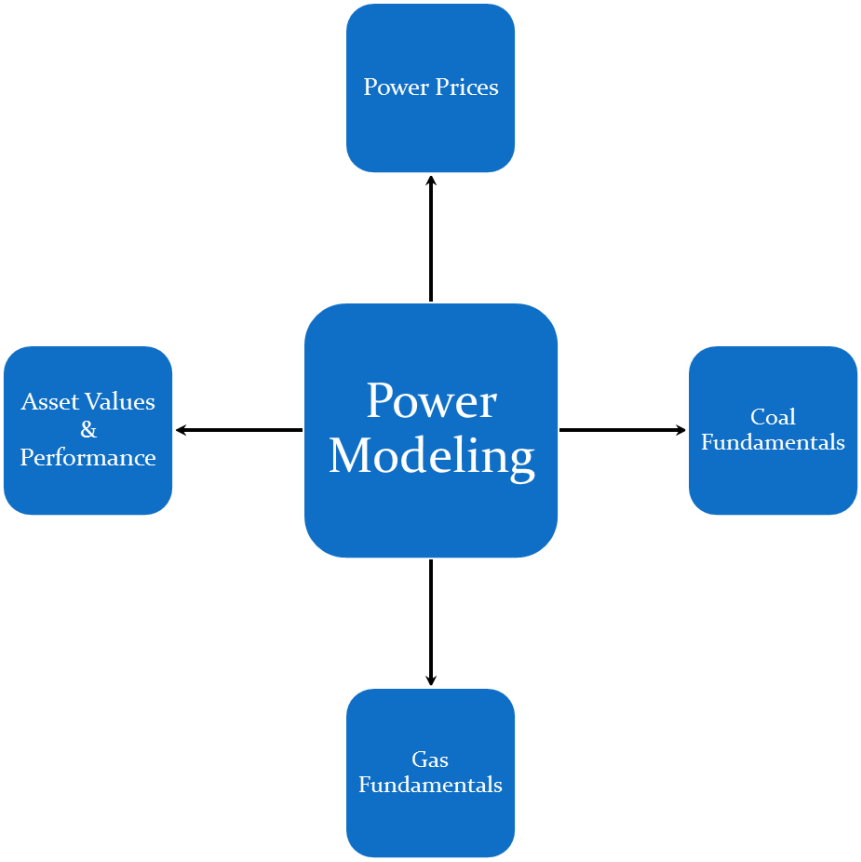
Key Pieces to Modeling Power Effectively

The necessary components for understanding the power markets

Power Modeling is a much more intensive process versus other modeling such as refinery modeling. The very nature of power creates this issue, as power cannot be effectively stored and maintained. Power must be balanced with demand and supply at all times else brownouts and potentially blackouts occur. This real-time nature and the platitude of generation options create a complex world. Modeling your power plant in an isolated system is one thing, but when you try to model the system to really understand the issues in the power market, now that's the challenge. The challenge does come with rewards. By modeling the power markets one gets insights into key components into the fundamentals of the gas and coal markets plus the obvious power related insights - power prices and power generation asset values and performance.

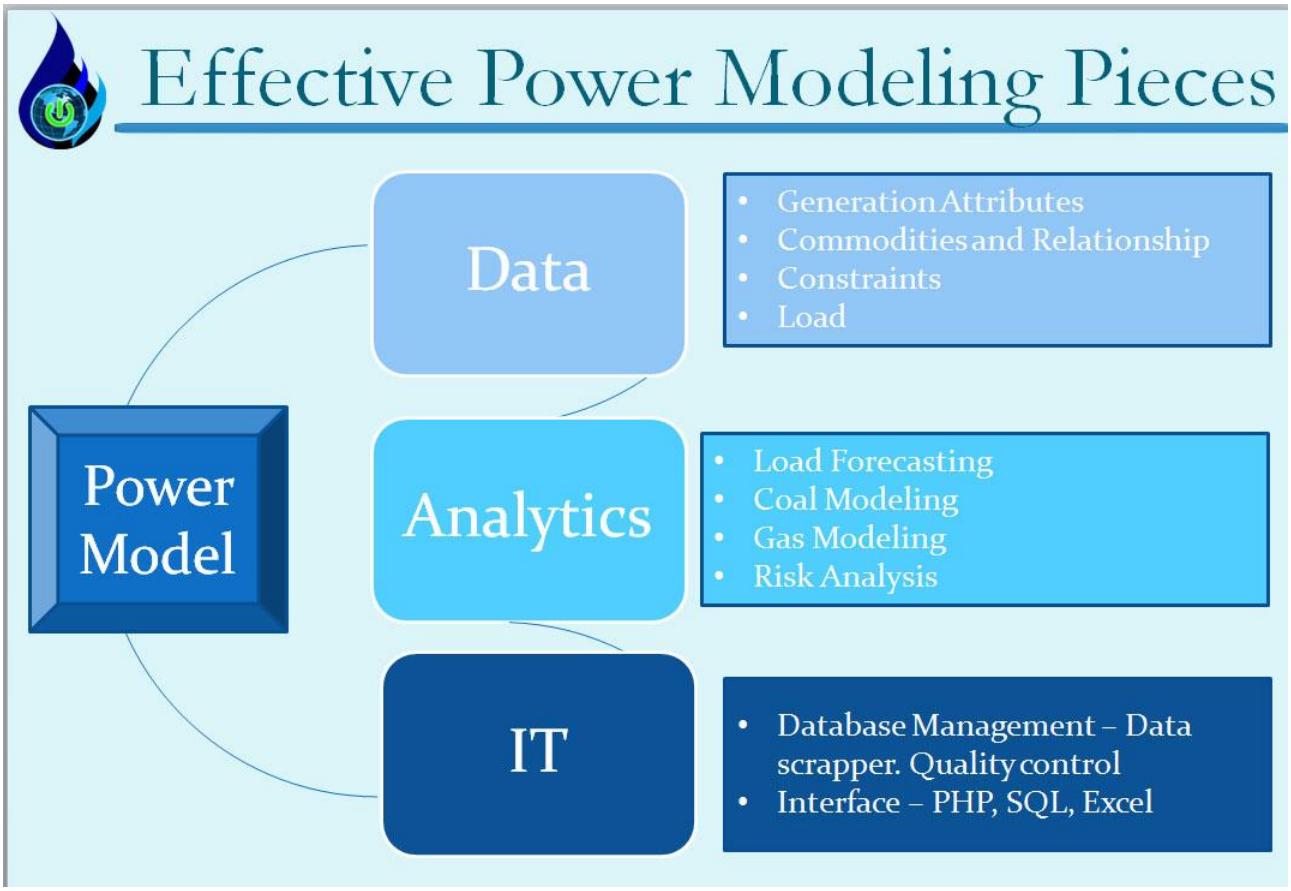


Dispatch Model

Building internal dispatch models is a test of futility given the options of the many software tools available. These software solutions took years to develop with years of continuous improvements. There are many vendors available. Personally, I prefer EPIS AuroraXMP. However, in the end, most of the available software,

assuming they already have an existing base of clients, will produce similar results given the exact inputs since it is just math. The difference between the various software solutions is usability and speed.

The dispatch model, unfortunately, is only a piece of the puzzle. As a car engine by itself does not make a car – having obtained a dispatch model does not give you an effective power model. Though many software solutions may offer a direct out-of-the box experience – there is still much left to modeling power markets effectively. Power models require significant inputs from generation assets and their attributes, commodity information, load, transmission, and policy and regulation constraints (Renewable portfolio standards, carbon regulation, so2, etc…). The list mentioned is in a very simple form. The first three in the list are the big drivers in how well the dispatch model will perform. And it is not just about data, but the capability to analyze the data to make it into meaningful input for the power model.



Generation Assets and Attributes

Generation assets and their attributes involve a table of multiple rows representing all the individual units and then multiple columns representing the attributes. In Power Market Analysis (PMA) the N. American power database contains 22+K rows along with 85+ columns that drive each unit's operations characteristics. The magic comes in having the ability to understand how each type of unit may operate to assign the attribute to them. Besides the common attributes of capacity, heat rate (efficiency of unit), startup cost, ramp rates, etc…

there are the obscure attributes such as bidding factors and peak credits. These variables are not found in text books, but by experiencing power plant operations and trading floors. Note the plural form in the previous sentence, as many regions and companies operate differently. The software companies for these dispatch models do not necessarily hold that experience nor would they want to "force" their users to a variable which is subjective given their prime expertise is software not power markets. However, a good software company designs it so it is easy to input and manage these variables. I have been fortunate to experience and have the knowledge on how various companies in various regions operate and dispatch plants. This experience is translated into PMA.

Commodity Information

Commodity information is another beast in itself as each unit has a particular cost as location and choice of fuel creates a unique structure. In PMA, we have over 1100 unique fuel codes. Once again, your power model software may have fuel prices and structure, but are they experts in coal, gas, and oil markets, too? Coal models require knowledge of barge and rail options plus the engineering issues of quality issues from heat content to metallurgical concerns. The gas units also are not as simple as linking it to a natural gas pricing hub as many have done. Natural gas also has a cost to move and deliver, which requires other considerations such as firm transport. All this needs to be factored into the unit price. A good software model will enable you to easily configure and manage this issue. I have been fortunate to spend my initial career in the Oil & Gas world then spend time at American Electric Power (AEP), which is one of the largest utilities in N. America and also the largest coal buyer. This experience is translated into PMA.

Load Information

Load is another big driver in the model. There are over 220 electric load zones in N. America. At some level, you will have to roll them up to be able to understand and model them. Load forecasting is another art form required in effective power modeling. The endeavor involves obtaining weather information across the country along with economic parameters and then developing a methodology to forecast and normalize the weather. Will your software company support a staff of economist and experience load forecasters? My experience in leading the load forecasting team for AEP covering 11 states enabled me to develop quite a comprehensive load model for the entire N. America. PMA includes a load forecasting model which enables clients to adjust weather parameters (Cool Degree Day (CDD), Heating Degree Day (HDD)) by region and in economic parameters (gross domestic product (GDP)) by region.

IT Needs

Assuming you were able to accomplish the above, you will then need the IT infrastructure to maintain and operate the power model. PMA is based on SQL and PHP to develop the interactive online content. There are also multiple Excel files created to manage the output from the power model to enable non-power modelers to view and manipulate the output. There are significant amounts of data being scrapped each day. Over 37 gas forward marks are pulled in daily along with coal and emissions prices. All the data scraped then needs to be placed into the model and then if you want to understand the risk in the market place alternative scenarios need

to be developed from weather to commodity risk. PMA default already produces 5 risk cases daily. However, each of these cases can be customized and tailored for your needs with All Energy Consulting advising you.

Strategies to obtain Power Modeling Capabilities

Effective power modeling is possible and within reach. If you have many of the pieces mentioned above internal modeling will offer you the comfort of control and potential staff growth. All Energy Consulting has helped and continues to assist companies in their internal power modeling efforts as we believe in transfer of knowledge benefits all. We have worked with clients to setup, build, and operate power models. We have accelerated many clients deployment of their power modeling efforts. If you attempt to do the above from scratch with an experienced team, it could be 18 months before you get your first effective run. If you are missing multiple pieces of the puzzle from the above discussion, then you may want to seriously consider PMA as a potential option to enable you to have an effective power model now.

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