# ENERGY FORECASTING IN GAS SECTOR OF PAKISTAN USING LEAP MODEL

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## ABSTRACT

In the current study, Pakistan's natural gas energy consumption, cost and emission were foreseen for the next thirty years. Study used 2012 as base year while 2042 as the end year. Prime objective of this study was to develop a fully incorporated modeling scheme and to find out ways to minimize negative environmental impacts governed by poor energy utilization practices. Another important objective was to promote indigenous energy sources in order to reduce growing natural gas import loads. It was carried out in assistance of Long Range Energy Alternative Planning System or LEAP. LEAP forecasted Pakistan's natural gas consumption, cost and related six major emissions to the environment. Secondary data was collected and interpreted to the LEAP. Model depicted results in the form of different scenarios. Such scenarios were actually self-consistent story-lines to estimate future natural gas energy evolution over time. At first, a scenario called Business-as-Usual (BAU) or base scenario was constructed by using base year i.e. 2012. It was based on likely plans and policies revealing future energy situation carried on the same existing energy track. Later, alternative scenarios i.e. biofuel scenario (BIO), nuclear energy scenario (NUC) and renewable energy scenario (REN) were framed. Among these, REN scenario particularly encouraged formulation of new energy policy and enforcement to reduce natural gas energy consumption and environmental emissions such as $CO_2$ (non-biogenic, CO, $CH_4$, $NO_x$, $N_2O$ and $VOC_s$ while BIO and REN both were found to be natural gas energy cost efficient. Finally, recommendations were considered for governmental, non-governmental and policy makers to make planned, wise and efficient use of natural gas energy to control environmental emissions by developing a pollution reduction framework.

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## ABRREVIATIONS

| | |
|---|---|
| AEDB | Alternative energy development board (Pak) |
| ADB | Asian development bank |
| ALT | Alternative scenario |
| BASE/BAU | Baseline scenario |
| Bcf | Billion cubic feet |
| BIO | Biofuel scenario |
| $CH_4$ | Methane |
| CO | Carbon monoxide |
| $CO_2$ | Carbon dioxide |
| GDP | Gross domestic product |
| GHG | Greenhouse gas |
| GUSA | Gulf-South Asia pipeline |
| HDIP | Hydrocarbon development institute of Pakistan |
| ICC | International chamber of commerce |
| IPCC | Intergovernmental panel on climate change |
| IPI | Iran-Pakistan-India pipeline |
| LEAP | Long-range energy alternatives planning system |
| MCF | Million cubic feet |
| MMcf/d | Million metric cubic feet per day |
| MMT | Million metric tonnes |
| MT | Metric tonnes |
| MTOE | Million tonnes of oil equivalent |
| $NO_x$ | Nitrogen oxides |
| $N_2O$ | Nitrous oxide |
| NUC | Nuclear scenario |
| OECD | Organization for economic co-operation and development |
| OGDCL | Oil and gas development company limited (Pak) |
| REN | Renewable scenario |

| | |
|---|---|
| SEI | Stockholm environmental institute |
| TAPI | Turkmenistan-Afghanistan-Pakistan-India pipeline |
| TCF | Trillion cubic feet |
| TED | Technology and environmental database |
| TOE | Tonnes of oil equivalent |
| UNFCCC | United Nations framework convention on climate change |
| US EIA | United States energy information administration |
| $VOC_s$ | Volatile organic compounds |

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