Economic Impacts of Non-contestable Customers moving to an Efficient Market Price for Electricity in Tasmania:

Notes from modelling with MMRF

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1 INTRODUCTION

Using the Monash Multi-Regional Forecasting model (MMRF),[1] and inputs for changes in retail prices to non-contestable customers from Frontier economics, we examine the economic impacts of non-contestable customers in Tasmania moving from a regulated retail electricity price to an 'efficient market price'. The efficient market price is the Frontier spot market estimates plus contract premium (5%) plus hydrological risk premium ($3 per Mwh).

Two scenarios are run spanning the financial years 2011-12 ("2012") to 2019-20 ("2020"):

- Reference case which incorporates the Commonwealth Government's proposed CPM (Carbon Pricing Mechanism) scheme; and
- Scenario 1 in which the retail electricity price for non-contestable customers in Tasmania rises to the efficient market price.

A brief general description of MMRF is given in Section 2. Aspects of simulation designed are given in Section 3. The effects of the scenario are given in Section 4 as deviations between the values of variables in the policy scenario and their values in the Reference case (or basecase).

2 MMRF

2.1 Overview

MMRF is a dynamic, multi-sectoral, multi-regional model of Australia. The current version of the model distinguishes 58 industries (see Table 1), 63 products produced by the 58 industries, 8 states/territories and 56 sub-state regions. At the state/territory level it is a fully-specified bottom-up system of interacting regional economies. To allow estimates of the effects of policy at the sub-state level, a top-down approach is added.

Of the 58 industries, three produce primary fuels (coal, oil and gas), one produces refined fuel (petroleum products), six generate electricity and one supplies electricity to final customers. The six generation industries are defined according to primary source of fuel: *Electricity-coal* includes all coal-fired generation technologies; *Electricity–gas* includes all plants using gas turbines, cogeneration and combined cycle technologies driven by burning gas; *Electricity-oil*

[1] A full description of MMRF is given in Adams, P.D., J. Dixon, J. Giesecke, and M.J. Horridge (2011), "MMRF: Monash Multi-Regional Forecasting Model: A Dynamic Multi-Regional Applied General Equilibrium Model of the Australian Economy", Working Paper, G-223. Available from the Centre of Policy Studies, Monash University.

products covers all liquid-fuel generators; *Electricity-hydro* covers hydro generation; while *Electricity-other* covers the remaining forms of renewable generation from biomass, biogas, wind etc. Nuclear power generation is not currently used in Australia but *Electricity–nuclear* is included and could be triggered, if desired, at a specified CO2 price.

Apart from *Grains* (industry 4) and *Petroleum products* (industry 20), each industry produces a single product. *Grains* produces grains for animal and human consumption and biofuel used as feedstock by *Petroleum products*. *Petroleum products* produces five products – gasoline (includes gasoline-based biofuel blends), diesel (includes diesel-based biofuel blends), LPG, aviation fuel, and other refinery products (mainly heating oil).

2.2 General equilibrium core

2.2.1 The nature of markets

MMRF determines regional supplies and demands of commodities through optimising behaviour of agents in competitive markets. Optimising behaviour also determines industry demands for labour and capital. Labour supply at the national level is determined by demographic factors, while national capital supply responds to rates of return. Labour and capital can cross regional borders in response to relative regional employment opportunities and relative rates of return.

The assumption of competitive markets implies equality between the basic price and marginal cost in each regional sector. Demand is assumed to equal supply in all markets other than the labour market (where excess supply conditions can hold). The government intervenes in markets by imposing ad valorem sales taxes on commodities. This places wedges between the prices paid by purchasers and basic prices received by producers. The model recognises margin commodities (e.g., retail trade and road transport freight) which are required for each market transaction (the movement of a commodity from the producer to the purchaser). The costs of the margins are included in purchasers' prices but not in basic prices of goods and services.

2.2.2 Demands for inputs to be used in the production of commodities

MMRF recognises two broad categories of inputs: intermediate inputs and primary factors. Firms in each regional sector are assumed to choose the mix of inputs that minimises the costs of production for their levels of output. They are constrained in their choice by a three-level nested production technology. At the first level, intermediate-input bundles, primary-factor bundles and other costs are used in fixed proportions to output. These bundles are formed at the second level. Intermediate-input bundles are combinations of goods imported from overseas and domestic goods. The primary-factor bundle is a combination of labour, capital and land. At the third level, inputs of domestic goods are formed as combinations of goods sourced from each of the eight domestic regions, and the input of labour is formed as a combination of inputs of labour from nine different occupational categories.

2.2.3 Household demands

In each region, the household buys bundles of goods to maximise a utility function subject to a household expenditure constraint. The bundles are combinations of imported and domestic goods, with domestic goods being combinations of goods from each domestic region. A Keynesian consumption function is usually used to determine aggregate household expenditure as a function of household disposable income.

2.2.4 Demands for inputs to capital creation and the determination of investment

Capital creators for each regional sector combine inputs to form units of capital. In choosing these inputs, they minimise costs subject to a technology similar to that used for current production; the only difference being that they do not use primary factors directly.

2.2.5 Governments' demands for commodities

Commodities are demanded from each region by regional governments and by the Federal government. In MMRF, there are several ways of handling these demands, including:

- by a rule such as moving government expenditures with household consumption expenditure or with domestic absorption or with GDP;
- as an instrument which varies to accommodate an exogenously determined target such as a required level of government deficit; and
- exogenously.

2.2.6 Foreign demand (international exports)

MMRF adopts the ORANI specification of foreign demand. Each export-oriented sector in each state faces its own downward-sloping foreign demand curve. Thus, a shock that reduces the unit costs of an export sector will result in increased export volume, but a lower foreign-currency price. By assuming that the foreign demand schedules are specific to product and region of production, the model allows for differential movements in foreign-currency prices across domestic regions.

2.2.7 Regional labour markets

The response of regional labour markets to policy shocks depends on the treatment of three key variables – regional labour supplies, regional unemployment rates and regional wage differentials. The main alternative treatments are:

- to set regional labour supplies and unemployment rates exogenously and determine regional wage differentials endogenously;
- to set regional wage differentials and regional unemployment rates exogenously and determine regional labour supplies endogenously (*via* interstate migration or changes in regional participation rates); and
- set regional labour supplies and wage differentials exogenously and determine regional unemployment rates endogenously.

The second treatment 2 is the one adopted for the current modelling, with regional participation rates exogenous. Under this treatment, workers move freely (and instantaneously) across state borders in response to changes in relative regional unemployment rates. With in regional wage rates indexed to the national wage rate, regional employment is demand determined.

2.2.8 Physical capital accumulation

Investment undertaken in year t is assumed to become operational at the start of year t+1. Under this assumption, capital accumulates according to (industry and region indexes dropped for convenience):

$$K(t+1) = (1 - DEP) \times K(t) + Y(t) \quad (1)$$

where:

K(t) is the quantity of capital available in industry at the start of year t;

Y(t) is the quantity of new capital created during year t; and

DEP is the rate of depreciation, which is treated as a fixed parameter.

Given a starting point value for capital in t=0, and with a mechanism for explaining investment through time, equation (1) can be used to trace out the time paths of industry capital stocks.

Following the approach taken in the MONASH model, investment in year t is explained via a mechanism of the form

$$\frac{K(t+1)}{K(t)} - 1 = F^t\left[\frac{EROR(t)}{RROR(t)}\right] \quad (2)$$

where

EROR(t) is the expected rate of return in year t;

RROR(t) is the required rate of return on investment; and

$F^t[\,]$ is an increasing function of the ratio of expected to required rate of return with a finite slope.

In the current version of MMRF, it is assumed that investors take account only of current rentals and asset prices when forming current expectations about rates of return (static expectations). An alternative treatment available in the MONASH model, but not currently for MMRF, allows investors to equate the expected rate of return with the present value in year t of investing $1, taking account of both the rental earnings and depreciated asset value of this investment in year t+1 as calculated in the model (rational expectations). In standard closures of the model, *RROR* is an exogenous variable which can be moved to achieve a given change in capital.

2.2.9 Lagged adjustment process in the national labour market

The Victorian simulations are year-to-year recursive-dynamic simulations, not comparative-static simulations. In the year-to-year simulations it is assumed that deviations in the national real wage rate from its base-case level increase through time in proportion deviations in the national unemployment rate. The coefficient of adjustment is chosen so that effects of a shock on the unemployment rate are largely eliminated after about ten years. This is consistent with macroeconomic modelling in which the NAIRU is exogenous.

This treatment of the national labour market differs from the treatment of regional labour markets outlined in Section 2.2.7. If the national real wage rate rises in response to a fall in the national unemployment rate, then wage rates in all regions rise by the same percentage amount, and regional employment adjusts immediately, with regional labour supplies adjusting to stabilise relative regional unemployment rates.

2.3 Environmental enhancements

In this sub-section, we describe the key environmental enhancements of MMRF that underpin simulations of a carbon price (such as for the Commonwealth's CPRS and CPM). These cover:

- an energy and greenhouse-gas emission accounting module that covers each emitting agent, fuel and region recognised in the model;
- quantity-specific carbon taxes or prices;
- equations for inter-fuel substitution in transport and stationary energy;
- mechanisms that allow for abatement of non-combustion emissions;
- a representation of Australia's National Electricity Market (NEM); and
- improved treatment of energy-using equipment in private household demand.

2.3.1 Energy and emissions accounting

MMRF tracks emissions of greenhouse gases according to: emitting agent (58 industries and residential); emitting state or territory (8); and emitting activity (9). Most of the emitting activities are the burning of fuels (coal, natural gas and five types of petroleum products). A residual category, named *Activity*, covers emissions such as fugitives and agricultural emissions not arising from fuel burning.

The resulting $59 \times 8 \times 9$ matrix of emissions is designed to include all emissions except those arising from land clearing. Emissions are measured in terms of carbon dioxide equivalents, $C0_2$-e. Table 2 summarises MMRF's emission data for the starting year of the simulations – the financial year 2005-06. Note that MMRF accounts for domestic emissions only, so a change in world emissions as a result of a change in volume of Australian coal exports, say, is not accounted for.

2.3.2 Carbon taxes and prices

MMRF treats an emissions price in an ETS as a carbon tax. Taxes on emissions from fuel combustion are imposed as sales taxes on the use of individual fuels. Taxes on activity emissions are imposed as taxes on production of the relevant industries.

2.3.3 Inter-fuel substitution

In the standard specification of MMRF, there is no price-responsive substitution in demand between composite units of commodities, or between composite commodities and the composite primary factors. In this framework, $C0_2$-e taxes can only induce abatement through activity effects, with fuel-fuel and fuel-factor substitution ruled out.

We correct for this in two ways:

- first, by introducing inter-fuel substitution in electricity generation using the "technology bundle" approach; and
- second, by introducing a weak-form of input substitution outside of electricity to mimic "KLEM substitution".

A variety of power-generating industries are distinguished based on the type of fuel. There is also an end-use supplier (*Electricity supply*) in each state and territory and a single dummy industry (*NEM*) covering the six regions that are included in Australia's National Electricity Market (i.e., New South Wales, Victoria, Queensland, South Australia the Australian Capital Territory and Tasmania). The electricity generated flows to the local end-use supplier either directly in the case of Western Australia and the Northern Territory or indirectly via *NEM* in the remaining regions: The end-use supplier distributes electricity to local and inter-state final users.

The purchasers of electricity from the generation industries (*NEM* in NEM regions or the Electricity supply industries in the non-NEM regions) can substitute between the different

generation technologies in response to changes in their production costs. Such substitution is price-induced; the elasticity of substitution between the various types of electricity is set to a high number, typically around 5.

For other energy-intensive commodities used by industries, MMRF allows for substitution possibilities by including a weak form of input-substitution specification. If the price of say, cement, rises by 10 per cent relative to other inputs to construction, the construction industry will use 1 per cent less cement and, to compensate, a little more of labour, capital and other materials. In most cases, as in the cement example, we have imposed a substitution elasticity of 0.1. For important energy goods, petroleum products, electricity supply, and gas, the substitution elasticity in industrial use is 0.25. This input substitution is driven by price changes, and so is especially important in and ETS scenario, where outputs of emitting industries are made more expensive.

2.3.4 The National Electricity Market

The NEM is a wholesale market covering nearly all of the supply of electricity to retailers and large end-users in NEM regions. MMRF's represents the NEM is as follows.

Final demand for electricity in each NEM region (Section 2.3.3) is determined within the CGE-core of the model in the same manner as demand for all other goods and services. All end users of electricity in NEM-region r purchase their supplies from the *Electricity supply* industry in that region. Each of the *Electricity supply* industries in the NEM regions sources its electricity from a dummy industry called *NEM*, which does not have a regional dimension: in effect it is a single industry which sells a single product (electricity) to the *Electricity supply* industry in each NEM region. *NEM* sources its electricity from generation industries in each NEM region. Its demand for electricity generation is price-sensitive. For example, if the price of hydro generation from Tasmania rises relative to the price of gas generation from NSW, then *NEM* demand for generation will shift towards NSW gas generation and away from TAS hydro generation.

The explicit modelling of the NEM enables substitution between generation types in different NEM regions. It also allows for inter-state trade in electricity, without having to trace explicitly the bilateral flows. Note that WA and NT are not part of the NEM and electricity supply and generation in these regions continues to be determined on a state-of-location basis[2].

This modelling of the NEM is adequate for many MMRF simulations but for the ETS simulations reported in this chapter much of it was overwritten by results from Frontier's detailed bottom-up model of the electricity system (Section 3.2). Nevertheless, the MMRF electricity-system structure described above does provide a suitable basis for interfacing MMRF with the bottom-up model.

2.3.5 Services of energy-using equipment in private household demand

The final three industries shown in Table 1 provide services of energy-using equipment to private households. These *dummy* industries enable households to treat energy and the associated capital equipment as complementary, rather than as substitutes as is the case in the standard LES budget-allocation specification in the model.

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[2] Note that transmission costs are handled as margins associated with the delivery of electricity NEM or to the Electricity supply industries of WA and the NT. Distribution costs in NEM regions are handled as margins on the sale of electricity from *NEM* to the relevant *Electricity supply* industries.

Industry 56 provides private transport services to the household sector, using inputs of capital (private motor vehicles), automotive fuel and other inputs required for the day-to-day servicing and running of vehicles. Industry 57 provides the services of electrical equipment (including air conditioners) to households, using inputs of capital (electrical equipment) and electricity. Industry 58 provides the services of appliances used for heating and cooking, using inputs of capital (heat and cooking appliances), gas and electricity. Energy used by these three industries accounts for all of the energy consumption of the residential sector.

Including these industries improves the model's treatment of price-induced energy substitution and its treatment of the relationship between energy and energy equipment in residential demand. For example, in the previous specification of household demand, if the price of electricity fell relative to the price of other goods and services, electricity could be substituted for other commodities, including electrical and heating appliances. Now, with no direct usage of electricity, a change in the price of electricity induces substitution only through its effect on the prices of electrical equipment services and private heating services. If the change in electricity price reduces the price of electrical equipment services relative to the price of other products, then electrical equipment services (including its inputs of appliances and energy) will be substituted for other items in the household budget.

3 SIMULATION DESIGN

3.1 Introduction

The effects of non-contestable customers in Tasmania being charged a higher (than basecase) market price for electricity are reported as deviations away from values in the basecase projection.

3.2 Assumptions for the Macroeconomy in the policy scenario

The following assumptions are made for key aspects of the macro-economy in the policy simulation.

3.2.1 Labour markets

At the national level, initially the real-wage rate is constrained to be sticky and so employment can deviate from its basecase value in response to a policy shock. Thereafter, real wage adjustment steadily eliminates most, if not all, of the short-run employment consequences of the emissions price. This means that in the long run the costs of the assumed changes in electricity pricing in Tasmania are realised almost entirely as a change in the national real wage rate, rather than as a change in national employment. This labour-market assumption reflects the idea that in the long run national employment is determined by demographic factors, which are unaffected by developments in electricity pricing in Tasmania.

At the regional level, labour is assumed to be mobile between state economies. Labour is assumed to move between regions so as to maintain inter-state unemployment-rate differentials at their levels in the basecase projection. Accordingly, Tasmania may experience a relative change in its labour force and employment as a result of the change in electricity pricing.

3.2.2 Private consumption and investment

Private consumption expenditure is determined via a Keynesian consumption function which links nominal consumption to Household Disposable Income (HDI). HDI is the sum of payments to domestic labour and capital and government transfer payments net of direct taxation.

Investment in all but a few industries is allowed to deviate from its value in the basecase scenario in line with deviations in the expected rate of return on the industry's capital stock. Investors are assumed to be myopic, implying that expected rates of return move with contemporaneously observed rates of return.

3.2.3 Rates of return on capital

In the policy scenarios, MMRF allows for short-run divergences in rates of return on industry capital stocks from their levels in the basecase. Such divergences cause divergences in investment and hence capital stocks. The divergences in capital stocks gradually erode the initial divergences in rates of return, so that, provided there are no further shocks to the system, in the long run rates of return revert to their basecase levels.

3.2.4 Government consumption and fiscal balances

MMRF contains no theory to explain changes in real public consumption. In these simulations, public consumption is simply indexed to nominal GDP. The fiscal balances of each jurisdiction (federal, state and territory) are fixed at their values in the basecase. Budget-balances constraints are accommodated by endogenous movements in lump-sum payments to households.

3.2.5 Production technologies and household tastes

MMRF contains many types of technical-change and household-preference-change variables. Under the policy scenarios, it is assumed that all technology and preference variables are exogenous and have the same values as in the basecase projection.

4 ECONOMIC EFFECTS OF INCREASED ELECTRICITY PRICE FOR NON-CONTETABLE CUSTOMERS IN TASMANIA

The inputs to MMRF for this scenario consist of data supplied by Frontier Economics for changes away from basecase in the retail price of electricity charged to non-contestable customers in Tasmania. The deviations are shown in Figure 1.

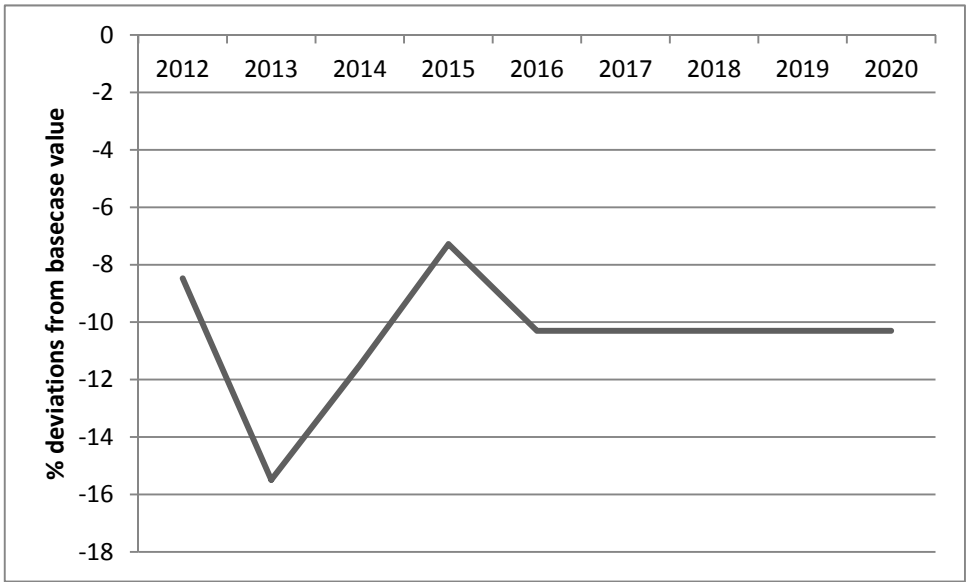

Figure 1: Retail Electricity Price for Non-contestable Customers in Tasmania (percentage deviations from basecase)

According to Frontier, moving from a regulated retail electricity price to an 'efficient market price' for non-contestable customers reduces the price paid by these customers by just over 8 per cent in 2012, and by nearly 16 per cent in 2013. Some adjustment occurs thereafter, with the retail price settling to around 10 per cent below its basecase value through the years to 2020.[3] Note that it is assumed that the wholesale price of electricity in Tasmania does not change from its basecase path, and neither does the retail price paid by contestable customers.

For the MMRF modelling it is assumed that all household customers are non-contestable, as are customers in the following industries: 41. Construction services, 42. Trade services, 43. Accommodation, hotels & cafes, 52. Business services, and 55. Other services. According to the MMRF database in 2011 the total purchases value of electricity for these customers is about $310 million.

The effects of the change in retail pricing on Tasmania's real GSP are shown in Figure 2 in terms of percentage and absolute ($m, 2010 prices) changes. The cut in retail prices has a positive impact on real GDP in Tasmania. In 2012, real GSP rises by about 0.03 per cent, or $7 million. This gap widen to 0.1 per cent, or $22 million, in 2016 and to 0.13 per cent, or $33 million, in 2020.

[3] Frontier provides numbers only to 2016. For the purposes of modelling with MMRF we have assumed that the deviation in 2016 also applies to the remaining years to 2020.

Real GSP increases because the cut in electricity tariff imparts a competitive improvement to Tasmanian industries, resulting in Tasmania attracting resources from the rest of Australia (and from overseas via increased exports). The source of this competitive improvement is direct via a fall in electricity costs in a number of key service sectors, and indirect via a lowering in the nominal wage rate. The cut in electricity price directly reduces the CPI in Tasmania. Due to the labour market assumption in MMRF, the real wage rate in Tasmania changes little, hence the nominal wage rate falls slightly in line with the CPI.

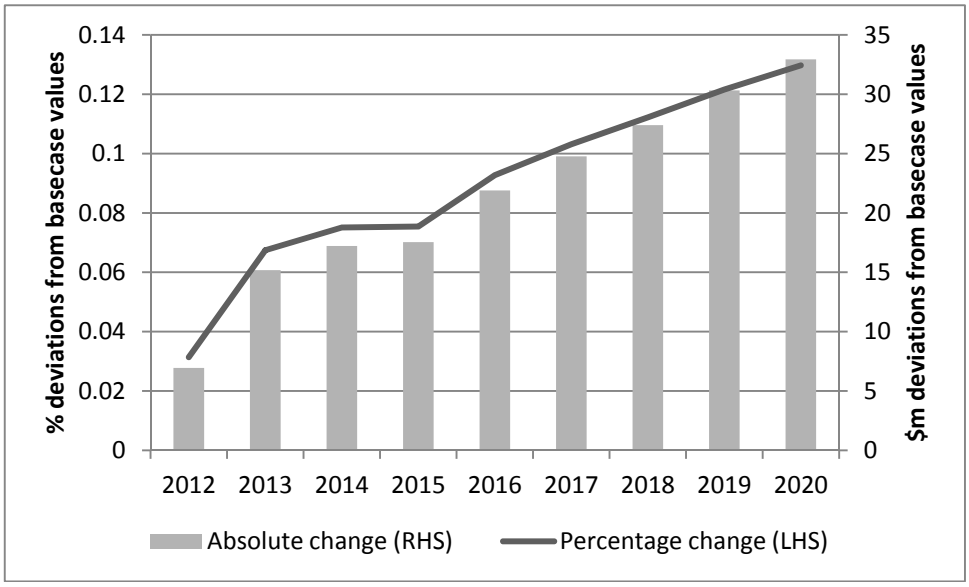

Figure 2: Real GSP in Tasmania (percentage and absolute deviations from basecase)

The effects of the change in retail pricing on employment in Tasmania are shown in Figure 3 in terms of percentage and absolute ('000 persons) changes.

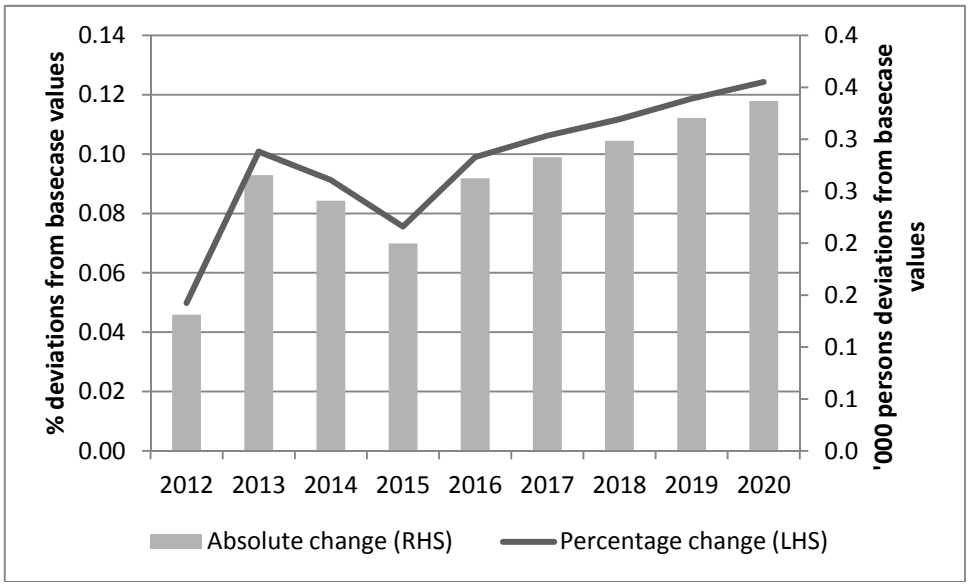

Figure 3: Employment in Tasmania
(percentage and absolute deviations from basecase)

Similar to the chart for real GSP, the picture for employment is a positive one. In terms of total jobs, in 2016 around 320 jobs are created by the change in retail pricing. In 2020, nearly 400 new jobs have been created. Note that the year-to-year pattern of deviations in employment shows and up and down pattern which corresponds to the up and down pattern in electricity price deviations (Figure 1).

The effects of the change in retail pricing on real private consumption in Tasmania are shown in Figure 4 in terms of percentage and absolute ($m, 2010 prices).

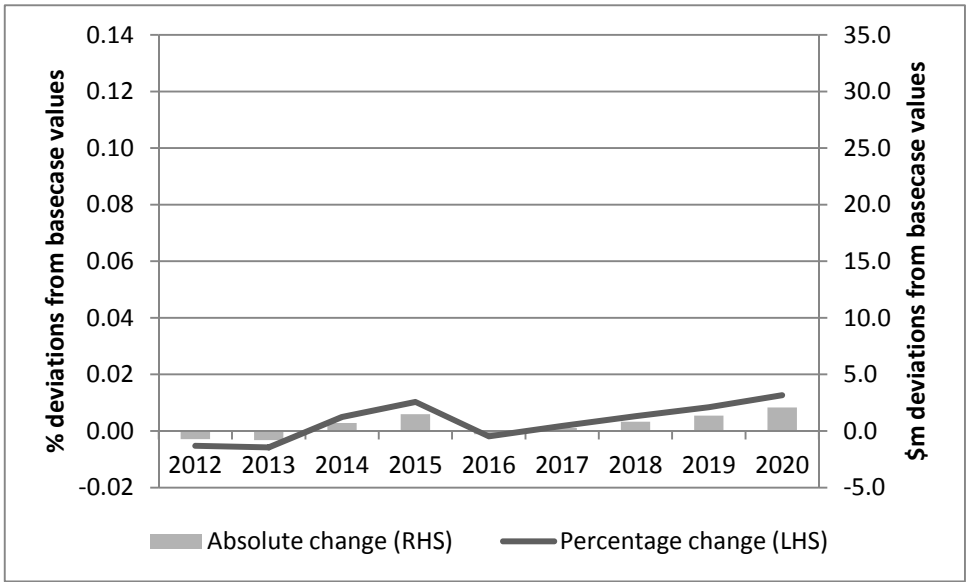

Figure 4: Real private consumption in Tasmania (percentage and absolute deviations from basecase)

In these simulations the change in real private consumption is a measure of the effects of the policy change on the welfare of Tasmanians. The chart shows that the pricing change has virtually no effect on welfare. Why is this? In our modelling, it is assumed that the entire electricity sector in Tasmania is government owned. So, a shift to efficient pricing for non-contestable customers, which reduces monopoly profit to the electricity sector, leads directly to a reduction in government income. In these simulations we fix government budget balances to their basecase value (Section 3.2.4). So all else unchanged, the reduction in government income is financed by a lump-sum payment by households to the state government. The value of this transfer equals the percentage deviation in retail price (Figure 1) times the purchases value of electricity by non-contestable customers. The values are given in the table below.

Table 2: Value of transfer from households to government ($m, 2010 prices)

2012	2013	2014	2015	2016	2017	2018	2019	2020
30.3	57.7	42.9	27.0	39.3	39.6	39.7	39.9	39.4

All else unchanged the transfer from households to government leads to a reduction in real income for consumption and hence real consumption. This is offset by a reduction in the CPI and to increased income from labour and capital arising from the increase in real GDP. Overall, real household income and hence real consumption is little affected.

To complete our explanation, Table 3 shows the percentage impacts on industry production in Tasmania. In general the impacts are small, as can be expected from the macroeconomic outcomes. The industries that gain most, in terms of percentage changes, are *Electricity Supply* and the associated hydro generator, which benefit from increased demand for electricity from non-contestable customers due to a fall in retail price, and the service industries that also have their electricity costs cut.

Table 1: Industries in MMRF*

Name	Description of major activity
1. Sheep & beef cattle	Primary agricultural activities related to sheep and cattle production
2. Dairy cattle	Primary agricultural activities associated with dairy cattle
3. Other livestock	Primary agricultural activities associated with other animals
4. Grains	Grains production
5. Other agriculture	Other primary agricultural production
6. Agricultural services, fishing and hunting	Provision of agricultural services, fishing and hunting
7. Forestry	Logging and forestry services
8. Coal mining	Mining of coal
9. Oil mining	Mining of oil
10. Gas mining	Production of natural gas at well
11. Iron ore mining	Mining of iron ore
12. Non-ferrous ore mining	Mining of ore other than iron
13. Other mining	Other mining activity
14. Meat & meat products	Processed food related to animal
15. Other food, beverages & tobacco	Other food and drink products
16. Textiles, clothing & footwear	Textiles, clothing and footwear
17. Wood products	Manufacture of wood (including pulp) products
18. Paper products	Manufacture of paper products
19. Printing and publishing	Printing and publishing
20. Petroleum products	Manufacture of petroleum (refinery) products
21. Basic chemicals	Manufacture of basic chemicals and paints
22. Rubber & plastic products	Manufacture of plastic and rubber products
23. Non-metal construction products	Manufacture of non-metallic building products excl. cement
24. Cement	Manufacture of cement
25. Iron & steel	Manufacture of primary iron and steel.
26. Alumina	Manufacture of alumina
27. Aluminum	Manufacture of aluminium
28. Other non-ferrous metals	Manufacture of other non-ferrous metals
29. Metal products	Manufacture of metal products
30. Motor vehicles and parts	Manufacture of motor vehicles and parts
31. Other manufacturing	Manufacturing non elsewhere classified
32. Electricity generation - coal	Electricity generation from coal (black and brown) thermal plants
33. Electricity generation - gas	Electricity generation from natural gas thermal plants
34. Electricity generation – oil products	Electricity generation from oil products thermal plants
35. Electricity generation - nuclear	Electricity generation from nuclear plants
36. Electricity generation – hydro	Electricity generation from renewable sources – hydro
37. Electricity generation – other	Electricity generation from all other renewable sources
38. Electricity supply	Distribution of electricity from generator to user
39. Gas supply	Urban distribution of natural gas
40. Water supply	Provision of water and sewerage services
41. Construction services	Residential building and other construction services
42. Trade services	Provision of wholesale and retail trade services
43. Accommodation, hotels & cafes	Provisions of services relating to accommodation, meals and drinks
44. Road passenger transport	Provision of road transport services – passenger
45. Road freight transport	Provision of road transport services - freight
46. Rail passenger transport	Provision of rail transport services – passenger
47. Rail freight transport	Provision of rail transport services - freight
48. Water, pipeline & transport services	Provision of water transport services
49. Air transport	Provision of air transport services
50. Communication services	Provision of communication services
51. Financial services	Provision of financial services
52. Business services	Provision of business services
53. Dwelling services	Provision of dwelling services
54. Public services	Provision of government and community services
55. Other services	Provision of services not elsewhere classified
56. Private transport services	Provision of services to households from the stock of motor vehicles
57. Private electricity equipment services	Provision of services to households from the stock of electrical equipment
58. Private heating services	Provision of services to households from the stock of heating equipment

* For most of the industries identified in this table there is an obvious correspondence to one or more standard categories in the Australian and New Zealand Standard Industrial Classification (ANZSIC), 2006 version. The exceptions are: industries 32 to 38, which together comprise ANZSIC 26 *Electricity Supply*; industry 53, which is equivalent to the *Ownership of dwellings* industry in the industrial classification of the official Input/output statistics; and industries 56 to 58 which relate to the provision of services from the private stocks of motor vehicles, electrical equipment (not heating) and heating equipment.

Table 3: Industry production
(percentage deviations from basecsase values)

Name	2012	2013	2014	2015	2016	2017	2018	2019	2020
1. Sheep & beef cattle	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
2. Dairy cattle	0.13	0.25	0.20	0.15	0.20	0.20	0.21	0.21	0.21
3. Other livestock	0.12	0.26	0.24	0.21	0.27	0.29	0.31	0.32	0.33
4. Grains	0.03	0.05	0.05	0.04	0.06	0.06	0.06	0.07	0.07
5. Other agriculture	0.03	0.06	0.06	0.05	0.06	0.06	0.07	0.07	0.07
6. Agricultural services, fishing and hunting	0.03	0.06	0.05	0.04	0.05	0.05	0.05	0.05	0.06
7. Forestry	0.07	0.14	0.11	0.08	0.11	0.11	0.12	0.12	0.12
8. Coal mining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9. Oil mining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10. Gas mining	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11. Iron ore mining	0.01	0.03	0.05	0.06	0.07	0.09	0.11	0.12	0.14
12. Non-ferrous ore mining	0.05	0.14	0.18	0.21	0.27	0.31	0.36	0.40	0.44
13. Other mining	0.00	0.01	0.02	0.03	0.04	0.06	0.07	0.08	0.09
14. Meat & meat products	0.02	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.07
15. Other food, beverages & tobacco	0.04	0.07	0.07	0.06	0.08	0.08	0.09	0.09	0.10
16. Textiles, clothing & footwear	0.09	0.18	0.16	0.12	0.16	0.17	0.17	0.18	0.18
17. Wood products	0.08	0.16	0.16	0.14	0.17	0.19	0.20	0.21	0.22
18. Paper products	0.20	0.41	0.37	0.30	0.38	0.40	0.42	0.43	0.44
19. Printing and publishing	0.04	0.09	0.10	0.09	0.12	0.13	0.14	0.15	0.16
20. Petroleum products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21. Basic chemicals	0.06	0.13	0.12	0.10	0.13	0.14	0.14	0.15	0.15
22. Rubber & plastic products	0.05	0.11	0.10	0.09	0.11	0.12	0.13	0.13	0.14
23. Non-metal construction products	0.03	0.07	0.07	0.06	0.08	0.09	0.10	0.10	0.11
24. Cement	0.02	0.05	0.05	0.05	0.06	0.06	0.07	0.07	0.07
25. Iron & steel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26. Alumina	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27. Aluminum	0.19	0.39	0.36	0.28	0.37	0.37	0.38	0.39	0.37
28. Other non-ferrous metals	0.02	0.06	0.08	0.08	0.10	0.11	0.12	0.12	0.13
29. Metal products	0.05	0.11	0.10	0.08	0.11	0.11	0.12	0.13	0.13
30. Motor vehicles and parts	0.13	0.26	0.25	0.21	0.27	0.28	0.29	0.30	0.31
31. Other manufacturing	0.04	0.09	0.08	0.06	0.08	0.08	0.09	0.09	0.09
32. Electricity generation - coal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33. Electricity generation - gas	0.03	0.06	0.05	0.03	0.05	0.05	0.05	0.05	0.05
34. Electricity generation – oil products	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35. Electricity generation - nuclear	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36. Electricity generation – hydro	0.36	0.97	0.85	0.42	0.69	0.70	0.71	0.72	0.73
37. Electricity generation – other	0.03	0.06	0.05	0.03	0.05	0.05	0.05	0.05	0.05
38. Electricity supply	0.67	1.30	1.01	0.68	0.94	0.95	0.97	0.98	0.99
39. Gas supply	0.03	0.07	0.08	0.07	0.09	0.10	0.10	0.11	0.12
40. Water supply	0.01	0.02	0.03	0.03	0.04	0.05	0.05	0.06	0.06
41. Construction services	0.01	0.03	0.03	0.04	0.05	0.06	0.07	0.08	0.08
42. Trade services	0.06	0.12	0.11	0.09	0.12	0.13	0.13	0.14	0.14
43. Accommodation, hotels & cafes	0.01	0.03	0.03	0.04	0.05	0.05	0.06	0.06	0.07
44. Road passenger transport	0.03	0.06	0.06	0.05	0.06	0.07	0.08	0.08	0.09
45. Road freight transport	0.03	0.07	0.07	0.07	0.08	0.09	0.10	0.10	0.11
46. Rail passenger transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
47. Rail freight transport	0.08	0.17	0.16	0.14	0.18	0.20	0.21	0.23	0.24
48. Water, pipeline & transport services	0.03	0.06	0.06	0.06	0.07	0.08	0.09	0.09	0.10
49. Air transport	0.05	0.11	0.10	0.08	0.11	0.12	0.12	0.13	0.14
50. Communication services	0.06	0.13	0.15	0.16	0.20	0.23	0.26	0.30	0.33
51. Financial services	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05
52. Business services	0.13	0.29	0.28	0.25	0.33	0.36	0.39	0.41	0.43
53. Dwelling services	0.00	-0.01	-0.02	-0.03	-0.03	-0.04	-0.04	-0.05	-0.05
54. Public services	0.03	0.05	0.05	0.04	0.05	0.06	0.06	0.07	0.07
55. Other services	-0.02	-0.04	-0.02	0.00	-0.01	0.00	0.00	0.00	0.01
56. Private transport services	0.00	-0.01	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03
57. Private electricity equipment services	0.07	0.16	0.19	0.20	0.25	0.28	0.31	0.33	0.36
58. Private heating services	0.06	0.13	0.14	0.13	0.16	0.18	0.19	0.20	0.21