I have just started my PhD and my first project is focused on Data centres. Specifically, we are looking at how data centres can provide flexibility in their power consumption. We want to build an optimisation model which integrates all of the available assets in the data centre that can provide flexibility. These are: IT workloads, UPS (uninterruptable power supply), the cooling system (HVAC), thermal energy tank storage and other commonly occurring data centre assets. The main research questions are:

1) What are the flexibility characteristics of various assets within a data centre,

2) How can the flexibility of each asset be aggregated into an overall 24-hour flexibility envelope, considering the recovery times?

3)How can data centres optimally utilise flexibility resources to support power systems without compromising their operational performance and reliability?

Search through all the sources and find equations which relate to the cooling system of the DC. This could be the HVAC system and TES tank. I am particularly interested in how these papers model flexibility. I think there will be an equation which describes the rate of change of temperature as a function of numerous variables. There will also be constraints. Find these equations and give me all of them from the different papers.