

Competitive Assessment of Natural Gas

Report prepared for Envestra Limited

CORE
ENERGY
GROUP

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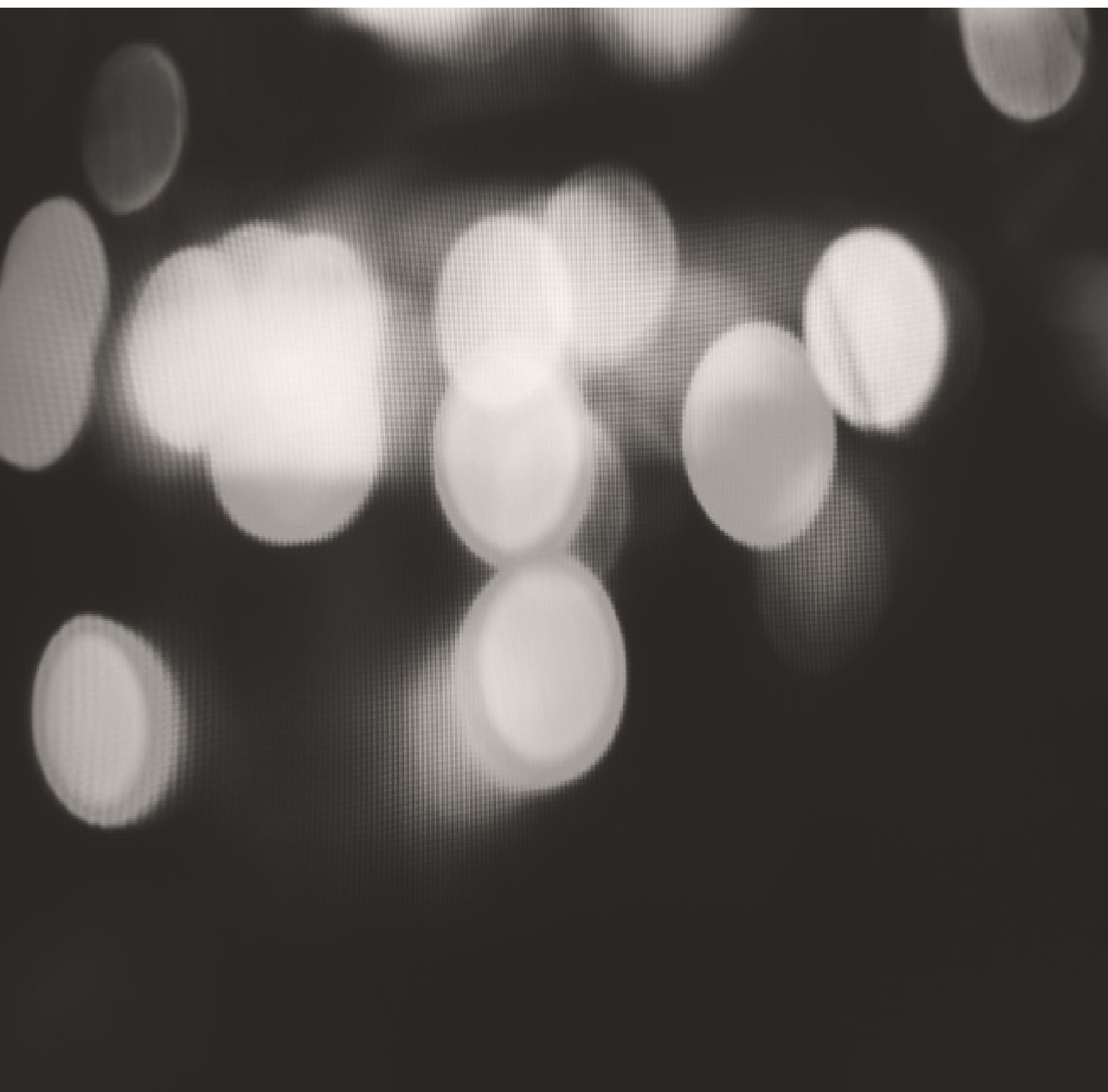


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1. Definitions

Acronyms used throughout this document are defined in the table below.

Table 1.1: Projected Outlook for Residential Electricity Prices

AUD	Australian Dollar
GJ	Gigajoule
IPART	Independent Pricing and Regulatory Tribunal
kWh	Kilowatt hour
MW	Megawatt
MWh	Megawatt hour
NCC	National Competition Council
NGR	National Gas Rules
RET	Renewable Energy Target
Supporting Model	The accompanying model titled “Core Energy WWGDN Supporting Model”
TJ	Terajoule
WWGDN	Wagga Wagga Gas Distribution Network

2. Introduction and Scope of Work

On 1 May 2013 Envestra Limited (“**Envestra**”) applied to the National Competition Council (“**NCC**”) under section 102 of the National Gas Law (“**NGL**”) for revocation of coverage of its Wagga Wagga gas distribution network. On 17 June the NCC released its draft recommendation that coverage should remain on the basis that pipeline coverage criteria (a) and (d), as set out in the NGL, are satisfied. As part of its reasoning in regards to criterion (a), which relates to whether coverage would promote a material increase in competition in a dependent market, the NCC noted Envestra’s submission that:

*“Envestra argues that any ability it may have to price above efficient costs is constrained by the availability of alternative fuels-electricity and LPG-and also the prospect that industrial users could bypass the WWGDN [**“Wagga Wagga Gas Distribution Network”**] and connect directly to a transmission pipeline via a new lateral pipeline. Accordingly, Envestra says users have a degree of countervailing market power as they can switch to alternate energy sources.”*

In response, the NCC stated that:

“... while in principle the matters outlined above could be expected to constrain the ability of Envestra to use market power and thereby adversely impact on competition in the relevant dependent market, the feasibility of such matters must also be taken into account. The purported alternatives for users are not without costs. Installing new appliances or machinery that use an alternative source of fuel to gas requires expenditure by the user. Similarly, assuming it is even possible, configuring existing appliances or machinery to use an alternative fuel source also comes at a cost. The Council considers that in both the domestic and industrial contexts such costs are likely to be substantial, allowing exploitation of significant market power without triggering significant switching.”

In regards to the above, Core Energy Group (“**Core**”) has been engaged by Envestra to provide an independent and expert view of the relative competitiveness of natural gas and electricity as an energy source available to the residential segment in Wagga Wagga, the potential for switching from gas appliances to electric appliances and whether switching costs are likely to present a barrier to that switching. In doing so, Core has considered the following:

- The potential number of residential gas space heaters, gas hot water heaters and gas cooking appliances (and their respective energy usage) currently in use and requiring replacement over the period to June 2019;
- The key factors (and an assessment of the relative importance of each) residential customers are likely to consider when deciding to replace a gas appliance;
- The outlook for residential gas and electricity charges in Wagga Wagga and a comparison of the average residential cost per annum for gas and electricity, assuming equivalent gas/electricity appliances over the period to 2019; and
- The possible impact substitution of gas appliances for electricity appliances may have on total residential gas use for Envestra in Wagga Wagga over the period to June 2019 under a range of scenarios and Core’s view of the most likely outcome.

Core notes this analysis has been limited to the residential segment as gas distribution charges levied on residential customers account for the vast majority (circa 90 percent) of revenue generated by Envestra’s covered Wagga Wagga natural gas distribution network and therefore potential changes in gas consumption in this segment are likely to be material. Further, this analysis has been undertaken over the period July 2013 to June 2019.

The Report and Supporting Model (confidential) has been prepared under the guidance of Mr. Paul Taliangis, CEO of Core Energy Group. Mr. Taliangis’ relevant qualifications and experience is summarised in Attachment 2.

3. Summary of Findings and Conclusion

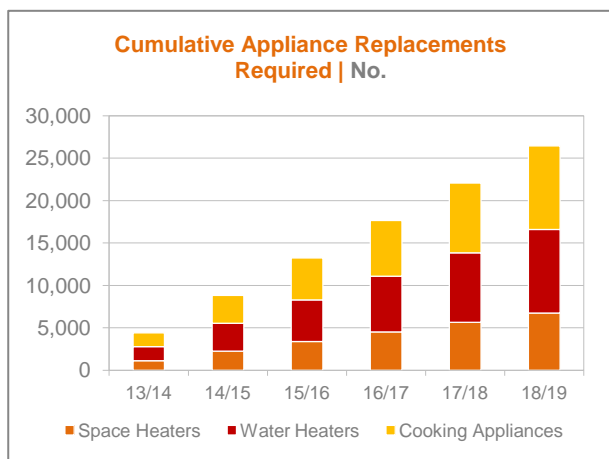
3.1. Residential gas use and appliance analysis

Envestra's Wagga Wagga distribution network currently supplies approximately 19,700 residential gas customers, with an average annual consumption of 42GJ. Core analysis suggests average annual consumption per customer is reflective of the following appliance mix and energy use per appliance:

- One cooker consuming 3GJ per annum with a useful life of 12 years;
- One water heater consuming 15GJ per annum with a useful life of 12 years; and
- One space heater consuming 24GJ per annum with a useful life of 17.5GJ years.

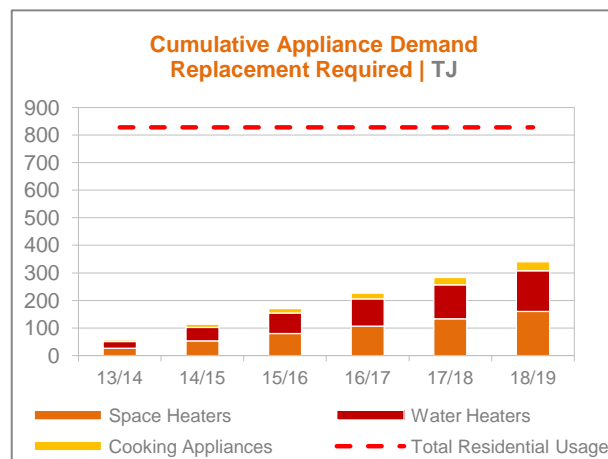
Core has developed an appliance turnover model to project the number of appliances and their respective share of total residential gas usage due for replacement at the end of their estimated useful lives over the period to June 2019. The outputs are illustrated in the figures below.

Figure 3.1: Cumulative Appliances Due for Replacement



Source: Core Energy Group; 2013.

Figure 3.2: Cumulative Gas Usage from Appliances due for Replacement



Source: Core Energy Group; 2013.

Over the period to June 2019, Core estimates that appliances accounting for 41 percent of total gas demand in Wagga Wagga will be subject to replacement based solely on appliance useful life. Importantly, this does not include those appliances that are replaced prior to the end of their useful life, which one would expect to occur given the forecast outlook for gas and electricity prices discussed in the next section.

3.2. Residential gas and electricity price outlook

Using assumptions published in recent reports by IPART, its consultants and Core's professional judgement, Core has developed projections of variable and fixed residential gas and electricity charges over the period to June 2019.

The following table highlights the projected saving for the average residential consumer as a result of substituting gas appliances for electric equivalent appliances, assuming a 42GJ per annum consumption of gas and 5,000kWh per annum consumption of electricity for the equivalent electricity appliances, which is then applied to Core's projected gas and electricity charges. This shows that, by as early as next year, consumers could be XXXXXXXXXX better off by choosing electric appliances over their gas equivalent.

Table 3.1: Comparison of Average Residential Electricity and Gas Prices

Nominal / Year End June	Unit	2014	2015	2016	2017	2018	2019	CAGR 14-19	Absolute % 14-19
Total Gas Cost (incl GST)	AUD	■	■	■	■	■	■	■	■
Total Electricity Cost (incl GST)	AUD	■	■	■	■	■	■	■	■
Difference Gas less Electricity	AUD	■	■	■	■	■	■		

Source: Core Energy Group; 2013.

With regard to the table above, we note:

- A significant increase in the variable gas charge is expected to occur as a result of a step-change increase in the wholesale cost of gas in 2014/15. Assuming Origin Energy pass on the full projected wholesale cost increases, the average residential gas bill is expected to increase by ■ in 2015 and ■ in aggregate over the period to 2019.
- The equivalent residential electricity bill is projected to decline in real terms over the period to 2019, largely as a result of an expected reduction in the carbon price pass through from July 2015 and flat demand growth in wholesale electricity markets.
- The average projected gas bill over the period 2014/15 to 2018/19 is expected to be over ■ more than the total electricity bill, which Core believes provides electricity with a significant competitive advantage, particularly given that gas is a fuel of choice.

3.3. Consumer behavior

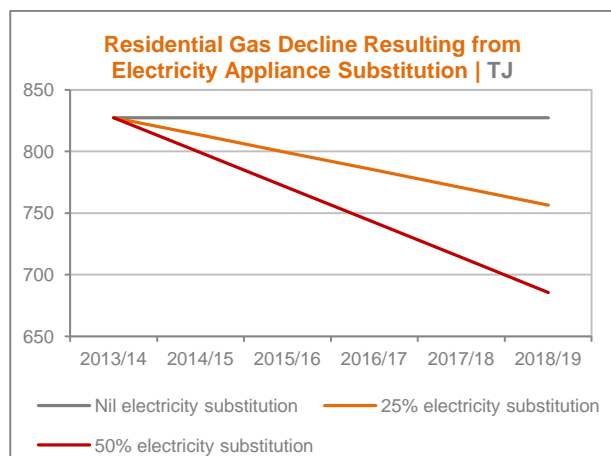
Core believes residential customers place the largest weight on appliance capital and operating cost over other factors at the time of considering replacement of space heating, water heating and cooking appliances. Significant differences in annual operating costs of gas versus electric appliance equivalents will provide incentive to encourage customers to change appliance type, either when the appliance has reached the end of its useful life or earlier.

In the event of end of life replacement, and contrary to the NCC view, Core believes that the costs of switching from a gas appliance to an electric equivalent appliance will be negligible given electricity is already supplied to the household. Core also considers that the cost of replacing an appliance prior to the end of its useful life is also likely to be negligible given the low likely residual value of the appliance at the time of replacement. Furthermore the value may be offset relatively quickly by the cost differential between fuel types shown in table 3.1 (and explaining the motivation for the early replacement).

Core therefore does not consider, for residential customers, that appliance switching costs “are likely to be substantial” as claimed by the NCC. To the contrary, and for residential customers, appliance switching costs are most likely to be negligible such that it would not provide a barrier to fuel switching.

3.4. Impact of substitution on gas demand

Core has modelled two potential scenarios to illustrate the potential level of competition or switching between gas and electricity as illustrated in Figure 3.3 below. The first scenario is where 25 percent of customers choose to replace a gas appliance with an electric equivalent upon reaching the useful life of the appliance (assumed appliance failure), while the second scenario is where 50 percent of appliances are replaced. Core has not sought to model more aggressive rates of appliance substitution over the next five years.

Figure 3.3: Scenario Analysis – Impact of Substitution on Gas Demand

Source: Core Energy Group; 2013.

Core believes that there is a high probability that the level of annual gas usage will fall as a result of moderate substitution to electric appliances. For example, assuming a 25% substitution rate total usage would decline from around 827GJ per annum in 2013/14 to below 760TJ per annum by 2018/19, representing a CAGR of around -1.8 percent. This reflects the median of the range of scenarios depicted in Figure 8.1, [REDACTED]

- Core's analysis suggests the cost of gas will be over [REDACTED] higher than the equivalent cost of electricity in Wagga Wagga by as early as 2014/15 (Table 6.3).
- Core is of the view the costs of switching from a gas appliance to an electric equivalent will be negligible in the case of appliance replacement given electricity is already supplied to the household. Further, the above analysis does not include an accelerated appliance change over, whereby residential customers may seek to substitute gas appliances nearing the end of their useful life for electric equivalents appliances.
- the analysis does not take into account the potential repeal of the carbon tax following the next federal election, which would further decrease the cost of electricity relative to gas (hence resulting in a greater rate of appliance switching); and
- Core has not considered a number of long observed and accepted drivers of declining average gas demand, including:
 - > ongoing improvements in appliance efficiency and/or improvements in the thermal efficiency of homes; and
 - > the trend towards milder weather.

4. Methodology and Approach

Core's methodology and approach is summarised below for each key scope area:

Residential gas use and appliance analysis

- Review forecast residential gas connections, volumes per connection and total usage from the WWGDN.
- Estimate the likely appliance mix per connection, including the function, number of appliances, and average energy usage per appliance.
- Estimate the useful life for each appliance based on useful lives published by the Australian Tax Office.
- Develop an appliance turnover model having regard to the information above to project the replacement profile of existing appliances.

Consumer behavior

- Identify and consider the key factors (and the relative importance of each) which are likely to impact the decision made by residential customers in selecting a particular gas or electric appliance.

Gas and electricity price outlook

- Undertake a literature review to identify current residential gas and electricity charges and forward projections of price movements relevant to residential customers in Wagga Wagga.
- Consider the projections from third parties on all factors contributing to gas and electricity costs, including views of retailers, the IPART and consultants commissioned by IPART.
- Use Core's professional judgment to account for factors expected to impact residential gas and electricity prices over the period not considered by relevant and recent public reports.
- Compare projected differences in gas and electricity costs to the average residential customer assuming gas appliances are substituted for electric equivalent units.

Impact of substitution on gas demand

- Having regard to residential gas usage, the competitive factors considered by consumers and the differences in projected gas and electricity charges and costs, quantify the effect of substitution between gas and electricity (if any) over the period.

5. Residential Gas Use and Appliance Analysis

5.1. Gas demand per connection

Envestra's Wagga Wagga gas distribution network currently supplies approximately 19,700 residential gas customers. Core has assumed current average gas demand for the year commencing July 2013 is 42GJ per annum, which is consistent with the current Access Arrangement forecast and actual average gas demand for 2011/12 (as reported in Envestra's application¹ to the NCC).

5.2. Likely appliance mix and energy use

For the purposes of this analysis, Core has estimated the average mix of gas appliances per connection, including the number, appliance function and average energy usage per residential connection. In developing an estimate of appliance numbers per residential connection, Core has had regard to the following factors:

- Core's view that the most common appliances used by the residential sector in Wagga Wagga are cooktops, water heaters and space heaters.
- Statistics reported by the Australian Bureau of Statistics² for 'Other NSW', which represents all NSW regional areas other than Sydney, indicates gas as a main source of energy used per dwelling accounted for circa 25 percent, whilst gas as a main source of energy for space heating accounted for circa 23 percent and gas a main source of water heating accounted for circa 17 percent. This analysis suggests that where a gas connection is available in 'Other NSW' gas is generally used for space heating and water heating.

In developing an estimate of the average energy use per appliance, Core has assumed the following:

- Essential energy report the average cooker uses 28MJ per hour³. Use for up to 20 minutes per day approximates 3GJ per annum.
- A study undertaken by George Wilkenfeld and Associates in 2005 reported a range of 23MJ to 58MJ was required for average daily water heating tasks⁴. Taking an average of 40.5MJ energy use per day represents approximately 15GJ per annum; and
- The balance of average energy usage being attributable to space heating. Having regard to the relatively colder climate in Wagga Wagga than Adelaide and Brisbane and the relatively higher average gas use per connection in these areas, this assumption appears reasonable.

The table below details the appliance mix and average energy use for each connection as assumed by Core.

¹ Envestra Limited, Wagga Wagga Network Revocation Submission, 1 May 2013, Paragraph 29.

² ABS catalogue 4602.0.55.001 - Environmental Issues: Energy Use and Conservation, March 2011 editions.

³ Essential Energy Fact Sheet, How much energy do your appliances use?, February 2013.

⁴ George Wilkenfeld and Associates, Estimated Household Water Heater Energy Use, Running Costs and Emissions, Victoria, May 2005.

Table 5.1: Estimated Appliance Mix and Energy Usage Per Connection

Appliance Mix	Appliances per connection	Estimated Energy Use (GJ per annum)
Cooker	1	3
Water heater	1	15
Space heater	1	24
Total per connection	3	42

Source: Core Energy Group; 2013.

5.3. Appliance useful life

Core has considered the likely useful life of each appliance for the purposes of modelling the projected number of appliances requiring replacement. For this purpose, Core has assumed a useful life consistent with the effective life of depreciating assets recommended by the Australian Tax Office⁵ as set out below.

Table 5.2: Appliance Useful Life

Appliance	Appliance Useful Life (years)	Appliances Due For Replacement (percentage per annum)
Cooker	12	8.3%
Water heater	12	8.3%
Space heater	17.5 ¹	5.7%

Note 1: Represents average life of ducted and non-ducted/ other units.

Source: Core Energy Group; 2013.

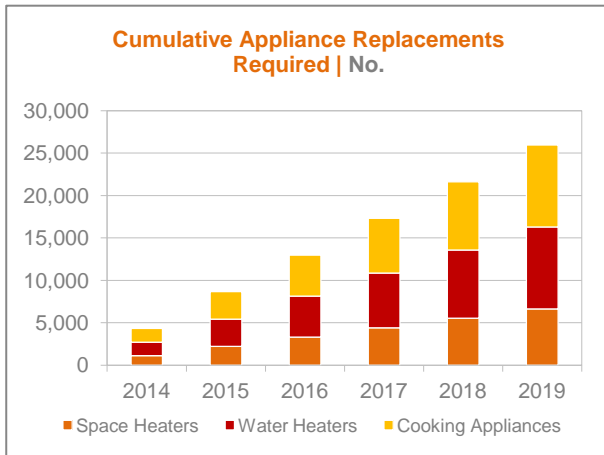
5.4. Appliance replacement profile

Having regard to the number of connections, assumed appliance mix and useful life of each appliance, Core has developed an appliance turnover model to project the number of appliances and their share of total residential gas demand requiring replacement over the period July 2013 to June 2019. A description of the model logic is provided below:

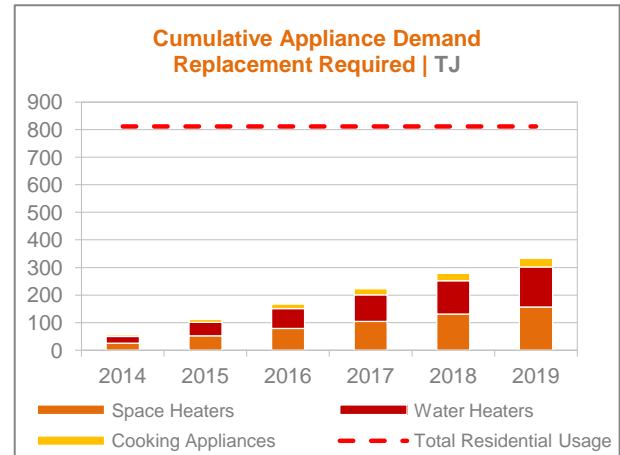
- Opening appliance numbers – assumed appliance mix per connection is multiplied by total customer numbers to derive opening appliance numbers for each appliance class (i.e. cookers, water heaters and space heaters).
- Appliances due for replacement – appliance numbers for each appliance class are divided by the assumed useful life to derive the number of appliances due for replacement annually over the period to 2019. Appliances due for replacement are subtracted from the total opening appliance numbers per year.
- New appliances – new appliances are derived by multiplying a percentage to the number of appliances due for replacement each year. The percentage rate takes into account the level of expected substitution of gas appliances to electric appliances.
- Closing number of appliances – closing number of appliances per year is calculated as the opening appliance numbers *less* appliances due for replacement *add* new appliances.
- Total energy use for each appliance class is derived by multiplying the closing appliance numbers by the assumed energy use per appliance.

Core's projection of the number of appliances and their share of total residential gas demand requiring replacement over the period July 2013 to June 2019 is illustrated in the figures below.

⁵ Australian Tax Office, Taxation Ruling 2013/4. Income Tax: effective life of depreciating assets, June 2013.

Figure 5.1: Cumulative Appliances due for Replacement

Source: Core Energy Group; 2013.

Figure 5.2: Cumulative Gas Usage from Appliances due for Replacement

Source: Core Energy Group; 2013.

With regard to the chart above, by June 2019, approximately 41 percent of total gas demand will be subject to change based on the requirement for appliances to be replaced. Importantly, this does not include those appliances that are replaced prior to the end of their useful life, which one would expect to occur given the forecast outlook for gas and electricity prices discussed in the next section.

6. Gas and Electricity Price Outlook

6.1. Introduction

The projected outlook on gas and electricity prices for the residential segment in Wagga Wagga is expected to significantly impact the relative competitiveness of gas against electricity over the next three years.

6.2. Gas price outlook

To illustrate the potential impact on residential gas prices over the period July 2013 to June 2019, Core has estimated a breakdown of the variable and fixed residential retail supply charges published by Origin Energy effective 1 July 2013 into the various components of:

- Variable charge:
 - > Wholesale gas cost (including transmission)
 - > Distribution
 - > Carbon cost
 - > Retail
- Fixed charge:
 - > Distribution
 - > Retail

For the period July 2015 to June 2019, Core has developed a projection of each component above, having regard to:

- Projections set out in the report titled 'Review of Regulated Retail Prices and Charges for Gas; Final Report, June 2013' prepared by the IPART ("**IPART Gas Report**");
- Projections of wholesale gas costs set out in the report titled 'DRAFT Cost of gas for the 2013 to 2016 regulatory period' prepared by ACIL Tasman as a consultant to IPART ("**ACIL Tasman Report**"); and
- Core's assessment of the future impact of Carbon costs, having regard to current EU carbon price futures.

A summary of the variable and fixed charges and total gas bill assuming average consumption of 42GJ per annum over the period to June 2019 is detailed in the table below.

Table 6.1: Projected Outlook for Residential Gas Prices, AUD Nominal

Nominal / Year End June	Unit	2014	2015	2016	2017	2018	2019	CAGR 14-19	Absolute % 14-19
Variable Charge									
Wholesale cost	AUD per GJ	■	■	■	■	■	■	■	■
Distribution	AUD per GJ	■	■	■	■	■	■	■	■
Carbon	AUD per GJ	■	■	■	■	■	■	■	■
Retail	AUD per GJ	■	■	■	■	■	■	■	■
Total Variable Charge	AUD per GJ	■	■	■	■	■	■	■	■
Average Residential Usage	GJ p.a.	42.0	42.0	42.0	42.0	42.0	42.0		
Total Variable Cost	AUD	■	■	■	■	■	■	■	■
Distribution	AUD	■	■	■	■	■	■	■	■
Retail	AUD	■	■	■	■	■	■	■	■
Total Fixed Cost	AUD	■	■	■	■	■	■	■	■
Total Gas Cost (excl GST)	AUD	■	■	■	■	■	■	■	■
Total Gas Cost (incl GST)	AUD	■	■	■	■	■	■	■	■
Movement	% p.a.		■	■	■	■	■		

Source: Core Energy Group; 2013.

With regard to the table above, Core notes the average residential gas bill is expected to increase by ■ in 2014/15 and ■ in aggregate over the period to 2018/19, largely due to an effective doubling of the wholesale gas price in 2014/15.

The assumptions supporting the projections set out in the table above are detailed in Attachment 1. It is relevant to note that whilst the IPART Gas Report states Origin Energy intends to increase future regulated gas prices in order to boost its retail margin, Core has not included an estimate of future increases to the retail margin in its price outlook due to a lack of data reported required to determine a sensible assumption. The inclusion of an upward adjustment to Origin Energy's retail component would further increase the average residential gas bill.

6.3. Electricity price outlook

To illustrate the potential impact on residential electricity prices over the period July 2013 to June 2019, Core has estimated a breakdown of the variable and fixed residential retail supply charges published by Origin Energy effective 1 July 2013 into the various components of:

- Variable charge:
 - > Energy costs (including retail costs)
 - > Distribution
- Fixed charge:
 - > Distribution
 - > Retail

For the period July 2015 to June 2019, Core has developed a projection of each component above, having regard to:

- Projections set out in the report titled 'Review of Regulated Retail Prices and Charges for Gas; Final Report, June 2013' prepared by the IPART ("**IPART Electricity Report**"); and

- Core's assessment of the future impact of Carbon costs, having regard to current EU carbon price futures.

A summary of the variable and fixed charges and total electricity bill assuming an equivalent average consumption of 5,000kWh⁶ per annum over the period to June 2019 is detailed in the table below.

Table 6.2: Projected Outlook for Residential Electricity Prices, AUD Nominal

Nominal / Year End June	Unit	2014	2015	2016	2017	2018	2019	CAGR 14-19	Absolute % 14-19
Variable Cost									
Other	C per kWh	■	■	■	■	■	■	■	■
Distribution	C per kWh	■	■	■	■	■	■	■	■
Variable Charge – All Consumption	C per kWh	■	■	■	■	■	■	■	■
Average Residential Usage – All Consumption	kWh p.a.	■	■	■	■	■	■		
Variable Cost – All Consumption	AUD	■	■	■	■	■	■	■	■
Variable Cost – Controlled Load	C per kWh	■	■	■	■	■	■	■	■
Average Residential Usage – Controlled Load	kWh p.a.	■	■	■	■	■	■		
Variable Cost – Controlled Load	AUD	■	■	■	■	■	■	■	■
Total Variable Cost	AUD	■	■	■	■	■	■	■	■
Total Fixed Cost- Controlled Load¹	AUD	■	■	■	■	■	■	■	■
Total Electricity Cost (excl GST)	AUD	■	■	■	■	■	■	■	■
Total Electricity Cost (incl GST)	AUD	■	■	■	■	■	■	■	■
Movement	% p.a.		2%	■	■	■	■		

Note 1: For the purposes of this analysis, Core has assumed only the fixed supply charge of controlled load is considered as it relates to a substitutable hot water system, and excluded the supply charge levied on all consumption it is deemed non-substitutable.

Source: Core Energy Group; 2013.

The assumptions supporting the projections set out in the table above are detailed in Attachment 1. With regard to the projections, Core notes the average equivalent electricity bill is projected to decline on a real basis over the period to 2019, largely as a result of:

- an expected reduction in the carbon price pass through from July 2015, as the price of carbon is set under the emissions trading scheme linked to the European Union market; and
- increases in capacity of lower cost coal generation as load is freed from a reduction in electricity demand.

6.4. Comparison of gas and electricity price outlook

Having regard to the comparable gas and electricity cost projections set out in 6.1 and 6.2 above, the following table highlights the projected savings for the average residential consumer as a result of substituting gas appliances for electric

⁶ Assuming average gas usage of 42GJ per annum per connection is comparable to 5,000kWh per annum, split between 3,000kWh for hot water and 2,000kWh for heating and cooking as reported within Envestra Limited's Wagga Wagga Network Revocation Submission, 1 May 2013, paragraph 44.

equivalent. This shows that, by as early as next year, consumers could be [REDACTED] better off by choosing electric appliances over their gas equivalent.

Table 6.3: Comparison of Movement in Residential Electricity and Gas Prices

Nominal / Year End June	Unit	2014	2015	2016	2017	2018	2019	CAGR 14-19	Absolute % 14-19
Total Gas Cost (incl GST)	AUD	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total Electricity Cost (incl GST)	AUD	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Difference Gas less Electricity	AUD	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: Core Energy Group; 2013.

7. Customer Behavior

7.1. Customer considerations

Core believes residential customers will have regard to the following factors when considering the replacement or substitution of gas appliances:

- Cost – comprising the upfront appliance purchase cost, associated installation costs and ongoing operating costs;
- Timing – the ease and timing at which appliances can be replaced or substituted with minimal disturbance;
- Reliability and performance – the relative reliability and performance of a particular appliance; and
- Desirability/social – unique features of particular appliances which satisfy individual wants or appeal generally to society.

Having regard to the above factors, Core believes cost is the most significant consideration faced by customers. For the purposes of this analysis, the various elements of appliance costs are further discussed below.

Purchase and installation cost

Due to the wide range of appliance specification, performance, technology (i.e. instant vs. storage water heating) and purchase cost for each of the common appliances considered in this analysis, Core assumes the difference in upfront purchase cost is immaterial between gas and electricity substitute appliances of equal relative performance. If anything, the greater demand/scale of electric appliances is likely to lower their cost relative to their gas equivalent.

Installation costs are likely to be considered by the customer as part of the purchase cost. We note installation costs are likely to be lower when replacing like for like appliances (i.e. gas for gas, electricity for electricity) and generally highest for installation of new substitute gas appliances than equivalent substitute electricity installations. That said, Core believes any installation costs where a gas appliance is replaced by an electric appliance are likely to be immaterial given the availability of electricity supply at every household.

Core is therefore of the view that the costs of switching from a gas appliance to an electric equivalent will be negligible in the case of appliance replacement given electricity is already supplied to the household. Core also considers that the cost of replacing an appliance prior to the end of its useful life is also likely to be negligible given the low likely residual value of the appliance at the time of replacement, which value is likely to be offset relatively quickly by the cost differential between fuel types (explaining the motivation for the early replacement).

Core therefore does not consider, for residential customers, that appliance switching costs “are likely to be substantial” as suggested by the NCC. To the contrary, and for residential customers, appliance switching costs are most likely to be negligible such that it would not provide a barrier to fuel switching. Core has not however applied accelerated appliance change over in the appliance projections set out in Section 5.4, which Core considers a conservative assumption.

Operating cost

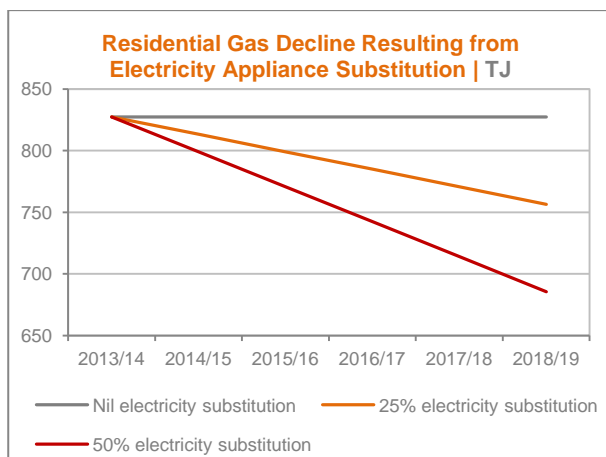
Operating costs can vary based on the extent appliances are used in the household. Whilst current operating costs are closely comparable, analysis in Section 6.4 indicates customers face a significant cost differential over the period to 2019, and as early as 2014/15, as average gas operating costs are expected to far outweigh equivalent electric operating costs.

8. Impact of Substitution on Gas Demand

8.1. Substitution scenarios

Based on the approach outlined in Section 5.4, Core has developed a series of scenarios to illustrate the potential level of competition or substitution between gas and electricity. Figure 8.1 below illustrates total potential loss of demand in the residential segment as a result of various rates of substitution of cookers, water heaters and space heaters to equivalent electric appliances as items are due for replacement at the end of useful lives. As already noted, the below impacts are based on a series of conservative assumptions, including no accelerated appliance switching.

Figure 8.1: Scenario Analysis – Impact of Substitution on Residential Gas Use



Source: Core Energy Group; 2013.

Core believes that there is a high probability that the level of annual gas usage will fall as a result of moderate substitution to electric appliances. For example, assuming a 25% substitution rate, total usage would decline from around 827GJ per annum in 2013/14 to below 760TJ per annum by 2018/19, representing a CAGR of around -1.8 percent. This reflects the median of the range of scenarios depicted in Figure 8.1, [REDACTED]

- Core's analysis suggests the cost of gas will be over [REDACTED] higher than the equivalent cost of electricity in Wagga Wagga by as early as 2014/15 (Table 6.3).
- Core is of the view the costs of switching from a gas appliance to an electric equivalent will be negligible in the case of appliance replacement given electricity is already supplied to the household. Further, the above analysis does not include an accelerated appliance change over, whereby residential customers may seek to substitute gas appliances nearing the end of their useful life for electric equivalents appliances.
- the analysis does not take into account the potential repeal of the carbon tax following the next federal election, which would further decrease the cost of electricity relative to gas (hence resulting in a greater rate of appliance switching); and
- Core has not considered a number of long observed and accepted drivers of declining average gas demand, including:
 - > ongoing improvements in appliance efficiency and/or improvements in the thermal efficiency of homes; and
 - > the trend towards milder weather.

9. References

- ACIL Tasman Consultant Report; Cost of Gas for the 2013 to 2016 Regulatory Period, 22 April 2013.
- Envestra Limited; Wagga Wagga Network Revocation Submission, 1 May 2013.
- IPART; Review of Regulated Retail Prices and Charges for Gas; Final Report, April 2013.
- IPART; Review of Regulated Retail Prices and Charges for Electricity; Final Report, April 2013.
- Australian Tax Office, Taxation Ruling 2013/4. Income Tax: effective life of depreciating assets, June 2013.

Attachment 1 – Gas and Electricity Price Outlook Assumptions

The following tables outline the assumptions used to calculate the projected outlook for residential gas and electricity prices in Tables 6.1, 6.2 and 6.3 of the Report.

Table: A.1 Gas Price Outlook Assumptions

Component	Description of Assumption
Wholesale gas cost	<ul style="list-style-type: none"> Used mid-point of wholesale gas costs projected in the ACIL Tasman Report over the period 2014/15 and 2015/16, remaining constant in real terms thereafter.
Distribution	<ul style="list-style-type: none"> Actual distribution charge for 2014, remaining constant in real terms thereafter.
Carbon	<ul style="list-style-type: none"> Carbon cost price for 2013/14 sourced from IPART Gas Report and halved in 2015 to reflect projected decline in carbon price from 1 July 2015 upon transition to emissions trading mechanism within linkage to the European Union price.
Retail	<ul style="list-style-type: none"> Assumed to be the remaining charge once wholesale gas cost, distribution charge and carbon cost estimates are subtracted from the actual variable charge published by Origin Energy for 2014, and assumed to remain constant in real terms thereafter.

Source: Core Energy Group; 2013.

Table: A.2 Electricity Price Outlook Assumptions

Factor	Description of Assumption
Distribution	<ul style="list-style-type: none"> Distribution charge for 2014 sourced from Essential Energy - Annual pricing proposal 2013-14, 1 May 2013 and assumed to remain constant in real terms thereafter.
Other	<ul style="list-style-type: none"> Other includes energy costs (i.e. cost of purchasing energy from the NEM, complying with green schemes and energy losses) and retail cost component. Other costs are assumed to be the remainder of the total variable charge published by Origin Energy for 2014 after the distribution charge has been subtracted. Energy costs are further estimated into the following components: <ul style="list-style-type: none"> > Electricity cost allowance – using projections in the IPART Electricity Report over the period 2013/14, 2014/15 and 2015/16 and assumed to remain constant in real terms thereafter; > Customer Acquisition and Retention Cost allowance – using projections in the IPART Electricity Report over the period 2013/14, 2014/15 and 2015/16 and assumed to remain constant in real terms thereafter > A balancing factor assumed to be the remainder of the Other costs after the above components have been subtracted. The balancing factor is assumed to include the retail component and other costs which are assumed to remain constant in real terms over the period.

Source: Core Energy Group; 2013.

Attachment 2 - Qualifications

Mr. Paul Taliangis

Mr. Taliangis is Chief Executive and founder of Core Energy Group, a boutique strategic advisory firm specialising in the Australian energy industry.

Mr. Taliangis has formal qualifications in economics and accounting and is a Chartered Accountant, gained during the early stage of his career, at Price Waterhouse (now PwC).

His nearly twenty year experience in the Australian energy industry includes an eight plus year term as an executive with Santos Limited in Corporate Development, Corporate Planning and Finance and ten years as CEO of Core Energy. During this period he has undertaken extensive independent expert assignments for stakeholders along the entire gas and electricity value chain, including Governments, foreign and domestic fund managers, investors and energy companies.

In the gas, electricity and LNG sectors, Mr Taliangis has provide broad based advice in relation to a wide range of leading energy organisations including the Australian Energy Market Operator, AGL, APLNG, Arrow Energy, Energy Australia, GLNG, QGC, Origin Energy, Santos and Woodside.

In the regulated and non regulated energy infrastructure arena, Mr. Taliangis has gained extensive experience, including valuations and strategic analysis and advice relating to:

- Market Operator (AEMO)⁷
- Companies:
 - > APA
 - > Hastings
 - > Spark
 - > Envestra
 - > DUET
- Assets:
 - > Wagga gas distribution network
 - > Victorian gas distribution network
 - > WA gas distribution network
 - > Moomba Adelaide Pipeline (MAP)
 - > Eastern Gas Pipeline (EGP)
 - > South West Gas Pipeline (SWQ)
 - > Moomba Sydney Pipeline (MSP)
 - > SEAGas Pipeline

⁷ Core has provided a range of submissions in support of the 2012 and 2013 Gas Statement of Opportunities.