Forecasting Long-term Electricity Demand for Hedging, Residential Sector, Finland

Erno Savela
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Agenda

1. Development process and results
2. Why the commercial alternative was not selected

The law of large numbers

"Listen," Marty says. "As individuals, people are completely unpredictable. Okay? **One person making one bet... I couldn't possibly tell you what they're going to do. But the law of large numbers tells me that a million people making a million bets? That is completely predictable. Completely ordered.**

"So," Marty continues. "You give me a million people walking into this place, I can tell you that 3 percent are trying to cheat us while another 1.2 percent will have been sent here to try to catch us committing a crime.

There will be a pattern to how those 3 percent are trying to cheat us, and those 1.2 percent are trying to catch us.

"Give me a little bit of surveillance and a little bit of time... and I'll find that pattern.“

Image/quote source: Netflix (https://www.dailymail.co.uk/tvshowbiz/article-7866721/Ozark-Season-3-images-revealed-Netflix-announces-premiere-date.html)

1. Development process and results

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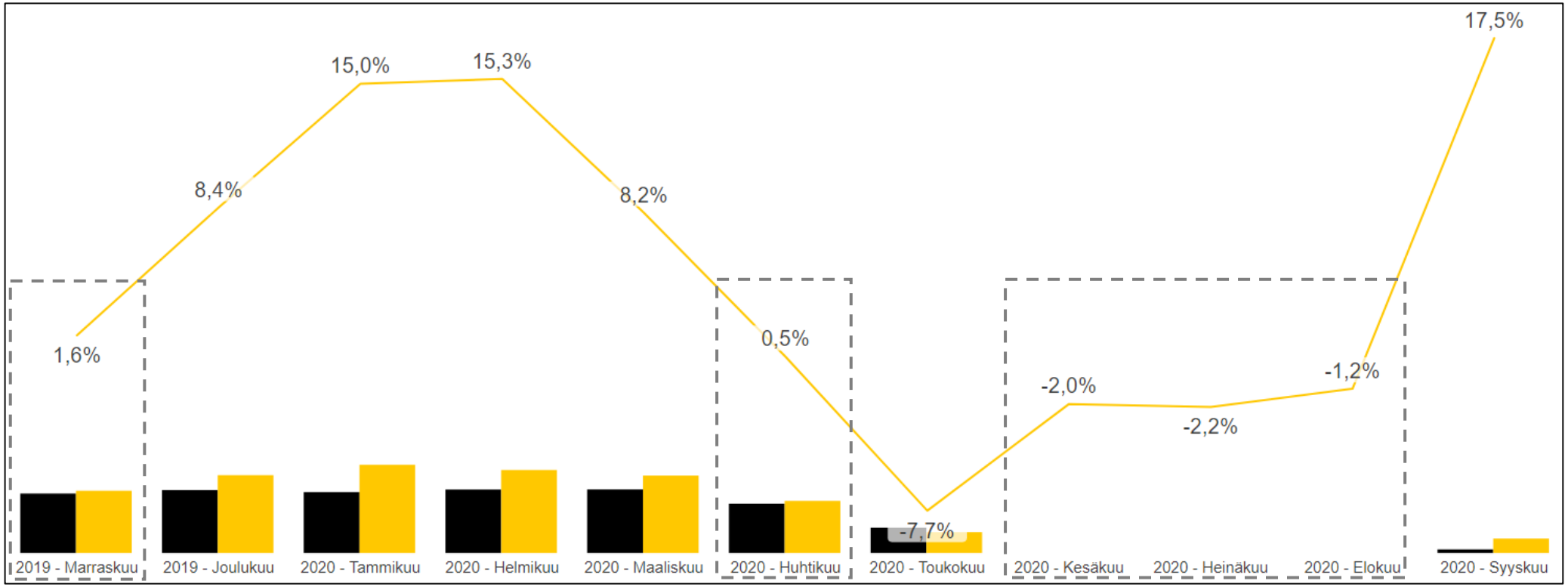
Science	• Forecasting the behavior of a large group is easier than the behavior of an individual or a small group • On a weekly or monthly period temperature and especially its aggregates have a linear relationship, high correlation, to residential energy consumption, in a statistically median or average weather in Finland in the heating period in each season.
Business	• Forecasts are also needed for different product sources, portfolios and financial forecasting & budgeting. • There are changes in the customer base.
Split to key factors	• The number of consumption sites per month • Energy consumption per consumption site per month in the most average weather in the future • Hedging level, hedging periods
The measurement of success	• Minimizing financial risk • Reliability, maintainability, explainable changes • Forecasting/calculating the number of consumption sites correctly • MAPE (mean absolute percentage error) for non-extreme months in the terms of the weather, per consumption site
Competition	• Old model • Commercial product • Multiple own models, trials with gbm, random tree, but further feature engineering with linear+tree modelling as shown already in a simple setup high potential, fit to the factors listed in the points above
Follow-up	• Comprehensive reporting and automatic checkups, focus on data quality and management

Image source: flaticon.com

Model developed by Helen selected to the production Example results bellow, includes also small businesses (forecast was made 9.2019)



≈ -1% with the same consumption sites as in 9.2019

2. Why the commercial alternative was not selected

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Science	• Our data was too sparse: segmentation is dependent on the quality of the data used for the segmentation • Expert knowledge and a couple of carefully studied and engineered parameters in a tree type model yielded better results in our case than automatically updating segmentation due to the limited amount of the data • The hour/daily level energy consumption forecasting for long-term consumption would have required more attention to feature engineering, different weather patterns, also locally, in Finland
Business	• Changes in our customer base yielded in unpredictable and unexplainable changes in the forecasts
The measurement of success	• 1 percentage point higher MAPE in the winter than in-house model • Alternative might have been better for the forecasting of min or max, for example
Split to key factors	• Alternative covered well only the energy forecasting part. In-house model can include more important factors in multiple stages as an entity. We at Helen consider the whole puzzle and its development and maintenance. • During the development new important factors emerged which would have been hard to spot if not working in Helen with hedging, sales and customer data for a long period of time.
Follow-up	• In this case, data quality capabilities and reporting more maintainable in-house than of the commercial product.

Image source: flaticon.com