D Modelling indirect effects in the RIT–T

Key Points

- The Regulatory Investment Test for Transmission (RIT-T) is a cost–benefit process that is applied to all major, new transmission projects. By choosing projects that deliver the greatest net benefit for the community, the RIT-T aims to replicate the investment decisions that would be made in a competitive market environment.
- At present, this process is confined to looking at costs and benefits that occur within the electricity sector. However, it is likely that some projects, particularly interconnectors, will have impacts in areas beyond the electricity sector.
- Some have suggested that including benefits and costs from secondary markets may improve the RIT-T process. However, while it would be possible to do so, a number of potential problems would arise.
  - Other industries do not have the ability to capture indirect effects through investment decisions, meaning that an attempt to encapsulate such effects within the RIT-T process might result in overinvestment in the transmission industry.
  - To correctly measure impacts in secondary markets would require judgments to be made about the relevance of distortions across the economy for particular investment projects.
  - A cost benefit analysis that considers impacts in secondary markets should consider all projects and policies in those markets as potential options. This would greatly expand the task of the RIT-T.
- As well as the theoretical objections, there are a number of practical issues related to the modelling of indirect effects. These include choosing the correct modelling methodology and the extra cost that such modelling would involve.
- Seeking to encompass indirect impacts in the RIT-T would therefore be problematic, both on theoretical and pragmatic grounds.

The RIT-T is a cost–benefit analysis that must be completed for any new transmission project (including interconnectors) costing above a threshold of $5 million. In Victoria, the RIT-T is performed by the Australian Energy Market Operator (AEMO). In all other jurisdictions in the National Electricity Market (NEM), the test is performed by the Transmission Network Service Provider (TNSP) that is also responsible for constructing the project suggested by the test.

As discussed in chapter 18, the aim of the RIT-T is to identify transmission investments (or any more efficient non-network options) that provide the greatest benefit to the community as measured by the sum of consumer and producer surplus. In effect, the test attempts to identify the investments that would be made were transmission projects delivered by an efficient and competitive industry.

Within the current RIT-T framework, only costs and benefits that fall on those within the electricity market can be considered. The RIT-T states that a market benefit is:

> a benefit to those who consume, produce and transport electricity in the *market*, that is, the change in producer plus consumer surplus. (AER 2011, p. 4)

There has been some concern raised that constraining the RIT-T in this way may miss some important indirect or general equilibrium effects (AEMO 2011, Grid Australia, sub. 22, p. 14). This appendix examines these concerns with a view to assessing whether an attempt to include broader economic effects in the RIT-T would improve the investment process.

In this regard, there are a wide range of modelling techniques that claim to capture the 'wider benefits' of a project to society. However, several — such as multiplier analysis — have significant methodological flaws when used for this purpose. A summary of the issues involved is provided by Denniss (2012) and the Western Australian Department of Treasury and Finance (2002).

If the RIT-T were expanded to include indirect effects, it would therefore be essential that this was done in a way that avoided such flaws. The design of the model would need to be sound, such as adapting an existing, respected model, with that model applied in a structured and consistent way. But even then, as the following discussion illustrates, there would be a range of other obstacles to overcome.

D.1 The nature of indirect effects

When a large transmission project is developed, the majority of costs and benefits are directly borne by those in the electricity market. For example, a new interconnector that runs between two regions:

- will lead to lower customer prices in the importing region as lower-cost generators in the source region are dispatched ahead of higher cost generators in the importing region. Prices in the exporting sector would tend to be higher, leading to closer alignment of regional prices

- may improve the security and reliability of the electricity network. As an example, the Basslink interconnector provided Tasmania with power during its drought, and Victoria with power following the recent earthquake and floods which affected the Latrobe Valley generators in Victoria
- will improve the capacity for low marginal cost renewable generators to access customers in other regions, in turn making it easier to meet the Renewable Energy Target
- may undermine market power by generators in a particular region, and help to correct the adverse effects such power might have on efficient prices and investment.

While not always easily calculable, these 'direct' impacts are the focus of the RIT-T in its current form. However, it is likely that there will also be effects in closely related markets. For example, a major interconnector project will affect the price of goods that are produced using electricity, such as aluminium, and in turn, the prices of goods that use aluminium. As well, there will be implications for the allocation of capital and labour to industries throughout the economy, and for the makeup of imports and exports.

Such impacts have national economic welfare implications, though it is important to be careful when attempting to measure and interpret them. In some cases, outcomes that look like welfare improvements in secondary markets will already have been encapsulated in impacts in the primary market. In others cases, impacts will just be transfers between two parties, and hence have no net welfare impact. In further instances, apparent gains should be disregarded because they stem from distortions in other markets, which would be better addressed directly.

An example

In a hypothetical world of perfectly competitive markets, and no other market distortions, such as taxes or externalities, it would be possible to measure the value of a new project just by looking at the costs and benefits in the primary market (Dinwiddy and Teal, 1996). The intuition behind this result is that in the secondary market, any benefit or cost that is observed will have already been accounted for by changes in prices in the primary market.

This serves to illustrate how easy it can be to double count benefits when looking at the effects of policies and projects in related markets. For example, in the aforementioned case of a transmission investment that lowers electricity prices for the aluminium industry, it is tempting to treat the lower prices and incremental activity that ensues in the aluminium industry as an additional benefit of the reform.

However, these benefits have already been considered as consumer surplus in the electricity industry.

Adding some more realistic assumptions

The above result only holds when there are no distortions present in the economy. However, when this (unrealistic) condition is not met, impacts in other markets will have welfare implications. For instance, in the case of a transmission investment that lowers the price of electricity that is discussed previously, the introduction of a tax to the aluminium industry that lowers the output in that market below the efficient level will have welfare effects that will influence investment decisions in the electricity market.

As shown in figure D.1, if the new project results in a lower cost of electricity and increases output in the aluminium market from q_0 to q_1, this will increase the sum of consumer and producer surplus by an amount equal to the shaded area.

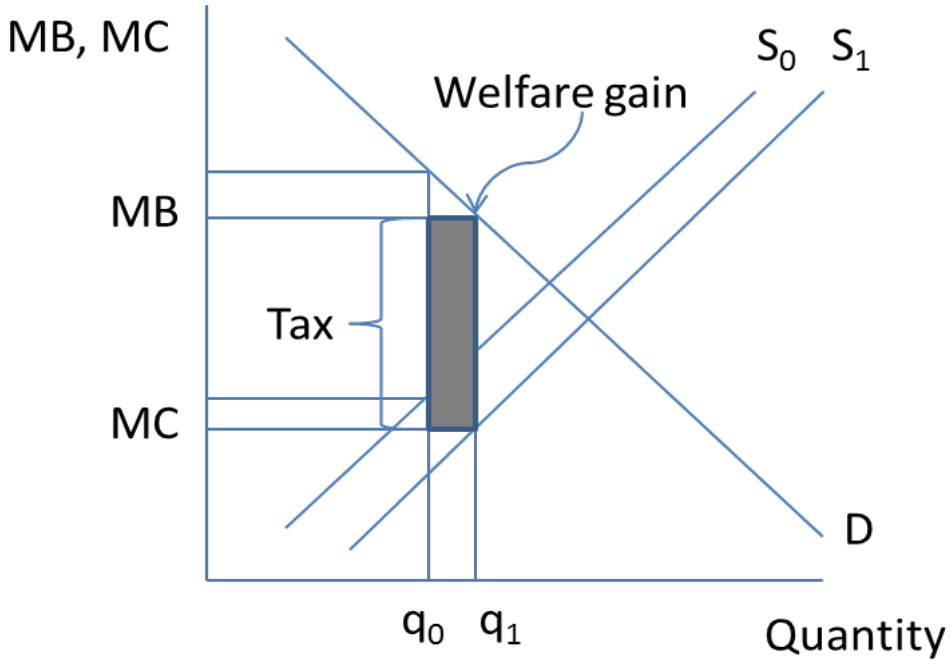
In reality, most markets in the economy have some distortion that pushes the market price away from the shadow price — which is the real resource cost of production. These distortions include:

- taxes, subsidies and any inefficient regulations
- externalities, like pollution
- non clearing markets, such as unemployment in the labour market
- the inefficient use of market power.

Importantly, these distortions do not have to occur in the markets directly affected by an investment or policy change. A distortion in one market will flow through to closely-related markets, whether they are substitutes, compliments or used as inputs in a production process. As a result, secondary impacts will have real welfare effects in most cases.

However, as the next sections explain, it is not necessarily clear such effects should be counted as a benefit in investment proposals.

Figure D.1 **Welfare effects in a distorted secondary market**

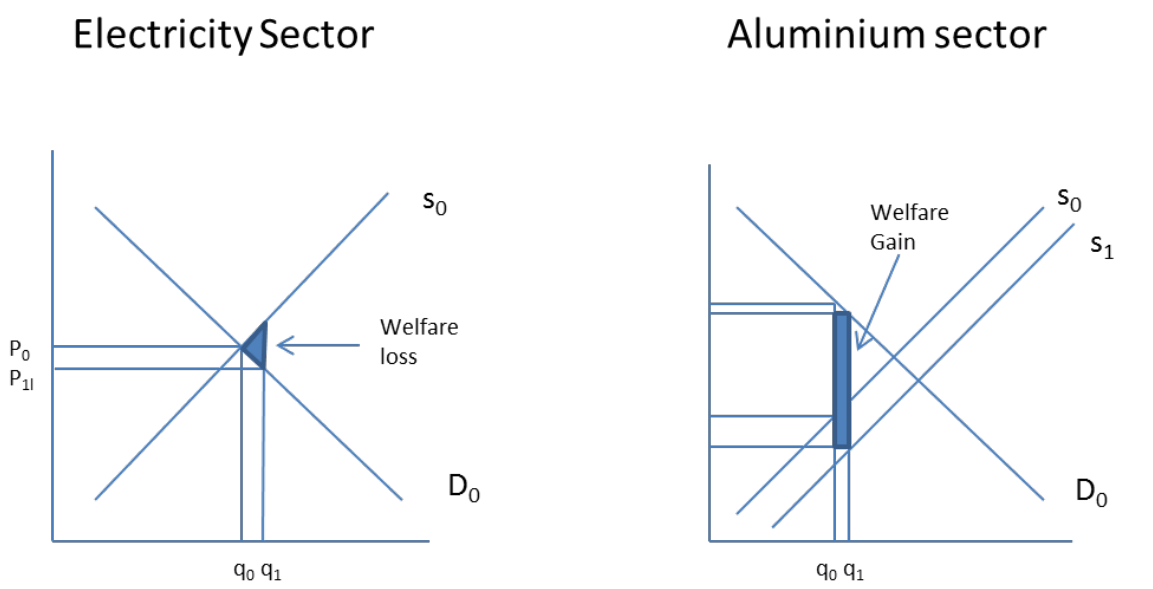


D.2 Including indirect effects in a cost–benefit framework

While investments may have impacts that occur in secondary markets that are not captured by investors or consumers in the primary market, it would still be problematic for the RIT-T to attempt to incorporate such effects. Here again, the case of a transmission investment benefiting an inefficiently taxed aluminium sector is illustrative.

A RIT-T that only considered the direct costs and benefits attaching to the investment would result in q_0 of electricity being consumed at a price of p_0. However, if the benefits of offsetting the tax distortion in the aluminium market were included in the calculus, the optimal outcome would be to offer more electricity at a lower price (p_1, q_1), notwithstanding the welfare loss that would arise in the electricity sector (figure D.2).

Figure D.2 **Welfare impacts in secondary markets**



However, it is far from clear that seeking to encompass such effects in RIT-T decisions would, in practice, improve investment decision making.

- It would require the evaluation of all projects and policies in the economy simultaneously. For instance, in the example above, it may be better to address the tax in the aluminium market directly rather than through 'second best' investments in the transmission industry.
- Firms in other industries cannot capture benefits that occur in secondary markets, and therefore will not consider them when making investment decisions. As such, the inclusion of indirect effects in the RIT-T may create a bias towards investment in transmission.
- In order to perform this type of assessment it would be necessary to make judgments about the magnitude of distortions in the economy, and in some cases, value judgments about the policy relevance of externalities. It is highly unlikely that a TNSP or AEMO would be best placed to make this decision.

The Commission considers that these limitations are by themselves a sufficient reason to justify limiting the costs and benefits encompassed in the RIT-T to the electricity market. However, there are also a number of practical constraints that lend further weight to this position.

D.3 Calculating indirect effects in practice

The indirect impacts of a project can be assessed using a range of analytical techniques, each of which has strengths and weaknesses.

Extending the partial equilibrium analysis

One option to assess indirect effects within the RIT-T framework would be to extend the partial equilibrium analysis to closely related sectors of the economy. This would be reasonably simple in principle, as it would extend the existing framework to look at other 'important' sectors, without needing to model the entire economy. Nevertheless, it would require judgment about which related markets were sufficiently important, and information about the characteristics of those markets (such as demand and supply elasticities).

Another way of extending the partial equilibrium analysis would be to employ shadow prices in the cost–benefit framework. Shadow prices describe the value of a good where a market price is either not available or is a bad estimate of the true value of the good. However, as the discussion of the application of shadow prices to labour costs in box D.1 illustrates, it can be difficult to determine the 'correct' shadow price.

Box D.1 **The shadow price of labour**

The shadow price of labour is the opportunity cost of using this resource. Hence for a proposed investment in a transmission project, the shadow price would reflect what the employees involved would do if the project did not go ahead. If it is assumed that the labour market will always return to a certain level of unemployment, then new projects will not employ any additional staff at an economy wide level. In this case, the correct shadow wage would be the market wage of that worker. On the other hand, if in the absence of the project the worker would be unemployed, the shadow wage should be lower.

While there are a range of opinions on the 'stability' of the aggregate unemployment level, it should be noted that the Department of Finance and Deregulation (Commonwealth of Australia 2006, p. 40) recommends that unless a compelling reason can be found to suggest otherwise, it should be assumed that labour markets are fully employed. This would imply that the market wage is the appropriate shadow wage, as is currently the case in the RIT–T.

Incorporating a general equilibrium model

Another option is to use a Computable General Equilibrium (CGE) model. These models comprise a set of equations that represent a stylised version of the economy. They include a large amount of information about the tax and transfer system, as well as links between related markets. Importantly, these models are calibrated to allow for quantitative estimates of a range of changes in the economic environment to be made.

CGE models have many advantages for testing the impacts of government policies, such as tariff changes, and policies that increase productivity. However, they are less suited to modelling the impacts of individual commercial investments. Such modelling would usually require finer level detail, which would be difficult to incorporate into the model, and would typically rely on credible assumptions rather than empirical data.

It is also unclear which welfare measure would be used in choosing between projects when using a CGE approach. While the existing RIT-T uses the sum of consumer and producer surplus to differentiate projects, CGE models usually calculate monetary measures such as Gross Domestic Product or Gross National Income.[1] While in principle CGE models could be adapted to calculate a surplus-based welfare measure, this feature is not currently available in the standard models. (Forsyth 2010, and Layman n.d)

Costs involved

All of the options discussed above will add complexity to the modelling exercise and, as a result, will increase the cost of the modelling. These costs would fall not just on the party responsible for preparing the RIT-T, but also on anyone who wants to interpret the results. As such, adoption of an extended modelling approach could have the potential to limit the involvement of interested third parties in the RIT-T process.

How big will the effects be?

The extent to which inclusion of indirect effects would alter the results of individual assessments within the RIT-T process is an empirical issue. Nevertheless, there are

[1] There is a strong relationship between consumer and producer surplus and measures such as GDP and GNI. GNI is the better welfare measure of the two and has been used previously by the commission for this purpose. For a further discussion of these welfare measures see McClosckey (1985).

reasons to believe that the effects on the level of transmission and interconnection in the NEM are unlikely to be large. For most projects, there will be both indirect benefits and costs, with the net effect potentially being modest, especially relative to the primary market impacts.

D.4 In summary

On both conceptual and practical grounds, the case for including the modelling of indirect effects in the RIT-T appears to be weak. This has informed the recommendation in chapter 17 of this report that the RIT-T should not be amended to include indirect effects of investment decisions.