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**A Tradeable Emissions Entitlements Scheme
for Greenhouse Gases
from the NSW Electricity Industry**

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1. Background¹

The NSW Parliament has passed legislation committing the Government to ensuring that greenhouse gas emissions from the NSW electricity industry be reduced by 20 per cent below current levels by the year 2005. The NSW Labor Government has also made a commitment, in the Electricity Reform Statement, to reduce carbon dioxide emissions by a total of 2 million tonnes over the next three years. The question now arises of how the NSW Government will ensure that the legislated target is met. Little thought appears to have been given to this question, and it is possible that current legislated requirements will fail to see the target actually achieved. This paper puts forward a system of tradeable emissions entitlements for greenhouse gas emissions from the NSW electricity sector. It is a system that will both lock in the emissions reductions of the new legislation and achieve them at lowest economic cost.

The electricity industry has a number of components. The generators will become part of the national wholesale electricity market in 1996 under national reforms. Transmission and local distribution of power will remain a natural monopoly. However, competition will be introduced in the retailing of electricity beginning with major customers. While the 'wires' business will remain a monopoly, distributors will be able to compete with each other to sell to final customers.

The three bills recently passed by the NSW Parliament -- the Electricity Supply Bill 1995, the Electricity Corporations Bill 1995 and the Sustainable Energy Development Bill 1995 -- are designed to introduce potentially far-reaching reforms to the industry in NSW focussing on the promotion of competition among both electricity distributors and, through the distributors, generators. The reforms will take place against the backdrop of Australia-wide changes to the electricity industry which will see the introduction of a national wholesale electricity market and initiatives to introduce competition in the gas market.

It is anticipated that competition in the wholesale electricity market will lead to productivity improvements and the more efficient allocation of capital investment. At the same time, the amalgamation of some distribution businesses in NSW is expected to deliver economies of scale. Since the combined effect is likely to be lower prices, these measures on their own will both lead to increased electricity use and undermine the profitability of some energy efficiency activities. If the NSW reforms are to deliver environmentally beneficial outcomes, it is essential that various measures are introduced to promote less-polluting forms of energy, to encourage energy efficiency and to constrain demand. The new legislation takes a large stride in this direction.

The current situation in NSW provides a unique opportunity to introduce a far-sighted, innovative, flexible and effective system for the phased reduction of greenhouse gas

¹ This paper has been prepared after discussions with Jeff Angel (Total Environment Centre), Keith Tarlo (Greenpeace), Dietrich Willing (Friends of the Earth), Judy Messer (Nature Conservation Council of NSW), and Chris Dunstan, and the energy consultants George Wilkenfeld, Hugh Saddler, Mark Ellis and Alan Pears. However, the views expressed in the paper are those of the author.

emissions. This paper sets out such a system.

2. The objective

The electricity sector is the largest emitter of greenhouse gases in the state (accounting for 49% of carbon dioxide emissions) so achieving the Government's moderate target will require a system that provides strong incentives for the electricity sector to cut its emissions by pursuing efficiencies, diversifying to low-emissions sources and reducing overall demand for electricity.

The objective of the scheme advocated in this paper is to define specific enforceable targets for reductions in greenhouse gas emissions while at the same time ensuring that emissions reductions are brought about at the lowest economic cost. In designing a greenhouse gas reduction scheme, the system needs to balance long-term certainty, so that generators can plan their investments, while allowing enough flexibility for the community to reduce allowable emissions in response to stronger international commitments that are likely in the future.

It is inevitable that Australia, along with all industrial countries, will enter international agreements to reduce emissions. Those Australian states with the foresight to act early to put in place electricity generation systems that can respond to these international commitments will benefit not only from lower costs of compliance but from opportunities to sell emissions reduction technologies and expertise to other states and other countries.

The current reforms of the NSW electricity industry provide an excellent opportunity for NSW to take a leadership role in developing an environmentally responsible energy sector. To date, microeconomic reform of the energy sector and policies for ecologically sustainable development have been uncoordinated and often in conflict. The purpose of the proposals below is to pursue both economic efficiency and environmental protection in order to maximise the benefits of reform to the community.

Regulation should be as much about inducing innovation as imposing constraints on business. Competition in the energy services sector combined with a transparent, effective and efficient system of cutting emissions will achieve this.

3. Possible approaches

There are three broad approaches to controlling and reducing greenhouse gas emissions -- the regulatory approach, the carbon tax and tradeable permits schemes. It is important to note that each of these involves the setting of emissions targets, although in the case of the carbon tax the target is only implied by the level of the tax and the assumed responsiveness of the industry to price changes. The issues for debate, therefore, are over the effectiveness of each scheme in achieving the desired targets and the economic and administrative costs involved.

The *regulatory approach* -- which has been traditionally favoured by environmentalists, among others -- involves the specification of detailed emission standards along with monitoring and enforcement mechanisms. It should be pointed out that since the network will remain a monopoly and retailers will also retain a monopoly position with respect to non-contestable customers, a regulatory structure will be required.

The NSW Government is committed to restructuring its electricity industry to introduce a competitive market, as agreed under COAG. Because of this, it is no longer possible unilaterally to impose simple regulatory limits on emissions from NSW electricity authorities. The new legislation appears to allow much scope for slippage in meeting the targets.

Under the new legislation in NSW, electricity distributors will need to be licensed. As part of their licence conditions they will be required to develop plans for energy efficiency and demand management as well as to develop strategies for purchasing energy from renewable sources. These plans will need the approval of the Minister for Energy and will be audited at least once every three years by the NSW EPA. The Minister for Energy may fine licensees or revoke their licenses if they fail to meet the requirements of the legislation.

While in many cases (such as lead and sulphur emissions) the regulatory approach has proven to be a feasible and effective one, when reforms of the scale demanded by global warming are required careful consideration must be given to the effects on economic efficiency of reducing emissions. A key component of reducing greenhouse gas emissions will be the introduction of new technologies, something that the regulatory approach (in which targets are based on known technologies) generally does not handle well.

It is possible to achieve the same emissions targets at greater or less economic cost. Reducing the economic costs is important for two principal reasons:

- higher economic costs will almost certainly be borne disproportionately by poorer households through higher unemployment and lower real incomes; and
- higher economic costs may, in some circumstances, lower the international competitiveness of some industries (in this case, energy-intensive industries) and this may impose an unfair burden on poorer households as well as on the population generally.

The *carbon tax* is an efficient economic instrument for reducing atmospheric emissions. The tax is levied on the carbon content of fuels -- falling most heavily on coal, then petroleum, then natural gas, with zero tax on hydro-electricity and renewables such as solar and wind generation. A carbon tax is capable of raising large revenues but would more appropriately be levied at a federal level. The tax is set at a level that is anticipated to achieve a desired emissions target and would need to be adjusted periodically as

information is gained on the effectiveness of tax levels in reducing emissions. Political pressures may prevent increases in tax rates. In addition, depending on the competitive environment, it may be cheaper for generators to pass on the higher taxes to consumers than to undertake potentially expensive capital investments to reduce emissions.

Using the *tradeable permits approach* the Government sets targets and issues permits that carry entitlements to emit a specified volume of greenhouse gases over a specified period. This sets an absolute upper limit on allowable emissions. Corporations that engage in activities that are responsible for emissions of greenhouse gases may only emit by owning permits. Permits can be acquired through buying from other permit owners. This introduces flexibility into the emissions reduction program because not every polluter is required to reduce emissions at the same rate. Some polluters can achieve faster reductions and profit by selling excess entitlements, while others can reduce emissions more slowly but at the cost of purchasing more entitlements. The overall emissions reductions are the same. The evidence indicates that faster technological progress is induced compared to the regulatory approach and this will allow greater reductions in targets at future dates.

A tradeable emissions entitlements scheme for the NSW electricity distribution industry is set out below. It should be pointed out that although similar schemes have been operating in the USA for some years (eg. the EPA's transferable permit system for ozone-depleting substances, the EPA's lead banking scheme and California's Regional Clean Air Incentives Market), such an emissions scheme would be entirely new to Australia (although tradeable permits scheme operates in the fishing industry, for instance). Thus a number of details will need further development to ensure that the system is the one best suited to the circumstances.

4. Tradeable emissions entitlements scheme for NSW

The Electricity Supply Act is designed to create a competitive market among electricity distributors. National electricity reforms will see distributors and generators from other states seeking to sell electricity into NSW. The purpose of the tradeable emissions entitlements scheme (TEES) is to harness these new competitive forces in the interests of environmental improvement. It will do this by making the cost of greenhouse gas emissions an essential component of commercial decisions by both distributors and generators.

Under the proposed scheme, electricity distributors in NSW would be permitted to sell electricity only up to an amount permitted by their entitlements to emit greenhouse gases. This will clearly influence both how much electricity they sell and where they source it from. The scheme will cover emissions of carbon dioxide and methane with emissions of methane weighted by its global warming potential.² Electricity bought on the spot market

² The proposed scheme will provide strong incentives to the development of coal-seam methane and land-fill gas projects.

from the national grid cannot be traced to its source. However, it is very likely that most electricity sold by distributors, possibly up to 90%, will be bought under long-term contracts, with each contract agreed between a distributor and a generator. In these circumstances, the source of electricity and the quantity bought will be known. For the remaining spot market transactions, it may be necessary to average emissions for the purpose of using up entitlements.

The total of permits issued would be determined by the legislated greenhouse gas emissions targets, although the timing of cuts is open to discretion. In the first instance this would involve issuing of entitlements up to the amount determined by the existing commitment to cut emissions by 20% by 2005. The entitlements could be reduced rapidly thereafter. While long-term announced targets are necessary, they should be subject to adjustment periodically, and a five-year horizon is proposed.

Permits could thus be issued for a five-year period with entitlements specified in terms of tons of emissions per year. However, more flexibility would be had by simply granting entitlements in tons, with entitlements retired at any point over the life of the permit. Thus instead of allowing, say, 1000 tons per year over a 5-year permit period, distributors would be allowed emissions of 5000 tons over the 5-year permit period.

Permits would be required by all retailers who sell electricity in NSW including those who buy electricity from interstate. Clearly such a scheme will have a major impact on generators since there will be definite limits on the market for greenhouse gas-intensive forms of generation. This scheme imposes no limits on the amount of electricity sold in NSW, only on its environmental impact.

Under the proposed scheme, entitlements to emit greenhouse gases could be bought and sold. Entitlements will thus be valuable and their cost will be treated in the same way as other business costs, such as costs of labour, material inputs and capital. Depending on how many entitlements are issued and how quickly their number is reduced over time, the cost of acquiring entitlements will form a significant part of a distributor's costs. This will force distributors to choose carefully their sources of supply from among high-emitting sources (coal-fired power stations), moderate emitters (gas) and low or zero emitters (renewables), with an increasing preference over time for the latter. It will also induce distributors to attempt to keep their customers supplied with energy services through demand management and energy efficiency schemes in homes, factories and offices.

The tradeable permits scheme would permit simultaneous pursuit of competition policy and environmental policy objectives. There are several features of the proposed scheme that require elaboration.

5. Allocation of permits

Two methods of initially allocating permits are possible. The first is to auction them so that electricity distributors would need to purchase permits from the NSW Government at market-clearing prices. The second is to distribute them free using an allocation rule based on historical levels of emissions (this is known as ‘grandfathering’). The latter method would thus allocate permits to the existing distributors according to their current levels of emissions (and allowable emissions would reduce each year thereafter). Auctioning of permits would impose an immediate additional financial burden on distributors, and they would find a regulatory approach cheaper. Moreover, it is preferable to encourage distributors to use financial resources to reduce the costs of generation.

It is therefore proposed that the permits initially be distributed free to existing distributors. The principal disadvantage of this approach is that it does not generate any funds for the Government to use in promoting related activities. There are three important uses to which these revenues could be put:

1. providing for the Sustainable Energy Fund to promote renewable energy sources;
2. providing funds for the Government to buy back entitlements to be allocated to new entrants into the electricity market; and
3. providing funds for the Government to buy back and then retire entitlements as a way of hastening the reduction in greenhouse gas emissions.

It is therefore proposed that an annual levy be imposed on electricity distribution licence holders, set as a proportion of the notional value of entitlements.

6. New entrants and market power

It is expected that one of the impacts of the newly legislated emissions targets will be to encourage new entrants into the electricity generation industry, especially those offering low or zero-emissions forms of energy. Under the proposed emissions entitlements scheme, distributors will seek out such sources in order to meet customer demand while staying within the emissions limits specified by their entitlements. Since under the proposed scheme, it is distributors of electricity that must own permits, the proposed free allocation of permits should not disadvantage new generators. Generators may emit as much as they choose as long as they can find a distributor to buy their electricity.

However, new entrants to the distribution business would be disadvantaged by the free allocation of permits since they would be required to buy entitlements from existing distributors at full market prices. It is therefore proposed that the NSW Government put itself in a position to buy entitlements and make an initial allocation to new entrants,

including interstate distributors. Government would raise funds for this purpose from the annual levy imposed on licence holders.

There is a danger of large distributors using market power to amass entitlements and to either exclude their competitors by refusing to sell excess entitlements or to sell them at prices well above those that would prevail in a competitive market. It will be important to ensure that the initial allocation of permits does not result in any distributor acquiring surplus entitlements. However, the issue is broader. The new legislation is designed to introduce competition into electricity distribution, so a failure of competition in the distribution of entitlements would represent a failure in the competitive structure of the industry as a whole. The legislation and subsequent amendments should prevent the emergence of excessive market concentration.

7. The market for entitlements

If there are not enough competitors in the electricity distribution and generation industries then the market for entitlements may be ‘too thin’, thereby preventing adequate price signals to be sent about the value of entitlements. The new industry structure approved by the NSW Parliament should ensure that there are sufficient distributors to avoid this, and the emergence of the national market, which will bring competition into NSW from Victoria and Queensland, will deepen the market.

Nevertheless, experience indicates that emissions-trading schemes result in fewer trades than expected and that this is due in part to high transactions costs including the need to hire brokers to seek out potential traders.³ Private bilateral trading may mean that other distributors and new entrants are unaware of the value of entitlements and therefore cannot make fully informed investment planning decisions. The solution to this is to provide a clearing-house for all buyers and sellers. Both spot and future auctions for entitlements could be held.

8. The national market

The proposed system appears to be consistent with the emerging national market. As long as the NSW Government is in a position to allocate permits to new entrants, interstate distributors will not face a competitive disadvantage in the NSW retail market. They will, however, need to be licensed to sell electricity in NSW. Generators that can offer lower emissions per unit of power will possess a competitive advantage, whether they are based in NSW or interstate.

³ On this point and on several others in this paper, I have been guided by the review article by Tom Tietenberg, ‘Design Lessons from Existing Air Pollution Control Systems: The United States’ in Susan Hanna and Mohan Munasinghe (eds), *Property Rights in a Social and Ecological Context: Case Studies and Design Applications* (Beijer International Institute of Ecological Economics and The World Bank, 1995).

It should be pointed out that the National Competition framework gives powers to states to deal with environmental aspects of industry according to their own standards. The proposed tradeable emissions entitlements scheme will permit interstate generators and distributors to participate in the NSW market and to satisfy the greenhouse targets of the NSW Government.

The Federal Government's 'Greenhouse Challenge' program, which develops voluntary agreements with major emitters to introduce phased reductions in emissions, would dovetail neatly with the proposed system. Participation in the tradeable permits system would become the central component of voluntary agreements between NSW distributors and the Federal Government.

The national grid will provide an excellent means of monitoring the emissions of generators whose electricity is sold into NSW under long-term contracts. The tradeable permit system will require the regular estimation of total greenhouse gas emissions for each distributor.

9. The Sustainable Energy Fund

The Sustainable Energy Fund (SEF) is designed to stimulate the development and adoption of technologies that are currently not competitive, or where there are market barriers which inhibit the use of renewable technologies and energy efficiency measures. It has already been indicated that a levy imposed on licences could be used to augment the SEF.

The proposed tradeable emissions entitlements scheme would introduce market incentives to encourage development and adoption of renewables and energy efficiency measures. Distributors operating under market constraints imposed by the limited availability of entitlements will seek out ways of satisfying customer demand for energy services while limiting emissions. This will increase the relative commercial desirability of low and zero-emission sources. In addition, by encouraging generators of renewable energy, the SEF will introduce more competitors into the market for energy services providing an additional stimulus to efficiency. The SEF can play a vital role in positioning NSW on the leading edge of technology and implementation of advanced energy systems.

10. Benefits of the tradeable emissions entitlements scheme

The proposed tradeable emissions entitlement system would allow a more precise specification of emission targets for greenhouse gases from the NSW electricity sector. It has built-in incentives so that distributors would benefit financially from selecting low-emission generators. Higher-emitting generators would be penalised to the extent that distributors would use up more of their valuable entitlements when buying electricity

from them. High-emission generators would have to make their power cheap enough to offset the additional costs of distributor's entitlements.

This scheme therefore provides a set of incentives for specified reductions in emissions to be achieved at least economic cost. The scheme will mean that low-emissions sources will enjoy a price premium so that generators that want to maintain and increase their market share will need to shift to lower-emitting forms of power generation. We would expect owners of power stations that burn brown coal, for instance, to diversify into gas-fired stations and renewables.

The proposed scheme will provide a high degree of certainty for distributors and generators thereby encouraging effective long-term investment planning. It is expected that the administrative and monitoring structure required by a tradeable emissions entitlements scheme would be somewhat cheaper than that required for a regulatory system.

How would the proposed scheme affect electricity consumers? In the short term, the proposed free allocation of entitlements will mean that electricity prices are not affected (except by the proposed levy on licences). In the medium term (4-10 years), as entitlements are reduced to cut greenhouse gas emissions the costs of generating electricity may rise as distributors shift to low-emission sources. However, the benefits of tackling global warming will be achieved at least cost to consumers under the proposed scheme.

In the longer term, consumers may enjoy cheaper energy services than they would if no measures were taken as new technologies induced by the scheme become increasingly cost-effective. Moreover, since the national and international requirements to limit greenhouse gas emissions will ineluctably become tighter, residents of NSW will be relieved of the extra costs associated with a more rapid transition to low emissions later on. In both the medium and the long term, energy bills will be lowered to the extent that the proposed scheme encourages demand management. So while electricity prices may be higher per unit, electricity bills will be lower.
