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Global Energy Security and India's Energy Diplomacy

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 - (A) Security
 - (B) Stability
 - (C) Sustainability

1. What is Energy Security ?

What is Energy Security?

- Assured and, where possible, exclusive access to energy resources at affordable prices to obtain sustainable economic growth rates and national economic development.

Why are there concerns over Energy Security?

- Energy security is essential to achieve the economic **growth rates** of over 8-10% p.a. to which the nation is committed.
- High global demand and attendant supply constraints, as also geopolitical developments, are continuously pushing up oil & gas **prices**.
- With supply constraints, there is considerable international **competition** to secure these resources.
- National policies for Energy Security have to be compatible with concerns regarding climate change, particularly in regard to Greenhouse Gases.

2. Global Demand/Supply Scenario

- Global energy mix:
- Most of the **world's energy** comes from hydrocarbons (oil & gas) which account for 65% of the world's energy requirements. While oil constitutes 42% of the global energy mix, the other sources of global energy are: coal (24%), natural gas (22%), nuclear energy (6%), and renewable and non-conventional sources (7%).
- Over the last 30 years, **global energy demand** increased by 95%; over the next 20 years, it is expected to increase by 60% :
 - * Oil demand by 42%
 - * gas demand by 97%

This will be 50% more than the oil consumed in 2001, and six times more than global consumption in 1960.

Future Projection of Energy Demand

- Global Energy Demand will increase from 480 Quadrillion BTU in 2005 to 600 Quadrillion BTU in 2030, increase of 25%.

- **Other Projections of Increased Demand**

1. Global Transportation Demand:	35%
2. Global Industrial Demand :	27%
3. Residential/Commercial :	25%
4. Power Generation :	65%

Asian demand

- ❖ In recent years, the most significant development in the consumption of hydrocarbon fuels is the increase in **Asian demand**. In fact , there has been a consistent increase over the last few decades: between 1970-94, Asian energy demand increased by 400%, with demand for oil increasing by 274%; world demand growth during this period was only 63%.
- ❖ India's primary oil demand at 2.6 MMBD in 2005 is 40% of China's and around 13% of USA. By 2013, India is demand will be 35% of China and 22% of US.
- ❖ Today, US oil consumption is $1/4^{\text{th}}$ of world consumption. India is only 3% and China 8%. India's oil consumption growth in 2006-07 was around 3.5%, much lower than that of China.

Global Oil Demand: 2025 (in million barrels per day [MMBD])

	2001	2025
Asia: Big 4**	19	37
Rest of Asia	6	11
Middle East	5	9
North America	24	35
West Europe	14	14
Rest of World	9	13
TOTAL	77	121

** China – Japan – Republic of Korea - India

- Demand of the Big-4 will equal that of North America
- Demand of Asia (*minus* West Asia) will nearly equal that of North America and West Europe combined
- Total Asian demand will be only slightly less than that of the rest of the world taken together.
- **China and India** together will be responsible for 35% of the world's incremental consumption of oil over the next 25 years.

Global Oil Imports: 2025 [in mbd]

Region/Country (%oil of imported)	Total Imports	Net Increase in imports
Asia (74%)	29	12
➤ China (71%)	11	6
➤ India (87%)	4	2.7
➤ Japan (100%)	3	(-) 1.7
➤ RoK (100%)	2.5	0.6
Europe (80%)	12.5	2.4
USA (72%)	17.5	4

Predicted changes in oil production capacity, 2000-2020

	2000		2010		2020		Change
Region	Mb/d	% ^a	Mb/d	% ^a	Mb/d	% ^a	%
Persian Gulf	23.9	30	29.6	31	42.2	38	+77
FSU	7.3	9	10.1	11	13.1	12	+79
Africa	2.6	3	3.3	3	5.5	5	+115
United States	9.1	11	9.0	9	8.7	8	-4
North Sea	6.9	9	7.0	7	5.9	5	-4
World	80.4		95.0		112.2		+40

Source: *The Geopolitics of Energy*, 2000, Vol. 1, p.23.

Note: Mb/d = million barrels per day.

a: Share of world total.

Global Gas Reserves

Region	TCF
Russia/ Central Asia	1900
West Asia	2000
Africa	400
South & South East Asia	300
North America	200
South/ Central America	200
Europe	150
Australia	100

3. Geopolitics of Oil

Areas of Competition

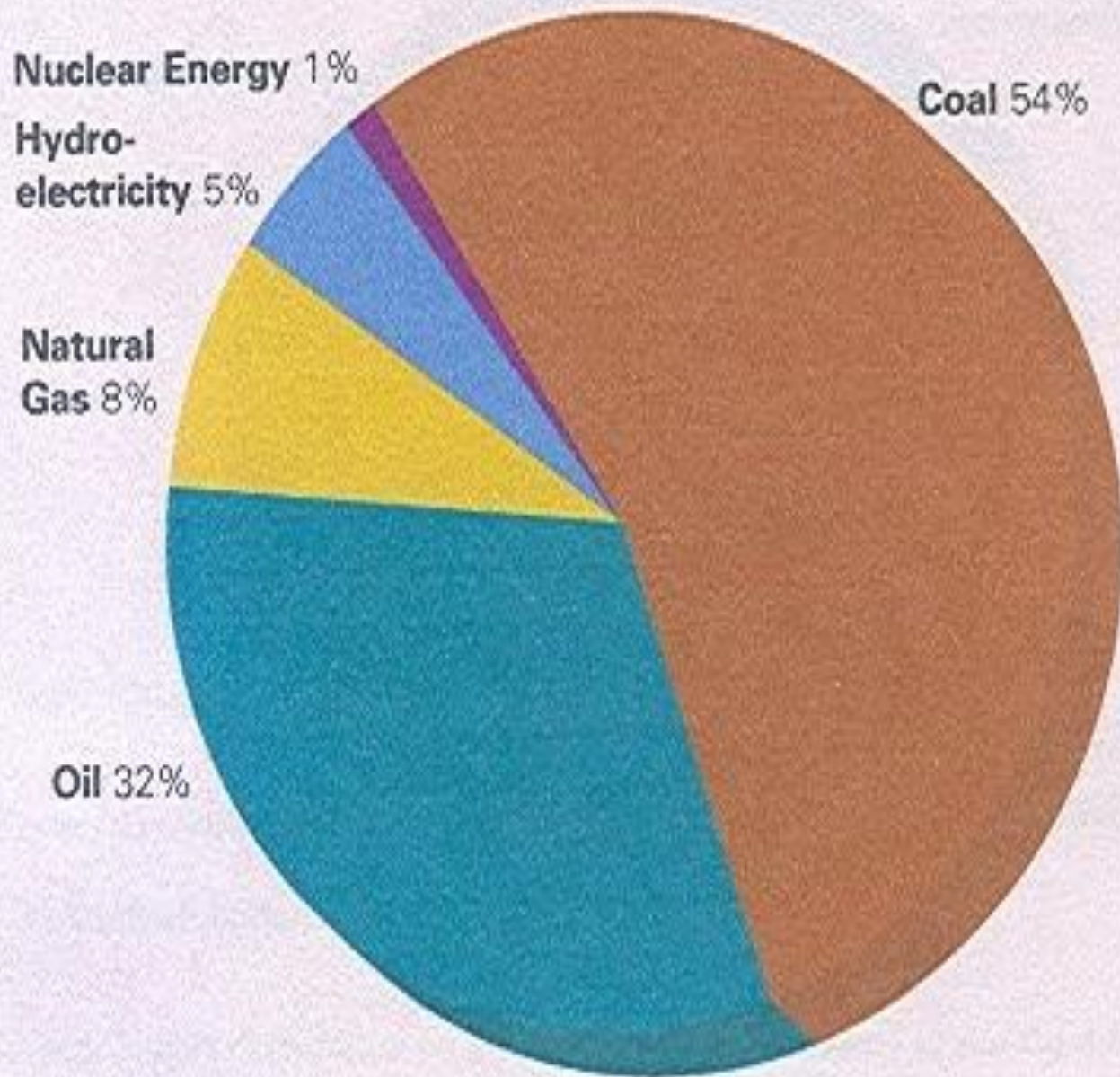
1. **The Gulf:** in the vortex of global competition, confrontation and conflict.
2. The “New Scramble for **Africa**”
3. The “New Great Game ” in **Central Asia**.

4. India's Energy Scenario

Energy Consumption Patterns

- ❖ India today is the **fifth largest consumer of energy** in the world, accounting for 3.7 percent of the world's consumption. Its total primary energy demand is expected to almost double by 2030. Its **primary commercial energy consumption** in 2004 stood at **375.8 mtoe** and involved coal, oil, gas, and electricity generated from nuclear, hydroelectric, and renewable sources. India's commercial energy consumption is expected to more than double to **812 mtoe in 2030**.
- ❖ **Per Capita primary energy consumption** is still fairly low in the country (520 kilograms of oil equivalent-less than a third the world average), with large disparities in the energy consumption pattern.

The India's Energy Mix



India's energy requirements to 2032

- India needs to **sustain an 8% to 10% economic growth rate**, over the next 25 years if it is to eradicate poverty and meet its human development goals.
- To deliver a sustained growth rate of 8% through 2031-32 and to meet the lifeline energy needs of all citizens, India needs, at the very least, to increase its primary energy supply by 3 to 4 times and its electricity generation capacity/supply by 5 to 6 times of their 2003-04 levels.
- By 2031-32, **power generation capacity must increase to nearly 800,000 MW** from the current capacity of around 160,000 MW, inclusive of all captive plants.
- To achieve these targets India would have to pursue all available fuel options and forms of energy, conventional and non-conventional.

India's Energy Mix

India's Energy Mix in different energy-use scenarios in 2032 (%)*

	Energy Source	Energy Mix in 2006	Coal dominant	Full use of Hydro, Nuclear & Gas	<i>Plus</i> enhanced fuel efficiency	<i>Plus</i> maximum use of renewables
1	Coal	51	54	45.5	42	41
2	Crude Oil	36	26	26	29	23
3	Gas	9	5.5	10.7	10.2	9.8
4	Hydro	2.1	0.7	2	2.1	2.2
5	Nuclear	1.5	4.0	5.3	6	6.4
6	Renewables	0.7	0.1	0.1	0.1	5.6

Source: *Integrated Energy Policy*, Planning Commission, New Delhi, Sep. 2006, pg. 44

* Note: In the above figures, non-commercial energy is between 10-12%

Present Hydrocarbon Scenario

(A) Domestic

- Increased domestic production of gas (from the Krishna-Godavri basin), and of oil from the Mangala fields in Rajasthan.
- Major global refining hub: refining capacity will increase from 178 million tonnes in 2010 to 250 million tonnes in 2012, with exportable surplus being 100 million tonnes: petroleum products are India's largest merchandise export.

(B) International

- Import dependence on oil is 75%, and likely to reach 90% by 2030
- Indian companies own oil producing assets in seven countries: investment of \$ 12 billion and production of 8.87 MT

India's total oil imports in 2009-10 were 160 MT, as against 128 MT in 2008-09. As compared to 2004-05 (96 MT), oil imports in 2009-10 indicate an increase of 66%

India: Principal Sources of Imported Oil (in MMT)

Source	2009-10		2008-09		2007-08	
	Quantity	% share	Quantity	% share	Quantity	% share
Total Imports	159.202		128.155		121.672	
Total GCC	64.39	40.44	55.946	43.65	53.756	44.18
Saudi Arabia	28.655	17.99	26.886	20.97	28.288	23.24
Kuwait	13.322	8.36	13.273	10.35	11.604	9.53
UAE	11.602	7.28	13.114	10.23	10.862	8.92
Other Gulf	36.157	22.71	35.709	27.86	33.779	27.76
Iran	21.197	13.31	21.318	16.63	19.486	16.01
Iraq	14.960	9.39	14.391	11.22	14.293	11.74
Total Gulf (including Yemen)	103.466	64.99	92.337	72.05	89.73	73.74
Africa	32.913	20.67	20.094	15.67	21.475	17.64
Latin America (including Mexico)	13.984	8.78	8.853	6.90	2.8	2.30
Eurasia	3.991	2.50	1.804	1.40	2.467	2.02
Europe	0.227	0.14	0	0	0.409	0.33
Other Asia	3.945	2.47	4.896	3.82	4.628	3.80

Achieving India's Energy Requirements

Domestic thrust

1. Augmenting domestic resources
2. Maximising the use of the national hydropower potential
3. Obtaining the materials and technology to pursue civilian nuclear power projects
4. Pursuing energy efficiency and demand side management policies
5. Diversifying energy sources through increased use of renewables.

But, note

- (i) Even if India succeeds in exploiting its **full hydropower potential** of 150,000 MW, the contribution of hydro energy to the energy mix will only be around **1.9 - 2.2%**.
- (ii) Even if a 20-fold increase takes place in India's **nuclear power capacity** by 2031-32, the contribution of nuclear energy to India's energy mix is also, at best, expected to be **4.0 - 6.4 %**.
- (iii) Even with a 40-fold increase in their contribution to primary energy, **renewables** may account for only **5 to 6%** of India's energy mix by 2031-32.
- (iv) **In all scenarios, fossil fuels will be between 74% and 85% of the energy mix, as against 96% at present.**
 - Hence the need to obtain energy resources from abroad.
 - Hence the need for ENERGY DIPLOMACY.

5. India's Energy Diplomacy

- Substantial, robust, multi-faceted global engagements
- These engagements are to be based on bilateral & regional “strategic energy partnerships”
- Engagements are aimed at promoting:
 - ❖ Domestic resources & capabilities
 - ❖ Diversification of hydro-carbon supply sources
 - ❖ Acquisition of foreign hydrocarbon assets
 - Equity participation in producing fields
 - E & P contracts
 - Criss-cross investments in downstream projects
 - ❖ Gas contracts
 - Long term LNG contracts
 - Trans-national gas pipelines
- Regional and global producer-consumer dialogue
- Enhancement of the national knowledge – base and acquisition of technologies in respect of:
 - * conservation
 - * non-conventional fuels
 - * Pollution – control
 - * environment concerns

India's Strategic Energy Partners

■ **Russia:**

- Partner in Sakhalin 1 oil & gas project
- Equity participation in oil companies
- Partners for E & P proposals in Russia and the neighbourhood

■ **Central Asia: Kazakhstan / Turkmenistan**

- E & P proposals
- Discussion on North-South energy corridor
- Participation in the TAPI pipeline project
- Purchase of Central Asia Oil at Ceyhan

■ **China:**

- Multifaceted cooperation across the hydrocarbon value chain
- Joint bids for projects in third countries, including E & P contracts

■ **Japan and RoK:**

- Dialogue partners as principal Asian consumers,
- Partners in the enhancement of India's knowledge base in: conservation; environment-friendly fuels; strategic and commercial storage

Saudi Arabia & Iran:

- Partner-countries in upstream and downstream areas on the basis of criss-cross investments
- pursuit of long-term LNG contracts

Turkey:

- Principal East-West transit route
- Cooperation in midstream and downstream projects and transnational pipelines

Norway:

- Multifaceted cooperation, including upgradation of domestic capability through:
 - (a) reform of DGH; (b) R&D and technology; (c) health and safety
- E&P projects in each other's country and in third countries, particularly those involving deep-sea exploration.

Nigeria, Angola, Sudan:

pursuit of E&P proposals in tandem with economic development packages.

Venezuela, Brazil, Ecuador and Cuba:

pursuit of E&P proposals

USA, UK, Canada:

- R & D: unconventional & non-conventional fuels; conservation
- Indo-US Energy Dialogue [2005]

6. Co-operation for Energy Security: India's perceptions

- **Unique features of energy security**
 - (a) inherently cooperative
 - (b) a dynamic concept
- **The logic of Global Energy Co-operation**
 - (a) *need to mobilise resources globally:*
 - Hydrocarbon resources to meet global demand over next 30-50 years are available: new technologies continue to yield fresh discoveries and augment supplies from old fields.
 - Oil will be available in physically challenging areas such as the deep sea or frozen terrain or environmentally sensitive locations.
 - Exploration and development of these resources will require rather huge investments, amounting cumulatively to over \$5 trillion upto 2030, @ \$20 billion per annum.
 - (b) *need to protect the entire energy supply chain and infrastructure: production facilities, transport, refining, pipelines, storage facilities, power plants and transmission lines.*
 - Currently, daily 40 million barrels of oil cross the oceans in tankers; could come 67 mill. barrels in 2020
 - Currently, 150 million tonnes of LNG is transported by sea; could become 460 million MT by 2020.

Producer-Consumer Cooperation

*The opportunity, Your Excellencies, lies in fashioning a more fair, more just and more remunerative oil order for all of us in Asia-in which the **Asian producer** is ensured a stable, secure and sustainable return for a most precious but depleting natural resource, and the **Asian consumer** is assured a stable, secure and sustainable regime within which to promote progress and prosperity for that deprived one-half of humankind and inhabits our shared continent of Asia.*

-Mani Shankar Aiyar, Indian Petroleum Minister, Jan 2005

*We consumers need energy. You producers have energy. We need assured sources of supply as much as you need assured markets. Both of us – producers and consumer – can jointly invest in **infrastructure**. We can together invest in **exploration** (as we are, for instance, already doing in Sakhalin); we can together invest in **production** (as we already doing in numerous producing fields in Asia and elsewhere); we can together invest in **transportation** (I call upon your imagination to summon up an Asian oil and gas grid); we can together invest in ship building and **shipping, in ports and terminals**; we can together build **refineries** and gas processing plants and power generation stations and petrochemicals units; in short, we can together take on the world! That would be true Energy Security.*

-Mani Shankar Aiyar, November 2005

Asian Cooperation for Energy Security

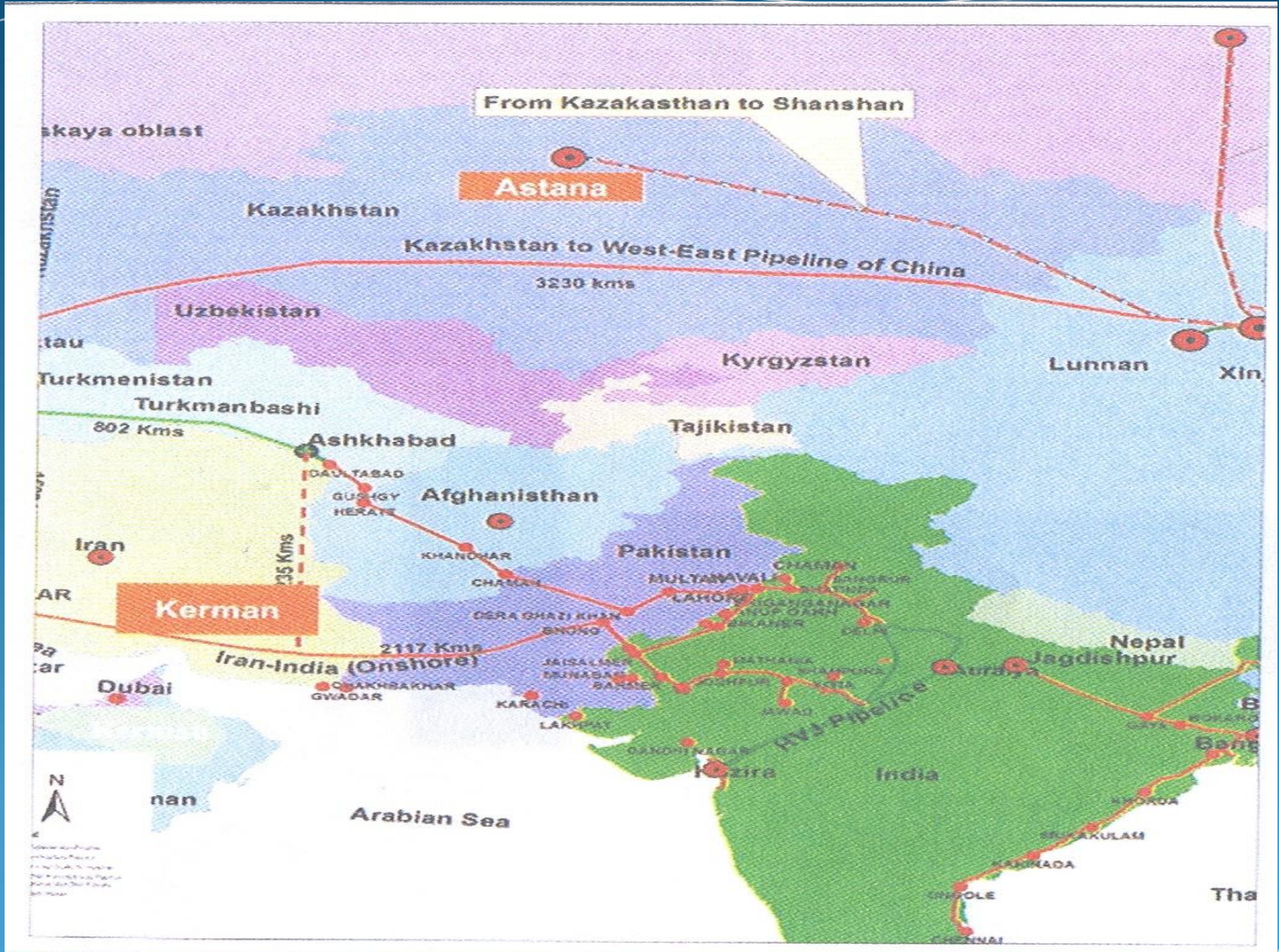
- **Round Tables in New Delhi of Oil Ministers of the principal Asian oil – producing and consuming countries:**
 - ⇒ January 2005
 - ⇒ November 2005
- **The Round Tables explored the promotion of**
 - * security
 - * stability, and
 - * sustainability

of the Asian hydrocarbon economy
- **Consensual Producer-Consumer Agreements emerged from these meetings:**
 - ⇒ Reform of the Asian Oil Markets
 - ⇒ Criss-cross investments in the hydro-carbon sector
 - ⇒ The Asian Gas Grid

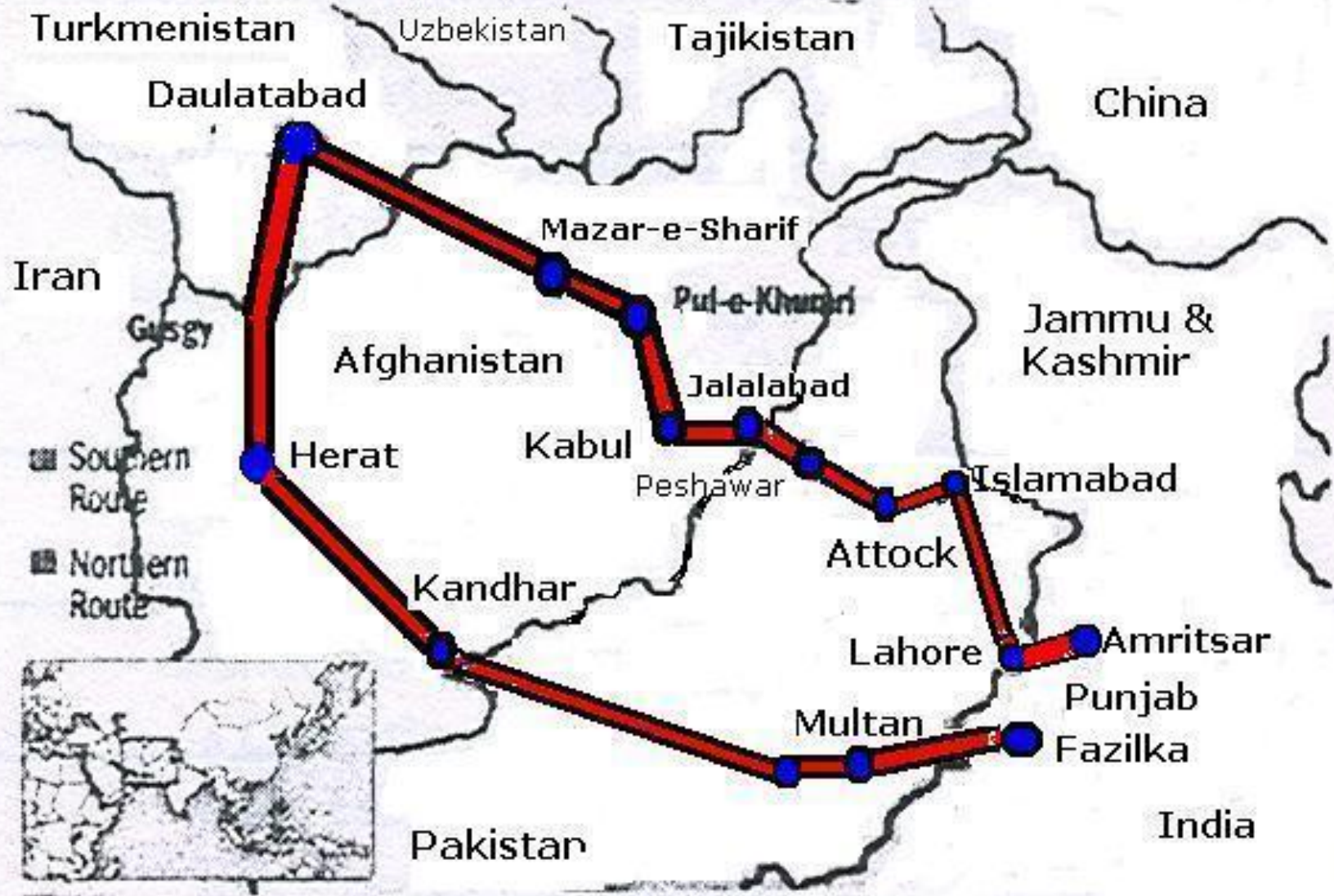
Regional Cooperation

- ❖ This is best manifested through pursuit of transnational gas pipelines. India is pursuing two transnational gas pipeline proposals:
 - (i) The Iran-Pakistan –India (IPI) project
 - (ii) The Turkmenistan-Afghanistan-Pakistan-India(TAPI) project

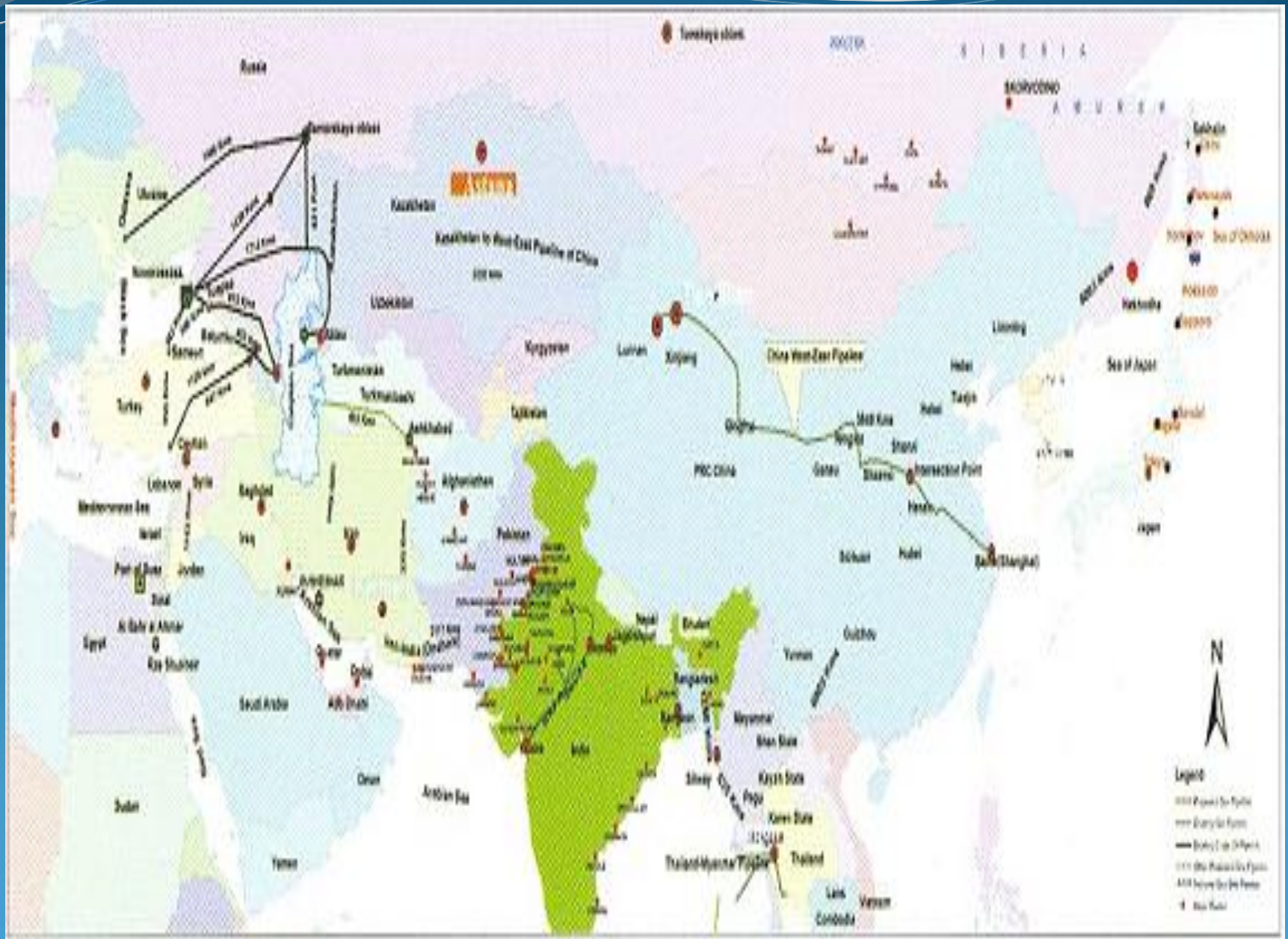
The Iran-Pakistan-India Pipeline



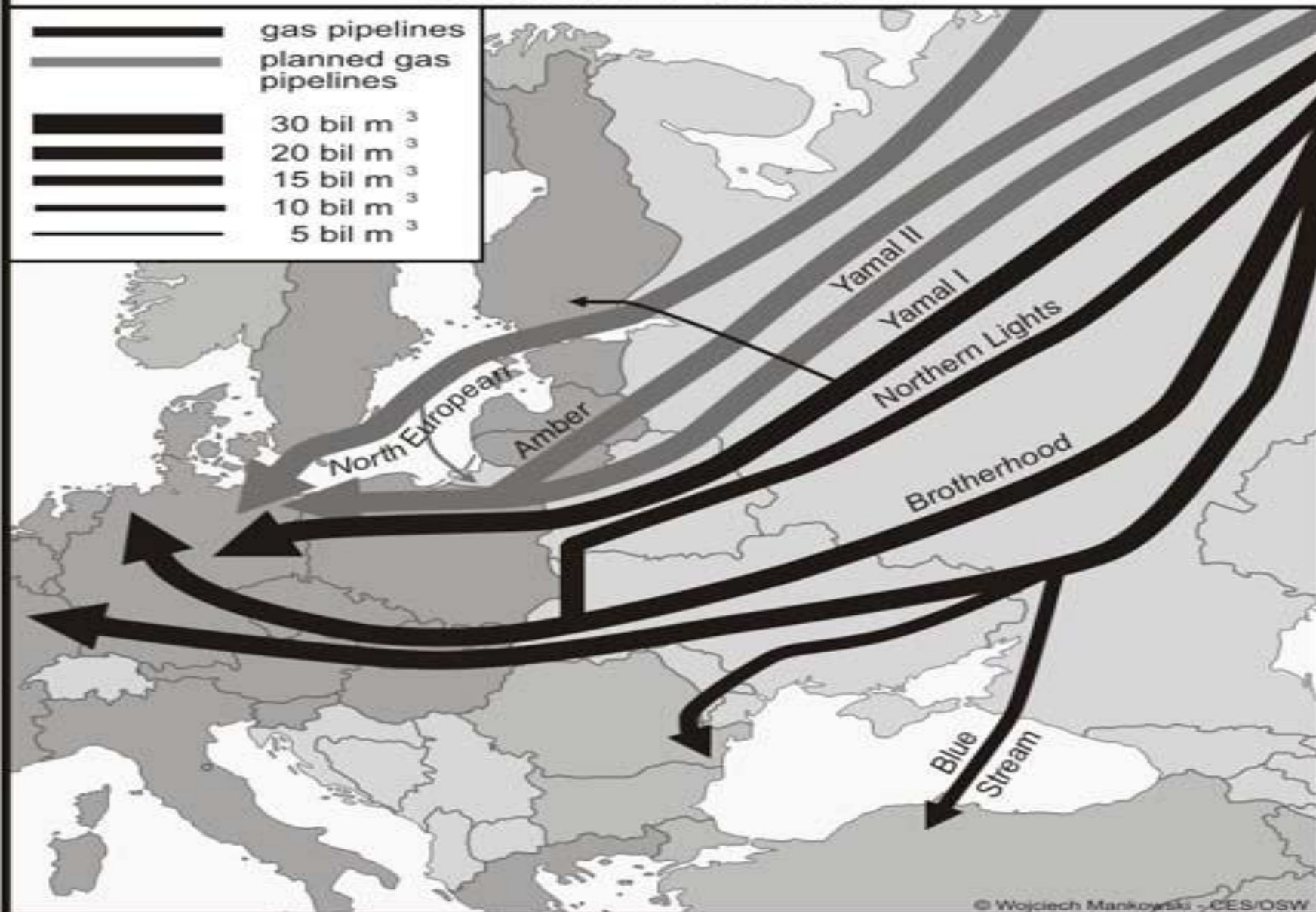
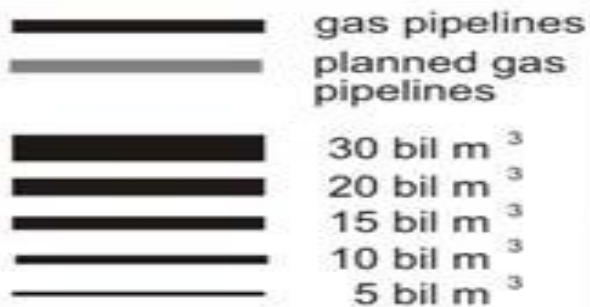
Turkmenistan-Afghanistan-Pakistan-India (TAPI) Gas Pipeline



Existing Gas Pipelines in Asia



MAIN EXPORT GAS PIPELINES RUSSIA - EUROPE



European gas today



Source: GIE, Europe

But it was a 35 year venture

1970



1980



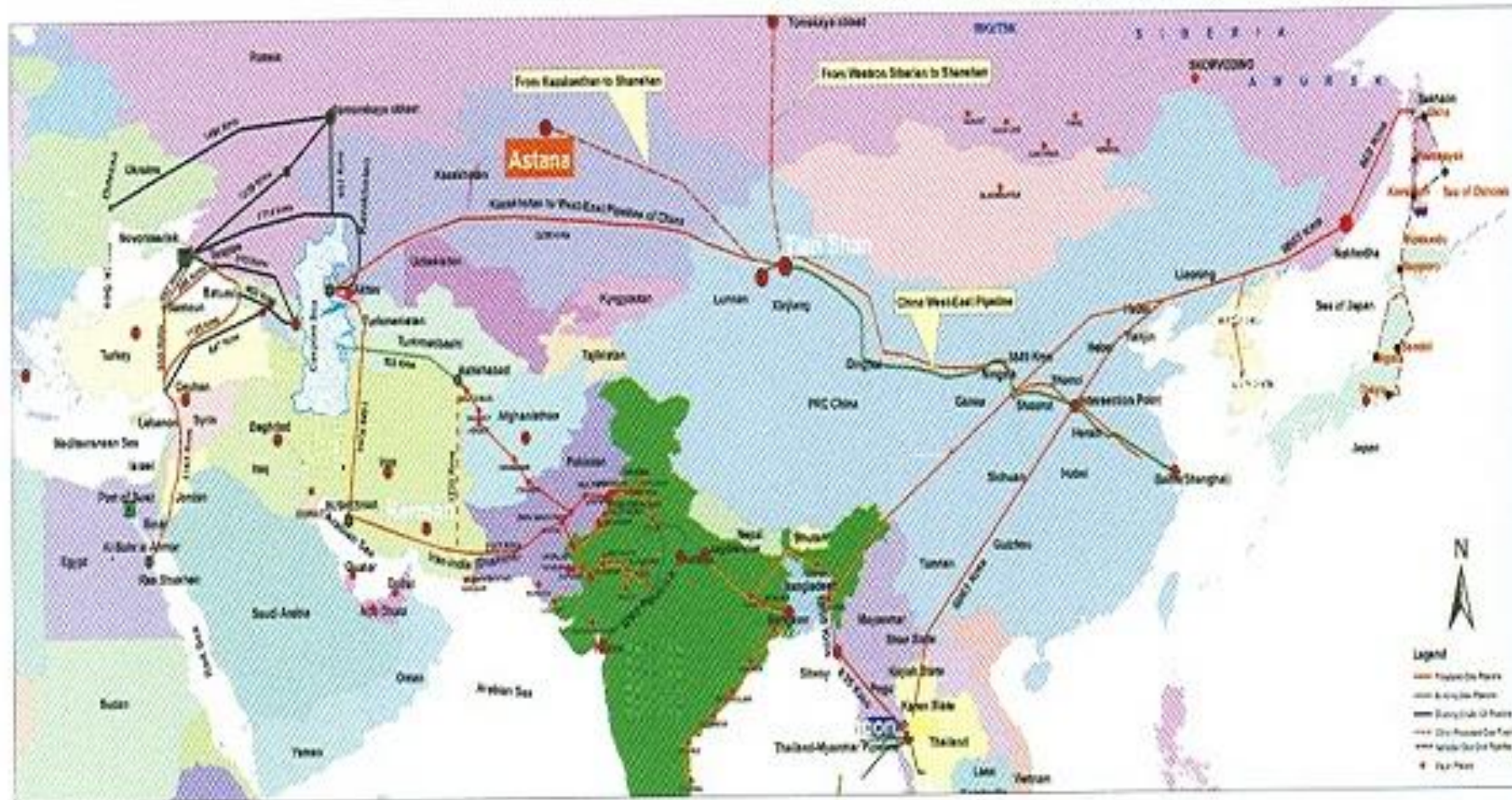
2005



1990



Asian Gas Grid



A Bold Adventure into Asia's Future

Short to Medium Term Approach

There are a variety of energy systems that have the potential to reduce greenhouse gas emissions, increase efficiencies in conventional energy sectors, and deliver relatively clean power to communities around the world. Many of the threats posed by current energy trajectories could be eased by shifting more rapidly towards **natural gas, unconventional methane deposits and renewable energy systems.**

- ❖ **Natural gas** is the least environmentally harmful of all hydrocarbons, with a given unit of energy from gas generating about 40% less carbon dioxide than oil and 75% less than coal.
- ❖ **Renewable energy industries** (which include hydroelectric, biomass, geothermal, solar, wind, and other modern systems) together provided only around 3.5% of the commercial energy consumed in 2000.

Renewable Energy : Longterm

(A) Nuclear

- Today, 439 nuclear reactors in 31 countries supply 15% of world's electricity (370 GW)
- Countries with 40% of total power produced by nuclear power: France – 78%; Belgium – 53%; Sweden – 50%; ROK – 40%.
- USA: 103 commercial nuclear power stations at 64 sites in 31 states provide 20% electricity: average age of stations 21 years; last station set up in 1980.
- Worldwide, 31 reactors under construction: power capacity could increase to 520 GW in 2030.

Positive features:

- ❖ Low running cost.
- ❖ No carbon emissions: - competitive if carbon emissions (from coal & gas plants) are taxed.

Negative features:

- ❖ High capital cost : double the cost of a coal plant, and even more than for gas plants: i.e., Rs. 10 crores per MW i.e. 20,000 MW for Rs. 200,000 crores as against: (a) Gas: Rs. 3 crores per MW; (b) Coal: Rs. 4.5 crores per MW.
- ❖ Commercially viable technology i.e. “breeder” at nursery stage.
- ❖ Limited global supply of Uranium *plus* high cost: only 100 years supply at current rates of consumption.
- ❖ Safety issues
- ❖ Radiation hazard from waste: radioactive materials not burned in reactors, have half-life of several hundred thousand years.
- ❖ “Dual use” concerns regarding “breeder” technology and reprocessing.

(B) Wind

India: installed capacity 8000 MW (v/s 1600 MW in 2003-04)

- Highly infirm supply
- Potential capacity : 45,000 MW
- Technical capacity: 13,000 MW

(C) Solar

- Grid connected: 3 MW
- Intermittent power:
- High cost: Rs. 9 per unit (4 times that of coal- based power)
- Land acquisition: 1000 MW plant needs 10,000 acres

(D) Bio-fuel

- 4 lakh acres of jatropha under cultivation
- 20% ethanol in diesel requires 100 lakh hectares
- Problem of food use v/s biofuel

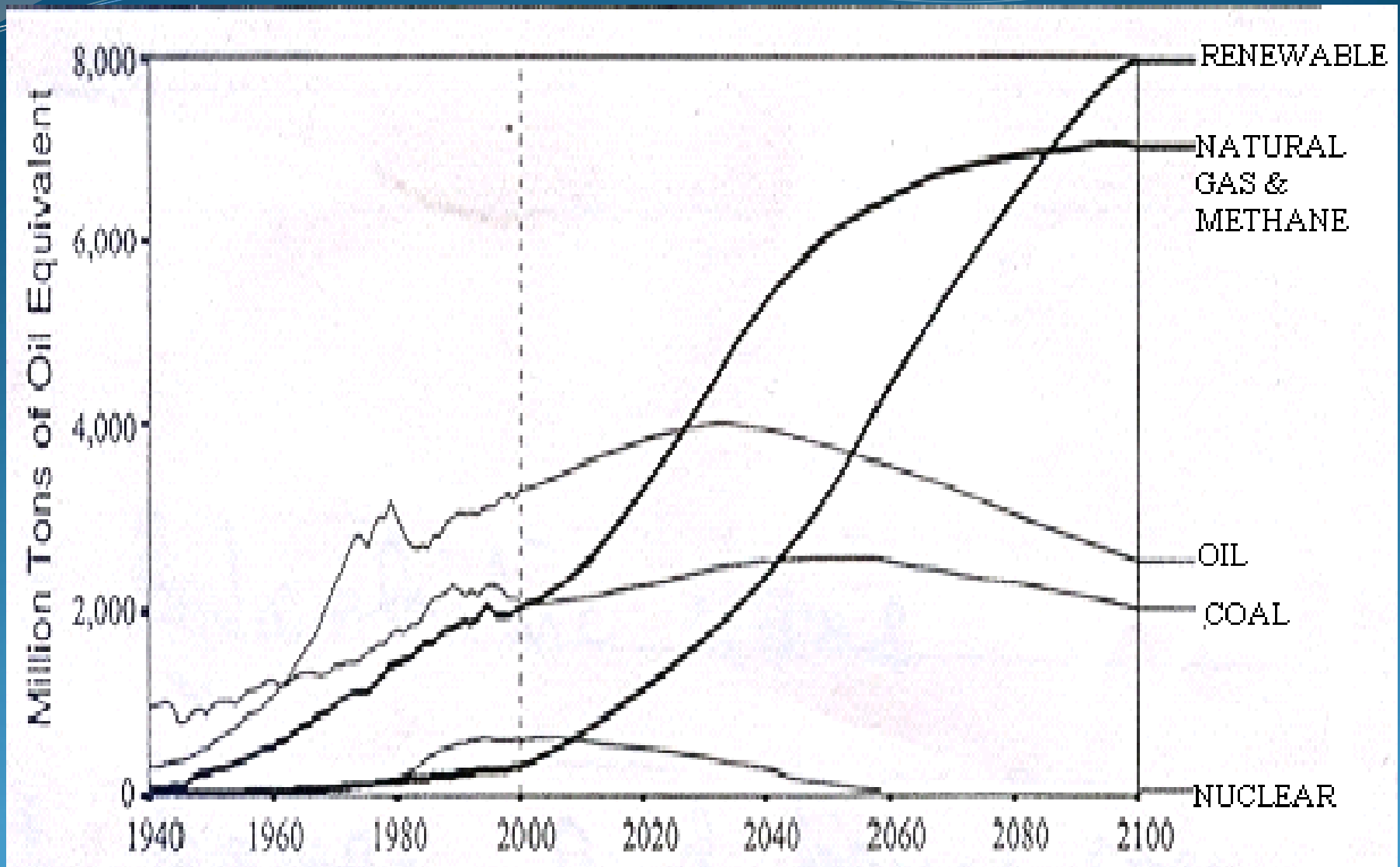
(E) Hydro-power

- Total hydropower potential: 148,700 MW
- Currently under operation: 28,000 MW
- Small hydropower projects: 15,000 MW
- potential : presently tapped: 2000 MW

Multilateral Dialogue: International Energy Forum

- IEF: world's largest energy forum, with 90 member countries and 13 international organisations
- Central role player in the Global Energy Dialogue
- Market transparency: Joint Oil Data Initiative (JODI)
 - decision to extend it to other energy sources
 - expand it to include collection and dissemination of annual data on investment plans, capacities and stocks
- Principal areas of interest:
 - volatility in energy markets
 - need for enhanced investments
 - reducing energy poverty
 - promoting new technologies
 - addressing climate change

Projected Global Energy Shifts



Source: *Global Energy Shifts* by Bruce Podobnik

Final Words

We stand at the end of an era and on the threshold of a new period of history.... Asia after a long period of quiescence has suddenly become important in world affairs.. Asia is again finding itself.... The people of India welcome their fellow Asians from other countries to confer with them about the present and future, and lay the foundation of our mutual progress, well-being and friendship.

- Jawaharlal Nehru, Asian Relations Conference, New Delhi, April 1947

The Asian Quest for Energy Security could lead to Asia regaining its traditional place - a place it has held for thousands of years of recorded history and lost only in the last two hundred years or so - in the vanguard of the advancement of human civilization.

The Asian renaissance brought us all to independence and liberation. Now, the Asian Resurgence depends on energy cooperation in Asia. The 21st century will indeed be the Asian century only if Asian countries - buyers or sellers - join hands together in a continent-wide bid at bringing Asia together and keeping Asia together. I am confident that we will.

-Mani Shankar Aiyar, Indian Petroleum Minister, Beijing, January 2006