ENERGY EXPORT STRATEGIES OF THE CENTRAL ASIAN CASPIAN REGION

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Overview

Almost all the most important energy-producing countries are highly dependent on energy exports, and this dependence typically results in a very large share of the energy sector to the GDP and fundamental contributions to exporting State budgets. This is also true for the Central Asia and Caspian region countries. Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan are rich of natural gas and oil and their rent share in GDP is substantial. To develop domestic economies, to commit to environmental targets, to exploit the fields, these countries need certain and predictable flows (demand) and fair prices, and need to include the concept of vulnerability (in terms of "security of demand") in their energy sector strategies. This study aims to test the effects of of long-term energy export strategies on the energy system of the Central Asian Caspian Countries (Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan). It explores the trade-off curves between a comprehensive "risk" indicator (associated to the vulnerability of export strategies) and the outcomes of key variables of the energy system, such as the cost of the strategies, and the corresponding quantities exported and revenues.

Methods

Making use of an energy system model, of a "risk-adjusted" concept of export routes, of scenario analysis, and of trade-off curves, analysis tests and evaluates the sensitivity of the energy system to strategies which attempt to minimise the risk of export and to keep sufficient level of revenues from export simultaneosly.

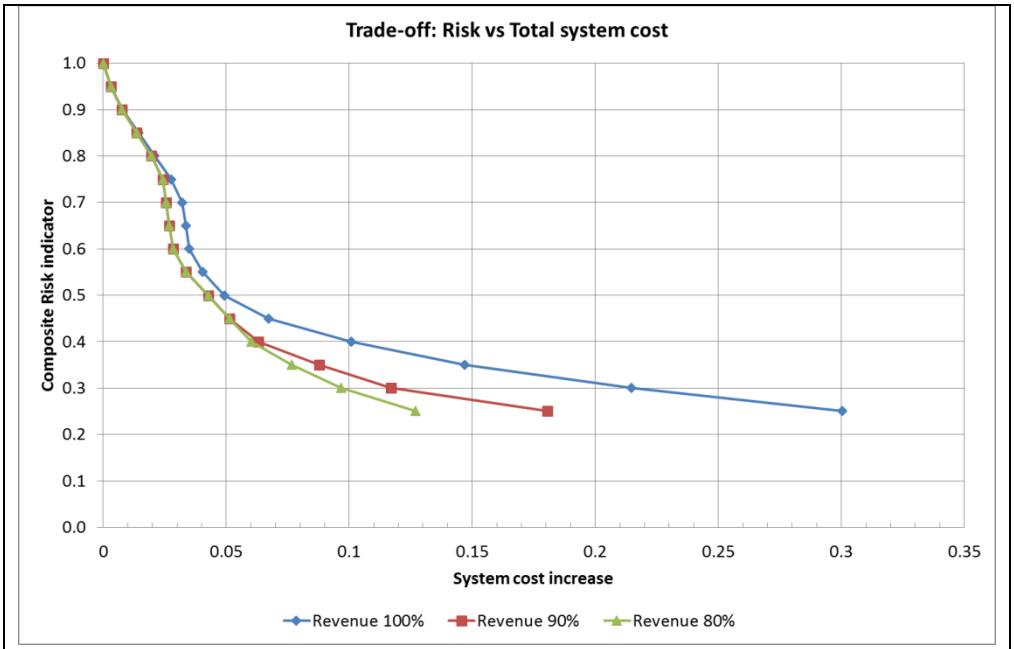
This energy system model was thought and designed as a comprehensive framework, able to simulate national and/or over-national constraints, in a long time horizon (until 2050) with the flexibility to also support analysis in a medium term (2030). All the potential export routes are explicitly described with specific techno-economic characteristics, and identified through some "exit points" which determine the borders of the multiregional system under analysis. All the possible directions of export are taken into consideration, such as "gas to Russia", "gas to China", "gas to the Mediterranean area (via Turkey)", "oil to the Mediterranean area (via Turkey)", "oil to China", "oil to Russia", "oil to Iran" and "gas to the Indian Subcontinent". Model optimises the domestic energy system (supply and demand of each energy form), the energy exchanges among the four countries, and and the trades with the external markets, in an integrated manner.

Four dimensions of risk have been identified and assigned to each export route: a non-energy related "geopolitical/socioeconomic component" of the transit countries, as well as three energy-related factors such as the "energy market liquidity", the estimate of "energy self-sufficiency" and the expectation about "energy/environmental policies of the potential customers" of the potential importers. Components are merged into one single risk indicator.

A "reference" scenario provides the estimates of revenues from oil&gas exports and the magnitude of risk, period by period, when no specific targets are assumed. Then, several risk reduction targets are tested subject to three main hypotheses on the level of yearly revenues: the same as in the reference case; a maximum relaxation of 10%; a maximum relaxation of 20%. Trade-off curves are built by running a number of sensitivity scenarios, one per each point of the curve.

Results

The trade-off lines between "risk" against "total system cost" in three cases (revenues as in the reference case, -10%, -20%) provide a quantitative insight of the room for vulnerability-of-export reduction, and the sensitivity of such indicator to revenue control strategies.



Trade-off: Risk vs Total system cost

The graph can be divided into three major areas. The first one (top-left) shows that within a total cost increase of 5%, the system can sharply decrease the risk indicator of 50% with respect to the reference case. The second area covers the risk decrease from 50% till around 20%, and shows the high sensitivity of the total system costs to such much more challenging goals. For example, a further risk reduction of 10% (from 50% to 40%), can be obtained with an additional extra cost of 5% (see blue line). The third area, which is below 20% of risk reduction, results "infeasible" for the Central Asian Caspian system when it is subject to the minimum revenues control. Only a more significant relaxation of such a "vital" source of value would allow to open more space for a further reduction of risk.

Conclusions

According to our analysis, there is a big room for reducing the vulnerability (with respect to the energy export) that the Central Asian Caspian area is currently facing. The cost of such reduction is relatively small (5% greater than the reference case) for a significant improvement of the indicator down to 50%. But the response of the system subject to alternative/additional environmental-oriented policies may depict very different trade-offs, in particular because of the greater sensitivity of the system to the natural gas allocation problem. Domestic commitments and targets (e.g. reduction of CO2 emissions, gasification plans) have strong impact on the slopes and shapes of the curves. An intergrated planning approach is therefore the only rationale way to handle the interdependencies, and find out the actions/strategies able to ensure the best compromise is such a complex decision problem for the Central Asian Caspian region.

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