



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

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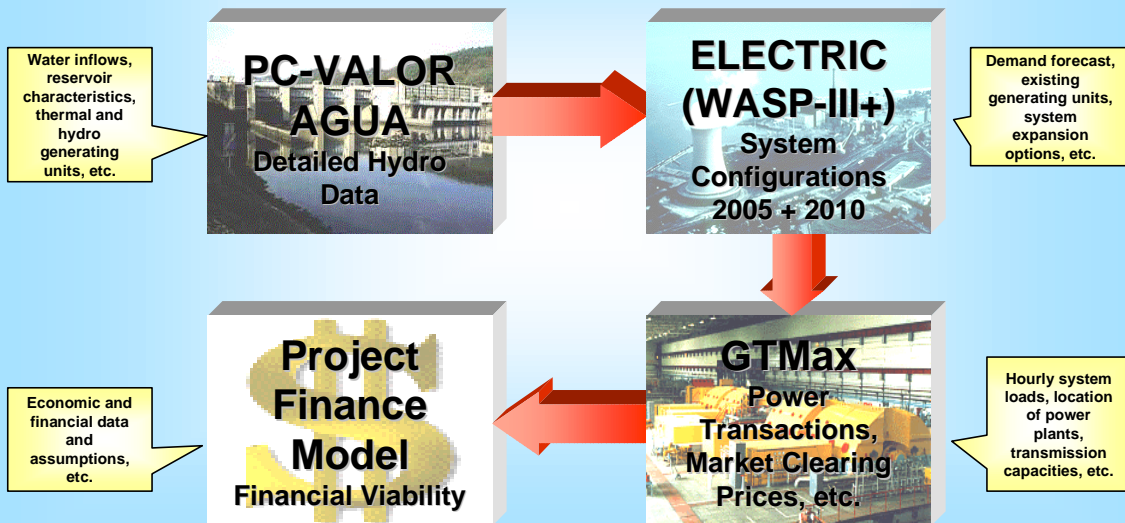
Opportunity: Electricity transactions among Albania, Bulgaria, and Macedonia are very limited. Although an effective power line system connects the three countries in a north-south direction with the electric power systems of Yugoslavia to the north and Greece to the south, the transmission links in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



Approach: Staff at Argonne National Laboratory's Center for Energy, Environmental, and Economic Systems Analysis (CEEESA) developed an integrated modeling framework to analyze the Balkan power market situation. The framework included four different computer models. An illustration of the integrated modeling framework is shown below. The analysis focused on the power market situation in three key years: 2000, 2005, and 2010. This approach allowed CEEESA staff to estimate the financial and economic benefits of constructing the two transmission lines. In addition, CEEESA 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



Argonne's GTMax and ENPEP Programs are Distributed by Adica

Scope of Work: CEEESA developed expansion plans for two scenarios, assuming

- (1) Expansion of isolated utility systems, and
- (2) Expansion of interconnected systems.

CEEESA experts determined the difference in operating cost between the three isolated systems versus 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.

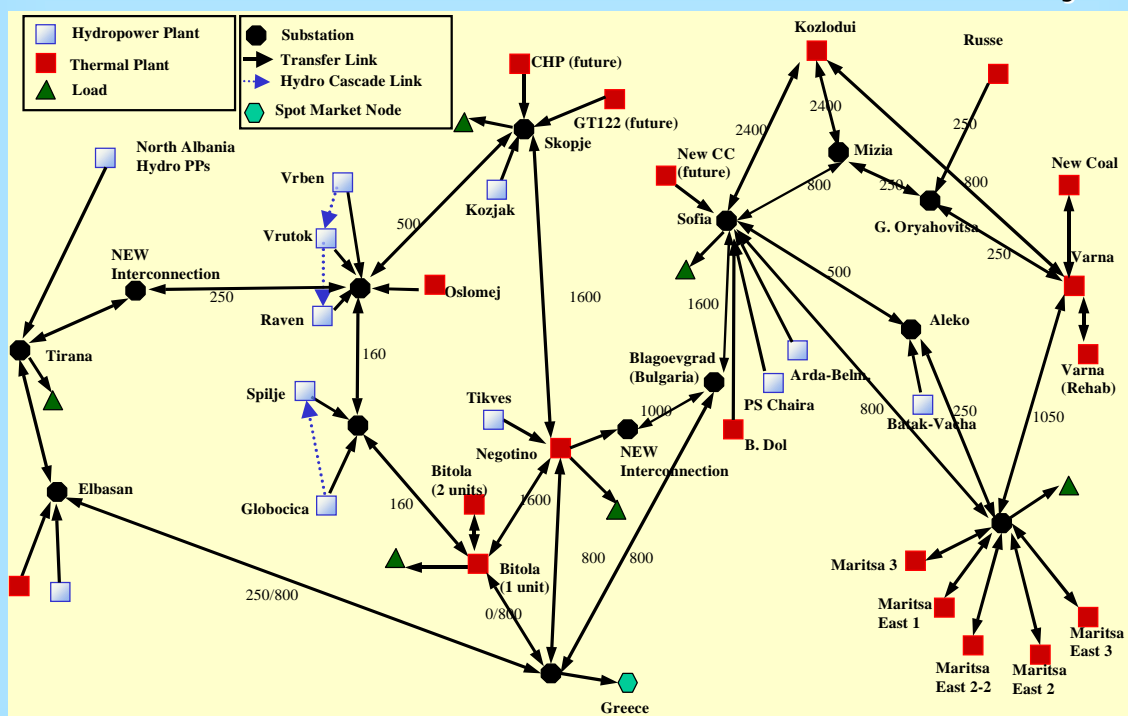
CEEESA transferred the expansion results to GTMax to (1) simulate the hourly dispatch and determine the power transactions among the three utility systems; (2) identify the market clearing prices for possible exports to Greece (taking into account the topology of the systems and their inter-connection links, the chronological hourly loads, the differences in the electricity generation costs for the

three systems, and (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. The second scenario allows power exchanges among the three utility systems across the new transmission lines. For this scenario, GTMax determined the hourly power transactions, optimized the exchanges among the utilities, and determined market clearing prices in each node of the network.

Finally, CEEESA 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



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