



Exelon Uses Ivara Asset Health Indices to Drive Capital Planning and Maintenance Prioritization



How does an organization with millions of assets get a handle on the overall health of their physical plant? How much should they be spending on capital renewal, and where should those investments be made for maximum impact? How much routine maintenance should be done on assets that are soon to be replaced? Exelon is using Health Indices which are generated using Ivara EXP as a key driver in their capital planning process, and as one of the inputs into their prioritization of ongoing maintenance work.

Exelon is one of America's largest electric companies with \$17B in annual revenues and \$47.8B in assets. They have the largest market capitalization in the electric utility industry, and are ranked #1 in Gas & Electric Utilities by Fortune Magazine. The ComEd division delivers electricity to several million customers in northern Illinois.

The Situation

Several years ago ComEd commissioned Kinectrics Inc. to do a study of 31 different classes of substation and transmission assets. The study developed a score for each of the 57,000 assets, where 0 represented an asset that had failed beyond repair and 100 represented a brand new asset. This "asset health index" score was initially used to drive capital replacement plans and help prioritize maintenance work for the following year.

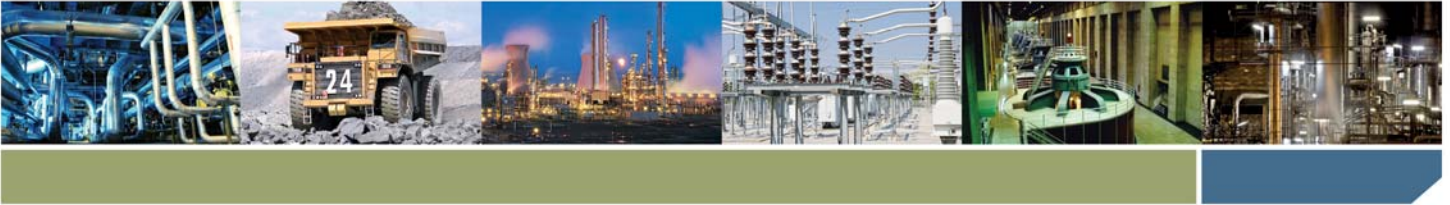


The Challenge

The study itself was quite valuable, and ComEd envisioned many more potential uses for the asset health indices, but the study results were becoming out of date. ComEd tried to manually recalculate the indices, but found the data volume to be overwhelming for their small internal staff. ComEd needed a way to update the indices on a fairly regular basis with minimal effort so that they could make decisions based on the current health of their assets, not the health as it was assessed several years ago.

The Solution

ComEd was impressed with Ivara EXP's ability to gather data from multiple disparate process control, SCADA, CMMS, and homegrown systems and use the data to generate alarms for condition based indicators. The challenge was to leverage EXP's data connectivity and flexible customization tools to develop complex health index calculations.



Ivara took a sample health index spreadsheet for one of the Asset Types and turned around a prototype in under two weeks for what the final health index system would look like. Based on this, Ivara was given the task of developing a production system in under 3 months for generating health indices for all 31 asset types and 57,000 assets.

The developed solution defined and created a “Health Index Worksheet” for each of the 31 identified Asset classes. Individual “Components” were then created for each Health Index Worksheet to define the desired calculation for that component. For example, one component might be to count the number of Infrared measurement problems (on a Circuit Breaker) over the past year. Another might be to determine the most recent Trip Time measurement (on a Circuit Breaker). A third might be to find the maximum Load Peak readings over the past 60 months (on a Transformer).

Each “Component” data value is then “normalized” by referencing a Factor Table and deriving a “Factor”, ranging from 4 (excellent Health), to 0 (very poor Health). Each Factor is then multiplied by a “Weighing Factor” to obtain a “Score” for that component.

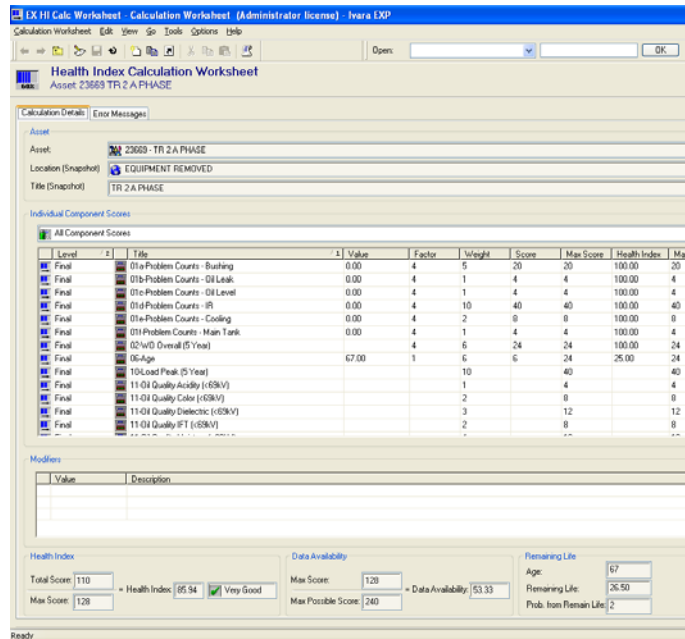
Some Asset classes could have as few as 14 uniquely calculated Components, whilst others could have as many as 90+ Components, depending on the complexity of the equipment.

Next, each Component Score is then calculated in a “Health Index Calculation”; the Component Score is divided by the maximum possible Score to derive a Health Index expressed in % (0 to 100%) for each Component.

Finally, all the Component Scores are combined and divided by the maximum possible Scores to determine the overall Asset Health Index in % (0 to 100%).

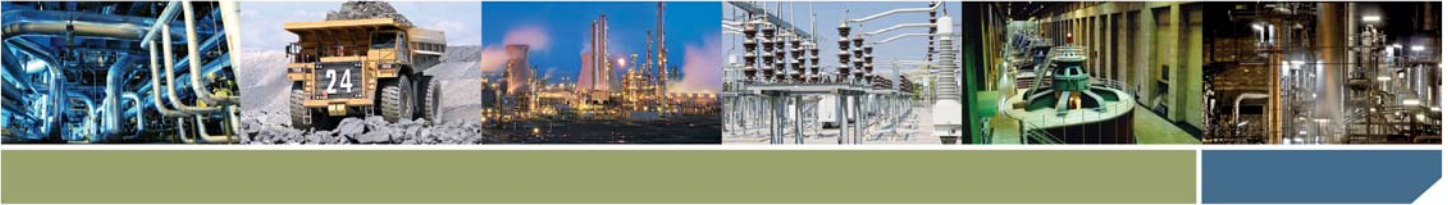
Also a calculation is made on the data that was found during the Component Calculations to evaluate how complete the data was during the calculations. For example, if a Health Index for an Asset was found to be 95% (quite good), while the Data Availability was only 65% (moderate) then the confidence of the Health Index might be somewhat suspect.

Assets in a given class can then be ranked by their Health Index score and the poorest ones (lowest %) identified for further analysis.



The data is provided by a number of automated daily interfaces to several legacy systems, providing:

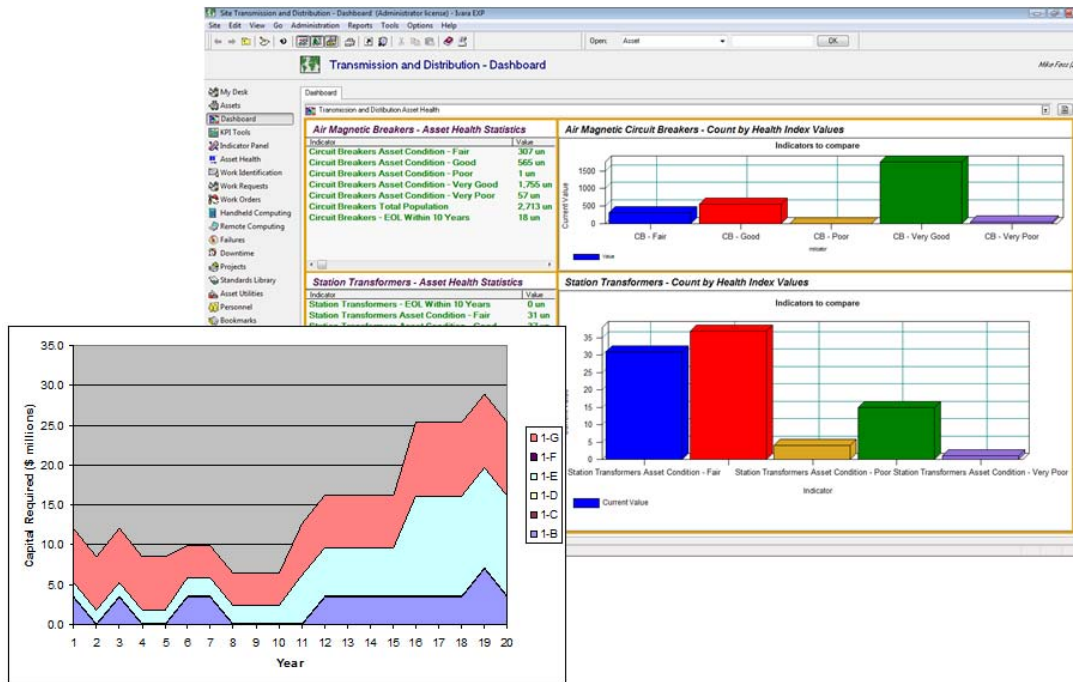
- Updates to the Assets
- Indicator readings (measurements) for all the measured parameters
- Work Orders (created against the assets)
- Problems identified in the field for each asset



All Factors, Weightings, Parameters and Components are maintainable and tailorable by Exelon personnel, allowing “what if” scenarios to be run at will. Health Indexes can be run on an Asset or by the entire Asset class.

The developed framework and logic allows other Asset classes and Health Indexes to be easily added.

Finally, the calculation programs can be modified by Exelon IT personnel to provide a robust flexible solution into the future.

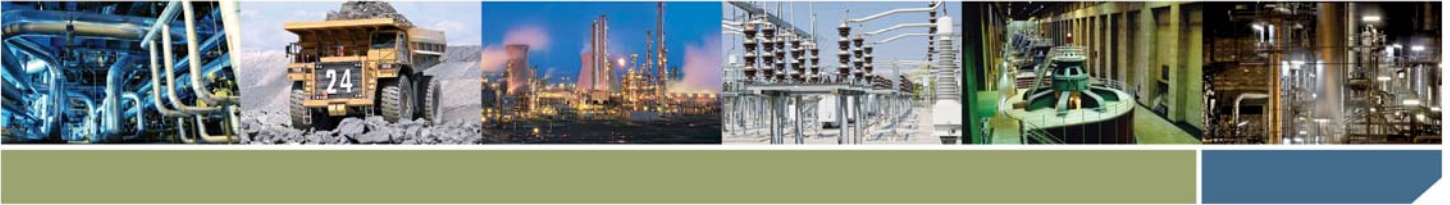


The Result

The inputs to the health index calculations are now collected automatically every night from the various source systems. On a monthly or quarterly basis this will be augmented with manual data from excel spreadsheets and updated indices will be calculated.

ComEd plans to use the much more timely health index data for a variety of purposes, which may include

- Putting in place a short term capital replacement plan for old assets with low health
- Developing a 5 or 10 year capital plan for replacing assets projected to deteriorate over the coming years
- Considering the deferral of maintenance for assets soon to be replaced
- Increasing the priority of maintenance work for lower health assets that are not scheduled for replacement.
- Doing root cause analysis for young assets with low health to determine why they are problematic and if they are recoverable



- Displaying the geographic dispersion of low health assets to determine if there are economies of scale in grouping maintenance or replacement of assets in close proximity with one another.
- Using histogram and regression analysis to determine if there are key factors that are causing poor asset health.
- Using trend analysis to determine the rate of change of asset health over time for both individual assets and overall asset classes.
- Calculating the probability of asset failure in the near term based on current health
- Combining probability of failure with an analysis of the criticality of failure to identify high risk assets that required urgent risk mitigation strategies.

Conclusion

By generating asset health indices in a much more timely and automated fashion, Ivara EXP is providing ComEd with much better visibility into the overall health of their extensive physical plant. Health Indexing is bridging the gap between short term corrective work driven by condition based maintenance, and longer term capital planning which used to be driven by periodic one-time studies (or last year's budget and available capital!). The foundation has been set for fact based decisions on how to find the right balance between ongoing maintenance, capital replacement, and overall risk mitigation.

For more information, call 1-877-746-3787 or visit us at www.ivara.com.