ENERGY

PROPOSAL CONCEPT

Report No. PSECC00E

PSECC LTD

Save 85.185 million metric

tons of CO_2 (tCO_2) a year

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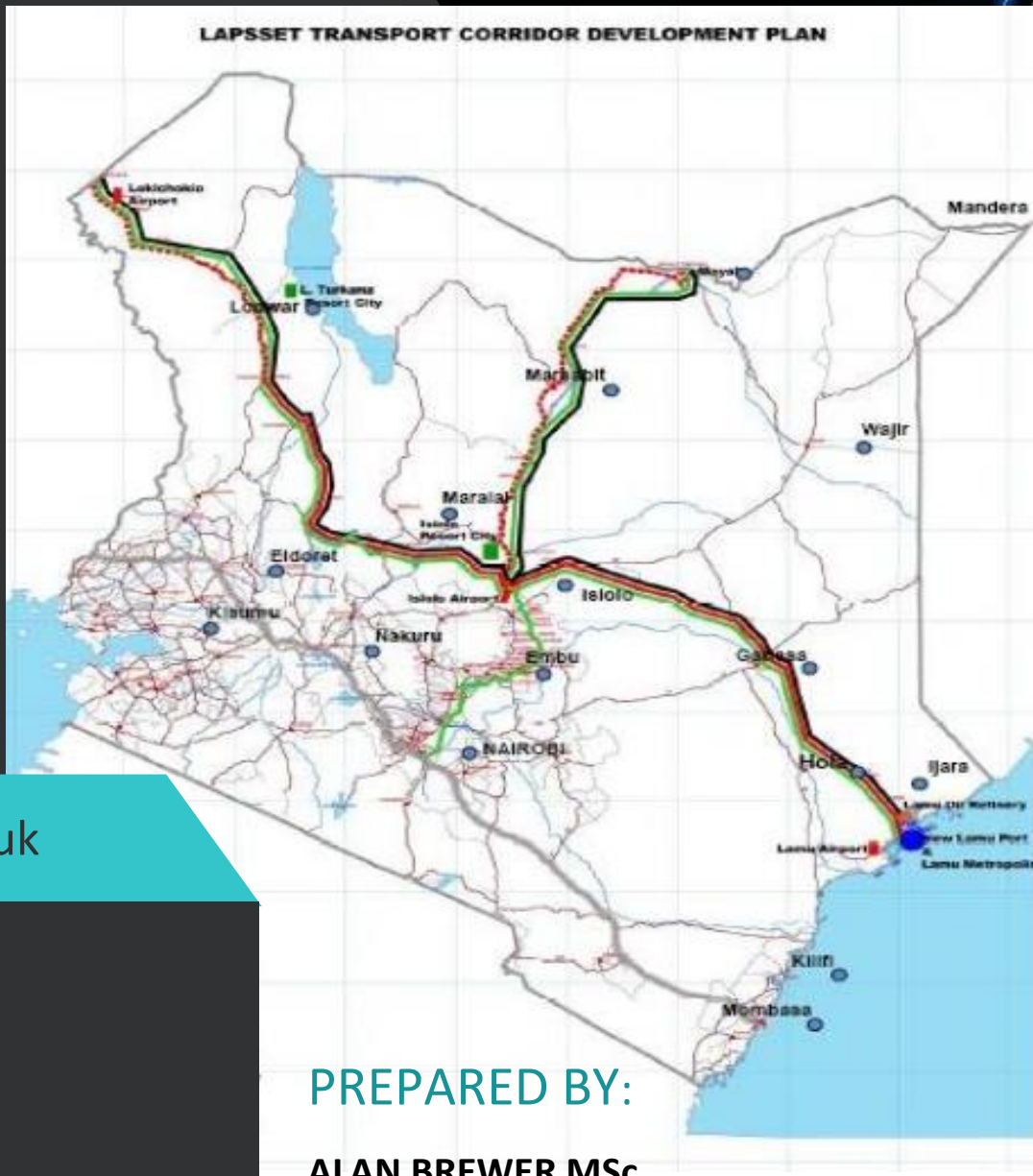

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PREPARED FOR:

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alan@psecc.co.uk Date: January 2024

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PROJECT NAME:	Lapsset Corridor Energy Proposal Concept Date: 2023		
Project type:	ENERGY	Proposal 1 Concept	
Project Sponsor:	PSECC LTD ALAN BREWER	Project Manager:	PSECC Ltd Alan Brewer

Target Completion:	2035	Total Budget Est:	US $25.525 Billion

Project Overview: - save 85.185 million metric tons of CO_2 (tCO_2) annually

Project Objectives Statement:

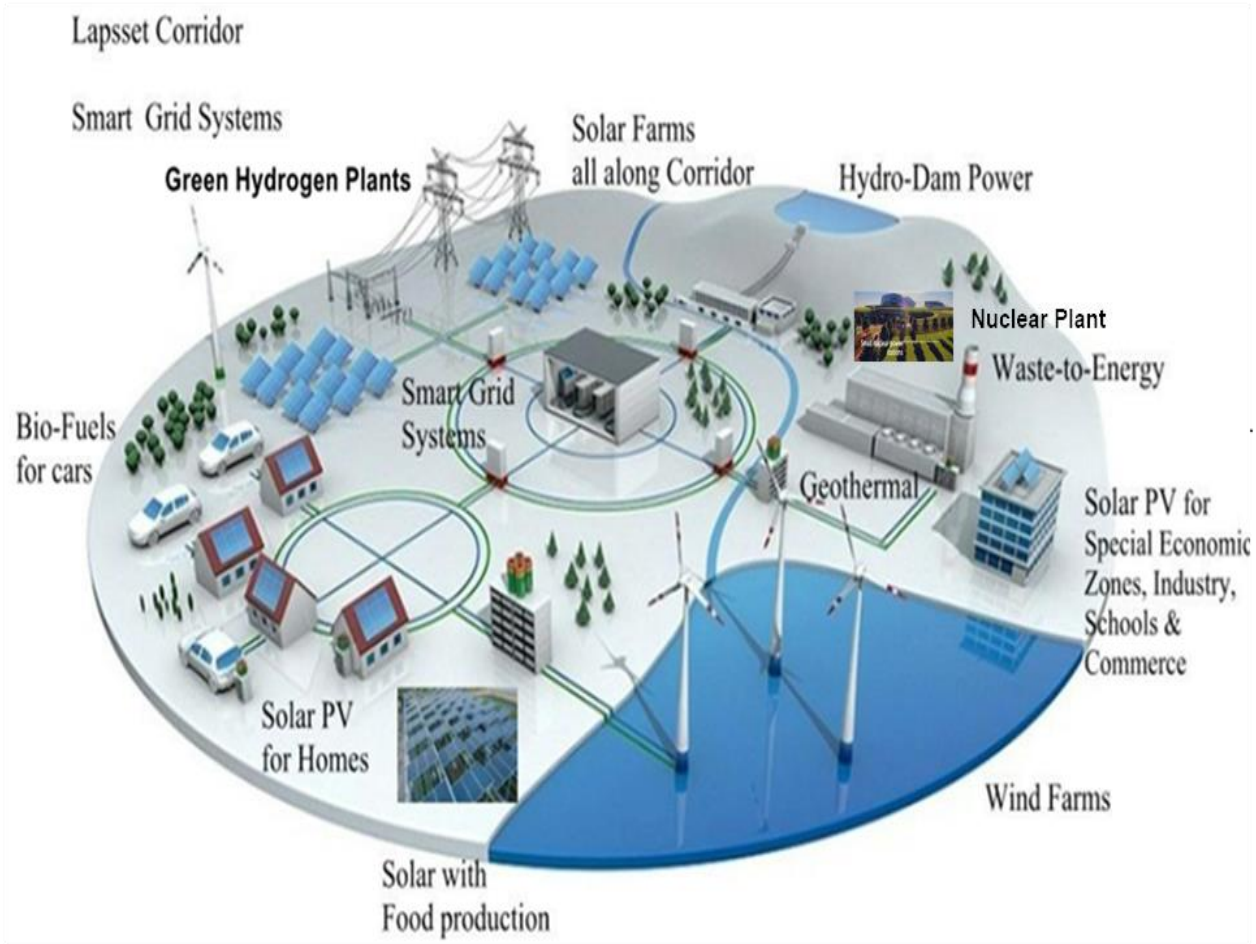
The concept is to make Lapsset Corridor truly sustainable and a showcase of Climate Change Mitigation and Renewable Energy development. We have a high level of ambition that will save ***85,185,000 metric tons of CO_2 (tCO_2) annually.*** *Review all relevant LCDA documentation. The Lapsset Corridor will generate all the required energy from resources within the Corridor and not be reliant upon KenGen or KPLC. The goal of this project is to negotiate with LCDA and Ministerial teams to put forward the case for the delivery of PSECC Ltd's estimate of 16.752 GW of Renewable Electricity as a consequence of Government and Presidential requirements to the Lapsset Corridor and Kenya between 2024 to 2035, no later than [2040] at an agreed price of US $0.05 KWh, working with Afri-Fund Capital, UK Export Finance, Credinvest International and technology partners. Each Renewable Energy plant will be 35% owned by "Least Cost" option will be chosen for all Renewable Energy types and ensuring Carbon Dioxide Emission reduction, Sustainable Development Goals (SDG's) and National Determined Contributions (NDC's) are met together with 1,000's of jobs being created for Kenyan's. LCDA to consider & agree to the concept.*

Engineering Phase One for Feasibility Studies will determine exact energy requirements for the Lapsset Corridor, costs, Environmental aspects and concerns.

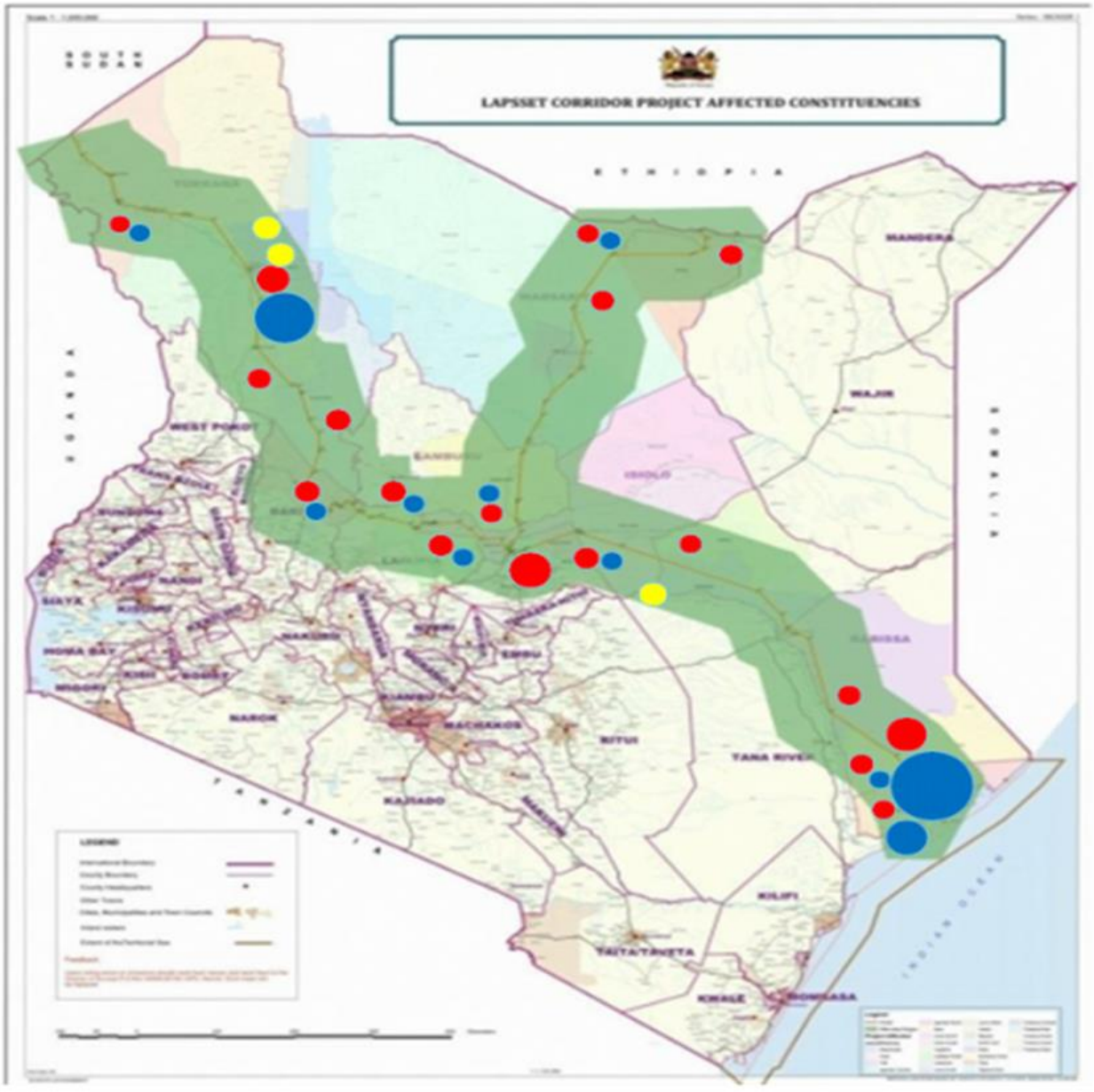
PSECC Ltd - Phase One Railway & Economic Zones - Energy Installed & Cost Recommendations to meet Kenya Government, LCDA targets, NDC's and IPCC emission reduction.

		MW (2024 – 2028)		Cost	MW (2028 – 2035)		Cost
• expansion in geothermal	-	1,887	MW	US$ 2,830 m	3,113	MW	US$ 4,669 m
• solar PV	-	500	MW	US$ 500 m	500	MW	US$ 500 m
• solar farms	-	2,000	MW	US$ 1,770 m	1,000	MW	US$ 885 m
• solar PV Manufacturing plant	-	25	MW	US$ 10 m	50	MW	US$ 20 m
• waste plants	-	180	MW	US$ 900 m	180	MW	US$ 900 m
• wind farms	-	150	MW	US$ 328 m	350	MW	US$ 766 m
• green hydrogen	-	1,100	MW	US$ 1,432 m	1,100	MW	US$ 1,432 m
• dams – hydroelectricity	-	796	MW	US$ 796 m	500	MW	US$ 500 m
• climate smart agriculture Bio-Fuels	-	191	M Ltrs	US$ 190 m	150	M Ltrs	US$ 190 m
• Nuclear	-	-	-	- -	940	MW	US$ 4,800 m
• Clean Coal Technology	-	2,040	MW	US$ 2,107 m	-	-	- -
	Total	8,869	MW	US$ 10,863m	7,883	MW	US$ 14,662 m

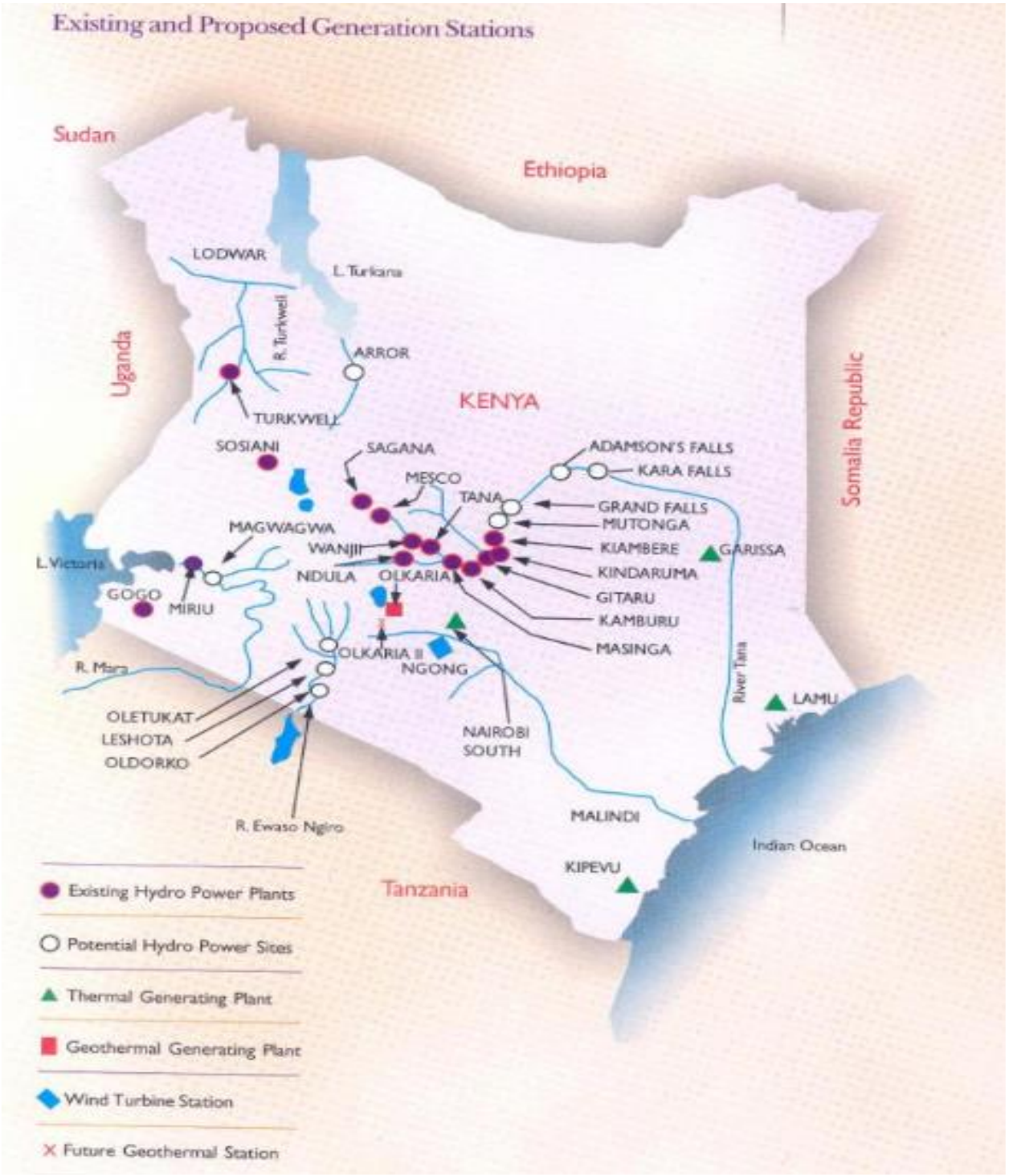
Exact energy demand will be calculated and corresponding projects then developed.



Conceptual Renewable Energy projects



Existing and selected proposed power plants



Business Justification

Strategy – working closely with LCDA and Government Ministry.

Business Justification: *PSECC Ltd have twenty-eight years of experience in the Climate Change Mitigation, Renewable Energy & Waste sectors and Headway USA have forty years' experience Why should Kenya and our company do it now – To meet all Government targets set out in the following:*

1. *Adherence to LCDA studies and relevant documentation.*
2. *KENYA VISION 2030 FLAGSHIP PROGRAMMES AND PROJECTS PROGRESS REPORT (FY 2020/2021), INTEGRATED TRANSPORT INFRASTRUCTURE MASTER PLAN FOR LAMU PORT CITY.*
3. *In keeping with President Ruto's signed a framework agreement for collaboration on the development of sustainable green industries in Kenya with an investor to produce 30 GW of green hydrogen in Kenya. We propose 2.2 GW of Green Hydrogen for the Lapsset Corridor.*
4. *REMARKS BY HIS EXCELLENCY HON. WILLIAM SAMOEI RUTO, PHD., C.G.H., PRESIDENT OF THE REPUBLIC OF KENYA AND COMMANDER-IN-CHIEF OF THE DEFENCE FORCES, ON BEHALF OF THE AFRICAN GROUP AND KENYA AT THE 27th CONFERENCE OF PARTIES (COP 27) TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC). SHARM EL SHEIKH, EGYPT - NOVEMBER 7TH 2022*
5. *THE STRATEGIC ENVIRONMENTAL ASSSESSMENT FOR THE LAPSSET INFRASTRUCTURE - CORRIDOR – 2015 – 2016.*
6. *MINISTRY OF ENERGY AND PETROLEUM - Development of a Power Generation and Transmission Master Plan, Kenya - Long Term Plan – Energy Efficiency 2015 – 2035 - October 2016.*
7. *Also the Kenya Nuclear Energy Authority have plans for 1,000 MW of Nuclear Energy to commence in 2027 after personnel have been trained.*
8. *Kenya - ambitious targets for geothermal energy. Expansion of its Hydroelectricity, geothermal power production to 5,000 MW by 2030, medium-term 1,887 MW by 2017 were required.*

We will create business justification for the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor renewable energy project, which involves demonstrating the economic, environmental, and social benefits of the project. It's essential to present a strong case for investment and approval. Here's how you can structure a business justification for such a project:

1. ***Executive Summary:***

Provide a concise overview of the renewable energy project and its primary objectives. Highlight the anticipated benefits and outcomes.

2. ***Project Description:***

Detail the renewable energy project, including its scope, scale, and technologies involved. Describe the location and key features of the project.

3. ***Business Goals and Objectives:***

Clearly outline the specific goals and objectives of the project. These should align with broader development, energy, and sustainability goals for the region and country.

4. ***Market Analysis****:*

Conduct a comprehensive analysis of the energy market within the LAPSSET Corridor. Include information about energy demand, supply gaps, and market trends.

5. ***Economic Feasibility****:*

Present financial analysis that includes cost estimates for each technology project, revenue projections, return on investment (ROI), and payback period. Demonstrate that the project is economically viable and profitable.

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6. ***Environmental Benefits****:*

Highlight the positive environmental impacts of the renewable energy project. This can include reduced greenhouse gas emissions, lower air and water pollution, and biodiversity conservation.

7. ***Energy Security:***

We will explain how the project contributes to enhancing energy security within the region. This can involve reducing dependence on imported energy sources or diversifying the energy mix

8 ***Job Creation and Economic Development***

Detail the number of jobs the project is expected to create, both during construction and in the operational phase. Discuss how the project will stimulate economic growth and support local businesses.

*9. **Energy Access**:*

We will further explain how the project will improve energy access for communities in the LAPSSET Corridor, particularly in underserved or remote areas.

*10. **Regulatory Compliance**:*

Highlight the project's adherence to regulatory requirements, including environmental, safety, and permitting standards. Demonstrate a commitment to legal and ethical compliance.

*11. **Stakeholder Engagement:***

Describe the engagement with local communities and stakeholders. Address their concerns, provide benefits, and promote social acceptance.

*12. **Risk Assessment and Mitigation**:*

Identify potential risks associated with the project and provide strategies for mitigating these risks. This includes financial, environmental, and technical risks.

*13. **Technological Advancements**:*

Explain how the project incorporates state-of-the-art renewable energy technologies and contributes to technological advancements and innovation in the energy sector.

*14. **Financing and Funding Sources**:*

Detail the sources of funding for the project, including public-private partnerships, grants, loans, and investments.

*15. **Timeline and Milestones**:*

Provide a project timeline with key milestones and deadlines. This demonstrates a well-planned and organized project execution.

*16. **Alternatives and Comparisons**:*

Compare the renewable energy project to alternative energy sources or approaches, highlighting the advantages of your chosen solution.

17. ***Social and Environmental Responsibility***:

Emphasize the project's commitment to social responsibility, including community engagement, environmental stewardship, and sustainable practices.

18. ***Conclusion and Recommendation***:

Summarize the business justification and provide a clear recommendation for proceeding with the renewable energy project within the LAPSSET Corridor.

19. ***Appendices***:

Include any supporting documents, such as detailed financial models, environmental impact assessments, technical specifications, and letters of support.

A well-structured business justification will help secure the necessary approvals, funding, and support for the LAPSSET Corridor renewable energy project, showcasing its benefits and its alignment with broader regional development goals and energy needs.

Alignment with Lapsset Corridor Strategy - How does it align with our strategy? What is the perceived impact if we don't do it now?

Yes our strategy aligns with Lapsset Corridor aspirations. The Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor is a major infrastructure development project in Kenya aimed at enhancing regional trade, connectivity, and economic development. The strategy for the LAPSSET Corridor in Kenya involves several key components:

Transport Infrastructure: *The primary focus of the LAPSSET Corridor is to develop transport infrastructure, including a new port in Lamu, roads, railways, and pipelines. The key elements include the Lamu Port, a new standard gauge railway line, and a highway connecting Lamu to South Sudan and Ethiopia. By introducing our partners and funding then the Transport Infrastructure strategy is met.*

Trade Facilitation: *The corridor aims to promote trade and economic development within the East African region. It will provide a shorter and more efficient route for goods to reach landlocked countries like South Sudan and Ethiopia from the Indian Ocean, reducing trade barriers and transportation costs. Our PSECC Ltd programme will enable increased trade with the Lapsset Corridor.*

Energy Projects: *The LAPSSET Corridor includes plans for various energy projects, such as geothermal power generation, wind energy, and transmission lines to supply power to the region. These projects aim to improve energy access and reliability. BY incorporating all the PSECC Ltd's recommendations Lapsset Corridor plans are met.*

Tourism Development*: The strategy also includes the development of tourism infrastructure, with plans to promote Lamu as a tourist destination. This includes the construction of an international airport and other tourism-related facilities.*

Oil and Gas Infrastructure*: There are plans for the development of oil and gas infrastructure, including pipelines and a crude oil refinery in Lamu, to facilitate the transportation and processing of oil from South Sudan and potentially other countries in the region. Our funding enables the development of this sector and the introduction of our PSECC Ltd Bioethanol plants will reduce fossil fuel Oil use and start to bring down the Green House Gas (GHG) emissions in the country of Kenya.*

Industrial Zones and Economic Hubs*: The LAPSSET Corridor includes the establishment of special economic zones, industrial parks, and logistics hubs along the corridor to attract investment and industrial development. Our Renewable energy will be used to power these SPZ's.*

Social and Environmental Responsibility*: The strategy emphasizes responsible and sustainable development, taking into consideration environmental and social impacts. This includes conducting environmental impact assessments and community engagement.*

Cross-Border Cooperation: *The success of the LAPSSET Corridor depends on cooperation with neighboring countries, particularly South Sudan and Ethiopia. The strategy involves negotiations and agreements to facilitate cross-border trade and transportation.*

Funding and Financing*: The strategy involves securing funding from various sources, including government investment, public-private partnerships, and international financing institutions, to support the development of the infrastructure. Our finance is low interest rate and will assist the Lapsset Corridor project.*

Long-Term Vision*: The LAPSSET Corridor project is part of Kenya's long-term vision for infrastructure and economic development. It aligns with Kenya's Vision 2030, a national development blueprint, and is expected to contribute to economic growth and regional integration.*

The LAPSSET Corridor project is a complex and multifaceted initiative that aims to unlock economic opportunities and enhance connectivity within East Africa. The strategy encompasses various sectors, from transportation and energy to tourism and industrial development, with the goal of promoting trade and regional integration. It's important to note that the project may continue to evolve as it progresses.

Should this project's schedule be accelerated? Why? *(e.g. to meet a market window, to respond to or beat competition, to achieve a desired ROI, etc.)?*

Accelerating the schedule of an energy project can be necessary for various reasons, especially in the dynamic energy sector. Common reasons for expediting the schedule of an energy project:

Energy Demand*: Rapidly increasing energy demand, especially in regions experiencing population growth or industrial development, may necessitate the acceleration of energy projects to meet immediate and future energy needs.*

Energy Security*: To enhance energy security and reduce dependence on imported energy sources, countries may need to accelerate domestic energy production and infrastructure development.*

Energy Transition*: As governments and organizations shift towards cleaner and more sustainable energy sources, there may be a need to accelerate renewable energy projects to reduce reliance on fossil fuels.*

***Economic Development**: Energy projects often drive economic growth. Accelerating these projects can create jobs, stimulate local economies, and attract investments.*

***Climate Change Mitigation:** Urgent efforts to reduce greenhouse gas emissions and combat climate change may require expediting the development and deployment of low-carbon or carbon-neutral energy technologies.*

***Resource Availability**: In renewable energy projects like wind or solar, resource availability, such as wind or sunlight, may vary seasonally. Accelerating the project can help capture these resources more efficiently.*

***Energy Storage Integration**: Energy storage solutions are becoming increasingly important for grid stability. Accelerating projects that integrate energy storage can enhance grid reliability and flexibility.*

***Natural Disasters**: In areas prone to natural disasters (e.g., hurricanes, earthquakes), there may be a need to expedite the construction of resilient energy infrastructure or emergency response systems.*

***Geopolitical Factors**: Geopolitical tensions, supply chain disruptions, or trade considerations may require countries to accelerate energy projects, ensuring energy independence and security.*

***Grid Upgrades**: Aging electricity grids may need rapid upgrades or expansions to accommodate increased demand and integrate renewable energy sources.*

***Energy Access**: In regions with limited access to electricity, accelerating energy projects can improve the standard of living, support education, and stimulate economic development.*

***Technological Advancements**: Breakthroughs in energy technologies may create opportunities to develop and deploy advanced systems more quickly to stay competitive and up-to-date.*

***Rural Electrification**: Accelerating energy projects can help bring electricity to remote and underserved areas, bridging the energy access gap.*

***Grid Resilience**: In areas prone to power outages due to extreme weather events, grid hardening projects may be accelerated to improve grid resilience and reduce disruptions.*

***Infrastructure Investments**: Government initiatives or incentives to stimulate infrastructure investments may lead to the acceleration of energy projects.*

***Interconnected Grids**: Projects that involve linking energy grids between regions or countries may be expedited to enhance energy reliability and transfer capacity.*

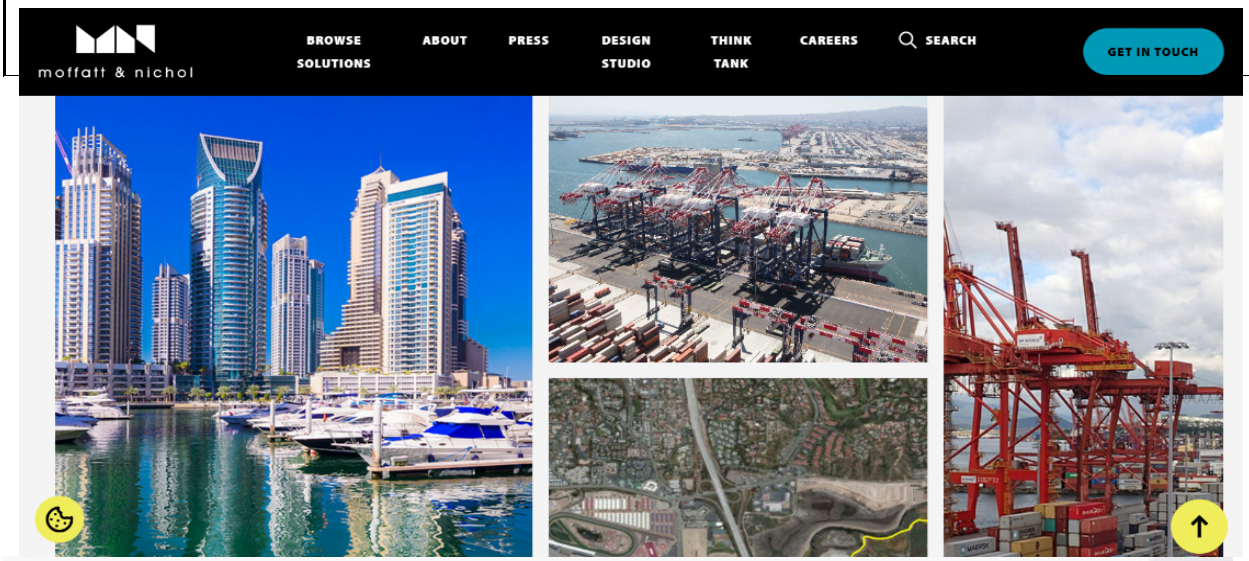
***Energy Export Agreements**: Energy-exporting countries may accelerate projects to meet international energy export agreements and commitments.*

***National Security**: Enhancing energy infrastructure can be crucial for national security by ensuring a stable energy supply during emergencies or conflicts.*

It's important to note that accelerating energy projects can pose challenges, such as increased costs, potential trade-offs in quality or environmental considerations, and heightened risks. Proper planning, risk assessment, and stakeholder engagement are essential for the successful and responsible acceleration of energy projects.

Key Stakeholders

LCDA, Ministry of Transport, Ministry of Energy, Ministry of Environment, Ministry of Finance, Afri-Fund Capital, PSECC Ltd, UK Export Finance, Credinvest International, Gleeds, Shive Hattery, Moffatt & Nichol and Port of Rotterdam.



In our Lapsset Corridor energy projects, various stakeholders play vital roles in planning, implementing, and ensuring the project's success. Identifying and engaging these key stakeholders is crucial for effective project management. Key stakeholders typically involved in energy projects:

Government Agencies*: Government bodies at the local, regional, and national levels are essential stakeholders. They provide regulatory oversight, permits, and approvals for energy projects. They may also offer incentives, tax benefits, or financial support.*

Energy Regulators*: Organizations responsible for regulating and overseeing the energy sector, ensuring compliance with industry standards, and managing energy market dynamics.*

Project Developers*: The entities or companies responsible for initiating and managing the energy project, including planning, financing, and execution.*

Investors and Financiers: *Individuals or organizations providing the funding and financial resources needed for project development and implementation. This may include banks, private equity firms, or government agencies.*

Utility Companies*: If the energy project is connected to the grid or involves electricity generation, transmission, or distribution, utility companies are significant stakeholders.*

Local Communities*: The communities near the project site, as well as those along transportation routes and near associated infrastructure, are essential stakeholders. Their concerns about environmental impact, jobs, and land use must be addressed.*

Environmental Agencies*: Organizations responsible for assessing and ensuring environmental compliance throughout the project's lifecycle, including conducting environmental impact assessments (EIAs).*

Technology Providers*: Suppliers of the technology, equipment, and materials necessary for energy production, such as solar panels, wind turbines, or power plant components.*

***Contractors and Suppliers**: Companies and individuals involved in the construction, installation, and maintenance of energy infrastructure.*

***Environmental and Conservation Organizations**: Non-governmental organizations (NGOs) and advocacy groups concerned with environmental protection, biodiversity, and sustainable practices. They may influence project development and advocate for responsible environmental practices.*

***Community and Landowners**: Individuals or groups who own or have land rights in the project area. Their consent, cooperation, and compensation agreements may be critical for project development.*

***Grid Operators**: Organizations responsible for managing and operating the electrical grid and facilitating the integration of energy projects into the grid.*

***Legal and Regulatory Advisors**: Legal experts and consultants who ensure that the project complies with all relevant laws and regulations.*

***Safety and Security Agencies**: Entities responsible for ensuring the safety and security of project personnel, infrastructure, and the surrounding area. This may include local law enforcement and security companies.*

***Project Managers and Consultants**: Experts in energy project management, engineering, and consulting who provide technical expertise and project oversight.*

***Industry Associations:** Organizations representing the interests of the energy sector, which can provide valuable industry insights, standards, and networking opportunities.*

***Local and National Governments of Affected Countries**: For cross-border energy projects, the governments of the affected countries are crucial stakeholders, as the project may have significant economic, political, and strategic implications.*

***Consumers and End-Users**: The ultimate beneficiaries of the energy project, such as households, businesses, and industries, are also stakeholders, as the project's success can impact their access to affordable and reliable energy.*

***Research and Educational Institutions**: Universities and research organizations involved in studying and advancing energy technologies and sustainability, which may provide expertise and innovation to the project.*

***Non-Governmental Organizations (NGOs):** Environmental, human rights, and social justice organizations that monitor and advocate for responsible and ethical energy project development.*

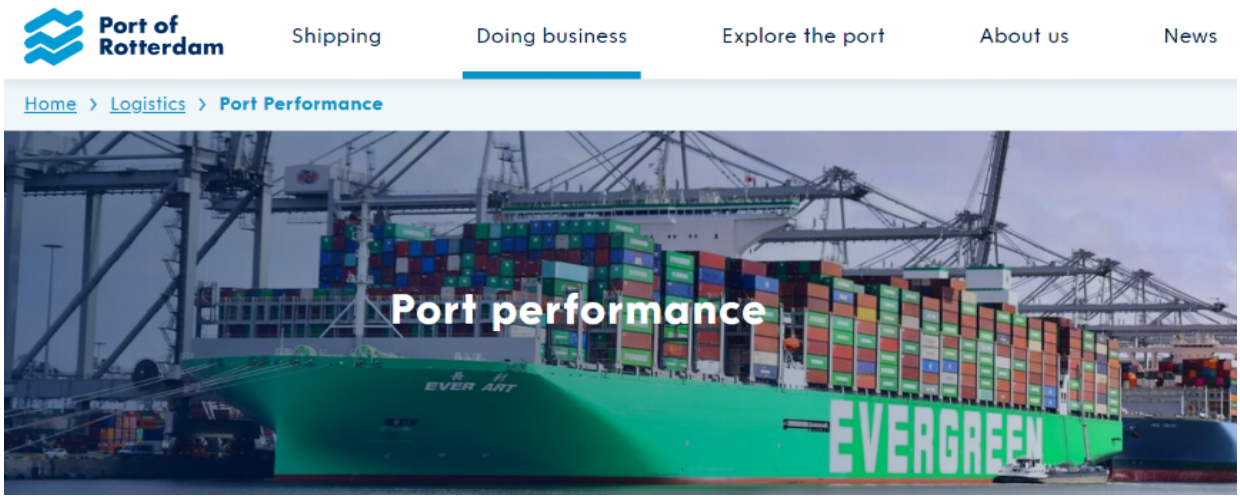
Effectively managing and engaging these key stakeholders is essential for gaining support, mitigating risks, and ensuring the success of energy projects. It often involves communication, negotiation, and collaboration to address concerns and align interests.

Related Projects: *Known dependencies with other projects:*

Grand Falls Dam

Kenya aims to reduce GHG emission by 30% by 2030 compared to a Business-as-Usual (BAU)-scenario and suggest the following mitigation measures:

- *expansion in geothermal, Dams Hydroelectricity, solar and wind energy production;*
- *enhanced energy and resource efficiency;*
- *establishment of a forest tree cover of at least 10%;*
- *low carbon and efficient transport;*
- *climate smart agriculture (aligned with the National CSA Framework);*
- *sustainable waste management systems.*



Lapsset Corridor Energy projects often have regional and international implications, and related country projects can be critical for their success and impact. Here are some examples of related country projects that can be interconnected with energy projects:

Cross-Border Energy Transmission Projects*: When energy is generated in one country and transmitted to another, cross-border transmission projects become essential. These projects involve the construction of high-voltage transmission lines and substations that connect the grids of two or more countries.*

Regional Energy Grid Integration*: Regional energy grid integration initiatives aim to harmonize the energy systems of neighboring countries to enhance energy security, share renewable energy resources, and support grid stability. Projects can involve grid interconnections, power exchange agreements, and the establishment of regional grid operators.*

International Pipeline Projects*: Oil and gas pipeline projects that cross international borders are common in the energy sector. These projects facilitate the transportation of hydrocarbons from production sites to markets, often involving multiple countries.*

Regional Renewable Energy Initiatives*: Countries within a region may collaborate on renewable energy initiatives, such as shared wind or solar farms, to take advantage of resources and achieve economies of scale. These projects can include joint research, funding, and infrastructure development.*

Transnational Hydropower Projects*: Hydropower projects that span international rivers and water bodies may involve multiple countries in project planning, development, and operation.*

Energy Trading Agreements*: Bilateral or multilateral energy trading agreements between countries enable the sale and purchase of electricity or natural gas across borders. These agreements may lead to the development of interconnectors and subsea cables.*

LNG (Liquefied Natural Gas) Terminals*: Liquefied natural gas terminals that import or export LNG often require coordination and agreements between countries. These terminals are crucial for supplying natural gas to regions without direct pipeline access.*

Regional Environmental Mitigation and Conservation Projects*: Large-scale energy projects, such as hydropower dams, may require collaborative efforts among countries to address environmental and ecological concerns. Mitigation and conservation projects can aim to protect ecosystems and preserve biodiversity.*

Electricity Grid Upgrades and Interconnections*: Countries may collaborate on upgrading and interconnecting their electricity grids to enhance cross-border electricity trade and improve grid stability.*

Nuclear Energy Projects*: Nuclear power plants often require international cooperation for fuel supply, safety, and waste management. This may involve multiple countries in various aspects of the nuclear energy lifecycle.*

***Energy Export Agreements**: Countries with significant energy resources, such as oil or natural gas, may engage in energy export agreements to supply neighboring or distant countries. This can lead to infrastructure development projects like export terminals and pipelines.*

***Regional Climate Change Mitigation Initiatives**: Multiple countries may collaborate on climate change mitigation projects, such as carbon capture and storage (CCS) or renewable energy deployment, to reduce greenhouse gas emissions collectively.*

***Interconnection of Regional Energy Markets:** Integrating energy markets to create regional electricity or natural gas markets can facilitate cross-border trading and enhance energy security.*

These related country projects often require close coordination, agreements, and regulatory frameworks to ensure successful implementation. International organizations and diplomatic efforts can play a significant role in promoting cooperation and resolving potential conflicts in energy projects with cross-border implications.

Technology

Technology: What's involved? What are the technology risks?
The development of Solar Farms, Green Hydrogen Plants, Wind Farms, Geothermal plants, Hydroelectricity Dams, Nuclear Plants, Clean Coal Technology, Bioethanol plants, Waste-to-Energy plants, Solar Mini Grids and Solar PV with Food Production. All technologies are well proven beyond demonstration projects so minimal risk

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Energy technology encompasses a wide range of innovations and advancements aimed at producing, storing, distributing, and utilizing energy more efficiently and sustainably. Various components and aspects are involved in energy technology, along with associated technology risks:

Components of Energy Technology:

Energy Generation Technologies: *These include various methods of producing electricity or other forms of energy, such as solar panels, wind turbines, nuclear reactors, natural gas power plants, and hydropower facilities.*

Energy Storage Technologies*: Energy storage systems are essential for balancing supply and demand. This category includes batteries, pumped hydro storage, thermal storage, and compressed air energy storage.*

Energy Distribution and Grid Technologies*: Efficient and reliable distribution of energy is vital. This involves high-voltage transmission lines, substations, smart grid technology, and demand response systems.*

Energy Efficiency Technologies*: These technologies focus on reducing energy consumption and waste, including LED lighting, energy-efficient HVAC systems, and insulation materials.*

Renewable Energy Integration*: Technologies to integrate intermittent renewable energy sources, like solar and wind, into the grid, including grid-tied inverters, energy management systems, and energy forecasting tools.*

***Carbon Capture and Storage (CCS)**: CCS technologies capture and store carbon dioxide emissions from fossil fuel-based power plants and industrial processes to mitigate climate change.*

***Nuclear Energy Technologies**: Nuclear power involves complex technology for reactor operation, fuel handling, and waste management.*

***Energy Conversion Technologies:** These include technologies that convert one form of energy into another, such as fuel cells, combined heat and power (CHP) systems, and geothermal heat pumps.*

***Technology Risks in Energy Technology**:*

***Technical Challenges**: Developing and deploying new energy technologies can face technical hurdles, including issues related to efficiency, reliability, and performance.*

***Resource Variability**: For renewable energy sources like wind and solar, variability in resource availability poses technology risks. The intermittency of these resources can affect grid stability and energy generation.*

***Storage and Battery Risks**: Energy storage technologies, particularly batteries, can be susceptible to issues like capacity degradation, safety risks, and supply chain dependencies.*

***Cybersecurity**: Energy infrastructure, including the grid and control systems, is vulnerable to cyberattacks. Ensuring the cybersecurity of energy technology is a significant concern.*

***Regulatory and Policy Risks**: Changes in government policies and regulations can impact energy technology projects. Uncertainty in regulatory environments can lead to project delays and financial risks.*

***Environmental Risks**: Some energy technologies, such as hydraulic fracturing for natural gas or large-scale hydropower, may carry environmental risks and face opposition from environmental groups and communities.*

***Supply Chain Disruptions**: Energy technology relies on complex supply chains, and disruptions can lead to delays, increased costs, and project risks.*

***Market Risks**: The adoption and acceptance of new energy technologies by consumers and businesses can be influenced by market factors, such as energy prices, competition, and consumer preferences.*

***Financing Risks**: Securing funding for energy technology projects can be challenging, especially for innovative technologies with unproven track records.*

***Integration Challenges**: Integrating new energy technologies into existing infrastructure can be complex and may require modifications to grid systems, power plants, or distribution networks.*

***Regulatory Compliance**: Meeting environmental regulations and permitting requirements is critical and involves risks related to compliance and legal issues.*

***Natural Disasters**: Energy infrastructure, particularly power generation and transmission facilities, can be susceptible to damage from natural disasters, such as hurricanes, earthquakes, or wildfires.*

Managing these technology risks involves careful planning, risk assessment, testing, and continuous monitoring. Collaboration between industry, government, and research institutions is often essential for developing and deploying new energy technologies successfully.

Large 50MW Solar Farms will provide electricity for irrigation water pumping to the largescale farms and Cities along the Lapsset Corridor

1.Solar Farms & Green Hydrogen

The government aims to have 600 MW of solar power generation capacity installed by 2030, up from less than 100 MW currently installed

We are proposing 3,000 MW of new solar farms to be installed (ten x 300MW in size) for the Lapsset Corridor.

To enable good Agricultural activity along the corridor Solar Farms can be used for water irrigation purposes as well as electricity supply to the whole of Lapsset Corridor – SEZ's, Industry and commerce and residential people.

2.The Green Hydrogen *Strategy and Roadmap for Kenya has been developed by the European Union Global Technical Assistance Facility (GTAF) for Sustainable Energy, in close cooperation with the Delegation of the European Union to Kenya (EU), the Ministry of Energy and Petroleum (MoEP) for Kenya.*

President Ruto has signed agreements with the UK Government for a 30 GW Green Hydrogen programme for Kenya. We propose 2.2 GW of Green Hydrogen plants for the Lapsset Corridor

The following is the targeted strategic objectives for Green Hydrogen in Kenya.


2023 - 2027
Domestic market development
Develop policy and regulatory instruments
First commercial-scale green hydrogen project(s) operational
20% of imported nitrogen fertilisers produced locally (≈ 100,000 tonnes)
100% import substitution of methanol (>5,000 tonnes/year)
Establish cooperations with international RTD centres
≈ 150 MW new dedicated renewable capacity for green hydrogen
≈ 100 MW of electrolyzer capacity installed
2028 - 2032
Domestic market growth
By 2030
50% import substitution of nitrogen fertilisers (300,000 - 400,000 tonnes/year)
Pilot projects in other sectors, incl. baseload power and transport
Production of green shipping fuels
Explore regional export opportunities for green fertilisers
≈ 350-450 MW additional renewable capacity for green hydrogen
≈ 150-250 MW electrolyzer capacity installed
At least 1 billion USD direct investments
At least 25,000 direct created
At least 250,000 tonnes CO_2 avoided per year
2032 and beyond
Domestic and export market growth
Roll-out further green hydrogen applications, like transport or green steel
Expand existing and explore new export opportunities for green hydrogen products "Made in Kenya"

3.Wind Farms *-*

Kenya has launched what has been billed as the largest wind farm in Africa allowing the country to inject an additional 310 megawatts of renewable power to the national grid.

Lake Turkana Wind Farm - 300 MW - Completed

Meru Wind Farm Isiolo Wind Farm Marsabit Wind Farm - 100 MW - Planned - 150 MW – Planned - 50 MW – Planned we propose 500MW..

4.Geothermal Plants *- National Electrification Strategy: achieve universal electricity service to all households and businesses by 2022 at acceptable quality of service levels. Produce 100 000 barrels of oil per day from 2022 and develop 2,275 MW of geothermal capacity by 2030.*

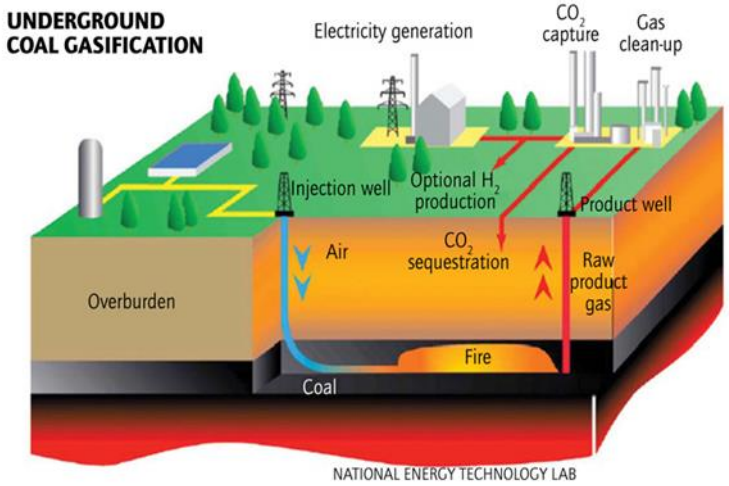
Kenya has set out ambitious targets for geothermal energy, aims to expand its geothermal power production capacity to 5,000 MW by 2030 and we support, with a medium-term target of installing 1,887 MW by 2017. Although there is significant political will and ambition, reaching these ambitious goals is a major challenge.

5.Hydroelectricity *– Grand Falls Dam, Hydroelectricity in the Lapsset Corridor Five Dams are suitable for development - generation will be 796 MW. Water from Dams can be channeled in canals across Agricultural Corridor and the canals covered with Solar PV to provide additional renewable energy for irrigation, refrigeration of crops when harvested and general agricultural use in order to develop a good agricultural base in the Lapsset Corridor. We propose 1,296MW.*

6.Nuclear Plants *-*

Kilifi and Kwale are suitable sites for development to have a capacity of 1,000 Megawatts (MW) development process commencing 2027.

Rolls Royce in the UK have a solution for small scale Nuclear plants upto 470MW in size so both Kilifi and Kwale could have one plant each totalling 940MW – US $2.662 Billion each.



7.Clean Coal Technology *– CCT -*

Kenya announces plans for 960MW coal plant in Kitui. The project stopped due to Environmental emission concerns.

There is a solution gasification of the coal to take place underground with no emissions. The UCG process, injection wells are drilled into an unmined coal seam, and either air or oxygen is injected into the seam along with water and the coal then ignited underground. Proposal 2,040MW

8.Bioethanol plants *-*

Kenya BIO-FUELS (E-10) PROGRAMME - THE BIOFUELS PROJECT For Lapsset Corridor. Proposal suggested is OSNO Biofuels Project in the Lapsset Corridor, the first Biofuels Project in the Kenya Biofuels Programme to drive the alternative renewable energy pursuit of the Government E10 Policy build six (6) ethanol plants across the country using cassava or sugarcane to be grown in each State in the Lapsset Corridor Proposal 341MW to help towards GHG emission reduction of 30% by substitution of Fossil fuel oil with Bioethanol. (Oil produces the most CO_2 emissions in Kenya).

*9.**Waste-to-Energy plants***

Headway USA & PSECC Ltd (the Developers) Consortium Submission documents and proposal for the development, operation and maintenance of a Waste to Energy project through a framework on a Design, Build, Finance, Operate and Transfer the "DBFOT basis.

This ZERO Waste ZERO Landfill waste projects could see Counties in the Lapsset Corridor having Waste-to-Energy Gasification & Recycling plants. Proposal 360MW.

10.Solar Mini Grids

Solar Mini Grids and Solar Farms can form part of a Smart Grid Energy systems for the Special Economic Zones Cities located in the Counties of Lamu, Isiolo and Turkana.

Providing power for the people and support agriculture, food production and storage capabilities together with small scale industries. Proposal 1,000MW.

Solar PV electricity generation with food production

***11.Solar PV with Food Production** A demonstration project already exists in Kenya – 50KW solar PV panel arrays with food production underneath – 40% savings in water usage and leads to food security in Kajiado, Kenya has found an increased agricultural production on land where solar panels were used to provide cover for their crops. This technique allowed users to harvest solar energy twice – for crops and for generating power. Researchers found that some of the crops grew three times bigger. using this technique compared to traditional fertilizer and water.*

Above – Solar PV provides electricity to polytunnels for food production, storage and pumping water to the crops.

Solar Farms can be built eight feet off the ground to enable food production underneath also saving 40% on water usage and upto three times crop growth.

Climate Change Mitigation within Lapsset Corridor

Strategy – working closely with LCDA, the First Lady and Government Ministry

The aim is to get to "NET ZERO"

.

To ensure, by design and developments that the Lapsset Corridor, in terms of Energy demonstrates 100% Renewable Energy where possible and minimizes emissions.

When considering climate change mitigation within the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor in Kenya, it's important to focus on sustainable practices and initiatives that reduce greenhouse gas emissions and contribute to environmental conservation. Here are key elements to include in climate change mitigation efforts within the LAPSSET Corridor:

Utilising the KCERT 2050 software model to indicate levels of commitment and effect on GHG emission reduction within the Lapsset Corridor and Kenya in General.

Sustainable Transport Infrastructure:

Develop and maintain transportation infrastructure (e.g., roads, railways, and ports) with a focus on low-carbon and energy-efficient designs to reduce emissions from transportation.

Renewable Energy Integration:

Promote the integration of renewable energy sources, such as solar, wind, and hydropower, into the energy projects within the corridor to reduce reliance on fossil fuels.

Energy Efficiency Measures:

Implement energy-efficient technologies and practices in all project components, from power generation to transportation systems, to reduce energy consumption and emissions.

Carbon Offsetting Programs:

Invest in afforestation, reforestation, and other carbon offset projects within the corridor to mitigate emissions generated by development activities.

Emission Reduction Targets:

Establish clear emission reduction targets for the infrastructure projects and track progress toward achieving these targets.

Sustainable Urban Planning:

Promote sustainable urban development and land use planning to minimize urban sprawl, reduce commuting distances, and encourage the use of public transportation.

Waste Management and Recycling:

Implement effective waste management and recycling programs to minimize landfill waste and reduce methane emissions.

Water Management:

Implement water conservation and management strategies to reduce water consumption and minimize the energy required for water treatment and transportation.

Climate-Resilient Infrastructure:

Design infrastructure that can withstand the effects of climate change, including extreme weather events and rising sea levels.

Electric Mobility:

Promote the use of electric vehicles and charging infrastructure within the corridor to reduce emissions from transportation.

Public Transportation:

Invest in and expand public transportation systems to reduce the number of private vehicles on the road, leading to lower emissions.

Green Building Standards:

Encourage the construction of energy-efficient and environmentally friendly buildings and infrastructure, adhering to green building standards and certifications.

Adaptation Measures:

Implement strategies and projects that increase resilience to climate change impacts, such as flooding and heatwaves.

Biodiversity Conservation:

Protect and preserve natural habitats and biodiversity within the corridor to maintain ecosystem services and sequester carbon.

Stakeholder Engagement*:*

Engage with local communities and stakeholders to raise awareness about climate change mitigation, gather input, and ensure inclusive decision-making.

Monitoring and Reporting*:*

Establish a robust system for monitoring and reporting on greenhouse gas emissions, energy consumption, and progress toward mitigation goals.

International Agreements and Funding:

Collaborate with international organizations and seek funding opportunities to support climate change mitigation initiatives within the corridor.

Education and Training:

Provide education and training programs to raise awareness and build capacity for climate-resilient and low-carbon practices among local communities and project staff.

Policy and Regulatory Frameworks:

Develop and enforce policies, regulations, and incentives that encourage climate change mitigation and sustainability in all projects and activities within the LAPSSET Corridor.

By incorporating these elements into the development and operation of projects within the LAPSSET Corridor, Kenya can contribute to climate change mitigation efforts while also promoting sustainable and resilient development in the region. It's essential to collaborate with stakeholders, including government agencies, local communities, and international partners, to ensure the success of these initiatives.

Major Risks: Global War, lack of funding, no support from LCDA & Government, Climate Change and poor coordination.

The Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor Project in Kenya is a significant infrastructure development initiative that encompasses various energy-related components. When assessing project risks for energy projects within the LAPSSET Corridor, you should consider the following specific risk factors:

Political and Regulatory Risks:

Changes in government policies, regulations, and energy sector legislation may impact the project's viability and profitability.

Political instability, especially in the case of cross-border energy infrastructure, can introduce uncertainties.

Financing Risks:

Difficulty in securing financing or investment for energy infrastructure can delay or halt project development.

Exchange rate fluctuations may affect the cost of funding for international investors.

Environmental Risks:

Environmental impact assessments and compliance with environmental regulations are crucial for energy projects. Failure to meet these standards could lead to project delays, fines, or legal actions.

Technology and Equipment Risks:

The use of advanced or unproven technologies in the energy sector can lead to technical challenges, cost overruns, and delays.

Delays or issues with the procurement of specialized equipment can disrupt project schedules.

Resource Risks:

Energy projects often depend on the availability of resources such as fuel (e.g., oil, natural gas), renewable energy sources (e.g., wind, solar), or water (for hydropower). Resource scarcity, variability, or price fluctuations can impact project operations.

Infrastructure Risks:

Dependence on the construction of critical infrastructure, such as transmission lines, pipelines, or port facilities, can expose the project to delays or logistical issues.

Market Risks:

Energy projects need to consider market demand and competition. Shifting energy markets, changes in energy prices, or demand fluctuations can affect project revenue.

Operational Risks:

Maintenance and operation of energy infrastructure involve various risks, including equipment failures, accidents, or natural disasters affecting operations and supply chains.

Security Risks:

Security concerns, such as vandalism, sabotage, or theft, may affect the safety and continuity of energy infrastructure.

Geopolitical Risks:

The LAPSSET Corridor spans multiple countries. Geopolitical tensions, border disputes, or conflicts in any of these regions could disrupt energy supply and transit.

Community and Social Risks:

Displacement of local communities, land acquisition issues, or social protests can disrupt project activities and generate negative publicity.

Legal and Contractual Risks:

Breaches of contracts, disputes with contractors, or issues related to land acquisition and rights of way can lead to legal and financial complications.

Currency Exchange Risks:

For international investors and project financiers, currency exchange rate fluctuations can impact the cost and profitability of the project.

Health and Safety Risks:

In the construction and operation of energy projects, health and safety risks to workers and nearby communities need to be managed effectively.

Natural Disaster Risks:

The region may be prone to natural disasters like floods, earthquakes, and cyclones, which can damage energy infrastructure.

To mitigate these risks, project developers and stakeholders should conduct comprehensive risk assessments, establish risk management strategies, and ensure compliance with local regulations and international standards. Additionally, effective communication and collaboration with local communities and relevant authorities are essential for successful project implementation in the LAPSSET Corridor.

Questions/items for further research before a full project would be approved and funded:

Full feasibility studies will be undertaken to determine exact energy requirements of the Lapsset Corridor project.

Utilise any current Feasibility Studies such as Grand Falls Dam & Geothermal plants identified together with Wind Farms and Solar Farms.

Private Wire Electricity Supply to Lapsset Corridor – Not National Grid (KPLC)

What aspects are required in a Private Wire electricity supply network to provide electricity to the Lapsset Corridor and not linking into the National Grid system.

A private wire electricity supply network for the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor, which is not linked to the national grid system, requires careful planning and consideration of several key aspects. This approach can offer increased reliability, energy independence, and specific benefits tailored to the project's needs. Here are the essential aspects to consider:

Generation Sources:

Identify and establish the primary sources of electricity generation for the private wire network. Common sources could include solar photovoltaic (PV) arrays, wind turbines, or other renewable energy sources.

Generation Capacity:

Determine the required generation capacity to meet the energy needs of the entire LAPSSET Corridor. This should consider both current and future energy demands.

Storage Solutions:

Integrate energy storage systems, such as batteries or pumped hydro storage, to store excess energy during periods of generation and release it when needed, ensuring a stable power supply.

Distribution Network:

Design and construct a distribution network that connects the generation sources to the various facilities and locations within the LAPSSET Corridor.

Transmission Infrastructure:

Install transmission lines and equipment to efficiently deliver electricity from the generation sources to the end-users, taking into account the distance and electrical losses.

Redundancy and Reliability:

Implement redundancy in the network to ensure a reliable power supply. This can involve backup generators, additional storage capacity, or multiple generation sources.

Microgrid Control Systems:

Deploy advanced microgrid control systems to manage energy flow, balance loads, and ensure the grid's stability. These systems can include automation, remote monitoring, and predictive maintenance.

Energy Efficiency Measures:

Implement energy-efficient technologies and practices throughout the LAPSSET Corridor to reduce energy consumption and optimize energy use.

Scalability:

Design the network with scalability in mind, allowing for the easy addition of new generation sources and loads as the project expands.

Regulatory and Compliance Considerations:

Ensure compliance with local and national regulations governing private electricity networks. Engage with relevant authorities to obtain the necessary permits and approvals.

Emergency Response and Safety:

Develop emergency response plans to address power outages, system failures, and safety issues. This includes establishing protocols for maintenance and repair.

Isolation from the National Grid:

Ensure that the private wire network remains isolated from the national grid system to maintain energy independence. This may involve implementing physical and control measures to prevent unintentional grid interconnection.

Environmental Impact:

Assess and mitigate the environmental impact of the private wire network, particularly if it includes large-scale energy generation infrastructure. This may involve ecological and habitat studies, as well as mitigation measures.

Community and Stakeholder Engagement:

Engage with local communities and stakeholders to address their concerns, gain support, and ensure that the private wire network aligns with local development goals.

Financial and Funding Considerations:

Develop a clear financial model that outlines the costs, funding sources, and potential revenue generation to support the project's financial sustainability.

Monitoring and Performance Analysis:

Implement a robust monitoring and data collection system to track the network's performance, optimize operations, and identify potential issues proactively.

Energy Export or Trading Considerations:

If there is surplus energy production, consider options for exporting or trading excess electricity to neighboring areas or communities, potentially generating additional revenue.

Infrastructure Resilience:

Ensure the private wire network is designed with resilience to withstand natural disasters or extreme weather events that may affect power supply.

A well-planned and executed private wire electricity supply network can provide electricity to the LAPSSET Corridor while offering energy independence, sustainability, and reliability tailored to the project's specific requirements. It's essential to involve experienced professionals in energy project development and microgrid design to ensure success.

UPDATED LEAST COST POWER DEVELOPMENT PLAN
STUDY PERIOD: 2017 - 2037

June 2018

This development plan is essential to the Sustainable Development of Keny and particularly relevant to the Lapsset Corridor being developed with the provision of electricity supplied at $0.05 KWh (a low cost).

Expansion Planning

As indicated in the Least Cost Development plan - The total installed capacity grows from 2,234.83MW in 2017 to 7,213.88MW in 2030 and to 9,932.44MW in 2037. The contribution from the respective technologies for the period 2017-2037 is as outlined: Geothermal decreases from 29.1% to 26.7% , Hydropower decreases from 36% to 17.9%, Coal increases from 0% to 19.5% while Natural gas increases from 0% to 7.6%. It is noteworthy that Wind and solar will increasingly play a major role in the generation mix during the planning period, rising from 1.1% to 8.5% and 0% to 8.6% respectively.

Installed capacity in MW	2017		2030		2037	
	MW	%	MW	%	MW	%
Geo	650.8	29.1	1868.8	25.9	2647	26.7
Hydro	805.027	36.0	1522.427	21.1	1782.727	17.9
Coal	0	0.0	981	13.6	1941	19.5
Nuclear	0	0.0	0	0.0	0	0.0
Natural gas	0	0.0	0	0.0	750	7.6
Diesel engines	697.5	31.2	417.5	5.8	0	0.0
gasoil	54	2.4	0	0.0	0	0.0
Import	0	0.0	400	5.5	400	4.0
Cogeneration	2	0.1	220.4	3.1	278.36	2.8
Generic back-up capacity	0	0.0	160	2.2	440	4.4
Wind	25.5	1.1	861.4	11.9	841	8.5
Solar	0	0.0	782.35	10.8	852.35	8.6
TOTAL	**2234.83**	**100**	**7213.88**	**100**	**9932.44**	**100**

Current status in the power sector

Generation of electricity increased to 10,205 GWh in 2016/17 from 9,817GWh the previous year. The growth is related to the positive expansion in the commercial/industrial electricity consumption. Similarly, the maximum peak demand rose from 1,586MW to 1,656MW by June 2017 and 1,710MW by the end of 2017 calendar year.

Demand forecast

Demand forecast has been done in 3 scenarios namely reference, high and low each based on specific assumptions of the evolution of the related demand drivers.

From the simulation results, estimated peak demand for the period 2017-2037 ranges from 1,754MW to 6,638MW in the reference case scenario, 1,754MW to 9,790MW in the high case and between 1754MWin 2017 to 4,763MW in 2037 in the low case scenario. Energy growth forecast is estimated at 10,465GWh in 2017 rising to 39,187GWh in 2037 in the reference case. Over the same period, it increases from 10,465GWh to 57,990GWh under the high case scenario and between 10,465GWh to 27,945 GWh in the low case scenario. There is therefore a very slight difference between this year's load forecast and the load forecast done in the last update of 2015-2035 which indicates a 0.02% deviation.

Generation Planning

The energy sources considered in the system expansion plan for the different cases are as tabulated

Fixed medium term plan case	**Fixed system case**	**Optimised generation expansion case**
Geothermal	Geothermal	Geothermal
Wind	Wind	Wind
Solar	Solar	Solar
Imports	Imports	Import
Petrol-thermal plants	Petrol-thermal plants	Hydropower
Coal	Coal	Natural gas
Natural gas	Hydropower	Coal
	Natural gas	
	Nuclear	

Key observation arising from the expansion plan

(i) Addition of 300 MW LTWP at the end of 2018, Ethiopia 400 MW in mid-2019, 158 MW Olkaria V geothermal among other committed projects would raise the existing capacity to above 3,900 MW by 2020 resulting in an average of 583 MW excess capacity in the period 2019-2023 should demand grow moderately as depicted in the reference forecast.

(ii) Addition of 981.5 MW Lamu coal plant in 2024 will aggravate the projected supply-demand imbalance as the surplus margin would surpass 1,500 MW being 43% above the sum of peak and required reserve, with 32% excess energy during the year. The system LEC would rise rapidly to reach Shs. 16.86/kWh by the year 2024.

(iii) Capacity factors for geothermal, hydro and coal plants average 71.7%, 44.9% and 0.9% over the period after 2019, implying that the power plants, and particularly Lamu coal, will be grossly underutilized should demand grow moderately.

(iv) Lower demand would worsen the system LEC and plant utilization levels while higher demand would improve the two parameters.

(v) Due to the heavy introduction of intermittent technologies, the system is unlikely to be stable, implying that there is need to introduce some backup capacity. The team has recommended an introduction of 2 backup plants in 2019 and 2020 amounting to 160MW for purposes of backup and provision of primary reserve and other ancialliary services

Implementation of the Plan

The Implementation of the commited generation and transmission projects is as shown below:

Project description	Capacity MW / length of KM	Time lines	Implementing agencies	Cost of running the system
Committed generation projects	4,908.55 MW	2017-2024	KENGEN,IPP & GOK	US$ 12.71 billion
Candidate generation projects	9,497 MW	25-2037	KENGEN and IPP	US$40.4 billion
Proposed transmission projects	8,478Km	2017-2037	KETRACO	US$5.876 billion
TOTAL				US$58.986BILLION

Table 16: Flagship projects and their assumptions

Project	Reference				High			
	First year of operation	Initial load [MW]	Year of total load	Total load [MW]	First year of operation	Initial load [MW]	Year of total load	Total load [MW]
Electrified mass rapid transit system for Nairobi	2024	15	2030	50	2022	15	2027	50
Electrified standard gauge railway Mombasa - Nairobi	2022	98	2030	130	2021	100	2028	300
Electrified standard gauge railway Nairobi - Malaba	2026	61.74	2035	61.74	2024	63	2032	189
Electrified LAPSSET standard gauge railway	-	-	-	-	2035	30	2037	30
Oil pipeline and Port Terminal (LAPSSET)	2025	50	2037	150	2022	50	2032	150
Refinery and Petrochemical Industries (LAPSSET)	2028	25	2037	100	2025	50	2030	200
Konza Techno City	2024	2	2037	190	2022	2	2034	200
Special Economic Zones	2021	5	2037	110	2020	30	2028	110
Integrated Steel Mill					2030	100	2035	200

Demand forecast:

The forecast results developed for the peak load (MW) and energy consumption (GWh) for the long term period 2017 (base year) to 2037 are presented in this section based on the three defined scenarios:

Electricity consumption and peak load - reference, High, low scenarios Annual electricity demand and peak load are expected to grow for all scenarios over the planning period. For the reference scenario, the gross electricity consumption grows from 10,465GWh in 2017 to 14,334GWh and 39,187GWh in 2022 and 2037 respectively as per Table 16. This represents an average annual growth of 6.7% per annum.

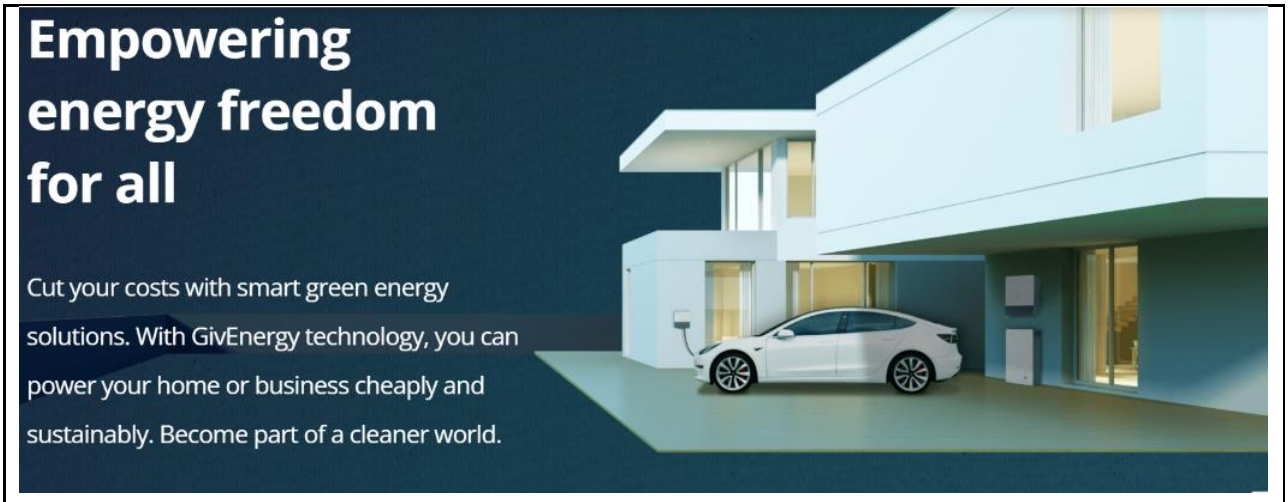
Energy Demand by scenarios (with flagships)

	Low			Reference			High			Losses (Reference Scenario)
Year	GWh	Growth	MW	GWh	Growth	MW	GWh	Growth	MW	%
2017	10,465	4.9%	1,754	10,465	4.9%	1,754	10,465	4.9%	1,754	19.0%
2018	11,032	5.4%	1,842	11,169	6.7%	1,866	11,470	9.6%	1,917	18.5%
2019	11,530	4.5%	1,928	11,820	5.8%	1,978	12,464	8.7%	2,088	18.0%
2020	12,071	4.7%	2,021	12,546	6.1%	2,103	13,676	9.7%	2,293	17.6%
2021	12,612	4.5%	2,114	13,312	6.1%	2,234	14,900	9.0%	2,516	17.0%
2022	13,156	4.3%	2,207	14,334	7.7%	2,421	16,456	10.4%	2,766	16.5%
2023	13,810	5.0%	2,319	15,293	6.7%	2,586	17,989	9.3%	3,027	16.5%
2024	14,503	5.0%	2,438	16,327	6.8%	2,764	19,799	10.1%	3,342	16.6%
2025	15,229	5.0%	2,563	17,750	8.7%	2,989	22,056	11.4%	3,705	16.6%
2026	15,982	4.9%	2,692	19,098	7.6%	3,224	24,295	10.1%	4,078	16.6%
2027	16,780	5.0%	2,829	20,393	6.8%	3,441	26,572	9.4%	4,450	16.6%
2028	17,627	5.0%	2,975	22,082	8.3%	3,720	29,043	9.3%	4,854	16.6%
2029	18,525	5.1%	3,129	23,593	6.8%	3,974	31,509	8.5%	5,261	16.6%
2030	19,475	5.1%	3,293	25,195	6.8%	4,244	34,847	10.6%	5,780	16.6%
2031	20,482	5.2%	3,466	26,864	6.6%	4,525	37,632	8.0%	6,251	16.6%
2032	21,552	5.2%	3,651	28,640	6.6%	4,826	40,587	7.9%	6,752	16.6%
2033	22,798	5.8%	3,872	30,529	6.6%	5,148	43,635	7.5%	7,272	16.6%
2034	24,008	5.3%	4,081	32,542	6.6%	5,491	46,954	7.6%	7,842	16.6%
2035	25,297	5.4%	4,305	34,691	6.6%	5,859	50,595	7.8%	8,468	16.6%
2036	26,561	5.0%	4,523	36,848	6.2%	6,232	54,105	6.9%	9,094	16.6%
2037	27,945	5.2%	4,763	39,187	6.3%	6,638	57,990	7.2%	9,790	16.6%

Electricity demand is expected to grow to 9,790MW in 2037 which is more than five times of the peak demand of 1,754MW in 2017 in the high scenario. This is mainly driven by the utilization of load achieved through the implementation of the flagship projects. In this scenario the energy consumed grows from 10,465GWh in 2017 to 57,990GWh in 2037 which is approximately 8.8% growth per year.

In the low scenario, the electricity consumption growth is gradual over the planning period averaging 5% per annum. The energy consumed increases to 27,945 GWh by the year 2037 from 10,465 GWh in 2017.

Losses in the reference case are expected to reduce to 16.6 % in the year 2037 from 19% in the base year an annual average of 0.1% reduction.



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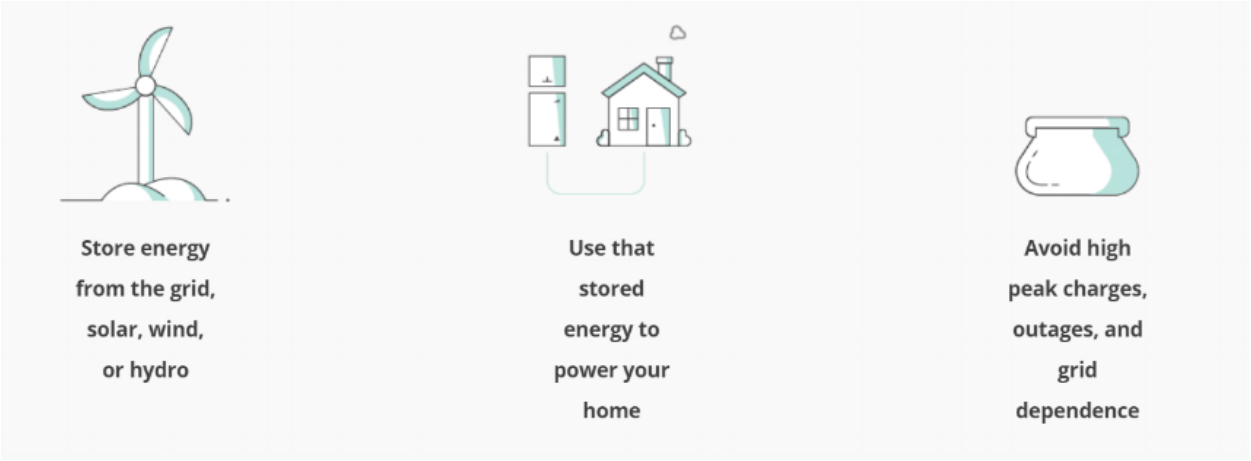
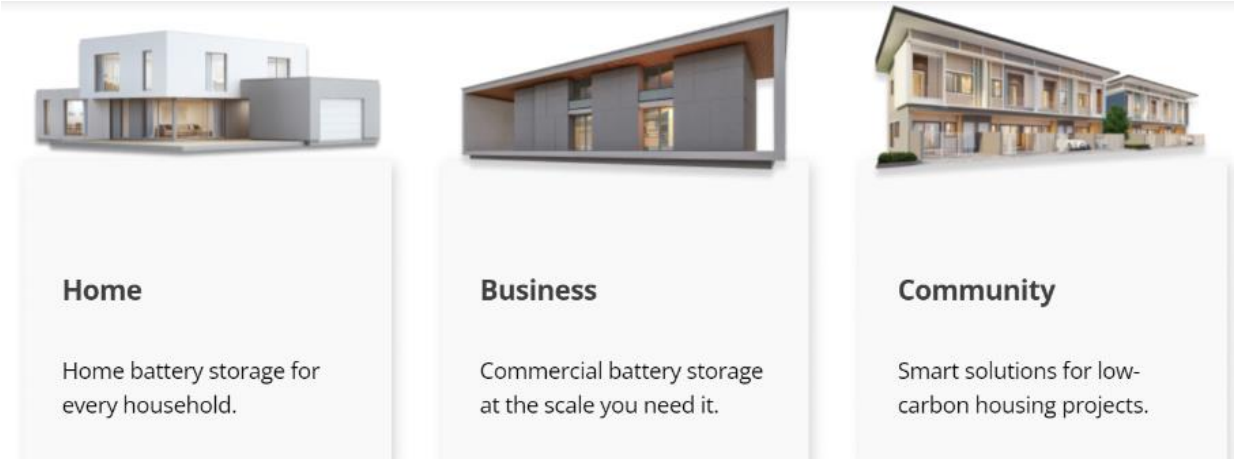
With GivEnergy batteries installed, you can: Homes, Business & Industry – SEZ's





Store green energy – either from renewables, and/or from the grid via off-peak tariffs

Cut both your energy costs and your carbon emissions

Use that stored energy to cheaply and cleanly power your home

What is included in an energy ecosystem from GivEnergy?

Inverters

AC coupled. Hybrid. Single-phase. 3-phase. The GivEnergy inverter range is designed to flexibly meet any need.

Battery storage

From small home batteries, to stackable batteries, to full commercial systems - we have a battery for every use case.

All in One & Giv-Gateway

Our ground-breaking inverter and battery technologies, combined in one sleek product. Complemented with a backup gateway.

EV charger

An adaptive EV charger that plays nicely with the grid, renewables, and home storage batteries alike.

Software

Sophisticated software to track and manage energy usage. Comprises a powerful web portal, plus a lightweight app.

Accessories

Smart plugs, energy meters, dongles, and more - all designed to complement the GivEnergy system.

Carbon reduction total by using the technologies

Carbon reduction quantity if the Lapsset Corridor installs 5,000 MW of expanded Geothermal, 1,000MW of Solar PV, 3,000MW of Solar Farms, 360MW of Waste to energy plants, 2,200MW of Green Hydrogen plants, 2,200MW of Hydroelectricity Dams, 341MW of Bioethanol plants, 940MW of Nuclear plants and 2,040 of clean coal plants

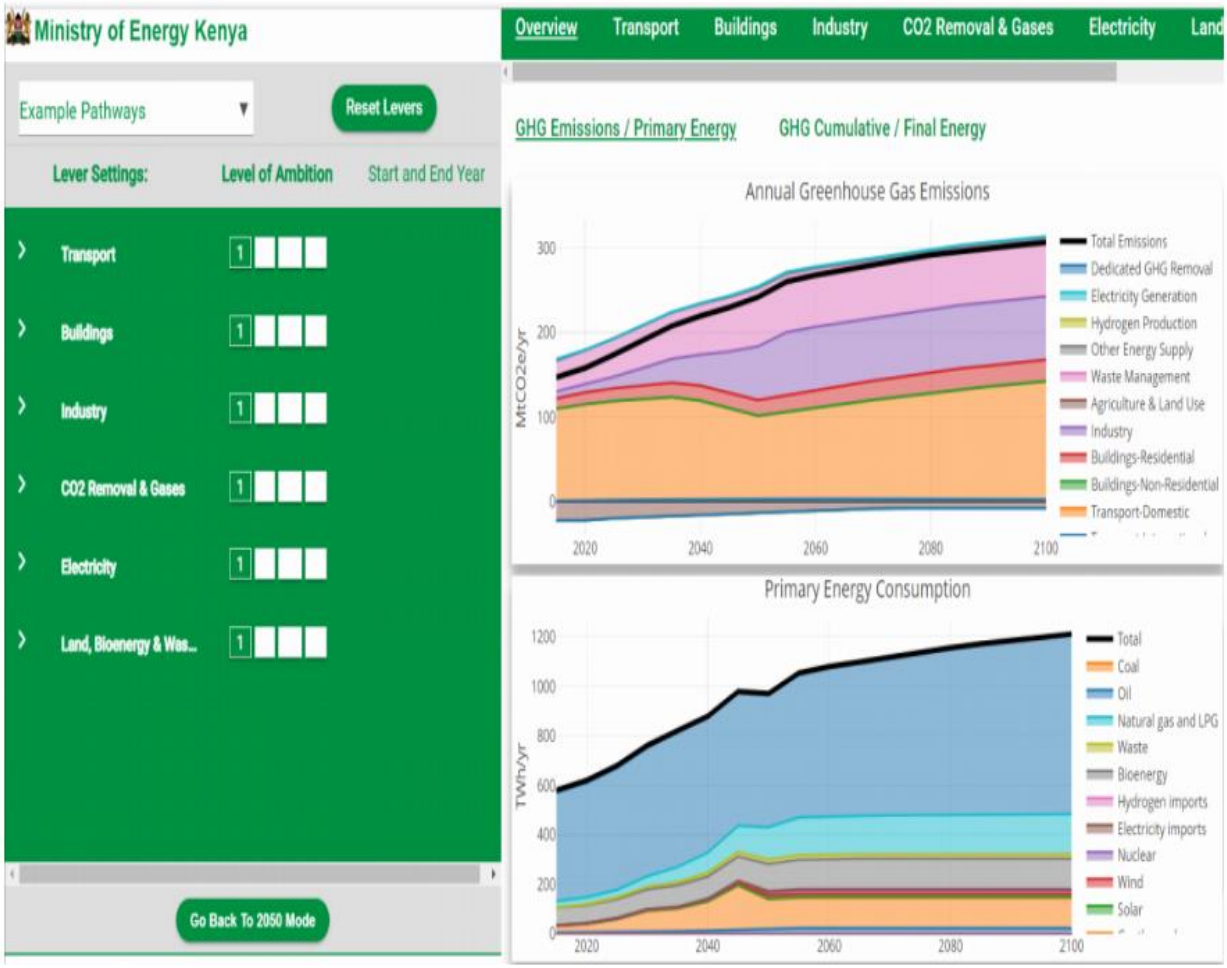
To estimate the total carbon reduction quantity for the LAPSSET Corridor with the specified energy sources, you would need to calculate the carbon emissions reduction for each energy source and then sum them up. Here's a table showing the estimated annual carbon reduction for each energy source and the total carbon reduction:

Energy Source Capacity (MW) Estimated Emissions Reduction (tCO2/MWh) Annual Carbon Reduction (tCO2) of the new Renewable Energy plants

Energy Source	Capacity (MW)	Estimated Emissions Reduction (tCO2/MWh)	Annual Carbon Reduction (tCO2)
Geothermal	5,000	0.01	50,000,000
Solar PV	1,000	0.02	2,000,000
Solar Farms	3,000	0.02	6,000,000
Wind Farms	500	0.02	1,000,000
Waste to Energy Plants	360	0.05	1,800,000
Green Hydrogen Plants	2,200	0.00 (assuming zero emissions)	0
Hydroelectricity Dams	1,296	0.00 (assuming zero emissions)	0
Bioethanol Plants	341	0.05 (assuming emissions similar to waste-to-energy)	1,705,000
Nuclear Plants	940	0.01	9,400,000
Clean Coal Plants	2,040	0.7 (assuming lower emissions for cleaner coal technology)	14,280,000
Total Carbon Reduction			**85,185,000**

The estimated total carbon reduction from the installation of these energy sources in the LAPSSET Corridor is approximately 85,185,000 metric tons of CO2 (tCO2) annually. *Please note that these are simplified estimates and may not account for all factors that influence emissions. The values used for emissions reduction are indicative and can vary significantly based on specific technology choices, operational practices, and regional grid emissions. For precise emissions calculations, it's recommended to use specific emissions data for the chosen technologies and their operational conditions.*

Current Green House Gas emissions for Kenya



By increasing the level of ambition then emissions will come down.

The estimated total carbon reduction from the installation of the new energy sources in the LAPSSET Corridor is approximately 85,185,000 metric tons of CO2 (tCO_2) annually.

The aim is to get to "NET ZERO"

Projected Green House Gas emission reduction for Kenya

Source: KCERT 2050 Carbon Calculator Ministry of Energy Kenya

Why does Green Hydrogen and Hydroelectricity have 0.00 Estimated Emissions Reduction (tCO2/MWh) - the answer is:

Green hydrogen and hydroelectricity have an estimated emissions reduction of 0.00 tCO2/MWh in the table because these energy sources are considered low-carbon or zero-emission technologies when they are produced using specific methods and conditions:

Green Hydrogen: *Green hydrogen is produced through a process called electrolysis, which uses electricity to split water into hydrogen and oxygen. If this electricity comes from renewable sources like wind, solar,*

or hydropower, the entire hydrogen production process can be considered emissions-free. Therefore, when green hydrogen is produced using renewable electricity, its carbon emissions are effectively zero.

Hydroelectricity: *Hydroelectric power, generated by harnessing the energy of flowing water, is a renewable energy source that does not produce direct carbon emissions during electricity generation. Hydroelectric dams use the kinetic energy of water to turn turbines and generate electricity without burning fossil fuels. This process is considered emissions-free.*

It's important to note that while the generation of green hydrogen and hydroelectricity is low-carbon or carbon-neutral, there may still be emissions associated with other aspects of these technologies, such as the manufacturing of equipment or infrastructure. Additionally, the environmental and social impacts of hydroelectric dams can vary, and care must be taken to mitigate potential negative effects.

The estimate of 0.00 tCO2/MWh is a simplified assumption based on the emissions-free nature of these technologies when certain conditions are met. The actual emissions associated with these technologies can depend on various factors, including project-specific details and operational practices.

The value of carbon credits, also known as carbon offsets, can vary widely depending on several factors, including the specific carbon market, the type of carbon offset project, the region or country, and market supply and demand. Carbon credits represent a metric ton of carbon dioxide equivalent (tCO2e) emissions reduced or removed from the atmosphere. Here are some key considerations that influence the value of carbon credits:

Carbon Market*: Different carbon markets have different prices for carbon credits. Some of the most established carbon markets, like the European Union Emissions Trading System (EU ETS) or the California Cap-and-Trade Program, often have more stable and higher prices for carbon credits compared to voluntary markets.*

Type of Carbon Offset Project*: The type of carbon offset project significantly impacts the value of carbon credits. Projects that reduce or remove emissions through activities such as renewable energy generation, reforestation, and energy efficiency improvements tend to have higher values compared to certain industrial projects.*

Market Region: *Carbon credit prices can vary by region and country. Regions with more stringent emissions reduction targets or higher demand for carbon credits tend to have higher prices. Conversely, regions with lower demand or regulatory support may have lower prices.*

Supply and Demand: *The fundamental principle of supply and demand plays a critical role in determining carbon credit prices. If the supply of carbon credits is limited and demand is high, prices tend to rise. Conversely, if there is an oversupply of credits, prices may be lower.*

Market Confidence: *The confidence of market participants in the long-term stability and effectiveness of the carbon market can influence prices. Strong regulatory support and policy consistency can boost market confidence.*

Project Quality and Verification*: High-quality carbon offset projects that are rigorously verified and audited to international standards often command higher prices. The credibility of the emission reductions matters.*

Voluntary vs. Compliance Markets*: Voluntary carbon markets are typically more diverse and can offer a wide range of prices. Compliance markets, on the other hand, are often subject to more regulated pricing mechanisms.*

Market Trends: *Market conditions, such as changes in energy prices, evolving regulations, and technological advancements, can affect carbon credit prices over time.*

As of our knowledge update in January 2022, carbon credit prices could range from a few dollars per tCO2e to over $20 or more, depending on the factors mentioned above. However, carbon credit prices can fluctuate, and they may have changed since that time. It's essential to consult up-to-date sources and market data to determine the current value of carbon credits in specific markets.

Emission Factors for energy types

Emission factors for energy types represent the amount of greenhouse gas emissions produced per unit of energy generated or consumed. These factors vary depending on the type of energy source and the specific combustion or production process. Here are some commonly used emission factors for various energy types:

Coal:

Emission factors for coal combustion can vary depending on factors like the type of coal, combustion technology, and the presence of emissions control equipment. On average, coal-fired power plants emit around 2.2 pounds of CO2 per kilowatt-hour (lbs CO2/kWh).

Natural Gas:

Natural gas is generally considered a cleaner-burning fuel compared to coal. Emission factors for natural gas power generation can vary, but it's roughly estimated at about 0.6-0.7 lbs CO2/kWh.

Oil:

Emission factors for oil combustion depend on the specific type of oil (e.g., diesel, gasoline, heavy fuel oil) and the application. On average, oil combustion can result in emissions of around 2.3-2.5 kg of CO2 per liter of oil burned.

Renewable Energy Sources:

Emission factors for renewable energy sources like wind, solar, and hydropower are typically very low because these sources do not produce direct greenhouse gas emissions during electricity generation. However, there may be emissions associated with the manufacturing, installation, and maintenance of renewable energy equipment.

Nuclear Energy:

Nuclear power generation is virtually emissions-free during the electricity generation process. However, there are emissions associated with uranium mining, fuel processing, and plant construction and decommissioning.

Biomass:

Emission factors for biomass energy can vary widely depending on the type of biomass and the combustion technology. Biomass combustion emits CO2, but it is often considered carbon-neutral as long as the carbon released is reabsorbed by the growth of new biomass.

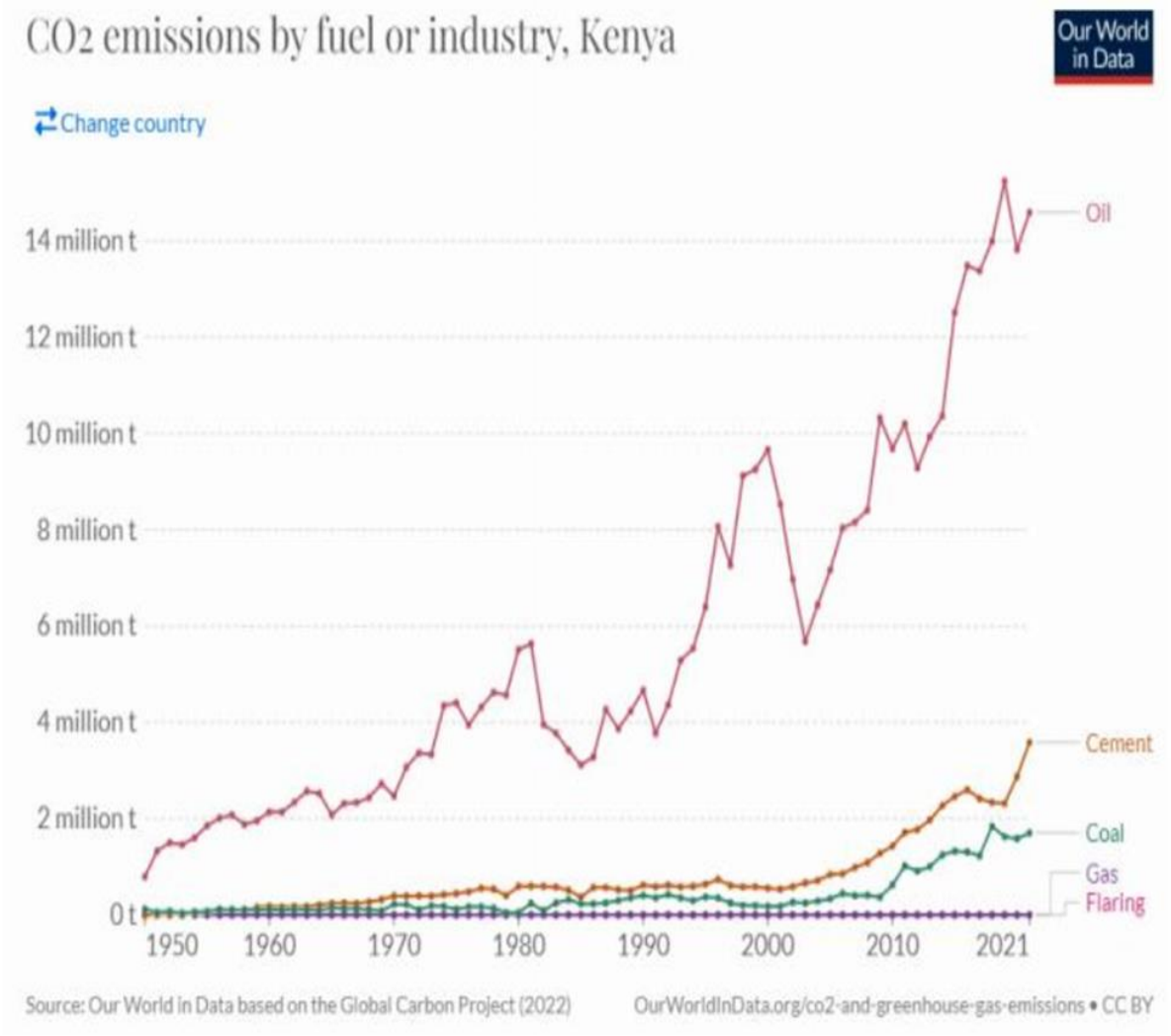
Geothermal:

Geothermal power generation has low emissions, primarily related to drilling and infrastructure construction. Emission factors for geothermal energy are typically quite low.

Waste-to-Energy:

Emission factors for waste-to-energy facilities can vary depending on the waste composition and the efficiency of emissions control equipment. These facilities may release CO2, as well as other pollutants.

It's important to note that emission factors can vary by region, depending on factors like the energy mix, technology, and regulations. The values provided here are general estimates, and specific emission factors should be obtained from local or national regulatory authorities or relevant databases when conducting emissions calculations or assessments for a particular project or location. Additionally, emission factors may change over time as technology and emissions control measures improve.



Most of Kenya's CO2 emissions are from Oil so we propose new Bioethanol plants – Ethanol together with Green Hydrogen plants and increased electrification of the Transport sector to reduce these levels. We are further proposing increasing Kenya's Renewable Energy by 16.752 GW by 2035 to include two 470MW Nuclear Plants – 2027.

The new energy projects would add more CO2 emissions, however because the new energy projects are Renewable Energy technologies emissions can be reduced. The estimated total carbon reduction from the installation of the new energy sources in the LAPSSET Corridor is approximately 85,185,000 metric tons of CO2 (tCO2) annually.

Oil usage in Kenya

The Lapsset Corridor, which stands for the Lamu Port-South Sudan-Ethiopia Transport Corridor, is a major infrastructure project in Kenya and East Africa. It includes the development of a new port at Lamu on the Kenyan coast, a transportation network connecting the port to South Sudan and Ethiopia, and the development of various facilities and infrastructure along the corridor. While the primary focus of Lapsset is transportation and trade facilitation, oil can play a role in the project in several ways:

Transportation: *Oil is a significant component of the transportation sector. The Lapsset Corridor is designed to enhance connectivity and trade between countries in the region, and this may include the transport of oil and petroleum products. Roads, pipelines, and railway networks within the corridor can be used for the movement of oil, which is crucial for the energy and industrial sectors in Kenya and other East African countries.*

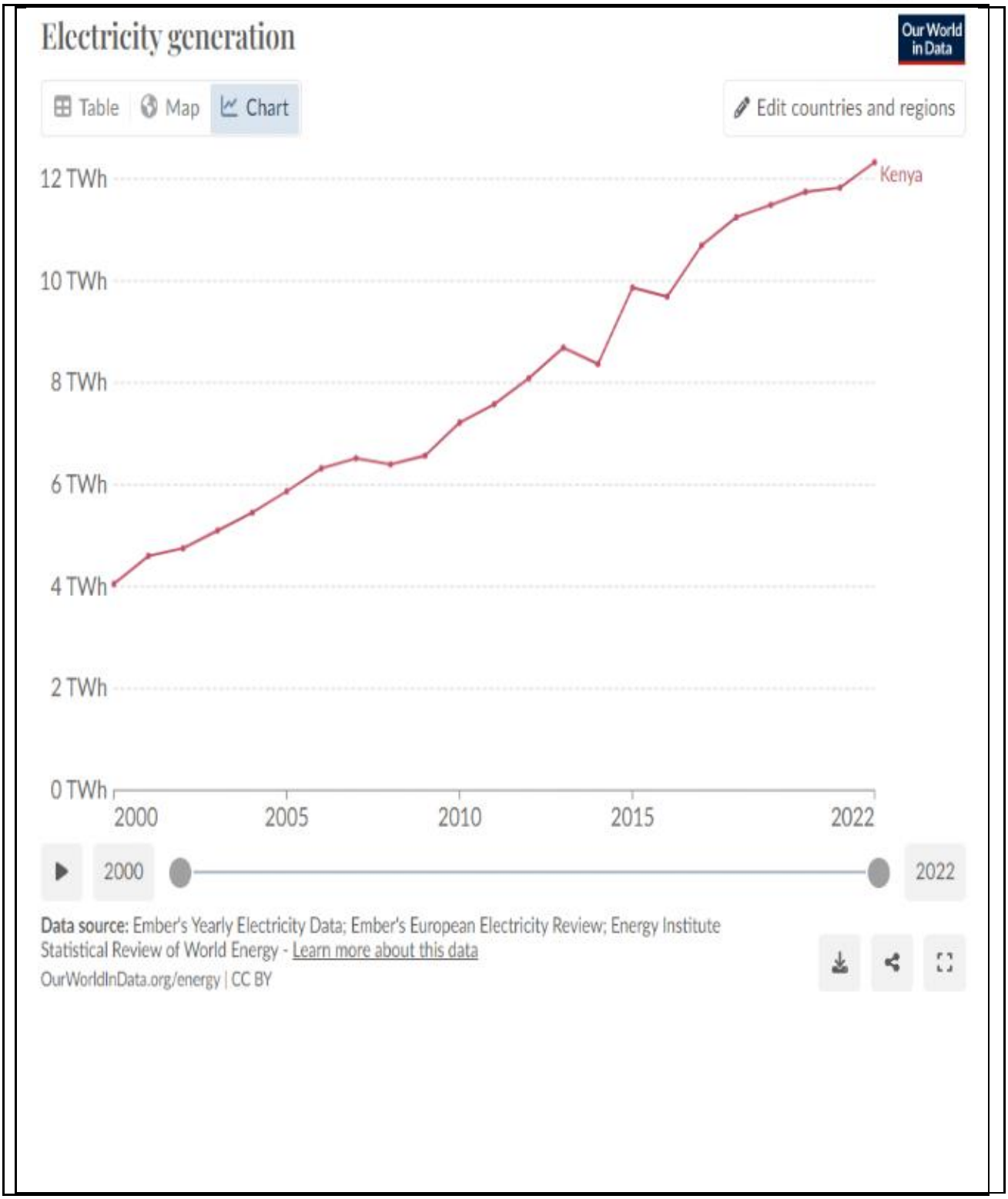
Industrial Use: *Oil and petroleum products are essential for various industrial processes, including manufacturing, power generation, and construction. The industrial facilities developed along the Lapsset Corridor may rely on oil for their energy needs or as raw materials for their operations.*

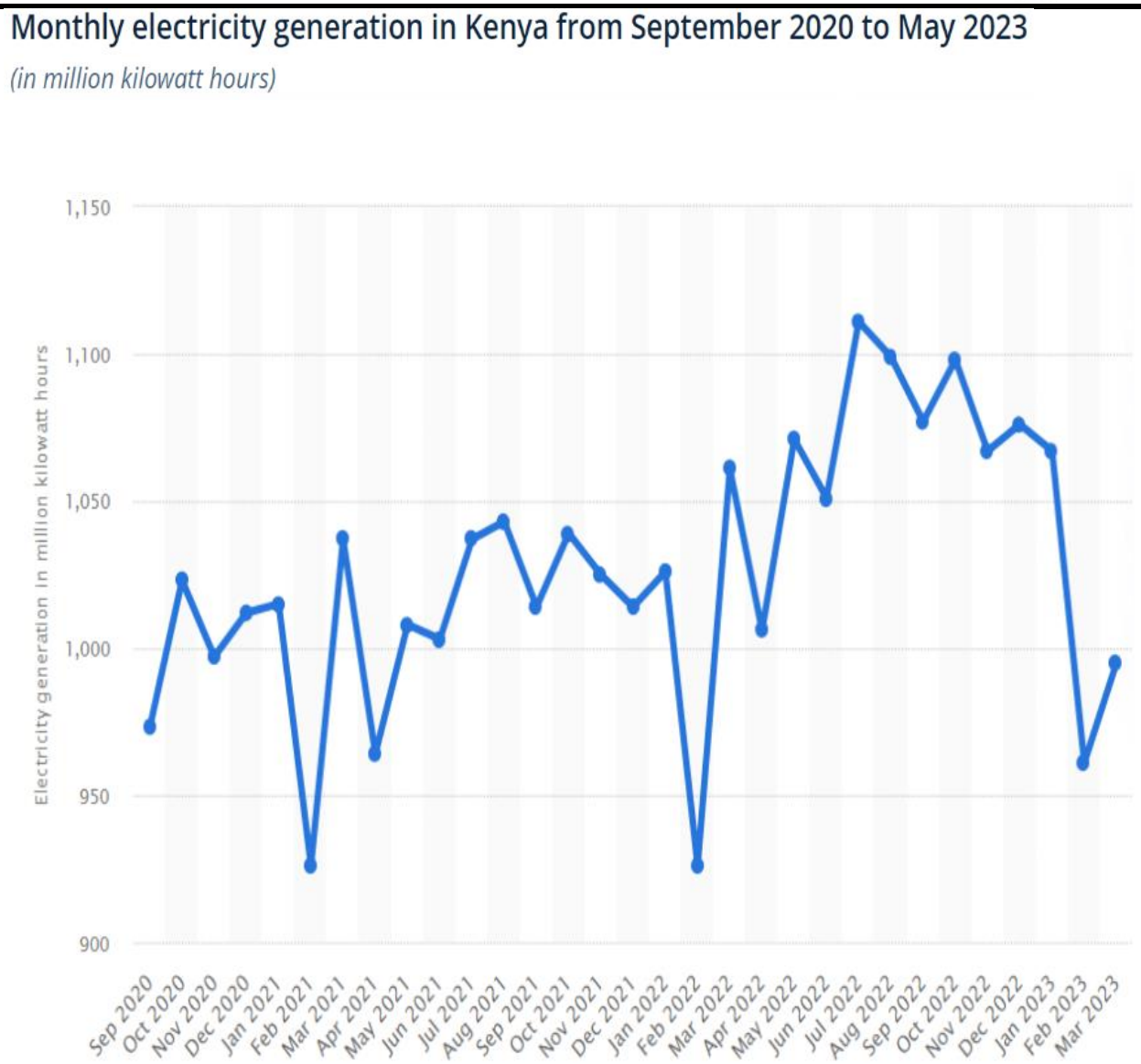
Energy Generation: *Oil is used as a source of energy in power plants and for electricity generation. In Kenya, as in many countries, oil is used in thermal power plants to supplement energy supply during peak demand periods or when other energy sources are insufficient.*

Infrastructure Development: *The revenue generated from oil-related activities in the region could potentially fund infrastructure development projects within the Lapsset Corridor, such as roads, ports, and rail networks.*

It's important to note that the specific uses of oil within the Lapsset Corridor and Kenya, in general, may evolve over time, and the country's energy and economic policies will also play a significant role in determining how oil is used. Additionally, the focus on oil and energy sources may change as countries in the region explore and develop alternative and cleaner energy sources to meet their growing energy demands.

The aim is to reduce this Fossil fuel oil and replace with Biomass Oils and oil from waste.


Electricity generation
Our World in Data
Table
Map
Chart
Edit countries and regions
12 TWh
10 TWh
8 TWh
6 TWh
4 TWh
2 TWh
0 TWh
Kenya
2000
2005
2010
2015
2022
2000
2022
Data source: Ember's Yearly Electricity Data; Ember's European Electricity Review; Energy Institute Statistical Review of World Energy - Learn more about this data
OurWorldInData.org/energy | CC BY



Kenya generated 995 million kilowatt-hours of electricity as of March 2023, slightly lower than the previous month. The total electricity generated in the country fluctuated during the period in review, peaking at 1,111 million kilowatt-hours in July 2022.

Here are some organizations, authorities, and resources where you can find carbon market experts and the latest market data and pricing information:

United Nations Framework Convention on Climate Change (UNFCCC): *The UNFCCC oversees international climate agreements and the Clean Development Mechanism (CDM). They provide information on carbon markets and carbon pricing mechanisms.*

World Bank's Carbon Pricing Leadership Coalition (CPLC): *CPLC is a global initiative that brings together governments, businesses, and civil society to advance carbon pricing. They provide resources, reports, and data related to carbon pricing and markets.*

International Emissions Trading Association (IETA): *IETA is a leading global organization for carbon markets. They offer insights, analysis, and events related to carbon pricing and market developments.*

Carbon Market Watch: *This non-governmental organization provides updates on carbon markets, policy developments, and carbon pricing.*

Climate Focus: *Climate Focus is a consultancy specializing in climate and sustainability. They offer expertise on carbon markets and emissions reduction projects.*

BloombergNEF (BNEF): *BNEF is a leading source of information on clean energy, carbon markets, and sustainable finance. They provide market analysis and reports on carbon pricing.*

Ecofys, a Navigant company: *Ecofys, a part of Navigant, is a consultancy specializing in renewable energy, energy efficiency, and climate policy. They offer expertise in carbon markets and emissions reductions.*

PwC, Deloitte, KPMG, EY: *Major consulting and advisory firms often provide insights and services related to carbon markets. They publish reports and analysis on market trends.*

Regional Environmental Authorities: *Local or regional environmental authorities in Kenya or African countries may have information on regional carbon markets and emissions reduction efforts.*

Industry Associations: *Associations related to specific sectors, such as renewable energy or forestry, often have experts who can provide information on carbon markets and offset projects.*

Government Agencies: *Contact government agencies responsible for environmental and climate policies. They may have information on national carbon pricing mechanisms and market developments.*

Market Data Providers: *Organizations like Refinitiv (formerly Thomson Reuters), S&P Global Platts, and others offer market data and analysis, including carbon credit pricing information.*

Carbon Market Exchanges: *If there are carbon market exchanges in your region, they can be valuable sources of market data and pricing information. For example, the European Energy Exchange (EEX) in Europe.*

Research Institutions and Universities: *Many research institutions and universities conduct research and publish reports on carbon markets and climate finance.*

Climate Conferences and Summits: *Attend climate-related conferences, such as the United Nations Climate Change Conferences (COP), where experts and organizations often share insights on carbon markets.*

Please note that the availability of experts and data may vary by region, and it's important to use multiple sources to gather comprehensive and up-to-date information on carbon markets and carbon credit pricing.

Project Scope

In Scope:

Defining the working scope, including what is in scope and what is out of scope, is a critical aspect of project management and ensures that everyone involved in the project understands the boundaries of the work. Here's what should typically be included in the scope and what should be excluded (out of scope):

***Project Objectives**: Clearly state the project's objectives, goals, and desired outcomes. This is the foundation of the project scope.*

***Deliverables**: Specify the products, services, or results that the project will create or produce. This includes tangible items, documents, reports, and more.*

***Constraints**: Identify any limitations that the project must work within, such as budget constraints, time constraints, or resource constraints.*

***Assumptions**: Document any assumptions that are made about the project, its environment, or other factors that may affect the project.*

***Scope Statement**: Create a formal scope statement that provides a detailed description of the project's scope, objectives, deliverables, assumptions, and constraints.*

***Work Breakdown Structure (WBS):** Break down the project into smaller tasks or activities, known as the Work Breakdown Structure, to provide a more granular view of the scope.*

Out of Scope:

How this proposal fits into existing Kenya Government Policies and Strategies on Energy, Renewable Energy and Climate Change Mitigation.

***Exclusions**: Clearly specify what is not included in the project. This can include specific features, services, or tasks that are intentionally left out.*

***Future Phases**: If the project has multiple phases, clearly state which phase is in scope and which ones are not. Future phases can be defined in a high-level manner but should not be part of the current project's scope.*

***External Dependencies**: If the success of the project depends on external factors or work performed by external parties, these should be considered out of scope and documented as dependencies.*

***Non-Project Activities**: Any activities or work that are not directly related to the project objectives should be defined as out of scope.*

***Additional Costs**: If additional work or scope increases the project's budget or timeline beyond what was initially agreed upon, it should be explicitly designated as out of scope.*

***Ongoing Maintenance:** Post-project maintenance or ongoing operational activities may be out of scope, as the project typically focuses on the development or implementation phase.*

***Third-Party Work**: If work must be performed by third-party vendors or external entities, this should be clarified as out of scope unless it's explicitly included in the project.*

It's important to remember that the project scope is not static and may change over time due to factors like project constraints, stakeholder requests, or unforeseen circumstances. Therefore, scope management is an ongoing process that involves carefully managing changes to the scope through a formal change control process to ensure that project objectives are met while preventing scope creep.

Deliverables:

Fully developed Lapsset Corridor Energy Strategy together with completed Feasibility studies for the Railway, Highway, Port and Renewable Energy projects with costings.

SSA Marine & Ports America, Siemens Mobility & Hitachi Railway division – costings for Port & Railway.

Energy projects within the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor in Kenya can encompass various aspects, from power generation to transmission and distribution. The specific project deliverables can vary depending on the type of energy project. Common project deliverables for energy projects in the LAPSSET Corridor:

Feasibility Study Reports:

A comprehensive report assessing the technical, economic, environmental, and social feasibility of the energy project.

Environmental Impact Assessment (EIA) Reports:

A report outlining the potential environmental impacts of the project and proposing mitigation measures to ensure compliance with environmental regulations.

Permit and Regulatory Compliance Documentation:

All necessary permits, licenses, and regulatory approvals required for the construction and operation of the energy project.

Engineering Design and Specifications:

Detailed engineering plans, blueprints, and specifications for the construction of power generation facilities, transmission lines, substations, or other energy infrastructure.

Construction Plans and Schedules:

Project timelines, schedules, and construction plans *outlining the sequence of activities and milestones.*

Site Surveys and Land Acquisition Documentation*:*

Surveys of project sites, land acquisition agreements, and rights-of-way documentation if applicable.

Financial Plan and Budget:

A detailed financial plan, including project budget, cost estimates, and funding sources.

Procurement Plan and Documentation:

***Procurement strategy** and documentation for the purchase of equipment, materials, and services required for the project.*

Risk Assessment and Mitigation Plan:

A comprehensive risk assessment that identifies potential risks and a plan for mitigating or managing these risks.

Safety and Health Plan:

A plan outlining safety measures, protocols, and health standards for construction and operation, ensuring the well-being of workers and communities.

Quality Control and Quality Assurance Plan:

Procedures and protocols for maintaining the quality of construction, equipment, and project deliverables.

Operation and Maintenance Manuals:

Manuals detailing the operation, maintenance, and troubleshooting procedures for energy infrastructure.

Testing and Commissioning Reports:

Documentation of tests, inspections, and commissioning activities to ensure the proper functioning of equipment and systems.

Training Programs and Documentation:

Training materials and documentation for personnel responsible for operating and maintaining the energy infrastructure.

Energy Output and Performance Guarantees:

Guarantees related to the energy output, efficiency, and performance of the power generation facilities.

Grid Connection and Interconnection Agreements:

Grid – Private Grid *- Agreements and documentation related to connecting the energy project to the grid and establishing interconnections if applicable.*

Community Engagement and Stakeholder Communication Plans:

Plans for engaging with local communities and stakeholders, addressing concerns, and ensuring community benefits.

Monitoring and Reporting Framework:

A framework for ongoing monitoring and reporting on the project's progress, performance, and compliance with project goals and standards.

Handover and Acceptance Documentation:

Documentation for the handover *of the completed energy project to the owner or operator, including acceptance certificates and punch lists.*

Final Project Report:

A comprehensive report summarizing the entire project, including achievements, challenges, and lessons learned.

These deliverables will help ensure the successful planning, construction, and operation of energy projects in the LAPSSET Corridor, while also addressing regulatory, environmental, and safety requirements and fostering positive stakeholder relationships. The specific deliverables may vary depending on the size and complexity of the project and should be tailored to its unique requirements.

Resources & Staffing Levels

Resources & Early Staffing Estimates

Resources needed to investigate before project approval: *Identify resources that would be needed to investigate possible solutions, including estimated level of effort, duration, and expenditures – for the investigation Management needs before fully funding the project.*

Before seeking approval for an energy projects within the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor in Kenya, it's essential to conduct thorough investigations and studies to ensure that the project is viable, environmentally responsible, and compliant with regulations. Here are key resources that need to be investigated:

Feasibility Studies*: Comprehensive feasibility studies should be conducted to assess the technical, economic, financial, and operational feasibility of the energy project. These studies will help determine whether the project is viable and what resources will be required.*

Environmental Impact Assessment (EIA): *An EIA is essential to evaluate the potential environmental and social impacts of the energy project. It identifies mitigation measures and ensures compliance with environmental regulations.*

Site Assessment*: Conduct site assessments to evaluate the suitability of the project location, including geological, geographical, and climate conditions. This helps in making informed decisions regarding project infrastructure.*

Resource Assessment*: For renewable energy projects, like wind or solar, assess the resource availability (e.g., wind speed, solar irradiance) to determine the energy potential and optimize the project's design.*

Regulatory Framework*: Understand the regulatory environment, including permits, licenses, and compliance requirements. Investigate the legal and regulatory framework for energy projects in Kenya.*

Market Analysis*: Analyze the local and regional energy market conditions, including demand, competition, and pricing. This helps in developing a market entry and pricing strategy.*

Financial Analysis: *Conduct a financial analysis to determine the project's financial viability, including cost estimates, revenue projections, and return on investment.*

Energy Grid Connectivity*: If the project is connected to the grid, investigate the feasibility and requirements for grid connection, and assess the capacity and capabilities of the existing grid infrastructure.*

Land Acquisition and Rights of Way*: Investigate land acquisition requirements and negotiate land access and rights of way with landowners and relevant authorities.*

Technical Expertise*: Assess the availability of technical expertise and skills needed for project design, construction, and operation. Identify any training requirements for local personnel.*

Supply Chain and Procurement: *Investigate the availability of equipment, materials, and suppliers needed for the project. Consider the logistics and transportation of these resources.*

Community Engagement and Stakeholder Analysis*: Identify and engage with local communities and stakeholders to understand their concerns, build support, and address potential conflicts.*

Political and Geopolitical Factors*: Consider the political and geopolitical landscape, as energy projects can be influenced by government policies, trade agreements, and international relations.*

Financial Resources*: Evaluate the availability of funding sources, including potential investors, project financing options, and government incentives.*

Safety and Security Measures*: Investigate safety and security requirements and develop plans for mitigating risks and ensuring the safety of workers and the project site.*

Technology Assessment*: Assess the suitability of the chosen technology and equipment, including the availability of advanced or specialized technology.*

Interconnection Opportunities*: Investigate opportunities for interconnection or collaboration with neighboring energy projects or infrastructure.*

Market Access and Export Agreements*: For energy export projects, investigate market access and potential export agreements with neighboring countries.*

Adaptation and Resilience*: Assess the project's resilience to climate change impacts and the need for adaptation measures.*

Project Risk Analysis*: Identify and assess potential risks and develop a risk management plan to mitigate and manage them.*

These investigations are critical for project planning and the successful approval of an energy project within the LAPSSET Corridor in Kenya. Engaging with relevant stakeholders, government agencies, and local communities is also essential for ensuring project acceptance and alignment with broader development goals.

Staffing: Feasibility Studies will be coordinated from Kenya Afri-Fund-Capital / PSECC Offices in Nairobi and Headway USA Offices in the USA.

US EXIMBANK - US $25 million Engineering Phase One Feasibility studies Funding drawdown.

Negotiations and working relationship with LCDA and Ministerial Teams

Appointment of staff from Afri-Fund Capital, PSECC Ltd and Headway USA together with in Country Feasibility study partners (TBD).

Funding Resources Needed for Full Feasibility studies Project : US $25 million

Specialized resources that would be required (technical, management, etc.):		
FUNCTION:	***Skill level, specific experience, etc.***	***Full Time Equivalent (FTE) - total workload or staffing levels in terms of full-time positions***
PSECC Ltd	*Energy Strategy Coordination -*	*10*
Gleeds	*Project Management*	*7*
Afri-Fund Capital	*Financial arranger and Project Management*	*8*
OBAX	*Bioethanol Feasibility Studies and Environmental Impact study together with Business Proposal and Financials.*	*15*
Slendour Energy / Swiss Joule	*Solar Farm Feasibility Studies & Environmental Impact studies – Coordination of EPC and Financial projections*	*18*

"Function" means the various functional groups needed on the project (e.g. marketing, sales, development, process experts, networking engineers, architects, etc.)

"FTE" stands for "full time equivalent," or the approximate number of man-hours divided by 8 hours per day. Gives managers an understanding of how many people from each function may be required.

*Rough Project Timeline **					
Phase:	*Proposal*	*1 –*	*2 –*	*3 –*	*4 –*
Review Date:		*To be done (TBD)*	*TBD*	*TBD*	*TBD*
Range:					

*** As a small group does investigative work on alternatives, it should identify how a project timeline could play out – how the project would likely be broken down into phases, and of what rough duration. An early take at such a timeline during phase 0, before the idea is even approved, helps Management understand how the project would fit into the existing portfolio and resource allocation. The 'range' row is thus used to show uncertainty on the phase end dates. The proposal document can be updated all the way through the investigation/planning phase, until a full project plan and schedule exist, at which point these phase-end-dates would become solid.*

Related Documents Executive Decision Record		
Topic	***Description***	***Ref / Link/Attachment***
Energy recommendations review	*A detailed 744-page document produced by PSECC Ltd looking at Energy use in Kenya, Emissions and Energy strategy.*	

Executive Decision Record		
Date	***Approver***	***Decision Made*** *(resource assignments, project funding, scope decisions, etc.)*
	LCDA	
	PSECC Ltd	
	COP28 UK Export Finance CreditInvest	
	Afri-Fund-Capital	

Agreement to proceed with Concept to Negotiation stage

_____ _____

S. Ikua
DIRECTOR GENERAL/CEO

LCDA

Date:

Alan Brewer MSc. Director

PSECC Ltd

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PSECC

Ltd

Certified