Quarterly Energy Dynamics
Q3 2019
Market Insights
Gas prices reduce for the first time in a year

Gas prices reduce in every east coast market...

...despite increased demand

Gas prices reduce in every east coast market... despite increased demand.
Driven by bidding changes

QLD gas offered at lower prices

GSH – proportion of marginal offers by price bands

Q3 saw more gas offered at lower prices due to:

• More competition: since 9\textsuperscript{th} August BHP broke ranks with Esso offering gas at Longford around $8/GJ (~$1.50 below Esso).
• Falling international LNG prices during northern hemisphere summer may have contributed.
• Mild winter conditions led to unwinding of risk premium on gas held in storage.
VIC electricity prices increase
QLD & SA reduce...

Mixed results for spot electricity prices

Compared to Q3 2018:
VIC’s spot price rose $18/MWh to $98/MWh despite lower gas prices

VIC’s price setting outcomes show that water conservation continued to impact

<table>
<thead>
<tr>
<th>Fuel type</th>
<th>% time set</th>
<th>Av price set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>35%</td>
<td>$128/MWh</td>
</tr>
<tr>
<td>GPG</td>
<td>31%</td>
<td>$99/MWh</td>
</tr>
<tr>
<td>Black coal</td>
<td>29%</td>
<td>$78/MWh</td>
</tr>
<tr>
<td>Brown coal</td>
<td>2.5%</td>
<td>$12/MWh</td>
</tr>
</tbody>
</table>

Qld and SA prices fell ~$15/MWh partly due to negative spot prices.
- Negative prices reduced Qld avg by $3/MWh and SA avg by $8/MWh.
...but contract prices remained stubbornly high

ASX Energy – Cal20 swap prices by region

$/MWh

NSW  VIC  QLD  SA
Increased rooftop PV output continues to impact daytime demand

*Change in NEM-average operational demand by region and time of day (Q3 2019 versus Q3 2018)*

<table>
<thead>
<tr>
<th>Region</th>
<th>Av change (MW)</th>
<th>Drivers</th>
</tr>
</thead>
<tbody>
<tr>
<td>QLD</td>
<td>-142</td>
<td>Mild conditions; rooftop PV</td>
</tr>
<tr>
<td>NSW</td>
<td>-82</td>
<td>Rooftop PV</td>
</tr>
<tr>
<td>VIC</td>
<td>-29</td>
<td>Rooftop PV</td>
</tr>
<tr>
<td>SA</td>
<td>-2</td>
<td>Increased heating requirements – offset by decreased industrial load &amp; increased rooftop PV</td>
</tr>
<tr>
<td>TAS</td>
<td>-59</td>
<td>Reduced industrial load</td>
</tr>
</tbody>
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SA set a new minimum demand record (which has since been broken multiple times in Q4)
Outages affect Q3 supply mix

Change in generation mix – Q3 2019 versus Q3 2018

Varied response across portfolios

Change in supply mix by participant and fuel type – Q3 2019 versus Q3 2018

Increased output at Bayswater & Liddell to cover for LYA outages

EA ran Tallawarra and Ecogen assets harder to partially cover coal outages

Origin GPG up despite major outage of one Mortlake unit

Basslink outage limited output from Hydro Tas

0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00

Time

Average change (MW)

Brown Coal  Black Coal  Wind  Gas  Hydro  Solar  Rooftop PV

AGL  EA  Origin

Black Coal  Brown Coal  Gas
Negative spot prices hit record levels

Negative or zero spot prices hit record levels in SA and QLD

...resulting in depressed daytime pricing in QLD

Contrary to some reports, peak pricing has not increased

Midday avg almost $0/MWh
Interconnector drivers:
Sept 4-5th saw a large share of negatives prices

September outages caused record negatives
The impact of Tamworth-Armidale line outage on 4 and 5 September 2019

Significant de-rating of QNI on these 2 days (import limit <500 MW) resulted in a $4/MWh reduction in the Sept avg spot price.
Over Q3, 5% of variable renewable output curtailed

NEM VRE curtailment increases to record levels

LGC price rally continues
NEM battery revenue hits record levels

Revenue sources by storage technology

FCAS costs increase

$4m increase in FCAS revenues

Limited pumping during negative spot prices in QLD

Cost increase driven by increased FCAS requirements