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Outline

1. **Introduction:** Background on Scope 2 and the need for Guidance
2. **Boundary:** How do I determine what are my scope 2 emissions and how do I set my scope 2 boundary?
3. **Background:** What are "energy attribute certificates" like RECs?
4. **Methods:** What are the two scope 2 accounting methods?
5. **Calculation:** How do I calculate emissions based on both methods?
6. **Requirements:** What are the new accounting and reporting requirements?
7. **Targets:** How do I set reduction targets with the new methods and track emissions over time ?
8. **Impact:** How can I drive bigger impacts on new low-carbon projects that reduce emissions beyond BAU?
9. **Examples:** Calculation examples

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Learning objectives

- How to identify and calculate emissions
- Where to find relevant emission factors
- How to choose which emission factors are most appropriate for your inventory

For further reading, see:

GHG Protocol Scope 2 Guidance Chapter 6: Calculating Emissions.

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Steps to calculating emissions

1. Identify GHG emission sources for scope 2 emissions
2. Determine whether the market-based approach applies
3. Collect activity data and choose emission factors for each method
4. Calculate emissions
5. Roll up GHG emissions data to corporate level

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How do I calculate scope 2 emissions?

Scope 2 Emissions	=	Activity Data	x	Emission Factor (EF)
		MWh		mt CO2e/ MWh

For every MWh… Need an EF for each method.

MWh

Location-based

EF represents what's generating on the grid

Market-based

EF derived from contractual information, applied on a MWh basis

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Activity data

- Metered electricity consumption or utility bills specifying consumption in MWh or kWh

- If not available, estimations may be used such as allocating an entire building's electricity usage to all tenants on the basis of the reporter's square footage and the building's occupancy rate (called the Area Method).

Are **any** of your energy-consuming facilities located in areas where grid customers can be provided with product or supplier-specific data in the form of contractual instruments?

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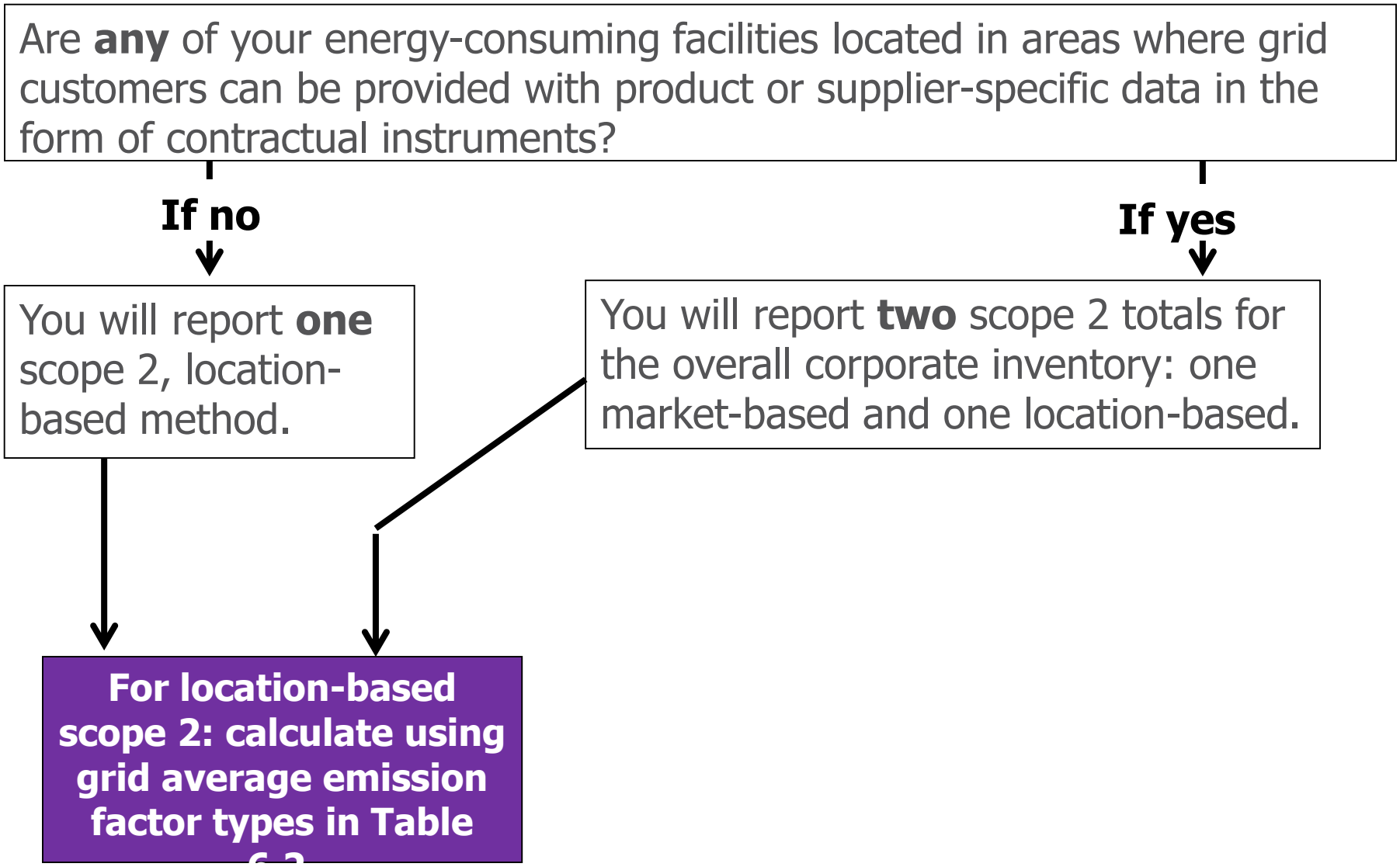
If no

You will report **one** scope 2, location-based method.

For location-based scope 2: calculate using grid average emission factor types in Table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If no
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You will report **one** scope 2, location-based method.
You will report **two** scope 2 totals for the overall corporate inventory: one market-based and one location-based.
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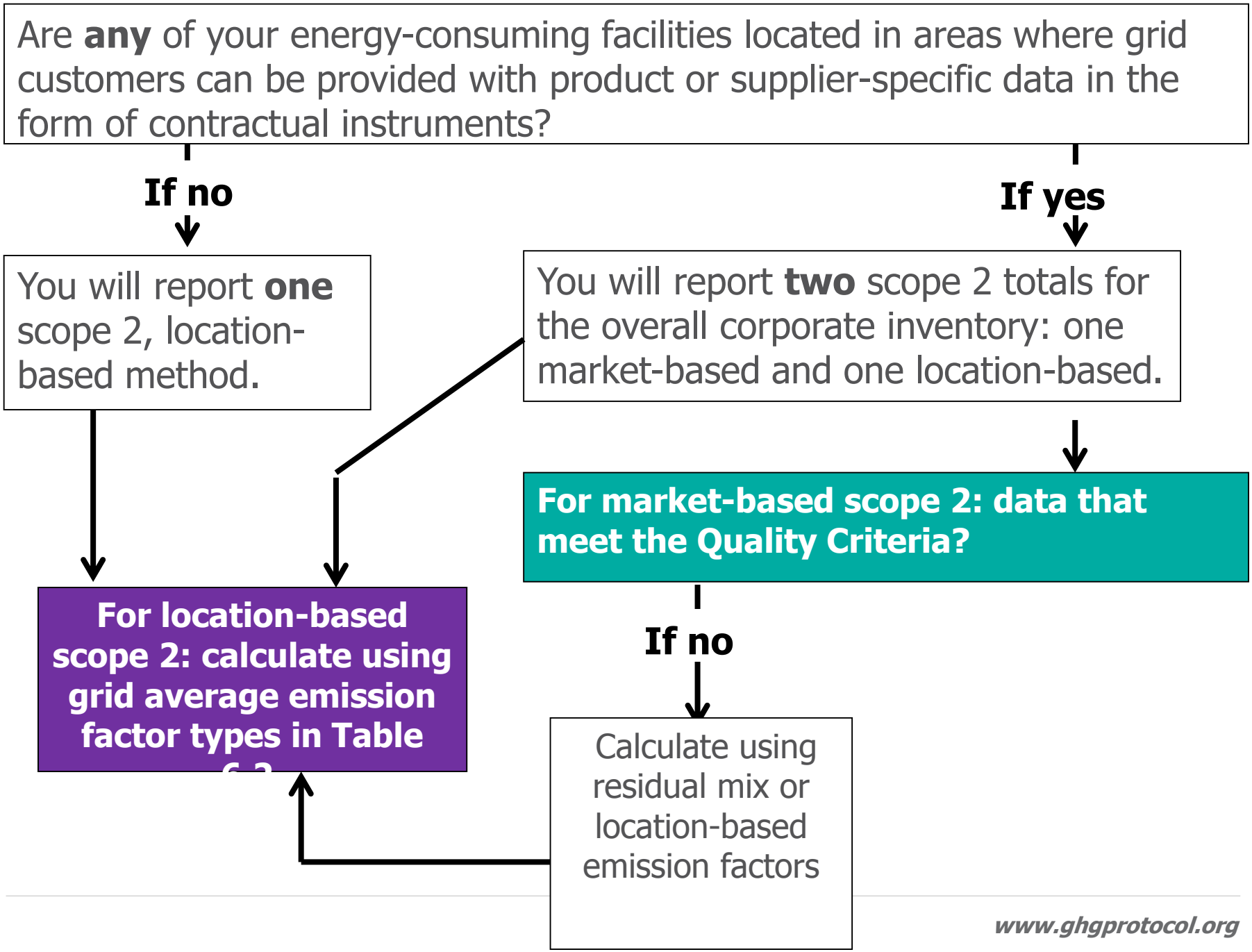
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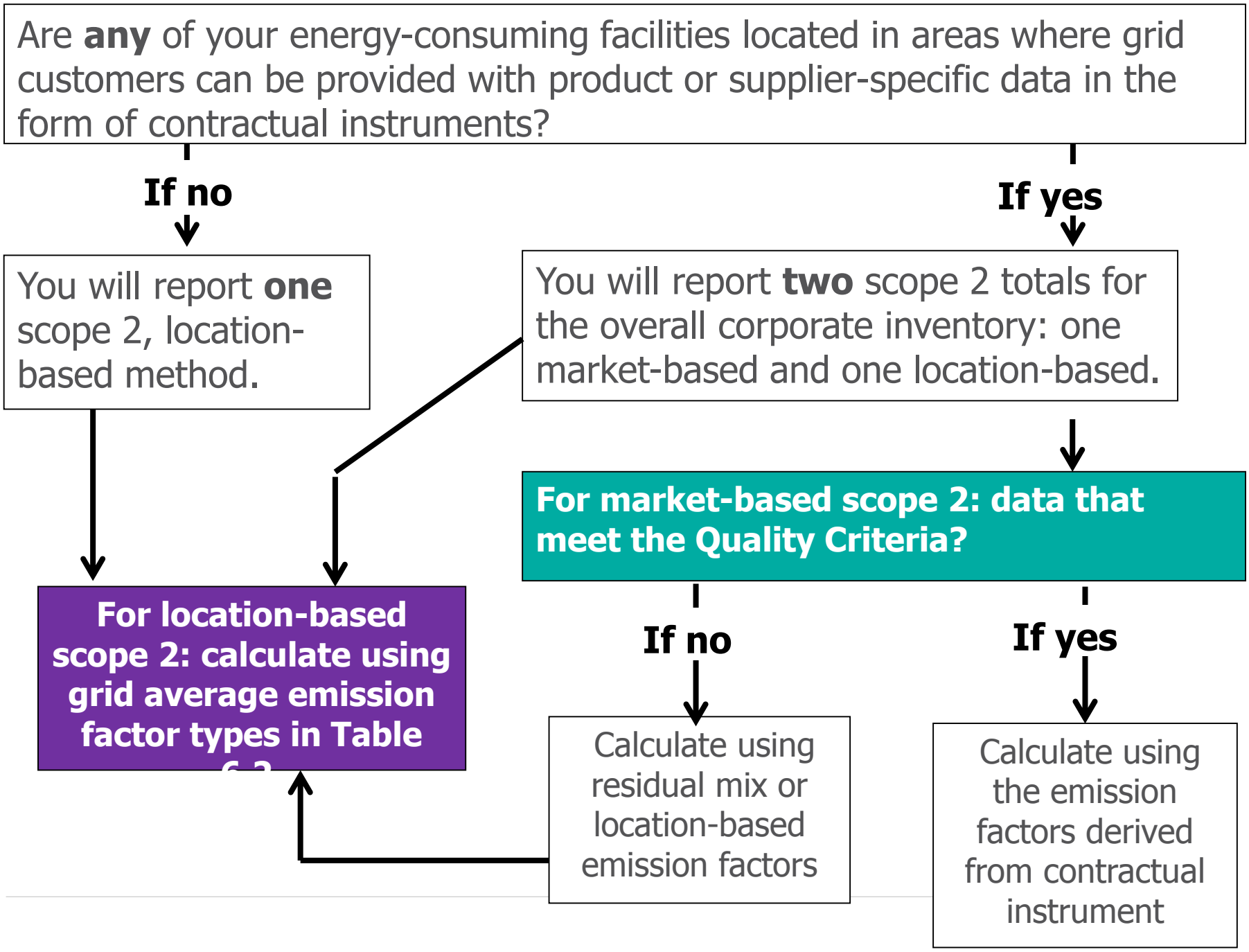
For market-based scope 2: data that meet the Quality Criteria?
If no
For location-based scope 2: calculate using grid average emission factor types in Table
Calculate using residual mix or location-based emission factors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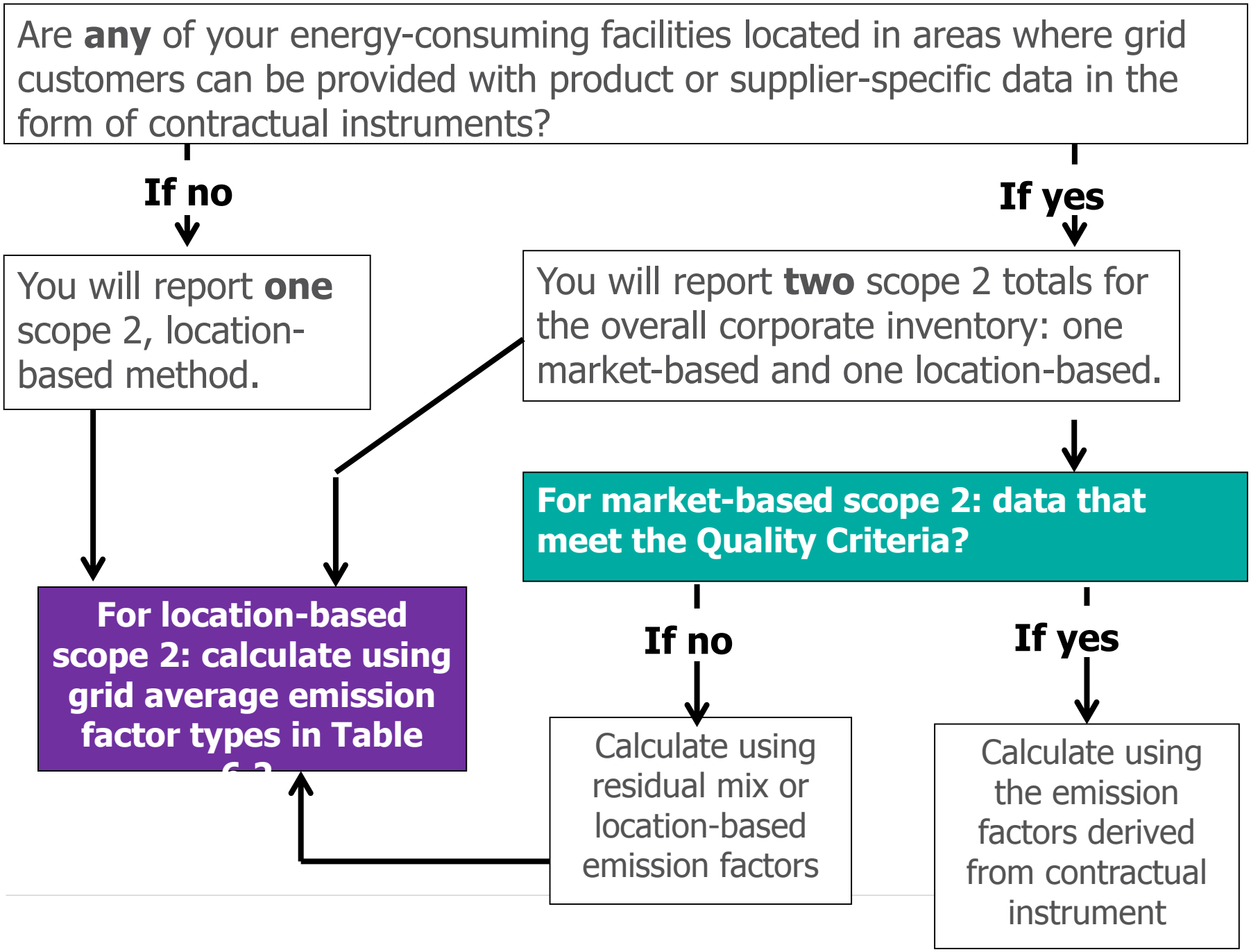
For market-based scope 2: data that meet the Quality Criteria?
For location-based scope 2: calculate using grid average emission factor types in Table
If no
If yes
Calculate using residual mix or location-based emission factors
Calculate using the emission factors derived from contractual instrument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Match emission factors to each unit of electricity consumption

1. Multiply activity data from each operation by the emission factor for that activity for each applicable GHG. Some electricity emission factor sets may include emission rates for CO_2, CH_4 and N_2O; others may only provide CO_2 emission rates (see Box 7.1)

2. Multiply Global Warming Potential (GWP) values by the GHG emissions totals to calculate total emissions in CO_2equivalent (CO_2e).

3. Report final scope 2 by each method in metric tons of each GHG (where available) and in metric tons of CO_2e.

Table 6.1 Accounting for scope 2 with and without certificates sales

	Scope 2 with location-based method	Scope 2 with market-based method
Energy consumed from owned/operated generation (e.g. a company owns a solar panel and consumes the energy)		
No certificates generated or sold	No scope 2 reported for consumption from owned generation	
Certificates from generation facility retired/retained by the generation facility's owner who consumes the energy	Should report certificate retention separately, but no scope 2 reported for consumption of on-site generation	
Certificates sold to 3rd party	Use location-based emission factor hierarchy	Use market-based emission factor hierarchy

Already in scope 1

Effectively, it's already in scope 1

Effectively, it's "grid" MWhs now, reported in scope 2

Table 6.1 Accounting for scope 2 with and without certificates sales

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Certificates sold to 3rd party	Use location-based emission factor hierarchy	Use market-based emission factor hierarchy
Direct line (e.g. a company receives power directly from a generator, with no grid transfers)		
No certificates generated or sold	Use source-specific emission factor from direct line	
Certificates from generation facility purchased and retired/retained by the energy consumer	Use source-specific emission factor from direct line (same as certificate emission factor)	Use certificate emission factor (same as source- specific emission factor)
Certificates sold to 3rd party	Use location-based emission factor hierarchy	Use market-based emission factor hierarchy

Note: can't apply certificates to source-specific consumption (e.g. no RECs for electricity portion of a CHP facility)

Table 6.1 Accounting for scope 2 with and without certificates sales

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Certificates sold to 3rd party	Use location-based emission factor hierarchy	Use market-based emission factor hierarchy
Direct line (e.g. a company receives power directly from a generator, with no grid transfers)		
No certificates generated or sold	Use source-specific emission factor from direct line	
Certificates from generation facility purchased and retired/retained by the energy consumer	Use source-specific emission factor from direct line (same as certificate emission factor)	Use certificate emission factor (same as source- specific emission factor)
Certificates sold to 3rd party	Use location-based emission factor hierarchy	Use market-based emission factor hierarchy
Grid-distributed		
No certificates generated or sold from any generation facilities on the grid	Use location-based emission factor hierarchy	Use market-based emission factor hierarchy
Certificates purchased from grid generation facilities, or included in a supplier-specific emission factor	Use location-based emission factor hierarchy	Use market-based emission factor hierarchy
Certificates from grid generation facilities sold to 3rd parties	Use location-based emission factor hierarchy	Use market-based emission factor hierarchy

Most of the training is on this grid-distributed scenario

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Location-based Method Emission Factor Hierarchy

EMISSION FACTORS	INDICATIVE EXAMPLES
Regional or sub-national emission factors	*eGRID total output emission rates (US)* *Defra annual grid average emission factor (UK)*

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Location-based Method Emission Factor Hierarchy

EMISSION FACTORS	INDICATIVE EXAMPLES
Regional or sub-national emission factors	*eGRID total output emission rates (US)* *Defra annual grid average emission factor (UK)*
National production emission factors	*IEA national electricity emission factors*

Data forms listed here should convey combustion-only (direct) GHG emission rates, expressed in metric tons per MWh or kWh.

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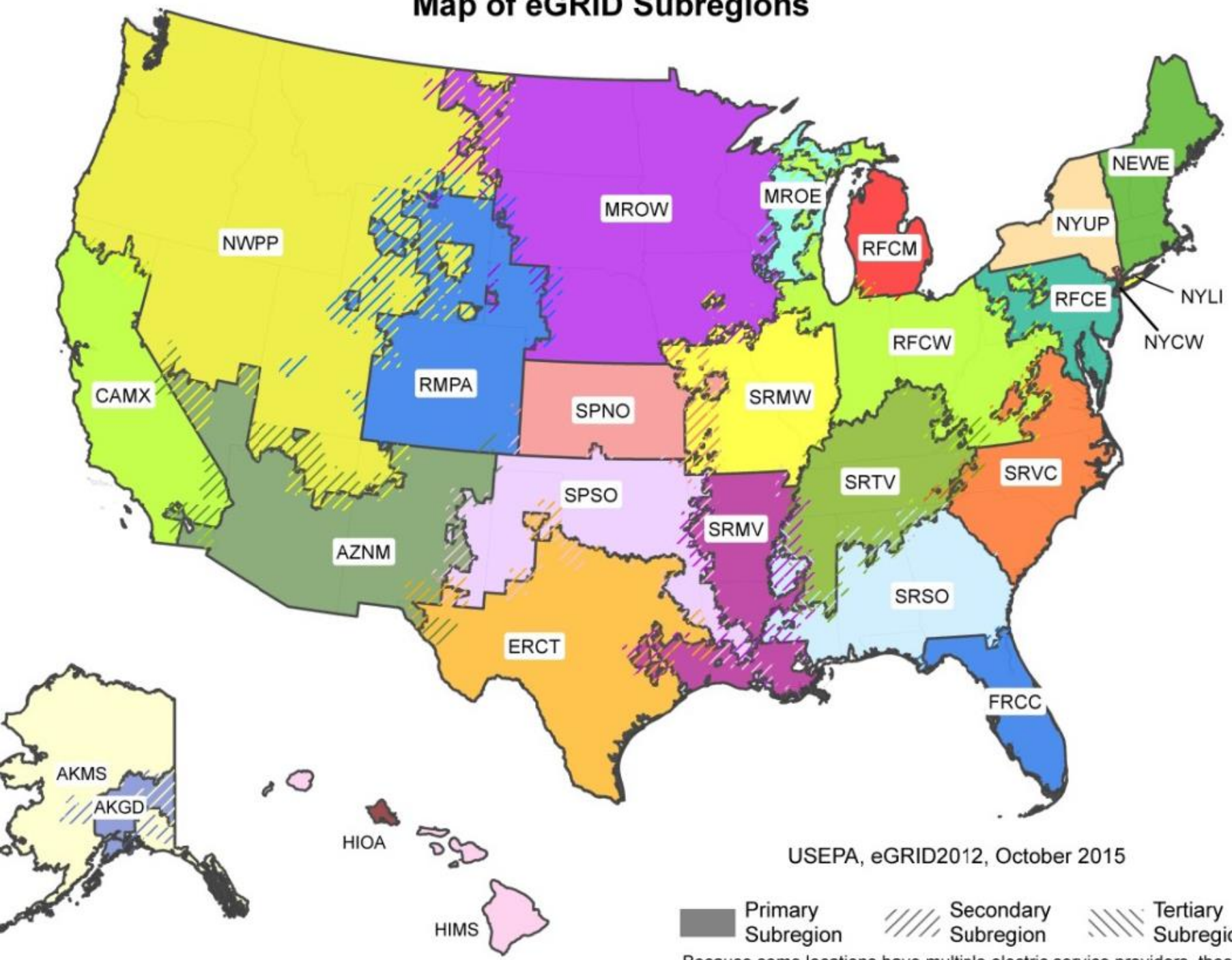
Guidance on location-based method emission factors

- Location-based is not supplier-specific.
- Grid average emission factors do not factor out contractual purchases
- Grid average emission factors are different from marginal grid emission factors

– *Spatial boundaries:* Approximate regions of energy distribution and use, such as balancing areas. All generation and emissions data within this boundary should be aggregated and any net physical energy imports/exports and their related emissions should be taken into account.

– *Other data quality:* Companies can evaluate emission factor data based on quality indicators including their reliability, completeness, and geographic, temporal, and technological representativeness.

Map of eGRID Subregions



USEPA, eGRID2012, October 2015

Primary Subregion

Secondary Subregion

Tertiary Subregion

Because some locations have multiple electric service providers, these areas

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Example location-based calculation

Sites	Annual Consumption	eGRID subregion and EF[1]		**LB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*		**669,230**
California	500 MWh grid	652.72 *CAMX*		**326,360**
	500 onsite leased solar (RECs retained)	N/A source-specific		**0**
Indiana	500 MWh	1,386.55 *RFCW*		**693,275**
New York	100 MWh	140.31 *NYUP*		**14,031**
Florida	100 MWh	1,129.86 *FRCC*		**112,986**
			Total	**1,872,006**

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

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eGRID subregion acronym	eGRID subregion name	Annual total output emission rates			Annual non-baseload output emission rates		
		Carbon dioxide (CO_2) (lb/MWh)	Methane (CH_4) (lb/GWh)	Nitrous oxide (N_2O) (lb/GWh)	Carbon dioxide (CO_2) (lb/MWh)	Methane (CH_4) (lb/GWh)	Nitrous oxide (N_2O) (lb/GWh)
AKGD	ASCC Alaska Grid	1,268.73	26.34	7.59	1,377.77	28.66	3.38
AKMS	ASCC Miscellaneous	481.17	18.65	3.55	1,404.49	55.64	10.70
AZNM	WECC Southwest	1,152.89	18.65	15.11	1,236.02	21.56	10.52
CAMX	WECC California	650.31	31.12	5.67	1,018.87	37.61	6.04
ERCT	ERCOT All	1,143.04	16.70	12.33	1,280.59	21.53	10.71
FRCC	FRCC All	1,125.35	40.05	11.85	1,333.93	38.81	13.79
HIMS	HICC Miscellaneous	1,200.10	68.08	12.68	1,331.47	96.82	17.15
HIOA	HICC Oahu	1,576.38	90.41	21.55	1,402.27	118.01	19.43
MROE	MRO East	1,522.57	24.30	25.55	1,739.00	30.17	26.26
MROW	MRO West	1,425.15	27.60	24.26	1,965.21	52.60	32.72
NEWE	NPCC New England	637.90	72.84	10.71	1,079.73	67.70	12.90
NWPP	WECC Northwest	665.75	12.60	10.38	1,579.07	38.30	22.84
NYCW	NPCC NYC/Westchester	696.70	25.51	2.93	1,081.11	22.50	2.32
NYLI	NPCC Long Island	1,201.20	78.20	9.87	1,303.42	31.40	3.56
NYUP	NPCC Upstate NY	408.80	15.59	3.83	1,228.56	39.00	13.04
RFCE	RFC East	858.56	26.44	11.49	1,492.01	32.74	18.69
RFCM	RFC Michigan	1,569.23	30.36	24.12	1,856.21	33.91	28.72
RFCW	RFC West	1,379.48	17.11	21.67	1,791.71	21.76	27.85
RMPA	WECC Rockies	1,822.65	21.66	28.13	1,669.58	22.89	20.66
SPNO	SPP North	1,721.65	20.22	27.14	2,112.08	26.11	30.63
SPSO	SPP South	1,538.63	23.75	19.98	1,590.13	27.60	16.19
SRMV	SERC Mississippi Valley	1,052.92	20.95	10.61	1,301.65	27.43	9.75
SRMW	SERC Midwest	1,710.75	19.58	27.50	1,917.96	23.29	28.84
SRSO	SERC South	1,149.05	22.66	15.49	1,696.79	28.17	24.83
SRTV	SERC Tennessee Valley	1,337.15	17.39	20.78	1,743.96	22.84	26.11
SRVC	SERC Virginia/Carolina	932.87	23.95	14.60	1,790.57	53.10	29.94

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Frequently Asked Question

Can I use the Clean Development Mechanism (CDM) country-published emission factors for the location-based method calculation?

- No. These emission factors are designed for estimating emission reductions from renewable energy or energy efficiency carbon offset projects. They reflect the *marginal* emission rate on the grid, not the *grid average emission* rate required for scope 2 accounting.

- In the absence of better information, stick with International Energy Agency national emission factors.

Market-based Method Emission Factor Hierarchy

EMISSION FACTORS	INDICATIVE EXAMPLES
Electricity attribute certificates or equivalent instruments	• *Renewable Energy Certificates (US, Canada, Australia and others)* • *Generator Declarations (UK) for fuel mix disclosure* • *Guarantees of Origin (EU)* • *Any other certificate instruments meeting the Quality Criteria*

Market-based Method Emission Factor Hierarchy

EMISSION FACTORS	INDICATIVE EXAMPLES
Electricity attribute certificates or equivalent instruments	• *Renewable Energy Certificates (US, Canada, Australia and others)* • *Generator Declarations (UK) for fuel mix disclosure* • *Guarantees of Origin (EU)* • *Any other certificate instruments meeting the Quality Criteria*
Contracts for electricity, such as power purchase agreements (PPAs)	• *In the US, contracts for electricity from specified non-renewable sources like coal in regions other than NEPOOL and PJM* • *Contracts that convey attributes to the entity consuming the power where certificates do not exist.*

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Market-based Method Emission Factor Hierarchy

EMISSION FACTORS	INDICATIVE EXAMPLES
Electricity attribute certificates or equivalent instruments	• *Renewable Energy Certificates (US, Canada, Australia and others)* • *Generator Declarations (UK) for fuel mix disclosure* • *Guarantees of Origin (EU)* • *Any other certificate instruments meeting the Quality Criteria*
Contracts for electricity, such as power purchase agreements (PPAs)	• *In the US, contracts for electricity from specified non-renewable sources like coal in regions other than NEPOOL and PJM* • *Contracts that convey attributes to the entity consuming the power where certificates do not exist.*
Supplier/Utility emission rates	• *Emission rate allocated and disclosed to retail electricity users* • *Green energy tariffs* • *Voluntary renewable electricity program or product*

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Market-based Method Emission Factor Hierarchy

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Supplier/Utility emission rates	• *Emission rate allocated and disclosed to retail electricity users* • *Green energy tariffs* • *Voluntary renewable electricity program or product*
Residual mix (sub-national or national)	• *Calculated by EU country under RE-DISS project ,*

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Market-based Method Emission Factor Hierarchy

EMISSION FACTORS	INDICATIVE EXAMPLES
Electricity attribute certificates or equivalent instruments	• *Renewable Energy Certificates (US, Canada, Australia and others)* • *Generator Declarations (UK) for fuel mix disclosure* • *Guarantees of Origin (EU)* • *Any other certificate instruments meeting the Quality Criteria*
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Supplier/Utility emission rates	• *Emission rate allocated and disclosed to retail electricity users* • *Green energy tariffs* • *Voluntary renewable electricity program or product*
Residual mix (sub-national or national)	• *Calculated by EU country under RE-DISS project*
Other grid-average emission factors (sub-national or national) – *see location-based data*	• *eGRID total output emission rates (US).* In many regions this approximates a consumption-boundary, as eGRID regions are drawn to minimize imports/exports • Defra annual grid average emission factor (UK) • IEA national electricity emission factors

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Frequently Asked Question

What is a REC swap? How do I account for it?

- **Definition**: where a company acts as an off-taker to a renewable energy project, entering into a power purchase agreement, but the RECs from the generation are sold to another party, typically a utility. The offtaker then buys unbundled "replacement" RECs so that a green power usage and scope 2 claim can still be made.

- The scope 2 accounting looks at the replacement RECs. The sold RECs are out of the picture.

- See Federal Trade Commission guidelines on how to describe renewable energy usage (e.g. can only refer to features of replacement RECs, not the power purchase agreement project).

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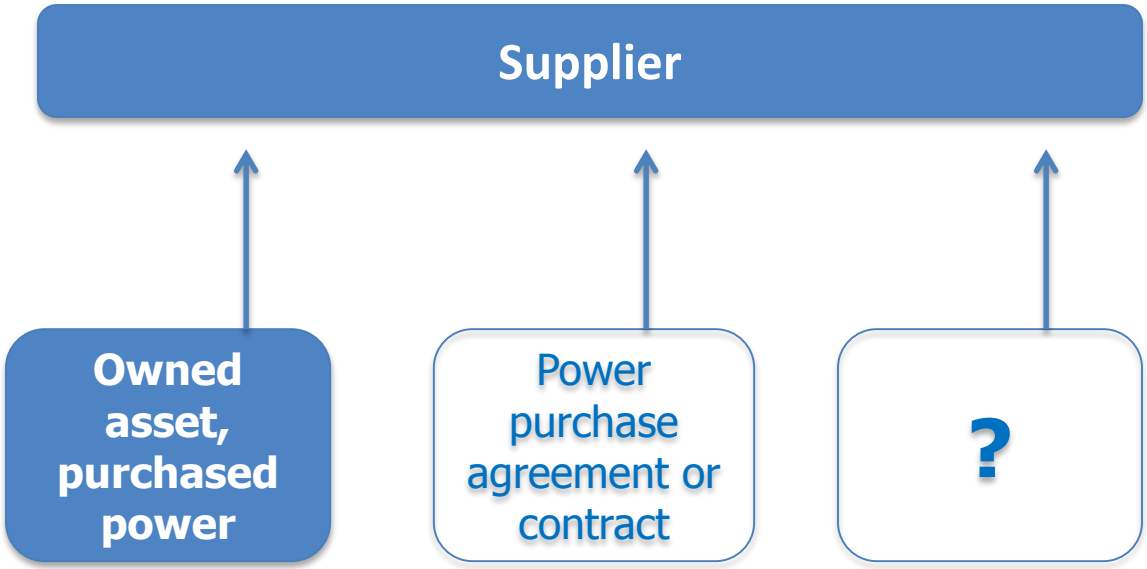
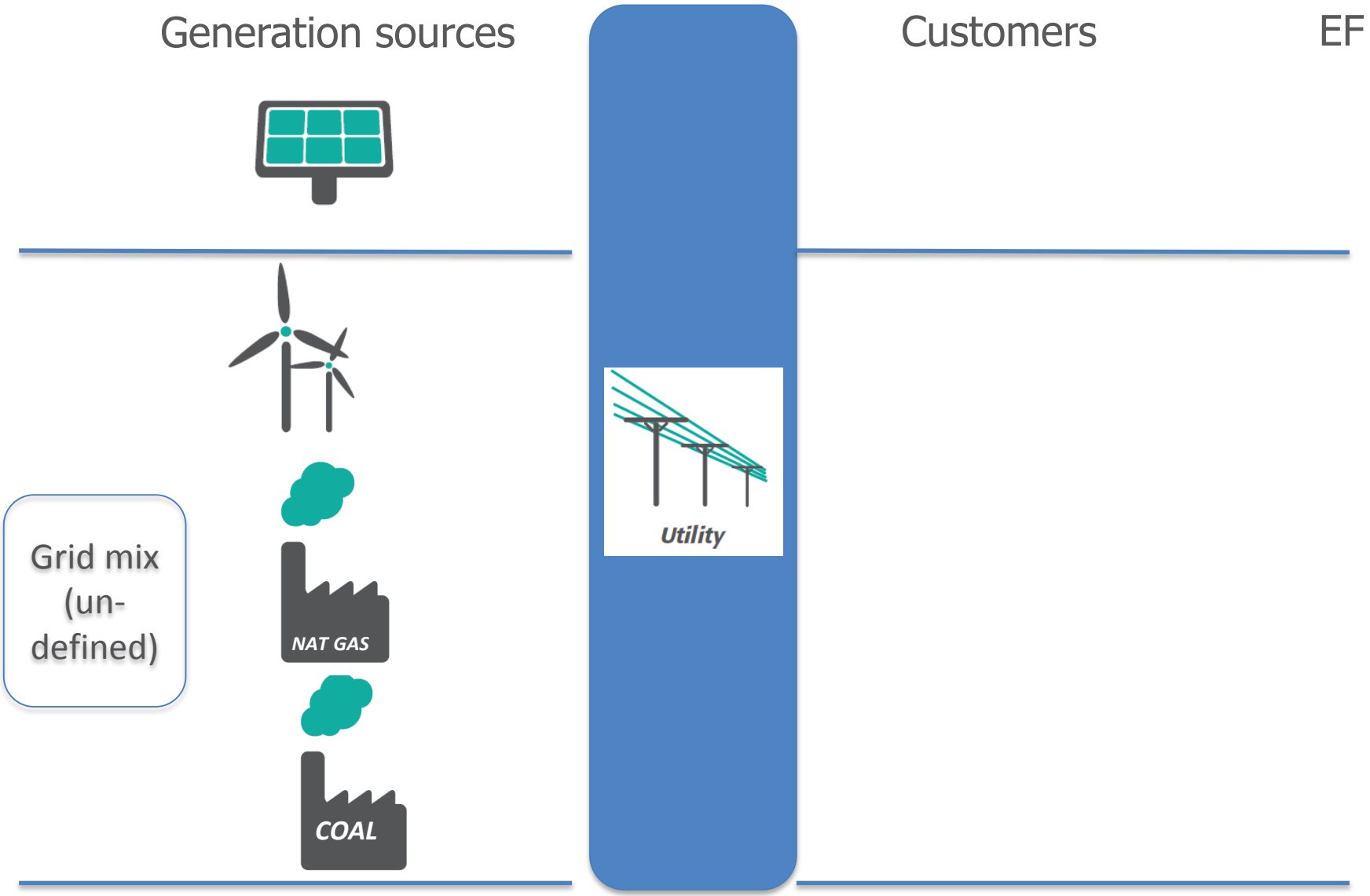
Supplier emission factor disclosure

- An emissions factor/rate for every MWh supplied to customers
- For energy generation that has certificates – must have + retire on behalf of customers
- Unbundled certificates possible – must apply transparently to delivered energy (either for whole product or just green power program)



Differentiated Products



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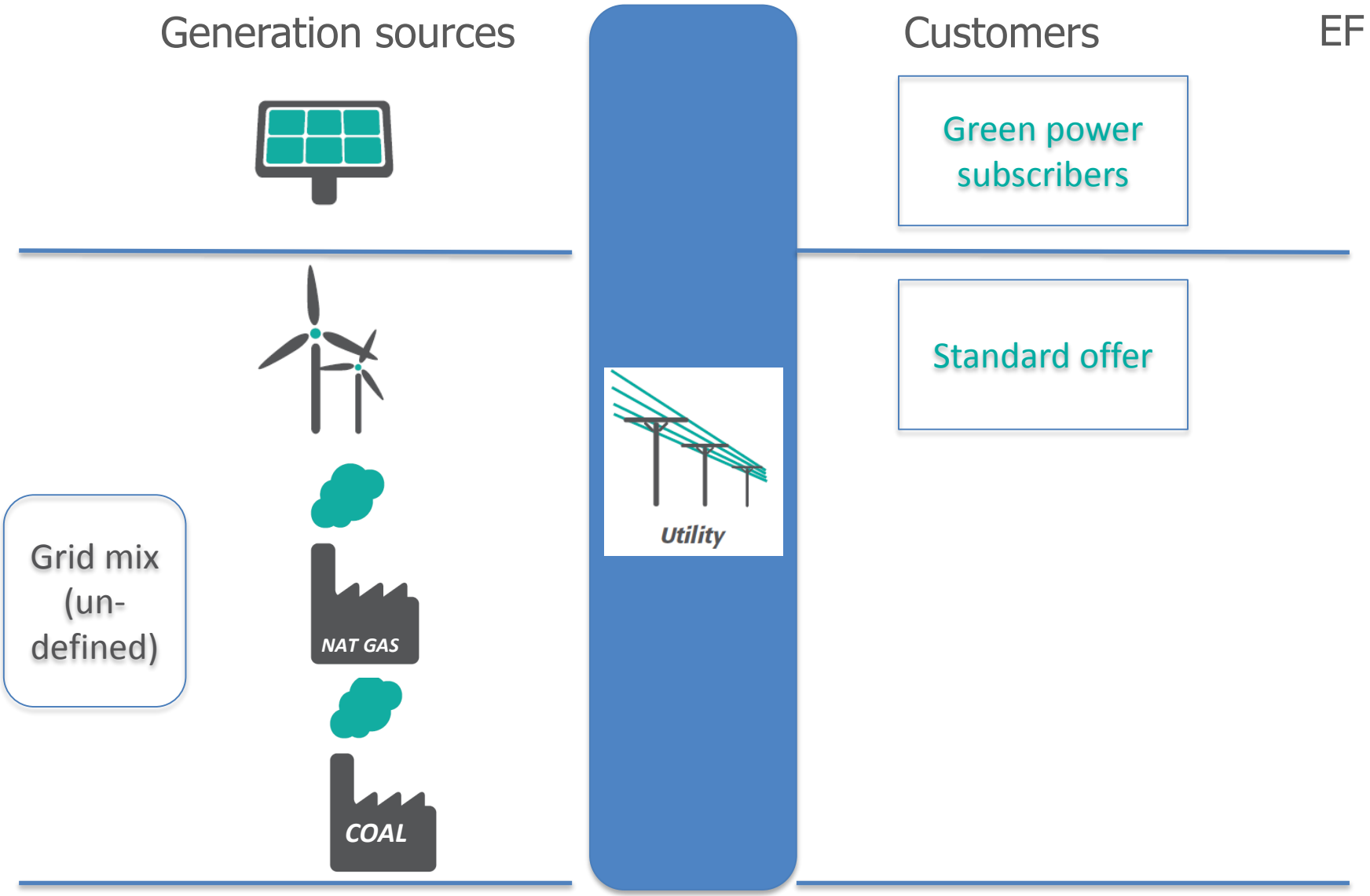

Differentiated Products

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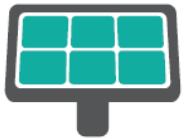
Generation sources

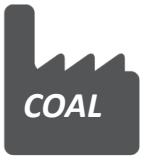
Customers

EF



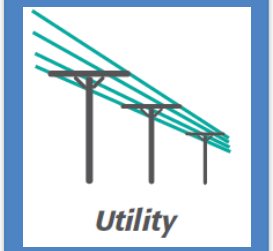
Green power subscribers

REC



REC ?

Grid mix (un-defined)



Standard offer

REC

REC

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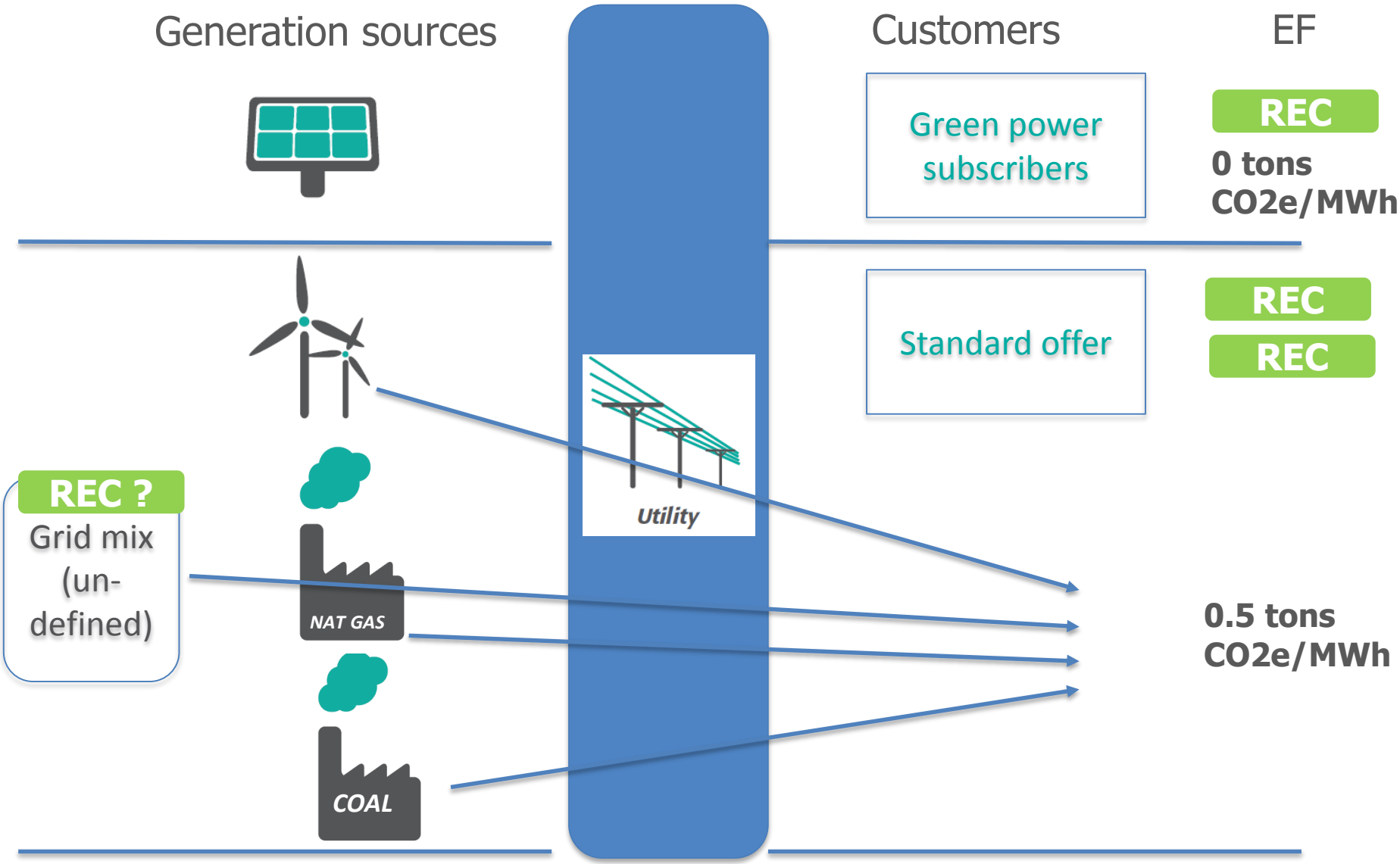
Differentiated Products



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Example market-based method calculation

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	750 lbs CO_2e/MWh (utility emission factor)	750,000
California	500 MWh	652.72 *CAMX*	Green pricing program for 100% of consumption	0
Indiana	500 MWh	1,386.55 *RFCW*	250 MWh RECs	346,638
New York	100 MWh	140.31 *NYUP*	No information	14,031
Florida	100 MWh	1,129.86 *FRCC*	1,580 lbs CO_2e/MWh (utility emission factor)	158,000
			Total	0

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Frequently Asked Question

Why is it hard to get supplier specific factors? What amount of effort should I put in?

- Possible reasons:
  - Suppliers lack knowledge of Scope 2 consumer requirements
  - Complex reporting for complex utility/holding company structures and multiple customer classes
  - Reporting overload: permitting, GHG reporting, EIA forms, state environmental labels/power source disclosure (usually only owned assets)
  - Staff turnover
- Data acquisition should not overtake inventory process –other data available on the emission factor hierarchy.

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Residual Mix

- **Definition:** The mix of energy generation resources and associated attributes such as GHG emissions in a defined geographic boundary left after contractual instruments have been claimed/ retired/canceled. The residual mix can provide an emission factor for companies without contractual instruments to use in a market-based method calculation.

Only available in EU currently

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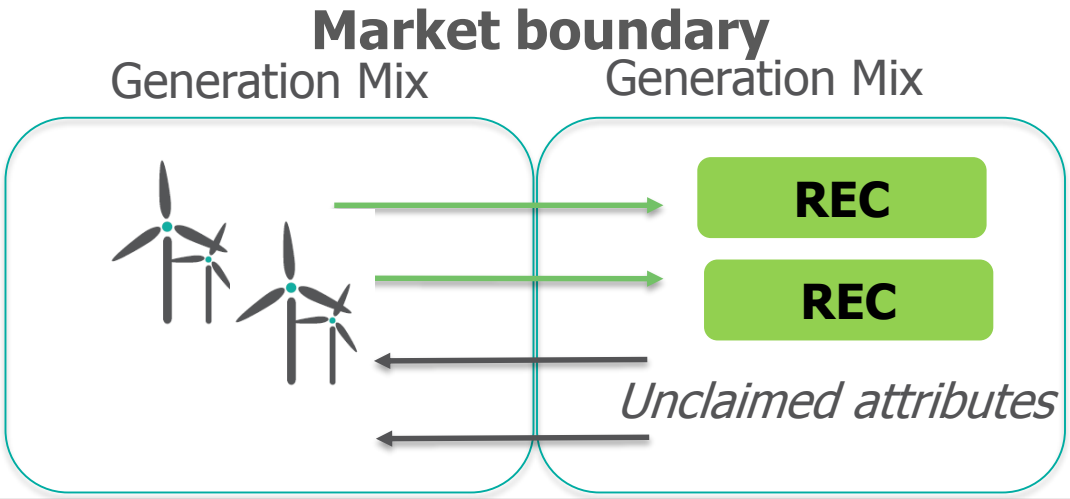
Residual Mix

- **Definition:** The mix of energy generation resources and associated attributes such as GHG emissions in a defined geographic boundary left after contractual instruments have been claimed/ retired/canceled. The residual mix can provide an emission factor for companies without contractual instruments to use in a market-based method calculation.

Residual mix for a state or country = State or country generation mix (grid average factor) – sold attributes (e.g. RECs) + unclaimed attributes from other regions in the market boundary (in portion to sold attributes)



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How to "apply" certificates if decentralized

- Guidance does not prescribe how to allocate certificates to consumption sites within a market boundary

- Companies should clarify method they use

- Example: One 100 MW wind project in Texas generates enough RECs for half of a company's U.S. footprint (offices in five states). The company can decide how RECs are allocated to each office on a MWh basis.

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Frequently Asked Question

Why can't we treat RECs like offsets, and deduct avoided emissions?

- RECs are not offsets, do not convey tons avoided global emissions that can be deducted form the inventory. *Secondary avoided emissions attribute can be reported separately for context.*
- Avoided emissions/"offset" approach would treat renewables differently from other labeled electricity. Not consistent with how suppliers calculate and disclose emissions.
- Reductions approach more relevant for new and additional projects, not able to be consistently applied across scope 2. Would require time limit/eligibility decisions.

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8. **Impact:** How can I drive bigger impacts on new low-carbon projects that reduce emissions beyond BAU?
9. **Examples:** Calculation examples

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Learning objectives

- Which information must reported in a GHG inventory
- Which information may be reported optionally
- Each market-based method Scope 2 Quality Criteria and how to apply it to contractual data

For further reading, see:

GHG Protocol Scope 2 Guidance Chapter 7: Accounting and Reporting Requirements and Chapter 8: Recommended Reporting on Instrument Features and Policy Context.

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For companies with operations only in markets without information or choice about electricity product or supplier

No change.

Only one scope 2 total will be reported based on the location-based method.

GREENHOUSE GAS PROTOCOL

For companies with operations in markets with information about their electricity product or supplier:

1. Dual reporting
   - Methodology disclosure
   - Method in base year
   - Method basis for goal setting

2. Scope 2 Quality Criteria

3. Recommended additional disclosures

Country	Location-Based Total (mtCO2e)	Market-Based Total (mtCO2e)	Instrument Types
USA	650	0	RECs to cover 100% of consumption
Norway	100	500	Residual mix
China	800	800	N/A
India	850	400	Collaborative solar PPA to cover 50% consumption
Mexico	400	0	PPA to cover 100% of consumption
TOTAL	**2,800 mtCO2e**	**1,700 mtCO2e**	

GREENHOUSE GAS PROTOCOL

Scope 2 Quality Criteria (for market-based method)

Contractual instruments shall:

1. Convey GHG information
2. Be an exclusive claim
3. Be retired
4. Match up to inventory period
5. Be sourced from same market as company

Utility emission factors shall be:

6. Calculated based on delivered electricity

Direct purchases shall:

7. Convey GHG claims to the purchaser

Using any instruments requires:

8. Adjusted residual mix, or disclose its absence

GREENHOUSE GAS PROTOCOL

Criteria 1: Conveying GHG emission rate attribute and claims

- Why this criteria? Scope 2 accounting requires emission rate (tons Co2e/MWh) so certificate must convey this. Ensures it is designed and intended for consumer claims.

- *If certificates do not specify attributes:* Certificates that do not currently specify what, if any, energy attribute claims are conveyed, may still convey a claim implicitly through proving the second point: that no consumer is claiming the same energy generation attributes. Evidence of this may be achieved through attestations from each owner in the chain of custody or equivalent procedures providing the same information.

- *If the attribute emission rate itself is not specified and the technology is not zero emissions,* the reporting organization should seek from the generating entity a specific emission rate from that generation facility. Otherwise, a default factor from IPCC or other government publications may be used and disclosed.

GREENHOUSE GAS PROTOCOL

Criteria 2: Unique claims

- Why this criteria? Ensure no double counting in scope 2 across multiple instruments.

- *Where multiple instruments carry the GHG emission rate attribute claim,* some jurisdictions or programs may require acquisition and "pairing" of the multiple certificates to support a voluntary consumer GHG emission rate claim.

GREENHOUSE GAS PROTOCOL

Criteria 3: Retirement for claims

- Why this criteria? Ensure only consumers make a claim, even as instrument may change hands through trading.

- Terminology: Retired/redeemed/claimed/canceled

- Achieved through tracking system, audit of contracts, 3rd party certification, or other disclosure registries, systems or mechanisms.

GREENHOUSE GAS PROTOCOL

Criteria 4: Vintage

- Why this criteria? Ensure temporal accuracy (as much as possible) in scope 2 accounting in market-based method. The generation on which the emission factors are based occurs close in time to the reporting period for which the certificates (or emissions) are claimed.

- Date of energy generation from which the contractual instrument is
- derived. (This is different from the age of the facility.)

- Should be consistent with existing standards for the market where the contractual instruments exist.

GREENHOUSE GAS PROTOCOL

Criteria 4: Vintage

- Why this criteria? Ensure temporal accuracy (as much as possible) in scope 2 accounting in market-based method. The generation on which the emission factors are based occurs close in time to the reporting period for which the certificates (or emissions) are claimed.

- Date of energy generation from which the contractual instrument is
- derived. (This is different from the age of the facility.)

- Should be consistent with existing standards for the market where the contractual instruments exist.

GREENHOUSE GAS PROTOCOL

Criteria 5: Market Boundary

- Why this criteria? Ensure certificates are used as intended by electricity suppliers and regulators, and consumers direct demand to market reasonably linked to their usage.

- *Why limit it to a regional market?* No globally liquid market for certificates, because no single electricity market. Boundary for usage should be "reasonable for an RE usage claim."

- *Why not make it grid region?* Definition of a tradable instrument already necessitates a separation from "physical" flows, so any further restrictions would simply be policy/program choices rather than "inherent accounting" restrictions.

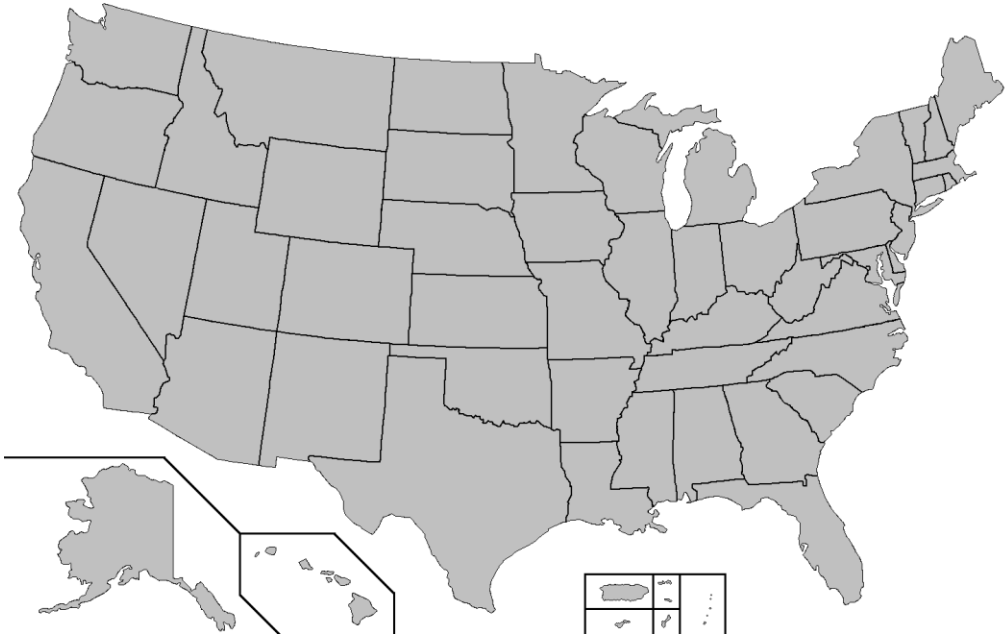
- *If the market boundary is not specified or not clear:*
- Assume political (country) or regulatory boundaries, not just physical interconnection. Over time can be group of countries that recognize each other's certificates as fungible and available to any consumers located therein, and create common tracking system and residual mix.

GREENHOUSE GAS PROTOCOL

- **US as single market**

  - United by overarching federal laws (FERC) despite state regulation of sector

  - Argument to provide flexibility in sourcing, build RE where most cost-effective



GREENHOUSE GAS PROTOCOL

- **"Internal/Common market"**
  - Electricity is a product, and trading of electricity and its attributes should be permitted throughout EU and EEA (EFTA)

  - Legal cases on "discriminating against non-national production"

GREENHOUSE GAS PROTOCOL

Frequently Asked Question

Why can't we apply a certificate from one country to another? What if there are no certificates/contracts/supplier programs available in the countries where I have operations?

- Goal is to address company's electricity emissions where they occur.
- Markets take time to develop. Electricity consumers demanding disclosure, tracking and procurement options can help build market, change supply and reduce emissions over time.
- In the meantime, use other scope 2 emission factor sources.

GREENHOUSE GAS PROTOCOL

Recommended reporting (1 of 2)

1. Annual electricity consumption (in kWh, MWh, BTU, etc.)
2. Method basis for upstream scope 3
3. Instrument features
4. Other instrument retirement
5. Role of corporate procurement in driving

GREENHOUSE GAS PROTOCOL

Recommended reporting (2 of 2)

To distinguish differences in purchases between markets, and enhance transparency, Guidance recommends disclosing:

- **Instrument labels**
- **Power plant features**
  - resource type, facility location, facility age
- **Policy context**
  - Supplier quotas like RPS?
  - Cap and trade?
  - Funding/subsidy receipt?

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Optional reporting

1. Scope 2 totals disaggregated by country
2. Avoided emissions estimation
3. Advanced grid study estimation
4. Scope 2 results calculated by other methods
5. Purchases that did not meet S2 Quality Criteria

GREENHOUSE GAS PROTOCOL

Outline

1. **Introduction:** Background on Scope 2 and the need for Guidance
2. **Boundary:** How do I determine what are my scope 2 emissions and how do I set my scope 2 boundary?
3. **Background:** What are "energy attribute certificates" like RECs?
4. **Methods:** What are the two scope 2 accounting methods?
5. **Calculation:** How do I calculate emissions based on both methods?
6. **Requirements:** What are the new accounting and reporting requirements?
7. **Targets:** How do I set reduction targets with the new methods and track emissions over time ?
8. **Impact:** How can I drive bigger impacts on new low-carbon projects that reduce emissions beyond BAU?
9. **Examples:** Calculation examples

GREENHOUSE GAS PROTOCOL

Learning objectives

- How to assess your company's emissions trends
- How to choose a base year
- How to clarify whether reduction targets reflect market-based method results, location-based method results, or both
- When you may need to re-calculate base year emissions

For further reading, see:

GHG Protocol Scope 2 Guidance Chapter 9: Setting Reduction Targets and Tracking Emissions over Time.

GREENHOUSE GAS PROTOCOL

Selecting a base year

- Companies that have already set a base year for scope 2 shall specify which method was used to calculate it, in order to allow for clearer comparison over time.

- For companies calculating a GHG inventory for the first time, the *Corporate Standard* guidance on choosing a base year applies (see Chapter 5 of the *Corporate Standard*).

GREENHOUSE GAS PROTOCOL

Recalculating base year

- This guidance's new requirement to report scope 2 according to two different methodologies—location-based and market-based—constitutes a change that could trigger base-year recalculation.

- Companies should ensure that the base-year inventory includes both a location-based and market-based scope 2 total, if applicable and feasible. This ensures "like with like" comparison over time.

- For most companies, location-based data was used in the base year and market-based contractual information was not likely available. Therefore, recalculation would only entail disclosing that the market-based figure for the base year is the same as location-based (using 'proxy data').

GREENHOUSE GAS PROTOCOL

Targets

- If setting a target, companies shall specify which method is used in the goal calculation and progress tracking.

- Two targets, one for each method's results, can help prioritize new low-carbon energy projects that will reduce both totals' emissions over time (if contractual instruments are retained from the project).

- **Renewable energy sourcing** targets should follow market-based methodology – no double counting location-based levels of RE and certificates.

- Supplier-specific emission factors and RE product disclosure typically includes RE sourced to meet quota (e.g. RPS in US), and forms a portion of all customers' electricity. Programs recognizing corporate leadership differ as to how this is counted towards corporate targets.

GREENHOUSE GAS PROTOCOL

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GREENHOUSE GAS PROTOCOL

Learning objectives

- The difference between corporate accounting and project-level accounting
- The term "additionality" in offset accounting and its application to energy accounting in scope 2
- Different ways to achieve impact

For further reading, see:

GHG Protocol Scope 2 Guidance Chapter 11: How Companies can drive Electricity Supply Changes over Time with the Market-Based Method.

GREENHOUSE GAS PROTOCOL

Concept of Additionality

- Definition: A criterion often applied to GHG project activities, stipulating that project-based GHG reductions should only be quantified if the project activity "would not have happened anyway"—i.e., that the project activity (or the same technologies or practices that it employs) would not have been implemented in its baseline scenario.

- ***Why not require?***
  - The market-based method for scope 2 accounting applies to all energy generation in a defined grid, not just "low-carbon" or renewable energy from projects supported by a specific company's financial support.
  - Suppliers and companies can make energy procurement choices that can shift a company's impact from "aggregate" to more directly spurring an increase in new, low-carbon energy generation facilities in a short period of time, consistent with the ambition needed to avoid dangerous climate change.

GREENHOUSE GAS PROTOCOL

Corporate accounting vs. consequential (project-level) accounting

FIGURE 2.1 Quantifying GHG reductions relative to a baseline scenario

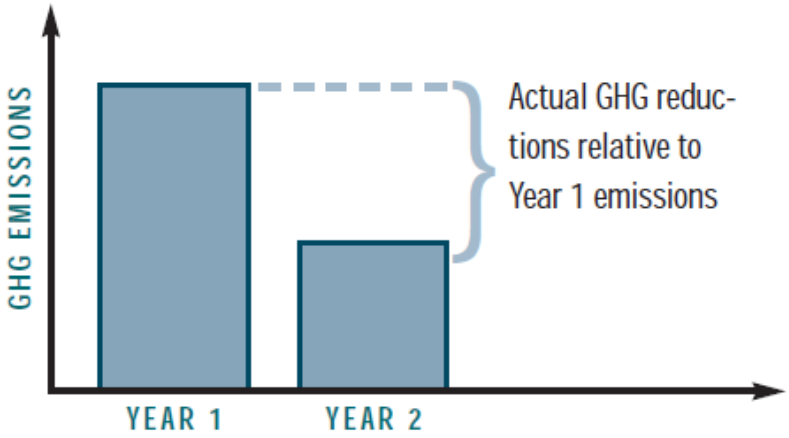


FIGURE 2.1a: Comparison against a base year for corporate/entity accounting

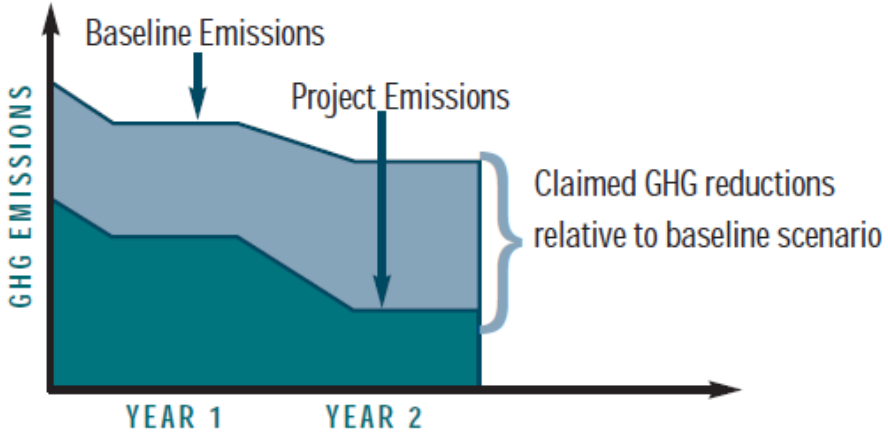
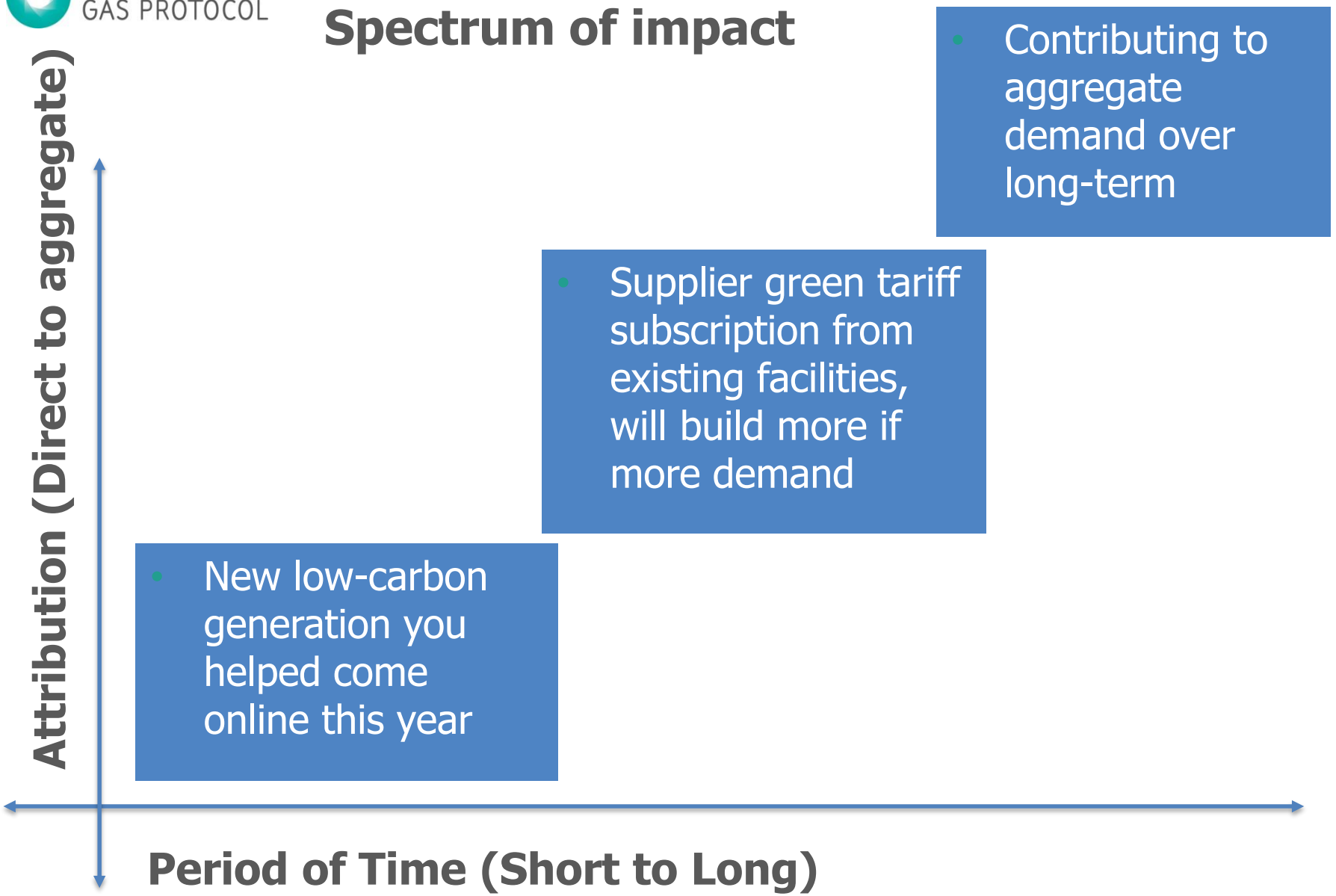


FIGURE 2.1b: Comparison against a baseline scenario for project accounting

GHG reductions must be quantified relative to a reference level of GHG emissions. Under national and corporate-level GHG accounting, reductions are typically quantified against actual GHG emissions in a historical base year (see Figure 2.1a). For project-based GHG accounting, however, GHG reductions are quantified against a forward-looking, counter-factual baseline scenario (see Figure 2.1b). The most important challenge for GHG project accounting is identifying and characterizing the baseline scenario.

GREENHOUSE GAS PROTOCOL

Spectrum of impact



GREENHOUSE GAS PROTOCOL

Choices by all players in the market can have an impact

- Jurisdictional policy
- Certification schemes
- Utility/ supplier labels
- Corporate policy and decisions

Companies can:

1. Contract directly with new low-carbon energy projects
2. Work with electricity suppliers for new projects
3. Establish "eligibility criteria" for corporate procurement
4. Provide incremental funding or donations

WRI papers on Additionality and policy interactions (like Clean Power Plan) coming in Fall/Winter 2016-2017

GREENHOUSE GAS PROTOCOL

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GREENHOUSE GAS PROTOCOL

Level: Easier

Example 1. No U.S. contractual purchases or information at all

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information ?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	None, no residual mix		
California	500 MWh	652.72 *CAMX*	"		
Indiana	500 MWh	1,386.55 *RFCW*	"		
New York	100 MWh	140.31 *NYUP*	"		
Florida	100 MWh	1,129.86 *FRCC*	"		
			Total		

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Easier

Example 1. No U.S. contractual purchases or information at all

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information ?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	None, no residual mix	669,230	
California	500 MWh	652.72 *CAMX*	"	326,360	
Indiana	500 MWh	1,386.55 *RFCW*	"	693,275	
New York	100 MWh	140.31 *NYUP*	"	14,031	
Florida	100 MWh	1,129.86 *FRCC*	"	112,986	
			Total	1,815,882	

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Easier

Example 1. No U.S. contractual purchases or information at all

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information ?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	None, no residual mix	669,230	669,230
California	500 MWh	652.72 *CAMX*	"	326,360	326,360
Indiana	500 MWh	1,386.55 *RFCW*	"	693,275	693,275
New York	100 MWh	140.31 *NYUP*	"	14,031	14,031
Florida	100 MWh	1,129.86 *FRCC*	"	112,986	112,986
			Total	1,815,882	1,815,882

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Easier

Example 2. RECs to match all U.S. consumption

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	1,000 MWh RECs @ 0 lbs CO2e/MWh	669,230	
California	500 MWh	652.72 *CAMX*	1,000 MWh RECs @ 0 lbs CO2e/MWh	326,360	
Indiana	500 MWh	1,386.55 *RFCW*	500 MWh RECs @ 0 lbs CO2e/MWh	693,275	
New York	100 MWh	140.31 *NYUP*	100 MWh RECs @ 0 lbs CO2e/MWh	14,031	
Florida	100 MWh	1,129.86 *FRCC*	100 MWh RECs @ 0 lbs CO2e/MWh	112,986	
			Total	1,815,882	

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Easier

Example 2. RECs to match all U.S. consumption

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	1,000 MWh RECs @ 0 lbs CO2e/MWh	669,230	0
California	500 MWh	652.72 *CAMX*	1,000 MWh RECs @ 0 lbs CO2e/MWh	326,360	0
Indiana	500 MWh	1,386.55 *RFCW*	500 MWh RECs @ 0 lbs CO2e/MWh	693,275	0
New York	100 MWh	140.31 *NYUP*	100 MWh RECs @ 0 lbs CO2e/MWh	14,031	0
Florida	100 MWh	1,129.86 *FRCC*	100 MWh RECs @ 0 lbs CO2e/MWh	112,986	0
			Total	1,815,882	0

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Moderate

Example 3. 1,000 MWhs RECs purchased

Allocation to sites is up to you!

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*		669,230	
California	500 MWh	652.72 *CAMX*		326,360	
Indiana	500 MWh	1,386.55 *RFCW*		693,275	
New York	100 MWh	140.31 *NYUP*		14,031	
Florida	100 MWh	1,129.86 *FRCC*		112,986	
			Total	1,815,882	

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Moderate

Example 3. 1,000 MWhs RECs purchased

Allocation to sites is up to you! – All allocated to Nevada site

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	1,000 MWh RECs	669,230	0
California	500 MWh	652.72 *CAMX*	No information	326,360	326,360
Indiana	500 MWh	1,386.55 *RFCW*	No information	693,275	693,275
New York	100 MWh	140.31 *NYUP*	No information	14,031	14,031
Florida	100 MWh	1,129.86 *FRCC*	No information	112,986	112,986
			Total	1,815,882	1,146,652

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Moderate

Example 3. 1,000 MWhs RECs purchased

Allocation to sites is up to you! – allocated to multiple sites

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	No information	669,230	669,230
California	500 MWh	652.72 *CAMX*	300 MWh RECs (200 MWhs with no information)	326,360	130,544
Indiana	500 MWh	1,386.55 *RFCW*	500 MWh RECs	693,275	0
New York	100 MWh	140.31 *NYUP*	100 MWh RECs	14,031	0
Florida	100 MWh	1,129.86 *FRCC*	100 MWh RECs	112,986	0
			Total	1,815,882	912,760

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Moderate

Example 4. Partial supplier specific information

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	750 lbs CO_2e/MWh (utility emission factor)	669,230	
California	500 MWh	652.72 *CAMX*	Green pricing program for 100% of consumption	326,360	
Indiana	500 MWh	1,386.55 *RFCW*	250 MWh RECs	693,275	
New York	100 MWh	140.31 *NYUP*	No information	14,031	
Florida	100 MWh	1,129.86 *FRCC*	1,580 lbs CO_2e/MWh (utility emission factor)	112,986	
			Total	**1,815,882**	0

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Moderate

Example 4. Partial supplier specific information

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO2e	**MB** in lbs CO2e
Nevada	1,000 MWh	669.23 *NWPP*	750 lbs CO_2e/MWh (utility emission factor)	669,230	750,000
California	500 MWh	652.72 *CAMX*	Green pricing program for 100% of consumption	326,360	0
Indiana	500 MWh	1,386.55 *RFCW*	250 MWh RECs	693,275	346,638
New York	100 MWh	140.31 *NYUP*	No information	14,031	14,031
Florida	100 MWh	1,129.86 *FRCC*	1,580 lbs CO_2e/MWh (utility emission factor)	112,986	158,000
			Total	1,815,882	1,268,669

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

GREENHOUSE GAS PROTOCOL

Level: Moderate

Example 5. Asia Pacific Sites

Sites	Annual Consumption	National EF[1]	Contractual information?	**LB** in tons CO2e	**MB** in tons CO2e
Japan	1,000 MWh	0.55	Supplier specific factor, 0.45 tCO2e/MWh		
Australia	500 MWh	0.79	green power program for 100% consumption		
India A	500 MWh	0.82	Wind contract for 50% consumption		
India B	100 MWh	0.82	No information		
India C	100 MWh	0.82	No information		
			Total		

1. International Energy Agency, reported here in tonnes CO_2e/mWh

GREENHOUSE GAS PROTOCOL

Level: Moderate

Example 5. Asia Pacific Sites

Sites	Annual Consumption	National EF[1]	Contractual information?	**LB** in tons CO2e	**MB** in tons CO2e
Japan	1,000 MWh	0.55	Supplier specific factor, 0.45 tCO2e/MWh	550	
Australia	500 MWh	0.79	green power program for 100% consumption	395	
India A	500 MWh	0.82	Wind contract for 50% consumption	410	
India B	100 MWh	0.82	No information	82	
India C	100 MWh	0.82	No information	82	
			Total	**1,519**	

1. International Energy Agency, reported here in tonnes CO_2e/mWh

GREENHOUSE GAS PROTOCOL

Level: Moderate

Example 5. Asia Pacific Sites

Sites	Annual Consumption	National EF[1]	Contractual information?	**LB** in tons CO2e	**MB** in tons CO2e
Japan	1,000 MWh	0.55	Supplier specific factor, 0.45 tCO2e/MWh	550	450
Australia	500 MWh	0.79	green power program for 100% consumption	395	0
India A	500 MWh	0.82	Wind contract for 50% consumption	410	205
India B	100 MWh	0.82	No information	82	82
India C	100 MWh	0.82	No information	82	82
			Total	**1,519**	**819**

1. International Energy Agency, reported here in tonnes CO_2e/mWh

GREENHOUSE GAS PROTOCOL

Level: Difficult

Example 6. U.S. onsite/Off-site combination

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO_2e	**MB** in lbs CO_2e
California Site A	100 MWh electricity from CHP[2]	N/A for eGRID – source specific is 600 lbs CO_2e/MWh	Source specific is 600 lbs CO_2e/MWh		
California Site B	100 MWh onsite leased solar consumption with REC retention	N/A, onsite source-specific	N/A, onsite source-specific		
	100 MWh grid consumption	652.72 *CAMX*	100 MWh REC purchase		
New Jersey	100 MWh onsite leased solar consumption with REC sales	862.86 *RFCE*	REC sales, treat as grid delivered – no additional contractual information		
			Total		

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

2. CHP owned/operated by outside organization. Only consuming electricity output.

GREENHOUSE GAS PROTOCOL

Level: Difficult

Example 6. U.S. onsite/Off-site combination

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO_2e	**MB** in lbs CO_2e
California Site A	100 MWh electricity from CHP[2]	N/A for eGRID – source specific is 600 lbs CO_2e/MWh	Source specific is 600 lbs CO_2e/MWh	60,000	
California Site B	100 MWh onsite leased solar consumption with REC retention	N/A, onsite source-specific	N/A, onsite source-specific	0	
	100 MWh grid consumption	652.72 *CAMX*	100 MWh outside REC purchase	65,272	
New Jersey	100 MWh onsite leased solar consumption with REC sales	862.86 *RFCE*	REC sales, treat as grid delivered – no additional contractual information	86,286	
			Total	211,558	

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

2. CHP owned/operated by outside organization. Only consuming electricity output.

GREENHOUSE GAS PROTOCOL

Level: Difficult

Example 6. U.S. onsite/Off-site combination

Sites	Annual Consumption	eGRID subregion and EF[1]	Contractual information?	**LB** in lbs CO_2e	**MB** in lbs CO_2e
California Site A	100 MWh electricity from CHP[2]	N/A for eGRID – source specific is 600 lbs CO_2e/MWh	Source specific is 600 lbs CO_2e/MWh	60,000	60,000
California Site B	100 MWh onsite leased solar consumption with REC retention	N/A, onsite source-specific	N/A, onsite source-specific	0	0
	100 MWh grid consumption	652.72 *CAMX*	100 MWh outside REC purchase	65,272	0
New Jersey	100 MWh onsite leased solar consumption with REC sales	862.86 *RFCE*	REC sales, treat as grid delivered – no additional contractual information	86,286	86,286
			Total	211,558	146,286

1. EGRID 2012, reported here in lbs CO_2e/MWh only, for simplicity. Full reporting by gas, and in metric tons, required for complete inventory.

2. CHP owned/operated by outside organization. Only consuming electricity output.

GREENHOUSE GAS PROTOCOL

- **Download the Guidance, Executive Summary, other materials at: http://www.ghgprotocol.org/scope_2_guidance**

Thanks!

Mary Sotos
Mary.sotos@wri.org
202-729-7627