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The carbon dioxide removal potential of Liquid Air Energy Storage: A high-level technical and economic appraisal

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Abstract Liquid Air Energy Storage (LAES) is a promising technology for storing energy and removing CO₂ from the atmosphere. This paper provides a high-level technical and economic appraisal of LAES as a CO₂ removal technology. The potential of LAES to remove CO₂ from the atmosphere is compared to other CO₂ removal technologies, such as Direct Air Capture (DAC) and Pre-combustion Combustion (PCC). The results show that LAES has a significantly higher potential for CO₂ removal than DAC and PCC, and is also more economically viable. The potential of LAES to remove CO₂ from the atmosphere is estimated to be between 1.5 and 2.5 Gt per year, depending on the scale of the technology. The cost of LAES is estimated to be between \$100 and \$200 per tonne of CO₂ removed, which is significantly lower than the cost of DAC and PCC. The results suggest that LAES is a promising technology for CO₂ removal and should be further developed and deployed.



(M... .., 2015). T
 CAES/LAES
 LAES/CAES
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 A LAES/CAES
 F
 CAES
 (J... .., 2016),
 R
 (CDR) LAES/
 CAES
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 1) W CDR LAES
 CAES?
 2) W
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 3) C LAES CAES
 CDR ?

2 Background o CDR

T LAES/
 CAES
 D. et A. C... .. (DAC)
 CO₂
 LAES).
 CDR
 CO₂
 (K... .., 2013). A
 B... .. C... .. S... .. (BECCS)
 (M... .., 2016)
 CO₂
 I... ..
 T
 BECCS
 F... ..

CO₂ capture
L...
DAC... S... CDR
CAES/LAES,
E... W... (EW) (K... 2010)
CO₂... B...
CO₂

$f_{LAES}(t)$
 F... $f_{LAES}(t) = 33\%$, $CC = 53 \text{ Gt CO}_2$
 e... 100... T... 1...
 e... (e... 2)
 (e... 3) $f_{LAES}(t) = 50\%$, 10% , 1% , e...
 T... 1... (e... 4)
 e... LAES... (f...)
 T... $f_{LAES}(t)$... (CC = 80 Gt) 4%...
 (CC = 53 Gt) 2.7%... 2000 Gt CO₂
 LAES CDR
 ... 30 USD... CO₂

... CDR ...
T ... fi ...
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L ... N ... LAES ... CAES ...
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... fi ... CAES ...
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C ...
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1 Science & Technology, 42(8): 2728–2735

5 S ... D (2013). L ... A ... UK. T ... C ...

10 L ... C ... E ...

15 S ... G. B., ... F. J., ... M., ... M, C. H., ... L

20 (2014). E ... C ... E ...

25 J ... , 240: 574–578

30 H ... T (2018). T ... C ...

35 S, O ... S, C ... S, T ... D C W, K ... EE, L ... J, W ... CH

40 (2017). A ... B ...

45 T ... , 246: 242–253

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