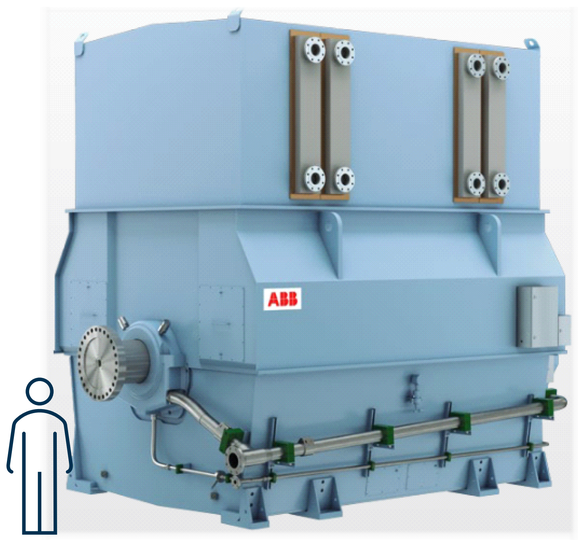
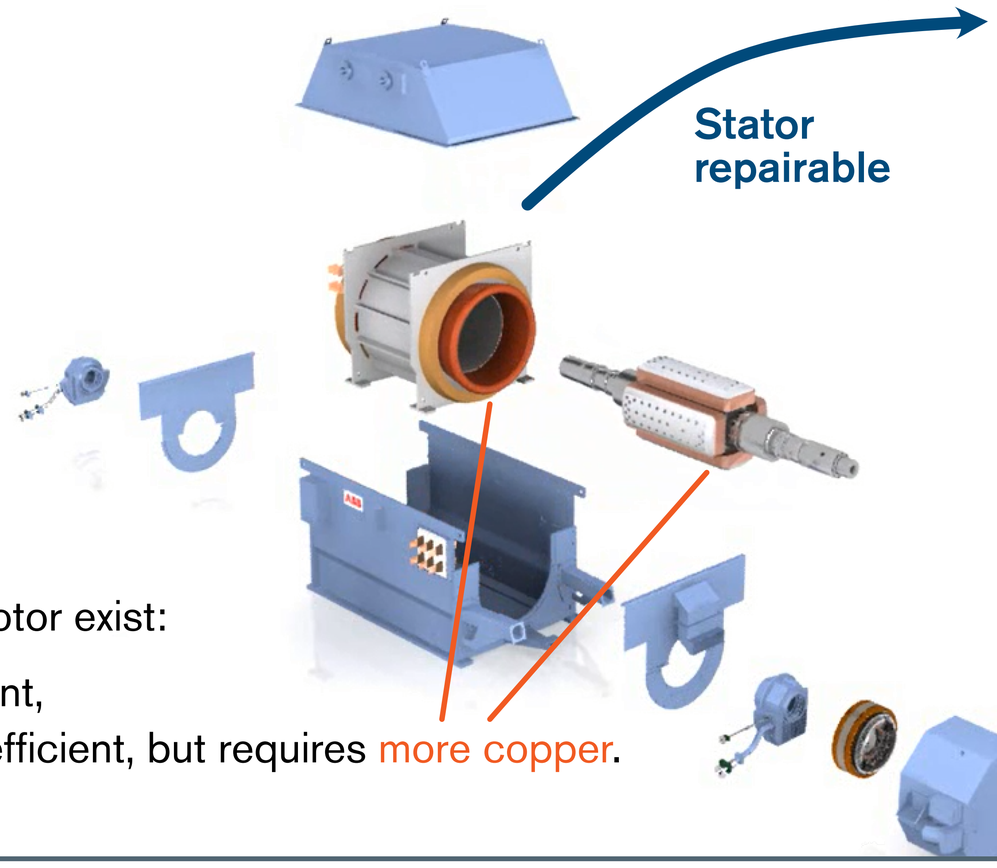
For **durable and energy intensive products**, maintaining **high energy efficiency is key for repair** to be beneficial.

Context

High voltage electric motors are big and long-lived (designed for min 20 years) stationary motors used in the industry. Examples of application are in the chemical and metal industries, to drive pumps or compressors.





Two main designs of high voltage motor exist:

- Induction motor: less energy efficient,
- Synchronous motor: more energy efficient, but requires more copper.

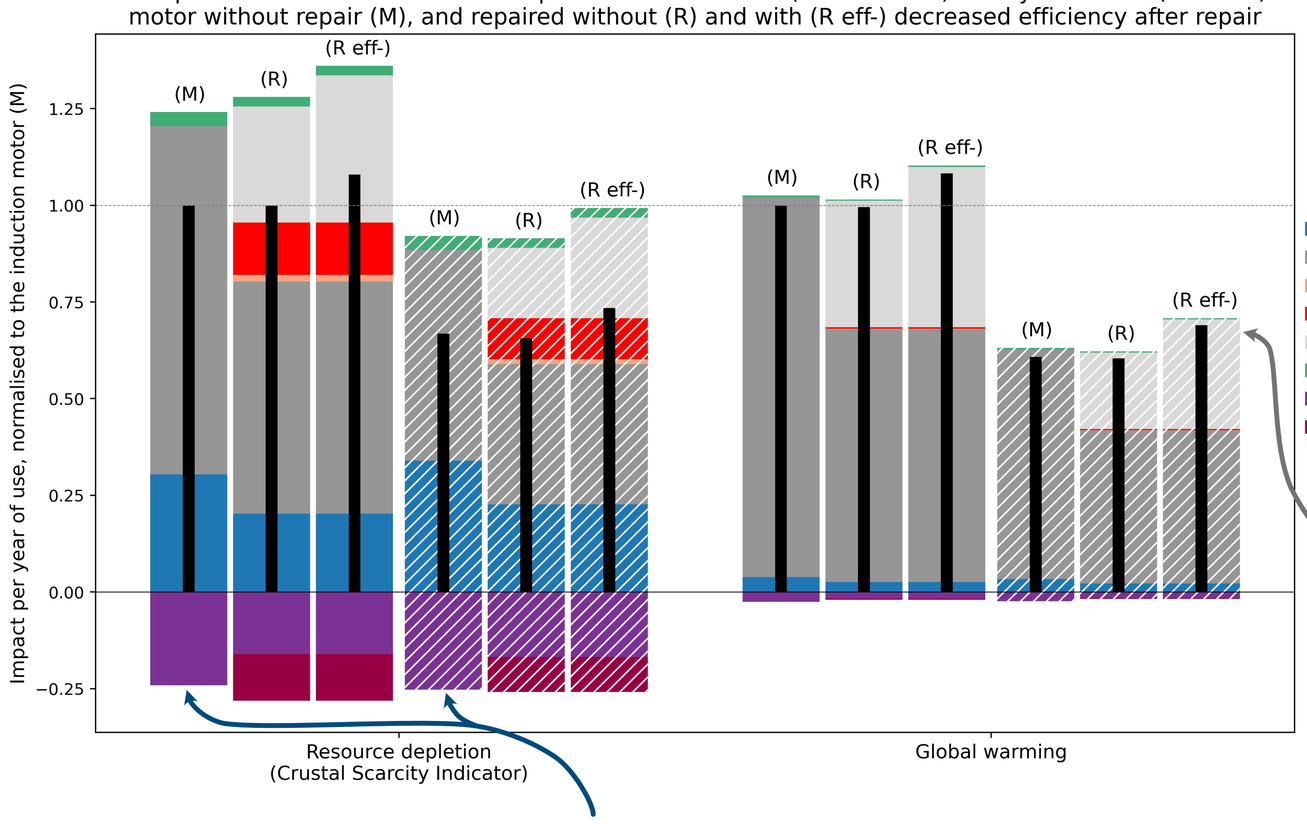
High voltage motors are often used until failure, with one of the most common faults occurring in the stator copper windings.

The stator could be repaired by rewinding, i.e. replacing the copper windings, for an additional lifetime (here assumed 10 years).

The repair may lead to a reduced energy efficiency.

Results

Comparison of the environmental impact for the induction (non-hatched) and synchronous (hatched) motor without repair (M), and repaired without (R) and with (R eff-) decreased efficiency after repair



Higher production impact on resource depletion for the synchronous motor. But lower energy losses compensate for the difference.

Changing the design to a more energy efficient one is preferred over use extension with repair.

The contribution of rewinding is lower than motor production.

But the net benefit of repair is very small for both global warming and resource depletion (comparison of (R) and (M) for both designs).

With an efficiency reduction after repair, the additional energy losses offset the gain from avoiding the production of a new motor (impact for (R eff-) higher than for (M)).

The repair is not beneficial if high efficiency is not maintained.

Environmental sustainability of high voltage motors: do better efficiency and repair lead to improved environmental impact?
Repair for high-voltage electric motors: energy efficiency vs resource use?

Adeline Jerome[1], Maria Ljunggren[1] and Matty Janssen[1]

[1] **Environmental Systems Analysis**
Chalmers University of Technology
Gothenburg, Sweden
Contact: adeline.jerome@chalmers.se

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