

Case study on Energy Efficiency in Mr. Abai's factory

Please read the scenario below and complete the given tasks.

On a typical day in Hawassa, Mr. Abai, the Managing Director of ABC Textiles is reading some news reports with a crease on his forehead. As people are experiencing rolling blackouts of several hours a day with an unreliable power supply and increasing cost of energy, all his factory production is coming to a halt. As most of his steam boilers are electric and his machines are steam reliant, he is facing a lot of challenges. In the meantime, he started reading a report of IEA which is as follows:

Global energy crisis shows urgency of accelerating investment in cheaper and cleaner energy in Africa¹

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Today's crippling spikes in energy prices underscore the urgency and the benefits for African countries of accelerating the scale up of cheaper and cleaner sources of energy, the IEA says in a new [special report](#) released today.

Russia's invasion of Ukraine has sent food, energy and other commodity prices soaring, increasing the strains on African economies already hard hit by the Covid-19 pandemic. The overlapping crises are affecting many parts of Africa's energy systems, including reversing positive trends in improving access to modern energy, with 25 million more people in Africa living without electricity today compared with before the pandemic, according to the [Africa Energy Outlook 2022](#).

At the same time, Africa is also already facing more severe effects from climate change than most other parts of the world – including massive droughts – despite bearing the least responsibility for the problem. Africa accounts for less than 3% of the world's energy-related CO2 emissions to date and has the lowest emissions per capita of any region.

*Despite these challenges, the report finds that the **global clean energy transition** holds new promise for Africa's economic and social development, with solar, other renewables and emerging areas such as critical minerals and green hydrogen offering strong growth potential if managed well. Increased international ambitions for cutting emissions are helping set a new course for the global energy sector amid declining clean technology costs and shifting global investment patterns. African countries are poised to benefit from these trends and attract increasing flows of climate finance.*

"Africa has had the raw end of the deal from the fossil fuel-based economy, receiving the smallest benefits and the biggest drawbacks, as underlined by the current energy crisis," said Fatih Birol, the IEA Executive Director. "The new global energy economy that is emerging offers a more hopeful future for Africa, with huge potential for solar and other renewables to power its development – and new industrial opportunities in critical minerals and green hydrogen."

Reading the report, Mr. Abai started a walk through his factory and planned to be more conscious about the use of energy.

¹ <https://www.iea.org/news/global-energy-crisis-shows-urgency-of-accelerating-investment-in-cheaper-and-cleaner-energy-in-africa>

Your tasks:

1. Walk with Mr. Abai through the factory, (a) find out and list the possible non-renewable energy sources that are being used for textile processing. (b) Also brainstorm the possible renewable energy alternatives and (c) suggest a suitable one that can be set-up for clean energy transition.
2. Power cuts are making it harder to run Mr. Abai's electric boilers. Moreover, his gas boilers are also becoming expensive to run for the increasing price and scarcity of gas. To align with the vision of the IEA report above, as a long-term, sustainable solution, which boiler will be better? Present a comparative analysis in terms of performance, energy conservation and efficiency.
3. Mr. Abai learnt that one of his electric boilers is running at 30% efficiency which is a clear sign of concern for him. So, he is determined to understand the underlying factors causing the reduction in the efficiency. The electric boiler is situated at a dark boiler room in a gloomy rat-infested place surrounded by walls full of spider web.
The management team responsible for that boiler presented the following information:
 - The ideal boiler pressure is 1.5 bar but it is reported to be found below 1 bar.
 - The boiler has a faulty thermostat.
 - Rumbling, popping, and hissing sounds come from the electric water heater.
 Find out the possible root causes of less energy efficiency of that boiler. Present a pragmatic solution so that the efficiency can be increased.
4. After getting to know about the low efficiency of the boiler, Mr. Abai is quite concerned about the energy efficiency of the other machines.
 - (a) For achieving a holistic solution, help Mr. Abai by explaining the importance of Energy Management and Energy Audits to know about the overall energy situation and find out the cost saving opportunities in the factory.
 - (b) Also propose a plan by taking the role of an Energy Manager to conduct an energy audit for the factory.
5. After the energy audit as an Energy Manager, you have found out the following types of investment opportunities. Calculate and present which one of them has more attractive economic viability with respect to payback period.

Type of investment	Investment (Birr)	Operating cost (Birr)	Annual savings (Birr)
A	2,220,000	42,000	487,000
B	30,400	1290	46,890
C	38,360	793,767	1,242,087