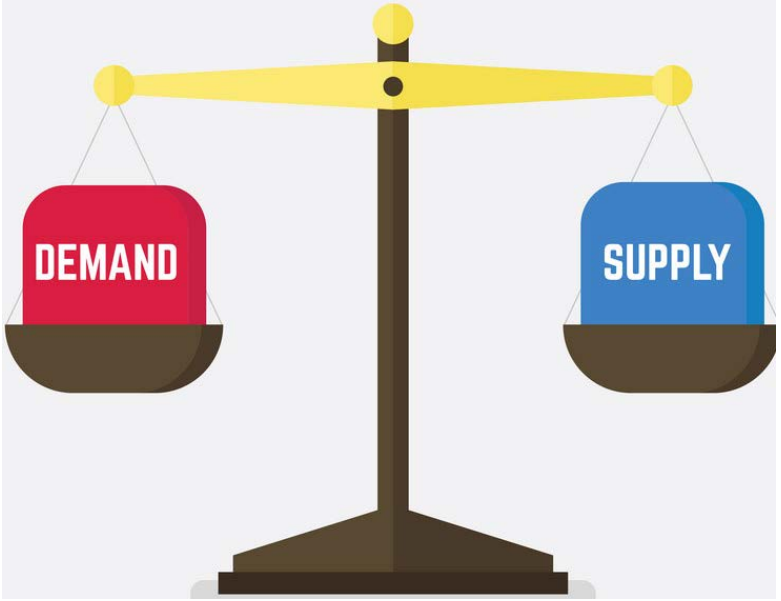
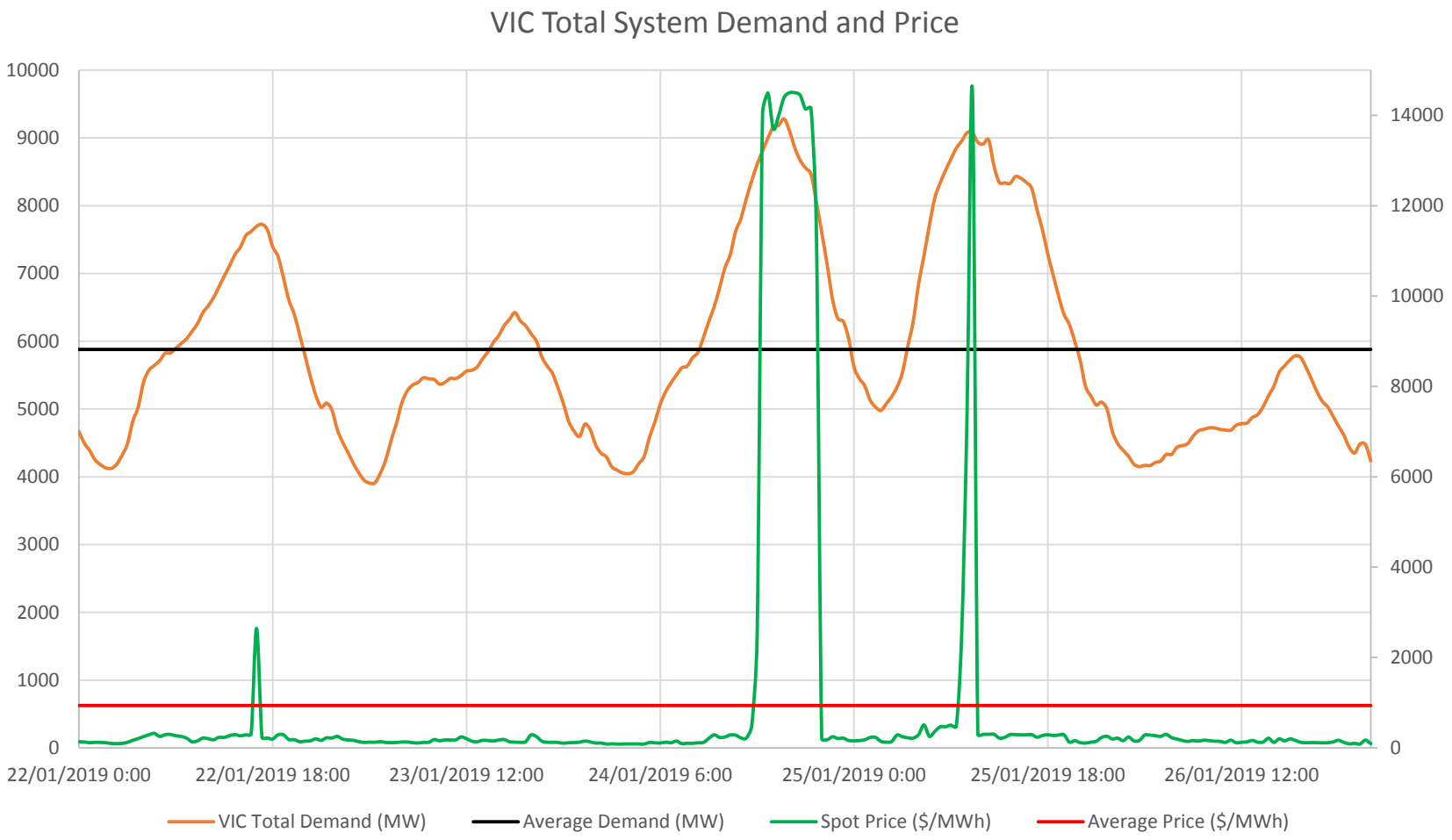

GloBird
energy

# The electricity market is unique

- Electricity is used not stored, very different to water / petrol
- **Customer demand / Generation / Price change by the minute**
- Wholesale spot price ranges ($-1.0/KWh to $14.5/KWh)
- Retail flat ($0.25/KWh) approx.
- High demand usually correlates with high price
- **Important note:** Retailer’s absorb wholesale volatility to protect customers



# Actual example – 24 Jan 2019




1. Actual AEMO data for Victoria 22/Jan to 26/Jan
2. **When not hedged, a retailer could lose up to $250 per residential customer on a day like this!**
3. VDO sets the whole year's retail cost (Gross Margin) to be $250 per customer

# A Prudent Retailer Must Hedge

- **Prudent retailer must hedge wholesale energy risk in advance to**:
  - Lock its gross margin
  - Have adequate cash to settle in the wholesale market and meet the AEMO prudential requirements. Particularly when the market price and customer demand spikes.
  - Settle with AEMO next day by 11AM
  - Retail license only granted with a proper wholesale risk management policy (aka Hedging Strategy) in place.

# Frontier Economics Model - Challenges

- Some good work has been done, however it's **NOT practical**:
  - **A closed box model lacks transparency**, can not be independently checked or verified, no guarantee of accuracy, and no warranty given
  - Machine rather than human based. Curve fitted and optimised from hindsight, **impossible for retailer to achieve**
  - Contains minimal sample data, significantly **underestimates** risk and cost **in summer**
  - **Ignores** some other key input costs

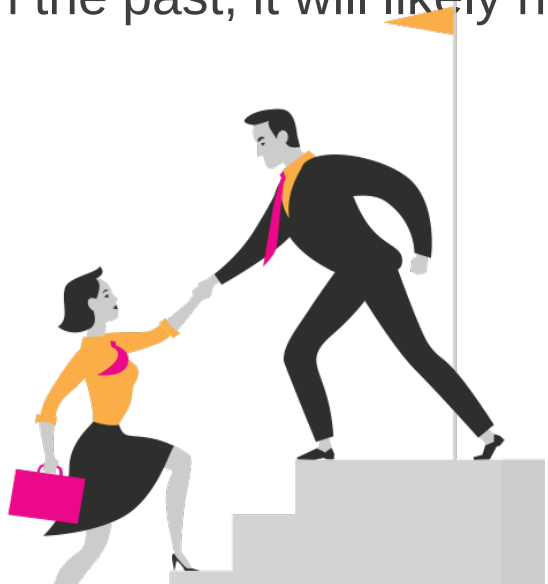
# A sound WEC Model should be:

- **Transparent & verifiable**
- **Practical, human executable and achievable**
- **Repeatable**

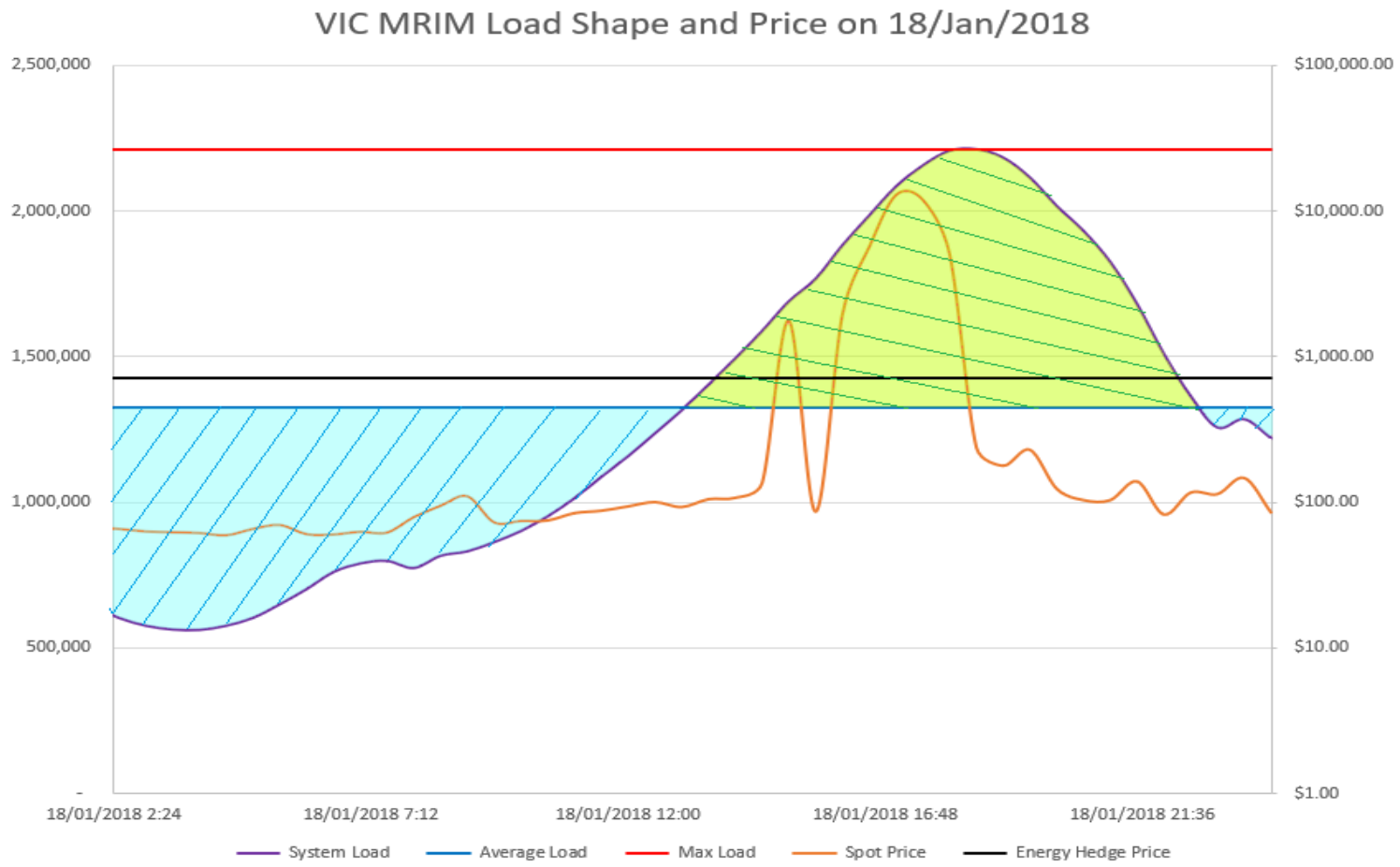
- And, based on a real world Hedging Strategy, using main stream products:
  - Protects retail margin
  - Covers the liquidity risk under credible stress test scenario
  - Uses main stream hedging practice for a prudent retailer
  - Quarterly based portfolio, handles the seasonality issue in the electricity market
  - Takes into account all costs, broker, margin and AEMO Prudentials, etc.

# Proposed WEC Model

- A model based on industry practice, transparent, humanly tradable and repeatable:
  - Hedge on the quarterly basis, inline with quarterly futures contracts
  - Hedge the average demand use Base swaps
  - Hedge any extra demand up to the maximum demand use the $300 CAP product
  - For the max demand, remember: If it happened in the past, it will likely happen again



# Proposed Model – in more detail




Hedging is a straight line, actual price and demand is **NOT**. After hedging, a retailer still face some **Load Shape Variance Cost:**

- When the demand is higher than the hedged average demand, and the price is different to the hedged price
- When the demand is lower than hedged demand, and the spot price is different to the hedged average price

- In reality, further cost incurs because the actual average demand and maximum demand is never the same compare to the forecasted/hedged average and max demand – **Demand Forecast Variance Cost**

# WEC by the model

- Based on the model, the WEC can be calculated using a **formula**:

$$\boldsymbol{Wholesale\ Energy\ Cost} = Energy\ Hedge\ Cost + Capacity\ Hedge\ Cost + Load\ Shape\ Variance\ Cost + Wholesale\ Trading\ and\ Funding\ Cost$$

- WEC should include the ‘Wholesale Funding & Trading Cost”, which can be as high as $8.00/MWh
  - Reallocation contracts for AEMO’s wholesale prudential requirements
  - Brokage fees for Futures Market
  - Funding cost on futures contract margin
  - Compare to the average futures price, actual achieved price often higher

# Load Shape Variance Cost

- **The actual Load Shape Variance Cost is about 20% on top of the average spot price based on historical data since Jan 2015**.
- We can apply the same cost ratio to futures quarters.
- Formulas to calculate:

  - $Load\ Shape\ Variance\ Cost = Over\ Contracted\ Energy\ Cost + Under\ Contracted\ Energy\ Cost$
  - $Over\ Contracted\ Energy\ Cost = \sum(Acutal\ Demand - Average\ Demand) * (AveragePrice - SpotPrice)$
  - $Under\ Contracted\ Energy\ Cost = \sum(Acutal\ Demand - Average\ Demand) * Min(SpotPrice, 300)$
  - $Load\ Shape\ Variance\ Cost\ Ratio = \frac{Load\ Shape\ Variance\ Cost}{Total\ Load * AveragePrice}$

# Historical Load Shape Variance Cost

- Using VIC MRIM data and the actual AEMO settlement price since Jan 2015, we have calculated the average price and the Load Variance cost ratio

| Year | Quarter | Average Price | Load Weighted Price | Max Demand / Average Demand | Average Load | Load Variance Cost Price Ratio |
|---|---|---|---|---|---|---|
| 2015 | 1 | $26.60 | $28.50 | 2.38 | 718,766 | 18.15% |
| 2016 | 1 | $42.93 | $55.29 | 2.79 | 736,885 | 21.52% |
| 2017 | 1 | $79.34 | $87.68 | 2.57 | 818,212 | 22.15% |
| 2018 | 1 | $102.45 | $136.24 | 3.05 | 818,881 | 18.94% |
| | | | **Max.** | **3.05** | **Average:** | **20.19%** |
| 2015 | 2 | $31.04 | $33.26 | 1.87 | 854,377 | 18.76% |
| 2016 | 2 | $64.17 | $74.27 | 1.94 | 832,032 | 28.42% |
| 2017 | 2 | $104.91 | $107.62 | 1.81 | 941,485 | 14.35% |
| | | | **Max.** | **1.94** | **Average:** | **20.51%** |
| 2015 | 3 | $38.04 | $39.99 | 1.79 | 929,631 | 15.99% |
| 2016 | 3 | $49.73 | $54.73 | 1.76 | 956,349 | 20.74% |
| 2017 | 3 | $100.03 | $105.54 | 1.72 | 1,044,039 | 16.33% |
| | | | **Max.** | **1.79** | **Average:** | **17.68%** |
| 2015 | 4 | $39.57 | $44.70 | 2.78 | 711,388 | 23.22% |
| 2016 | 4 | $33.02 | $35.15 | 2.43 | 774,956 | 16.73% |
| 2017 | 4 | $84.44 | $89.42 | 2.58 | 785,562 | 16.62% |
| | | | **Max.** | **2.78** | **Average:** | **18.86%** |

# WEC Formula

$$\boldsymbol{Wholesale\ Energy\ Cost\ Price} = Base\ Swap\ Price + \left(\frac{Max\ Demand}{Average\ Demand} - 1.0\right) * Cap\ Price + Forecasted\ Spot\ Price * Load\ Shape\ Variance\ Ratio + Wholesale\ Trading\ and\ Funding\ Cost$$

**where**

$$Forecasted\ Spot\ Price = Base\ Swap\ Price - Futures\ Premium$$

- An example to calculate WEC for VIC Q1 2019:

  $WEC = \$135 + (3.05 - 1.0) * \$35 + \$135 * (1 - 5\%) * 20.19\% + \$7.85 * = \$240.49/MWh$

  *: Assume:*

  1. *Futures Premium is 5% of the futures price*
  2. *Actual realized futures price is 2.5% higher compare to average*

- The annual WEC is the average of all quarters

# Other issues for consideration

- Budget for Demand Forecast Variance Cost?
- Calculate deviations to the realized price compare to average price?
- CAL 19 or FY 19 price?
- 6 months or 12 months average pricing?
- A WEC per network distributor? We see little point of doing so.
- What if wholesale cost rallies again?

# Questions ?