

OXYFUEL COMBUSTION											
Date of factsheet	12-8-2020 Sam Lamboo										
Author	CCS										
Sector	CCS										
TS / Non-ETS	ETS										
ype of Technology	CCS										
Description	In this factsheet a generic solution	on to capture CO2	from flue gases	after the comb	ustion of solid	fuels such as co	oal, solid bior	mass and munici	pal solid waste	(MSW) mixe	d with high
	In this factsheet a generic solution to capture CO2 from flue gases after the combustion of solid fuels such as coal, solid biomass and municipal solid waste (MSW) mixed with high purity oxygen in power plants is considered. The combustion with high purity oxygen makes for a high concentration of CO2 in the flue gas (>80%), from which the remaining water										
	vapour is removed by cooling and compressing the gas stream resulting in high purity CO2 (IPCC, 2005). The main cost component is therefore not in the CO2 capture, but in the										
	cryogenic air separation for oxygen production. There may be different requirements for flue gas cleaning depending on the fuel used (dust filters, NOx removal, sulphur scrubbers,										
	etc.) which will influence performance and costs. The performance and cost ranges are considered to be sufficiently close for the variety of solid fuels to group them together in one										
	factsheet.										
	The focus of this factsheet is sole	ely on oxyfuel com	bustion CCS at	power plants op	perating on soli	d fuels. Solid fu	iel power pla	nts without CCS	are used as a r	eference (sur	er)critical
	The focus of this factsheet is solely on oxyfuel combustion CCS at power plants operating on solid fuels. Solid fuel power plants without CCS are used as a reference (super)critical coal/lignite, solid biomass power plant, etc.) and all reported data is relative to the reference plants (e.g. investment costs are additional costs for oxygen production and carbon										
	capture, the reported data does not include investment costs for the power plant itself). Plants can be retrofitted with oxyfuel CCS technology (JRC, 2014).										
	Compression and dehydration ar	•	•	•	•			· ·			
	pressure levels it is possible to tra any additional compression requ	•			•				-		=
	compression costs and energy re					ession will be i	equireu. ITai	isport by pipelin	e is considered	i the deladit (option and
	dempression costs and energy re	iqui emento are tir		idaea iii tiie iae							
RL level 2020	TRL 7										
	Oxyfuel power pilot plants with t	hermal power of 1	L5 and 30 MWt	h are being test	ed. Cryogenic a	air separation u	ınits are a ma	ature technology	. (Kotowicz et	al., 2019; IEA	GHG, 2014a)
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ECHNICAL DIMENSIONS											
	Functional Unit	t				V	alue and Ran	nge			
apacity	Mton CO2/year					3.90					
				3.00			-			5.50	
	EU	Gton CO2		Current			2030			2050	
otential				300.00			-	1		-	1
Andret al		24	300.00	-	300.00	Min	-	Max	Min	-	Max
Market share	0	%	8.4*	-	0.0	8.61	-	ρ. σ	n a*	-	
			Min	_	Max	Min	_	Max	Min	-	Max
apacity utlization factor	7.500.0.000								-		
ull-load running hours per year	7,500-8,000										
nit of Activity	Mton/year										
nit of Activity echnical lifetime (years)	30-40 (IPCC 2005)										
Init of Activity echnical lifetime (years) rogress ratio	30-40 (IPCC 2005) 0.99-0.80 (Rubin et al 2015b)										
Init of Activity echnical lifetime (years) rogress ratio Iourly profile	30-40 (IPCC 2005) 0.99-0.80 (Rubin et al 2015b) No	s on many factors	such as size of i	nower plant car	nture rate etc	Value and ran	ge given here	e are for oxyfuel	coal nower pla	ints (500MW-	1GW
nit of Activity echnical lifetime (years) rogress ratio ourly profile	30-40 (IPCC 2005) 0.99-0.80 (Rubin et al 2015b) No Annual capture capacity depends	•	•					•		nts (500MW-	1GW
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a a section floring			A dia	- I	A A any	A Air	-	1.4574	A 4:	- T	A A CIV	
Material flows			Min	_	Max	Min	_	Max	Min	_	Max	
			Min	<u>-</u>	May	Min	<u>-</u>	1 1/04	Min	<u>-</u>	May	
Material flows explanation			Min	_	Max	Min	_	Max	Min	_	Max	
•	ated emissions or emissions reduction	oc (o a CCS)										
EIVIISSIONS (NOII-IUCI/ CITCISY-ICI	Substance			Current			2030			2050		
	CO2	ton/MWhe				-			-			
		(011) 1011111	-1.00	-0.92	-0.82	Min	_	Max	Min	<u> </u>	Max	
		+	2.00	-	J 0.02		<u>-</u>	11161.		-	171900	
Emissions			Min	_	Max	Min	_	Max	Min	_	Max	
				-	<u>I</u>		-	<u> </u>		-		
			Min	_	Max	Min	_	Max	Min	_	Max	
				-	<u>I</u>		-	<u> </u>		-		
			Min	_	Max	Min	-	Max	Min	_	Max	
	The inclusion of CCS reduces CC	O2 emissions from a	plant. Referen	ce is a supercr	itical pulverised	l coal (SCPC) po	wer plant wit	h no CCS. 90-989	% CO2 reduction	on assumed (Ri	ubin et al.,	
OTHER												
OTHER Parameter	Unit			Current			2030			2050		
Parameter				Current 0.92			2030			2050		
Parameter	Unit % CO2 captured		0.90		0.98	Min		Max	Min	2050	Max	
Parameter Capture rate				0.92 - -	I		-			- -	_ L	
Parameter Capture rate			0.90 <i>Min</i>	0.92	0.98 <i>Max</i>	Min Min	- -	Max Max	Min Min	-	Max Max	
Parameter Capture rate			Min	0.92 - - - -	Max	Min	- - - -	Max	Min	- - -	Max	
Parameter Capture rate				0.92 - - - - -	I		- - -			- - -	_ L	
Parameter Capture rate			Min Min	0.92 - - - - -	Max Max	Min Min	- - - -	Max Max	Min Min	- - -	Max	
	% CO2 captured	able to capture nea	Min Min Min	0.92 - - - - - -	Max Max	Min Min Min	- - - - - -	Max Max	Min Min Min	- - - - - -	Max Max	
Parameter Capture rate		•	Min Min Min arly all of the Co	0.92 - - - - - - D2 produced. H	Max Max Max However, the ne	Min Min Min	- - - - - -	Max Max	Min Min Min	- - - - - -	Max Max	
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Mantripragada, Zhai and Rubin (2019). Boundary dam or Petra Nova - Which is a better model for CCS energy supply?