



CLIMATE
ACTION
RESERVE

Low-Carbon Cement Protocol Version 1.0

Public Comment Webinar

August 25, 2023

Housekeeping

- All attendees are in listen-only mode but will be unmuted for the Q&A at the end of the session – please use the raise hand function
- We will be happy to take questions throughout the session – please use the Q&A chat box to place your question
- We will follow up via email to answer any significant questions not addressed during the meeting
- The slides and a recording of the presentation will be posted online

Agenda



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- Introductions
- Protocol Development Process
- Protocol Overview
- Question, comments, and next steps



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INTRODUCTIONS

Climate Action Reserve



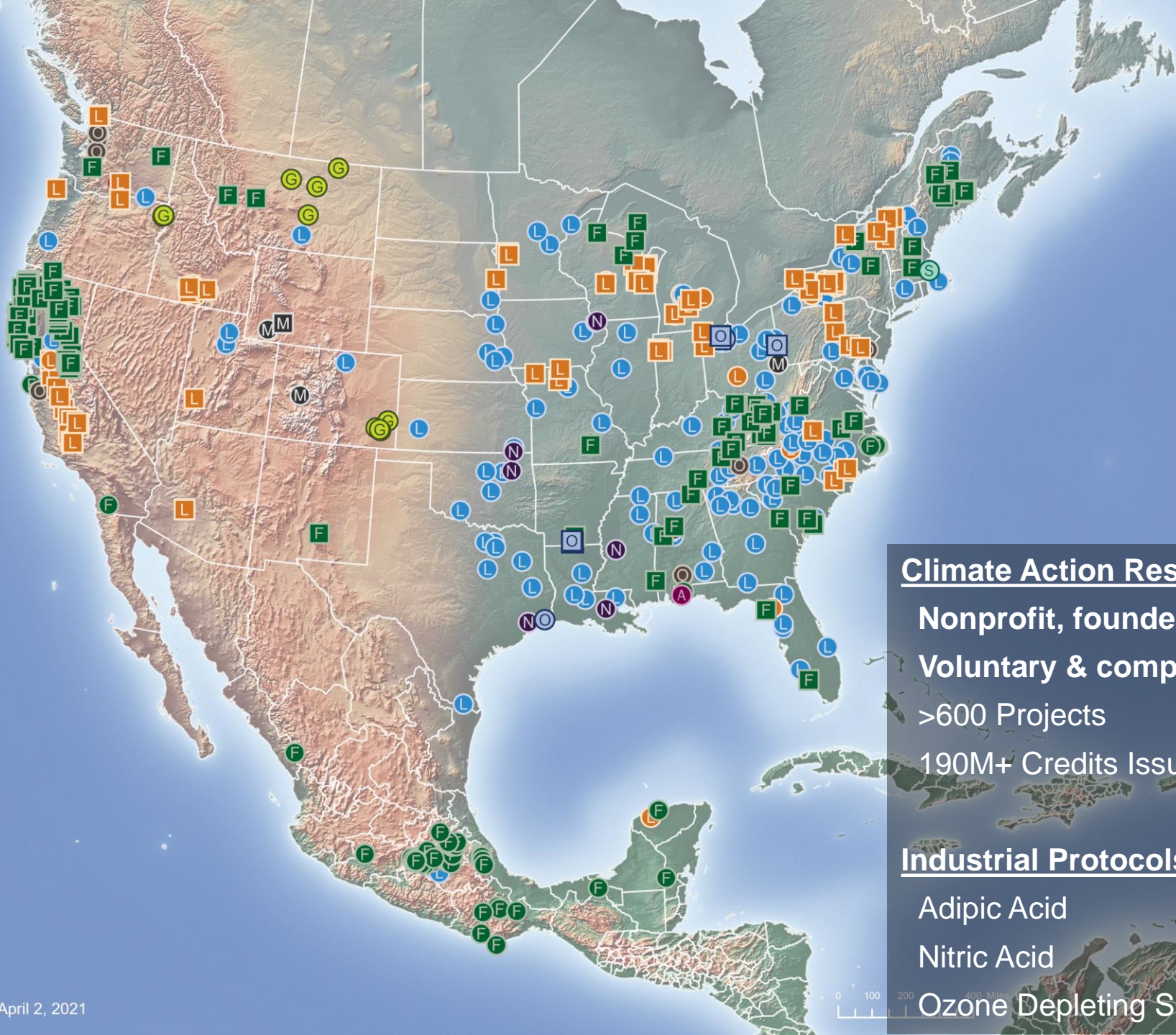
- Mission: to develop, promote and support innovative, credible market-based climate change solutions that benefit economies, ecosystems and society
- Develop high-quality, stakeholder-driven, standardized carbon offset project protocols across North America
- Accredited Offset Project Registry under the California cap-and-trade program and Washington cap-and-invest program
- Serve compliance and voluntary carbon markets
- Reputation for integrity and experience in providing best-in-class registry services for offset markets
- Based in Los Angeles, CA



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- A Adipic Acid
- F Forest
- F Forest (ARB)
- G Grassland
- L Landfill
- L Livestock
- L Livestock (ARB)
- M Mine Methane
- M Mine Methane (ARB)
- N Nitric Acid Production
- O Organic Waste Composting
- O Organic Waste Digestion
- O Ozone Depleting Substances
- O Ozone Depleting Substances (ARB)
- S Soil Enrichment

Listed, Registered, Transitioned, & Completed Projects as of April 2, 2021



Climate Action Reserve

Nonprofit, founded 2001

Voluntary & compliance

>600 Projects

190M+ Credits Issued

Industrial Protocols

Adipic Acid

Nitric Acid

Ozone Depleting Substances



Workgroup Members

| Name (Alphabetical) | Organization |
|-------------------------|--|
| Craig Ebert | Climate Action Reserve (President) |
| McKenzie Smith | Climate Action Reserve (Protocol Development Lead) |
| David Bangma | Ash Grove |
| Jamie Meil | Athena Institute |
| James Salazar | Athena Institute (Alternate) |
| Seth Baruch | Carbonomics |
| Ram Verma | CDWR |
| Lauren Mechak | ClimeCo |
| Kayla Carey | ClimeCo (Alternate) |
| Danny Gray | Eco Material Technologies |
| James Carusone | Eco Material Technologies (Alternate) |
| Gaurav Sant | Institute for Carbon management UCLA |
| David Perkins | Heidelberg Materials |
| Adam Swercheck | Heidelberg Materials |
| Matthew Lemay | National Ready Mix Concrete Association |
| Thomas Van Dam | Wiss, Janney, Elstner Associates, Inc. |
| Christina Theodoridi | NRDC |
| Lauren Kubiak | NRDC (Alternate) |
| Jamie Farny | Portland Cement Association |
| Eric Giannini | Portland Cement Association (Alternate) |
| Miguel Angel Freyermuth | Ruby Canyon Environmental |
| Jimmy Knowles | SEFA Group |

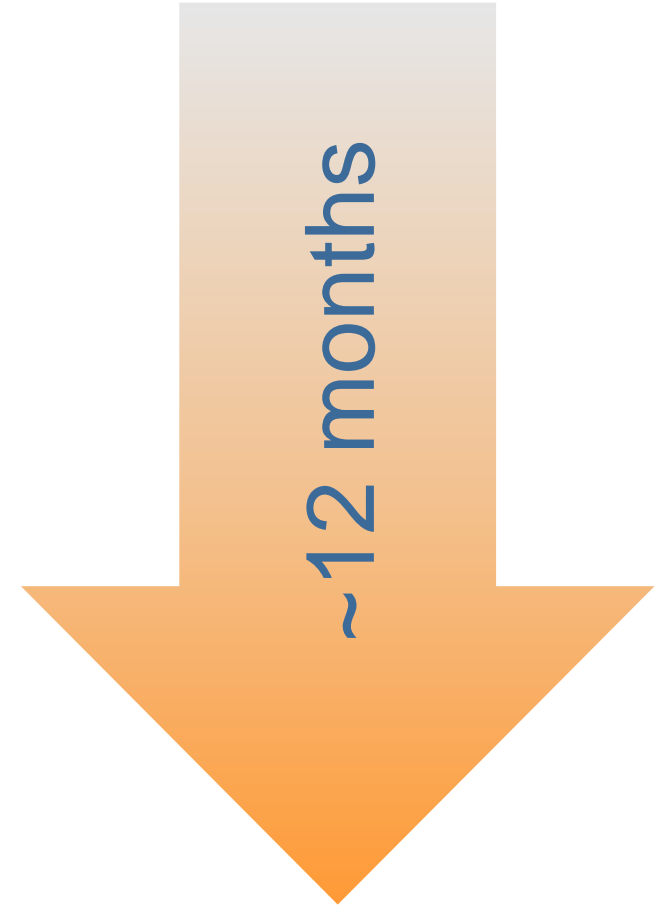


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PROTOCOL DEVELOPMENT PROCESS

Protocol Development Timeline

- Kick-off Meeting (November 3, 2022)
- Workgroup Meetings (December 2022 – April 2023)
 - Workgroup meeting #1 (December 19, 2022)
 - Workgroup meeting #2 (January 20, 2023)
 - Workgroup meeting #3 (February 17, 2023)
 - Workgroup meeting #4 (March 17, 2023)
 - Workgroup meeting #5 (April 19, 2023)
- Public Comment Period
 - Finalizing draft protocol (April – August 2023)
 - 30-day Public Comment Period (August 9, 2023 – September 8, 2023)
 - **Public Comments due 6pm PST Friday September 8, 2023**
 - Public Comment Webinar (August 25, 2023)
- Board adoption (TBD – October 4th, 2023)





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PROTOCOL OVERVIEW

Key considerations for protocol development

1) Introduction

2) Project Definition

- Activities, ownership, etc

3) Eligibility

- Start date, crediting period, additionality, etc

4) GHG Assessment Boundary

5) Quantification

- Baseline modeling approaches, Project emissions, etc

6) Monitoring

- Monitoring parameters, requirements for quantity and quality of data, etc

7) Reporting

- Documentation, reporting periods

8) Verification

- Monitoring plan, verification activities

9) Glossary

10) References

- Appendix A: Development of a Performance Standard Threshold
- Appendix B: Developing a Legal Requirement Test
- Appendix C: Development of Conservative Regional Emission Factors for PC Production

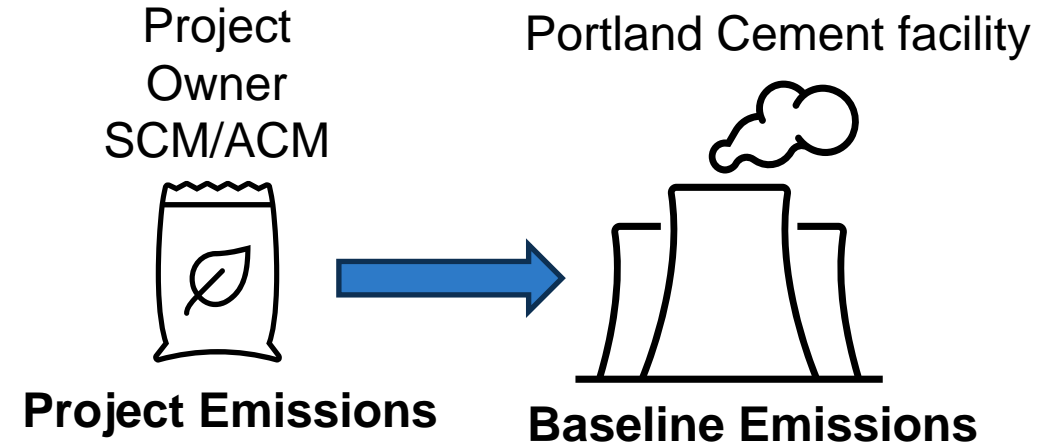
- Cement production is one of the largest sources of greenhouse gas (GHG) emissions, accounting for **approximately 7% of all global carbon dioxide (CO₂) emissions.**
- **Clinker**, the primary intermediary component of portland cement, is produced when limestone or clay undergoes calcination, which can only be achieved with extremely high temperatures. **Most cement manufacturing emissions can be attributed to this process.**
- Byproducts currently unused or naturally derived supplementary cementitious materials (SCMs) or alternative cementitious materials (ACMs) have the **potential to partially or fully replace clinker in cement production** and lower overall emissions.
- Due to limited and shrinking supply of traditional SCM, incentives may be necessary to **increase production of new SCMs to replace portland cement.**

Section 2.2: Project Definition

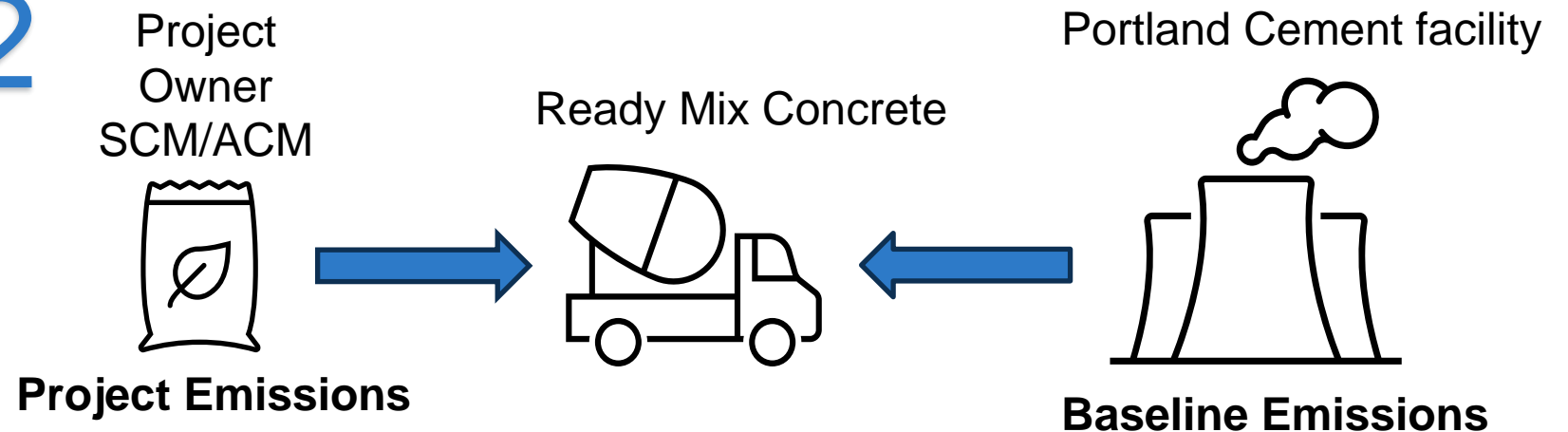
- For the purpose of this protocol, the GHG reduction project is defined as:
 1. the manufacturing of SCMs or ACMs that can partially or fully replace PC;
and
 2. the avoidance of GHG emissions from PC production.
- Attestation of SCM/ACM Use and sales receipts will be verified to provide reasonable assurance that the SCM/ACM has been purchased to displace PC.

Section 2.3: The Project Owner

Scenario 1



Scenario 2



3.0 Eligibility Rules

3.1 Location - All phases of sourcing, production, and end use of the SCM/ACM must occur in the United States, U.S. tribal lands and territories

3.2 Project Start Date – Date which SCM/ACM production commences with a start-up period



3.3 Project Crediting Period – 10 years (one renewal CP allowed)

3.0 Eligibility Rules

3.4 Additionality

3.4.1 Performance Standard Test

- Ineligible projects include *fresh* fly ash, slag, silica and portland limestone cement
- Fresh vs. harvested ash – must show processing to meet ASTM specifications
- Project Developer must demonstrate that the usage rate of the novel SCM/ACM in concrete is either near zero (first-of-its kind) or is less than 5% of the cementitious materials market in the U.S.

3.4.2 Legal Requirement Test

- No federal regulations related to SCM/ACM production or cement manufacturing
- North Carolina Coal Act for harvested ash
- Caltrans requirements for % SCM inclusions
- Cap-and-Trade regulates PC manufacturing

3.5 Regulatory Compliance - Attestation of Regulatory Compliance

3.0 Eligibility Rules

3.6 Quality Standards

| <u>Eligible SCM/ACM /ACM</u> | <u>ASTM Standard Specifications</u> |
|--|---|
| Beneficiated ash | C618-23ε1: Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete |
| Natural pozzolans | C618-23ε1: Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete |
| Ground glass pozzolans | C1866/C1866M – 22: Standard Specification for Ground-Glass Pozzolan for Use in Concrete |
| Calcined clays/shale and/or metakaolin | C618-23ε1: Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete |
| Limestone calcined clay cements (LC3) | C595/C595M – 21: Standard Specification for Blended Hydraulic Cements (or C1157/C1157M) |
| CO ₂ / Biochar | Standard Specification for Cement that Hardens by Carbonation (in development) |
| Blends (including an eligible SCM/ACM) | C595/C595M – 21: Standard Specification for Blended Hydraulic Cements (or C1157/C1157M) |
| Manufactured ACMs | C989: Standard Specification for Slag Cement for Use in Concrete and Mortars* |
| Other artificial pozzolans or treated calcined materials (including rice husk ash) | ** |
| Other waste by-products (including Bauxite residue (Red Mud), lime kiln dust, or cement kiln dust) | ** |
| Hydroxide products (including (Ca(OH) ₂) and (Mg(OH) ₂)) | ** |

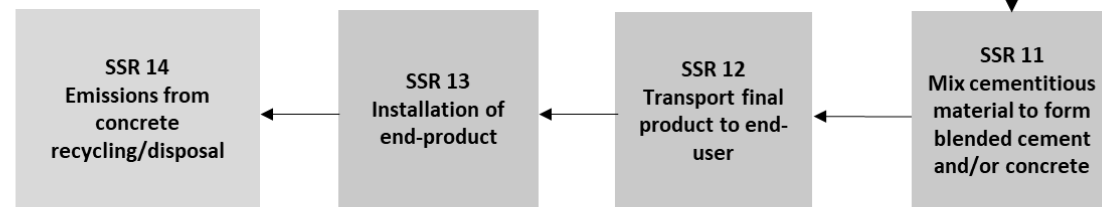
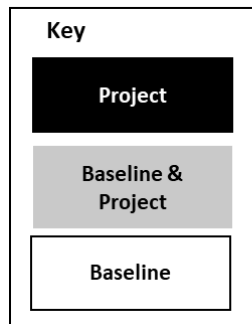
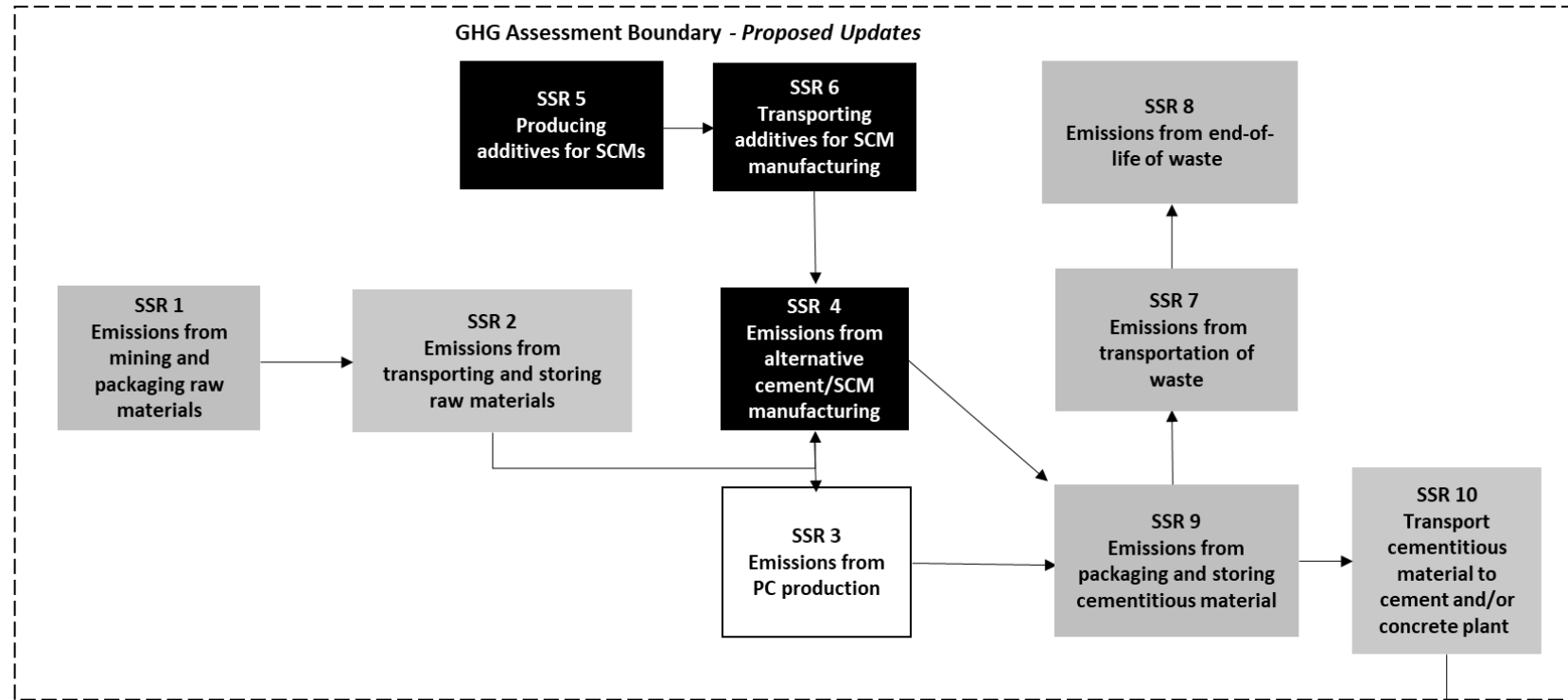
Eligibility Rules

3.6 Quality Standards – Beneficiated Ash

| Chemical Requirement | Before Processing | After Processing |
|---|--------------------------|-------------------------|
| Silicon dioxide (SiO ₂) plus aluminum oxide (Al ₂ O ₃) plus iron oxide (Fe ₂ O ₃) | <50.0% | >50.0% |
| Sulfur trioxide (SO ₃) | >5.0% | <5.0% |
| Moisture content | >3.0% | <3.0% |
| Loss on ignition | >6.0% | <6.0% |

| Physical Requirement | Before Processing | After Processing |
|---|---------------------------------------|------------------------------|
| Fineness (wet-sieved, retained on 45- μ m (No. 325) sieve) | >34% | <34% |
| (retained on 150- μ m (No. 100) sieve). Only applies to harvested coal ash or coal ash containing bottom ash. | > 10% | < 10% |
| Strength activity index | <75% of control at both 7 and 28 days | > 75% at either 7 or 28 days |
| Water requirement, max, percent of control | >105% | <105% |
| Uniformity Requirements <ul style="list-style-type: none"> - Density, max variation from average - Percent retained on 45-μm (No. 325) | >5% | <5% |

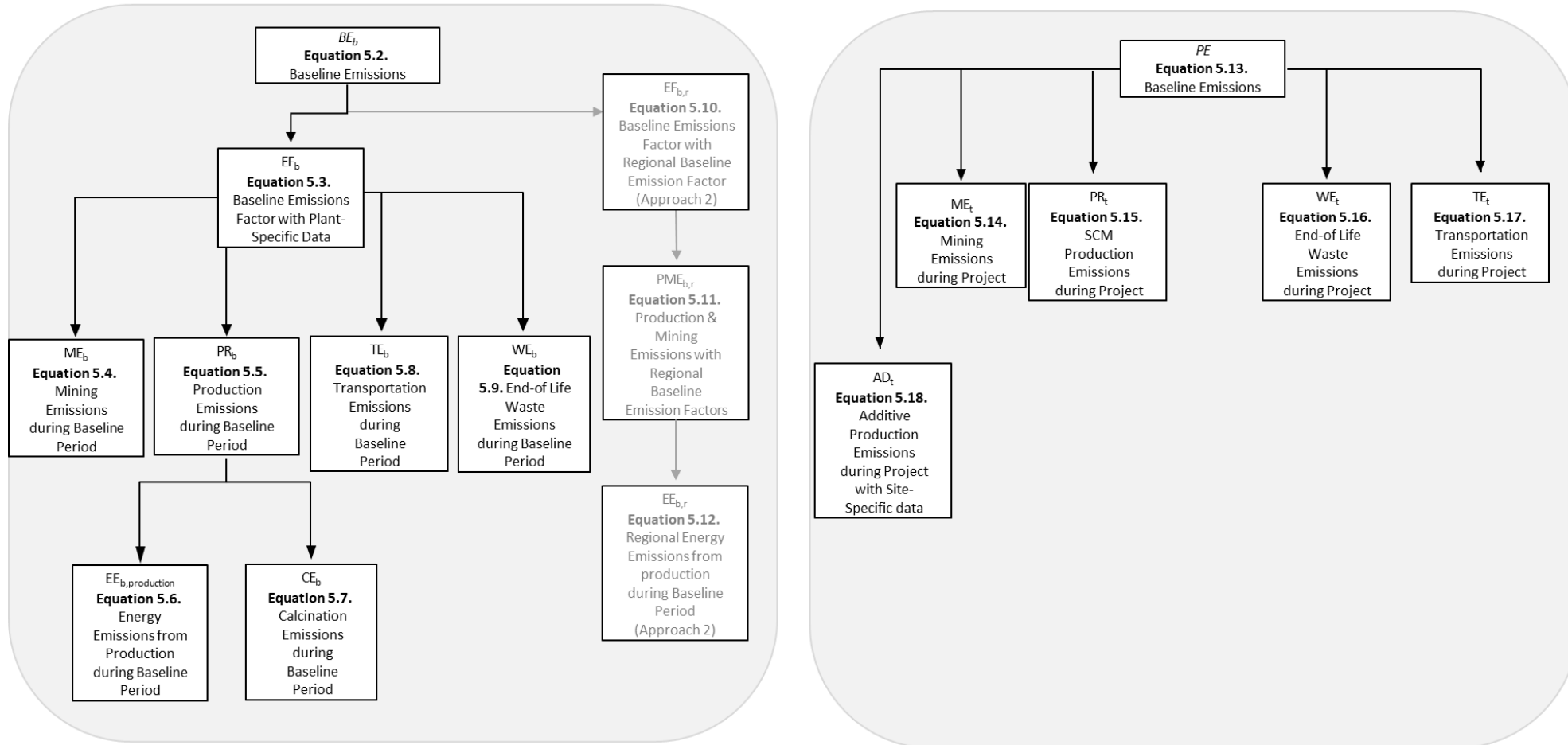
4.0 GHG Assessment Boundary



5.0 Quantification Overview



ER
Equation 5.1.
Emission Reductions = Baseline Emissions - Project Emissions



5.0 Quantification

Equation 5.1. Calculating GHG Emission Reductions

$$ER = BE - PE$$

Where,

Units

| | | |
|-----------|--|--------------------|
| <i>ER</i> | = Total emission reductions for reporting period. | tCO ₂ e |
| <i>BE</i> | = Total baseline emissions from all SSRs in the GHG Assessment Boundary, see Equation 5.2. | tCO ₂ e |
| <i>PE</i> | = Total project emissions from all SSRs in the GHG Assessment Boundary, see Equation 5.9. | tCO ₂ e |

5.0 Quantification – Project Emissions

Equation 5.14. Quantifying Project Emissions for SCM/ACM Manufacturing

$$PE_{\square} = \sum_s ME_{t,s} + PR_{t,s} + TE_{t,s} + WE_{t,s} + AD_{t,s}$$

Where,

| | | <u>Units</u> |
|------------|---|--------------------|
| PE | = Project emissions for SCM/ACM manufacturing during the reporting period | tCO ₂ e |
| $ME_{t,s}$ | = Mining emissions for SCM/ACM manufacturing during the reporting period for all eligible SCM/ACM "s" | tCO ₂ e |
| $PR_{t,s}$ | = Production emissions for SCM/ACM manufacturing during the reporting period for all eligible SCM/ACM "s" | tCO ₂ e |
| $TE_{t,s}$ | = Transport emissions for SCM/ACM inputs to manufacturing, storage, additives, delivery, and waste during the reporting period for all eligible SCM/ACM "s" | tCO ₂ e |
| $WE_{t,s}$ | = End-of-life of waste emissions generated during SCM/ACM manufacturing | tCO ₂ e |
| $AD_{t,s}$ | = Additive production emissions for SCM/ACM manufacturing during the reporting period | tCO ₂ e |

5.0 Quantification – Project Emissions

Equation 5.15. Quantifying Mining Emissions for SCM/ACM Manufacturing

$$ME_t = (EL_{t,mining,grid} \times EF_{t,mining,grid}) + (FC_{t,mining} \times EF_{t,mining,fuel})$$

Where,

| | | <u>Units</u> |
|----------------------|--|-----------------------------|
| ME_t | = Mining emissions for inputs to SCM/ACM manufacturing during the reporting period | tCO ₂ e |
| $EL_{t,mining,grid}$ | = Grid electricity consumption for SCM/ACM mining during the reporting period | kWh |
| $EF_{t,mining,grid}$ | = CO ₂ emission factor for grid electricity consumed during mining in the reporting period from the most recent EPA eGRID emission factor publication. ³⁴ Projects shall use the annual total output emission rates for the subregion where the project is located | tCO ₂ /kWh |
| $FC_{t,mining}$ | = Fuel consumption for SCM/ACM mining during the reporting period | t of fuel |
| $EF_{t,mining,fuel}$ | = CO ₂ emission factor for fuel consumed during the reporting period from the most recent EPA Emission Factors for Greenhouse Gas Inventories. ³⁵ Projects shall use the CO ₂ factor for the appropriate fuel type | tCO ₂ /t of fuel |

5.0 Quantification – Project Emissions

Equation 5.16. Quantifying Production Emissions for SCM/ACM Manufacturing

$$PR_{t,s} = (EL_{t,production,grid} \times EF_{t,production,grid}) + (FC_{t,production} \times EF_{t,production,fuel})$$

Where,

| | | <u>Units</u> |
|--------------------------|--|-----------------------------|
| $PR_{t,s}$ | = Production emissions for SCM/ACM manufacturing during the reporting period | tCO ₂ e |
| $EL_{t,production,grid}$ | = Grid electricity consumption for SCM/ACM manufacturing during the reporting period | kWh |
| $EF_{t,production,grid}$ | = CO ₂ emission factor for grid electricity consumed during the reporting period from the most recent EPA eGRID emission factor publication. ³⁶ Projects shall use the annual total output emission rates for the subregion where the project is located | tCO ₂ /kWh |
| $FC_{t,production}$ | = Fuel consumption for SCM/ACM production during the reporting period | t of fuel |
| $EF_{t,production,fuel}$ | = CO ₂ emission factor for fuel consumed during the reporting period from the most recent EPA Emission Factors for Greenhouse Gas Inventories. ³⁷ Projects shall use the CO ₂ factor for the appropriate fuel type | tCO ₂ /t of fuel |

5.0 Quantification – Project Emissions

Equation 5.17. Quantifying End-of-Life Waste Emissions from SCM/ACM Manufacturing

$$WE_{t,s} = \sum_s qw_{t,s} \times EF_{t,s,waste}$$

Where,

| | | | |
|----------------------|---|---|------------------------------------|
| $WE_{t,s}$ | = | End-of-life waste emissions generated during SCM/ACM manufacturing | <u>Units</u> tCO ₂ e |
| $qw_{t,s}$ | = | Quantity of waste generated during SCM/ACM manufacturing | t |
| $EF_{t,s,transport}$ | = | CO ₂ emission factor for end-of-life of waste from the most recent ecoinvent or similar database. ³⁸ Projects shall use the CO ₂ factor for the appropriate disposal method (landfill, incineration, recycling | tCO ₂ /t |

5.0 Quantification – Project Emissions

Equation 5.18. Quantifying Transportation Emissions for SCM/ACM Manufacturing and Delivery

$$TE_{t,s} = \sum_s d_{t,s} \times EF_{t,s,transport}$$

Where,

| | | <u>Units</u> |
|----------------------|---|------------------------|
| $TE_{t,s}$ | = Transport emissions for SCM/ACM inputs to manufacturing, storage, additives, delivery and waste during the reporting period for all eligible SCMs/ACMs "s" | tCO ₂ e |
| $d_{t,s}$ | = Distance traveled for SCM/ACM manufacturing and delivery during the reporting period (in gallons, miles, etc) | unit |
| $EF_{t,s,transport}$ | = CO ₂ emission factor for mode of transport during the reporting period from the most recent EPA Emission Factors for Greenhouse Gas Inventories. ⁴⁰ Projects shall use the CO ₂ factor for the appropriate transportation mode | tCO ₂ /unit |

5.0 Quantification – Baseline (Approach 1)

Plant Specific Information

Equation 5.2. Quantifying Total Baseline GHG Emissions

$$BE = (Q_b \times R_b \times EF_b)$$

Where,

| | | <u>Units</u> |
|-----------------------|--|--------------------------------|
| <i>BE</i> | = Total baseline emissions for the reporting period, from all SSRs in the GHG Assessment Boundary. | tCO ₂ e |
| <i>Q_b</i> | = Total quantity of PC that would have been produced during the reporting period. | tonnes |
| <i>R_b</i> | = PC to SCM/ACM weight adjustment factor in percent during the reporting period. | percent |
| <i>EF_b</i> | = CO ₂ emission factor for PC production during the reporting period. | tCO ₂ e/tonne of PC |

5.0 Quantification – Baseline (Approach 1)

Plant Specific Information

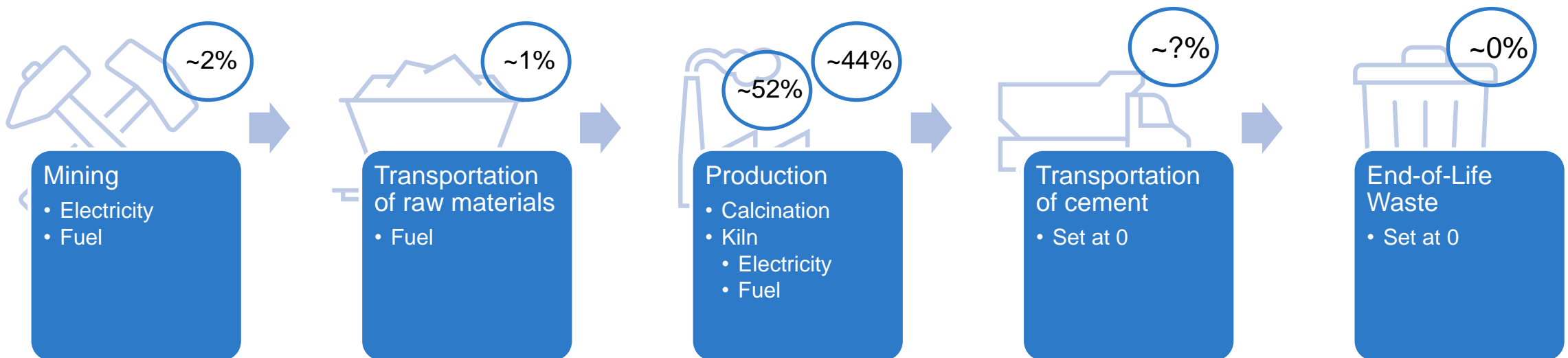
Equation 5.3. Quantifying Baseline Emission Factor from Plant-Specific Data

$$EF_b = \frac{(ME_b + PR_b + TE_b + WE_b)}{Q}$$

| <i>Where,</i> | | <u>Units</u> |
|---------------|--|-----------------------------------|
| EF_b | = CO ₂ emission factor for PC production during the look-back period. | tCO ₂ e/tonne of PC |
| ME_b | = Mining emissions for PC production during the look-back period. | tCO ₂ e |
| PR_b | = Production emissions for PC production during the look-back period. | tCO ₂ e |
| TE_b | = Transport emissions for PC production during the look-back period. | tCO ₂ e |
| WE_b | = End-of-life waste emissions for PC production during the look-back period. | tCO ₂ e |
| Q | = Quantity of PC produced during the look-back period. | Tonnes |

5.0 Quantification – Baseline (Approach 2)

- If plant specific PC baseline information is not available to the project developer, a regional approach may be used
- The Reserve worked with the Portland Cement Association to include the most granular and up-to-date regional energy consumption use data for PC across the U.S.
- The approach is both regional for electricity and fuel consumption and conservative as it excludes minor emission sources



5.0 Quantification – Baseline (Approach 2)

Regional Estimates

Equation 5.10. Determining Regional Baseline Emission Factor

$$EF_{b,r} = ME_{b,r} + PR_{b,r} + TE_{b,r} + WE_{b,a}$$

Where,

| | | <u>Units</u> |
|-------------|--|-----------------------------|
| $EF_{b,r}$ | = Regional average CO ₂ emission factor for PC production from the most recent annual report | tCO ₂ e/t of PC |
| $PME_{b,r}$ | = Regional average production and mining emission factor for PC production from the most recent annual report (calculated with Equation 5.12 and Equation 5.13) | tCO ₂ e /t of PC |
| $TE_{b,r}$ | = Average transport emission factor for PC production from the most recent annual report = 0 tCO ₂ e /tonne of PC (on-site mining and production transportation emissions are included fuels in Equation 5.11 and Equation 5.12) | tCO ₂ e /t of PC |
| $WE_{b,a}$ | = Average end-of-life waste emission factor for PC production from the most recent annual report = 0 tCO ₂ e /tonne of PC | tCO ₂ e /t of PC |

5.0 Quantification – Baseline (Approach 2)

Regional Estimates

Equation 5.11. Determining Regional Mining Emissions for PC Production ($ME_{b,r}$)

$$ME_{b,r} = (EL_{b,r,mining,grid} \times EF_{b,r,mining,grid}) + \sum(FC_{b,r,mining} \times EF_{b,r,mining,fuel})$$

| Where, | | <u>Units</u> |
|----------------------|--|-------------------------|
| $ME_{b,r}$ | = Regional mining emissions for PC production from the most recent annual report | tCO ₂ e |
| $EL_{b,mining,grid}$ | = Regional grid electricity consumption for PC mining from the most recent annual report (see Table 5.1) | BTU |
| $EF_{b,mining,grid}$ | = CO ₂ emission factor for grid electricity consumed from the most recent U.S. Environmental Protection Agency (EPA) eGRID emission factor publication. ³⁰ Projects shall use the most recent total output emission rates for the subregion where the project is located | tCO ₂ e/BTU |
| $FC_{b,mining}$ | = Regional fuel consumption for PC mining from the most recent annual report (see Table 5.2) | BTU |
| $EF_{b,mining,fuel}$ | = CO ₂ emission factor for fuel consumed from the most recent EPA Emission Factors for Greenhouse Gas Inventories. ³¹ Projects shall use the CO ₂ factor for the appropriate fuel type | tCO ₂ e/ BTU |

Quantification – Baseline (Approach 2)

Regional Estimates

Equation 5.12. Determining Regional Production Emissions for PC Production ($PR_{b,r}$)

$$PR_{b,r} = EE_{b,r} + CE_{b,a}$$

Where,

| | | <u>Units</u> |
|------------|---|-----------------------------|
| $PR_{b,r}$ | = Regional production emission factor for PC production and mining from the most recent annual report | tCO ₂ e /t of PC |
| $EE_{b,r}$ | = Regional energy emissions for PC production and mining from the most recent annual report (calculated with Equation 5.13) | tCO ₂ e /t of PC |
| $CE_{b,a}$ | = Average calcination emissions for PC production from the most recent annual report =0.48 tCO ₂ e /tonne of PC | tCO ₂ e /t of PC |

5.0 Quantification – Baseline (Approach 2)

- Regional Estimates

Equation 5.13. Determining Regional Energy Emissions for PC Production

| | | <u>Units</u> |
|--|--|-------------------------------|
| $EE_{b,r} = (EL_{b,r,grid} \times EF_{b,r,production,grid}) + \sum(FC_{b,r} \times EF_{b,r,fuel})$ | | |
| <i>Where,</i> | | |
| $EE_{b,r}$ | = Regional energy emission factor for PC production and mining | tCO ₂ e/t of PC |
| $EL_{b,r,grid}$ | = Regional grid electricity consumption for PC production from the most recent annual report (see Table 5.1) | BTU |
| $EF_{b,r,production,grid}$ | = CO ₂ emission factor for grid electricity consumed from the most recent EPA eGRID emission factor publication. ³² Projects shall use the most recent annual total output emission rates for the subregion where the project is located | tCO ₂ e/BTU |
| $FC_{b,r}$ | = Average fuel consumption for PC production from the most recent annual report (see Table 5.2 and Table 5.3) | BTU/ |
| $EF_{b,r,fuel}$ | = CO ₂ emission factor for fuel consumed from the most recent EPA Emission Factors for Greenhouse Gas Inventories. ³³ Projects shall use the CO ₂ factor for the appropriate fuel type | tCO ₂ e/BTU |

5.0 Quantification – Baseline (Approach 2)

- Regional Estimates

Equation 5.13. Determining Regional Energy Emissions for PC Production

| | | <u>Units</u> |
|--|--|-------------------------------|
| $EE_{b,r} = (EL_{b,r,grid} \times EF_{b,r,production,grid}) + \sum(FC_{b,r} \times EF_{b,r,fuel})$ | | |
| <i>Where,</i> | | |
| $EE_{b,r}$ | = Regional energy emission factor for PC production and mining | tCO ₂ e/t of PC |
| $EL_{b,r,grid}$ | = Regional grid electricity consumption for PC production from the most recent annual report (see Table 5.1) | BTU |
| $EF_{b,r,production,grid}$ | = CO ₂ emission factor for grid electricity consumed from the most recent EPA eGRID emission factor publication. ³² Projects shall use the most recent annual total output emission rates for the subregion where the project is located | tCO ₂ e/BTU |
| $FC_{b,r}$ | = Average fuel consumption for PC production from the most recent annual report (see Table 5.2 and Table 5.3) | BTU/ |
| $EF_{b,r,fuel}$ | = CO ₂ emission factor for fuel consumed from the most recent EPA Emission Factors for Greenhouse Gas Inventories. ³³ Projects shall use the CO ₂ factor for the appropriate fuel type | tCO ₂ e/BTU |

5.0 Quantification – Baseline (Approach 2)

- Regional Estimates

Table 5.1. Regional Electricity Consumption for PC Mining and Production (BTU/tonne of PC)

| | | Mining | Production |
|-----------------|---------------------|-----------|------------|
| Regional | West | 563.26 | 444,098.25 |
| | Midwest | 954.88 | 499,413.48 |
| | South | 678.30 | 486,587.02 |
| | Northeast | 8,279.12 | 539,891.98 |
| State | Arizona | 2,789.58 | 432,067.92 |
| | California | 2,115.51 | 433,518.29 |
| | Florida | 10,836.93 | 470,031.01 |
| | Indiana | 4,000.19 | 587,625.49 |
| | Missouri | 3,949.26 | 473,887.76 |
| | Pennsylvania | 11,716.44 | 500,207.09 |
| | Texas | 728.67 | 452,227.10 |

5.0 Quantification – Baseline (Approach 2)

- Regional Estimates

Table 5.2. Regional Transport Fuel Consumption for PC Mining and Production (BTU/tonne of PC)

| | | Diesel | | Gasoline | |
|-----------------|---------------------|-----------|------------|----------|------------|
| | | Mining | Production | Mining | Production |
| Regional | West | 2,998.81 | 38,899.04 | 40.56 | 1,637.09 |
| | Midwest | 1,811.86 | 27,890.44 | 180.48 | 1,177.14 |
| | South | 1,122.84 | 38,897.02 | 72.84 | 2,185.37 |
| | Northeast | 4,740.03 | 40,077.66 | 15.85 | 1,068.85 |
| State | California | 10,557.28 | 43,994.61 | - | - |
| | Florida | 2,132.93 | 42,250.21 | - | - |
| | Indiana | 9,200.27 | 21,904.48 | - | - |
| | Missouri | 7,668.93 | 25,184.88 | - | - |
| | Pennsylvania | 5,434.81 | 27,410.82 | - | - |
| | Texas | 4,162.03 | 27,288.67 | - | - |

5.0 Quantification – Baseline (Approach 2)

- Regional Estimates

Table 5.3. Regional Kiln Fuel Consumption for PC Production (BTU/tonne of PC)

| | | Coal Consumption | Natural Gas Consumption | Pet Coke Consumption |
|-----------------|---------------------|------------------|-------------------------|----------------------|
| Regional | West | 2,039,445.33 | 1,008,806.43 | 472,221.03 |
| | Midwest | 1,310,097.16 | 579,183.26 | 658,298.78 |
| | South | 1,037,706.67 | 1,245,224.90 | 552,127.90 |
| | Northeast | 290,424.48 | 1,694,051.72 | 843,736.51 |
| State | Arizona | 2,028,879.87 | 757,308.24 | 277,122.77 |
| | California | 1,492,024.60 | 366,502.81 | 962,952.28 |
| | Florida | 831,659.08 | 1,401,791.44 | 469,530.38 |
| | Indiana | 2,405,846.16 | 139,572.85 | 12,647.64 |
| | Missouri | 919,574.31 | 150,031.41 | 854,984.38 |
| | Pennsylvania | 435,636.72 | 1,696,209.63 | 583,667.97 |
| | Texas | 500,056.45 | 1,914,973.22 | 857,052.59 |

6.0 Monitoring

- All data inputs for the calculation of the project emission reductions
- Documentation for the quality and quantity of eligible SCMs/ACMs
- Documentation for the quantity of additives
- Copies of all solid waste, air, water, and land use permits, Notices of Violations (NOVs), and any administrative or legal consent orders dating back at least five years prior to the project start date, and for each subsequent year of project operation
- Executed Attestation of Title, Attestation of Regulatory Compliance, and Attestation of Voluntary Implementation form, Attestation of SCM/ACM Use

7.0 Reporting & 8.0 Verification

Reporting Period:

- A reporting period may not exceed 12 months in length, except for the initial reporting period, which may cover up to 24 months.

Verification Periods:

- The initial verification period for a low-carbon cement project is limited to one reporting period of up to 24 months of data
- Subsequent verification periods may cover up to two reporting periods, with a maximum of 24 months of data (i.e., 12 months of data per reporting period)
- CRTs will not be issued for reporting periods that have not been verified.

Verification Site Visits:

- A site visit at the SCM/ACM production facility, mining facility (if separate than the SCM/ACM production facility) and the PC facility (if Approach 1 is used to quantify baseline emissions) must occur during the initial verification, and at least once every two reporting periods thereafter.



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QUESTIONS & NEXT STEPS

Questions & Next Steps



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- Questions?
- Next Steps:
 - Written public comments due **Friday September 8th**
 - Climate Action Reserve Board Meeting October 4th
 - Subject to approval by Board, Verification training November 2023 (Date TBD)



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THANK YOU!