

Case Study - Evaluation of Covid 19 Impacts on Energy Consumption Using Energy Twin Machine Learning in SkySpark

Case Study
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TABLE OF CONTENTS

Introduction	1
Analysis.....	2
1st Covid Wave - Spring 2020	2
Summer 2020 loosening restrictions ..	3
3rd Covid Wave - Spring 2021	3
Conclusion	4
Energy Twin Machine Learning Extension for SkySpark	4
SkySpark® - Analytics for a World of Smart Device Data	5
About SkyFoundry	5

Introduction

Every building has its own “Covid 19 story” to learn from - find yours

During the pandemic, buildings were exposed to nonstandard regimes (reduced number of occupants, non-stop ventilation, total lockdown, etc.). Valuable data were measured by Building Management Systems. Analysis of these data provide valuable knowledge about the effectiveness of setback regimes.

In this case study, we will focus on the electrical energy consumption of three shopping malls during the covid 19 pandemics. All shopping malls are located in the Czech Republic, therefore, the same lockdown restrictions were imposed.

The evaluation was based on the Energy Twin (ET) SkySpark extension. ET uses Machine Learning to identify mathematical models of one’s building portfolio in order to identify problems and reveal the potential for future energy consumption savings and optimization.

Analysis

The models were identified using data from 2019. In other words, 2019 is a baseline period. Using ET, we can evaluate average weekly profiles for each period, compensating for the effect of the different outdoor temperatures. The ET model predicts how the energy consumption would look like with real weather conditions. We then compare the difference between measured data and ET model prediction. Actually, this is a typical task for a digital twin.

The overall results are summarized in the following table. It is clear that during lockdown periods, there was a significant energy consumption reduction. While almost typical consumption was measured during summer 2020, with loosening restrictions.

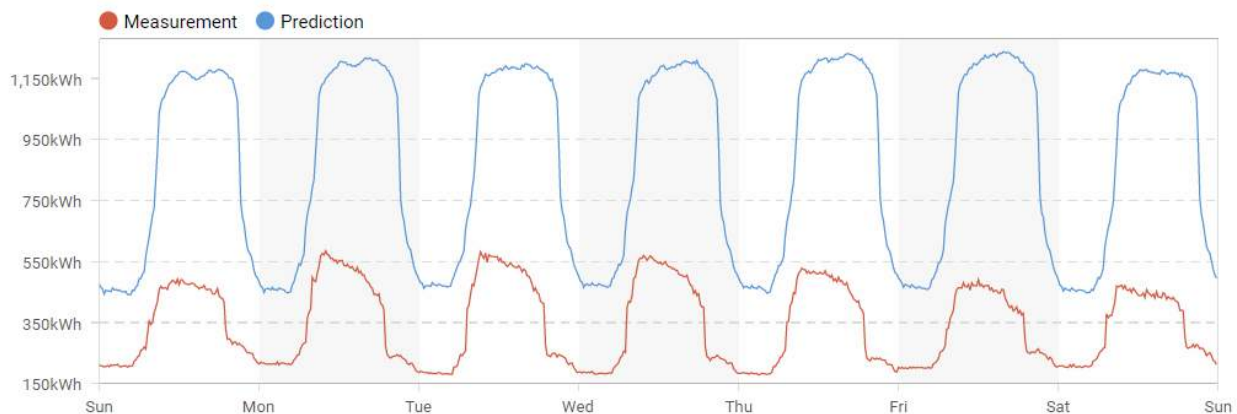
Meter	1st wave - spring 2020	Loosening - summer 2020	2nd wave - autumn 2020	3rd wave - spring 2021
Shopping mall 1	-51.5%	-7.3%	-51.9%	-47.9%
Shopping mall 2	-32.2%	-8.5%	-24.9%	-30.7%
Shopping mall 3	-60.4%	-3.9%	-44.1%	-35.4%

Despite the same lockdown measures, significant differences in energy consumption among the shopping malls can be observed. Shopping mall 1 maintained almost the same level of energy reduction (-52%, -52%, and -48%). On the other hand, we can see a continuous drop in energy reduction (-60%, -44%, and -35%) in the case of the shopping mall 3.

Let’s have a closer look at shopping mall 3 with an observed decrease in energy savings.

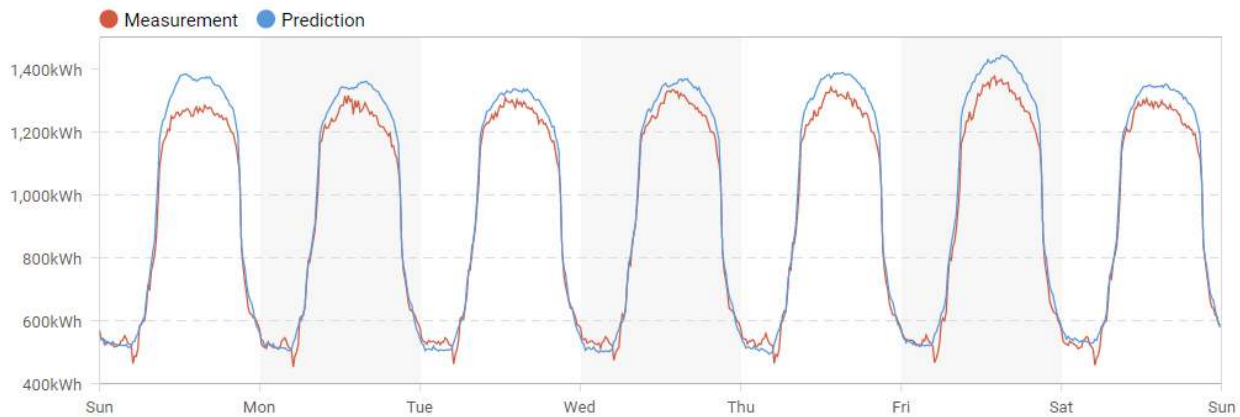
1st Covid Wave - Spring 2020

Major energy consumption reduction was achieved during the first lockdown. The estimated energy savings were 383 MWh per month. Figure below shows the average week (predicted and measured).



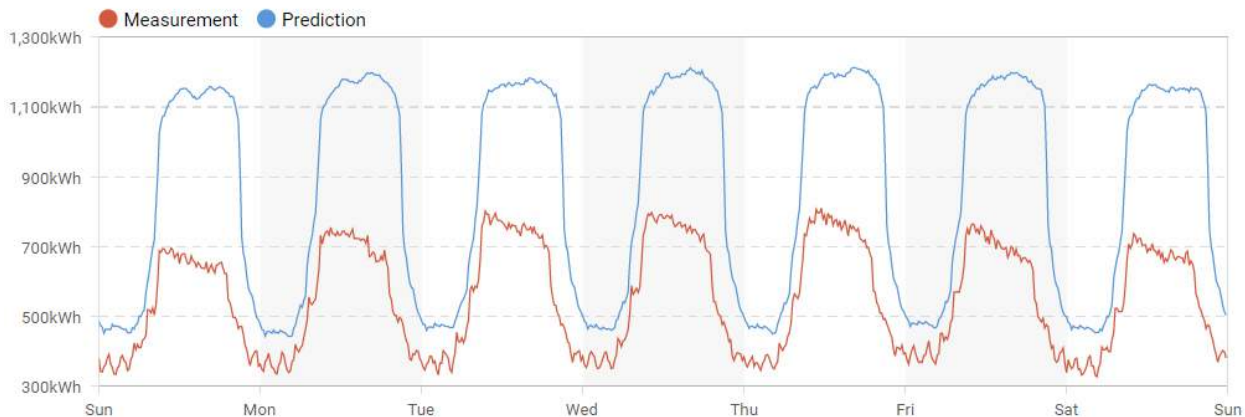
Summer 2020 loosening restrictions

There was an almost typical energy use pattern during the loosening of the restrictions.



3rd Covid Wave - Spring 2021

At first sight, a nice energy consumption reduction was achieved during the third lockdown period. The estimated energy savings were 223 MWh per month. It is a significant amount of energy, however, one should ask why there was not the same setback as one year before. The difference between energy savings in spring 2020 and spring 2021 was 159 MWh per month.



The next step for the facility technicians is to investigate setback regime differences using historical data in the BMS between spring 2020 and spring 2021. It should provide answers to crucial questions such as: “Is such change arguable? Wasn't it possible to maintain higher energy savings? How can higher energy savings be achieved?”

Conclusion

Energy consumption reduction is definitely not the main objective during the pandemic. It is just a welcomed side effect that, in some cases, helps ease the negative economic impact. However, we can see significant differences among buildings that were exposed to the same regimes. Using machine learning tools such as ET can provide helpful insight and gain valuable knowledge.

We all expect our governments to learn a lesson and be more prepared for such events in the future. Using energy data, we can, with almost no effort, be more prepared as well. With the help of machine learning, we can systematically compare multiple buildings in real-time and react. Small efforts can bring significant energy savings during nonstandard events. You just need to be prepared for that.

Energy Twin Machine Learning Extension for SkySpark

The Energy Twin team is a SkyFoundry partner based in the Czech Republic. They have deep expertise in Machine Learning and other advanced AI techniques for energy analysis and fault detection.

For more information, contact the Energy Twin team at:

<https://et.mervis.info/>



SkySpark® – Analytics for a World of Smart Device Data

The past decade has seen dramatic advances in automation systems and smart devices. From IP connected systems using a variety of standard protocols, to support for web services and xml data schemas, it is now possible to get the data produced by the wide range of devices found in today's buildings and equipment systems.

Access to this data opens up new opportunities for the creation of value-added services to help businesses reduce energy consumption and cost and to identify opportunities to enhance operations through improved control, and replacement or repair of capital equipment. Access to the data is just the first step in that journey, however. The new challenge is how to manage and derive value from the exploding amount of data available from these smart and connected devices. SkyFoundry SkySpark directly addresses this challenge.

About SkyFoundry

SkyFoundry's mission is to provide software solutions for the "Internet of Things". Areas of focus include:

- Building automation and facility management
- Energy management, utility data analytics
- Remote device and equipment monitoring
- Asset management

SkyFoundry's software helps customers derive value from their investments in smart systems. Learn more and request a demonstration at www.skyfoundry.com.



The new frontier is to efficiently manage and analyze data to find what matters™.

SkyFoundry

www.skyfoundry.com

info@skyfoundry.com