

Energy Monitoring and Modelling Energy demand by Markov Switching model for Operation Data Fusion; Case Study of a Wastewater Treatment Plant in Fukushima

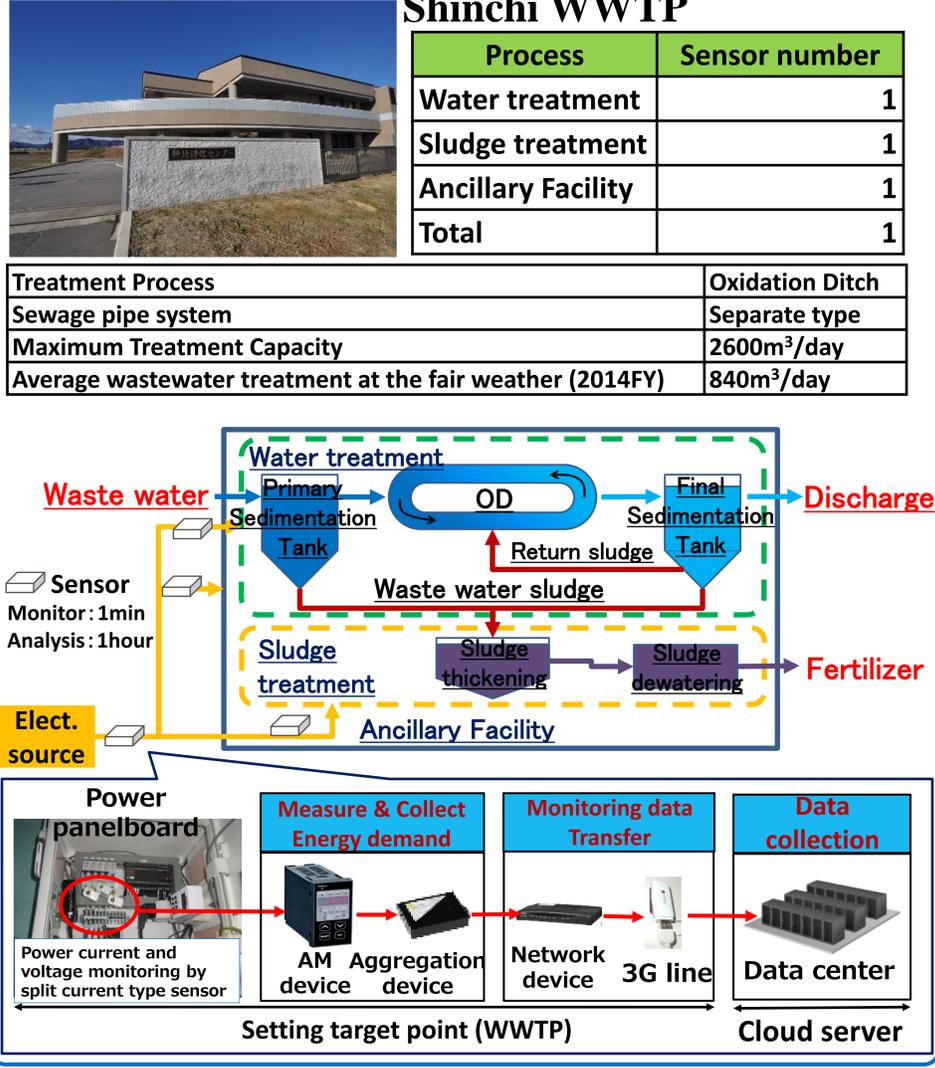
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Introduction & Background

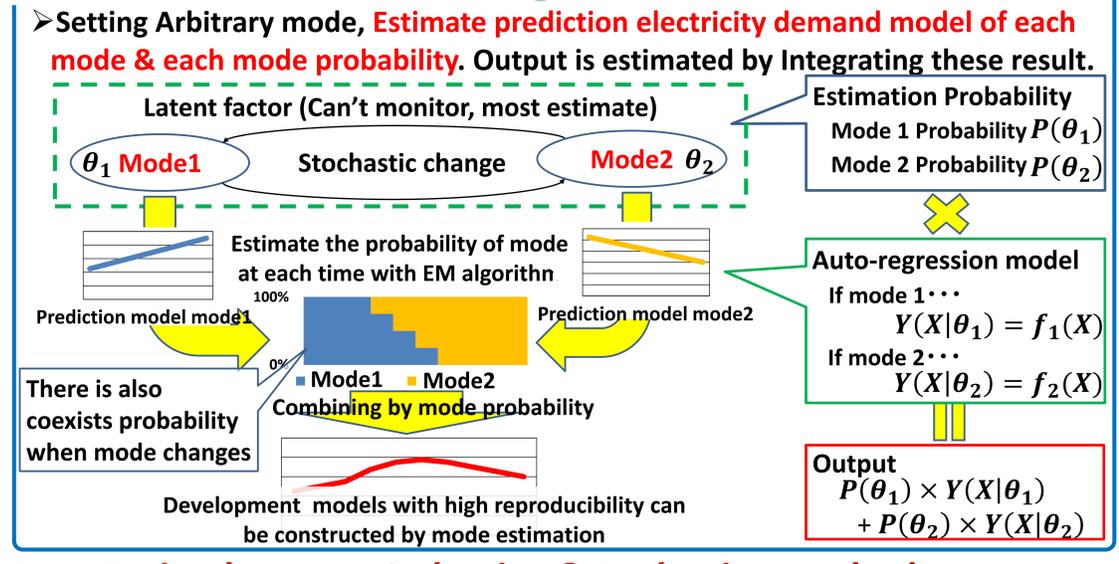
The Great East Japan earthquake caused a major damage to many of public infrastructures including Wastewater treatment plants (WWTP) in Fukushima prefecture. Following the nuclear disaster, which lead to shortage of energy, government of Japan enacted new policy measures to redefine its energy mix. To meet this requirement, Japan needs to restructure its current electricity consumption by identifying the optimal demand of electricity by households, commercial, and public sectors. In addition, it is necessary to promote further energy conservation including operation management from monitoring results. To support the policy of toward conservation of energy, we outline the energy demand of a WWTP, one of a public facility, in Fukushima Prefecture, Japan, and based on the data obtained using an innovative information and communication technology (ICT) tool. Using the monitored data, we further predict the electricity demand for each process of the WWTP using Markov switching models.

Methodology

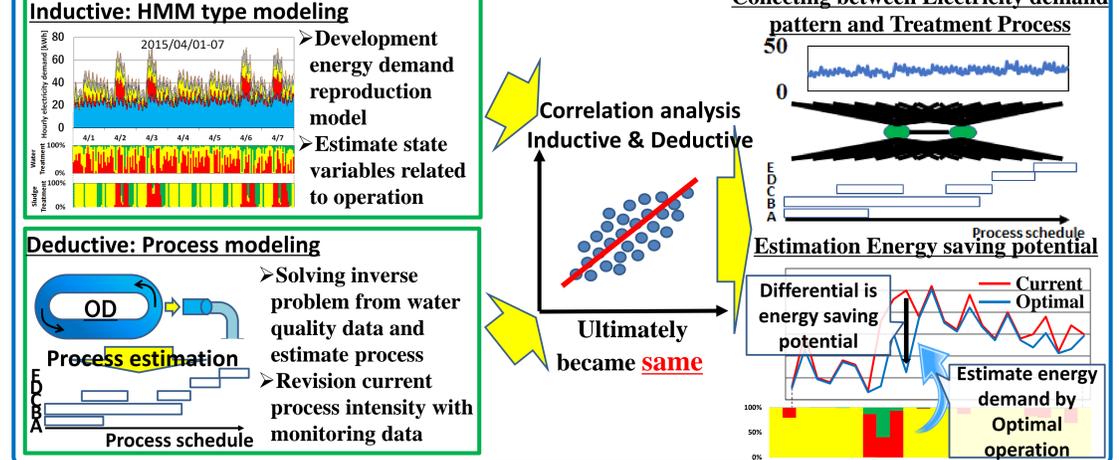
Monitoring Target



Prediction -Markov switching model-

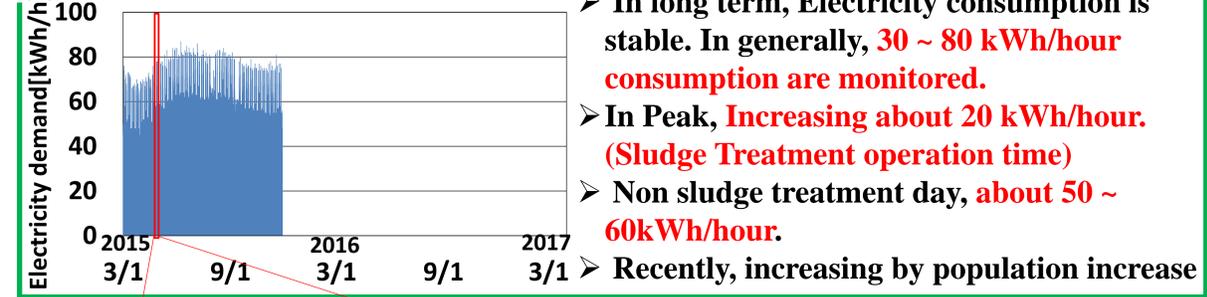


Data Fusion between Inductive & Deductive methods

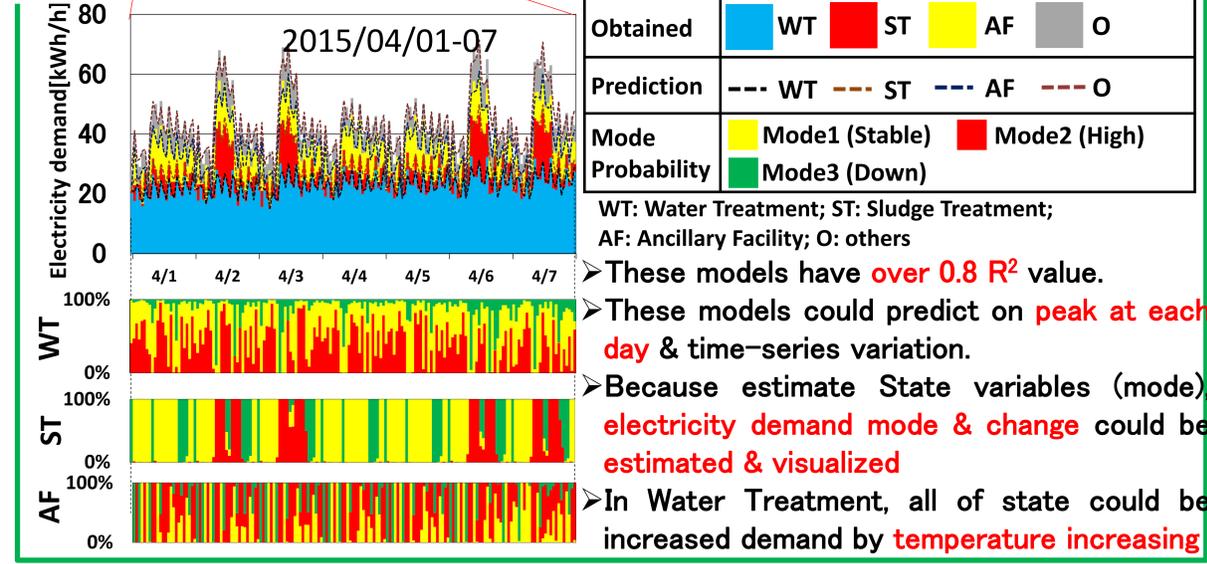


Result & Discussion

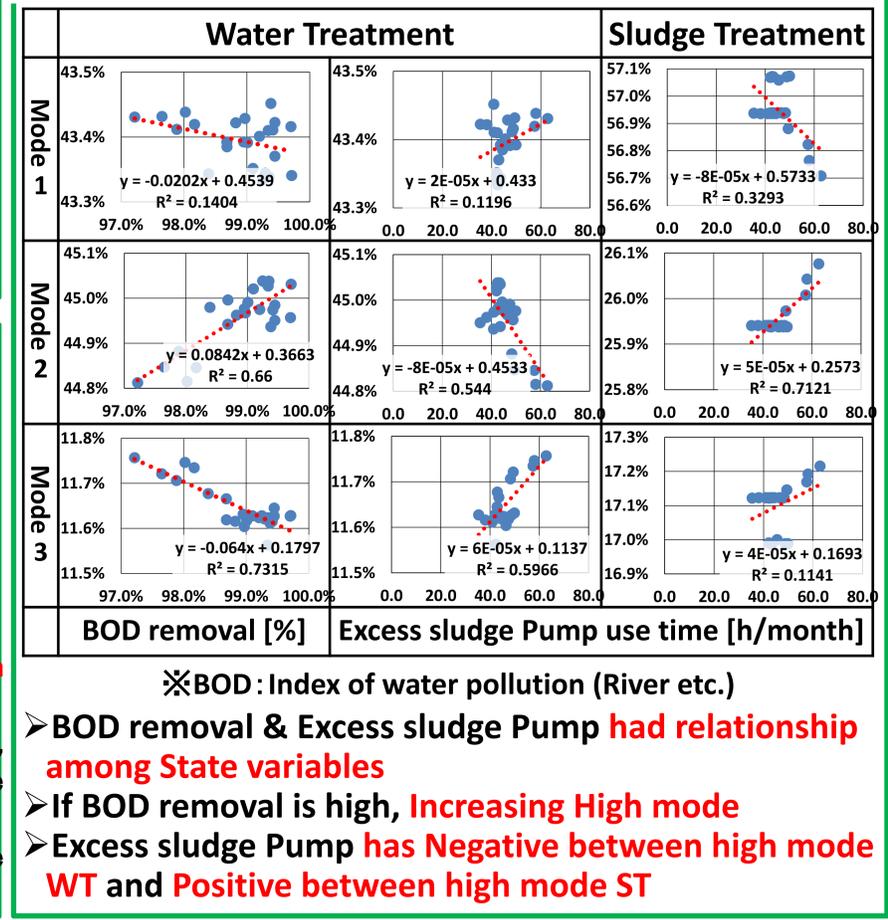
Monitoring Result



Markov modeling Result



Correlation between state & operation



Conclusion

- Monitored each process hourly electricity consumption data
- Development model include Mode estimation & High repeatability
- Some Process data & Mode probability have correlation ship
- We could predict Future Electricity Consumption
- We demonstrated relationship Water Treatment Process & Electricity Consumption data and Mode

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