Argonne NATIONAL LABORATORY

Energy, Environment & Economic Analysis

Power Market Analysis for Two Proposed Transmission Lines between Albania, Bulgaria, and Macedonia

Opportunity

Electricity transactions among Albania, Bulgaria, and Macedonia are very limited. Although an effective power line system connects the three countries in a north-south direction with the electric power systems of Yugoslavia to the north and Greece to the south, the transmission links in the east-west direction are weak. Two new 200-400 kV transmission lines—one between Dubrovo and Radomir and another between Vrutok and Burrel—would strengthen the east-west ties among Albania, Bulgaria, and Macedonia and significantly increase transfer capabilities among utilities in these three countries.

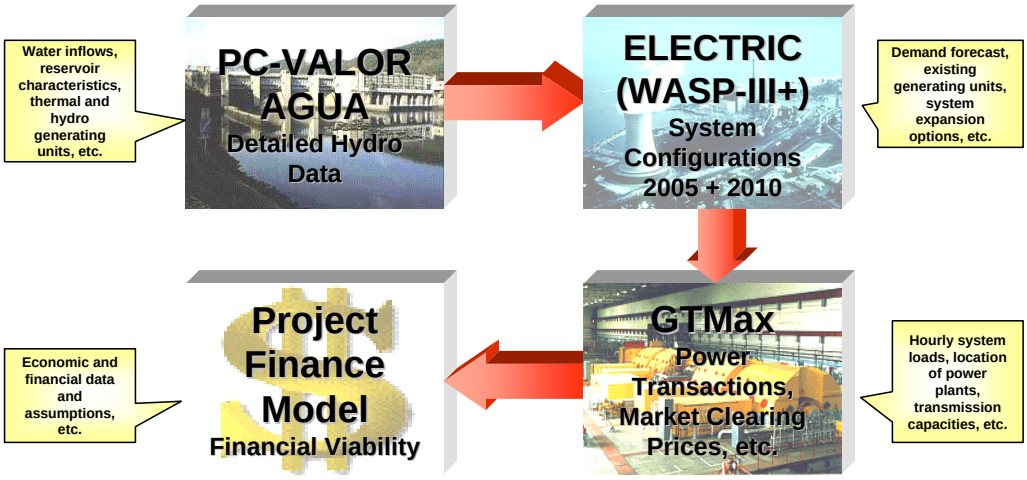
The Center for Energy, Environmental, and Economic Systems Analysis (CEEESA) at Argonne National Laboratory has a wealth of experience in energy studies. CEEESA's energy systems analysts have studied a wide range of key strategic issues for a diverse set of clients, including international lending institutions, international agencies, and domestic and foreign regulatory and government bodies.

Approach

To analyze the Balkan power market situation, Argonne's CEEESA staff developed an integrated modeling framework, which combined features from four proven computer models. An illustration of the integrated modeling framework is shown below.

Our analysis focused on the power market situation in three key years: 2000, 2005, and 2010. This approach made it possible for our staff to estimate the financial and economic benefits of constructing the two transmission lines. In addition, our experts estimated the economic benefits of coordinated or joint system operation, including the possibility for short-term firm power sales agreements.

Integrated Framework for Power Market Analysis



Scope of Work

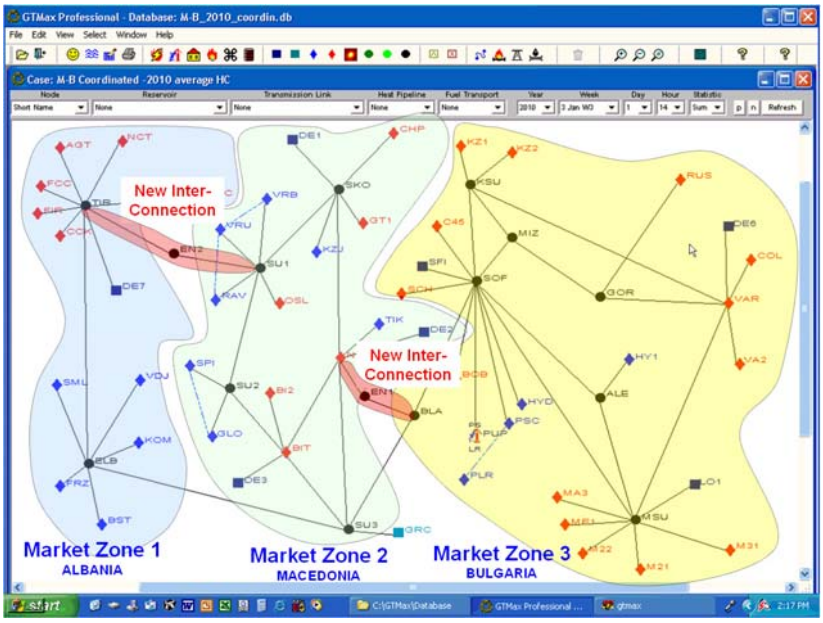
CEEESA developed expansion plans for two scenarios, based on two assumptions: (1) expansion of isolated utility systems and (2) expansion of interconnected systems. Our analysts then determined the difference in operating costs among the three isolated systems compared with the interconnected systems. The cost difference provided an indication of the maximum interconnection benefits. Expected cost savings offered by the interconnection result from load diversity, lower spinning reserve requirements, more efficient dispatch of generating units, higher system reliability, and other factors.

We transferred the expansion results to the GTMax model to (1) simulate the hourly dispatch and determine the power transactions among the three utility systems; (2) identify the market clearing prices for possible exports to Greece (taking into account the topology of the systems and their interconnection links, the chronological hourly loads, the differences in the electricity generation costs for the three systems, and the capacity constraints of the transmission interties); (3) calculate the market clearing prices for electricity sales and purchases in different regions (zones) of the network; and (4) optimize power transactions to minimize overall variable operating costs.

GTMax simulated power system operations for 2005 and 2010 for two basic scenarios. In the first, the power systems in Albania, Bulgaria, and Macedonia operate independently and do not trade, sell, or exchange energy or capacity with one another or with the Greek power system. In the second, power exchanges are allowed among the three utility systems across the new transmission lines. GTMax also determined the hourly power transactions, optimized the exchanges among the utilities, and determined market clearing prices in each node of the network.

Finally, we transferred the GTMax results to the Project Finance Model to determine the economic and financial viability of the proposed new interconnection lines.

GTMax Network for Trans-Balkan Power Line Project



Learn more about the Center for Energy, Environmental & Economic Systems Analysis at:
http://www.dis.anl.gov/ceesa

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