

# Decarbonization using 45Q Federal tax credits

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*Southern Company*

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# 45Q Tax Credit for CO<sub>2</sub> Storage in Geological Formations

## *Pre-Act 45Q Projects v. Post-Act 45Q Projects*



	Pre-Act Projects	Post-Act Projects
Non-EOR	<ul style="list-style-type: none"><li>• \$20/T + inflation (\$22.66/T)**</li><li>• 75 million ton limit for EOR and non-EOR combined*</li><li>• Power, Industrial but goes to the entity that captures the CO<sub>2</sub></li></ul>	<ul style="list-style-type: none"><li>• \$22.66/T → \$50/T over 10 years** + inflation after 10 year period</li><li>• 12-year credit</li><li>• Power, Industrial, direct air capture, and credit can be transferred</li><li>• CO<sub>x</sub></li></ul>
EOR	<ul style="list-style-type: none"><li>• \$10/T + inflation (\$12.83/T)**</li><li>• 75 million ton limit for EOR and non-EOR combined*</li></ul>	<ul style="list-style-type: none"><li>• \$12.83/T → \$35/T over 10 years** + inflation after 10 year period</li><li>• 12-year credit</li><li>• Applies to: EOR, EGR, photosynthesis, chemosynthesis, chemical conversion, &amp; other commercial use</li></ul>

\*Credit expires when 75 million total load claimed \*\*10 year linear progression from 2017 to 2026

# Overview of Post-Act 45Q Tax Credit



- **Bad things -**
  - January 1, 2014
  - Legal issues with RR reporting associated with CO<sub>2</sub>-EOR (revenue positive outside of tax equity is a plus)
  - Challenging offtake agreements: generator must rely on the storage operator to pay or take and certify the tax credit
- **Good things -**
  - Includes small facilities - if emitting  $\leq 500,000$  tpy CO<sub>2</sub>, must capture  $\geq 25,000$
  - Includes direct air capture and CO<sub>2</sub> utilization
  - Class VI wells are basically RR compliant to receive the credit
- **Really good things -**
  - Increase to \$35 and \$50 and transferability of the credit
  - Drives advanced R&D and promotes interest from a wide range of new stakeholders
  - Treasury Request for Information (RFI)
  - Upfront capital is being offered up by tax equity investors

# Reconsidering CCUS in the electricity industry under 45Q tax credits



- Adding PCC to new coal plants is economically viable under the existing version of 45Q
- Extending the availability of the tax credit to 20 years enables retrofitting existing coal plants with PCC and adding new PCC to NCCC plants to be economically viable
- Retrofitting existing NGCC plants with PCC will require additional incentives and/or requiring additional capture costs reductions with R&D
- A key issue in our modeling is source - sink matching including low-cost geologic storage with a modest transportation element
- 45Q can results in increasing EGU dispatching over other assets

# Illustrative Example: Cost-effectiveness of Electricity Generation With and Without CO<sub>2</sub> Capture and Valuation



	Coal-Fueled Unit			Natural Gas-Fueled Unit		
	No Capture	Capture	Capture \$50/tonne value	No Capture	Capture	Capture \$50/tonne value
Heat Rate (MMBtu/MWh)	10	13	13	6	8	8
Cost of Fuel (\$/MMBtu)	2	2	2	3	3	3
Cost of Fuel (\$/MWh)	20	26	26	18	24	24
Variable O&M (\$/MWh)	5	6	6	3	4	4
<b>Total Incremental Cost (\$/MWh)</b>	<b>25</b>	<b>32</b>	<b>32</b>	<b>21</b>	<b>28</b>	<b>28</b>
CO <sub>2</sub> emissions (tonne/MMBtu)	0.09	0.09	0.09	0.05	0.05	0.05
CO <sub>2</sub> capture (tonne/MWh)*	-	1.09	1.09	-	0.38	0.38
Value of captured CO <sub>2</sub> (\$/MWh)**	-	-	54	-	-	19
Value of electricity when generating (\$/MWh)	30	35	25	25	30	25
<b>Net margin when generating (\$/MWh)</b>	<b>5</b>	<b>3</b>	<b>47</b>	<b>4</b>	<b>2</b>	<b>16</b>
Generation of Electricity (MM MWh/yr)	2	1	3	2	1.5	3
<b>Net margin (million \$ / yr)</b>	<b>10</b>	<b>3</b>	<b>140</b>	<b>8</b>	<b>3</b>	<b>48</b>
Change in net annual margin relative to <i>No Capture</i> (million \$ / yr)		-7	+130		-5	+40
<b>Discounted value of 12 years of capture with \$50 CO<sub>2</sub> value (billion \$)</b>			\$1.1			\$0.34
*CO <sub>2</sub> capture (tonne/MWh) = 0.9 capture rate * CO <sub>2</sub> emissions (tonne/MMBtu) * Heat Rate (MMBtu/MWh)						
**Value of captured CO <sub>2</sub> (Sec. 45Q tax credit of \$50/tonne) per \$/MWh = (CO <sub>2</sub> capture (tonne/MWh) * Tax Credit (\$/tonne))						
Captured CO <sub>2</sub> (MM tonne/yr).	-	1.09	3.3	-	0.57	1.15