Document 1

From: (s22)
To: Pearce, Kelly
Subject: FW: FYI - Concentrating Solar Power [DLM=For-Official-Use-Only] [SEC=UNCLASSIFIED]
Date: Thursday, 17 March 2016 5:30:10 PM
Attachments: image001.png
image002.png
image003.png

Just for interest. K

(s22)

Sent: Thursday, 17 March 2016 5:29 PM
(s22) (s22); Black, Wendy;(s22)
Subject: RE: FYI - Concentrating Solar Power [DLM=For-Official-Use-Only] [SEC=UNCLASSIFIED]

(s22) .

(s22) .

New entrant wind and solar PV are more expensive than new entrant coal and gas, and require support if the policy objective is to deliver more renewable into electricity markets. New entrant solar thermal, wave and geothermal require even greater (and different type of support) to bring them to a stage where they are able to compete on a commercial basis.

(s22)

(s22)

(s22)

To: (s22) Black, Wendy;(s22)
Subject: RE: FYI - Concentrating Solar Power [DLM=For-Official-Use-Only] [SEC=UNCLASSIFIED]

All,

(s22) has already completed a 2015 levelised cost assessment of fossil and renewable technologies in South Australia and the NEM. This is attached.

Key charts/tables are below. Solar thermal with storage is estimate as the highest cost form of new entrant electricity generation in SA.

(s22)

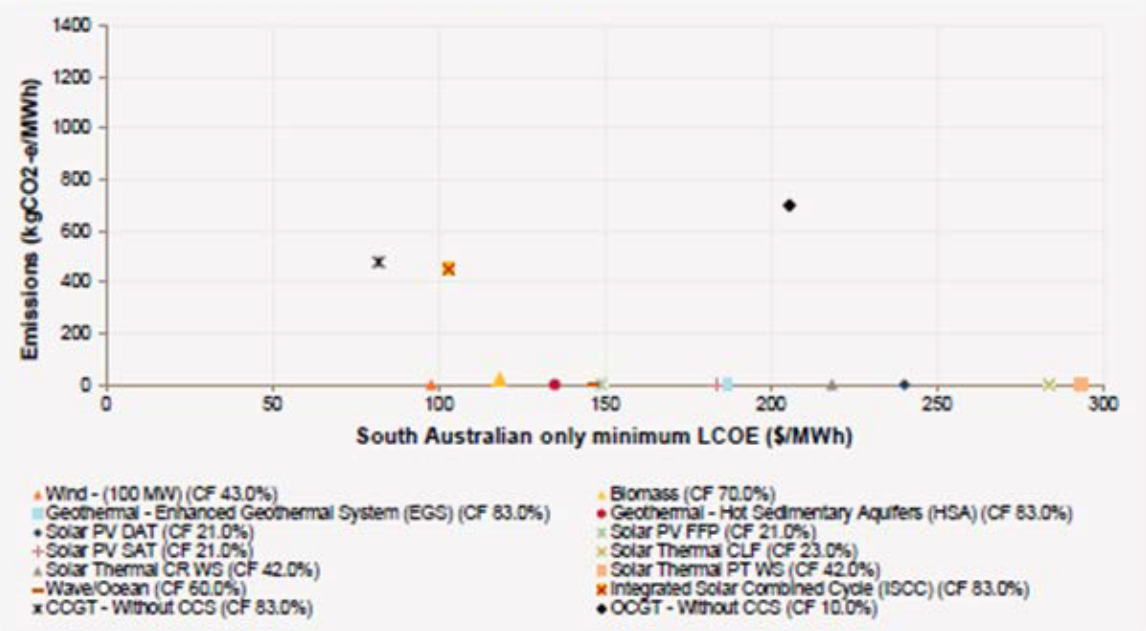
Table 12 LCOE and emissions comparison across technologies (renewables)

Technology	Fuel type	Max Capacity factor (%)	2014		2015	
			CO_2 emissions ($kgCO_2$-e/MWh)	Minimum LCOE ($/MWh sent out)	CO_2 emissions ($kgCO_2$-e/MWh)	Minimum LCOE ($/MWh sent out)
Wind (100 MW)	Wind	43	-	99	-	99
Biomass	Biomass	70	23	100	23	119
Solar PV (FFP)	Solar	21	-	224	-	149
Solar PV (SAT)	Solar	21			-	183
Solar PV (DAT)	Solar	21			-	240
Solar thermal (CR with storage)	Solar	42	-	277	-	218
Solar thermal (CLF)	Solar	23	-	328	-	284
Solar thermal (PT with storage)	Solar	42	-	302	-	294
Wave[157]	Oceanic	60			-	147
Geothermal - HAS	Geothermal	83	-	137		
Geothermal - EGS	Geothermal	83	-	137		

Table 13 LCOE and emissions comparison across technologies (non-renewable)

Technology	Fuel type	Capacity factor (%)	Region	2014		2015	
				CO2 emissions (kgCO2-e/MWh)	Minimum LCOE ($/MWh sent out)	CO2 emissions (kgCO2-e/MWh)	Minimum LCOE ($/MWh sent out)
Open Cycle (OCGT)	Gas	10	SA	700	240	699	205
			NEM	700	240	592	195
Combined cycle (CCGT)	Gas	83	SA	499	101	478	82
			NEM	499	101	405	73
Combined cycle (CCGT – with CCS)	Gas	83	SA	213	140		
			NEM	213	140	97	115
Supercritical (SCPC)	Brown coal	83	SA				
			NEM			1213	91
Supercritical (SCPC – with CCS)	Brown coal	83	SA				
			NEM			175	169
Supercritical (SCPC)	Black coal	83	SA				
			NEM			827	72
Supercritical (SCPC – with CCS)	Black coal	83	SA				
			NEM	123	152	134	140
Supercritical (SCPC – with oxy combustion CCS)	Black coal	83	SA				
			NEM	22	158		
Integrated Gasification and Combined Cycle (IGCC – with CSS)	Black coal	83	SA				
			NEM	150	191		
Integrated solar combined cycle (ISCC)	Gas / Solar	83	SA	446	123	450	103
			NEM	376	112	440	92

Figure 16 South Australia emissions at minimum LCOE



(s22)

From: (s22) on behalf of Philp, Brenton
To: "patrick.suckling@dfat.gov.au"; Pearce, Kelly; Archer, Brad
Cc: Chisholm, James; (s22) ; (s22) ; (s22) ; White, James; (s22) ; (s22) "; O"Toole, James
Subject: CSIRO Low Emissions Technology Roadmap - 2050 scenarios [SEC=DLM, DLM=For-Official-Use-Only]
Date: Friday, 28 October 2016 4:09:42 PM
Attachments: LETR - 2050 abatement v1.pdf
LETR pathways.pdf

Dear Kelly, Brad and Patrick

This is an out-of-session email to seek agreement from steering committee representatives about the Low Emissions Technology Roadmap post 2030 emissions reduction target and to note updated pathways.

(s22)

Updated Pathways

There has also been some evolution to the pathway analysis.

CSIRO have combined Pathways 3 and 4 (see attached Pathways slide), for two key reasons:

1. CSIRO found that wave and biomass which were analysed under Pathway 4 were

unlikely to reach significant scale, leaving Pathway 3 mainly focused on Concentrated Solar Thermal (CST).

2. CST is functionally similar to other baseload/dispatchable energy sources such as High Efficiency Low Emissions (HELE), nuclear and geothermal, and so it makes sense to include it in the same pathway.

s22 [redacted]

[redacted]

(s22) [redacted]

s22 [redacted]

Regards

Brenton Philp
Assistant Secretary
Gas, Governance and International | Energy Division
_____

Department of the Environment and Energy
PO Box 787, CANBERRA, ACT 2601
T: 02 6275 9026 | (s22) [redacted] brenton.philp@environment.gov.au | Environment.gov.au

The Department acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to them and their cultures and to their elders both past and present.

Low Emissions Technology Roadmap: key technologies in each pathway

			Pathways			
			P1. Energy productivity plus	**P2. Variable renewable energy (VRE)**	**P3. Dispatchable power and hydrogen**	**P4. All in**
Key technologies	**Energy productivity**		• Full potential of EP captured through a range of demand-side techs[1]	• BAU progress		• Full potential of EP captured through a range of demand-side techs[1]
	Electricity	**Generation**	• Wind and solar PV (capped at 40%) • Biomass • Gas combined cycle	• Wind and solar PV (no cap) • Wave • Biomass • Gas combined cycle	• As per P1, plus: • CST • HELE + CCSU • Nuclear • Geothermal	• All allowed (no cap on wind and solar PV)
		Enablers		• Storage • Other enabling equipment • DER control technologies • Standalone power systems and microgrids		• As per P2
	Electrification and fuel switching		• Electrification of industrial and building heat (when emissions intensity of grid allows emissions reduction) • Electric vehicles (EVs) and electrification of mobile equipment in mining (switch to conveyors)			
			• Solar thermal heat • Biomass heat			
			• Switch from coal to gas in industrial heat			
			• Switch to gas in freight		• Hydrogen economy e.g. solar fuels, export of hydrogen, FCVs[3]	
			• Next-generation biofuels			
	Other		• Technologies to reduce fugitives from underground coal mines • CCS for vented CO2 in LNG			
					• Other CCSU[2]	

1. E.g. HVAC, appliances, buildings, transport (includes demand reduction and transport mode switching); 2. Bioenergy with CCS (BECSS), hydrogen production from gas/coal, CCS for emissions from direct combustion; 3. Fuel cell vehicles

(s22)

From: (s22)
Sent: Friday, 17 March 2017 2:39 PM
To: (s22)
Cc:
Subject: RE: For input - Corro [DLM=For-Official-Use-Only]

For Official Use Only

Hi (s22)

Suggested words for the corro from (s22) 've asked (s22) s area to provide you some extra words on (s22)

(s22)

(s22)

Geothermal
Energy security is a top priority for the Government. Keeping the lights on and bills down are paramount. My Government is committed to achieving the policy trifecta of affordable, reliable and secure energy, while meeting our substantial global emissions reduction commitments. We are taking a technology agnostic, 'all of the above' approach to energy policy and focusing on the outcomes. I applaud the initiative taken by the (s22) in introducing geothermal energy technology to Western Queensland.

Cheers
(s22)

(s22)

From: (s22)
Sent: Friday, 17 March 2017 12:59 PM
To: (s22)
Subject: FW: For input - Corro [DLM=For-Official-Use-Only]

For Official Use Only

From: (s22)
Sent: Wednesday, 15 March 2017 5:26 PM
To: (s22)
Cc:
Subject: For input - Corro [DLM=For-Official-Use-Only]

For Official Use Only

Hello all,

(s22) (Qld) has written to the PM on a range of issues and the Office has asked us to prepare a response. Grateful if you could consider the attached and provide relevant input (standard words etc) by next **Monday 20 March**. The letter is very scant on detail but would appreciate any input to help build the response.

(s22)

- Attachment on Geothermal Energy — (s22)

(s22)

(s22)

(s22)

(s22)

From: (s22)
Sent: Thursday, 5 January 2017 5:20 PM
To: Pearce, Kelly; (s22)
Subject: Summary of (s22) work on 100% renewables in the NEM ~~[DLM=Sensitive]~~

~~Sensitive~~

All,

This is a quick summary o (s22) research. He has been funded by (s22) to do a feasibility study for 100% renewable energy in the NEM, and these are the preliminary results. Additional research will include energy market impacts, including retail prices.

What the study has looked at

- The study looks at the cost of achieving 100% renewables using only proven technologies – that is, technologies with more than 100 GW of global deployment. This is a very conservative feature of the study – it means that it doesn't rely on technologies for which there's no evidence base for cost and which don't have a pre-existing supply chain.
    - It focusses on solar PV, wind, pumped hydro energy storage (PHES) and a new high voltage DC (HVDC) transmission network.
    - It excludes solar thermal, tidal and geothermal as too speculative, nuclear as lacking social license, new on-river hydroelectricity (there are no more suitable sites) and new biomass (this would come at a cost to food production).

(s22)

(s22) [redacted]

From: (s22) [redacted]
Sent: Thursday, 5 January 2017 5:20 PM
To: Pearce, Kelly; (s22) [redacted]
Subject: Summary of (s22) [redacted] work on 100% renewables in the NEM ~~[DLM=Sensitive]~~

~~Sensitive~~

All,

This is a quick summary of (s22) [redacted] research. He has been funded by (s22) [redacted] to do a feasibility study for 100% renewable energy in the NEM, and these are the preliminary results. Additional research will include energy market impacts, including retail prices.

What the study has looked at

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(s22) [redacted]