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# Grid emission factors and off-grid power generation

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## What is a grid emission factor (GEF)?

- Factor of how “dirty” the power plants in the electricity are
- Measured in tonnes of CO<sub>2</sub> per megawatt-hr produced (tCO<sub>2</sub>/MWh)
- Calculated based on the amount and type of fuel used per plant as well as the amount of electricity generated
- Two components are averaged to calculate a factor representative of the present and future:
  - Operating margin: Current emissions from fossil fuel plants
  - Build margin: Emissions from ALL of the newest plants
- Key factor in calculating emissions reductions for any grid connected projects
  - Data used must be available in the Project Design Document
- Fixed for a crediting period or calculated annually



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# African grid emission factors

Country	Grid emission factor (tCO <sub>2</sub> /MWh)
Ethiopia	0.006
Swaziland	0.17
Ghana	0.41-0.58
Kenya	0.43
Egypt	0.49-0.51
Uganda	0.58
Cote d'Ivoire	0.59
Rwanda	0.70
South Africa	0.95-1.25
<b>China (average)</b>	<b>0.93</b>



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## GEF challenges

- Gathering data is difficult, especially from abroad
  - Gathering RELIABLE data is even more difficult
  - “Tool to calculate the emission factor for an electricity system” is complicated
    - Chicken & egg issue: having a GEF already calculated can attract carbon advisors but no carbon advisor will calculate this without having projects in the country which leaves it in the hands of the DNA
    - Outsider assistance is welcome (e.g. Austrian government calculated GEFs of Ethiopia, Uganda and Ghana)
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## Grid tool challenges

- Grid tool now allows for inclusion of off-grid power plants (e.g. diesel generators) but requires: *total capacity of off-grid power plants (in MW) should be **at least 10% of the total capacity** of grid power plants in the electricity system; or the total power generation by off-grid power plants (in MWh) should be **at least 10% of the total power generation** by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid is primarily due to constraints in generation and not to other aspects such as transmission capacity.*
    - Difficult to gather information about all of the off-grid power plants as there is not a central database
    - Default values would be useful – perhaps based on amount of power outages?
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## Grid tool challenges

- Version 2.0 of the grid tool touches upon suppressed demand issue (e.g. build margin should be weighted heavier because more of the newest types of plants would be built, if funding /technology was available) but the problem is not solved
- There is typically a large number of imports and the grid tool states imports must have an emissions factor of 0 tCO<sub>2</sub>/MWh





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Thank you  
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