



# Afghanistan

---

## **Energy Investment Strategy**

Preliminary Findings For Discussion

World Bank  
February 2005



# Context of Present Task

---

- Abundance of recent subsector technical analyses, need for comprehensive strategic approach to identify investment and policy priorities with emphasis on short-term critical actions.
- Evaluate specific investment projects/proposals in hierarchy of development priorities, with sensitivity to data limitations.
- Analytical framework:
  - Least-cost analysis of domestic and imported options as basis for evaluation, with consideration of externalities;
  - Meeting demand for energy services matters, not development of input industries *per se*;
  - Realism: strategic choices molded by financial and capacity constraints of all parties.
- Knowledge gaps present fundamental obstacle to strategic decision-making process; energy demand study needed.



En

ized)

Which supply options are least-cost for a given end-use – and affordable?

Which do consumers prefer or shun, and why?

Which have hidden costs for humans, the economy, the environment?

Role for Government policy: pricing, taxation, expenditures, subsidies?

electricity

els

**Agriculture, Heavy Industry,  
Transportation, etc.**



# Structure of Presentation

---

- Strategic Choices and Trade-offs
- Power
- Household Energy (incl. Rural Energy)
- Gas and Coal Prospects
- Potential of Private Sector
- Institutional Reform
- Immediate Priorities



# Strategic Choices and Trade-offs

---

- Optimal balance, over time, of domestic production of power vs. power imports
- Develop gas fields today, leave for future or import for power production?
- Coal for power, light industrial and/or residential use?
- Balance of State and private sector; institutional and legislative reform;



# Strategic Choices and Trade-offs

---

Broad policy context; given limited resources, is it best to...

- preserve status quo (e.g. subsidize power consumption in Kabul); or
- attempt to target subsidies to the poorest; or
- expand access in rural areas, or...
- invest in water? health? education?



# Power: key messages (1)

---

- Transmission: First-order priority investments have been identified and need to be implemented.
- Generation: Domestic generation can be cost-competitive with imports over time.
- Distribution: Investments and management reforms urgently needed to capitalize on gains of transmission and generation, ensure growth in access.



## Power: key messages (2)

---

- Financial sustainability:
  - without movement to cost-recovery, present efforts to rehabilitate and expand the system will not be sustainable;
  - over time, utility's own funds should be source of investments in distribution;
- Utility reform: Launch DABM restructuring.



# Transmission

---

- Priority No. 1 to increase supply, end load-shedding (= high cost to economy).
- Long distances between small load centers means regional networks preferable to national grid (“north” and “east” to be interconnected with completion of Termez-Kabul line);
  - ⇒ implications for generation, distribution strategy.
- Tajikistan-Afghanistan-Pakistan line unlikely source of rapid supply increase for Afghanistan; potential for transit revenues is limited; security constraints.



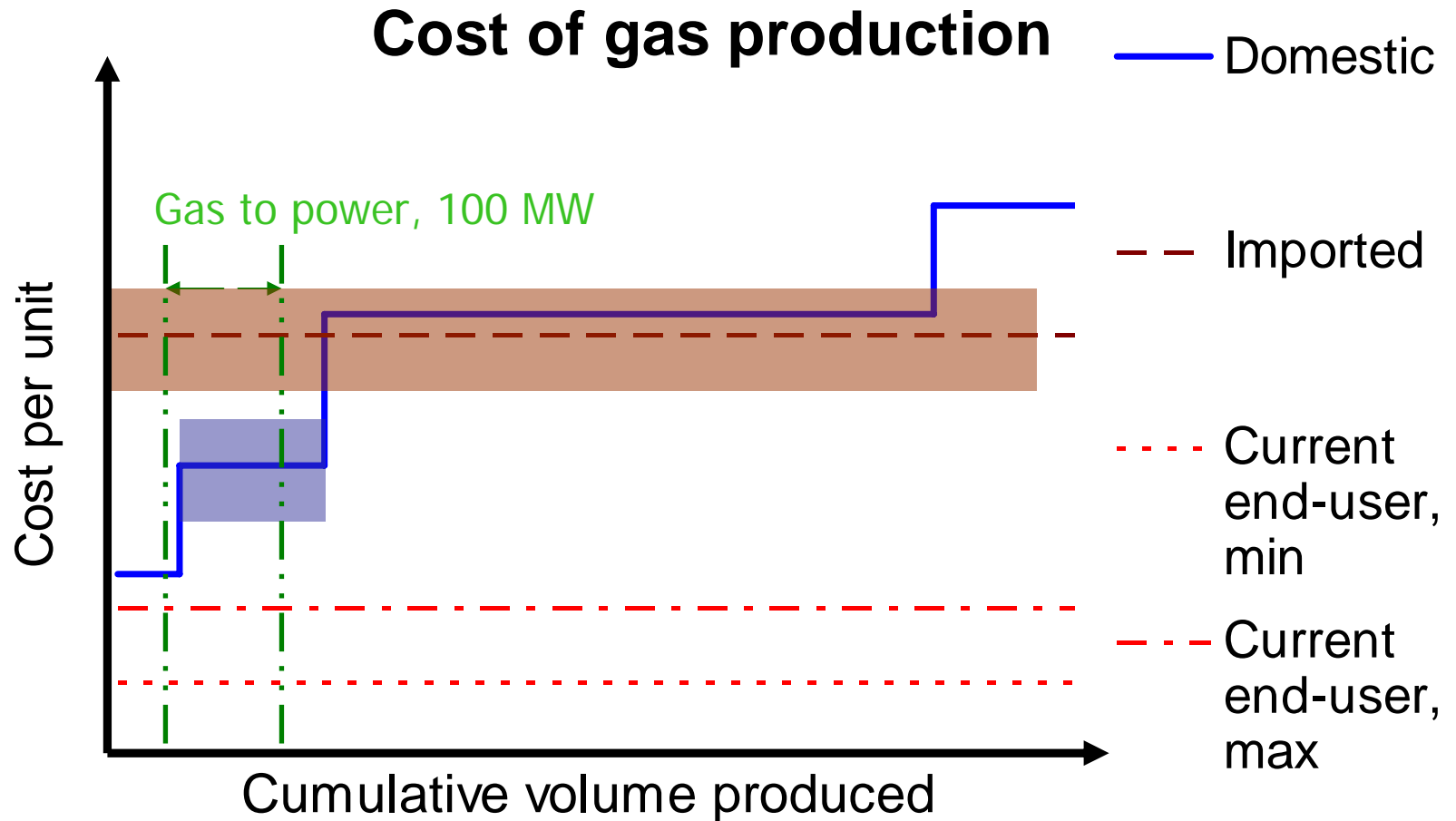
# Generation – domestic

Mine-mouth generation at Sheberghan (combined cycle gas turbine)\*

	<u>Low</u>	<u>Base</u>	<u>High</u>
Gas price at power plant gate (per MMBtu)	\$1.00	\$1.50	\$2.00
<b>Power generation – cents per kWh</b>	<b>2.8</b>	<b>3.2</b>	<b>3.5</b>

**Compare imports at 2-2.5 cents/kWh under uncertain future volume and price terms.**

# Economics of gas production





# Domestic generation—advantages

---

- Scope: a 100-MW CCGT plant at Sheberghan could cover Kabul's estimated demand in 2008;
- Can be cost-competitive with imports over time;
- Increased energy security: diversify supply, reduce risk of supply disruption;
- Strengthened basis for future negotiations on imports;
- Reduced foreign exchange risk (if grant financed);
- Create jobs, develop technical know-how.



# Distribution

---

- Weak link in the chain: transmission and generation achievements undermined without distribution system upgrade and expansion;
- \$300 mln needed for Kabul alone; IDA investing \$65+ mln on medium voltage network;
- Considerably more needed for low voltage network, expanding access, and rehabilitation in other cities.



# Financial sustainability

---

- Tariffs far below costs:
  - unsustainable burden on utility/budget;
  - waste encouraged;
  - generally, better-off subsidized;
- Indications that ability to pay is higher than often supposed: high-cost diesel gensets, high tariffs in Mazar, Herat, etc.;
- Together with cost-recovery tariffs, improved collections needed—DABM restructuring.



# Household energy–international

- Electricity the highest energy priority for households.
- If no electricity, kerosene used for lighting.

<u>% of HHs using</u>	<u>elec</u>	<u>kero</u>	<u>LPG</u>	<u>gas</u>	<u>biomass</u>	<u>coal</u>
<b>Nepal</b> (03/04)	37	92	9	2	85	0.2
<b>India</b> (99/00)	56	88	17	0.3	76	1
<b>Pakistan</b> (01/02)	77	39	8	20	77	0.2

- In rural areas, biomass even more important: 95% in Nepal, 92% in India, 95% in Pakistan.
- No successful case of price subsidy for liquid fuels targeted to poor: modern commercial fuels not a priority for poor (experience of kerosene in India, LPG subsidy in India and Nepal).



# Rural context—Afghanistan

---

- Enormity of challenge:
  - large rural population, low density → works against markets for energy services and affordability, and network economics;
  - information void: how do people meet demand for lighting, heat, cooking—and at what cost to themselves and environment?
  - reliance on biomass could lead to deforestation, increased energy costs; ultimately diminished human development possibilities, which encourages migration to cities;
  - electrification: recognize long-term nature of the solution (20+ year) and that grid extension is not (generally) the answer;
  - small-scale, site-specific solutions ⇒ no single approach for all, huge technical and financial challenge;
  - budget cannot meet demand for financing.



# Rural electrification: range of options

---

- Rural Electricity Cooperatives
  - community-owned and managed
- Rural Electricity Enterprises
  - privately owned and managed
- Individual solutions (own batteries, solar, diesel gensets, etc.)
- Mixed: HHs buy batteries, small business recharges them.



# Rural energy – Prospects for Afghanistan

---

- Rural electrification over time
  - ⇒ typology: (i) near grid; (ii) larger; (iii) hydro, wind; etc.
- For HH fuels, no simple solution where time is unconstrained and cash-earning opportunities are limited
  - ⇒ rural energy policy focus on supporting income-generating activities (leads back to electrification);
- Medium to long term: natural gas in urban areas, LPG in urban areas with no gas coverage, kerosene or LPG (long term) in rural areas.



# Rural—institutional options

---

- National Solidarity Program/MRRD as main vehicle for capital grants, TA for rural energy programs;
- De-link from DABM & MEW;
- Rural Energy Board to coordinate support;
- Relax economic regulation to encourage development;
- Consider capital subsidy schemes (system expansion, connection charges, etc.), possibly through output-based aid in peri-urban areas.



# Gas – status and potential

---

- Reserves sufficient for power generation over life of plant:
  - About 1 trillion cubic feet of proven reserves;
  - Compare: 942 in Iran, 102 in Turkmenistan, 65 in Uzbekistan, and 27 tcf in Pakistan ⇒ gas exports unlikely scenario;
  - Question of imports vs. domestic production.
- More seismic work needed to confirm enough proven reserves for pipeline to Kabul.
- Significant work needed to assess gas reserves in south.



# Special case of gas

---

- Oil and gas are very different commodities:
  - Gas takes much longer to commercialize;
  - Gas commercialization requires predictable and secure market over project cycle;
  - Gas for domestic consumption in Afghanistan will not carry the large “rent” inherent in oil.
- Clear gas pricing principles based on market value and contractual safeguards.
- Clear legal, fiscal, and contractual regime.
- Demonstrated history of payment at market prices.
- Private equity investment unlikely near term.



# Other options for oil and gas

---

- Alternative uses of Sheberghan gas not attractive:
  - fertilizer plant **uneconomic** under nearly all scenarios examined;
  - gas pipeline to Kabul: **uncertainty of reserves, high upfront cost**; re-visit in ~5 years.
- Domestic use of oil **uneconomic** under all scenarios examined:
  - Stand-alone refinery, stand-alone power plant using crude, refinery + power plant.



# Coal

---

- Coal reserves believed to be significant, but need re-evaluation and assessment of commercial viability.
- Dar-e-Suf reserves are good quality and abundant enough for economies of scale.
- Present analysis focused on two applications, power generation and residential use:
  - Power: not least-cost option on info available today, would require large-scale investments for new mine;
  - Residential: demand survey needed to determine extent and nature of use of coal by households.



# Coal

---

- “Heat industries”—cement, brick-making—also important applications;
- Other possible uses—e.g. briquetting—need more technical and market analysis.
- Small-scale rehab investments could bring down costs, increase supply and affordability; problems of distribution, environmental and health impacts.



# Potential of Private Sector

---

- For energy, Afghanistan has domestic tariff-based markets as opposed to export potential industries;  
⇒ private sector less interested in equity/ownership; consider other forms of private sector participation.
- For existing SOEs, first improve efficiency under continued State ownership (commercialize);
- Generation plant: internat'l manager/operator, 5-year contract with capacity development for Afghan staff;
- DABM: 3-year consultancy contract for commercialization of operations;
- Also rural: domestic entrepreneurs can meet energy demand (e.g. off-grid power); microfinance.



# Institutional framework

---

- Proposal: create single ministry responsible for oil, gas, mining and power:
  - no single subsector large enough to justify own ministry;
  - reduce costs of government, potential for bureaucratic abuse;
  - improve efficiency of public investments through strategic decision-making vs. lobbying.
- Rural electrification to remain with MRRD/NSP in partnership with NGOs, local entrepreneurs.



# Strategic Choices and Trade-offs

---

## **Power: domestic generation vs. imports**

Imports (thus, transmission) immediate priority to increase supply in short term.

Over time, domestic gas-fired and hydro generation will come on-line; imports continue to meet supply gap as needed; coal-fired generation possible in medium term.



# Strategic Choices and Trade-offs

---

## **Gas**

Good prospects for economic gas-to-power at Sheberghan; feasibility study top priority;

Demonstration effect: increased gas production, prompt tariff collection at market prices

Kabul gas pipeline and use of possible gas in south not viable options for today.



# Strategic Choices and Trade-offs

---

## **Coal**

For power generation, not least-cost in short term; to achieve efficient production, investment in new mine required + Central government control;

Evaluation of other uses of coal requires more information than presently available.



# Strategic Choices and Trade-offs

---

## **Household/Rural Energy**

Increasing rural access to modern energy is enormous challenge and Government's ability will be highly constrained for years;

Focus on electrification, income-generation;

Institutional reform together with fostering small private development and program of capital subsidies for electrification.



# Strategic Choices and Trade-offs

---

## **Potential for Private Sector**

International private interest in energy sector will be limited due to lack of export potential, unresolved fiscal regime, unfavorable energy pricing, other risks;

Focus on private sector expertise through “management” contracts.

Potential for domestic entrepreneurs in rural electrification?



# Immediate priorities

---

- Deepen information base:
  - Energy demand study/HH energy use survey.
  - Geological survey.
- Complete Termez-Kabul transmission line;
- Improve Power Purchase Agreements;
- Commence feasibility study for Sheberghan gas-to-power plant;
- Launch institutional and enterprise reform, restructuring of DABM and Gas Enterprise;
- Establish power and gas pricing principles.