Tufts Consulting Group: Macedonian Energy

An Executive Summary
Opportunity

In the more than 18 years since its independence from Yugoslavia, the Republic of Macedonia has achieved sustained economic growth. Its combination of market liberalizations and a low flat corporate income tax rate have made it a very attractive location for foreign direct investment. This growth, combined with increasingly transparent governance, has created the conditions for Macedonia’s admission to the European Union in the near future.

Macedonia’s impending need to comply with EU Renewable Energy Supply (RES) regulations creates an attractive investment opportunity within the renewable energy sector. To meet RES standards, Macedonia will need to increase its renewable energy portfolio from 10% to 20% by 2020. The planned retirement of several large thermal power plants, as well as the energy security concerns associated with importing 40% of total electricity demand, makes further investment in domestic energy infrastructure imperative.

Macedonian Energy Market Overview

The recently formed Energy Regulatory Commission (ERC) has shown its support for RES by introducing feed-in tariffs for electricity produced by small hydro, wind, biomass, and photovoltaic plants. The national grid operator will commit to 20 year contracts to accept all energy supplied from these four technologies at their specific above-market tariff price.

Of these four technologies, hydro and wind are the most mature and offer the largest potential for rapid scaling-up of the Macedonian renewable energy sector. At present, Macedonian renewable energy is nearly exclusively derived from hydroelectric power. We believe that wind energy is a substantially underutilized resource base that offers the possibility for substantial generation capacity in Macedonia.

Of 85 planned hydroelectric plants, virtually all are stalled at varying points in the permitting process. This is largely due to the inability to resolve riparian land ownership issues. Our analysis indicates that many of the permitting issues impeding hydroelectric dam construction can be avoided by installing wind turbines in locations removed from population centers. This approach will facilitate faster construction times, hastening entry of our clean and renewable energy into the Macedonian grid. While wind power is not currently competitive in Macedonia without regulatory inducements, the guaranteed twenty year, 8.9 €cents/kWh feed-in tariff for wind adopted by the ERC allows wind to be a viable source of electricity generation.

European and Macedonian Wind Market

Of all the renewable energy industries, the wind energy market is the most mature. Wind turbines (on average) are also the lowest cost renewable energy generation technology. The burgeoning European wind industry accounted for 36% of all new installed energy capacity
built in Europe in 2008—bringing the total installed capacity for the EU27 to 65 GW\textsuperscript{ii}. Globally, Europe has the highest concentration of cutting edge wind turbine manufacturers, including industry leaders Vesta, Siemens and Gamesa. This thriving European industry will provide support for wind development in Macedonia.

Wind is considered to have the second largest resource potential of any renewable energy source next to hydro\textsuperscript{iii}. In 2005 AWS Truewind mapped the wind speed data at the 80-meter level throughout the country. In recent years, three international consortiums have announced plans to enter the Macedonian market to take advantage of attractive conditions; however, publicly unavailable studies from the University Ss.Cyril and Methodius Skopje, Macedonia have identified four unused sites with average sustained wind speeds of 7-7.5 m/s.\textsuperscript{iv}

**Opportunity Overview**

We have identified an opportunity to invest in wind power generation on the NE-SW running Kozuf Ridge. The project will consist of 30 wind turbines with a total nameplate capacity of 62.50 Mw and will be sited in the SE corner of Macedonia (41.12-41.16 N, 22.19-22.16 E ; elevation 780 - 1720m). Preliminary wind studies reveal that the proposed location has sustained wind speeds of approximately 7.0-7.5 m/s, with relatively limited variability. The site’s proximity to existing transmission lines and relative distance from population centers are projected to keep land acquisition costs relatively low. Using a Rayleigh distribution model, which estimates the probabilistic frequency of wind speeds, we estimate that each turbine can yield up to 8.2 million kWh of saleable energy each year.

**Financial Overview\textsuperscript{1}**

We conservatively estimate that construction of the Kozuf Ridge project can generate 212.15 million kWh of saleable energy each year. This conservatively assumes energy yields 10% below Rayleigh projections, to account for downtimes and transmission lines power loss. At the Macedonian feed-in tariff rate of $0.125/kWh, we project annual revenues of $27.3M.

Operating costs for the Miravci wind farm are projected to begin at $0.014, based on equipment and site maintenance. These costs are expected to escalate by 4.86% per annum, which is equivalent to average Macedonian inflation from 2003-2008. Insurance costs are projected to be 1% of total installed costs, and maintenance costs are projected to be $0.004/kWh. As such, average annual operating margins are expected to be 70%. Depreciation of capital assets is applied based on a straight line 20 year model, and assume no asset salvage value. Macedonia flat corporate tax flat rate of 10% is then applied to arrive at an average annual profit margin of 40%.
In terms of capital expenditures, we have estimated the costs of turbine installation at $1.87M/installed MW, based on the costs projected by Invall Green Energy for a similar project. These costs, which include both turbines, environmental impact assessment site development, total $140.1M for 30 turbines.

Capital will also be required to build a 4 mile, 110 kv volt transmission line from the Kozuf Ridge to a nearby 440kV transmission line which connects to the rest of the Macedonian grid. This is projected to cost $3.3M, which is 10% higher on a per mile basis than other, larger scale transmission line projects in Macedonia. Our total capital requirements for built infrastructure are projected to be $143.4M.

In addition to these capital costs, we are expected to incur upfront costs for land acquisition. Miravci is government owned; however, the land concession can be acquired via public auction. We expect to bid approximately $14/m², in light of the fact that the land is far removed from any urban centre. With a total land requirement of 1,300 km², we anticipate land costs of $18.2M. This brings total project capital requirements to $161.7M.

**Funding Requirements**

We believe that 21% of total capital requirements can be secured through regional grant programs. The European Union’s Intelligent Energy Efficiency program has a mandate to provide 20-75% of project costs for renewable energy projects such as ours. We have conservatively anticipated 20% of project funding from this source, due to the bureaucratic uncertainties inherent in grant approval processes; however, we believe that the proportion of funding could be much higher. In addition, the Macedonian Bank for Development offers $5.6M for renewable energy projects, with repayment deferred for 8-13 years.

Based on available public funds, we anticipate a total private investment requirement of $128.8M. We project the net present value of the Miravci Project to be $30.1M, with an internal rate of return of 14%.

**Additional Opportunities**

The proposed 30 turbine Kozuf project represents approximately 1/3 of total regional turbine capacity. This could represent the first in a series of projects which could leverage existing capital investments and increase efficiency by investing returns in higher capacity turbines.

As a non-Annex 1 signatory to the Kyoto Protocol, Macedonia is eligible to produce certified emission reductions (CER) that can then be sold into the European Union Emissions Trading Scheme (ETS). The value of these CER fluctuate, and Macedonia will likely lose the ability to
sell these permits into the ETS once they gain EU membership, however before that time they represent another possible revenue stream.

**Potential Project Risks**

The primary risk to the Kozuf Ridge project is political. While the Macedonian government is increasingly transparent, and is opening itself to foreign investment, corruption is still more pervasive than in better developed democracies. This could lead to permitting difficulties, project timeline delays and regulatory inconsistencies. We believe that this will be mitigated by ongoing efforts to secure EU membership which will continue to create an environment emphasizing a positive foreign investment record.

Another risk is the increasing competitive intensity of the Macedonian market. Other interested parties seeking to uncover value in the wind sector could pursue their own concession on Kozuf land, which would increase the cost of land concessions. We believe that our willingness to invest in incremental transmission capability increases our attractiveness to the Macedonian government. Furthermore, our project only requires a portion of total attractive land the Kozuf area.

**Endnotes**

1. USAID Macedonia Energy Efficiency and Renewable Energy Assessment, June 2009