COAL FIRED GENERATION RELIABILITY AND FORCED OUTAGE RATES IN THE NEM

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THE ASSIGNMENT

- **Provide forward looking reliability projections for the coal fired generators in the NEM**:
  - Planned outage (maintenance rates)
  - Full forced outage rates, plus partial forced outage rates (hours) and average partial derating or partial forced outage rates assuming derating does not change
  - Effective forced outage rates (sum of above)

- **Determine these on a station by station basis but summarise at a state and fleet level**

INPUTS

- **AEMO provided data:**
  - Forced and partial outage summaries by unit from FY2011onwards
  - Calculated station factors for FOR, EPOR etc
  - Lists of forced and partial outages with summary descriptions from FY2016 onwards

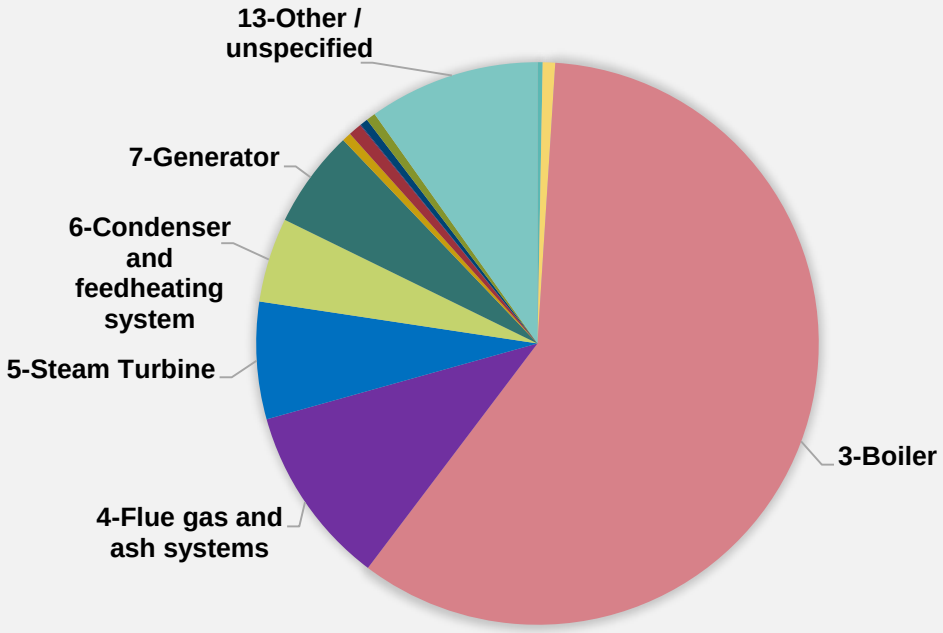
- **Generator provided data:**
  - Teleconferences with representatives of most stations to discuss history and plans etc.

APPROACH

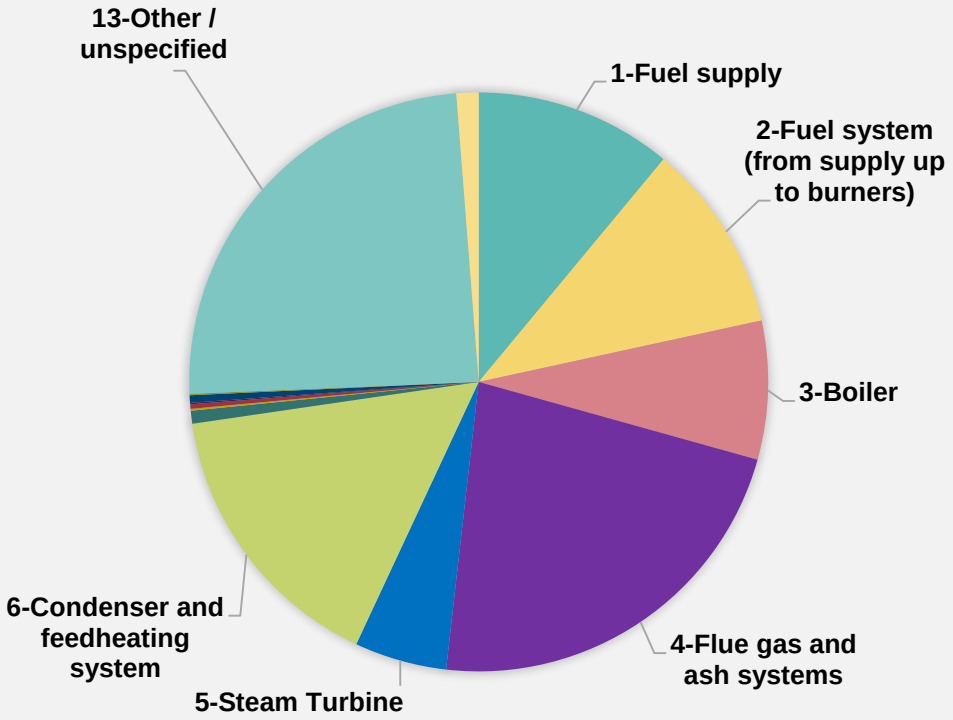
- Review reasons for outages and categorise these into 14 categories (examples of category splits are on next slide).
- Identify major events (low probability, high impact events) from FY2016 onwards and separate these from other outage events to get underlying rates.
- Reallocate the major events to stations on a flat, state-wide basis. The assumption being major events could occur at any station and that state-wide markets and capacities are key.
- Establish 4-year rolling average values for FOR and EPOR by station and state – the starting point for our projections. 4 years selected to reflect typical maintenance cycles.

CATEGORIES AND MAJOR EVENTS

BREAKDOWN OF FULL OUTAGES EXCLUDING MAJOR EVENTS



BREAKDOWN OF PARTIAL OUTAGES



IMPACT OF MAJOR EVENTS (2016 – 2020)

Region	FOR
Fleet	0.84%
NSW	0.43%
QLD	0.35%
VIC	2.46%

FORECASTING METHODOLOGY

- AEPE experience over many years and geographies employed to determine how different categories of causes (and the frequency of major events) may change over time assuming 'business as usual' and frequent low load operation with 30 to 40 weekend outages per year – the 'growth factors'

General ageing growth pa for each outage cause							
	Categories						
	1	2	3	4	5	6	7
Scenario	Fuel supply	Fuel system (from supply up to burners)	Boiler	Flue gas and ash systems	Steam turbine	Condenser and feedheating system	Generator
Business as usual	1.00%	0.50%	2.00%	0.50%	0.50%	0.50%	0.20%
Weekend shutdowns	1.00%	2.00%	4.00%	2.00%	0.75%	1.50%	0.20%

General ageing growth pa for each outage cause								
	Categories							
	8	9	10	11	12	13	14	
Scenario	Transformers (generator and unit transformers)	C&I system	Auxiliary mechanical	Auxiliary electrical	Human factors	Other / unspecified	Environmental emissions	Major events
Business as usual	0.10%	0.50%	0.10%	0.10%	0.10%	2.00%	1.00%	0.50%
Weekend shutdowns	0.10%	0.50%	0.20%	0.20%	0.50%	3.00%	2.00%	1.00%

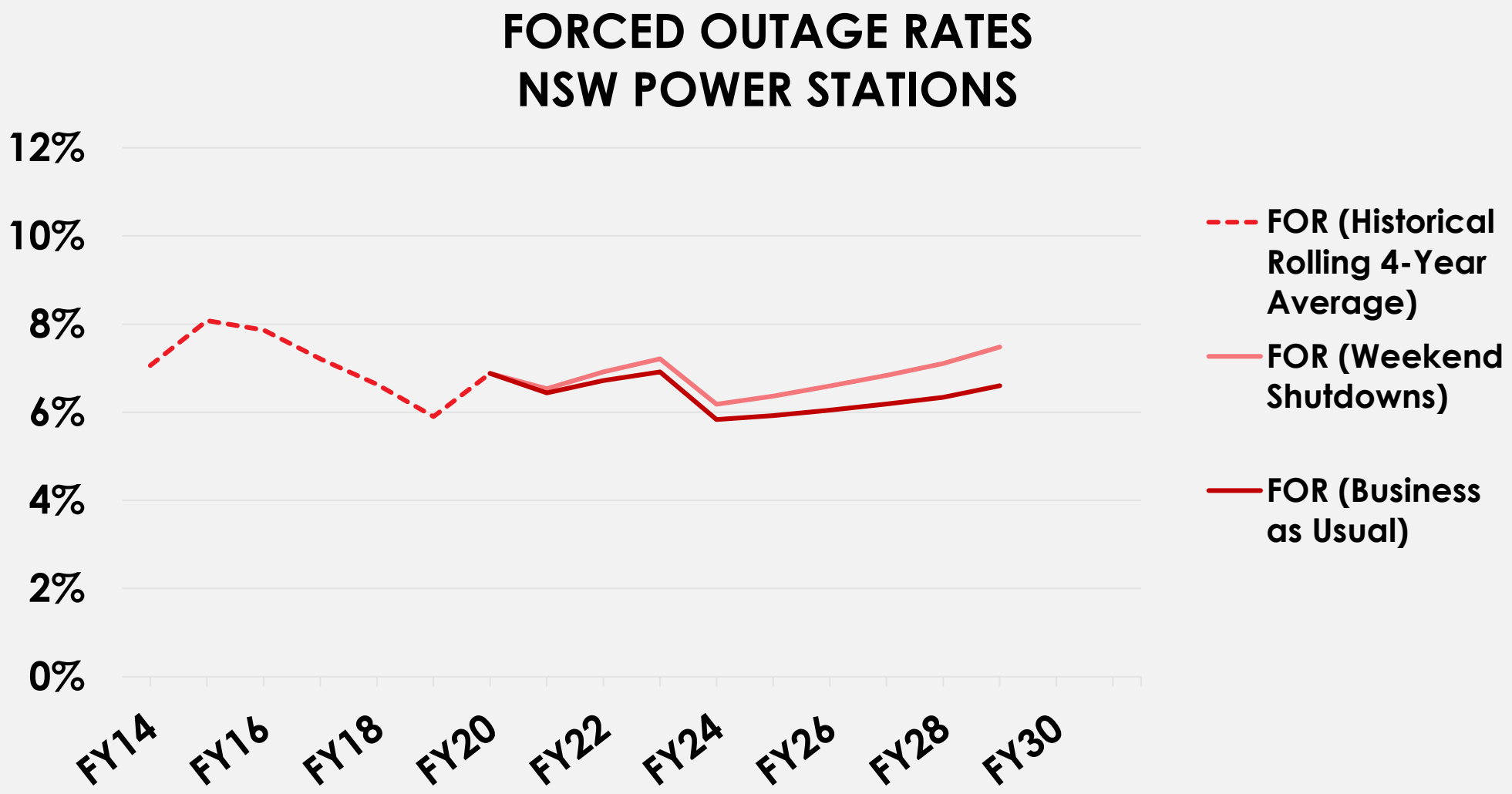
FORECASTING METHODOLOGY (cont'd)

- Outage rates expected to change in final few years of operation – noting market and other factors will be significant influencers

End of Life Growth Per Annum				
Scenario	3 years in	2 years in	1 year in	EOL
Business as usual	0.25%	0.30%	0.40%	0.50%
Weekend shutdowns	0.25%	0.30%	0.40%	0.50%

- AEPE reviewed information provided by Generators to determine if some categories of causes will change weighting in near future. It then modified start point for projections accordingly
  - Our analysis determined that there were few changes required
- AEPE used the category weighted growth factors on a station by station basis to determine FOR, EPOR and EFOR to end of planned station lives.
- Weighted statewide projections were derived from station data.

SUMMARY PROJECTIONS



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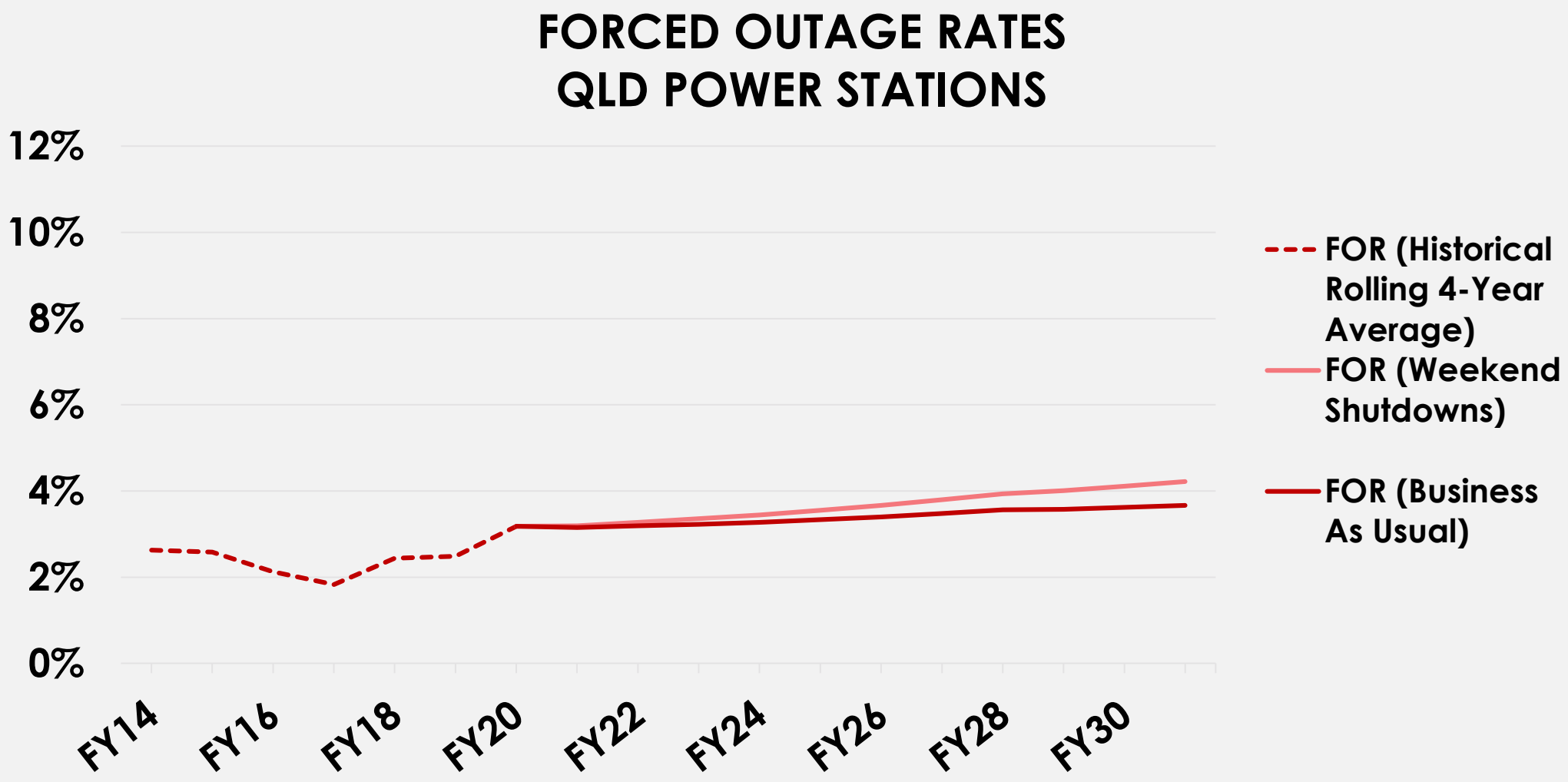

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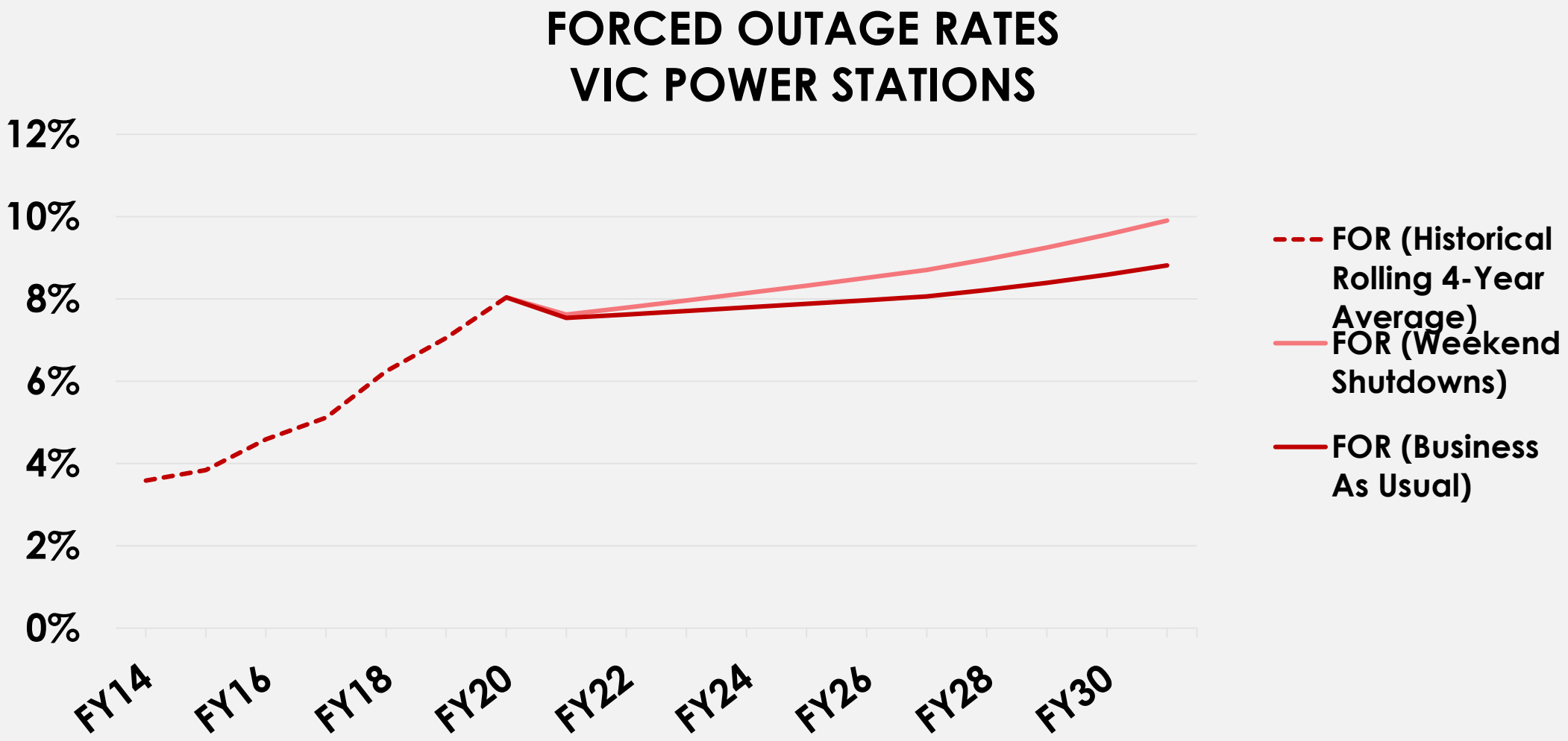

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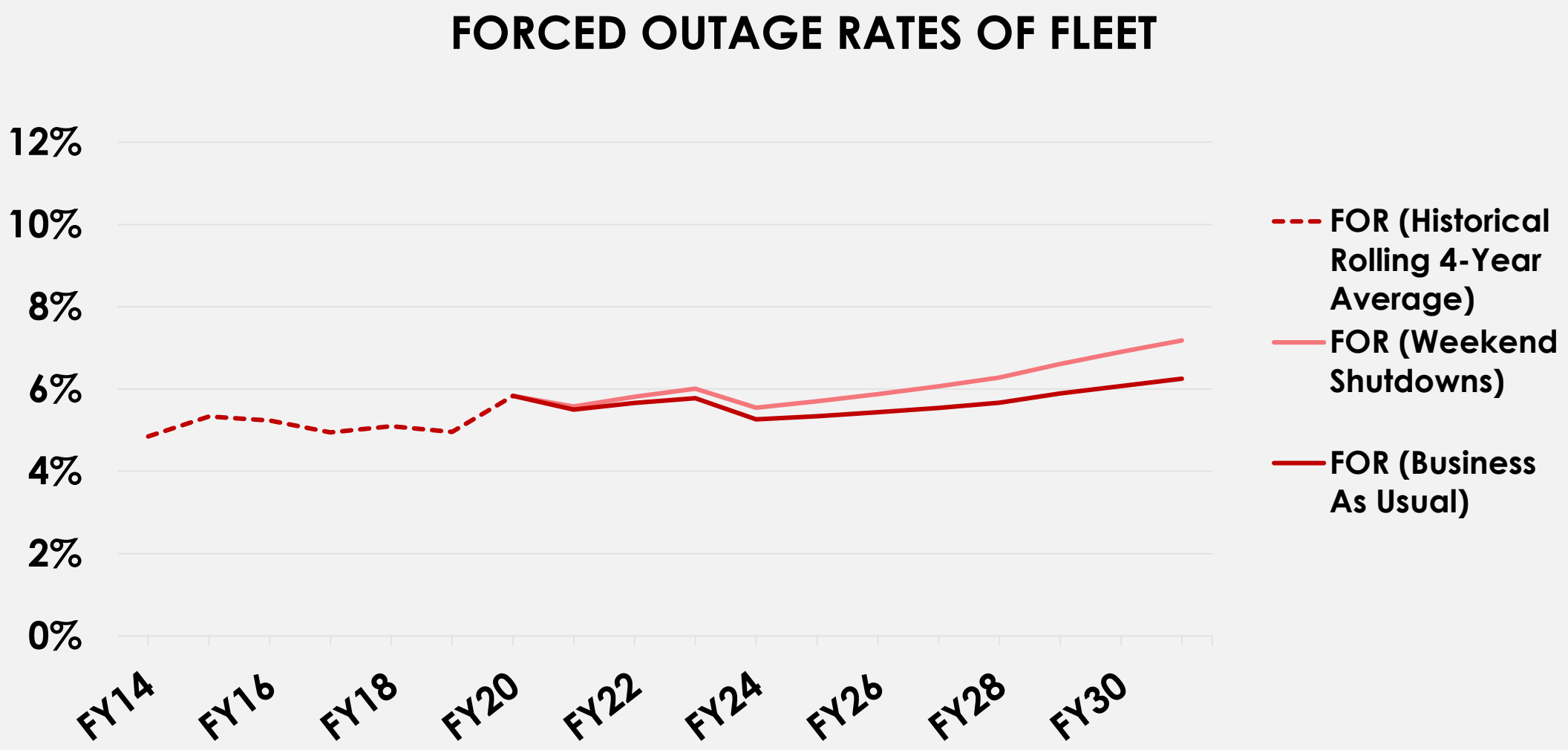

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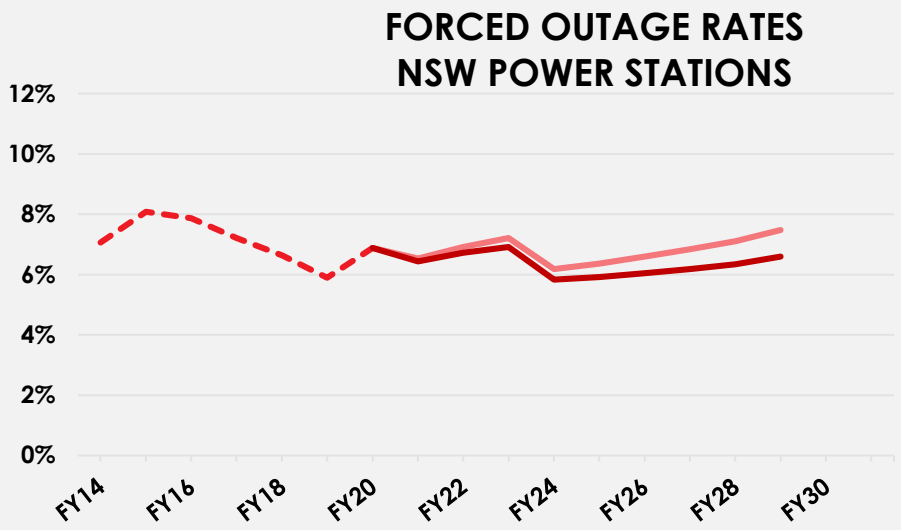

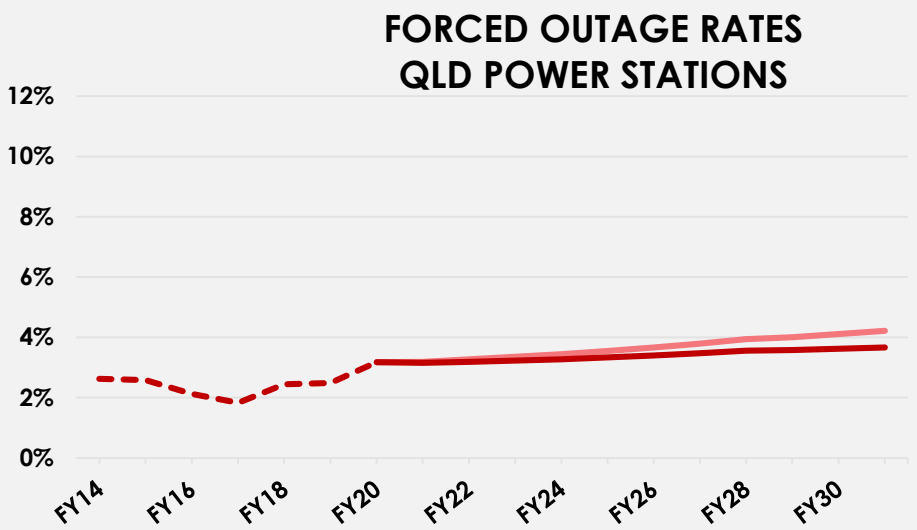

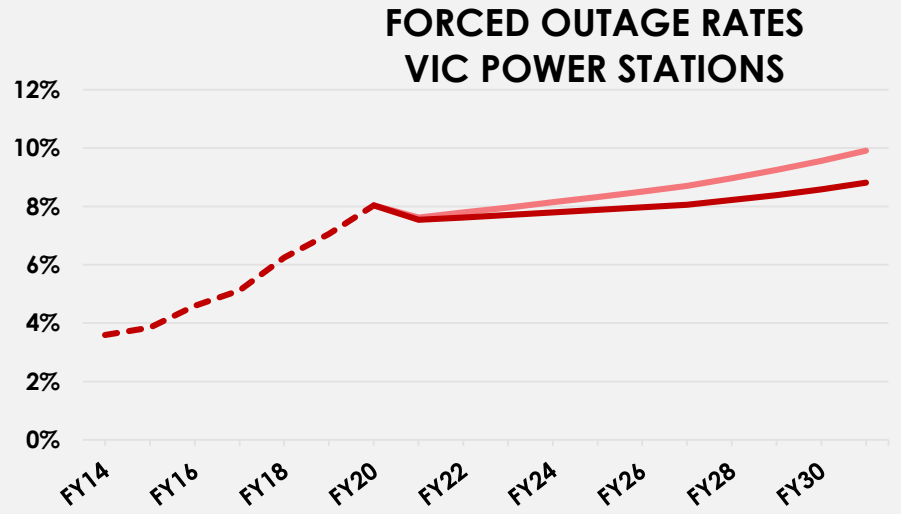

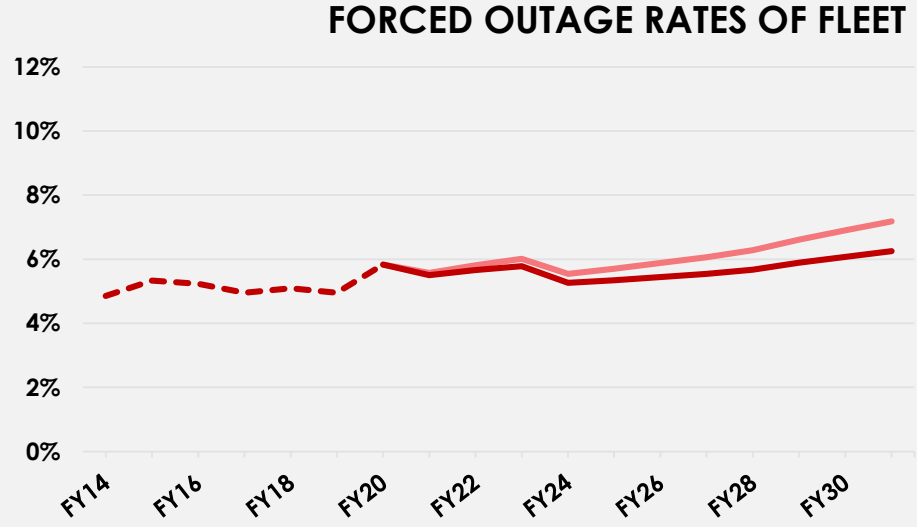

FOR (Historical Rolling 4-Year Average)

FOR (Weekend Shutdowns)

FOR (Business As Usual)

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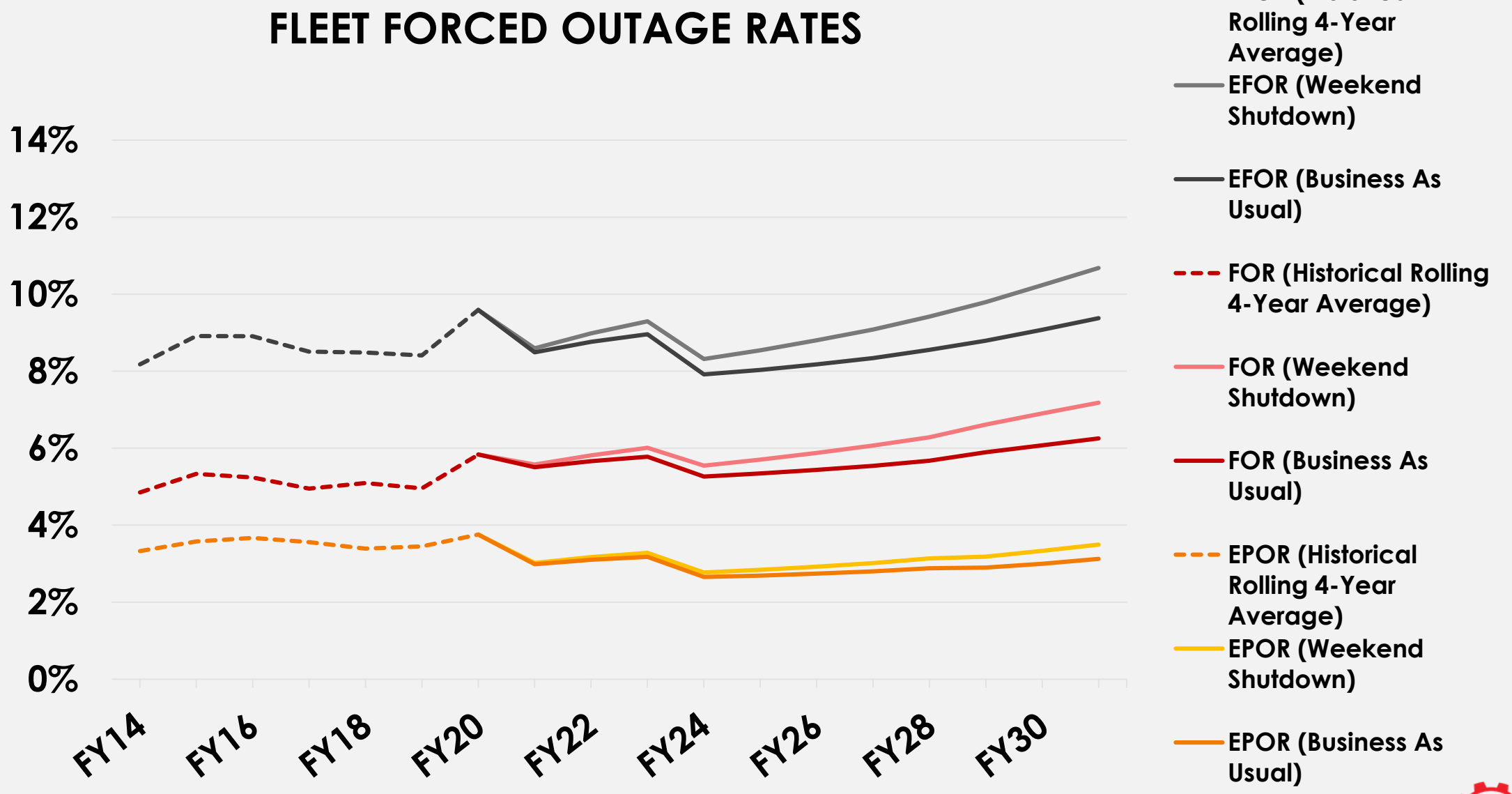
PROJECTIONS



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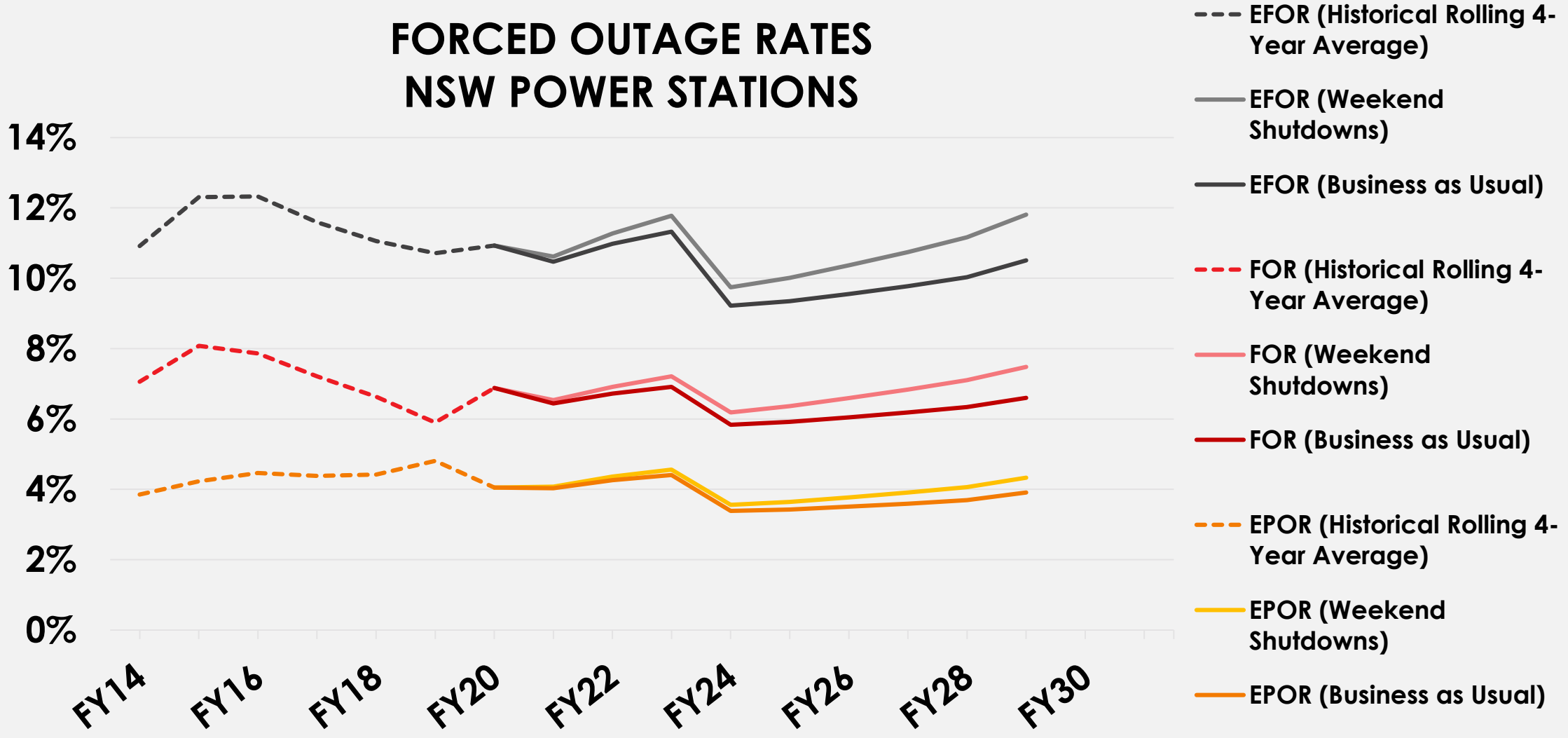
APPENDIX


FORCED OUTAGE RATES
NSW POWER STATIONS
14%
12%
10%
8%
6%
4%
2%
0%
FY14
FY16
FY18
FY20
FY22
FY24
FY26
FY28
FY30
EFOR (Historical Rolling 4-Year Average)
EFOR (Weekend Shutdowns)
EFOR (Business as Usual)
FOR (Historical Rolling 4-Year Average)
FOR (Weekend Shutdowns)
FOR (Business as Usual)
EPOR (Historical Rolling 4-Year Average)
EPOR (Weekend Shutdowns)
EPOR (Business as Usual)

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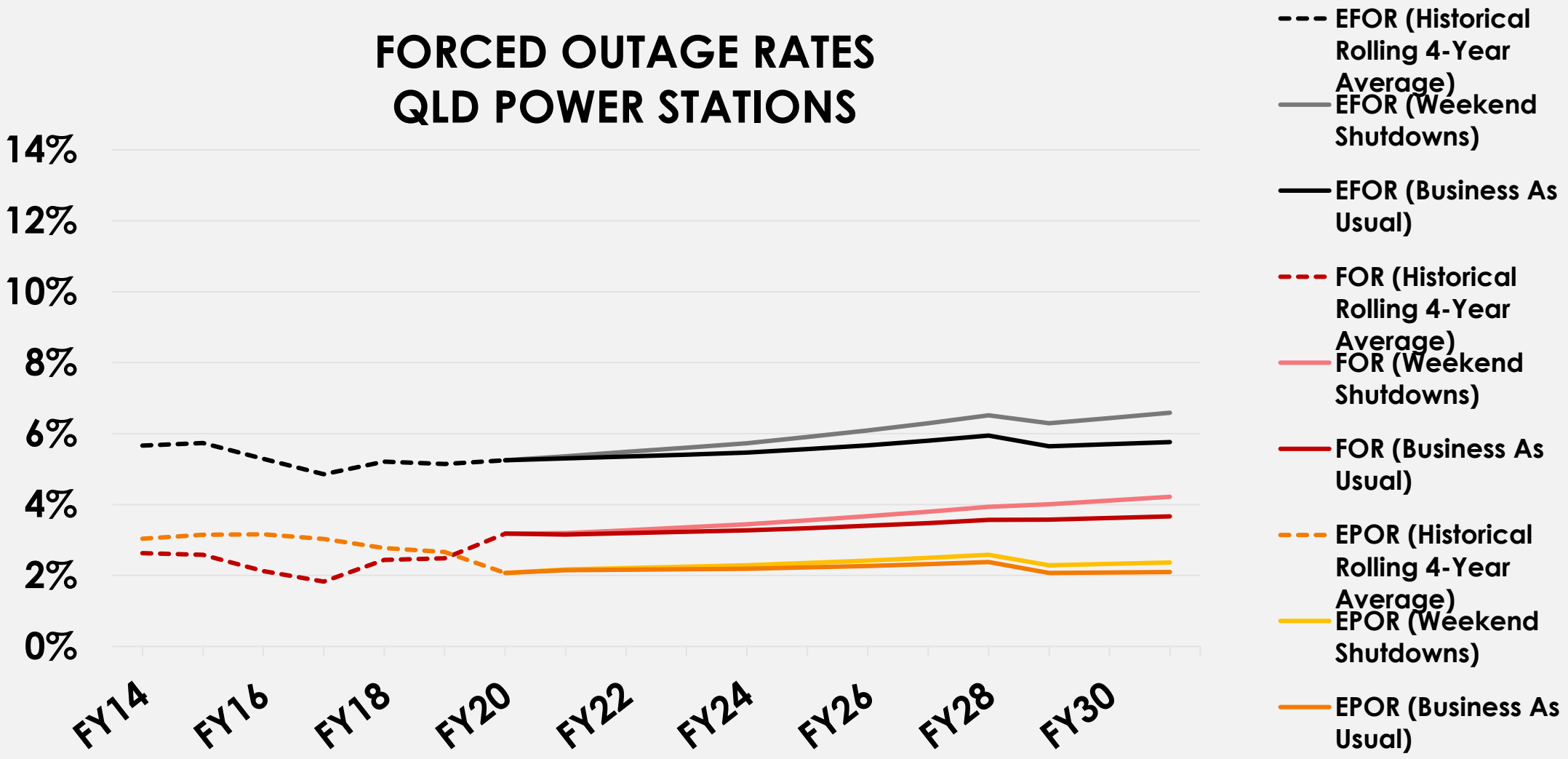
FORCED OUTAGE RATES
QLD POWER STATIONS
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8%
6%
4%
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FY22
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FY26
FY28
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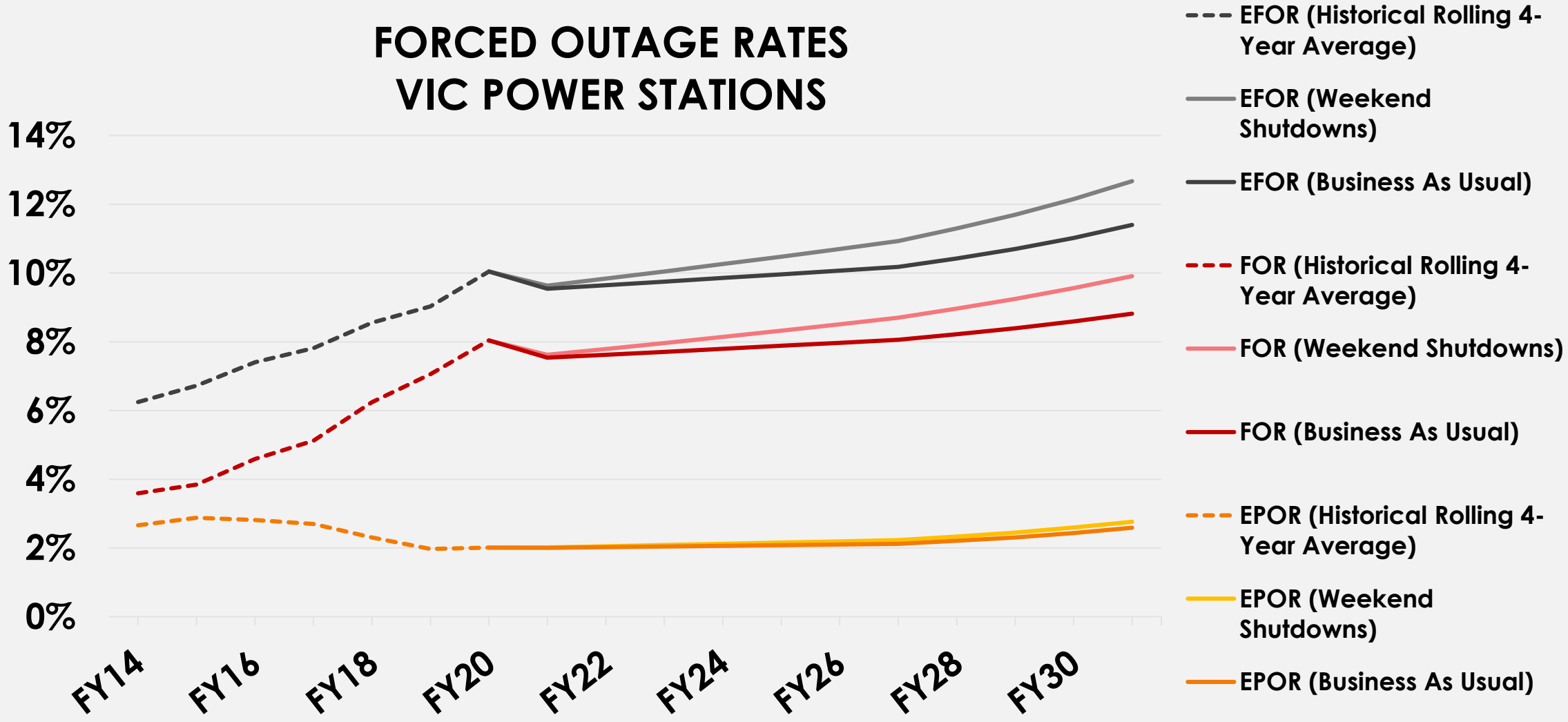
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