

## Assignment 1

The first step is to check whether the input iso and peak type are legal. Then based on the format of entered period, I will find the corresponding start date and end date, and if the period entered is not a single day, all the holidays in that period. The smallest unit of a period that is not a day is a month, and all NERC holidays are set in their corresponding months. NERC dictates that if a holiday occurs on a Sunday, the holiday will be postponed to the following Monday, but if a holiday occurs on a Saturday, then it will stay there. This affects Eastern ISOs since if a holiday is on Saturday, there will be one more workday for that period. The next step is to determine the number of Saturdays and Sundays in a time period. For Eastern ISOs, we get the number of off-days by adding number of Saturdays, Sundays and holidays in that period, and the rest are workdays. For Western ISOs, we only add Sundays and holidays.

If the period entered is a single date, we will then consider if that date is a weekend or holiday. Weekends are easy to check, since one only needs to account for the difference in Eastern ISOs and Western ISOs. New Year's Day, Independence Day and Christmas are on a set date, so it is also easy to check. The complication is that if the holidays occur on Sunday, the next Monday is also a NERC holiday. For Memorial/Labor Day, we first have to check if the given day is a Monday, then if the next/previous Monday is in June/August. For Thanksgiving, we check if the day is a Thursday, if the Thursday from three weeks ago is in November, and if the Thursday from four weeks ago is in October to ensure that it is indeed the fourth Thursday in November.

With all the workday and off-day information, we can then calculate the number of hours with given peak type. The math is rather straightforward. The final step is to adjust for daylight saving start and end dates for all ISOs except MISO. Daylight saving only affects "flat", "offpeak", and "7x8" peak type since changes happen before dawn. It won't have any impact if we are interested in annual number of hours, since the extra hour in March is compensated by the missing hour in November. Otherwise, if the period contains March, we subtract one hour from the off-peak hours, and add one if the period contains November. For daily data, we need to check if the given date is the second Sunday of March or the first Sunday of November.