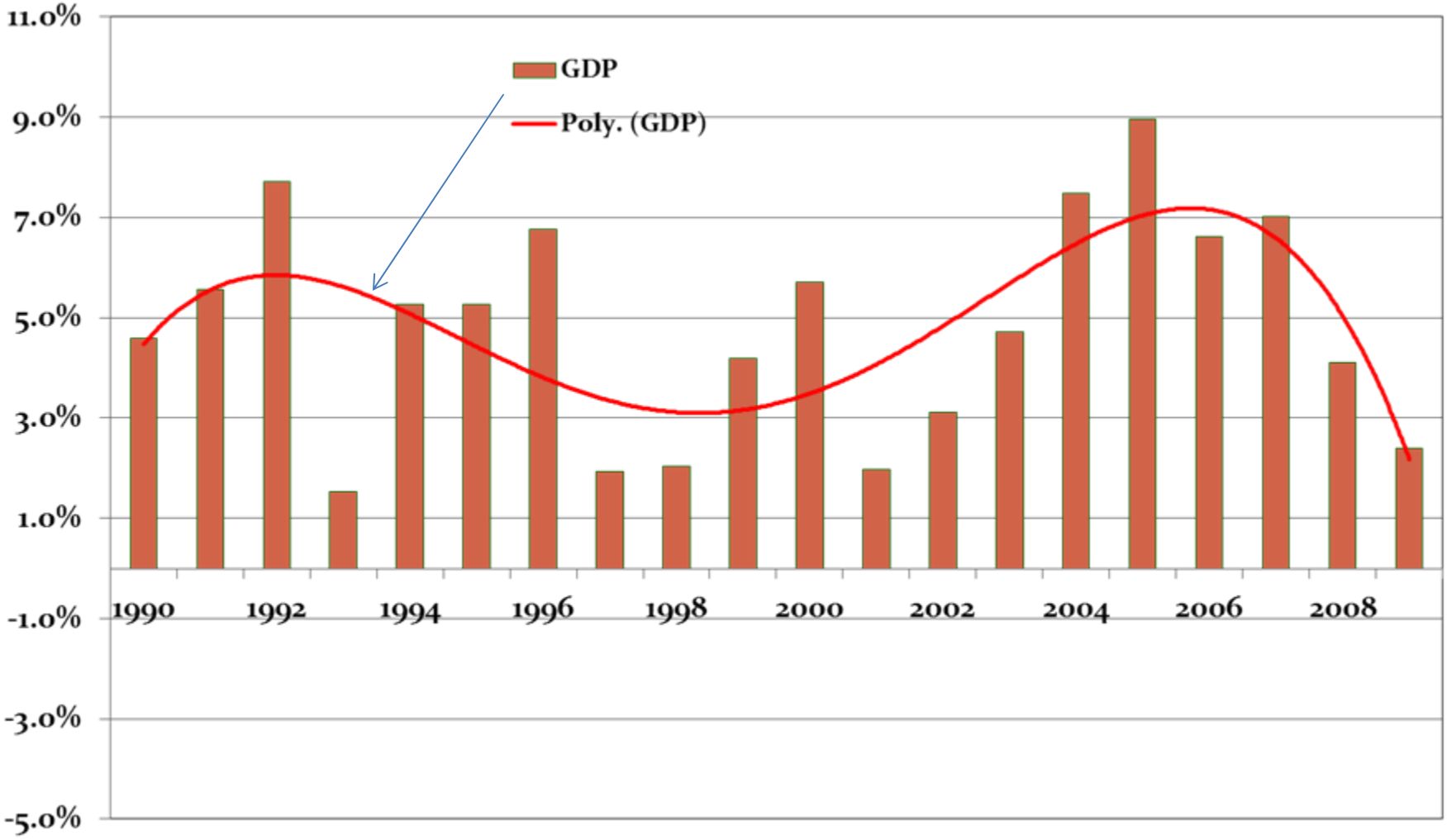
Pakistan possesses all the Four Seasons with Extremes

- The hottest temperature ever recorded in Asia and the Fourth highest ever in the world was in Mohenjo-daro, Sindh 53.5 ° C (128.3 ° F) on May 26, 2010 and at least 18 people died as a result.
- Apart from scarcely populated glacial regions in North where temperature falls as low as -50 ° C, the lowest temperature in inhabited area was recorded in Kallat in Balochistan a few years ago, which was -29 ° C.

First Japanese manufactured nuclear turbine under license from GE is installed at KANUPP installed in 1972

This turbine is still in perfect operating condition.

Pakistan's Economic, Energy & Electricity Growth (1990 - 2009)



Sources: Pakistan Energy Yearbook 2008, HDIP, Pakistan Economic Survey 2009.

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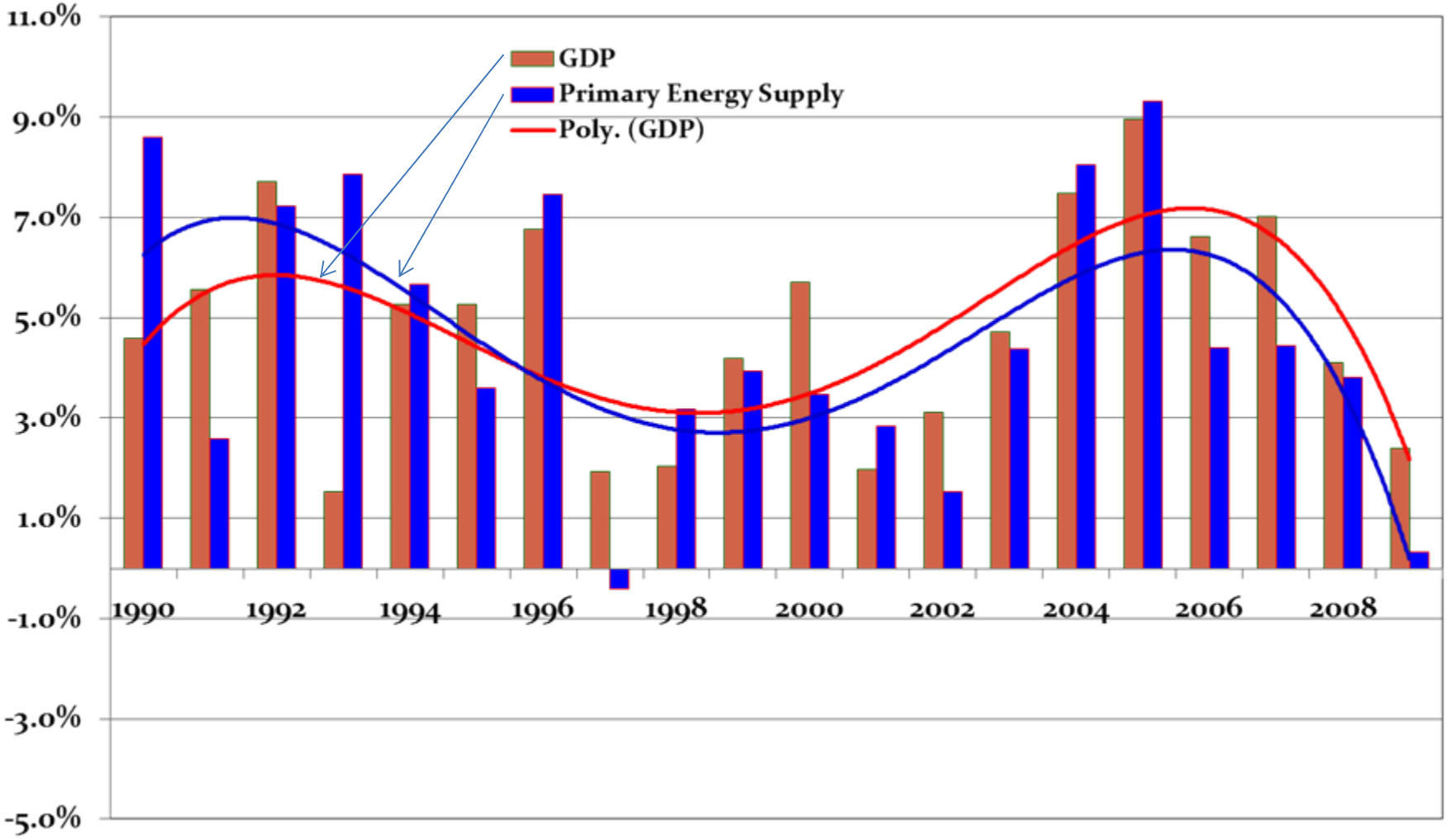

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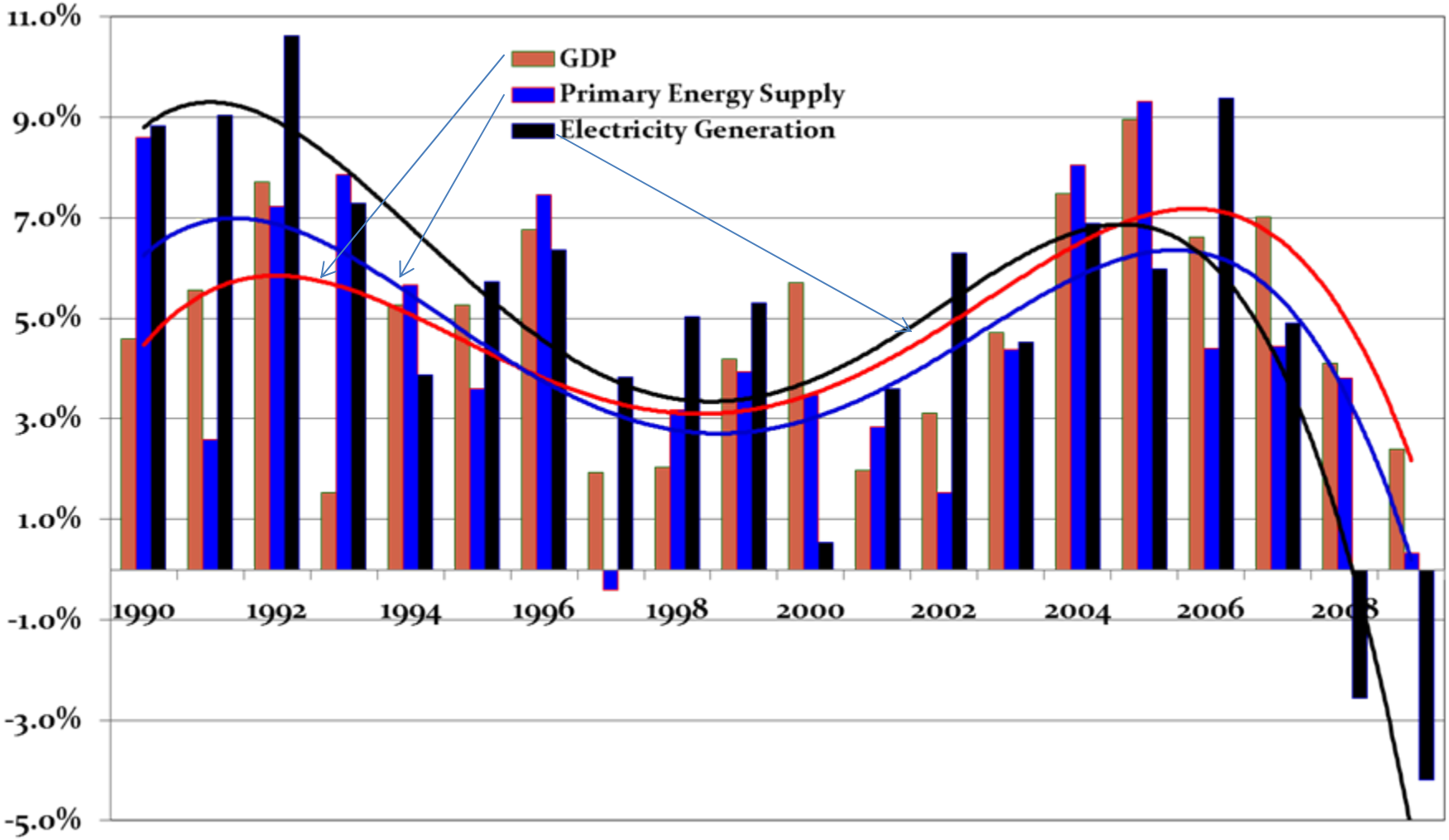


The close relationship between economic, energy and electricity growth shows the importance of sufficient and affordable electricity.

Sources: Pakistan Energy Yearbook 2008, HDIP, Pakistan Economic Survey 2009.

Pakistan's Per capita Energy Consumption is very low

Region/Country	Million BTU/Capita
World average	72
Singapore	477
Canada	427
USA	334
Europe	146
Japan	179
Middle East	127
China	56
Central & S. America	53
Asia & Oceana	43
India	16
Pakistan	**14**

Fossil Fuel Resource Potential of Pakistan

(as of 30 June 2010)

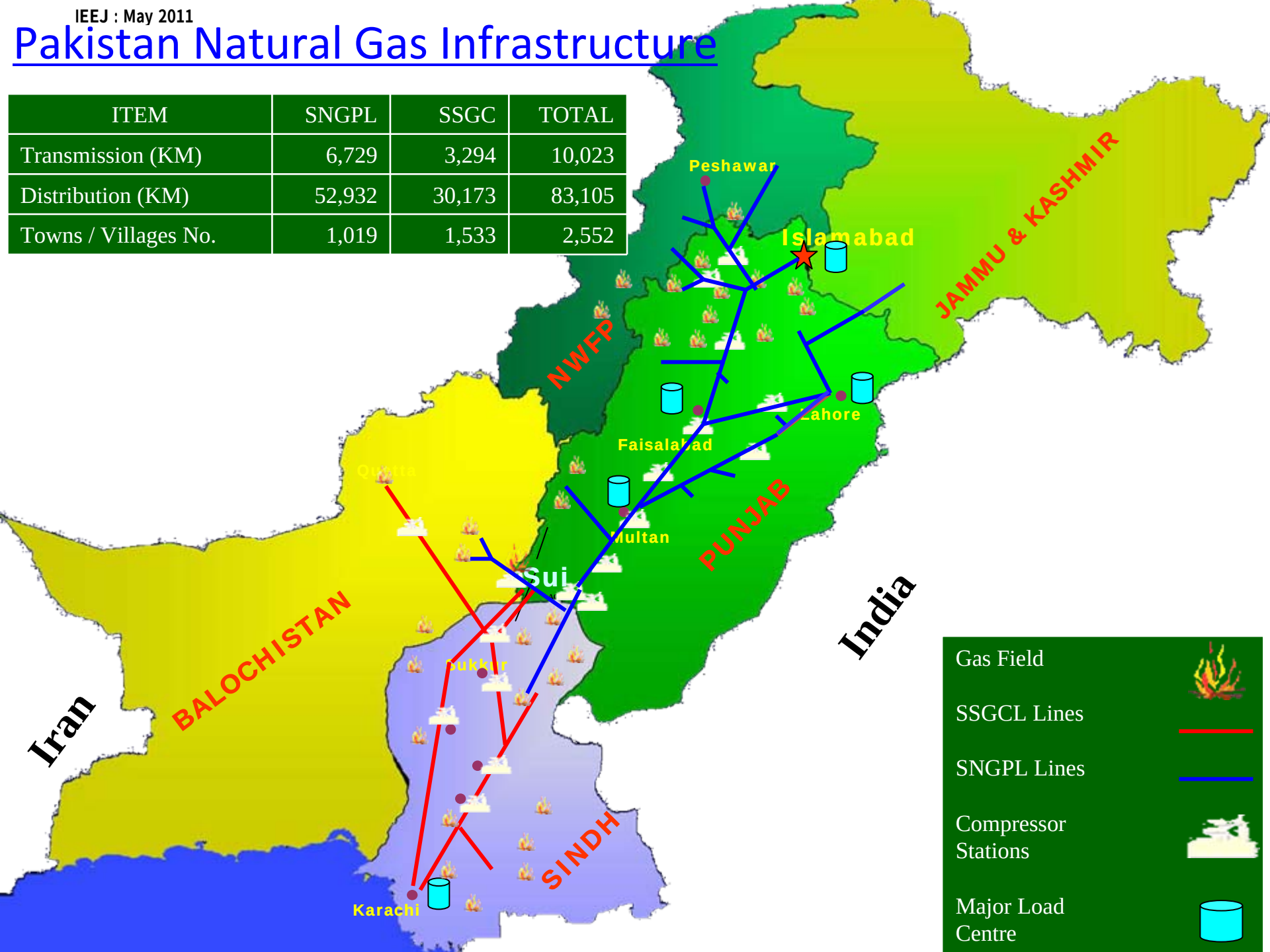
(MTOE)

	Oil	Natural Gas	Coal
Resource potential	3,622	6,849	78,450
Proven recoverable reserves	130	1,067	845
Cumulative production, so far	88	568	~89
Remaining recoverable reserves	41	499	797
Annual production	3.3	29.3	1.6
Reserves to production ratio	12 years	17 years	~528 years

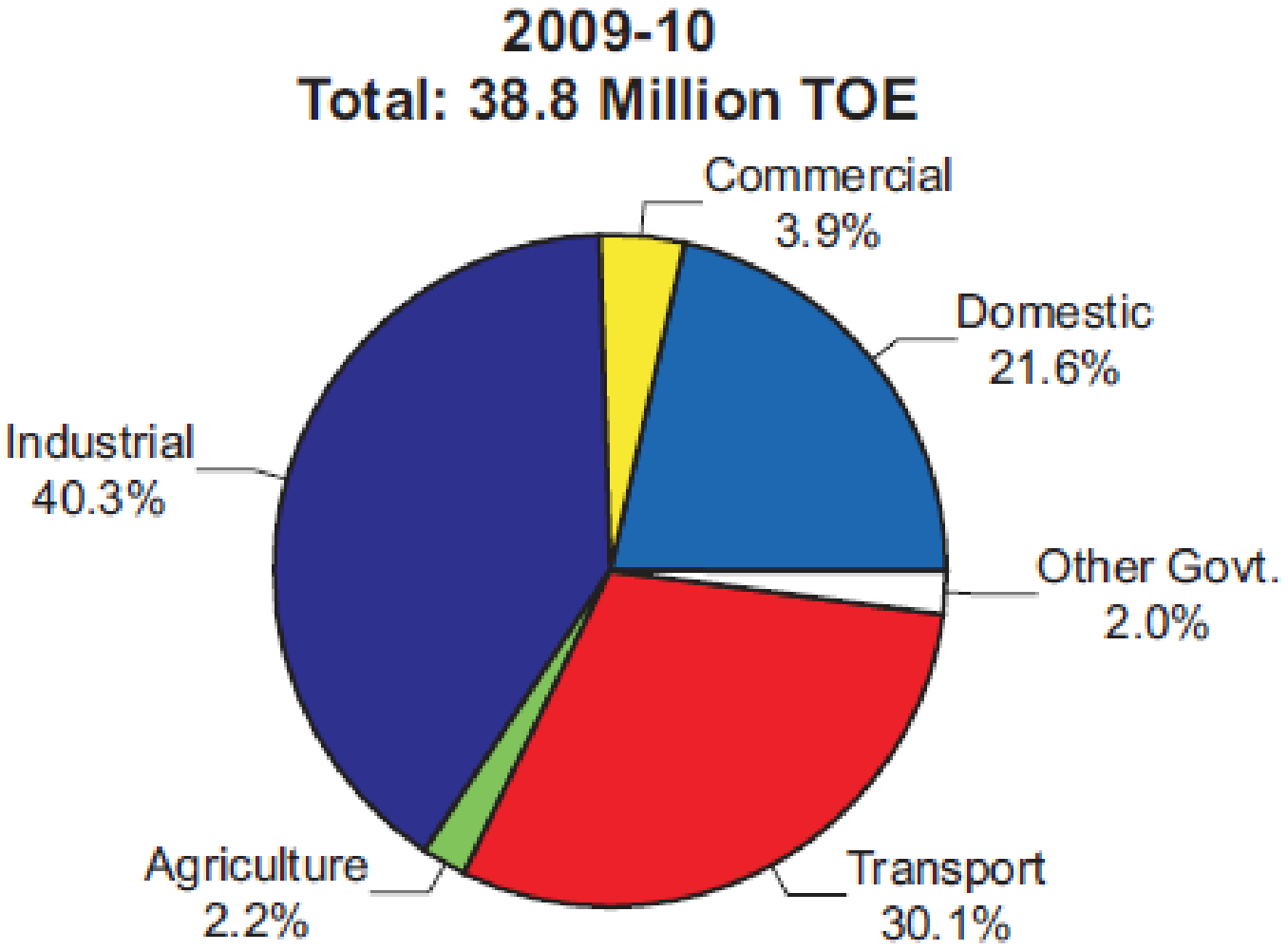
Source: Pakistan Energy Yearbook 2010

Pakistan Natural Gas Infrastructure

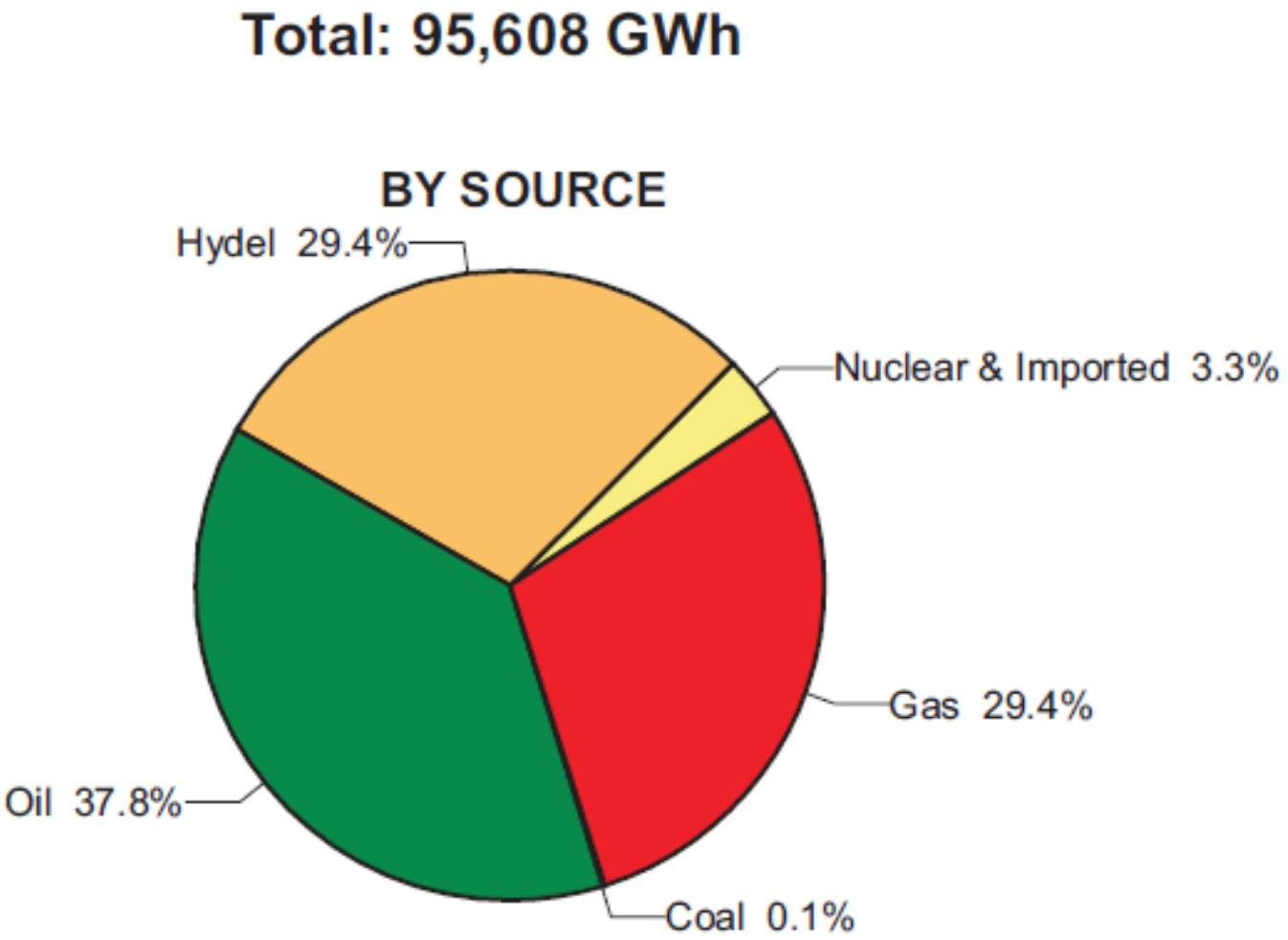
ITEM	SNGPL	SSGC	TOTAL
Transmission (KM)	6,729	3,294	10,023
Distribution (KM)	52,932	30,173	83,105
Towns / Villages No.	1,019	1,533	2,552



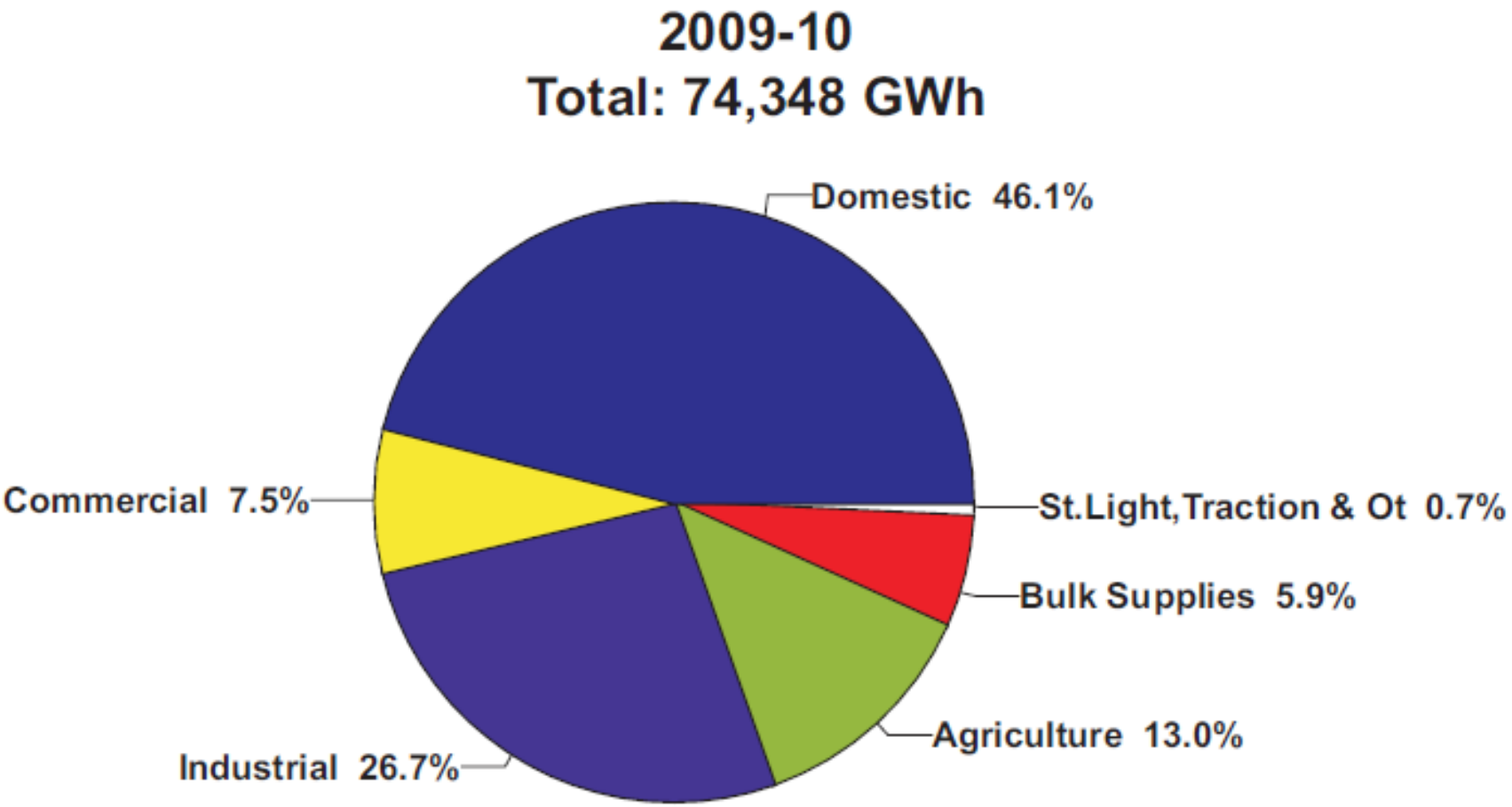
Comm. Energy Consumption by Sector



Electricity Generation 2009-10



Electricity Consumption by Sector



Sectoral Electricity Consumption Mix in 2004 and 2010

Sector	2003-04	2009-10
Domestic	45.0%	46.1%
Commercial	6.4%	7.5%
Industrial	30.2%	26.7%
Agriculture	11.6%	13.0%
Others	6.8%	6.7%

Pakistan Energy Security Plan 2030

	Nuclear	Hydel	Coal	Renewable	Oil	Gas	Total
Existing (2005)	**400**	**6,460**	**160**	**180**	**6,400**	**5,940**	**19,540**
2010	-	1,260	900	700	160	4,860	7,880
2015	900	7,570	3,000	800	300	7,550	20,120
2020	1,500	4,700	4,200	1,470	300	12,560	24,730
2025	2,000	5,600	5,400	2,700	300	22,490	38,490
2030	4,000	7,070	6,250	3,850	300	30,360	51,830
Total	8,800	32,660	19,910	9,700	7,760	83,760	162,590

Source: Energy Security Action Plan, Planning Commission of Pakistan, 2005

Electricity Generation Capacity (MW)

	Installed As In 2005	Planned for 2010**	Existing In 2010
Hydro	6,460	7,720	6,480
Oil & Gas	12,340	17,360	13,204
Coal	160	1,060	150
Nuclear	400	400	400
Renewables	180	880	2
Total Capacity	**19,360**	**27,420**	**20,258**
Winter Capacity (actual)	12,400	19,636	13,832
Summer Capacity (actual)	15,600	23,536	17,878
Demand (Peak Load)	14,621	21,426	19,257*

* In 2005, was projected to be 17,904 MW.

** As in Medium Term Development Framework, 2005.

Electricity Generation - Capacity Factors
WAPDA/ NTDC System

Type	No. of Plants	Capacity (MW)	Capacity Factor (%)			
			2005-06	2006-07	2007-08	2008-09
Hydro	14	6,444	54%	56%	51%	49%
IPPs	17	5,923	53%**	63%	64%***	66%
GENCOs	10	4,779	54%	52%	49%	47%
Nuclear	1	325	76%	68%	86%	37%
Total	**42**	**17,471**	**54%**	**57%***	**56%***	**54%***

* **Had this been 70%, load-shedding would not be so severe.**

** Due to lower demand?

*** Due to fuel shortage?

Source: GM (Planning), NTDC

There is a need to improve the Capacity Factor.

Incentive bonus related to production is one of the solutions.

Transmission & Distribution Losses and Theft (2007-08)

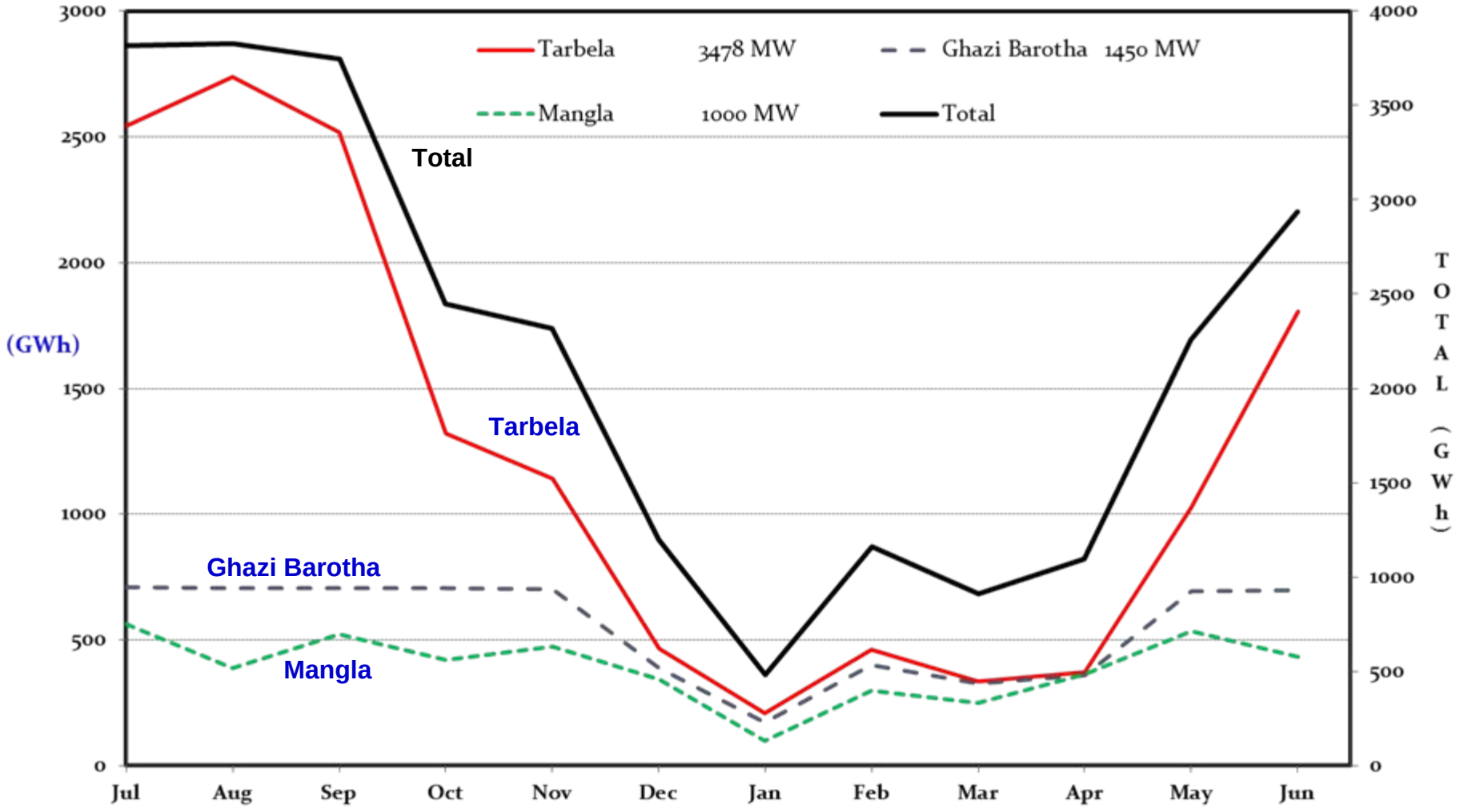
DISCO	Transmission Losses (%)	Distribution Losses (%)
LESCO	6.6%	12.8
GEPCO		11.1
FESCO		11.2
IESCO		10.3
MEPCO		18.5
PESCO+TESCO		34.5
HESCO		35.9
QESCO		20.8
Total WAPDA		18.5
KESC	5.1%	29.0
OECD Countries	Total: 7 – 8 %	

Areas with greater private industrial load

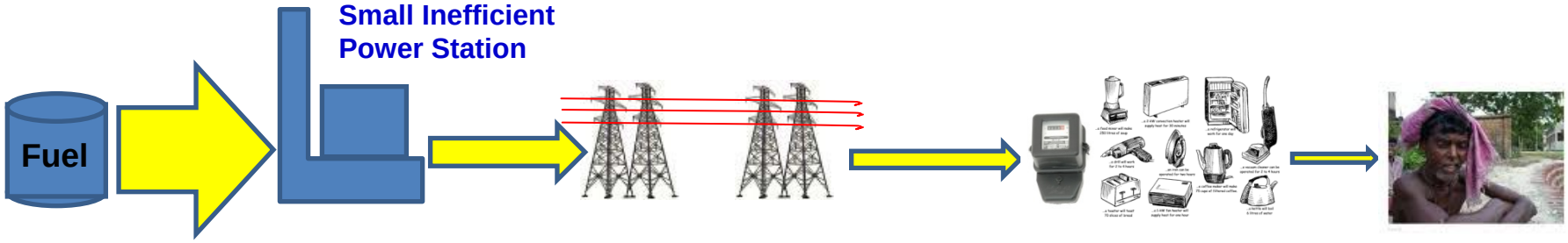
The high losses need to be reduced.

i) Up-gradation of transmission & distribution system; ii) Electricity consumption bills on internet and iii) Incentives to personnel of better performance grids and publicity of worst performing grids.

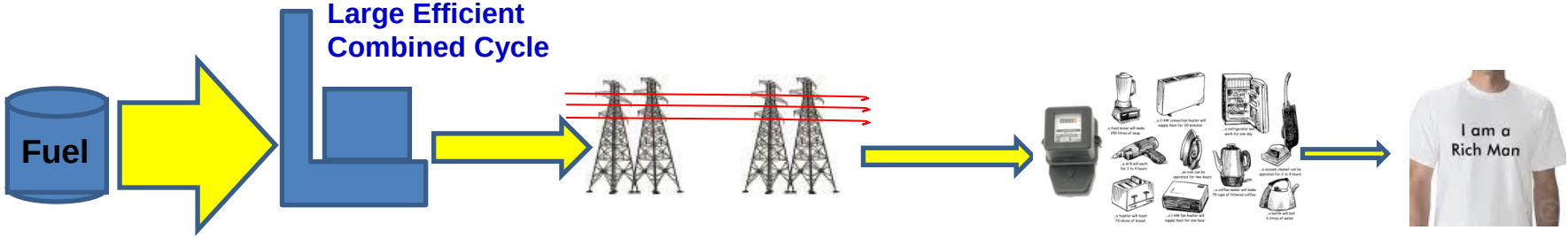
Seasonal Variation of Hydel Generation (2007-08)



Energy Losses in Power System (Generation, Transmission, Distribution & Consumption) and Improvements Possible



Energy MTOE (2009)	**22.3**	**Loss 66%**	**7.5**	**Loss 23%**	**5.7**	**Loss 30%-50%**	**2.9 – 4.0**
Achievable	**11.1**	**40%**	**6.7**	**8% - 10%**	**6.0**	**30%**	**4.0**



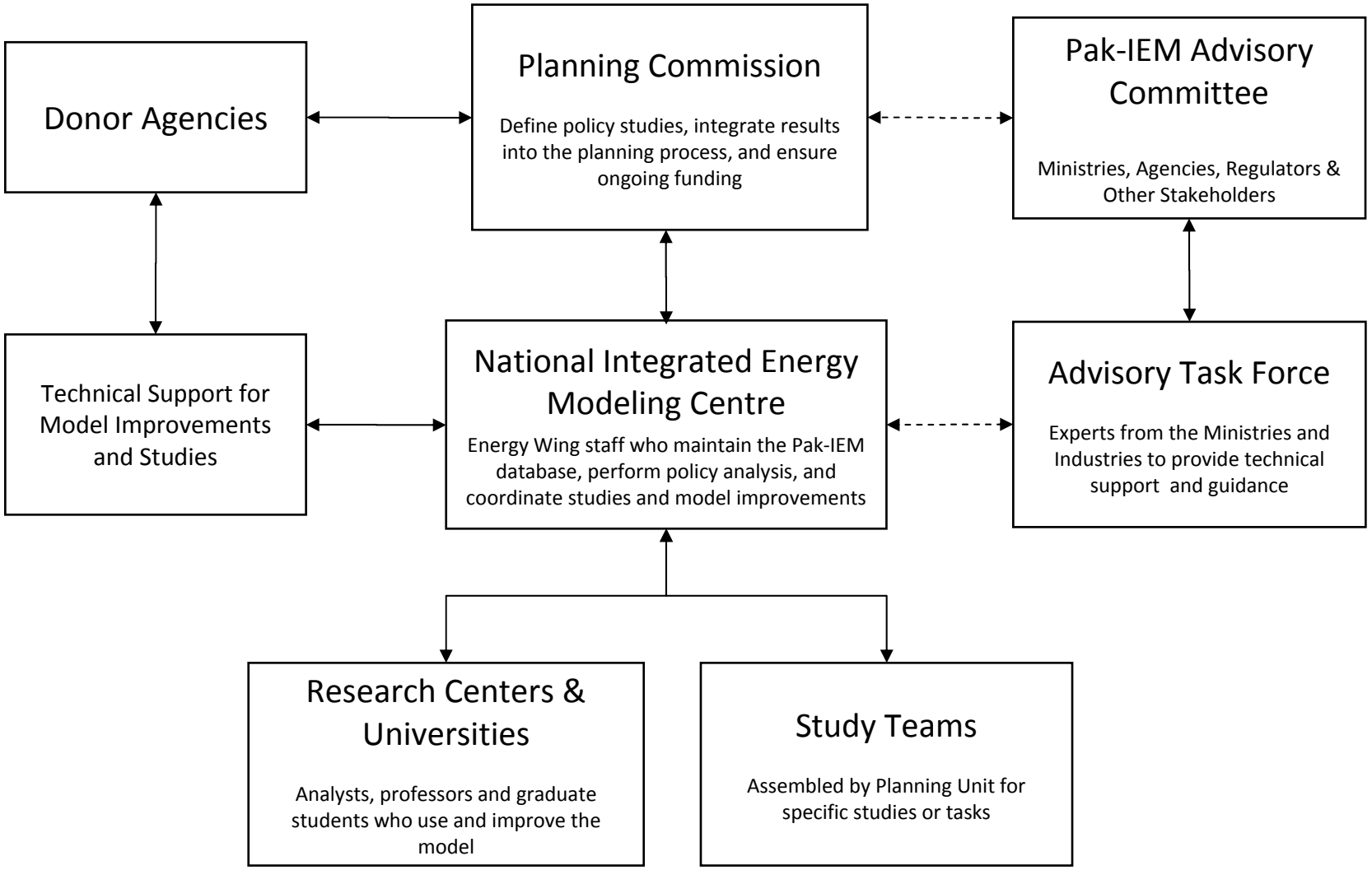
With half the fuel consumed, the circular debt phenomena could have been avoided.

Pakistan Integrated Energy Model (Pak-IEM)

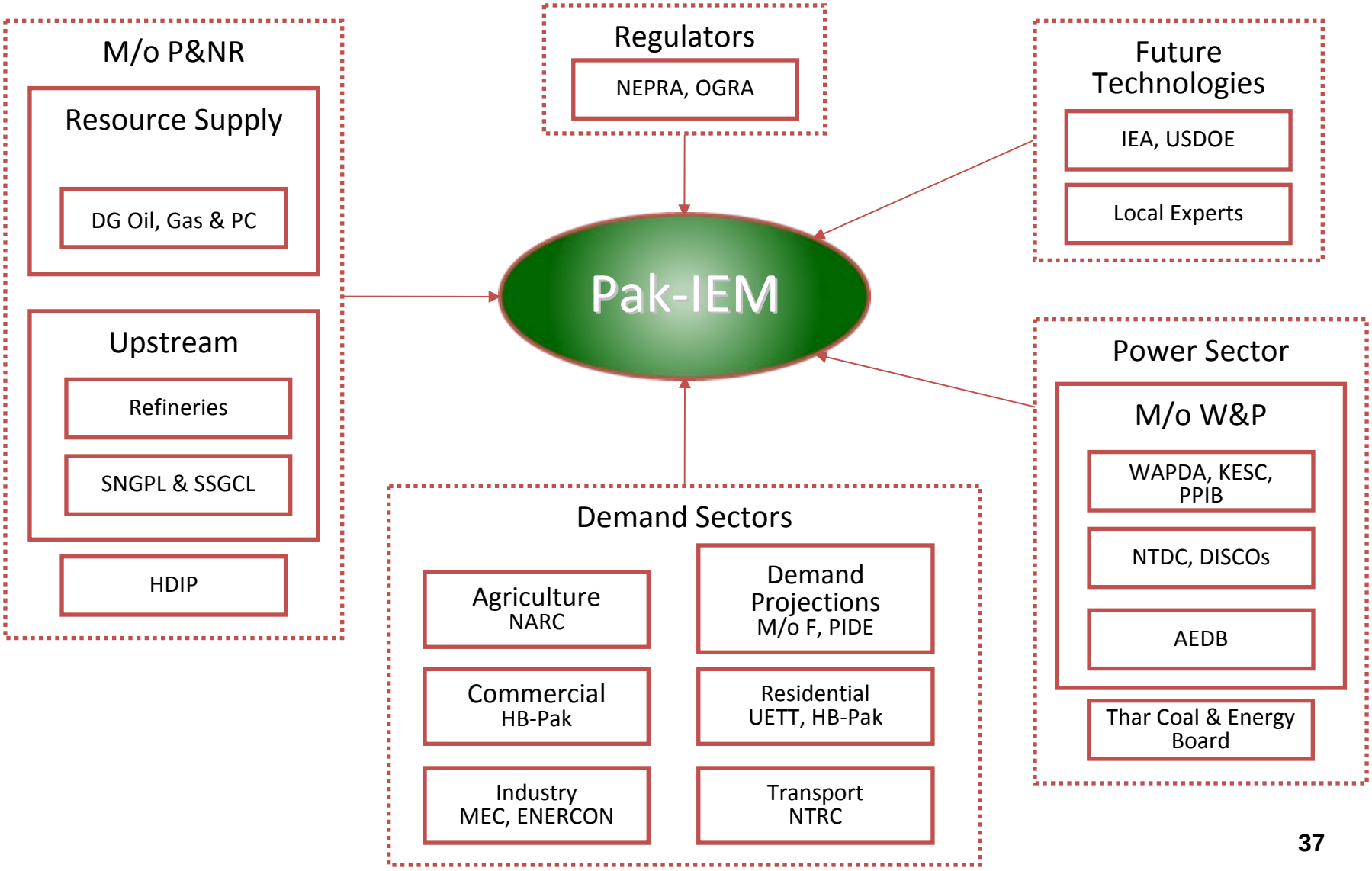
Objective

To develop a sustainable planning capability employing an integrated energy system model that will enable a national team of experts to assess impacts of various strategies for meeting future energy requirements in an optimal manner

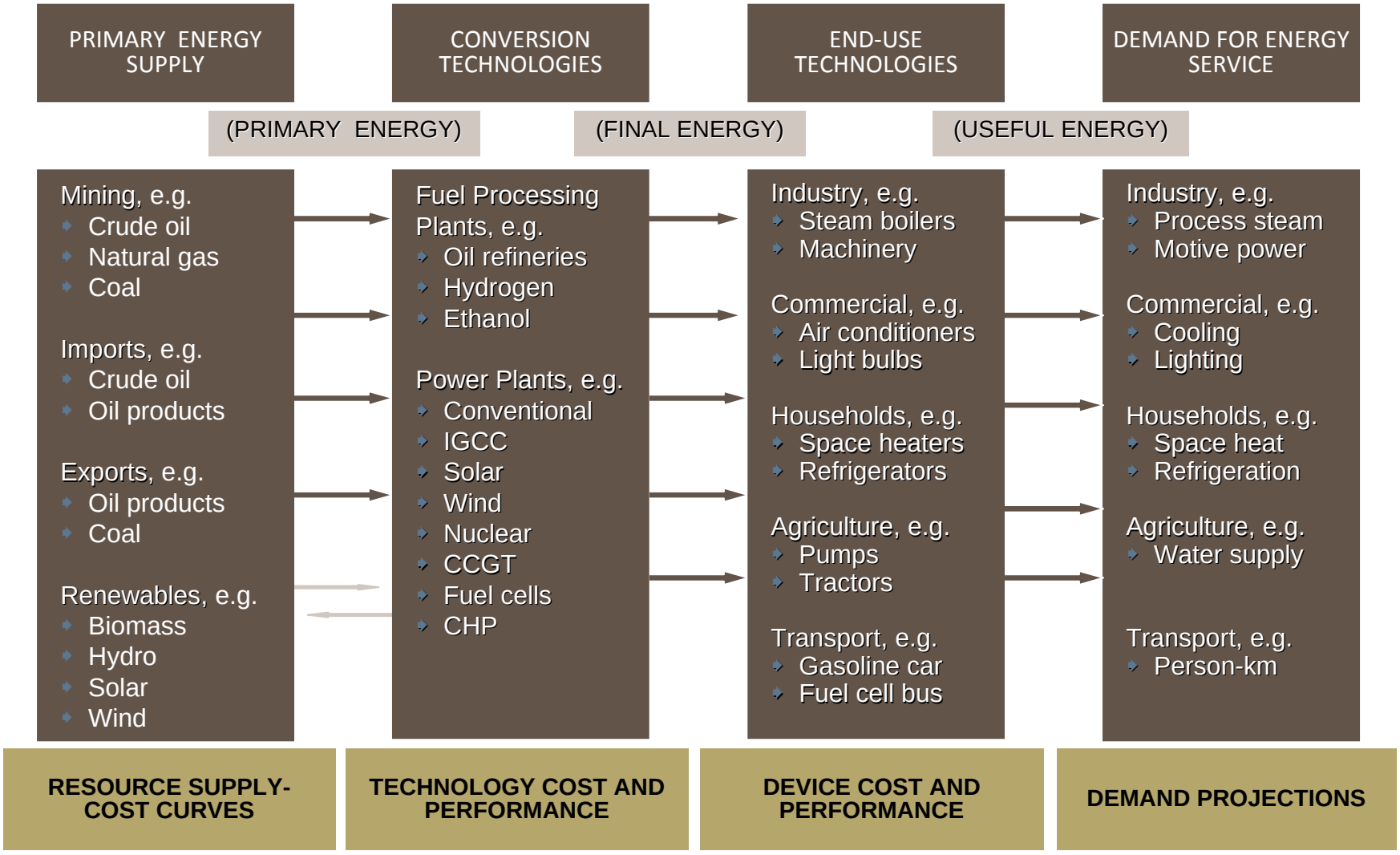
Pak-IEM: Institutional Structure



Pak-IEM: Contributing Stakeholders



Pak-IEM: Reference Energy System



Current Energy Crisis: Causes

- Weak planning & Implementation
- Unfavorable policies/ environment for private investment due to past policy reversals.
- Indecisiveness of the relevant departments causing delays.
- Lack of coordination among stakeholders.

Current Energy Crisis: Bottlenecks

- Many players involved in Thar coal development.
- Delay in implementation of mega hydel projects.
- Single supplier for nuclear power technology/ projects (China).

Current Energy Crisis: Short Term Measures

- Immediately Implement Energy Efficiency measures
- Campaigns for energy conservation
- Improve Fuel (Oil & Gas) supply by addressing Circular Debt problem.
- Control Electricity Theft and improve Tariff regime.

Current Energy Crisis: Long Term Measures

- Rationalize gas prices and its inter-sectoral use.
- Develop Base Load Capacity based on Hydel, Coal and Nuclear power.
- Discourage use of Oil for power generation.
- For credible balance between demand and supply, develop integrated energy modeling system.
- Supply side should be kept consistent with the expected national growth.
- Involve private sector in energy policy formulation.
- Close Coordination among various stakeholders in the energy sector
- Market forces to work in the Energy sector with strong regulator.

Expectations from The Training Course

- Pakistan is going to establish Pakistan Energy Research & Information Center
- We will appreciate if Japan can help us in its establishment
- What is experience of Japan in this area

Thank You

ありがとう (Arigatō)

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