Energy Storage in Developing Regions

Dr Matthew Rowe

November, 2019


BYD
Narada
MAN
MAN Energy Solutions

Global Leaders in Energy Storage Advisory Services

150+ years

100+ countries

100,000 customers

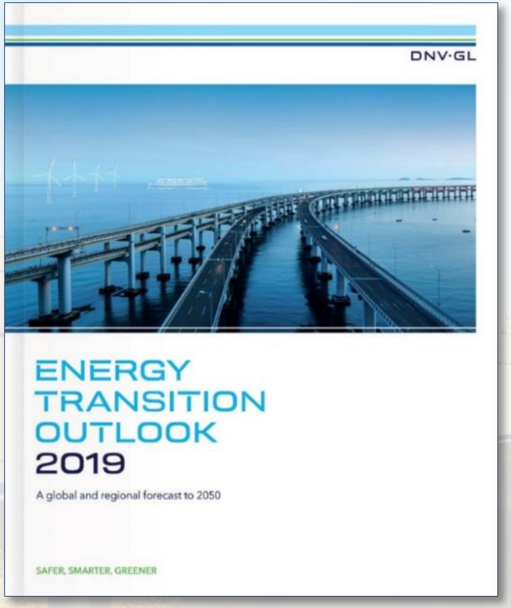
12,500 employees

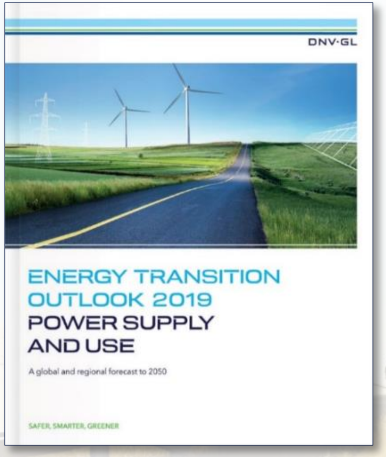
5 % of revenue spent on R&D

MARITIME	OIL & GAS	ENERGY	BUSINESS ASSURANC E	DIGITAL SOLUTION S
Access to Global Storage Experts	Experienc e from multiple sectors		Projects across the entire value chain	Data Driven Advisory Services

1. Energy Transition Outlook
2. Storage in Developing Regions
3. Lessons Learnt

Energy Transition Outlook 2019


DNV·GL
ENERGY TRANSITION OUTLOOK 2019
A global and regional forecast to 2050
SAFER, SMARTER, GREENER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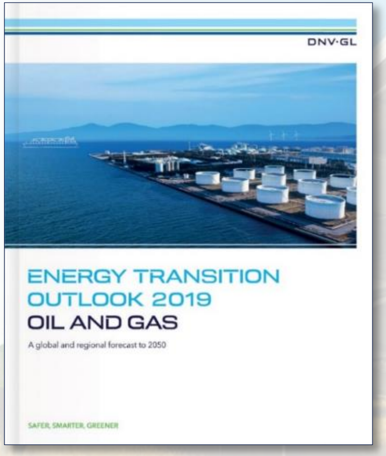
ENERGY TRANSITION OUTLOOK 2019
POWER SUPPLY AND USE
A global and regional forecast to 2050
SAFER, SMARTER, GREENER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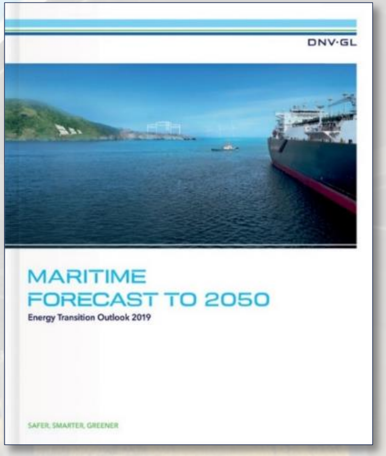
ENERGY TRANSITION OUTLOOK 2019
OIL AND GAS
A global and regional forecast to 2050
SAFER, SMARTER, GREENER


DNV·GL
MARITIME FORECAST TO 2050
Energy Transition Outlook 2019
SAFER, SMARTER, GREENER

2019 HIGHLIGHTS

Rapid energy transition – but not fast enough to meet the Paris agreement

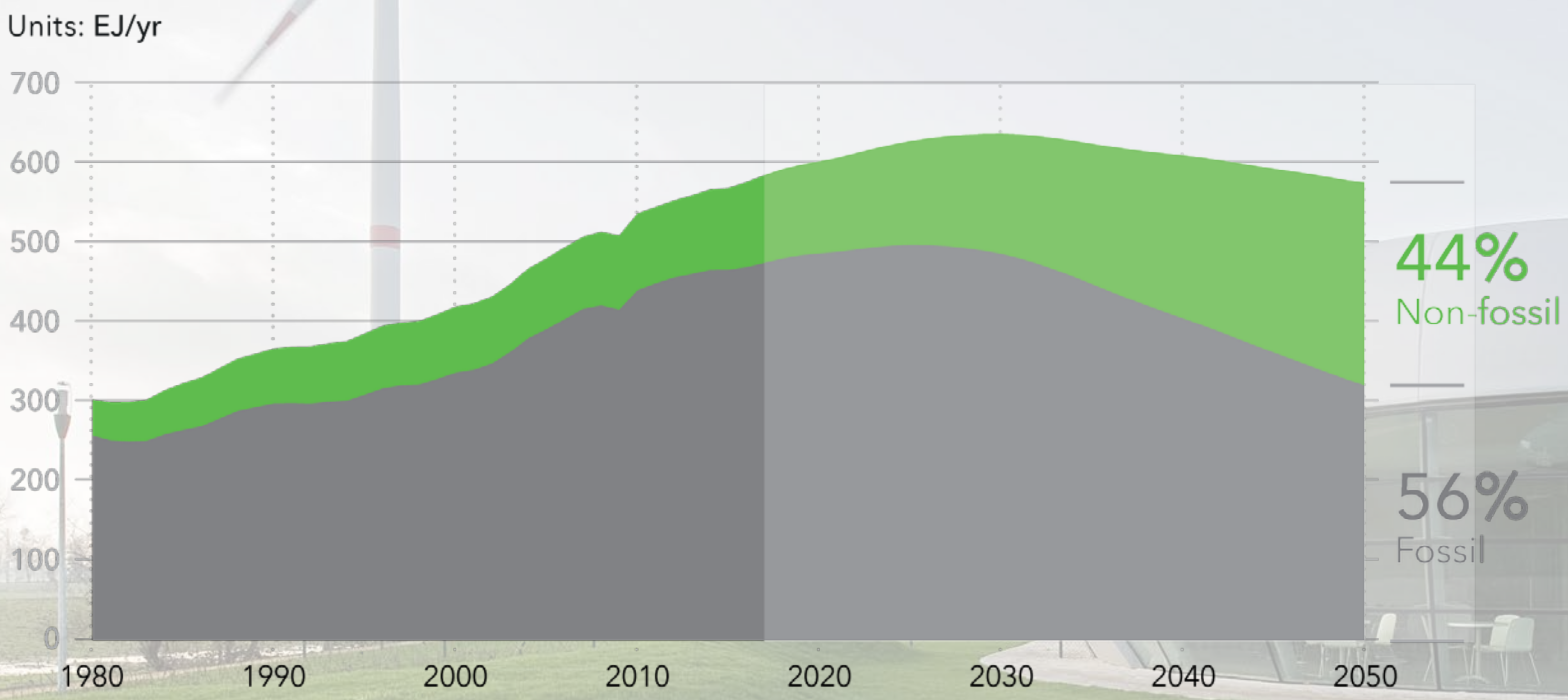
Existing technology can deliver the 1.5°C target

Global energy use peaks by 2030 due to energy efficiency

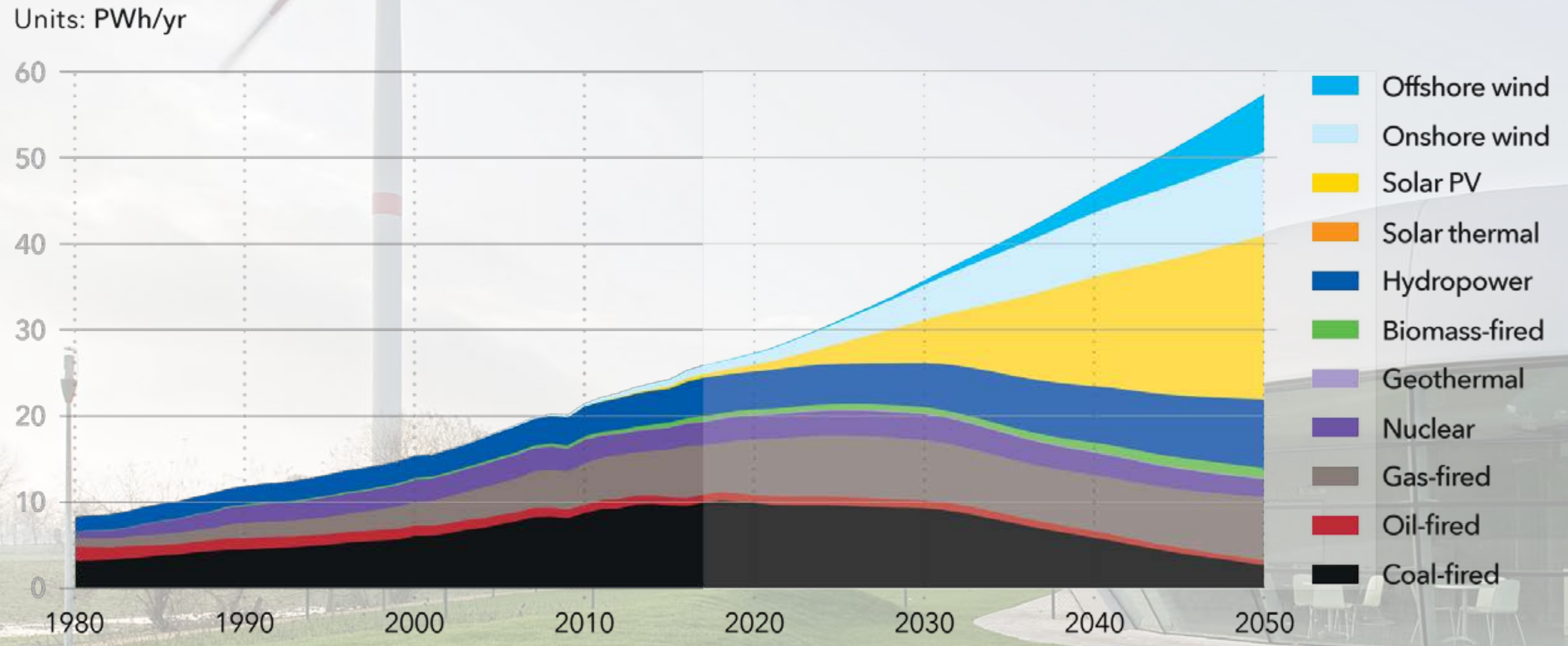
An affordable transition smaller share of GDP spent on energy

OUR FINDINGS

Global Energy Demand - Close to equal split by 2050



World electricity generation



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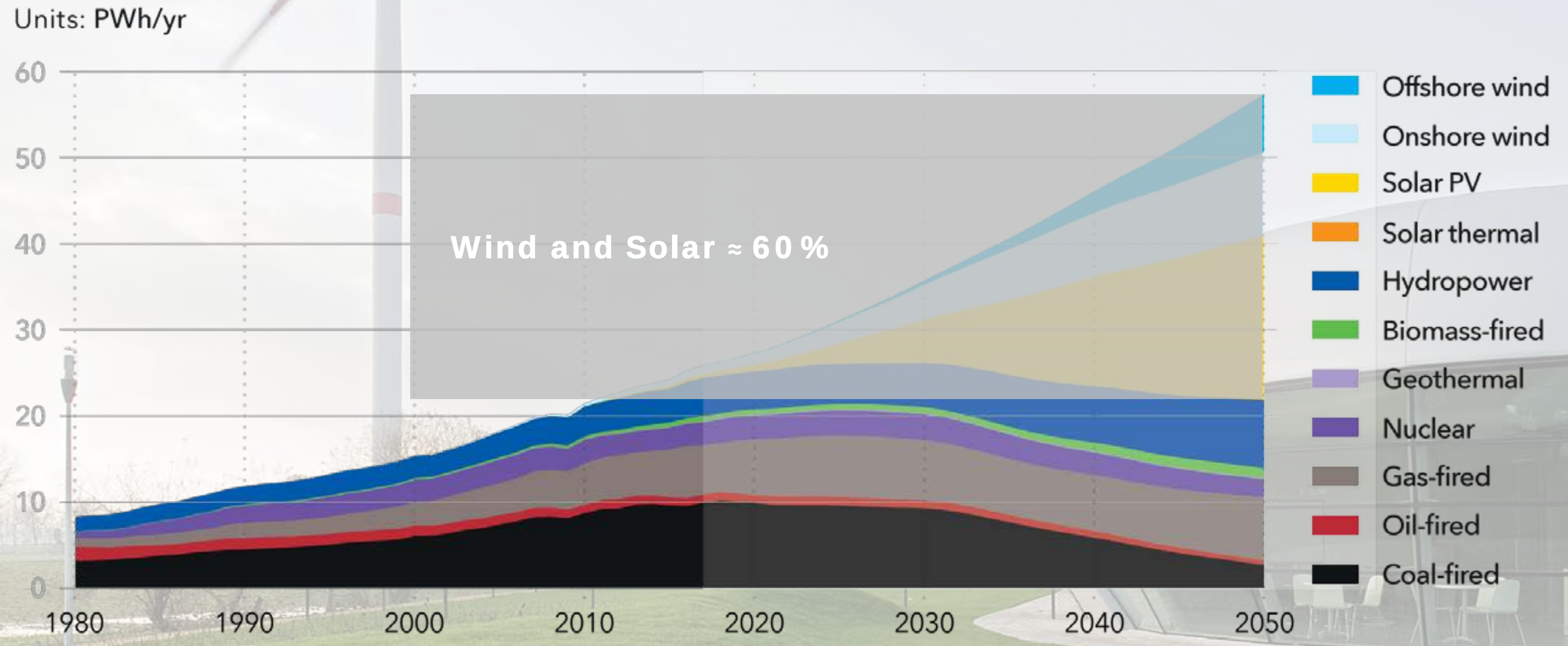
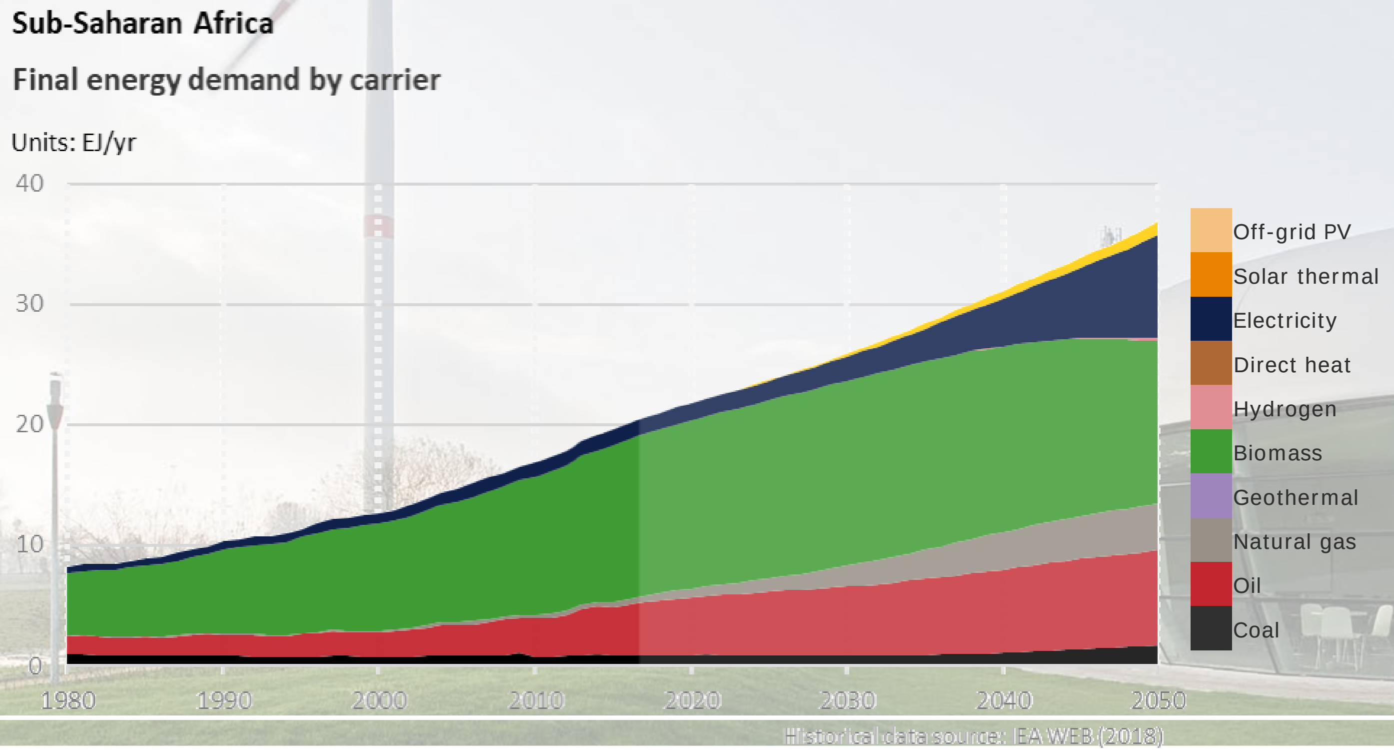
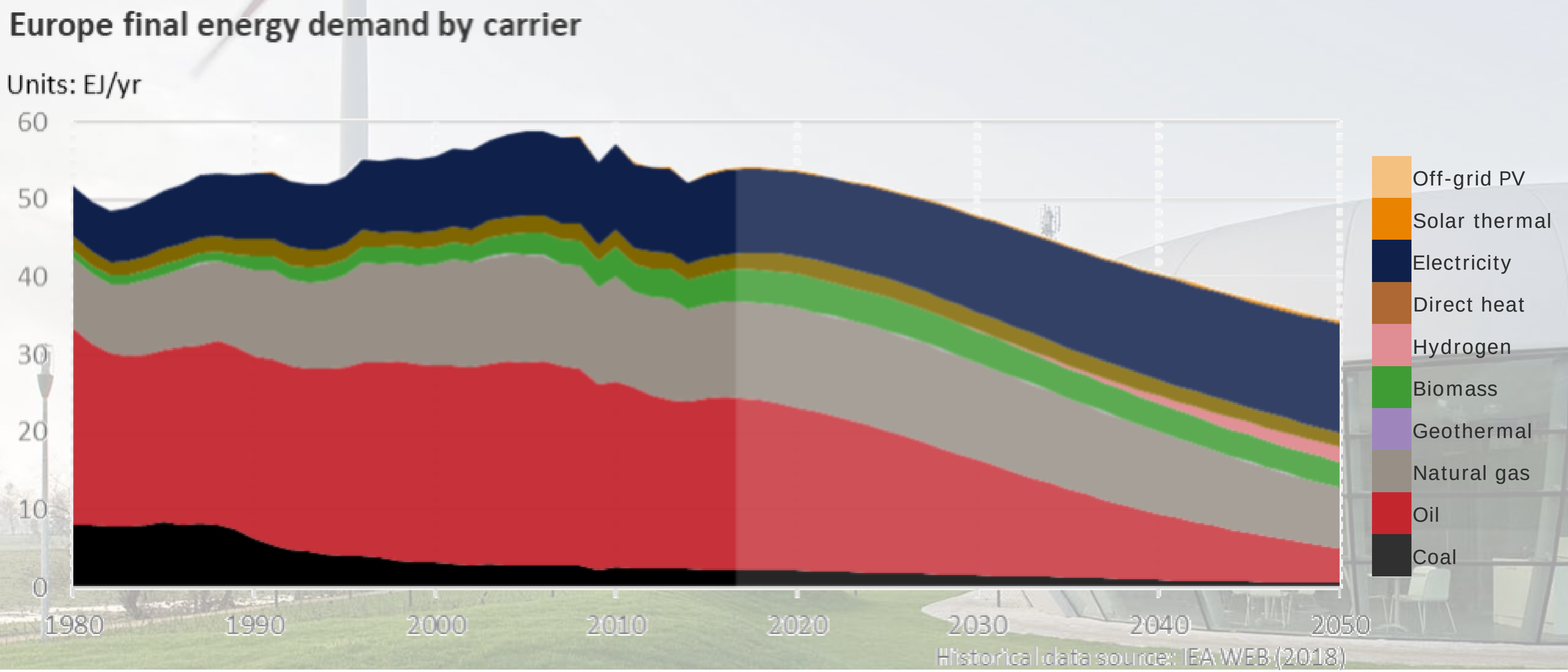
World electricity generation



Final energy demand mix – SSA



Final energy demand mix – Europe



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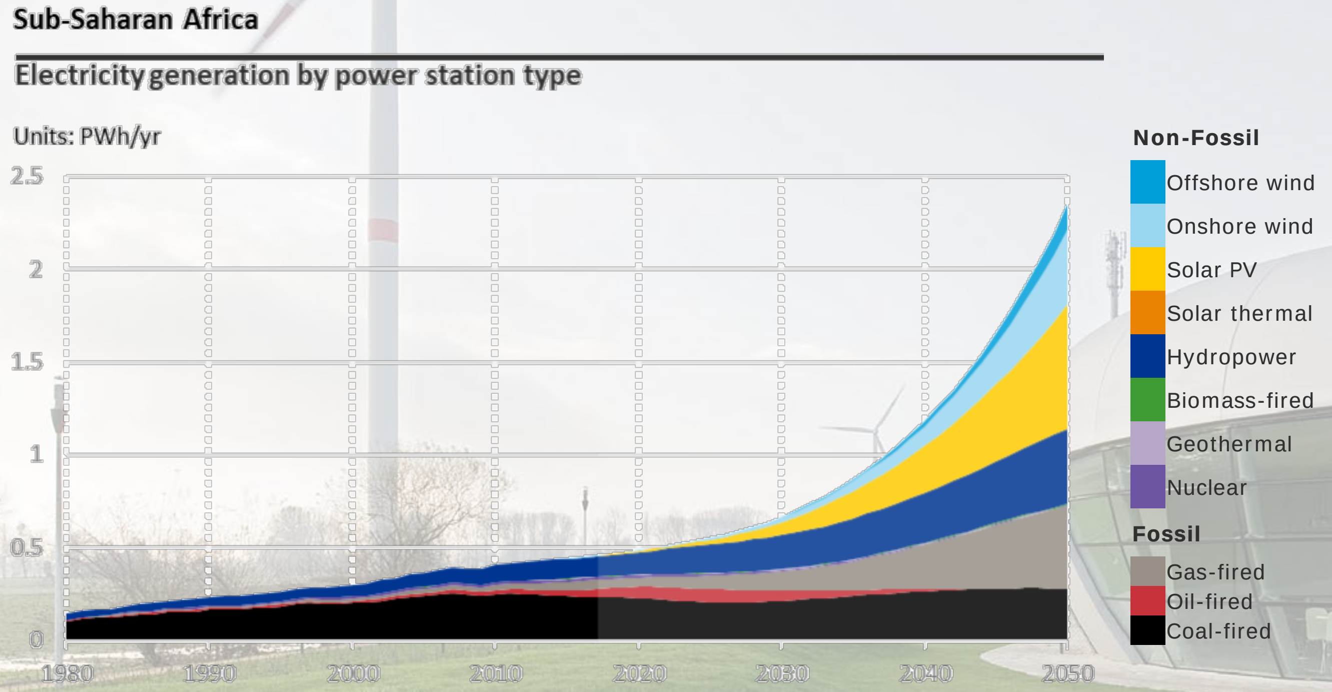
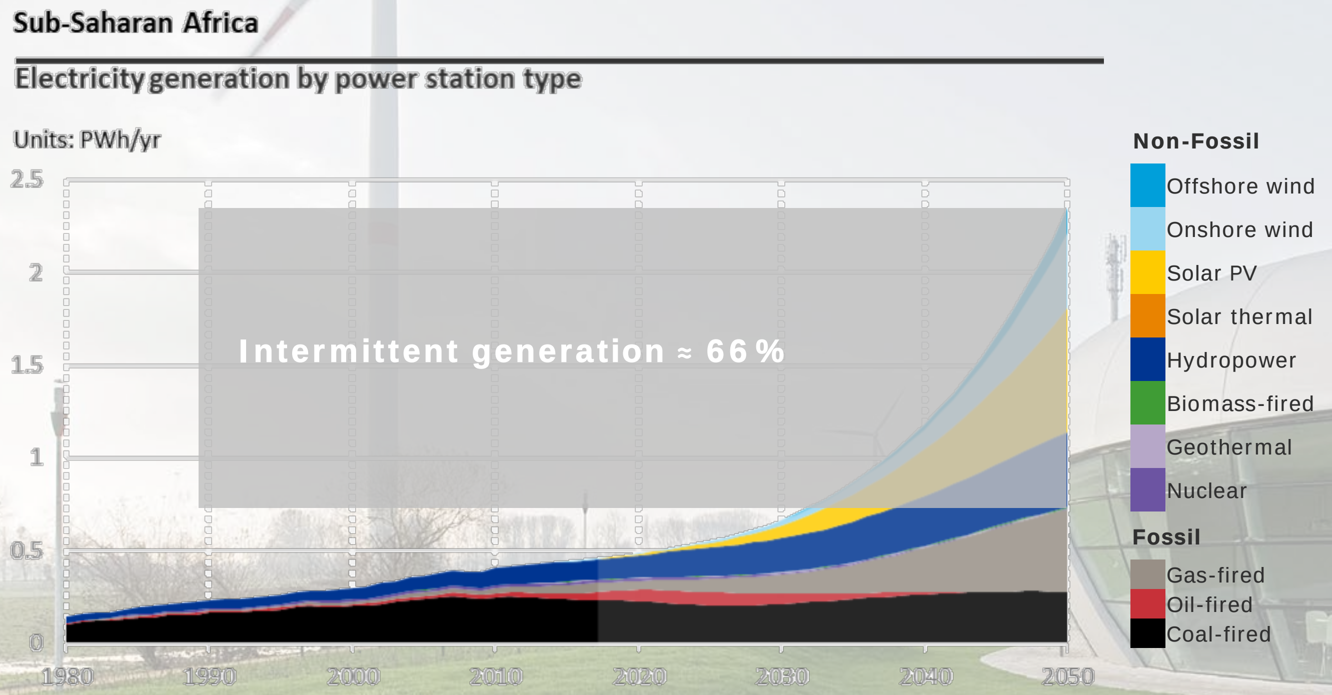
Electricity Generation Mix - SSA



Electricity Generation Mix - SSA



Ideal system characteristics for storage

High Penetration of Renewables

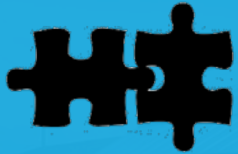
High usage of peaking diesel generators

Weak electrical networks and networks requiring upgrades

System Flexibility required to align supply and demand

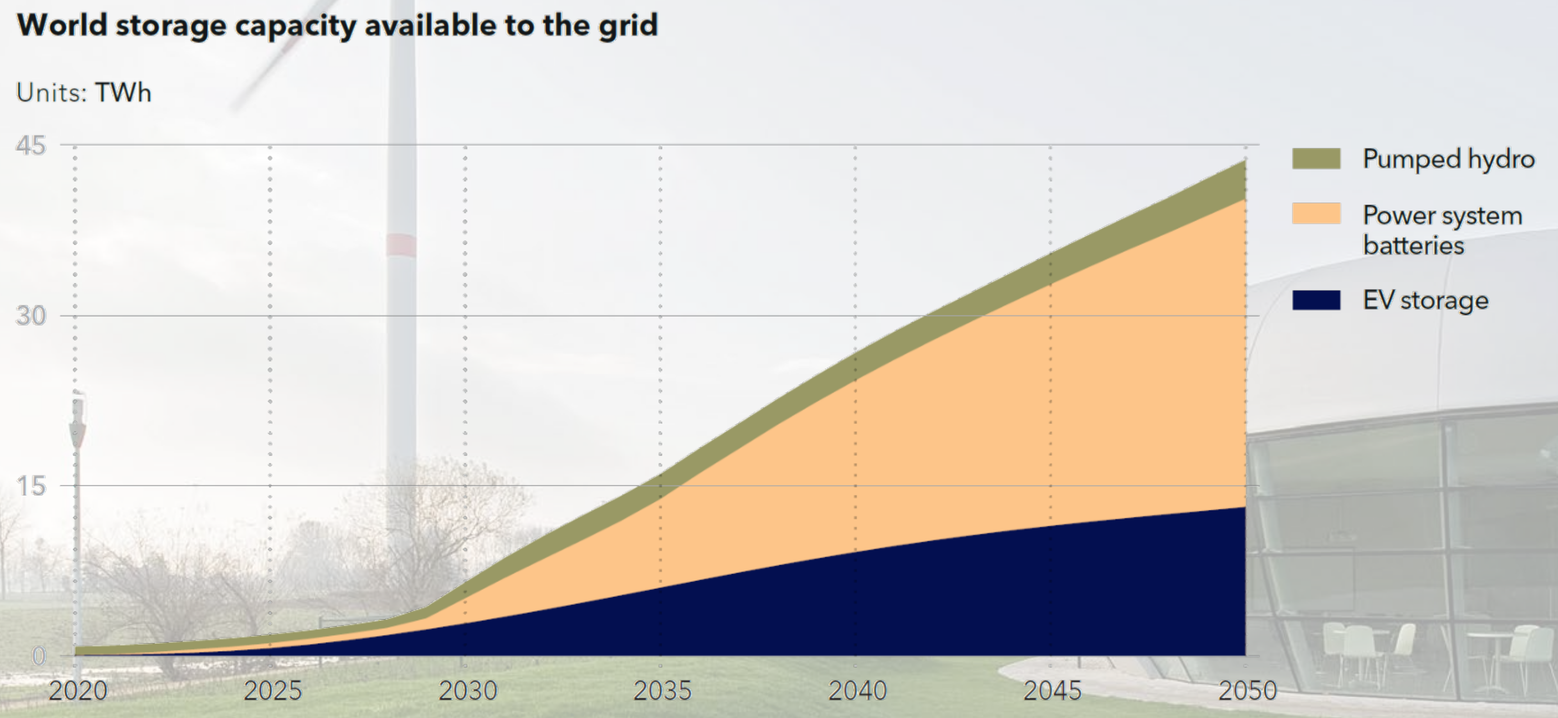
Off-Grid Systems

Ability to maximise cheap grid connection potential



Policy and Regulation

World Energy Storage Forecast Growth to 2050



Opportunities in Developing Countries

1

UTILITY SCALE GRID CONNECTED

>5MW

- Either owned and operated by Utility or IPP
- Commonly combined with generation such as diesel, wind, solar.
- Supplementing intermittent supply

2

COMMERCIAL & INDUSTRIAL

Usually 1MW – 5MW

- Energy arbitrage
- Peak shifting for time-of-use tariffs
- Backup power during outages
- Either PPA or owner invested

3

OFF-GRID, MINI-GRID, MICRO-GRID

Various sizes and configurations based on project needs

- Installed in remote areas, far from grid access
- Always combined with generation, often hybrid
- Challenges related to security of investment, recovery of energy costs

Example Planned Energy Storage Projects in Africa

University of Benin (Nigeria)

- 15 MW / 5 MWh
- Includes design, finance

Shitunguru (Tanzania)

- 60 kVA / 135 kWh
- Financed by AfricaCo Africa, being developed by

Nacala International Airport (Mozambique)

- 100 MWp
- Backed by USTDA Grant

WAPP

- Facilitates increased RES penetration to 32% by 2033
- 30 GWh of storage required

Syama Gild Mine

- 50 MWh HFO, 34 MW pv

Siaya County (Kenya)

- 40 MWp, Developer: Xago Africa, Batteries: Suniva
- Backed by USTDA

Isenzanya (Tanzania)

- 90 kVA / 138 kWh
- Financed by AfricaCo Africa, being developed by

Guinea Bissau

- 20 – 30 MW solar + storage
- World Bank finance
- Deliver power under PPA

ESKOM Grid Connected Storage

World Bank funding

$1 billion available in financing, mobilizing another $4 billion from other agencies
Funding approx. 17.5 GWh by 2025 for developing countries
Includes utility scale & off-grid (micro-grids & mini-girds)

Project Description

- ±10 separate projects
- Distributed across SA grid
- From 1MW to 100MW, 4 hours
- Combined 360MW, 1420MWh

Rationale

- Reduced National Peak
- Distributed projects provide additional benefits to local OU's
- Infrastructure upgrade investments deferred

Stakeholders

- ESKOM and World Bank

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Owners Engineer, developing business cases and providing technical storage support

Challenges

- Various use cases
  - National Peak
  - Local Load
  - Generation Smoothing

Progress

- Screening of sites conducted
- Due diligence, load flows, battery models in progress
- RfP out late 2019

Challenges or Perceived Barriers to Storage in Developing Regions

Policies / Regulations

- Sometimes non-existent
- Unclear
- Inconsistent

Prices

- Battery Energy Storage CAPEX costs
- Emerging markets are more price sensitive

Lack of data

- Limited forecast load data
- Limited supplier data

Lack of Local Expertise

- Finding competent distribution/installation partners
- Travel challenges (expensive, long trips, lack of infrastructure)

Value of Storage

- Quantifying the benefit of storage and putting in place a market to capture the value
- Who pays for or owns the asset?

Distance between site and supplier

- Communication challenges (time zone, lack of infrastructure)
- Travel challenges (expensive, long trips, lack of infrastructure)

Lack of site appreciation

- Local logistics, culture, politics, weather

Grid Monopolies

- Grids mostly owned and operated by single generator/transmission/distribution (usually SOE) - Centralized power mindset, rather than distributed

Lessons Learnt

1. Don’t expect to see the same prices you see in places like the US, UK, Germany, China and South Korea
2. Utilities need to support in quantifying the value of storage
3. Lack of data: forecast load, users, tariffs, prices
4. Define the primary function! Storage can do many things, but not all at once.
5. In grid scenario, nobody wants to pay for it, but everybody wants the value added

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