Aloe Energy

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Wires are not the limit: why Africa's power pool interconnectors carry less than their rating

Southern Africa's cross-border lines can carry about two thirds of their rating, and some links in Eastern Africa a tenth. Plans that count on imports should use what a line can carry, not what it is rated for.

Brandon Simons, Aloe Energy · Policy brief · November 2026 · Version 1.1 · License: CC BY 4.0
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Key findings

1. **Southern Africa's cross-border lines can carry about two thirds of their rating.** The 25 interconnections between Southern African Power Pool (SAPP) members are rated at 11,400 MW combined. The limits SAPP applies to them add up to about 7,760 MW, or 68%.
2. **The wires are rarely the problem.** On 24 of the 25 links, the binding limit is stability: how much power the connected grids can exchange and still recover from a fault. Only one link is limited by the heat rating of its conductors.
3. **Some links carry far less.** Five can use less than half their rating. Beitbridge to Messina, between Zimbabwe and South Africa, is allowed 15 MW on a 70 MW line.
4. **In Eastern Africa the gap is wider, for other reasons.** The Ethiopia to Kenya HVDC link is rated at 2,000 MW and carried a 200 MW peak contract until late 2026, rising to 400 MW; congestion in Kenya's own grid caps exports below 500 MW. The new Kenya to Tanzania line has moved a 50 MW test. Flows to Sudan fell from about 100 MW to 10 to 20 MW because of the war there.
5. **So rated capacity is a poor planning number.** A country counting on imports in a drought, or a planner assuming a new line will carry its rating, should use the usable limit and expect it to change. Power built close to demand, including mini-grids and storage at weak grid ends, does not depend on any of these limits.

Why this matters

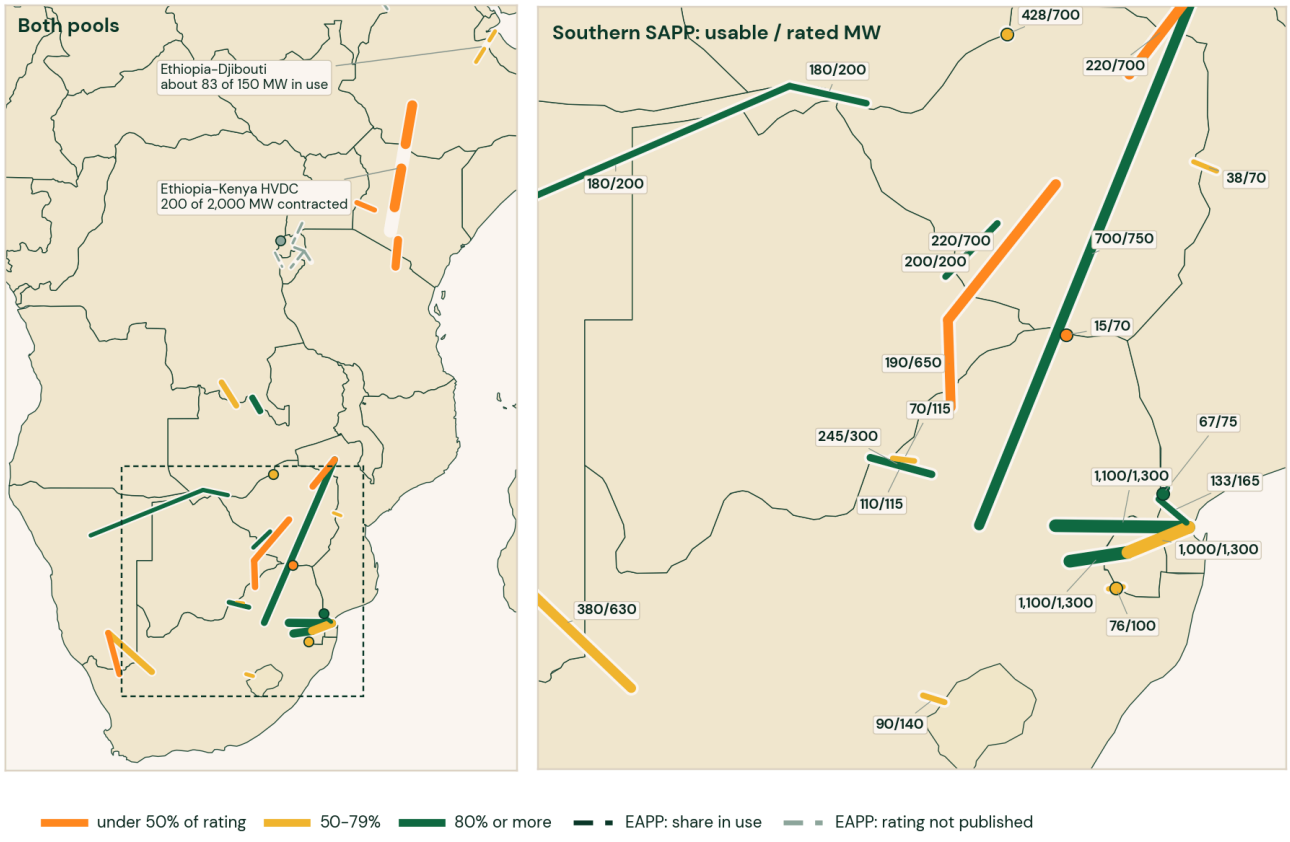
Power pools are meant to let countries share. A country short of water in its dams can import from a neighbor with coal or gas; a country with spare hydro can sell it. The case for each new interconnector rests on how much it can carry.

The number most often quoted for a line is its rating, the most its conductors can carry before they overheat. But a line between two grids almost never runs at its rating. Each power pool sets a lower limit for every link, based on what the grids at both ends can handle. And in practice, trade is often lower still, set by contracts, by congestion inside each country, or by conflict.

This brief compares the rating of each cross-border link with what it is allowed or contracted to carry, in the Southern African Power Pool (SAPP) and the Eastern Africa Power Pool (EAPP). It is a companion to our paper Promised vs built, which shows that new lines also arrive late.

Figure 1 puts every published link on one map. Each line is drawn from substation to substation, its width set by its rating and its color by the share of that rating that is usable (SAPP) or in use (EAPP). An interactive version with each link's limits and sources is at aloeenergy.org/research/interconnector-limits.

Figure 1. Share of rating usable on SAPP links and in use on EAPP links (dashed)

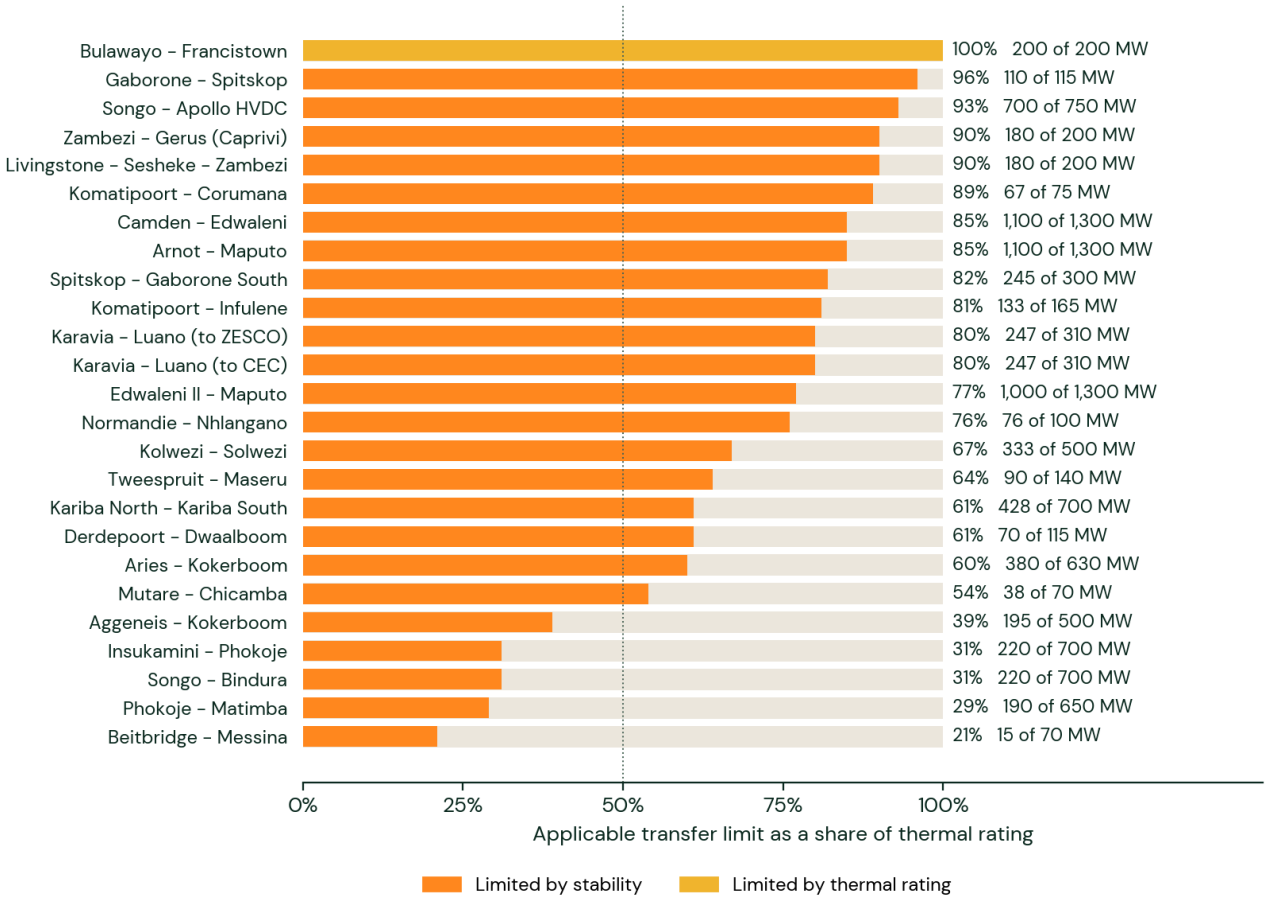


Sources: SAPP transfer limits (read 11 November 2026); EAPP sources as in Figure 3 and the reference list. Lines are straight and schematic, between the named substations. Labels in the right panel: usable / rated MW. SAPP internal corridors are not shown.

Southern Africa: two thirds of the rating

SAPP publishes four numbers for each interconnection: its thermal limit (the rating of the conductors), a voltage limit, a stability limit, and the applicable transfer limit, which is the lowest of the three. We read the table on SAPP's website on 11 November 2026; the page does not show the date of the limits.

Figure 2. Applicable transfer limit as a share of thermal rating, 25 SAPP cross-border links



Source: SAPP, Transfer limits (sapp.co.zw/transfer-limits, read 11 November 2026). Internal corridors (North and South of Hydra, Kariba South to Insukamini, Luano to Kariba North) are left out.

Three patterns stand out.

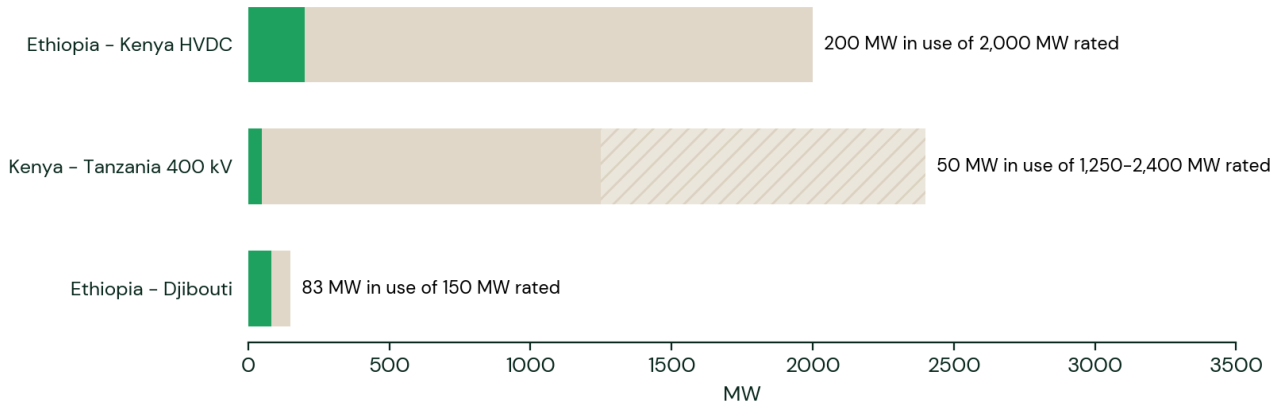
- **Stability, not heat, sets the limit.** On 24 of the 25 links the stability limit is the lowest of the three numbers. The one exception is Bulawayo to Francistown, where the thermal rating binds.
- **Big lines lose the most in megawatts.** The ten links of 330 kV and above are rated at 8,530 MW together but allowed about 5,670 MW. Three 330 and 400 kV links between Mozambique, Zimbabwe, Botswana and South Africa (Songo to Bindura, Insukamini to Phokoje, Phokoje to Matimba) can each use less than a third of their rating.
- **Small links can be almost unusable.** Beitbridge to Messina is allowed 15 MW of its 70 MW, about a fifth.

The links that come closest to their rating are the double-circuit lines into Mozambique and Eswatini (the MOTRACO lines, 77 to 85%), the Songo to Apollo HVDC line into South Africa (93%) and the two Zambia to Namibia links (90%).

Eastern Africa: rated for trade that is not happening yet

The EAPP does not publish a table of limits like SAPP's, so the comparison here is between a line's rating and what it is contracted to carry or has actually carried. That is a different measure, and it shows a different problem.

Figure 3. Rating and power in use on three EAPP links



Sources: I-TRACK Ethiopia country assessment (2025); Capital Ethiopia (15 September 2026); FurtherAfrica (1 September 2026); AfDB environmental and social summary for the Kenya to Tanzania line (2014); KETRACO (13 December 2024). The Kenya to Tanzania line is given as 1,250 MW and 2,400 MW in the same AfDB document; both are shown. Djibouti shows the midpoint of 75 to 90 MW on average. Ethiopia to Sudan is left out because its rating is not published.

- **Ethiopia to Kenya.** The 1,045 km HVDC line, in service since late 2022, is rated at 2,000 MW in either direction. Ethiopia sold 200 MW at peak and 65 MW off-peak under its contract with Kenya until a new arrangement raises this to 400 MW from December 2026. Ethiopian Electric Power data cited in the press put a cap below 500 MW on the corridor because of congestion in Kenya's own grid.
- **Kenya to Tanzania.** The 400 kV line was energized in December 2024. A test in June 2025 moved 50 MW of Ethiopian power through Kenya to Tanzania; a contract for 100 MW, rising to 200 MW over three years, is planned.
- **Ethiopia to Sudan.** Exports fell from about 100 MW to 10 to 20 MW because of Sudan's civil conflict and damaged infrastructure.
- **Ethiopia to Djibouti.** The busiest link for its size: 75 to 90 MW on average, 550 to 650 GWh a year, on a line of about 150 MW.

The EAPP's day-ahead trading platform has been tested and grid connection codes are in place, but formal trading had not started as of September 2026. Regional trade is mostly bilateral contracts.

Why lines carry less than their rating

- **Stability.** When a fault trips a large generator or line, the grids at both ends swing. A long, heavily loaded link can lose synchronism, which can black out both sides. Operators set the transfer limit so that the system survives the loss of the largest element. Long distances and weak grids at the ends push this limit down.
- **Weak grids behind the border.** A cross-border line is only as useful as the network that carries its power onward. The Ethiopia to Kenya cap comes from congestion inside Kenya, not from the HVDC line itself.

- **Single links.** Where one line carries all the trade between two countries, operators must plan for losing it, and that limits how much any one country can rely on it.
- **Contracts and markets.** In the EAPP, most power moves under bilateral contracts sized well below the line. Until a regional market runs, spare capacity on a line has no buyer.
- **Conflict and drought.** War cut Ethiopia's exports to Sudan. Drought cuts what hydro-rich exporters can offer: in 2024 Zambia lost 37% of its hydro output, about 730 MW on average, while the lines that bring power into the country had room for about 430 MW (Aloe Energy, When the river runs low, 2026).

What it means

- **Plan with usable limits, not ratings.** Import plans, drought contingency plans and the economic case for new lines should use the applicable limit, and say which one. Ratings should be quoted next to it, not instead of it.
- **Expect limits to move.** Stability limits rise when grids at both ends are strengthened, and fall when a large plant or line is out. A link's value depends on investment on both sides of the border.
- **Count the line and the grid behind it together.** Ethiopia to Kenya shows that a large interconnector can be held back by the national grid it connects to. Regional plans should cost the internal reinforcements that let a line carry its rating.
- **Build some supply close to demand.** Generation and storage near the load, including mini-grids and batteries at the weak ends of long lines, do not depend on a cross-border limit, a contract or a neighbor's rainfall. Our paper Power first, grid next looks at what that does for losses and the evening peak on Zambia's network.
- **Publish limits regularly.** SAPP's table is a good public start, but it is not dated. The EAPP publishes no equivalent. Dated, regular publication of transfer limits and actual flows would let planners and investors see whether links are getting more useful over time.

Limits of this brief

- The SAPP figures are one snapshot from SAPP's website, which does not date the table. Limits change with grid conditions; we did not collect past values.
- The EAPP figures compare ratings with contracted or actual flows, not with technical limits, so they are not directly comparable with SAPP's.
- For several EAPP links (Ethiopia to Sudan, Uganda to Rwanda, Rwanda to DR Congo, the Rusumo and Ruzizi links to Burundi) no rating is published, so they are left out of the totals and Figure 3; the map shows them in gray-green.
- We do not model the grids; the explanations of why limits are low are general, not link by link.

Data and sources

Version 1.0 was published on 11 November 2026. Version 1.1 (13 November 2026) adds the map in Figure 1; the numbers are unchanged.

The SAPP table and the EAPP cases are in Aloe Energy's open SAPP and EAPP grid atlases, which are checked against public sources every month. The data behind this brief is available on request by email.

- SAPP. Transfer limits. https://www.sapp.co.zw/transfer-limits (read 11 November 2026).

- I-TRACK Foundation. Country assessment report: Ethiopia (Ethiopian Electric Power), 2025.
- Capital Ethiopia. Ethiopia, Kenya finalize preparations to scale up cross-border power trade by December 2026. 15 September 2026.
- FurtherAfrica. Eastern Africa Power Pool eyes a $40bn trading shift. 1 September 2026.
- African Development Bank. Kenya-Tanzania power interconnection project: environmental and social impact assessment summary. July 2014.
- KETRACO. Kenya-Tanzania 400 kV interconnector energized. 13 December 2024.
- Aloe Energy. When the river runs low: hydro dependence and drought exposure in the Southern and Eastern African power pools. 2026.
- Aloe Energy. Promised vs built: how late are power projects in Southern and Eastern Africa? 2026.