+44 (0) 2392 471860
+44 (0) 7510977203
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email: alan@psecc.co.uk
Website: psecc.co.uk

# WIND FARMS
# PROPOSAL CONCEPT

November 2023

Prepared By: Alan Brewer MSc.

**PSECC Ltd**

www.psecc.co.uk

Project No. PSECC006

## Transitional Clean Energy

## Net ZERO

PSECC Ltd

Portsmouth Sustainable Energy & Climate Change Centre

PREPARED FOR:

**Mr S. Ikua**

Director General / CEO

**LAPSSET CORRIDOR**

Lapsset Corridor Development Authority - LCDA

Chester House, 2nd Floor, P.O.Box 45008-00100, Koinange Street, Nairobi, Kenya

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PSECC Ltd

Portsmouth Sustainable Energy & Climate Change Centre

# 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.**

The mammoth project constructed at a cost of $680-million is located in Turkana the remote northern part of the country. The 365-turbine wind farm on the eastern shores of Lake Turkana, is the largest private investment in Kenya's since independence.

Speaking during the launch of the project Kenya's previous President Uhuru Kenyatta said that the East African nation was in course to becoming a force to reckon with when it comes to renewable energy.

"Today, we again raise the bar for the continent as we unveil the single largest wind farm," said President Uhuru Kenyatta, after touring the project.

"Kenya is without a doubt on course to become a world leader in renewable energy." Kenya hopes that the Turkana wind farm will help to satisfy it rising demand of energy as it seeks to become an industrial country by the year 2030.

A consortium of Chinese firms is racing against time to complete the construction of Lake Turkana Wind Power line. The firms have pledged to connect the Lake Turkana Wind Power project to the national grid by August 31 otherwise they will pay a fine of Sh1.3 billion per month.



**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

NARI Group Corporation and Power China Guizhou Engineering Company, were awarded a Sh9.6 billion contract to complete the transmission line linking Lake Turkana Wind Power to the national grid following the termination of a Spanish firm's contract last year. Isolux's contract was terminated after it was placed under receivership, pushing back completion of the project.

Wind Energy from the Wind Farms can be used for Green Hydrogen production. The cost of green hydrogen production will continue to drop as countries ramp up their renewable energy ambitions.

About 3 billion people use conventional carbon- based fuels such as wood, charcoal, and animal dung for their daily cooking needs. Cooking with biomass causes deforestation and habitat loss, emissions of greenhouse.

The International Energy Agency estimates the cost of green hydrogen production to range from $3 to $7 per kilo.  The cost of green hydrogen production is largely due to the use of renewable electricity, which is the main component.


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk  Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

# KENYA STRATEGY

## President Ruto's commitment

President William Ruto in November 9, 2022 had arrived back from Sharm El-Sheikh, Egypt where he attended the 2022 United Nations Climate Change Conference (COP27). The President called on developed nations to invest in Africa to unlock its clean energy production potential citing wind power, geothermal electricity, and solar energy.

The President 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. There exist opportunities in Kenya to produce 20 GW of wind-power.

Fig 1.

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 |

## PSECC Ltd propose 500MW of Wind Farms for the Lapsset Corridor

**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

# BENEFITS OF WND FARMS

**Wind farms can offer various benefits to the LAPSSET (Lamu Port-South Sudan-Ethiopia Transport) Corridor project in Kenya, particularly in the context of energy generation and sustainable development. Here are key benefits:**

1. **Renewable Energy Generation:** Wind farms provide a source of renewable energy by harnessing the kinetic energy of the wind to generate electricity. This contributes to the diversification of the energy mix, reducing reliance on conventional and finite fossil fuel resources.
2. **Carbon Emission Reduction:** Wind energy is a clean and low-carbon power source. By generating electricity without burning fossil fuels, wind farms help mitigate climate change by reducing greenhouse gas emissions. This aligns with global efforts to transition to low-carbon energy systems.
3. **Energy Independence:** Wind farms contribute to energy independence by providing a locally available and abundant source of power. This reduces dependency on imported fossil fuels, enhancing energy security and stability within the LAPSSET Corridor.
4. **Job Creation and Economic Development:** The development, construction, and operation of wind farms create job opportunities and stimulate economic growth. This includes roles in manufacturing, installation, maintenance, and related support services, benefiting local communities and economies.
5. **Technological Innovation:** Investment in wind energy projects fosters technological innovation in the renewable energy sector. Advances in wind turbine technology, control systems, and grid integration contribute to the overall development of clean energy technologies.
6. **Diversification of Energy Sources:** Integrating wind power into the energy mix diversifies the sources of electricity generation. This diversity enhances the resilience of the energy infrastructure, as it reduces vulnerability to fluctuations in the availability or prices of specific energy resources.


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

7. **Grid Stability and Reliability:** Wind energy, when integrated into the power grid, can contribute to grid stability. Wind farms, especially when strategically located, can provide a reliable and continuous power supply, complementing other energy sources to meet the demands of the LAPSSET Corridor.
8. **Rural Electrification and Community Benefits:** Wind farms can bring electricity to remote or underserved areas along the corridor, contributing to rural electrification. This has positive impacts on local communities, providing access to modern energy services, improving quality of life, and supporting social development.
9. **Sustainable Infrastructure Development:** Wind farms align with the principles of sustainable infrastructure development. By investing in renewable energy, the LAPSSET Corridor promotes environmentally responsible practices and long-term sustainability.
10. **Reduced Air and Water Pollution:** Wind power generation produces electricity without emitting air pollutants or consuming water resources, which is common in traditional power plants. This leads to improved air and water quality in the region, benefitting both the environment and public health.
11. **Energy Access and Affordability:** Wind energy projects contribute to increased energy access and affordability. By generating electricity locally, wind farms can help address energy poverty and provide a cost-effective and sustainable power source for industries and communities along the corridor.
12. **Mitigation of Energy Price Volatility:** Wind energy has a stable and predictable cost structure once the infrastructure is in place. This can help mitigate the impact of energy price volatility, providing a more predictable and reliable energy supply for businesses and consumers in the LAPSSET Corridor.

**In summary, the integration of wind farms into the LAPSSET Corridor project in Kenya brings multiple benefits, ranging from clean energy generation and carbon emission reduction to economic development and improved energy resilience. These advantages align with sustainable development goals and contribute to the overall success of the corridor project.**

# ENERGY TRANSITION

**Green Energy investments within the corridor are on the rise.**

The LAPSSET Corridor investments will increase energy demand up to 1,000 MW

Lake Turkana Wind Farm - 300 MW  Completed

Meru Wind Farm – 100MW Planed

Isiolo Wind Farm – 150MW Planed

Marsabit Wind Farm- 50 MW Planed

This is a Wind Farm Energy Review – a Detailed Technical offer will follow on these Renewable Energy technology mitigation measure

**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk  Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

**Wind farms in the LAPSSET Corridor project in Kenya can contribute significantly to the energy transition of the country, by the following:**

1. **Renewable Energy Integration:** Wind farms provide a clean and renewable source of energy, contributing to the integration of sustainable and environmentally friendly power sources into Kenya's energy mix.
2. **Diversification of Energy Sources:** Integrating wind power diversifies Kenya's energy portfolio, reducing dependence on conventional fossil fuels. This diversification enhances energy security and resilience by mitigating risks associated with fluctuations in fuel prices and availability.
3. **Reduction of Greenhouse Gas Emissions:** Wind energy generation produces electricity without emitting greenhouse gases during operation. By displacing electricity generation from fossil fuel sources, wind farms contribute to the reduction of carbon emissions, aligning with Kenya's climate change mitigation goals.
4. **Mitigation of Climate Change Impact:** The deployment of wind farms supports efforts to mitigate the impact of climate change by reducing the carbon footprint of the energy sector. This aligns with global commitments, including Kenya's commitment to the Paris Agreement.
5. **Energy Independence:** Wind farms contribute to Kenya's energy independence by harnessing a locally available and abundant resource. This reduces the country's reliance on imported fossil fuels, promoting energy security and stability.
6. **Job Creation and Economic Development:** The development, construction, and operation of wind farms create job opportunities and stimulate economic growth. This is particularly relevant for local communities in and around the LAPSSET Corridor.
7. **Technological Innovation:** Investment in wind energy projects fosters technological innovation in the renewable energy sector. Advances in wind turbine technology, grid integration, and energy storage can contribute to the overall development of clean energy technologies in Kenya.
8. **Rural Electrification:** Wind farms can be deployed in remote or underserved areas, contributing to rural electrification. This extends access to electricity


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

to areas that may not be connected to the national grid, improving the quality of life in rural communities.

9. **Stable and Predictable Energy Supply:** Wind energy has a stable and predictable cost structure once the infrastructure is in place. This contributes to a reliable and consistent energy supply, reducing the impact of energy price volatility.
10. **Sustainable Infrastructure Development:** Wind farms align with sustainable infrastructure development goals, promoting environmentally responsible practices and long-term sustainability in Kenya's energy sector.
11. **Energy Access and Affordability:** Wind energy projects contribute to increased energy access and affordability. By generating electricity locally, wind farms can help address energy poverty and provide a cost-effective and sustainable power source.
12. **Government Renewable Energy Targets:** Kenya has set ambitious renewable energy targets, including a significant share of wind power in its energy mix. The deployment of wind farms in the LAPSSET Corridor can contribute to achieving these targets.

In summary, wind farms in the LAPSSET Corridor project play a crucial role in Kenya's energy transition by providing clean, renewable energy, reducing greenhouse gas emissions, promoting economic development, and contributing to the country's long-term sustainability goals.


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

## Wind Speed Map of Kenya

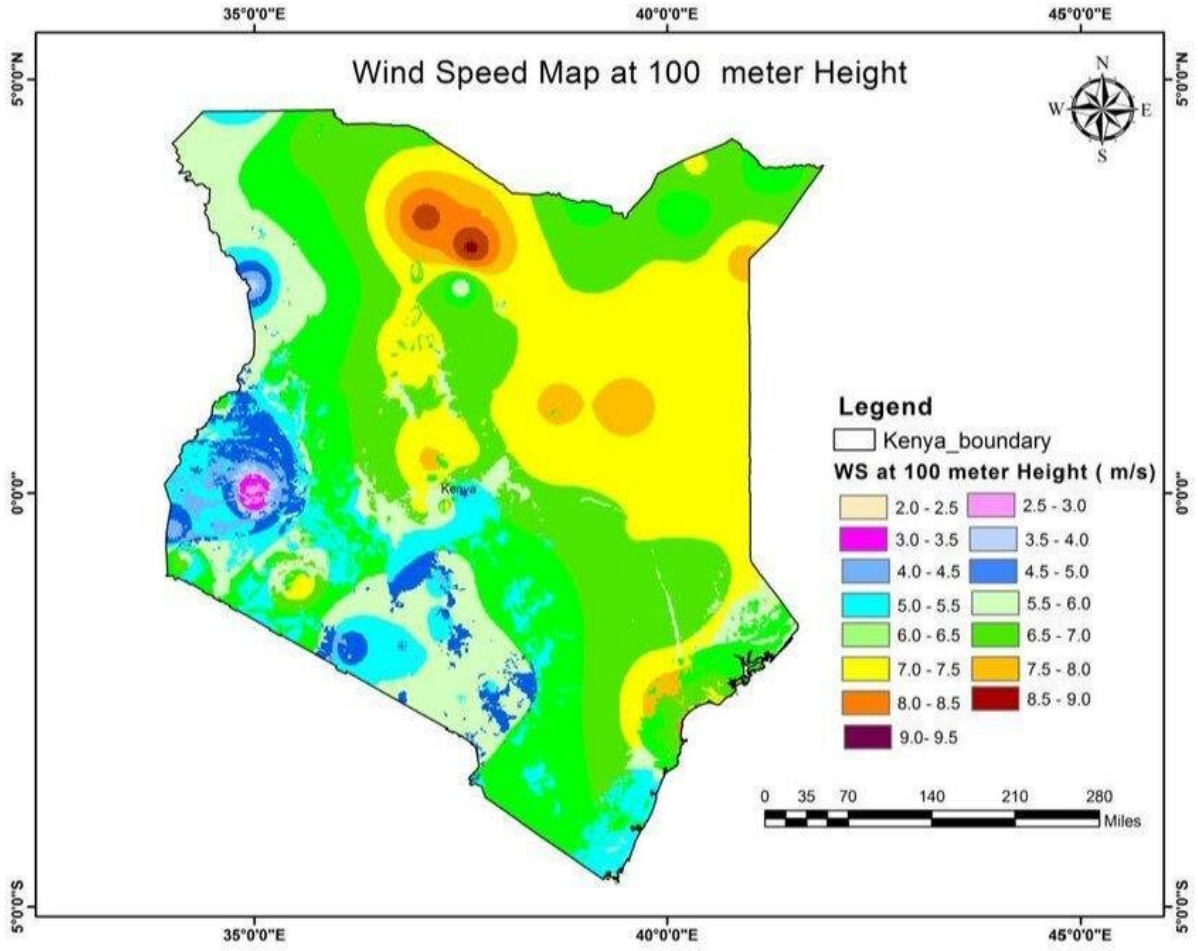


Figure 2: Wind Speed Map of Kenya at 100m height

# Energy Generated from 500MW of Wind Farms

**To calculate the annual energy production (AEP) from a 500 MW wind farm in Kenya with wind speeds of 7 m/s and running for 8 hours per day, you can use the following steps:**

1. **Calculate Daily Energy Production (DEP):**
   DEP=Installed Capacity×Capacity Factor×Hours per DayDEP=Installed Capaci ty×Capacity Factor×Hours per Day
   In this case:
   - Installed Capacity = 500 MW
   - Capacity Factor (assumed) = It can vary, but let's assume 35%.
   - Hours per Day = 8 hours/day

   DEP=500 MW×0.35×8 hours/dayDEP=500MW×0.35×8hours/day

2. **Convert DEP to kWh:** DEP in kWh=DEP×1,000DEP in kWh=DEP×1,000
   Now, let's calculate it step by step:
   DEP=500 MW×0.35×8 hours/dayDEP=500MW×0.35×8hours/day
   DEP in kWh=DEP×1,000DEP in kWh=DEP×1,000

   **Substitute the values and perform the calculations:**

   DEP=500×0.35×8=1,400 MWh/dayDEP=500×0.35×8=1,400MWh/day
   DEP in kWh=1,400×1,000=1,400,000 kWh/dayDEP in kWh=1,400×1,000=1,4 00,000kWh/day

So, the wind farm would generate approximately 1,400,000 kWh of electricity per day. To get the annual production, you can multiply this value by the number of days in a year. Assuming 365 days:

**Annual Energy Production=1,400,000 kWh/day×365 days/yearAnnual Energy Pr oduction=1,400,000kWh/day×365days/year = 511,000 MWh**

# CLIMATE CHANGE MITIGATION

**The installation of 500 MW of additional wind farms within the LAPSSET Corridor project in Kenya can have significant climate change mitigation effects. Here are the key ways in which this contributes to mitigating climate change:**

1. Reduction in Greenhouse Gas Emissions: Wind farms generate electricity without burning fossil fuels, which helps to reduce greenhouse gas emissions. By displacing electricity generated from conventional sources like coal or natural gas, the additional 500 MW of wind power can result in a substantial reduction in carbon dioxide ($CO_2$) emissions.
2. Avoided Fossil Fuel Combustion: The electricity generated by wind farms is considered "carbon-free" during operation. Installing more wind farms in the LAPSSET Corridor would avoid the combustion of fossil fuels, reducing the associated $CO_2$ emissions and air pollution.
3. Low Carbon Intensity: Wind energy has a low carbon intensity, meaning that the emissions produced per unit of electricity generated are significantly lower compared to many traditional power sources. This characteristic contributes to a more sustainable and environmentally friendly energy mix.
4. Alignment with National and Global Climate Goals: The installation of wind farms aligns with Kenya's commitment to addressing climate change. It supports the country's efforts to reduce its carbon footprint and achieve its targets outlined in international agreements, such as the Paris Agreement.
5. Contribution to Renewable Energy Targets: Kenya has set ambitious targets for increasing the share of renewable energy in its overall energy mix. The additional 500 MW of wind power contributes directly to meeting these targets, promoting a transition to a more sustainable and climate-friendly energy sector.
6. Enhanced Grid Stability and Reliability: Wind power, when integrated into the energy grid, can enhance stability and reliability. The variable nature of wind energy is often complemented by other renewable sources and energy storage solutions, creating a balanced and resilient power system.


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

7. Promotion of Sustainable Practices: Wind energy represents a sustainable and environmentally friendly power source. The expansion of wind farms in the LAPSSET Corridor project encourages sustainable practices in the energy sector, emphasizing the importance of reducing the environmental impact of electricity generation.
8. Air Quality Improvement: The reduction in the use of fossil fuels for electricity generation leads to improved air quality. Wind farms contribute to cleaner air by avoiding the release of pollutants associated with the combustion of coal, oil, or natural gas.
9. Economic and Social Co-Benefits: In addition to climate change mitigation, the development of wind farms brings economic and social co-benefits. It creates job opportunities, stimulates local economies, and improves living standards in the communities surrounding the wind farm sites.
10. Demonstration of Commitment to Sustainability: The installation of more wind farms within the LAPSSET Corridor demonstrates a commitment to sustainability and responsible environmental practices. It sets a positive example for other regions and contributes to a broader global effort to address climate change.

**In summary, the additional 500 MW of wind farms within the LAPSSET Corridor project in Kenya would contribute significantly to climate change mitigation by reducing greenhouse gas emissions, promoting sustainable energy practices, and aligning with national and global climate goals.**


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

# ALIGNMENT WITH LAPSSET

**How does further development of 500MW of wind farms fit into and have ALIGNMENT WITH LAPSSET in Kenya**

The further development of 500 MW of wind farms aligns with the LAPSSET (Lamu Port-South Sudan-Ethiopia Transport) Corridor project in Kenya in several ways:

1. **Diversification of Energy Sources:** Integrating 500 MW of wind farms contributes to the diversification of energy sources within the LAPSSET Corridor. This aligns with the corridor's strategy of having a balanced and diversified energy mix to enhance energy security and reliability.
2. **Renewable Energy Integration:** Wind farms represent a renewable energy source, and their development supports the integration of clean and sustainable energy into the energy portfolio of the LAPSSET Corridor. This aligns with the global trend toward reducing reliance on fossil fuels and transitioning to renewable energy.
3. **Climate Change Mitigation:** The development of wind farms is a climate-friendly initiative that aligns with efforts to mitigate climate change. By generating electricity without greenhouse gas emissions during operation, wind farms contribute to the corridor's commitment to environmental sustainability and addressing climate challenges.
4. **National Energy Transition Goals:** Kenya has set ambitious goals for transitioning to a more sustainable and renewable energy future. The development of wind farms within the LAPSSET Corridor contributes directly to Kenya's national energy transition goals, promoting the use of clean energy sources.
5. **Energy Independence:** Wind energy, being a locally available resource, contributes to energy independence. The further development of wind farms within the corridor reduces dependence on imported fossil fuels, enhancing energy security and self-sufficiency.
6. **Job Creation and Economic Development:** The development, construction, and operation of wind farms create job opportunities and stimulate economic growth. This aligns with the broader socio-economic development goals of the LAPSSET Corridor, contributing to local employment and prosperity.


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

7. **Sustainable Infrastructure Development:** The expansion of wind farms aligns with the principles of sustainable infrastructure development within the LAPSSET Corridor. It promotes environmentally responsible practices and contributes to the long-term sustainability of the corridor's energy infrastructure.
8. **Technology and Innovation:** Wind energy projects encourage technological innovation in the renewable energy sector. The development of advanced wind turbine technology, grid integration solutions, and energy storage methods contributes to the overall technological advancement within the corridor.
9. **Community Benefits and Stakeholder Engagement:** The further development of wind farms provides an opportunity for community engagement and benefits. Involving local communities in the planning and implementation of wind energy projects can enhance acceptance and support for sustainable development initiatives.
10. **Alignment with International Best Practices:** The integration of wind farms aligns with international best practices in the field of renewable energy and sustainable development. It positions the LAPSSET Corridor as a region committed to adopting environmentally friendly and socially responsible energy solutions.

**In summary, the development of 500 MW of wind farms within the LAPSSET Corridor in Kenya is in alignment with the corridor's goals for a diversified, sustainable, and resilient energy infrastructure. It contributes to national and global efforts in combating climate change, promoting renewable energy, and fostering economic and social development within the corridor.**


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

# TENTATIVE TIMELINE

Following is the tentative timeline of the Nuclear programme, divided into 3 phases:

| Phases | Name | Description | Time Frame |
|---|---|---|---|
| Phase 1: | Implementation / Feasibility | Strategic pathway | 2024 |
| Phase 2: | Five Wind Farms | 250MW | 2024 to 2028 |
| Phase 3: | Five Wind Farms | 250MWMW | 2028 to 2035 |

# COST

The details of the indicative cost are provided below (dependent upon exact criteria):

| Title | Cost (USD) | MWh per year |
|---|---|---|
| Phase 1. Implementation / Feasibility Study / EIA etc (approximately) | $300,000 | |
| Phase 2. Five Wind Farms | $250 Million | Approximately 255,500 MWh |
| Phase 3. Five Wind Farms | $250 Million | Approximately 1,110,720 MWh |

| Items | Cost |
|---|---|
| PSECC Ltd coordination | |
| Coordinator | To Be Determined |
| Project Manager | To Be Determined |


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

# REVENUE

PSECC Ltd calculations (to be confirmed once plant is operational and O&M considered) – indicative.

| Items | Revenue (USD) year |
|---|---|
| Yearly Energy Generation from 500MW plant producing 511,000 MWh – electricity sold at $0.05 KWh | $25.55 Million |
| Government 35% share of revenue per year | $8.94 Million |
| Total Government revenue share over 20 years | $178.85 Million |

**Loan repayments will then have to be made.**

**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

# CARBON DIOXIDE SAVINGS

**To estimate the potential carbon dioxide ($CO_2$) savings per year from a 500 MW wind farm operating at an average wind speed of 7 meters per second over 8 hours per day, you can follow these steps:**

1. **Calculate Annual Energy Production (AEP):**
   AEP=Capacity Factor×Installed Capacity×Hours in a YearAEP=Capacity Facto r×Installed Capacity×Hours in a Year

**In this case:**

- Installed Capacity = 500 MW
- Capacity Factor (assumed) = It can vary, but let's assume 35%.
- Hours in a Year = 8 hours/day * 365 days/year

AEP=0.35×500 MW×8 hours/day×365 days/yearAEP=0.35×500MW×8hours/day×3 65days/year

2. **Convert AEP to MWh:** Since we typically measure carbon intensity in kilograms of $CO_2$ per kilowatt-hour (kg CO2/kWh), you'll need to convert the AEP to MWh:
   AEP in MWh=AEP in kWh×1,000AEP in MWh=AEP in kWh×1,000
3. **Calculate $CO_2$ Emissions:**
   $CO_2$ Emissions=AEP in MWh×Carbon Intensity$CO_2$ Emissions=AEP in MWh× Carbon Intensity

Assuming a carbon intensity of
Carbon Intensity=0.4 kg $CO_2$/kWhCarbon Intensity=0.4kg $CO_2$/kWh:

$CO_2$ Emissions=AEP in MWh×0.4 kg CO2/kWh$CO_2$ Emissions=AEP in MWh×0.4kg $CO_2$/kWh


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

**Now, let's calculate it step by step:**

AEP=0.35×500 MW×8 hours/day×365 days/yearAEP=0.35×500MW×8hours/day×365days/year

AEP in kWh=AEP×1,000AEP in kWh=AEP×1,000

$CO_2$ Emissions=AEP in kWh×0.4 kg $CO_2$/kWh$CO_2$ Emissions=AEP in kWh×0.4kg $CO_2$/kWh.

**To calculate the annual energy production (AEP) from a 500 MW wind farm in Kenya with wind speeds of 7 m/s and running for 8 hours per day, you can use the following steps:**

1. **Calculate Daily Energy Production (DEP):**
   DEP=Installed Capacity×Capacity Factor×Hours per DayDEP=Installed Capacity×Capacity Factor×Hours per Day

**In this case:**

- Installed Capacity = 500 MW
- Capacity Factor (assumed) = It can vary, but let's assume 35%.
- Hours per Day = 8 hours/day

DEP=500 MW×0.35×8 hours/dayDEP=500MW×0.35×8hours/day

2. **Convert DEP to kWh:** DEP in kWh=DEP×1,000DEP in kWh=DEP×1,000

Now, let's calculate it step by step:

DEP=500 MW×0.35×8 hours/dayDEP=500MW×0.35×8hours/day

DEP in kWh=DEP×1,000DEP in kWh=DEP×1,000

Substitute the values and perform the calculations:

DEP=500×0.35×8=1,400 MWh/dayDEP=500×0.35×8=1,400MWh/day

DEP in kWh=1,400×1,000=1,400,000 kWh/dayDEP in kWh=1,400×1,000=1,400,00 0kWh/day

So, the wind farm would generate approximately 1,400,000 kWh of electricity per day. To get the annual production, you can multiply this value by the number of days in a year. Assuming 365 days:

Annual Energy Production=1,400,000 kWh/day×365 days/yearAnnual Energy Prod uction=1,400,000kWh/day×365days/year = 511,000,000KWh per year.

**Important to note that detailed Feasibility studies will be required to determine exact values from each Solar Farm proposed.**

To estimate the annual carbon dioxide ($CO_2$) savings from a 500 MW wind farm operating 8 hours per day with a wind speed of 7 m/s, you can follow these steps:

1. **Calculate Daily Energy Production (DEP):**
   DEP=Installed Capacity×Capacity Factor×Hours per DayDEP=Installed Capaci ty×Capacity Factor×Hours per Day

In this case:

- Installed Capacity = 500 MW
- Capacity Factor (assumed) = It can vary, but let's assume 35%.
- Hours per Day = 8 hours/day

DEP=500 MW×0.35×8 hours/dayDEP=500MW×0.35×8hours/day

2. **Convert DEP to MWh:** DEP in MWh=DEP×1,000DEP in MWh=DEP×1,000
3. **Calculate $CO_2$ Emissions:**
   $CO_2$ Emissions=DEP in MWh×Carbon Intensity$CO_2$ Emissions=DEP in MWh× Carbon Intensity

Assuming a carbon intensity of
Carbon Intensity=0.4 kg $CO_2$/kWhCarbon Intensity=0.4kg $CO_2$/kWh:

$CO_2$ Emissions=DEP in MWh×0.4 kg CO2/kWhCO2 Emissions=DEP in MWh×0.4kg $CO_2$/kWh

**Now, let's calculate it step by step:**

DEP=500 MW×0.35×8 hours/dayDEP=500MW×0.35×8hours/day

DEP in MWh=DEP×1,000DEP in MWh=DEP×1,000

$CO_2$ Emissions=DEP in MWh×0.4 kg $CO_2$/kWh$CO_2$ Emissions=DEP in MWh×0.4kg C $O_2$/kWh

Substitute the values and perform the calculations:

DEP=500×0.35×8=1,400 MWh/dayDEP=500×0.35×8=1,400MWh/day

DEP in MWh=1,400×1,000=1,400,000 kWh/dayDEP in MWh=1,400×1,000=1,400,0 00kWh/day

$CO_2$ Emissions=1,400,000×0.4=560,000 kg $CO_2$/day$CO_2$ Emissions=1,400,000×0.4= 560,000kg $CO_2$/day

**Now, to get the annual $CO_2$ emissions:**

Annual $CO_2$ Emissions=560,000 kg $CO_2$/day×365 days/yearAnnual $CO_2$ Emissions=5 60,000kg $CO_2$/day×365days/year

## Total annual CO2 emissions = 21.9 million tonnes per year.


**PSECC Ltd**
39 Woodhay Walk, Havant, Hants, PO9 5RD, UK
Email alan@psecc.co.uk Tel +44 (0) 2392 471860
Mbl +44 (0) 7510 977203

# CONTACT US

You can contact us with any of the following ways:

Phone: +44 (0) 2392 471860 / Mbl: +44 (0) 7510 977203
E-mail: alan@psecc.co.uk
Website: www.psecc.co.uk