Minutes 14/05 - Oliver Nunn (Sponsor)

Date: Friday 14/05/21, 5-6pm

- Oliver Nunn (oliver.nunn@endgame-economics.com)
- Calendar affect, what time, whether weekday
- Try to keep it simple.
- Big drive is time of day, solar PV hugh driver of demand changes, see impact,
- Big factor of demand forecast is solar, provide estimate solar output, subtract of output
    - Solar data is available
    - Estimated output from solar,
    - Prior 2010, solar won't be used
    - 2013 - high uptake of solar
- Use temperature
    - Use forecast temperature
    - Don't have actual temperature in the model
- Delta - should be provided, what is the best combination of weather forecast
    - Weather forecast from BOM is quite limited
- Demand
    - Demand 30 minutes forecast, Daily demand isn't helpful
    - Instantaneous is more important than daily demand
    - How high of 10 hours
    - Actual market is run every 5 minutes
    - Supply-demand must be constant 6s internal adjust output of key generator
    - Supply adjust second by second
- Pump hydro - to fill the top dam
    - Schedule demand: can control
    - Can't change demand from households, industries
    - Don't need to forecast that demand, send message to generator to pump or discharge when we need them to.
- Demand
    - We don't know how much energy being consumed, they take month to measure
    - Supply = demand, pump supply, so when ask what's demand is what is supply
    - All the houses, all business, everyone connecting to the grid
    - Demand = demand for grid source energy
- Location
    - Big load, not temperature sensitive
    - 880MW, 15% of NSW demand, not temperature sensitive at all
    - The other 10-15%
    - **Multiple temperature sites**
    - **Sydney CBD measurement**, short term forecast, cool change comes in affect demand in the CBD area
- Periods
    - Good couple of forecast
        - **6hrs, 3hrs, 1hr forecast,** decision to be made in those time
        - 6hr = decision on the coal plant, might decide for hot box for 6hrs, turn themselves off then back on
        - 3hrs = dispatch, to turn on gas turbine
        - 1hr OGCT, gas turbine to turn on
- 2012

    - They've done some major updated to incorporate new technique, hard to unpick exactly what happened, also how to interact with other forecasts
- Forecast s are not great, to beat consistency in that model is not that hard
- Data
    - Diff weather stations
    - More granular forecast, more application they are,
    - Avg demand whole of region,a lot of business e.g. train grid, ausgrid, interested in specific location, they not going to use aggregated demand
    - Use demographic only if you think they are going to be better predictor
        - Data is not available, it needs to be from study of zone substation data
    - Can you draw any insights from aggregate data from different weather station? Maybe you can.
    - 5 minutes forecast, we beat 5mins in space of hour
- Real-time bases demand
    - Those forecast provided all throughout time using engine
    - Can find this in **pre-dispatch forecast** very well documented
    - They use neural net (state of the art in 1998)
    - Reason why not state of the art, people are caution to change thing to do with electricity market,
    - There are much better forecasting tools to go through the process to get approved to use those tools, not in the level of production forecasting.
    - Feature - domain knowledge of the processor,
    - We know data drives demand: **temperature, solar PV upwards**, the challenge is about obtaining the data.
- Data
    - Frequency control, over the large industrial, clear profile, pretty flat, mid of the day making up portion of demand profile of residential profile
    - **Net system load profile - NSLP AEMO**
        - What typical residential looks like
    - **Zone substation data** - what diff demand in diff part of the state
        - Ausgrid - easy to get
    - **Clear Energy Regulator Postcode data**
        - Solar from 2010 when they start installing
    - **AEMO website** to look at data archives - might be interesting for your own benefit.
    - Wind speed
    - Measure of humidity
    - Use parent temperature
    - Air cond sales? GDP? - long term trend, we don't use it they are aggregated level
    - People interested in yesterday for short term, not adjust for Solar PV
    - Energy eff - diminishing energy annual demand
    - Covid - didn't mean anything, residential down industry up, impact of covide is 1-2% demand, significant in other countries but not in australia
    - Elina - longer term forecast, not day by day basis
    - Forecast error - 1hr time, every forecast is mean of the demand, distribution
        - Distribution - dispatch forecast
- Model
    - Measure in the market: average, distribution of error, outline event, minimising outliers, forecast on really hot day
    - **Price data** - normal, really hot day through the roof, 100 times higher, interested on those abnormally day
    - If you are participants in the market, wanna know demand,
    - Market operations - don't mind if over estimate demand all the time
    - How low demand can get, underestimate - be aware of the problem

    - We want to overestimate on high days and underestimate on the low days if power operator
- AEMO - min or max
    - Everyone interested in max demand
    - Min demand ppl less concern unless operator, issue for transmission network
    - Time-series of demand figures: any bias, don't think will see bias in the forecast
    - Hot extreme day 2017, forecast under what they should be
    - Was told to turn off the aircon, demand drop off
- Actual demand
    - Water going in = supply, water going out = load, Water in the bathtub = frequency
    - Too much change in water/frequency, we are done the whole system collapse
    - No need to predict system black event
- Outlier day
    - Lockday not impact
    - **Interested in Extreme weather days**, huge amount of money in stake
    - 10-20B lose money

Summary:
Additional Data:

- Solar PV - Clear Energy Regulator Postcode data
- Price data
- Pre-dispatch forecast
- Zone substation data for diff demand in diff part of the state
- Sydney CBD and multiple temperature sites

Periods: 6hrs, 3hrs, 1hr forecast

Outlier days: extreme weather days