

Gwadar – Nawabshah Pipeline Development of a Project

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Pakistan Energy Situation

Pakistan is the Muslim part of former British colony of India. Back in 1947 the country was created in two parts East and West Pakistan. In 1971, the Indian army intervened in the civil war situation in the eastern part, as a result of which the state of Bangladesh was created.

The founder of Pakistan, Muhammad Ali Jinnah, died too early to be able to establish his vision of Pakistan. Pakistan underwent several regime changes, not all of them being peaceful. A handful of rich families compete for dominance; the political parties are better assessed with a view of the persons involved than of the programs.

Pakistan ranks no. 147 of 188 of the United Nations Human Development Index 2014 (Germany: 6); the population of 199 million (estimation 2015) makes it no. 7 in the world; its area covers 796,095 km² corresponding to no. 36 in the world; the GDP 2015 is estimated at US\$ 931 billion, i.e. \$ 4,900 per capita, which is no. 27 of all countries (Germany: 6); Pakistan is no. 117 out of 167 on the corruption perception index of Transparency International (Germany no. 10).

Pakistan has common borders with Iran, Afghanistan (partly disputed), China (partly disputed), India (partly disputed) and 1,046 km of shore at the Arabian Sea with major ports in Karachi and Gwadar. Pakistan is an Islamic Republic of

77 % Sunnites and some 19 % Shiites and 4 % non-Muslim. Pakistan's army is the overall stabilising institution of the state; it has nuclear weapons at its disposal and is currently the driver of a "robust" campaign against local terrorism and very much supporting the current endeavours for fighting corruption. Pakistan's political game plan is quite successful in keeping a multidimensional balance between the major conflicting groups of the region and globally, the provincial antagonisms and the religious tensions at the domestic front.

The majority of inhabitants live in the state of Punjab which is favoured by nature – the alluvial deposits of river Indus revealed traces of one of the oldest places of human settlements on this planet. Other large parts of Pakistan are unfertile deserts and mountainous areas.

Pakistan's economy works with well-educated staff, incredibly bureaucratic regulations and structures and a legal system still characterised by the British roots. Personal networks are important and even in conflicts politeness and self-containment is highly regarded.

Demand and Supply

All travellers to Pakistan experience power outages. Commerce and industry suffer from a lack of reliable energy supply. Fast growing population is not adequately served by services and production because growth of economy is prevented by the lack of energy. **Figure 1** highlights Pakistan's gap in energy supply projected for natural gas. Power shall be imported from Central Asia hydropower plants.

Glaciers, mountains and rivers in Northern Pakistan provide huge potential for development of hydropower plants; the projects often suffer from missing investments and political controversy.

Pakistan has the largest Natural gas pipeline network per sq. km. in Asia and shall be a major contributor to the improvement of the energy supply situation. Pakistan domestic reserves of oil and gas, on the other hand, are not sufficient for satisfying the demand.

Recently, the Ministry for Petroleum and Natural Resources concluded Liquefied Natural Gas (LNG) supply contracts with Russia and Qatar. LNG Terminals in Port Qasim near Karachi will receive this LNG and existing networks of Sui North and Sui South plus a planned North-South-Pipeline shall transport the re-gasified LNG to one of the centres of consumption, Lahore.

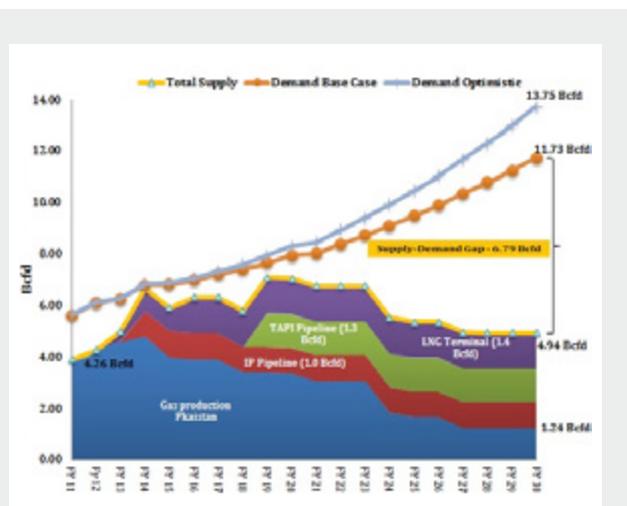


Figure 1: Demand Supply



Figure 2: Route Map

Last not least, the subject of this article “Gwadar Nawabshah Pipeline” (GNP) shall stabilise the country’s energy situation by diversification.

Selected Projects under Development

Following projects may be distinguished with

- » The Diamar Basha Hydropower plant project was first proposed in 2001. The capacity shall be 4.5 GW of electrical power; it includes a 272-m-tall roller-compacted-concrete dam, a permanent access bridge. The plant is located on the Indus River and the latest cost estimate ranges up to US\$ 12 billion. It would eliminate half of Pakistan’s energy shortfall and irrigate millions of acres of parched land. The project is politically discussed with regard to the Indus water management.
- » Kyrgyzstan, Tajikistan, Afghanistan and Pakistan agreed on a 1,222 km high voltage power transportation system to Peshawar in Pakistan referred to as CASA 1000. The receiving station in Peshawar is designed for up to 1,300 MW.
- » The import facilities in Port Qasim near Karachi require a new natural gas pipeline referred to as North-South Pipeline of some 1,300 km connecting the receiving facilities with the high supply demands in the Lahore area. The project is subject of a Russian-Pakistan Government to Government Agreement.

Turkmenistan-Afghanistan-Pakistan-India Pipeline

Turkmenistan, Afghanistan, Pakistan and India agreed to construct a natural gas pipeline from the Galkynesh field in West-

Turkmenistan to Fazilka in India. The project idea is related back into the nineties of the last century. 14 bcm out of the total capacity of 33 bcm pa is intended for Pakistan. The first construction works started in late 2015.

History of the Iran-Pakistan-Pipeline

Early ideas of a pipeline connection between Iran and Pakistan are reported from the mid fifties of the last century. In the nineties the preliminary agreements for the project between Iran, Pakistan and India were signed. The developments between 1994 and 2012 show a wide spectrum of technical ideas, political concepts and diplomatic interceptions. The Gas Sales and Purchase Agreement between Iran and Pakistan was signed in May 2009 and became effective in 2010. On Pakistan side ISGS (Interstate Gas Systems Private Limited, Islamabad) is nominated to realise the project.

In April 2011, the Engineering and Project Management started for the complete IP project. The basic design resulted in a Front End Engineering Design (FEED) for the Engineering Procurement Construction (EPC) tender process. A Strategic Environmental Impact Assessment (SEIA) described the social and environmental impacts, their mitigations and outlined the concept of a Community Benefit Program. This is intended to improve the situation of villages with regard to power supply, water supply, access to health care institutions and education - basic human needs after all.

The political situation around Iran and the international sanctions stopped the works on the project in 2013. It was taken up in 2015 as GNP Project (see below).



Figure 3: Example Active Fault Map



Figure 4: Route Photo

Gwadar – Nawabshah Project

The idea of establishing an LNG terminal in Gwadar and constructing a pipeline to Nawabshah shall pave the way for the IP project and reduce the works that are needed to implement the IP project at a later stage.

In the vicinity of Gwadar a Floating Storage and Re-gasification Unit (FSRU) shall be operated near the shoreline. A metering station and a connecting pipeline of 32”/4 km length shall provide the gas for the main pipeline.

In 2013 the idea was presented to the Pakistan decision makers. The project was included in the discussions about the China-Pakistan-Economic-Corridor and was supported by the governments of both countries in a government to government (G2G) agreement in 2015.

In the same year the tender procedure was started. Construction shall be started in 2016. The project shall be in operation in 2018.

The G2G agreement determines China to finance 85 % of the EPC contract. As a consequence a Chinese company shall execute the project and Chinese products shall be preferred. Such G2G clauses are the only accepted exceptions from the Public Procurement Regulatory Authority’s (PPRA) rules. Therefore the tender procedure was organised following the PPRA rules to the extent possible, for procurement from a single source. These proceedings provided advantages to all parties involved, mainly transparency and a common understanding of the tasks.

Route Gwadar-Nawabshah Pipeline

The starting point of the GNP System will be at the Block Valve Station located near Gwadar (Balochistan Province).

The route corridor of the GNP is passing through flat (approx. 80 %) and undulating, hilly and mountainous terrains (approx. 20%). The GNP has a total length of about 700 km of which about 580 km are located in Balochistan Province and approximate 122 km in Sindh Province.

The preferred route is the result of a selection process based on mapping constraints and narrowing down the total of eleven route corridors down to one. The coastal route selected mainly provides advantages with regard to security and logistics.

The features of nature teach respect when routing and designing a pipeline in the southern part of Pakistan. The following aspects shall illustrate that:

- » Crossing the River Indus: Indus is the longest and largest river in Pakistan and life line for country’s agriculture and hydropower. Drainage area of Indus is about 1,165,000 km². Total length of the river is about 3,200 km. Annual estimated flows are around 207 km³ making it the 25th largest river in the world with respect to annual flows. The route is crossing the Indus between Sukkur and Kotri barrages. Flood plain of Indus at pipeline crossing is about 6 to 7 km, while active perennial creek remains 700 to 800 m. A new bridge (Amri-Qazi Ahmad Bridge) of about 1.2 km length is under construction upstream of the route. The impact of flooding in the presence of this new bridge will be studied for detailed crossing design. The Basic Design resulted in a 1.5 km long pipe bridge.
- » Seismic conditions: The pipeline crosses or passes by in the vicinity of more than 30 fault zones. These were identified and avoided where possible. Corresponding maps were prepared. Statistics of earthquakes reported were analysed, more than 900 of them in the project area were taken into consideration when the technical means for a safe pipeline were developed. These measures are mainly sufficient strength and ductility of the pipes, special consideration is given to the backfill material of the trench. The direction of the route in critical zones was optimised for load distribution during possible fault displacement.

Logistics

The Baluchistan part of the pipeline leads to desert areas being very dry. Supply with materials and equipment is the normal

challenge of such a project. In this case the provision of food, beverages and water in general for the construction teams and the later operational crews is a special challenge. Transport can use the approach from sea and the coastal highway. Sustainable solutions for water supply will be most probably realised by desalination plants of suitable size. These will be designed to also give benefit to the villages of the area in course of the community benefit program.

System

The IP-system was originally designed to install all required facilities such as the 42"-pipeline, compressor stations and all other related equipment to transport 1,000 MMscfd natural gas imported from Iran to Pakistan.

For the GNP project only one small compressor station of 1.3 MW at the end shall ensure the correct delivery pressure into the receiving systems. The FSRU provides sufficient pressure for transport of the gas.

The new Gwadar-Nawabshah system will be fed with up to 500 MMscfd re-gasified natural gas, from the new LNG terminal and its metering station which is envisaged to be constructed at the Gwadar harbour facilities.

A software based dynamic pipeline modelling leak detection application integrated with the real-time SCADA database shall be implemented. Although the leak detection system shall be able to identify (detect) and locate the position of a leak, there will be no automatic pipeline shutdown. The operator will analyse the received information and initiate further action.

26 block valve stations are foreseen for the GNP. The size of the fenced area of each station is approximately 145 m x 100 m, this includes space for a second future pipeline.

Iran

The Gas Sales and Purchase Agreement is in place but currently suspended. Source of the natural gas will be the South Pars Field in Iran.

Until 2018, which constitutes the expected finalisation year of the GNP Project, the sanctions against Iran are expected to be lifted completely. Phase 2 of the project could be started immediately after that: building the missing 80 km of pipeline and the erection of four compressor stations.

The Iranian part of the project is about 1,150 km long and has been completed to a major extent.

Security

It is an everyday experience all over the world that media tend to report dramatic stories of injustice, violence, terror and human suffering. The selection of stories is a manipulation in itself and creates a picture of the world as of such elements. The same applies to the security situation in Pakistan. Reports of suicidal bombers, terror attacks and assassinations for ethnic, religious or political reasons are permanently filling pages of Pakistan newspapers and find entrance in international media as well. Experts say that the situation has significantly improved during recent years.

In addition the Pakistan Law Enforcement Agencies are still involved in large scale military operations against terrorism in critical areas like "Zarb-e-Azb" in Waziristan.

Camps of Chinese contractors in Pakistan were attacked in the past; therefore special attention and care for the security situation is required. For the Gwadar-Nawabshah Pipeline and LNG Terminal Project the Pakistan Law Enforcement Agencies take the responsibility for the overall security "from the outside" for all project installations and activity. The project needs to maintain a high level of planning of logistics and construction activity. Permanent interaction and maintenance of interfaces are mandatory for a peaceful project execution.

Prospect

President Rohani of Iran will visit Islamabad towards end of March 2016; impulses for the completion of the project to Iran are expected. However, the USA did not lift all sanctions from Iran; patience is required.

Pakistan has launched the formal decision making on the domestic part of the project budget. The GNP project is part of the Pakistan portfolio of projects of the energy sector. Prioritisation of GNP is expected, but not guaranteed.

The development of the Iran Pakistan Pipeline / Gwadar Nawabshah Pipeline is an exercise in patience, diplomacy and competence. The basic idea is economically viable and convincing. Rather sooner than later the project should be realised for the benefit of the Pakistani people.

References

- [1] „Pakistan Land der Extreme, Geschichte-Politik-Kultur“, Katja Mielke/Conrad Schetter, München, 2013
- [2] "Pakistan on the Brink", Ahmed Rashid, London 2012
- [3] "The Pakistan Paradox - Instability and Resilience", Christophe Jaffrelot, Gurgaon 2015
- [4] The World Factbook, Central Intelligence Agency, www.cia.gov, 2016-03-07
- [5] Transparency International Deutschland e.V., www.transparency.de, 2016-03-07
- [6] "Human Development Report 2015: Work for Human Development" UNDP, report.hdr.undp.org, 2016-03-07

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