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***Energy Security: A Global Challenge***

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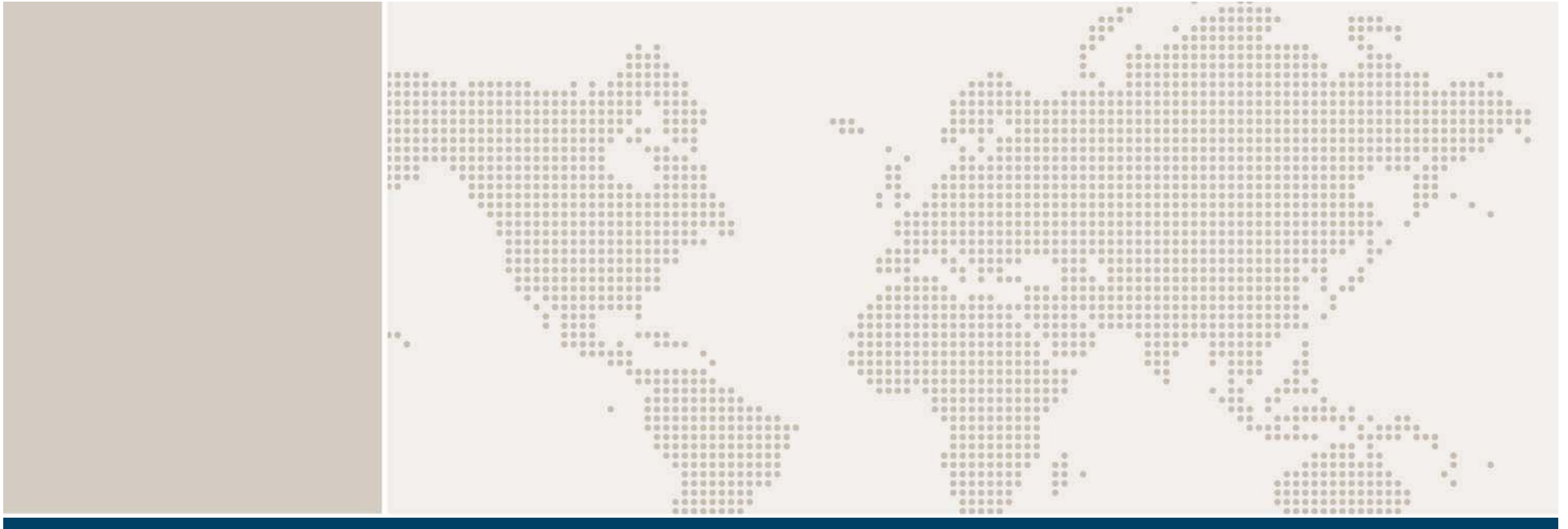
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# **Energy Security: A Global Challenge**

## **Emerging Regional Energy Security Issues China**

**National Defense University, September 29, 2009**

David Pumphrey, Deputy Director and Senior Fellow

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## ***Vital Signs of the Chinese Energy Sector, 1998-2008***

**120% increase in primary energy consumption**

**Share of total world consumption rose from 11% to 18%**

**Increase in energy consumption accounted for 40% of the world's growth**

**Doubling of oil consumption**

**Rapid growth in net oil imports, 0.5 mmb/d to 3.7 mmb/d (about 50%)**

**Coal dominates primary energy consumption, 70% in 2008**

**Per capita energy consumption 1/5 of US and 1/3 of Japan and Europe**

## Key Challenges for China's Energy Sector

- Economic growth requires sustained expansion of energy supply
- Electricity generating capacity must expand at unprecedented rates. Coal will continue to dominate but limits on the amount that produced and transported to market.
- Use of natural gas, nuclear and renewables will grow in the power sector.
- Oil consumption, taken increasingly from world markets, will rise rapidly.
- Will Chinese energy policy makers be able to handle these challenges?

## Drivers of Energy Demand

### 1. Economic growth and industry-led demand

- OECD estimates avg. annual GDP growth HAS DIPPED to below 9% for 2009.
- *Beijing wants to shift AWAY from heavy industry – toward value added (i.e., computers, electronics) But will it work?*

### 2. Increasing personal wealth and consumption-led demand

- Per capita GDP is US\$2,000 **(RAISING THIS IS A PRIMARY FOCUS FOR BEIJING)**
- Personal automobiles and air-conditioning become available to a greater proportion of the population.
- Automobile ownership has doubled since 2002 to more than 25 million vehicles (Approx. 140 million in U.S.); 5 million sold in 2006

- **CHINESE AUTO SALES OUTPACED US MARKET IN EARLY 2009**

### 3. Shifting demographics

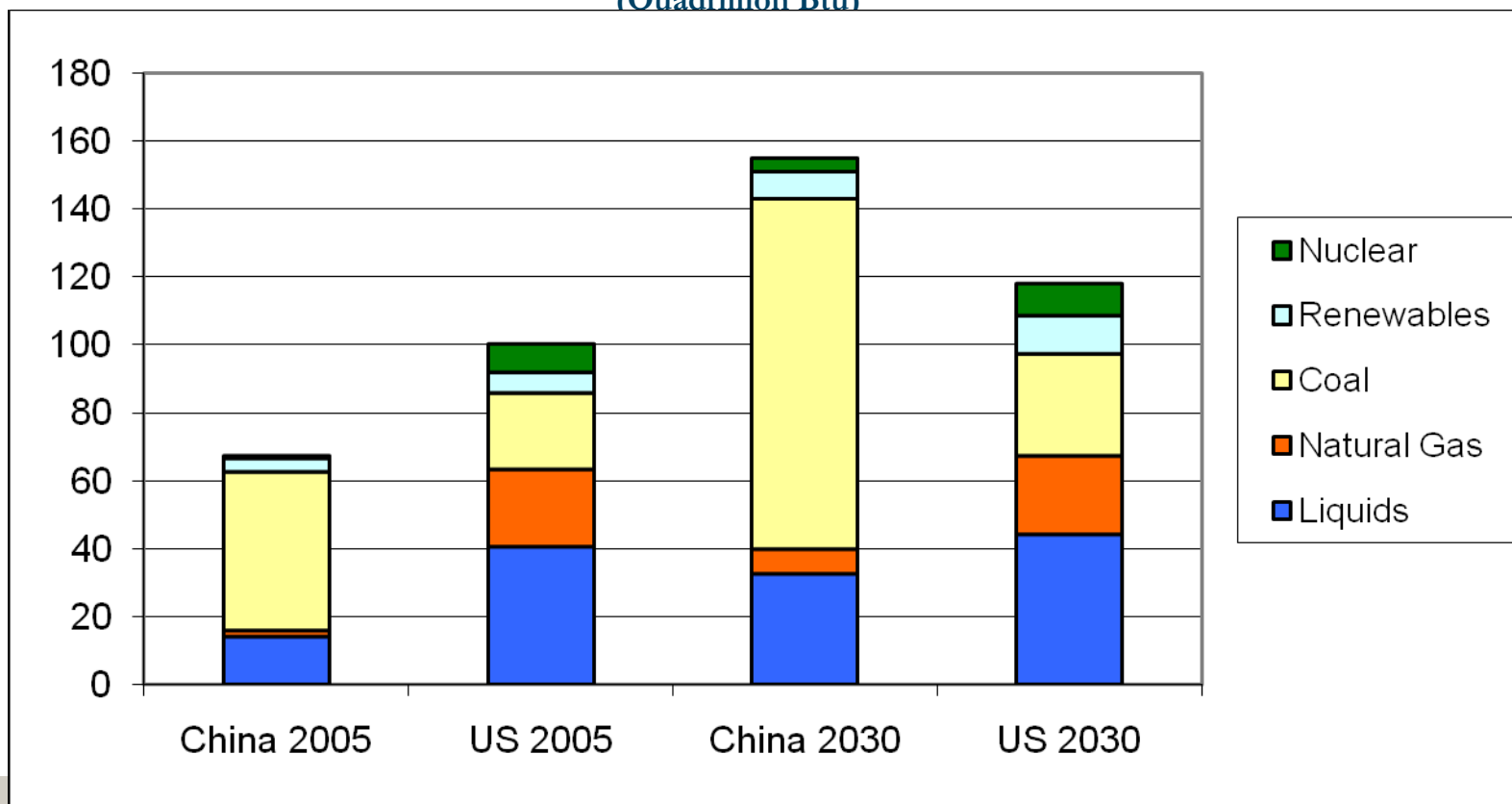
- Urbanization: 20% in 1980, 38% in 2002, expected 45% in 2010
- 400 million people expected to move from rural to urban areas by 2030

- **BEIJING NOW ENCOURAGING MIGRATION AWAY FROM COASTS**
- **CITIES ARE TOO CROWDED, INFRASTRUCTURE CRUMBLING**

# Energy Consumption by Fuel

## China and United States

(Quadrillion Btu)



Source: EIA International Energy Outlook 2008

## China's Energy Strategy – Energy Efficiency

### 11<sup>th</sup> Five year Plan set target of improving energy intensity by 20% by 2010

- Targets mandatory for government officials
- Specific targets set for each province

### Slow growth in energy intensive industries through fiscal and other measures

- Shut down small, old power plants and steel and cement facilities
- Accelerate development of service and high technology sectors

### Work with top 1,000 companies to improve efficiency.

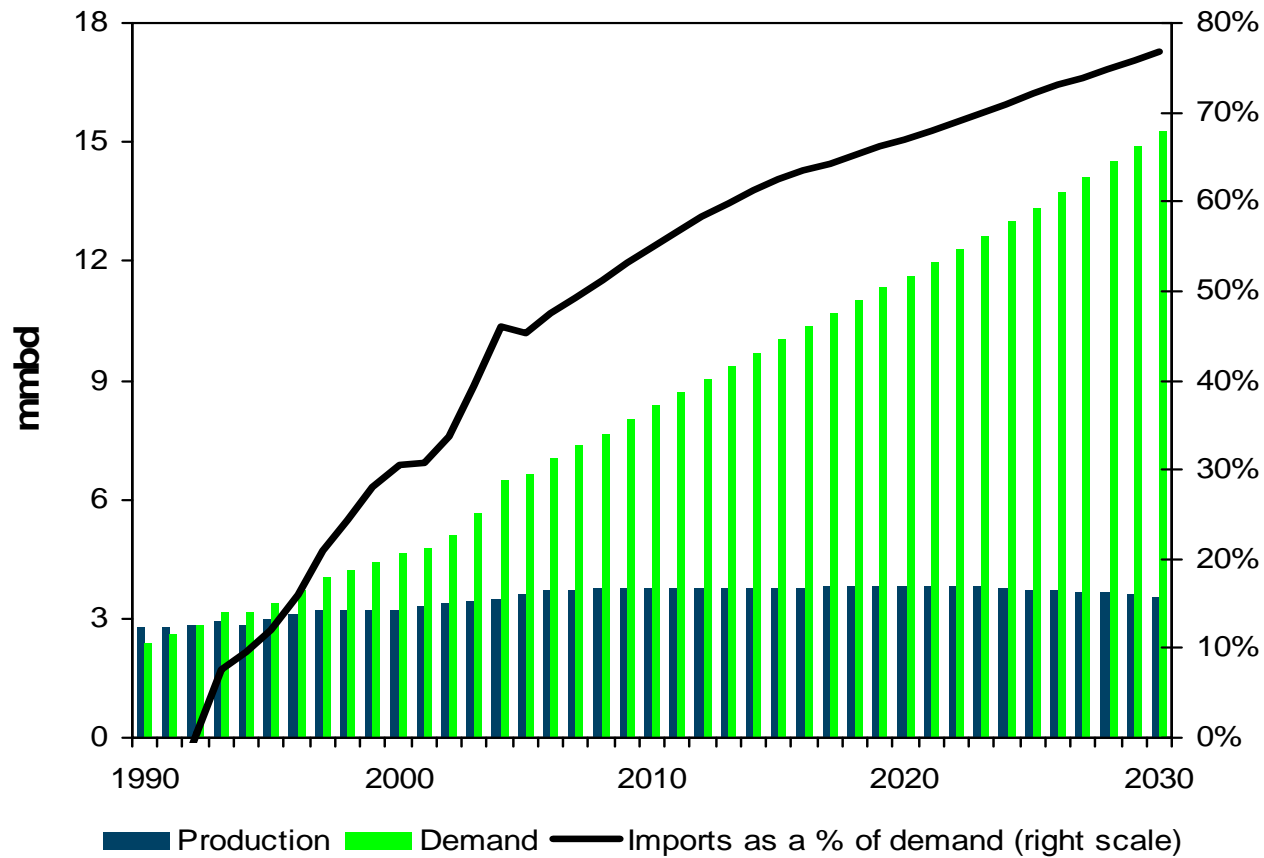
### Automobile efficiency standards – moving toward European standards and taxation of least efficient vehicles



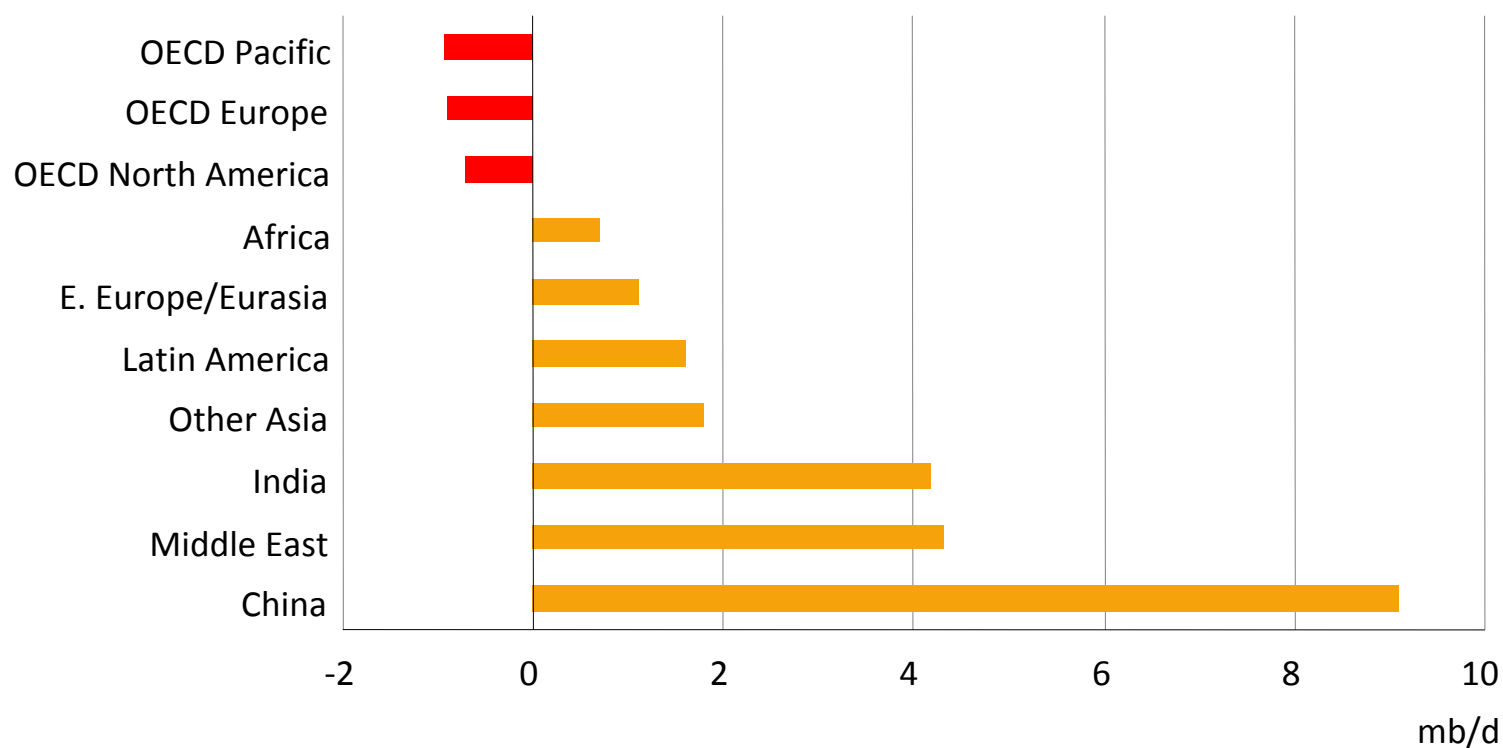
## China's Energy Strategy - Clean Power Generation

- **Renewable energy – target is to have 16% of primary energy from renewables by 2020. Currently less than 1% but growth is strong. Wind power growing rapidly with target of 30 GW in 2020.**
- **Nuclear Power– Reach installed capacity of 40 GW by 2020. Currently 9 GW.**
- **Clean Coal Technologies – Close small inefficient plants, deploy most efficient coal power technologies (ultra super critical) , research carbon capture and storage**

## China Oil Outlook to 2030



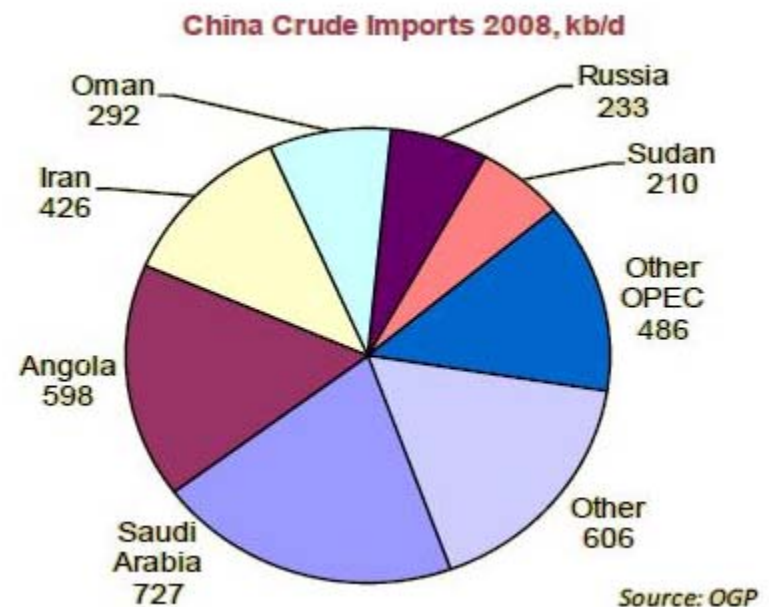
**All of the growth in oil demand comes from non-OECD, with China contributing 43%, the Middle East & India each about 20% & other emerging Asian economies most of the rest**



Source: IEA, WEO 2008

## China's Energy Strategy – Oil and Gas

- Increase domestic production through exploration and enhanced recovery.
- Strategic Petroleum Reserve being implemented.
- Secure foreign supplies through equity investment by Chinese oil companies, loans for oil and acquisitions.
- Develop Central Asia gas pipeline and LNG capacity



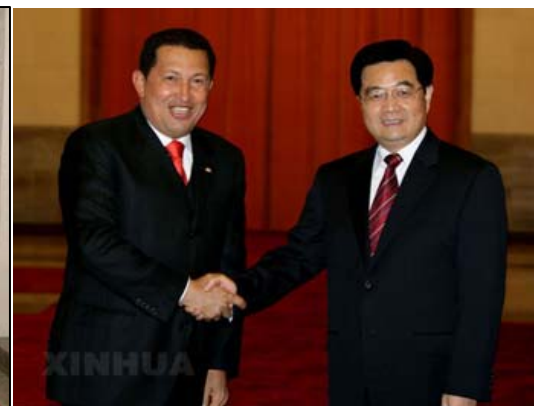
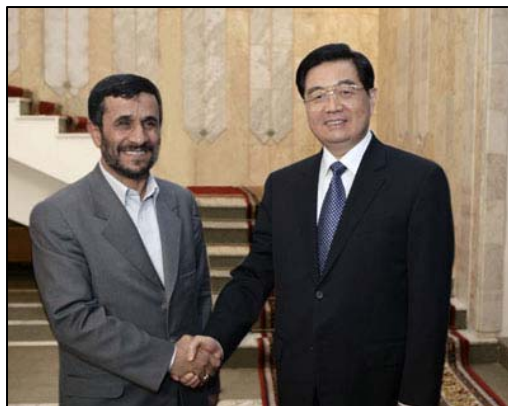
## Energy Security for China: SPRs

- Phase I completed in 2008): 103 million bbl (approximately 31 days of net imports or 15 days of total consumption) in four sites (Zhenhai, Zhoushan, Huangdao, and Dalian)
- Target for Phase II (by 2011/12): Another 169 million bbl, totaling 272 million bbl (approximately 60 days of net imports or 33 days of total consumption).
- Target for Phase III (by 2015): To establish 500 million bbl of SPRs.

## Central Asian Pipelines



## Diversification



## Chinese Oil Company Investments

- **China's state oil companies have been actively investing internationally. Government supported strategy to gain equity investment as an energy security benefit.**
- **Total equity production overseas is approaching 1 MMB/D. Largest player is CNPC/Petrochina with about 600 mb/d and 450 mmcf/d. CNOOC is second with 24 mb/d and 227mmcf/d. Sinopec has about 180 mb/d. Other companies have smaller shares.**
- **Investments have occurred worldwide but Africa, Middle East and Former Soviet Union have been main areas.**
- **Africa was early focus – Sudan and Angola.**
- **More recently focus has shifted to Central Asia, Iraq and Iran.**
- **Sinopec proposed acquisition of ADDAX for more than \$7 Billion brings estimated reserves of 536 mm barrels and 140mbd production.**

## Loans for Oil

- **Loan agreements have become increasingly important vehicle to assure oil supply.**
- **CNPC will receive priority access to future projects in exchange for a \$5 billion loan extended by CNPC to KazMunaiGas.**
- **\$25 billion financing package to Russia's state-owned Rosneft and Transneft, in exchange for about 300 mbd.**
- **Venezuela and China set up a joint investment fund with \$8 billion dollar from China and \$4 billion from Venezuela. PDVSA to sell 80-200 mbd to Petrochina.**
- **In Brazil, a \$10 billion dollar loan to Petrobras that guarantees China up to 200 mbd.**
- **China agreed to lend Turkmenistan \$4 billion to develop South Yoloten gas field and supply 40 bcm of natural gas to China**



## China's Role in Iran

- China is involved at all levels of Iran's petroleum industry including the upstream and downstream.
- Iran has been giving slightly more attractive terms in recent buy back contracts.
- Yardovan, Azadegan and North Pars fields are major upstream development projects.

## List of Upstream Agreements Between Iran and China in Recent Years

Project	Type of Contract	Signature Date	Estimated Value	Contractor(s)	Remarks
Exploration and Development in the Garmsar Block	Binding Contract	2005	Minimum US\$20 Million For Exploration Activities	Sinopec	Sinopec committed for exploration of the Garmsar block. However, exploration activities have not shown any commercial oil reserves in the block.
Exploration and Development in the Koohdasht Block	Binding Contract	2005	Minimum US\$18 Million For Exploration Activities	CNPC	The exploration of the block will be completed by end 2009. Recent exploration activities have not shown any significant commercial oil reserves in Koohdasht.
Development of the North Pars Gas Field	Preliminary Agreement	2006*	US\$16.0 Billion	CNOOC	NIOC and CNOOC agreed for development of the North Pars gas field and construction of a 20 mtpa LNG plant in Kangan.
Development of the Yadavaran Oil Field	Binding Contract (Buyback)	2007	US\$2.0 Billion	Sinopec	The first phase will take four years and will produce 85 kb/d of crude oil. The second phase will raise production by 100 kb/d, boosting total crude oil production to 185 kb/d.
Development of the Azadegan Oil Field	Binding Contract (Buyback)	2009	US\$1.8 Billion	CNPC	CNPC is expected to produce 75 kb/d of crude oil in the first phase. In the second phase, total oil production will increase to 150 kb/d.
Development of the Resalat Oil Field	Preliminary Agreement	2009**	US\$1.0 Billion	Malaysian Amona (Main Contractor), Chinese COSL and CNOOC	China Oilfield Services Limited (COSL) will undertake drilling operations, while China National Offshore Oil Corporation (CNOOC) will build the required offshore infrastructure.
Development of the South Pars Phase 11	Preliminary Agreement	2009	US\$4.7 Billion	CNPC	NIOC signed a preliminary agreement with CNPC for the development of Phase 11 of the South Pars gas field, replacing France's Total.

\* CNOOC signed an upstream contract with NIOC in the form of a buyback agreement in 2008 to develop the North Pars gas field. However, the negotiation in downstream section (construction of a LNG plant) has remained in early stages.

\*\* The original buyback contract was signed between Malaysian Amona and NIOC in 2008. Amona finalized negotiations with two Chinese contractors to join the Resalat development project consortium in July 2009.

## Avoiding Resource Conflicts

- **Key energy security issue is dealing with the growth in Chinese energy demand.**
- **Resource conflict is not inevitable in a global market. Investments by Chinese companies likely to increase total production available.**
- **China should be brought into organizations and processes promoting collaboration on energy security.**
- **IEA is principal body but will need to modify its charter. Members will have to make room for China.**
- **China should also be encouraged to join transparency initiatives.**