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South East Europe: Regional Gasification Study

Draft Final Report: Montenegro Market Report

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1 Physical, Demographic and Political Profile

Montenegro is a landlocked country bordering: Albania 172 km, Bosnia and Herzegovina 225 km, Croatia 25 km, Serbia 203 km. The mountains of Montenegro include some of the most rugged terrain in Europe. They average more than 2,000 metres in elevation. One of the country's notable peaks is Bobotov Kuk in the Durmitor mountains, which reaches a height of 2,522 metres. The terrain is a key consideration when deciding on pipeline routes and estimating their cost as elevation requires additional compression.

Montenegro has a population of approximately 0.7 million people and its capital city is Podgorica. The population is quite concentrated with the following cities having the respective populations:

- Podgorica (0.2 million)
- Nikšić (0.1 million)
- Pljevlja (0.04 million)
- Bijelo Polje (0.06 million)
- Herceg Novi (0.03 million)
- Berane (0.05 million)

Figure 1 Montenegro map

Source: CIA World Factbook

After World War I, Montenegro was part of the Kingdom of Yugoslavia, and, at the conclusion of World War II, it became a constituent republic of the Socialist Federal Republic of Yugoslavia. When the latter dissolved in 1992, Montenegro federated with Serbia, first as the Federal Republic of Yugoslavia and, after 2003, in a looser union of Serbia and Montenegro. Following a three-year postponement, Montenegro held an independence referendum in the spring of 2006 under rules set by the EU. On achieving a vote greater than 55%, as required by the EU Montenegro was able to declare its independence.

2 Economy

In January 2007, Montenegro joined the World Bank and IMF. Montenegro is pursuing its own membership in the World Trade Organization as well as negotiating a Stabilisation and Association agreement with the European Union in anticipation of eventual membership.

In 2006, Montenegro recorded a nominal GDP of US$ 2,308 million equating to a GDP per capita of US$ 3,723. GDP growth is now above 6%, inflation is low but severe unemployment remains a key political and economic problem for Montenegro and in fact for this entire region. Montenegro has privatised its large aluminium complex - the dominant industry - as well as most of its financial sector, and has begun to attract foreign direct investment in the tourism sector.

3 Energy Sector

3.1 Energy Resources

Montenegro has been a net importer of electricity more or less constantly since the early 1970s, because of insufficient generation capacities. The deficit was compensated with electricity from Serbia's power system.

While Montenegro has enormous unused hydropower potential (9,900 GWh/y), it lacks electricity at the annual level (with deficit levels reaching 1,300-1,500 GWh), used potential being at around 1,800 GWh/y (17.9%). [1]

Montenegro also has vast ore resources. In the Pljevlja basin there are reserves of about 205 million tons of lignite coal, with recoverable reserves estimated to be about 175 million tons. The coal mine in Pljevlja serves the thermal plant in the same city. In the Berane basin, there are also significant reserves of brown coal. The recoverable reserves are estimated to be 17 million tons.

[1] Government of Montenegro Investment Guide

The Government of the Republic of Montenegro has now decided to sell its shares together with the sale of TPP Pljevla property to a strategic investor in order to provide necessary investment enabling CMP and TPP to be viable industrial undertakings.

The installed electricity generation capacity is currently: Hydro 690 MW; Thermal 210 MW.

3.2 Energy Usage

Montenergo's energy system is small in size, compared to other energy networks in south Eastern Europe. Its main component is the electric power system and the corresponding transmission and distribution networks, all of which are integrated into the same company EPCG (now functionally unbundled). It supplies 200,000 customers.

There is no gas usage in Montenegro. Although there were some plans to expand the natural gas infrastructure system to Montenegro (while in Serbia & Montenegro), the costs of this were seen as prohibitive due to the mountains that separate Serbia and Montenegro and the small population of Montenegro.

Electricity consumption in 2006 was 4.5 GWh. Electricity generation in 2006 was: 2.8 GWh and therefore implying a significant import requirement of 1.7 GWh[1].

Up until 1980, electricity generation in Montenegro satisfied the needs of the consumers in the Republic. However, after the construction of the second phase of Aluminium plant and modernization of Railway, industrial consumption had significantly increased.

Nearly all Montenegrin households are also electrified and metered. Based on the latest available data, average monthly electricity consumption in Montenegro in 2001 was 367 kWh per household. The difference between Podgorica's average consumption of 407 kWh and Bijelo Polje's of 231 kWh is quite noticeable with Herceg Novi's average consumption being very close to the average. It is also worth mentioning that the main driver of a rather high average consumption in Montenegro is a year round high consumption level in the capital.

Unlike other parts of Former Yugoslavia, Montenegro does not have a district heating system. It was deemed to be unnecessary to invest in such a major project given Montenegro's mild winters. Instead, most homes are heated through an electric radiator system, an electric thermal accumulator or an individual heating system. Wood is one of the most popular heating sources in Montenegro. Heating

[1] www.erranet.org

methods used in Montenegro and the corresponding percentages are: electricity-(48.1%), stone coal – (5.3%), brown coal – (1.3%), wood – (42.4%)[1].

Existing power plants are past half their expected lives, with the opportunity for them to be replaced by gas-fired power plants.

3.3 Energy Development Plans

Montenegro has now formulated its energy policy and Energy Development Strategy. The current policy documents hardly discuss using natural gas as a viable route to develop. Except that the need for exploration of gas resources is noted, given that there are reports indicating availability of gas resources in the country.

Montenegro is a signatory for Energy Community Treaty (2005) resulting from the Athens process. It provides that the states will:

- Implement electricity and gas tariff reform plans
- Implement all necessary technical standards
- Create National Regulatory authorities and transmission system operators
- Develop local solutions to pressing problems of regulation, energy poverty and social equity
- Implement the gas and electricity directives

Within the Athens process, the Government of the Republic of Montenegro made a decision to open completely the energy market in 2009.

4 Gas Sector

4.1 Policy and Legal Framework

By adopting the new Energy Law in July 2003, an important step has been made towards reforming the energy sector, in accordance with international standards and regulations of the European Union and creating a legal framework for non-discriminatory approach to the distribution and transmission system.

The Ministry of Economy defines and implements the national energy policy and national energy strategy as well as long term and annual energy balances. It also

[1] Source: Austrian Energy Agency. http://www.eva.ac.at/enercee/scg/supplybycarrier.htm

contributes to new energy policy, ensures the application of measures for environmental protection, promotes and facilitates the investments in the energy sector of Montenegro, promotes and facilitates the competition within the sector and is the driving force behind seeking interconnections with neighbouring countries.

4.2 Regulatory Bodies

In 2004 the new independent Regulatory Agency[1] for energy sector was established, with the aim to regulate the energy sector in Montenegro on the principles of objectiveness, non-discrimination and transparency, in accordance with the effective international standards.

The Montenegrin parliament appoints the members of the board. ERA regulates electricity and liquid fuels. It supervises energy undertakings and establishes rules and regulations. It would be natural for ERA to regulate the gas sector too, once a market was to develop. On the basis of the Energy Law, the Energy Regulatory Agency has been established as an independent and functionally autonomous not-for profit organisation.

4.3 Institutional Framework

The natural gas market does not exist in Montenegro, and consequently there is no related legislation or functioning institutions. This indicates a requirement for further work on establishing the institutional and legislative framework in the gas sector in parallel to gasification plans and projects.

4.4 Fuel Prices

There is currently no gas consumption in Montenegro.

Petroleum product prices in Montenegro are calculated according to the 'Decree on Methodology of establishing a Maximum Price for Petroleum Products'. Table 1 shows the various prices in EUR/lit.

Table 1 Petroleum product prices[2]

Cost chain (EUR/lit)	Leaded 98	Unleaded 95	Gasoil 0.2	EKO Diesel	Extra light

[1] http://www.regagen.cg.yu/

[2] Correct as of 18 September 2007.

CIF cost	0.39	0.40	0.44	0.44	0.44
Taxes	0.59	0.58	0.42	0.42	0.25
Retail	0.10	0.111	0.12	0.12	0.10
Price	1.08	1.09	0.94	0.95	0.76

The current[1] retail prices for mazut and kerosene are 0.02 and 0.86 EUR/kg respectively. These prices include a 17% tax, however they are not subject to the 'Decree on Methodology of establishing a Maximum Price for Petroleum Products'.

4.5 EC Gas Commitments

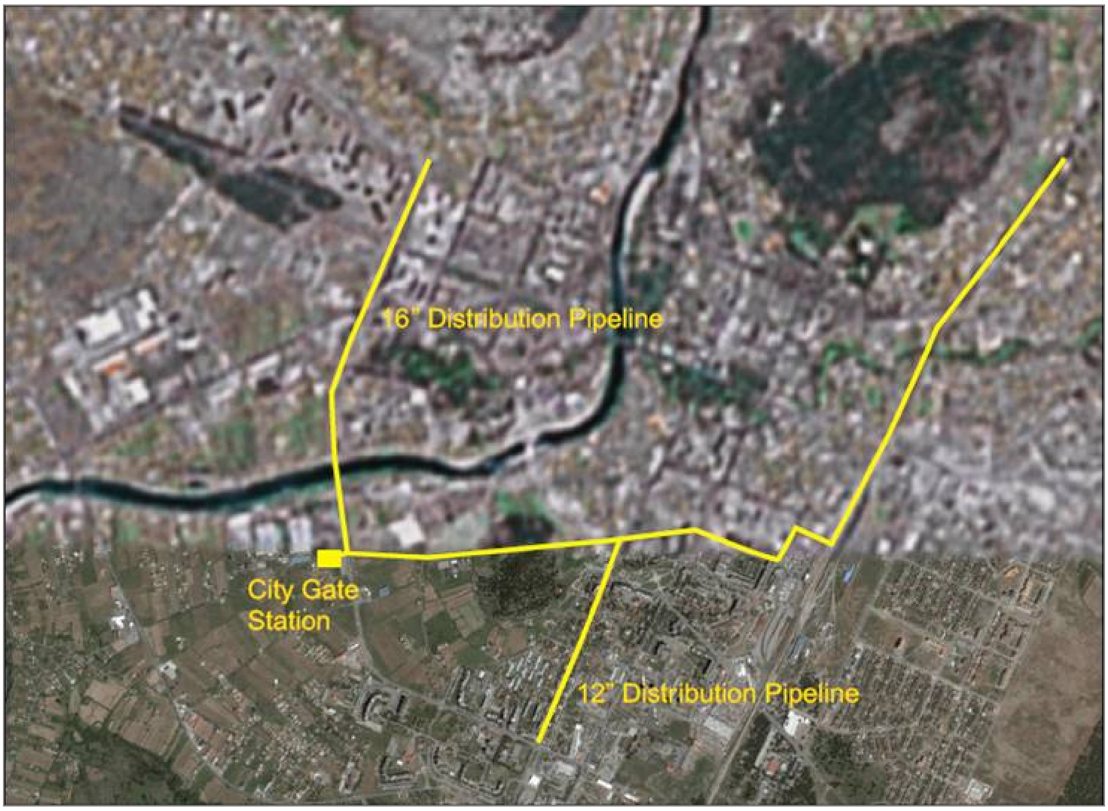
The reform of the energy sector of Montenegro started with the enactment of the Energy Law in 2003 which has its basis in the EU Directive 96/92. Currently, there are no activities taken towards its harmonisation with the 2003/54/EC Directive.

4.6 City Distribution Demand Studies

Podgorica is a city with a population of approximately 136,473. It is made up of a Residential and Commercial area of around 6.3 km^2 and 0.7 km^2 Industrial. This gives a population density of 21,662 per km^2. Figure 2 shows a map of Podgorica.

[1] 18 September 2007

Figure 2 Podgorica distribution map



Data provided shows a total number of households to be 45,491 estimated to comprise 34,118 apartments and 11,373 houses. Based upon an annual estimated consumption of 15,240 kWh and peak consumption of $3m^3$/hr per residential customer, residential demand is estimated at 693,283 MWh per annum, with a peak hour demand of $102{,}355m^3$/hr. Based on these assumptions, Table 4 shows the potential demand.

Table 2 Potential demand

Sector	Annual demand	Peak hour demand
	MWh	Cu.m/hr
Residential	693,282	102,355
Commercial	288,868	12,748
Industrial	173,320	6,374
Total	1,155,471	121,476

It is suggested that gas would be supplied to the city from the proposed SEE Ring via a 15km / 10in. diameter spur line, which will transport gas to a City Gate Station located to the south east of the city. Gas would be metered and the pressure reduced to 16bar for supply to a 5.9 km / 16in diameter and 1.5 km / 12in diameter high pressure steel distribution system.

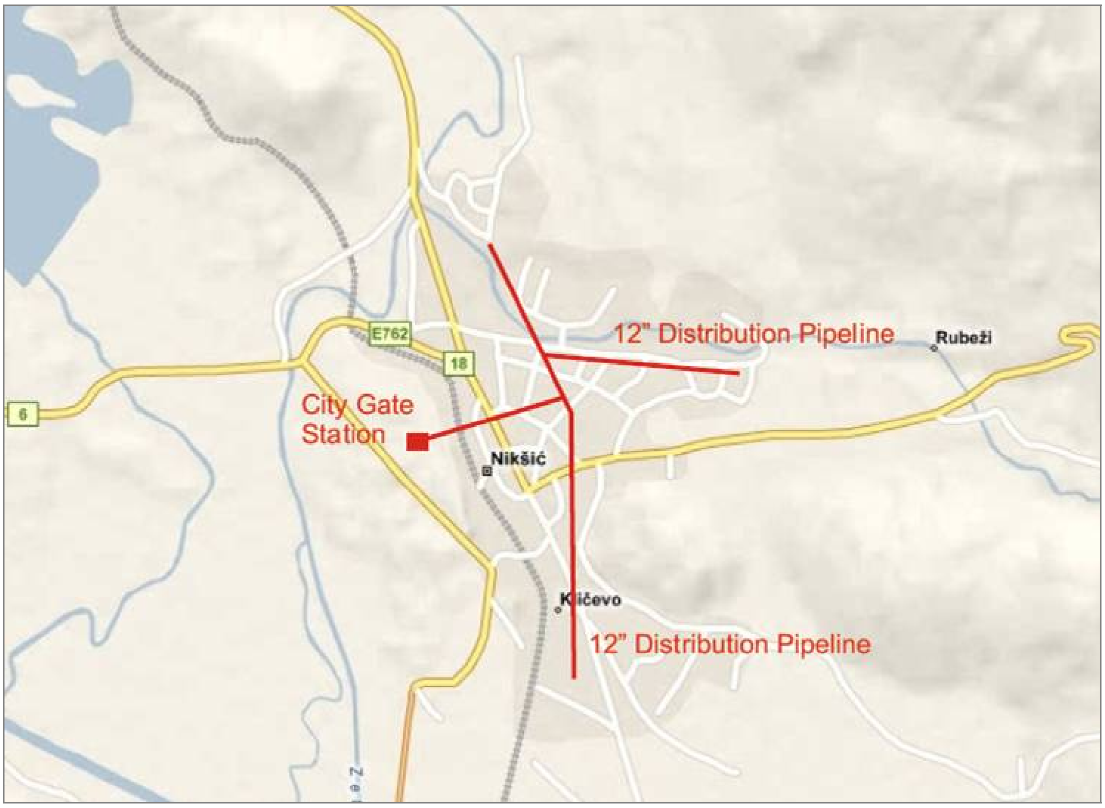
The high-pressure distribution system would supply the 4bar medium pressure network, which would in turn supply customers. Estimated capital costs are shown in Table 3.

Table 3 Estimated capital costs

Item	Total Cost
	US$ million
SEE Ring Connection	5.0
Spur Line	0.0
City Gate Station	4.0
HP Distribution System (16bar Steel)	3.5
MP Distribution System (4bar PE)	9.1
Residential Connections	36.9
Residential Installations	10.8
Industrial and Commercial Connections	5.1
Total	74.4

Niksic is a city with a population of approximately 90,000. It is made up of a Residential and Commercial area of around 8.1 km^2 and 0.9 km^2 Industrial. This gives a population density of 11,111per km^2. Figure 3 shows a map of Niksic.

Figure 3 Niksic distribution map



Data provided shows a total number of households to be 30,000 estimated to comprise 22,500 apartments and 7,500 houses. Based upon an annual estimated consumption of 15,240 kWh and peak consumption of 3m^3/hr per residential customer, residential demand is estimated at 457,200 MWh per annum, with a peak hour demand of 67,500m^3/hr.

Using the sectoral demand assumptions set out above results in the potential demand estimates shown in Table 4.

Table 4 Potential demand

Sector	Annual demand	Peak hour demand
	MWh	Cu.m/hr
Residential	457,200	67,500
Commercial	190,500	8,407
Industrial	114,300	4,203
Total	762,000	80,110

It is suggested that gas would be supplied to the city from the proposed SEE Ring via a 30km / 10in. diameter spur line, which will transport gas to a City Gate Station located to the north west of the city. Gas would be metered and the pressure reduced to 16bar for supply to a 7.1km / 12in diameter high-pressure steel distribution system.

The high-pressure distribution system would supply the 4 bar medium pressure network, which would in turn supply customers.

Estimated capital costs for the gas supply system are shown in Table 5.

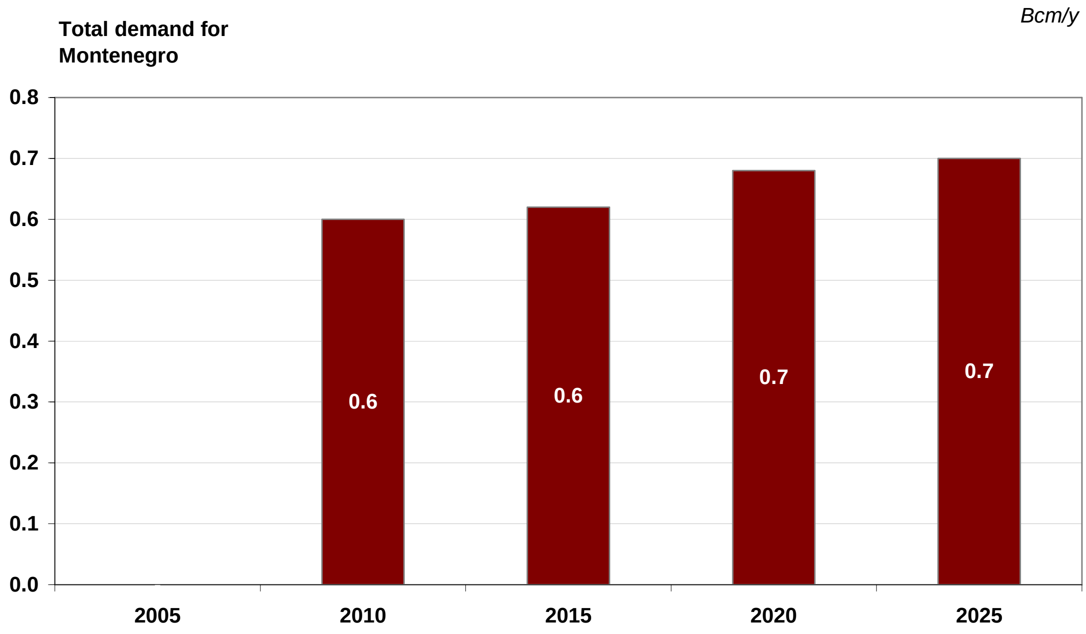
Table 5 Estimated capital costs

Item	Total Cost
	US$ million
SEE Ring Connection	5.0
Spur Line	7.9
City Gate Station	4.0
HP Distribution System (16bar Steel)	2.7
MP Distribution System (4bar PE)	8.7
Residential Connections	24.4
Residential Installations	7.1
Industrial and Commercial Connections	3.4
Total	63.1

4.7 Overall Demand for Gas

There is no gas market in Montenegro and no historical consumption statistics to base a time series econometric analysis upon. Therefore we have used a gas penetration technique, which focuses on a build up of per capita gas consumption over a period of time. Figure 4 shows our projection of gas demand for Montenegro.

Figure 4 Gas demand



4.8 Current Gas Supplies

At present there is no gas infrastructure within Montenegro.

4.9 Anchor Loads

There are currently no foreseen anchor loads.

4.10 Future Gas Supply Options

In April 2003, representatives from 8 Balkan Countries (Greece, FYROM, Serbia, Montenegro, Bosnia and Herzegovina, Albania, Croatia, and Slovenia) signed an agreement indicating their support for a proposed natural gas pipeline from Greece, through the Balkans and into Austria. The pipeline would be an extension of an interconnection being between Turkey and Greece.

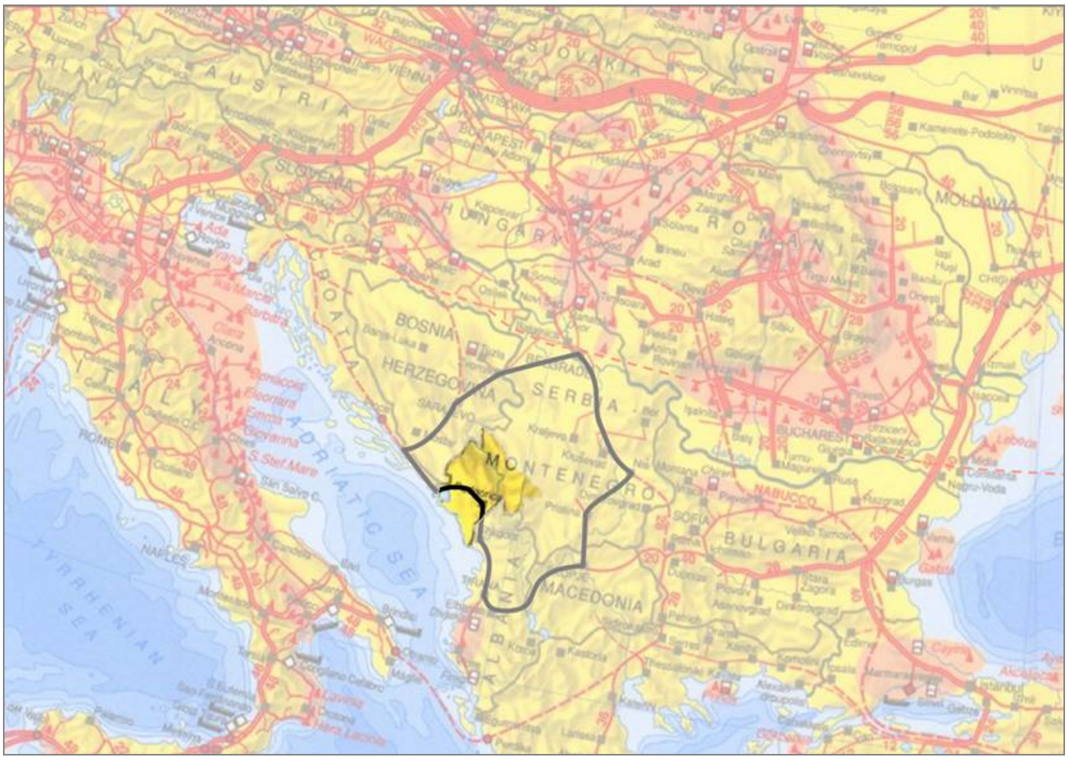
Construction of a gas pipeline between Bulgaria and Serbia and Montenegro for Russian natural gas transit and at a later stage – the possibility for gas transit from Iran and the Caspian Region, is another discussed project, and so is a possible route from Romania.

As part of Srbijagas's transmission system supplying gas from Nis, in Serbia, to Pristina, Kosovo, gas will also be supplied to Montenegro. Figure 5 shows a diagram of the proposed transmission pipeline network.

Figure 5 Proposed Montenegro gas transmission

Figure 6 shows the EC Ring from the perspective of Montenegro.

Figure 6 EC Ring – Montenegro



The supply possibilities for this option include all of those described in Table 6, as well as the mix of supply options for Croatia, once the pipeline reached the Croatian system. Such a branch pipeline, should be sized at constant diameter along its length with a view to subsequently connecting it across into Bosnia Herzegovina to the north of Montenegro to form the Energy Community gas transmission ring.

Table 6 Supply options of immediate interest to Montenegro

Transmission connection	Contract source/s	Delivery and physical flows	Physical source and swaps
Greek border	Contract for LNG via Revithoussa	Backhaul through Greek system. Physical molecules flow to Athens. Russian gas flows to Macedonia through the Greek-Macedonia transmission system.	Swap LNG delivered at Revithoussa for Russian gas contracted to Greece **at the Greece-Bulgaria border** and pay Greek transmission fees. Yields transmission cost savings in Greece.
FYR of Macedonia border	Contract for LNG via Revithoussa	Backhaul through Greek system. Physical molecules flow to Athens. Russian gas flows from Bulgaria to FYR of Macedonia and Montenegro.	Swap LNG at Revithoussa for Russian gas contracted to Greece **on the Bulgarian system** and pay Bulgarian exit fees and Macedonia transmission fees. Yields transmission cost savings in Greece and Bulgaria.
Greek border	Contract for Algerian gas via TransMed	Backhaul through Greece-Italy Poseidon pipeline and Greek system. Physical molecules flow up into Italian system. Russian and/or Caspian gas flows to Montenegro though the Greek system reduces Greece-Italy flows.	Swap Algerian gas at Mazara del Vallo for Caspian gas at the Greece-Albania border (or at the Turkey-Greece border and pay Greek transmission fees). Yields transmission cost savings on Poseidon and maybe some transmission cost savings in Greece.
FYR of Macedonia border	Contract for Algerian gas via TransMed	Backhaul through Greece-Italy Poseidon pipeline and Greek system. Physical molecules flow up into Italian system. Russian and/or Caspian gas flows to Montenegro though the Greek system and via Macedonia reducing Greece-Italy flows.	Swap Algerian gas at Mazara del Vallo for Caspian gas at the FYR of Macedonia-Albania border (or at the Greece-FYR of Macedonia border, or at the Turkey-Greece border and pay the Greek transmission fees. Yields transmission cost savings on Poseidon and maybe some transmission cost savings in Greece.
TAP	Contract for Russian and/or Caspian gas	Conventional delivery via the Greek system and through Macedonia, with offtake in Montenegro	Russian and/or Caspian gas. No swaps required.

Transmission connection	Contract source/s	Delivery and physical flows	Physical source and swaps
TAP	Contract for Algerian gas via TransMed	Backhaul through TAP direct to Macedonia. Physical molecules flow up into Italian system. Russian and/or Caspian gas flows to Montnegro though the Greek system reducing Greece-Italy flows on TAP.	Swap Algerian gas at Mazara del Vallo for Caspian and/or Russian gas at the Greece-Macedonia border and pay Greek transmission fees. Yields transmission cost savings on TAP. May yield some transmission cost savings in Greece.

5 Conclusion

A 500 MW combined cycle gas power station, which would require about 0.6 Bcm of gas per year (running in the base load) would anchor investment in a pipeline northwards from the Greek system via Albania, and connecting to the Croatian coastal extension southwards from Split.

The Energy Regulatory Agency is yet to embark on the design and adoption of a relevant legislative, institutional, financial and regulatory framework to encourage private sector involvement and investments in all aspects of energy infrastructure, and establishment of a competitive market.

The following are listed as the main goals and objectives of Energy Policy:

- Work towards ensuring available, accessible and affordable energy, as well as to secure the preconditions for establishment of an open energy market and fast integration into regional energy markets
- Secure, high quality, reliable, and diversified power supply
- Maintenance, rehabilitation and modernization of the existing infrastructure and the construction of reliable new infrastructure
- Design of relevant legislative, institutional, financial and regulatory framework to encourage private sector involvement and investments in all aspects of energy infrastructure