Parliamentary Budget Office - Election Policy Costing

NSW Parliament • Parliament House, Macquarie Street Sydney NSW 2000

Referred By:	Australian Labor Party	Proposal No:	A302
Date Referred:	30/01/2019	Date Published:	18/03/2019

Proposal Title: Clean and affordable energy plan – reverse auctions for additional clean energy generation

Cluster: Planning and Environment

General Government Sector Impacts

	2018-19 $'000	2019-20 $'000	2020-21 $'000	2021-22 $'000	4 year Total $'000
Expenses (ex. depreciation)	-	1,557	1,545	1,135	4,237
Depreciation	-	-	-	60	60
Less: Offsets	-	1,557	1,545	1,195	4,297
Revenue	-	-	-	-	-
Net Operating Balance:	**-**	**-**	**-**	**-**	**-**
Capital Expenditure	-	250	50	50	350
Capital Offsets	-	250	50	50	350
Net Capital Expenditure:	**-**	**-**	**-**	**-**	**-**
Net Lending/(Borrowing):	**-**	**-**	**-**	**-**	**-**

Total State Sector Impacts

Net Lending/(Borrowing):	**-**	**-**	**-**	**-**	**-**

Notes and costing assumptions

The policy proposes to procure 3,085 megawatts (MW) of large scale renewable energy generation infrastructure, via a series of competitive 'reverse auctions' and 'contracts for differences' over a 4-year period (see table below for the specified procurement and operation profile). The policy specifies that the infrastructure provided is to include generation and associated storage, and firming capacity infrastructure.

The policy also states that:

- the first round of auctions is to be completed by September 2020, with generation operations for the successful bidder(s) to start 2.5 years later from the completion of the auction, from the beginning of March 2023
- the prices set in the contracts for difference will be determined by the auction outcomes and is expected to decrease or alternatively, be no more expensive with each auction round.

MW auctioned	Auction date	Operational date
Round 1: 525 MW	Sept 2020	1-Mar-23
Round 2: 660 MW	Mar 2021	1-Sep-23
Round 3: 950 MW	Sept 2021	1-Mar-24
Round 4: 950 MW	March 2022	1-Sep-24
Total: 3,085 MW		

Notes and costing assumptions continued:

The PBO estimates the total net cost of procuring renewable energy under this policy is nil over the forward estimates. Administration costs totalling $4.6 million over this period are assumed to be met from within the Department of Planning and Environment's (DPE) existing resources, as specified under the policy.

The impact of the contract for difference would commence after the forward estimates period, from 2022-23. By 2032-33, the PBO estimates the net impact is :

- a net cost of $85.3 million if the prices set in the contracts for difference are fixed in nominal terms from 2022-23, when the first tranche of renewable energy is operationalised (Scenario A)
- a net revenue of $127.9 million if the prices set in the contracts for difference are to decrease in nominal terms at 1% per year, from 2024-25 (Scenario B).

The above amounts are driven by the net impact of the 'contracts for difference' where the NSW Government will pay or recoup from the private sector generation businesses, the difference between the fixed contracted price of renewable energy and the price the generation businesses actually receives (i.e. the wholesale price). This is similar to a financial derivative contract; private generation businesses are guaranteed by NSW Government a fixed income stream so they can invest and build renewable energy generation infrastructure.

Under Scenario A, most of the costs are driven by payments to solar energy generation businesses, because solar energy is mostly generated during periods of the day where the wholesale price for the electricity is less than the price in the contract for difference. As such, the government will have to pay for the difference between price in the contract and the wholesale price, for each solar megawatt hour (MWh) generated.

However under Scenario B, the costs to be paid to generation businesses will be less as the contract price is assumed to decrease by 1% per year. Over time, the contract price will be less than the wholesale price, thereby generating a net revenue for the NSW Government.

The PBO notes that the impacts are based on modelling of current market forecasts and that potential changes in technology, government policy on the electricity market and wholesale prices will affect the payments received and paid by the NSW Government under the contract for difference.

In particular, future changes in technology or government policies that will reduce the wholesale price of electricity will further increase the costs borne by the government as the contract for difference 'locks in' a price path for 10 years. In effect, the policy means the government will bear the risks and costs where wholesale prices decrease.

In contrast, technological and policy changes could also reduce the costs and risks borne by the government. For instance, improved and cheaper technology could reduce the barriers to entry for the generation industry and thereby increase the potential competition. This in turn could affect the competitiveness for the reverse auctions and place downward pressure on the prices set in the contracts for difference. Other things being equal, the additional competition would reduce net payments for solar and wind energy.

How the reverse auction and the contract for difference will operate

The policy proposes to procure large scale renewable energy via reverse auctions where non-government entities will bid to provide electricity projects, similar to the Victorian Renewable Energy Auction Scheme. The principle of reverse auctions is to create competition between energy providers, who bid for the right to supply electricity over a defined contract term, at competitive wholesale price.

A 'contract for difference' is then entered into with the successful bidder(s) where the government commits to pay any difference between an agreed price for the electricity set out in (a) the contract for difference and (b) the wholesale price. This way, if the wholesale price falls below the price set in the contract for difference, the electricity provider will still receive the same price per MWh from the government. In contrast, where the wholesale price exceeds the price set in the contract for difference the government will retain the windfall. In effect, the contract for difference allows the energy generation business a fixed and known income stream which aids the financing for the delivery of large-scale renewable energy infrastructure.

Notes and costing assumptions continued:

Composition of renewable energy generation

The costing assumes the renewable energy to be acquired will be from solar and wind sources. The overall MWh split between the two sources is 60% for solar and 40% for wind. The split between solar and wind renewable energy is based on DPE's advice, which used the Australian Energy Market Operator's (AEMO) forecasts of future sources of energy generation. As energy infrastructure is delivered over two financial years (March and September), the figures for each financial year have been apportioned accordingly. The costing assumes that that:

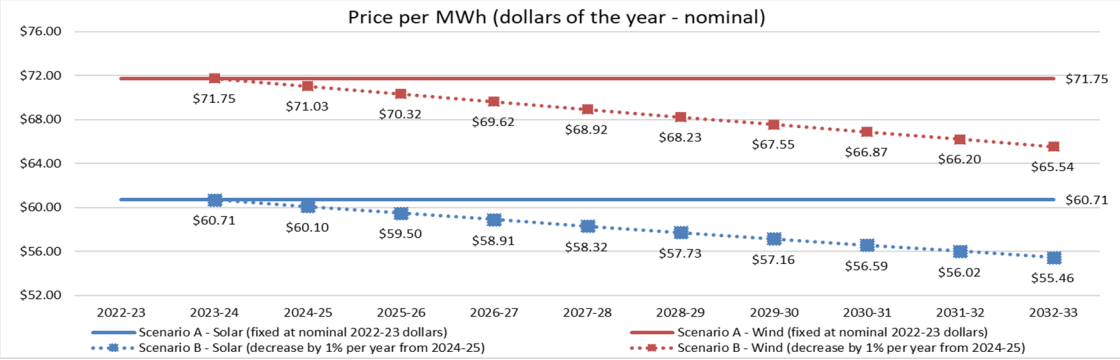
- the reverse auctions will be successfully completed at each round of auctions at the assumed price and amount of renewable energy to be provided
- that the successful bidder(s) will build the relevant generation, firming and connection infrastructure so as to deliver the above output capacity to the electricity grid 2.5 years thereafter, consistent with the policy's assumption
- the transmission and distribution networks are able to accommodate the renewable energy delivered to the electricity grid.

Contract for difference pricing assumptions

The costing assumes the starting contract price in 2020-21 for the first auction round is $55 per MWh for solar and $65 per MWh for wind sources. This is based on DPE's advice and modelling using AEMO's datasets and its estimated cost of producing electricity. These rates are presented in 2018-19 dollars, which DPE has escalated accordingly, based on its judgement of the likely price increases. DPE also advised that the term of the contract is assumed to be 10 years. The PBO notes that they are similar to the prices achieved by the Victoria Government in its 2018 reverse auctions (around $55 per MWh, plus an undisclosed fixed amount per MWh).

The PBO also requested DPE to model two price paths from 2022-23 (see chart below):

- **Scenario A:** the contract prices are to be fixed in nominal terms from 2022-23 at $60.71 per MWh for solar and $71.75 per MWh for wind (the year when the first tranche of renewable energy is operationalised). This is based on the policy's assumption that the prices are to be no more expensive each year. To calculate the above amounts, the PBO and DPE indexed the $55 and $65 figures for solar and wind from 2018-19 to 2022-23, at 2.5% per annum which the PBO considers to be a proxy for the long term trend in prices.
- **Scenario B:** the contract prices are to be fixed in nominal terms for 2022-23 and then decrease by 1% per year, from the beginning of 2024-25 (the year when the last tranche of renewable energy is operationalised). The 1% rate represents the PBO's sensitivity testing of a hypothetical discount in the price, based on the policy's expectation that prices in the contracts of difference would decrease each year e.g. additional competition pressures arising from technological improvements, cost reductions and lower barriers to entry.



Wholesale pricing assumptions

The wholesale price for electricity over the next 14 years is based on DPE's modelling using National Electricity Market datasets and the Plexos dispatch model, which forecasts and simulates electricity market outcomes.

Notes and costing assumptions continued:

The wholesale price varies throughout the day depending on peak/non-peak prices e.g. the prices are generally lower around early morning than during the evening. DPE advised that wholesale prices are based in 2018-19 dollars. As such, the PBO and DPE has escalated the wholesale prices by 2.5% per annum as a proxy for the long term trend in prices.

Settlement assumptions

Settlement under the contract for difference is assumed to occur on an hourly basis with a nil price floor, as advised by DPE. This means that, at each hour of the day, the wholesale price is measured against the contracted price to determine the amount payable or to be recouped from the generation businesses.

As a hypothetical example, if the wholesale price is $20 per MWh at 3pm and the contract price for solar is $55 per MWh, the NSW Government will pay the difference of $35 per MWh to the solar electricity generation business, for each MWh delivered to the National Electricity Market between 2pm and 3pm. In contrast, if the wholesale price is $70 per MWh at 4pm, then the solar generation business will have to pay the government $15 for each MWh delivered between 3pm and 4pm.

Electricity generation assumptions

The estimated cumulative amount of MWh generated for solar and wind generation businesses is set out in the table below. The figures are based on DPE's modelling of the expected cumulative output for the renewable energy procured, using AEMO datasets.

The PBO considers DPE's modelling to be reliable, noting that the figures are high-level estimates based on historical and existing datasets and are likely to change over the ten year period of this arrangement in light of actual estimates from the generation businesses involved. For instance, the impact of new technologies and a wide range of site specific factors will affect the MWh generated from both wind and solar sources.

Year	Solar (MWh)	Wind (MWh)	Total (MWh)
2022-23	199,624	147,733	347,356
2023-24	1,946,510	1,311,037	3,257,546
2024-25	4,284,755	2,738,221	7,022,977
2025-26	4,453,748	2,872,393	7,326,141
2026-27	4,455,420	2,881,945	7,337,365
2027-28	4,443,996	2,891,972	7,335,968
2028-29	4,459,723	3,151,022	7,610,745
2029-30	4,446,323	3,061,005	7,507,328
2030-31	4,463,979	3,092,177	7,556,155
2031-32	4,468,103	3,070,158	7,538,261
2032-33	4,416,871	2,989,721	7,406,592

Cumulative budget impacts arising from electricity generation

Based on the above assumptions about prices, indexation, settlement process and electricity generated, the PBO estimates the cumulative impact for the contracts for difference to be:

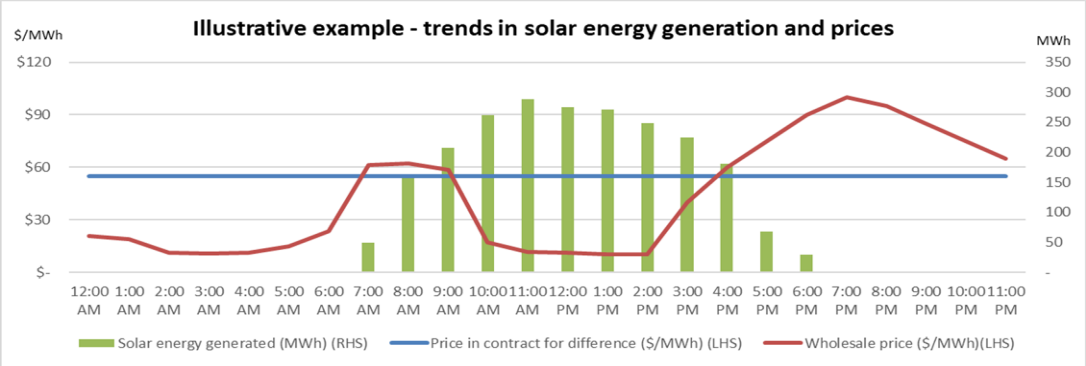
- a net cost of $85.3 million by 2032-33 under Scenario A, where the contract price is fixed in nominal terms
- a net revenue of $127.9 million by 2032-33 under Scenario B, where the contract price is set to decrease by 1% per annum in nominal terms from 2024-25.

Scenario A	**CFD payments ($ million)**		**CFD receipts ($ million)**		**Net received ($ million)**		
Year	**Solar**	**Wind**	**Solar**	**Wind**	**Solar**	**Wind**	**Total**
2022-23	-1.9	-1.0	1.5	1.2	-0.4	0.2	-0.2
2023-24	-46.4	-13.1	10.7	12.7	-35.7	-0.5	-36.2
2024-25	-122.2	-41.1	18.7	16.0	-103.6	-25.0	-128.6
2025-26	-130.6	-39.8	21.4	21.8	-109.1	-17.9	-127.0
2026-27	-128.2	-38.3	23.6	26.4	-104.7	-11.9	-116.6
2027-28	-120.8	-36.2	31.1	34.4	-89.7	-1.8	-91.5
2028-29	-92.3	-24.7	57.3	67.5	-35.0	42.8	7.8
2029-30	-101.3	-16.5	60.4	100.2	-40.9	83.7	42.8
2030-31	-90.6	-13.6	80.5	186.0	-10.0	172.3	162.3
2031-32	-98.7	-14.4	70.3	122.0	-28.4	107.5	79.2
2032-33	-107.8	-9.7	77.5	162.6	-30.3	153.0	122.6
Total	**-1,040.8**	**-248.4**	**453.0**	**750.9**	**-587.8**	**502.5**	**-85.3**

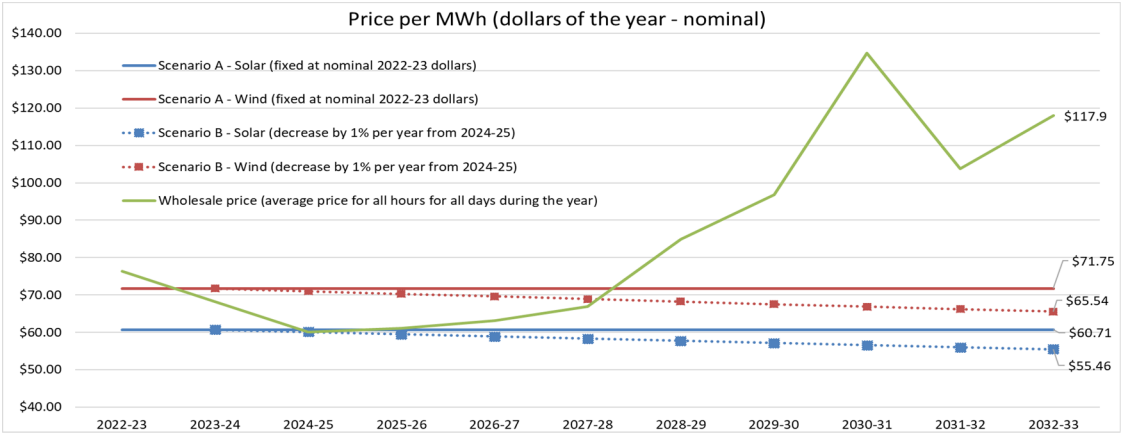
Notes and costing assumptions continued:

Scenario B	CFD payments ($ million)		CFD receipts ($ million)		Net received ($ million)		
Year	Solar	Wind	Solar	Wind	Solar	Wind	Total
2022-23	-1.9	-1.0	1.5	1.2	-0.4	0.2	**-0.2**
2023-24	-46.4	-13.1	10.7	12.7	-35.7	-0.5	**-36.2**
2024-25	-120.4	-40.1	19.4	17.0	-101.0	-23.1	**-124.0**
2025-26	-126.7	-37.9	23.0	24.1	-103.7	-13.8	**-117.6**
2026-27	-122.4	-35.7	25.8	29.9	-96.6	-5.8	**-102.4**
2027-28	-113.6	-33.1	34.5	39.5	-79.1	6.4	**-72.7**
2028-29	-84.6	-21.8	62.9	75.7	-21.7	53.9	**32.2**
2029-30	-91.9	-14.1	66.8	110.7	-25.1	96.6	**71.5**
2030-31	-80.8	-11.3	89.1	198.7	8.4	187.4	**195.8**
2031-32	-87.0	-11.7	79.5	136.3	-7.4	124.6	**117.1**
2032-33	-94.5	-7.4	87.3	178.9	-7.1	171.5	**164.4**
Total	**-970.0**	**-227.2**	**500.5**	**824.7**	**-469.6**	**597.5**	**127.9**

Most of the net payment amount is driven by payments to solar energy generation businesses (see example in the chart below) under the contract for difference. Solar power is generated during the day (green bars), where the wholesale prices for solar power (red line) are generally less than the price in the contract for difference (blue line). As a result, the government will be liable to pay for the difference between the wholesale price received by the solar energy generation business and the price stipulated in the contract for difference for each MWh generated.



However under Scenario B, the assumed 1% decrease in the price per year for the contract for difference will reduce the amount the government will pay to generation businesses. Over time, the modelling shows that the wholesale prices will generally exceed the price in contract for difference, thereby generating a net revenue for the NSW Government, especially for wind sources (see table above). This is illustrated in the chart below which shows the average wholesale price for all hours of the day during the year (green line) exceeds the contract prices from 2027-28 (red and blue lines). This is a high-level average and the PBO notes that the wholesale price and electricity generation fluctuates depending on the hour of the day and seasonal factors as shown above.



Notes and costing assumptions continued:

The PBO notes that potential changes in technology, Commonwealth Government policy and developments in the National Electricity Market and wholesale prices will affect the payments received and paid by the NSW Government under the contract for difference. In particular, future changes in technology or government policies that reduce the wholesale price of electricity will further increase the costs borne by the NSW Government as the contract for difference 'locks in' a price path for 10 years. In effect, the policy means the government will bear the risks and costs where wholesale prices decreases. In contrast, should wholesale prices increase, the risk borne by the NSW Government will decrease.

Furthermore, potential future changes in technology and policy could also lower barriers to entry for new businesses wishing to enter the solar and wind energy generation industry. As such, the growth in the industry may lead to additional competition during the auction process and thereby reduce the prices achievable for the contracts for difference. Other things being equal, the amount to be paid under the contracts for difference and cost of the policy would decrease.

Other administration costs to be absorbed by DPE

The PBO estimates administration costs are $4.6 million over the forward estimates, comprising $4.3 million in operating expenses and $0.3 million in capital expenses (see table below). The breakdown of the $4.6 million in administration costs are as follows:

- Establishment costs of $2.1 million, which is to be incurred in the 12 months leading up to the first auction in September 2020 (apportioned 9 months in 2019-20 and 3 months in 2020-21).
- Auction management expenses of $1.5 million between September 2020 and March 2022, comprising $1.2 million in employee costs and $0.3 million in professional services costs.
- Monitoring, evaluation and compliance costs of $0.6 million, comprising 2 full time equivalent (FTE) staff and professional services costs totalling 5% of overall FTE costs.
- IT systems to manage the auction and compliance functions, totalling $0.2 million in July 2020, plus $50,000 per annum in system refresh costs and depreciation expenses of $60,000 for 2021-22. The July 2020 start date represents when it is operationalised to manage the bids for the first round of auctions in the September 2020 auction.

	2018-19	2019-20	2020-21	2021-22	Total
Average employee cost	150,000	153,750	157,594	161,534	
(Including on-costs and 2.5% indexation)					
1. Establishment costs (Sept 2019 to Sept 2020)					
7 FTE staff		807,188	275,789		**1,082,977**
Professional services fees ($1 million prorated over 12 mths)		750,000	250,000		**1,000,000**
Sub-total					**2,082,977**
2. Auction management (Sept 2020 to Mar 2022)					
5 FTE staff			590,977	605,751	**1,196,728**
Professional services fees ($0.2 million per year prorated over 18 mths)			150,000	150,000	**300,000**
Sub-total					**1,496,728**
3. Monitoring, evaluation and compliance (from Sept 2020)					
2 FTE staff			236,391	323,067	**559,458**
Professional services fees (5% of 7 FTE costs)			41,368	56,537	**97,905**
Sub-total					**657,363**
4. IT costs (from July 2020)					
Establishment and system refreshes			200,000	50,000	**250,000**
Depreciation				60,000	**60,000**
Sub-total					**310,000**
Totals					
Employee-related expenses		807,188	1,103,156	928,818	**2,839,162**
Other operating expenses		750,000	441,368	206,537	**1,397,905**
Depreciation expenses				60,000	**60,000**
Total operating expenditure		**1,557,188**	**1,544,525**	**1,195,355**	**4,297,067**
Total capital expenditure			**200,000**	**50,000**	**250,000**

The above costs assume that the 7 FTE staff will transition from establishment functions to auction management and monitoring, evaluation and compliance functions from September 2020, when the first auction is carried out. For depreciation, the cost estimate is based on the ATO's 4-year depreciation profile for in-house software i.e. 30%/30%/30%/10% over four years.

Notes and costing assumptions continued:

Consistent with the policy, the PBO considers the absorption of administration costs to be feasible. The PBO notes that DPE's budgeted operating expenses (excluding cluster grants) is approximately $1.4 billion for 2018-19. The PBO also notes that after the forward estimates, the administration costs to be absorbed will decrease to $0.5 million per annum, once the auctions have been completed. This represents the ongoing monitoring, evaluation and compliance costs and system-related costs. As such, there is scope for DPE to reprioritise resources to absorb administration costs over the forward estimates and for the duration of this policy.