

Forum ACP Energies 9 Mars 2024



Namibie Programme de Capacity Building - Climate Change

- Pollution & Waste Management
- Disaster Risk Reduction
- Renewable Energy
- Loss and Damage
- Women and Inclusion in Energy

- Oil & gas Training Center
- NOC/IOC Technical support

NAMIBIA Quick Overview



Flag



Coat of arms

Motto: "Unity, Liberty, Justice"

Anthem: "Namibia, Land of the Brave"

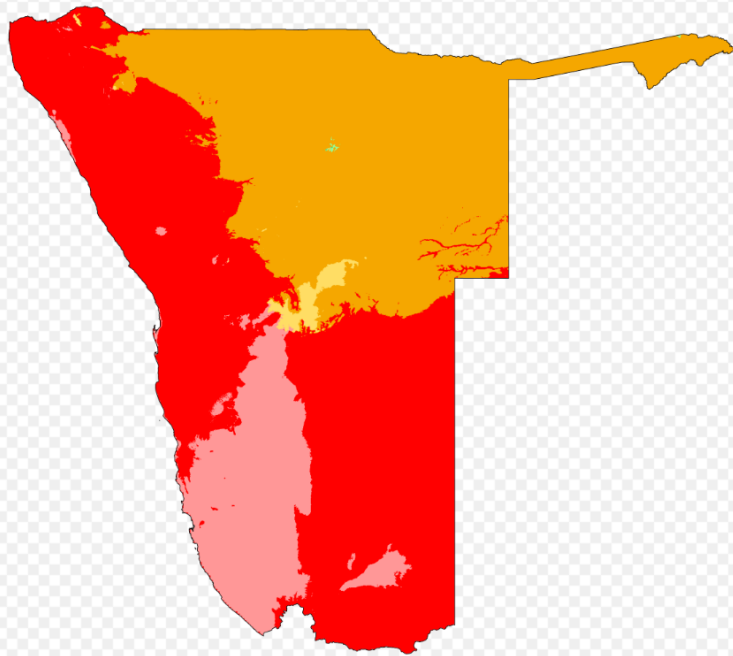
- ▶ Head Of State And Government: **President: Nangolo Mbumba**, from Feb the 4th 2024
- ▶ Capital: **Windhoek**
- ▶ Population:(2023 est.) **2,642,000**
- ▶ Form Of Government: Republic with National Council & National Assembly
- ▶ Official Language: **English**
- ▶ Stable multi-party parliamentary democracy. Agriculture, tourism and the mining industry (diamonds, uranium, gold, silver and base metals) – form the basis of its economy, while manufacturing sector is comparatively small.
- ▶ Today Namibia is one of the least densely populated countries in the world.
- The 50th member of the Commonwealth of Nations.
- Namibia is one of the most free and democratic countries in Africa.



NAMIBIA Quick Overview

► Challenging climate

Köppen-Geiger climate classification map for Namibia (1980-2016)



- Arid, desert, hot (BWh)
- Arid, desert, cold (BWk)
- Arid, steppe, hot (BSh)
- Arid, steppe, cold (BSk)
- Temperate, dry winter, hot summer (Cwa)
- Temperate, dry winter, warm summer (Cwb)



Namibia is primarily a large desert and semi-desert plateau.

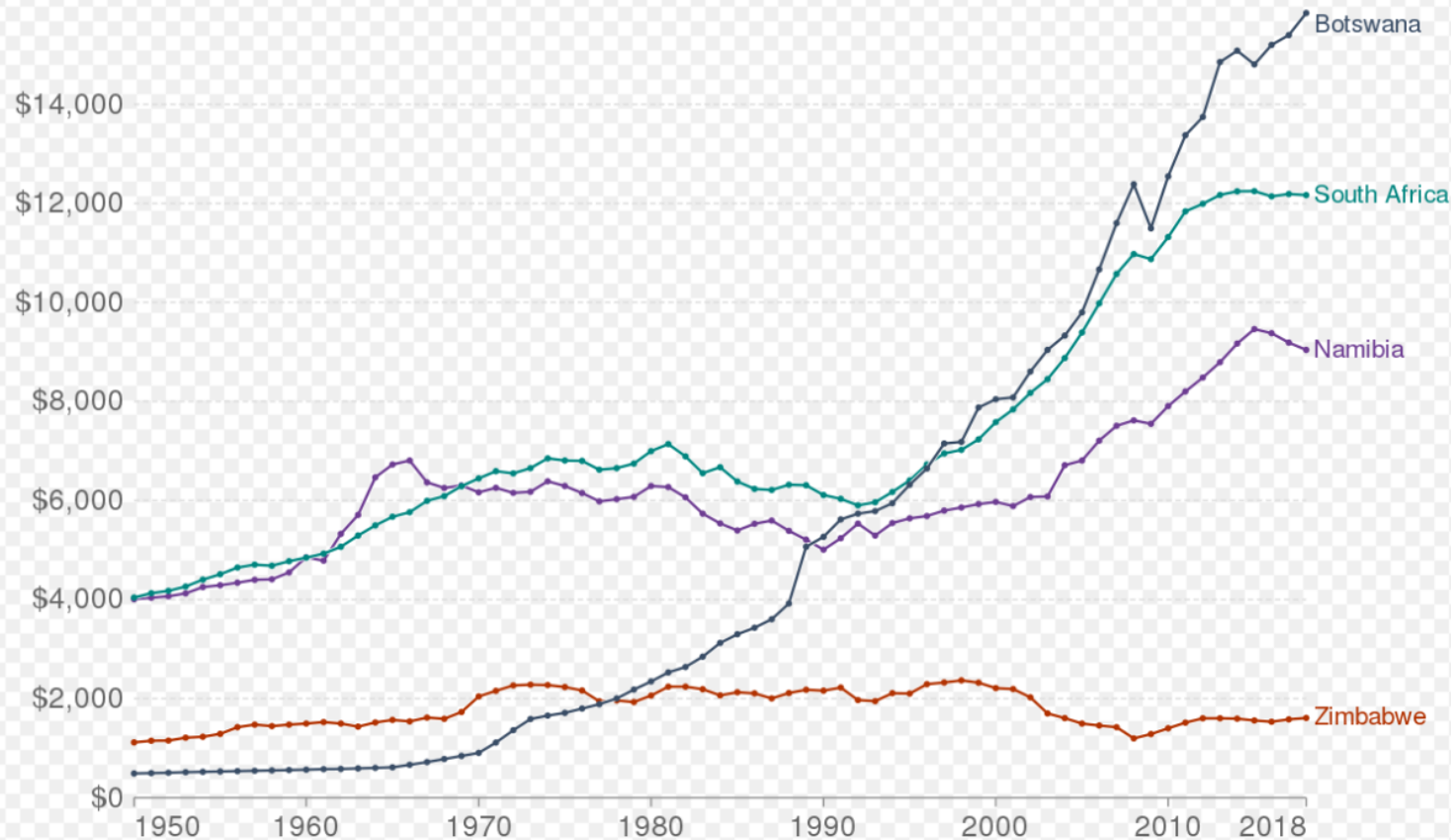


NAMIBIA Quick Overview

GDP per capita, 1950 to 2018

Our World
in Data

GDP per capita adjusted for price changes over time (inflation) and price differences between countries – it is measured in international-\$ in 2011 prices.



Source: Maddison Project Database 2020 (Bolt and van Zanden (2020))

Mining

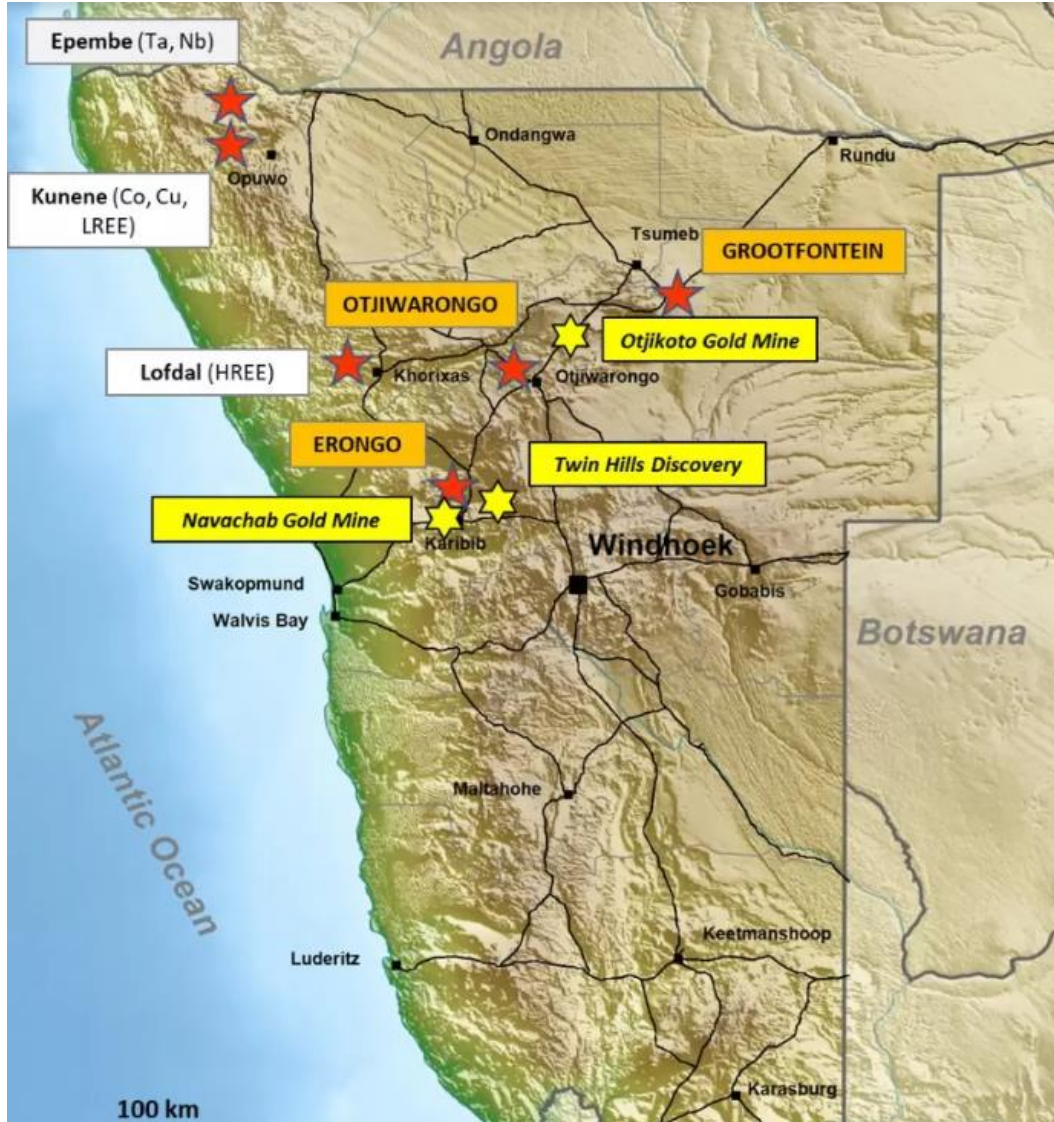


MAP OF MINES IN NAMIBIA





Mining



Canadian companies :

- ▶ Namibia Critical Minerals (Halifax)
- ▶ Northern Graphite (Ontario)
<https://northerngraphite.com/okanjande/>



Key companies: NAMCOR and NAMPOA



NAMCOR (National Petroleum Corporation of Namibia) is the national oil company of Namibia, with the mission of creating value to all its stakeholders across the oil and gas value chain. Our world-class exploration and production database, and oil license blocks form some of the major attractions to Namibia's hydrocarbon potential.



NAMPOA is a not-for-profit association established in 1992 to represent the Namibian upstream oil and gas industry, and serves as a forum for professional interaction and practical co-operation amongst the members. Most importantly, NAMPOA also provides an interface for the industry with the public and the Government.



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Namibie Programme de Capacity Building

OFFER OF SERVICES FOR THE SPECIFICATION & FEASIBILITY STUDY, TRAINING CENTER FOR OIL & GAS AND MINING IN NAMIBIA

To do so a Project team has been completed with following members :

- Project Director PD, Eric Martinez **Apave International**
- Head of Mission HM, Joaquim Pereira
- Assistant Head of Mission AHM, Jean Louis Gaillard
- Mapping Expert ME, Rogerio Kasiala, Director **RMASS**, Member of ACP energies
- Assistant Mapping AME Ambrosio Lusuekikio, local team (Namibia) from R Kasiala
- Education System Expert ESE, Bernard Gros, Director **PEC**, Member of ACP energies
- Training Equipment Expert TEE, Remy Geoffray

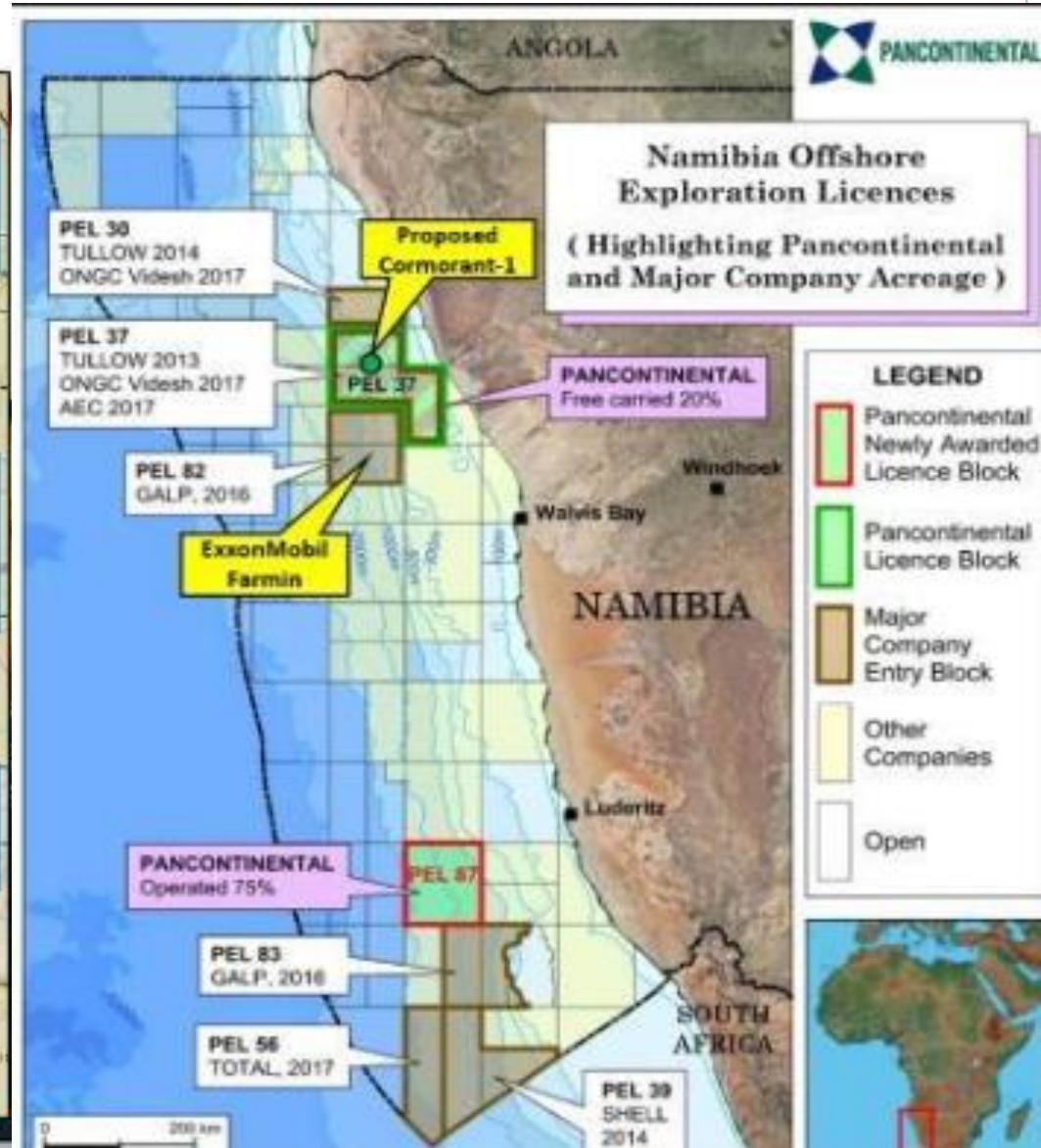
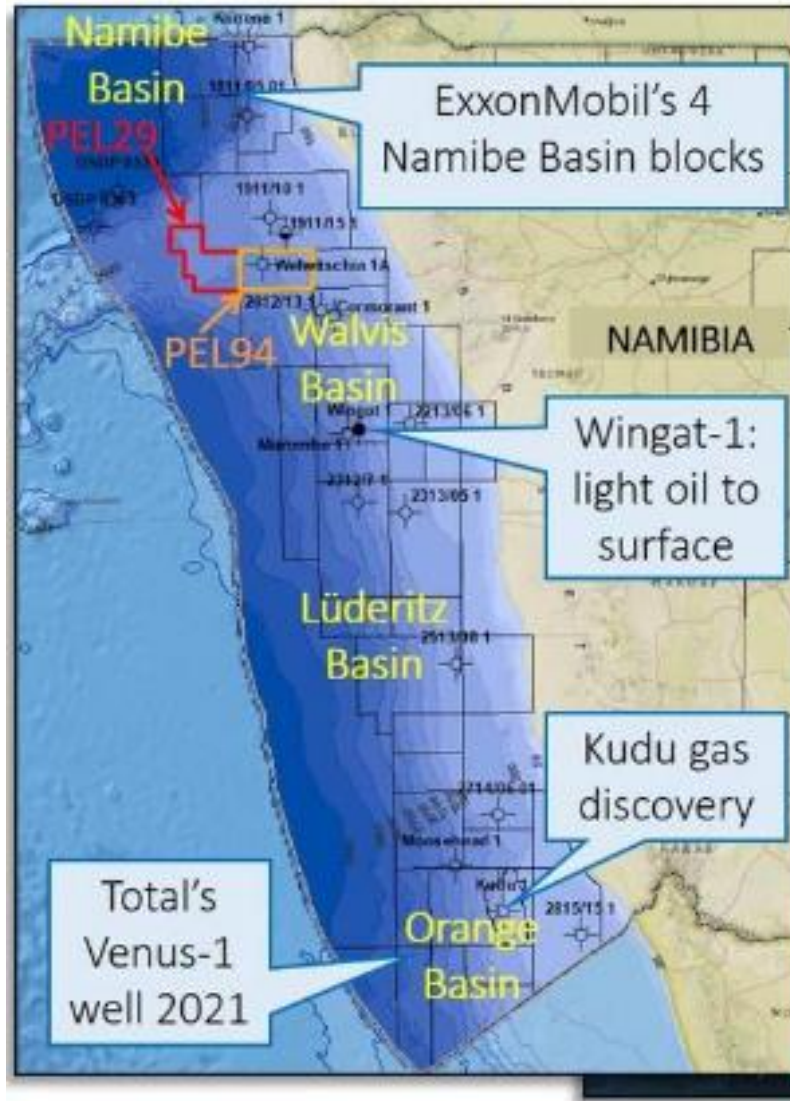
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#	Activity	# week											
		1	2	3	4	5	6	7	8	9	10		
a	Context & justification												
b	HR Needs												
b	Preparation of mapping questionnaire		■										
b	Follow-up, mail, phone, visits (optional)			■	■								
c	Missions & objectives of the center												
d	Services offered by the center												
e	Output flows of trainees per speciality												
e	Analysis & Report					■							
f	System of management & organisation												
f	Report						■						
g	Staff of the center												
g	Salary & taxes					■							
h	Investments												
h	Investment cost level					■							
h	Construction cost and Pedagogical cost						■						
i	Running cost of center												
j	Steering of the center												
k	Preliminary report												
l	Final Report												
l	Submission preliminary report									■			
l	Integration of request for adjustments										■		
l	Issuance Final Report									9		■	



Major Discoveries

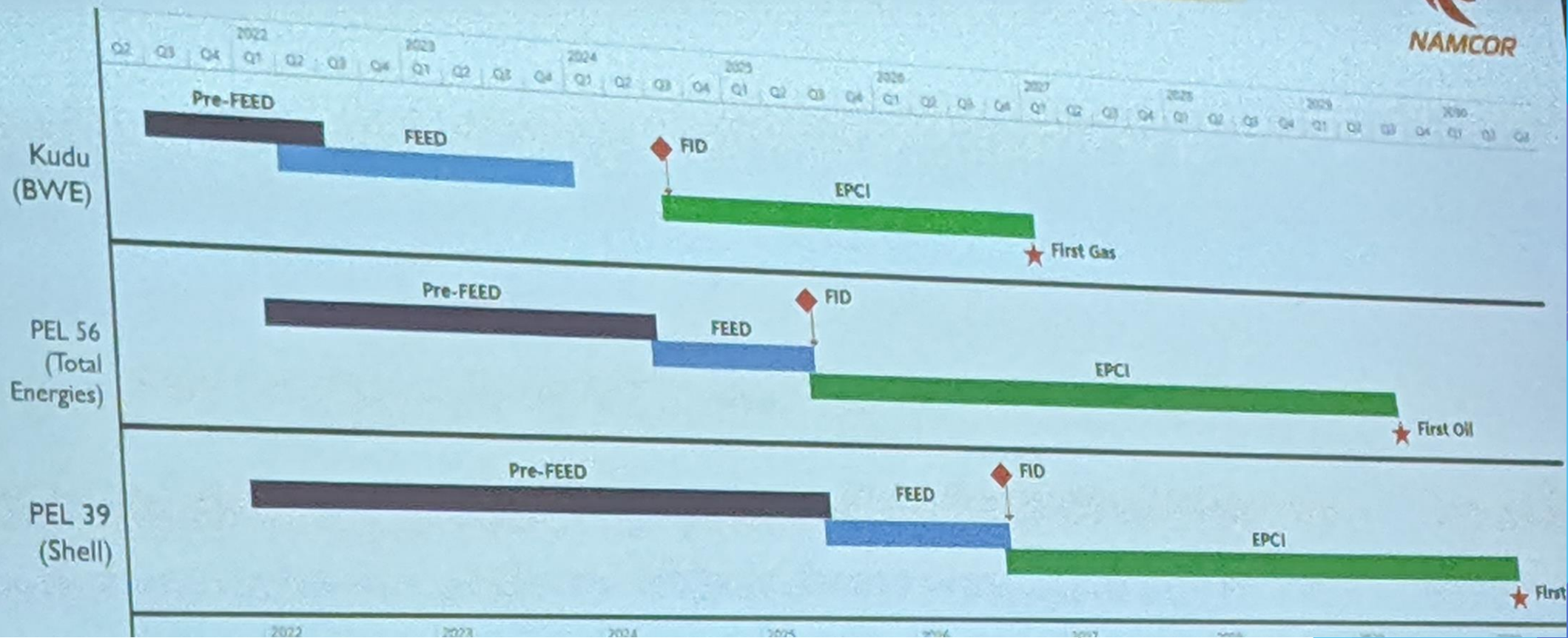


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B Namibie Programme de Capacity Building - Climate Change

Key Energy Projects: Timelines





New Players want to be part of it

▶ GALP (PEL) 83



Portuguese oil and gas company Galp – through its subsidiary Galp Energia – has signed a contract with maritime logistics firm SFL Corporation for the utilization of the company's Hercules semi-submersible rig. The rig will be deployed at Petroleum Exploration License (PEL) 83, located in the **Orange Basin**, offshore Namibia.

Under the terms of the contract, the sixth generation deepwater and harsh environment semi-submersible rig will drill two wells at PEL-83, and will additionally be used for optional well testing and the drilling program.



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B Namibie Programme de Capacity Building



Braulio de Brito, Chairperson AECIPA (Angolan Oil and Gas Service Companies Association) signs cooperation agreement with NAOGSP (Namibian Association for Offshore Oil and Gas Service Providers) to collaborate on research initiatives, and explore joint research projects...



Strength for Future with Hydrogen



[See videos :](#)
[Green Hydrogen Namibia](#)
[- Exporting Sunlight](#)
 [\(gh2namibia.com\)](http://gh2namibia.com)

Namibia is well-positioned to leverage her unparalleled natural resources to emerge as a key player in the African and global energy market.

With an abundant supply of energy resources, including wind and solar, Namibia is well poised to contribute towards meeting the continent's energy demands.

Namibia is positioning herself at the heart of the continent's energy industry, with ambitions to produce renewable energy and assist other nations to decarbonize.

- World-class oil and gas discoveries
- Competitive advantage in global GH2 and green ammonia value chain
- World class solar and wind resources with large tracts of land
- Conducive legislative environment



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Namibia – Renewable Energy and Hydrogen Production : Perspectives

- Namibia ambitions
 - Government plan in Kharas Region (South of Namibia) : investment of 9.4 B\$ for green hydrogen production
 - Project located in Tsau / Khaeb National Park, 300 000 tpa hydrogen for national and international market
 - Several phases for Renewable Energy power generation (solar and wind) :
 - 2 GWe initially for hydrogen production by electrolysis
 - Followed by next phases to increase electrolysis capacity to 5 GWe
 - Major impact on Namibia economy ;
 - Creation of 15 000 direct jobs for next 4 years
 - 3 000 permanent jobs for next 40 years
 - Strong partnership with Germany (e.g. Hyphen Hydrogen Energy)

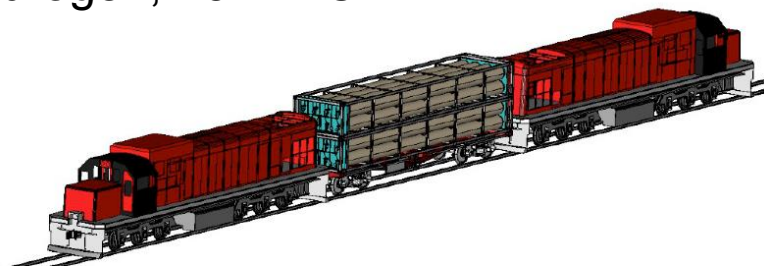
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B Namibia – Renewable Energy and Hydrogen Production : Perspectives

■ Some Representative Local Initiatives

- Hydrogen application in Port Environment : Walvis Bay, 5 MWe electrolyzer + mobile fueling station (compression, storage and distribution), 5.7 M€ ; Utilisation by tugs (ICE, CMB.Tech technology) and all other port « off-road » vehicles (e.g. cranes)
- Diesel Locomotive conversion to H2 DF mode (ICE) : Walvis Bay – Kranzberg line, 50 conversions, 7.6 M€ (CMB.Tech)
- Hydrogen Pilot Refueling Station : Walvis Bay, 5 MWc solar PV + 5 MWe Electrolyzer + compression + storage + dispensers , 25 M€
- Daures Green Village – Green ammonia production from green hydrogen, 15.1 M€

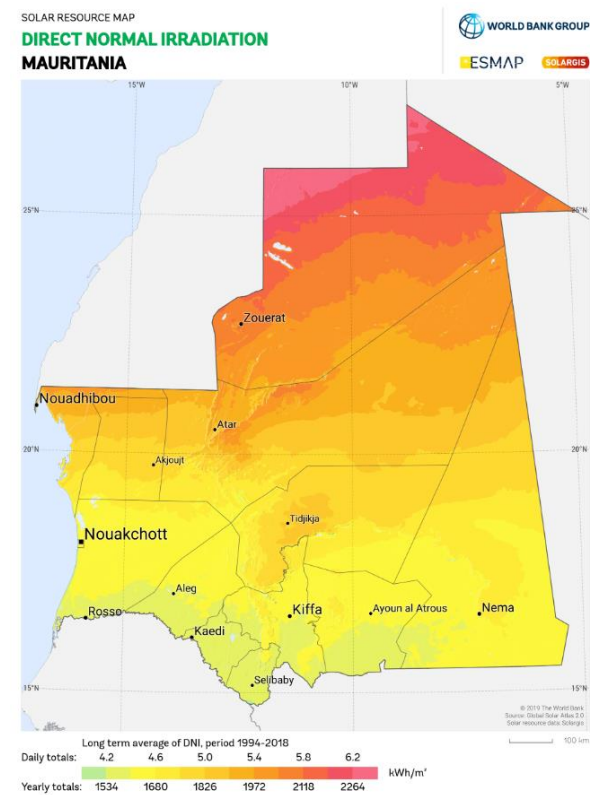
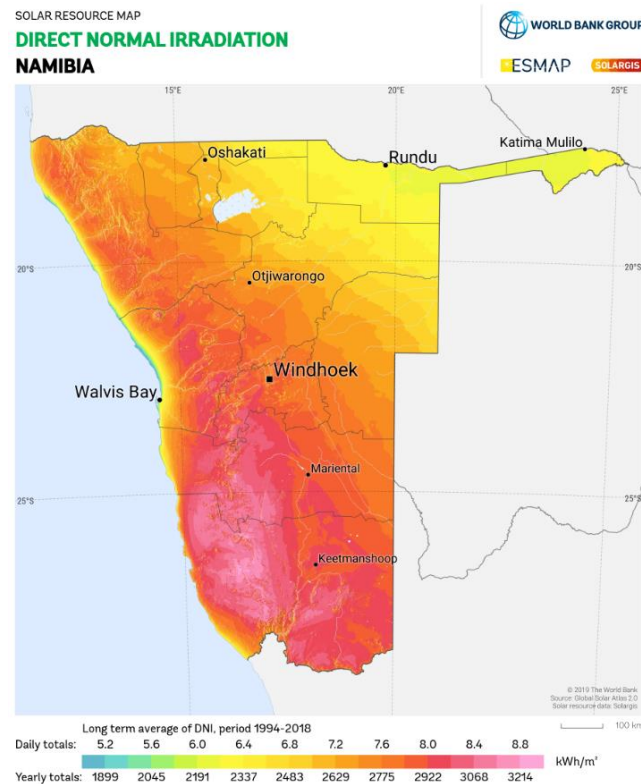


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Namibia – Renewable Energy and Hydrogen Production : Perspectives

- Namibia Solar Energy Potential
 - One of the best countries in Africa and better than Mauritania



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Namibia – Renewable Energy and Hydrogen Production : Perspectives

- Namibia Solar Energy Potential
 - Irradiation Scale Comparison – Direct Normal Irradiation / World Bank Group
Total annual radiation energy in kWh / m² over 1994 – 2018 period

Country	Irradiation Scale	Average
France	<p>949 1095 1241 1387 1534 1680 1826 1972</p>	1 400
Spain	<p>730 876 1022 1168 1314 1461 1607 1753 1899 2045 2191 2337 2483</p>	2 000
Mauritania	<p>1534 1680 1826 1972 2118 2264</p>	2 200
Namibia	<p>1899 2045 2191 2337 2483 2629 2775 2922 3068 3214</p>	2 900



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Namibia – Renewable Energy and Hydrogen Production : Perspectives

- Namibia Solar Energy Potential
 - Solar PV Parks Opportunities – 1.0 GWc Case Study
 - Annual Irradiation = 2 900 kWh / m²
 - Associated Loading Factor = 33 % ⇔ 2 890 hours / year
 - Annual Power Generation = 2 900 GWhe = 2.90 TWhe
 - CAPEX = Total Capital Requirements = 1.00 B\$
assumption based on data published for mega Solar PV projects in China and India
 - Over 20 years, total power production = 58.0 TWhe
 - Project Economics – Calculation of Levelized Cost of Energy LCOE when considering three cases :

Annual OPEX	% TCP	0.0%	1.5 %	2.5 %
	M\$ / year	0	13.5	22.5
WACC		0.0%	2.0 %	4.0 %
LCOE	\$ / MWhe	17.2	25.7	33.1



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Namibia – Renewable Energy and Hydrogen Production : Perspectives

- Namibia Solar Energy Potential - Conversion to Hydrogen Production
 - 1.0 GWe Electrolyser Case Study and 2 900 GWe / year
 - Alkaline electrolysers with 60 % efficiency \Leftrightarrow 55 kWhe / kg H₂
 - Hydrogen Production = 52 720 tpa
 - Water consumption (9 l / kg H₂ min.) = 0.527 Mtpa water
 - CAPEX assumptions : 1 200 \$ / kWe (electrolyzer as ME) + 1.65 integration factor and balance of plant => CAPEX 2.0 B\$ **when considering 2023 technologies**
 - OPEX assumptions = 2.5 % CAPEX = 50 M\$ / year
 - ELEX tariff assumption = 25.7 \$/MWhe => ELEX = 74.5 M\$ / year
 - Project Economics – Calculation of Levelized Cost of Hydrogen

Electricity Tariff	\$ / MWhe	17.2	25.7	33.1
H2 Plant OPEX	M\$ / year	50	50	50
WACC		0.0%	2.0 %	4.0 %
LCOH	\$ / kg H₂	3.8	4.7	5.6

For same plant of 1 GWe in EU - Grid

70 € / MWhe

45 M€ / year

4.0 %

5.1 € / kg H₂

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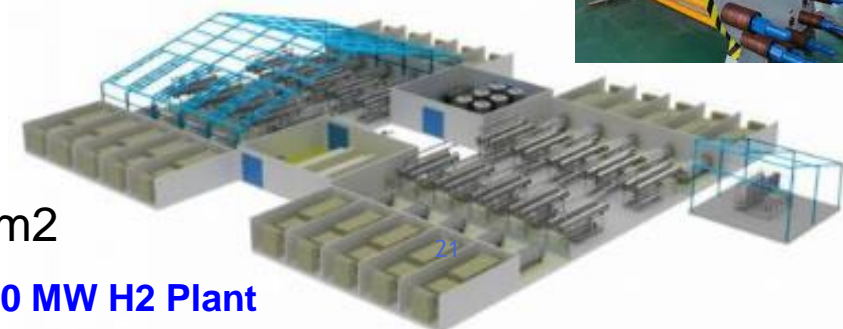


B Namibia – Renewable Energy and Hydrogen Production : Perspectives

- Hydrogen Production by Electrolysis and Power Provided by Solar Panels : Industrial Efforts Intensity for 1.0 GW Plant
 - Solar PV Park Size
 - Solar PV Panels efficiency = 21 % => 476 ha solar panels
 - Footprint for 1.1 MW / ha => 910 ha ⇔ 9.1 km²
 - Steel works for solar PV panels supports = 42 000 t
 - Number of PV Modules = 4.6 M
 - Electric cables total length = 13 000 km
 - Electrolysers Plant
 - Alkaline Unit Capacity = 5.0 MWe (John Cokerill)
 - Unit weight & size = 60 t – 2.5 m x 6.0 m
 - Nb. of Electrolysers = 200 ⇔ 12 000 t and > 15 000 m²



John Cockerill
5 MWe Electrolyzer



80 MW H₂ Plant

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Namibia – Renewable Energy and Hydrogen Production : Perspectives

- Main Take Aways
 - Namibia is strongly engaged in the development of hydrogen economy including 9 – 10 B\$ investment plans in the next 10 years aimed at producing 300 000 tpa ; However, based on 2023 technologies and equipment prices, a 3 B\$ green H2 project (solar PV + electrolyzers) can produce only 53 000 tpa => 300 000 tpa would more likely require 15 – 17 B\$
 - Moreover, despite its capacity to produce electricity from Renewable Energies (solar PV in particular) at very attractive cost ~ 25 - 30 \$ / MWh, green hydrogen production cost will be still in the order of 5 – 6 \$ / kg for projects operational in 2025 horizon
 - This cost level will not allow hydrogen export to UE (and Germany) at competitive prices for the next 5 – 7 years against Blue H2 at 3.0 € / kg and Yellow H2 (power from Grid and high load factor) at 5.5 € / kg
 - **Best short / medium term perspectives would then be for local development of hydrogen projects for Mobility applications, decarbonisation of some industries + possible export to nearby countries**

Merci de votre participation



A bientôt votre adhésion (75€)



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▶ Nous suivre sur www.acp-france.org (actualités à la une)

et sur <https://www.linkedin.com/company/association-consultants-petroliers/>