Empower
Impact Investment

Investing in solar for businesses and communities in Africa

Solar Power in Africa

February 24 - 25, 2021

Terje Osmundsen
Founder & CEO
Empower New Energy AS

Empower at a glance

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- An international award-winning renewable energy investment company with proven business and operating model, with current focus on high-growth markets in Africa
- Secured exclusive pool of high-impact renewable energy projects, representing about 100 MUSD of equity investments with attractive return
- Manager and Fund authorised with Norway's Financial Supervisory Authority. (Alternative Investment Fund/Manager)
- Current investors: Norfund, ElectriFI (European Union) & 15 private impact investors
  Preparing 40-50 MUSD private placement to execute expanding pipeline
- Uniquely experienced management; highly multidisciplinary and qualified team
- Grant partnership with African Development Bank (SEFA: Sustainable Energy Fund for Africa)

Solar for businesses and communities in Africa

Massive untapped market for local solar investments

Industries in Africa pay 25-100 % more for grid electricity than world average

"Genset economy": 15-20 GW in West Africa only 40 million across Africa

Cost of local solar PV cheaper than alternatives; battery costs falling

Cost of financing main barrier for solar investments

Business survey: 40% of suffer from unreliable electricity

Africa's investment needs to meet SDGs: 40 BUSD p.a.

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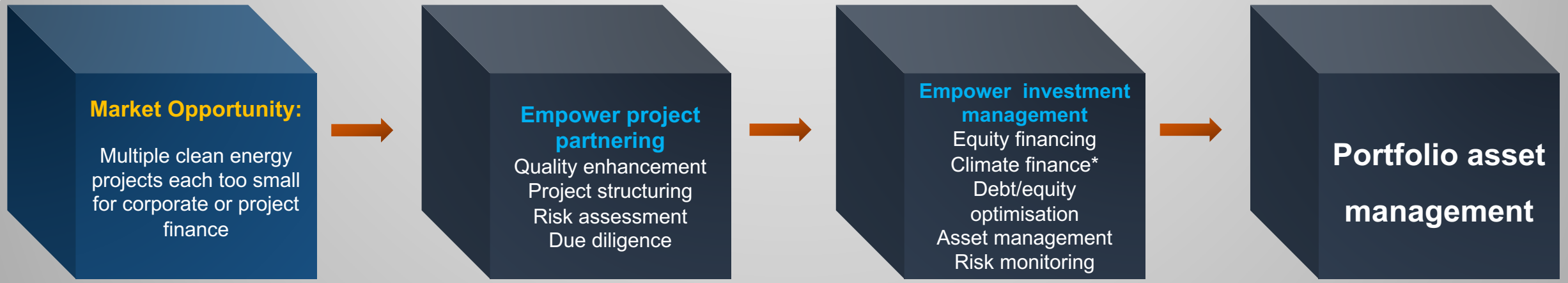
How we work with our partners

We work with our project development partners to select and prepare projects for investment

We bring equity and climate finance required to build and operate high-quality renewable energy assets



Empower executed project investments (Ghana)

Project highlights	
Offtaker	Miniplast Ltd.
Developer & EPC	Stella Futura
Project Size	704 kWp
Contract	20 years PSA
CO_2 avoidance	15 698 (30 yrs.)
Asst Mgmt	Empower New Energy
Investor	Empower Invest

pv magazine

Ghana´s first bilateral solar PPA

Plastic manufacturer Miniplast will buy electricity from a 704 kW grid-connected solar array owned and operated by Norwegian developer Empower New Energy AS.

- **Successful execution despite multiple lockdown-hurdles**
- **Significant cost savings for client, minimize use of gensets**
- **Pioneer sustainability project; employee and partner motivation**
- **Wholesale generation license from Energy Commission**

See short video presentation here

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Empower executed project investments (Egypt)

Project highlights	
Offtaker	InterCairo Aluminium SAE
Developer & EPC	Gree Solar
Project Size	495 kWp
Contract	25 years
CO_2 avoidance	11 250 (30 yrs.)
Asst Mgmt	Empower New Energy
Investor	Empower Invest

- **4 months from contract to commissioning**
- **Egypt's largest aluminium factory**
- **Solar to reduce energy costs and CO2 emissions**
- **Planned capacity increase**

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Empower executed project investments (Nigeria)

Project highlights	
Offtaker	Premium Poultry Ltd.
Developer & EPC	Rensource Energy
Project Size	700 kWp
Contract	25 years PSA
CO_2 avoidance	14 310 (30 yrs.)
Asst Mgmt	Empower New Energy
Investor	Empower Invest

- **12 weeks from contract to commissioning**
- **Nigeria's largest poultry farm**
- **Solar to replace irregular grid-power; reduce diesel consumption**
- **Planned capacity, incl. phase 2: 1,5 – 2 MW**

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Rensource – Premium Poultry Farm Development Partner

Nigeria's Rensource raises $20M to power African markets by solar

Rensource, a three-year old off-grid solar energy firm has raised $20 million in a Series A round jointly led by African venture capital fund, CRE Venture Capital and impact investor, the Omidyar Network. The round also saw participation from Inspired Evolution, Proparco, EDPR, I&P, Sin Capital, and Yuzura Honda.

Rensource develops and manages critical infrastructure that powers the productivity of small and medium sized enterprises.

Using the provision of solar-based microutilities an entry point, Rensource provides tools and services to support the digitalization and productivity growth of SMEs in West Africa.

What we do

Origination and Development

Our best-in-class team takes ideas from conception to bankable opportunity.

Project Engineering

We design the most effective solution for each use case, deploying a combination of internal and external resources towards implementation.

Merchant Services

Rensource provides tools and services for merchants, supporting the transition from offline to online (O2O), in Africa's largest market.

Premium Poultry Farm Technical highlights (from 10 Sept)

- Premium Poultry represents one of the largest poultry operations in Northern Nigeria. The company has the capacity to produce six-hundred thousand eggs daily, has its own feed mill and its egg products are distributed throughout Abuja and neighbouring states.
- The poultry farm is divided into two sections. One section is connected to the grid, while the other section relies entirely on diesel generators. The section not connected to the grid is called block 10.
- The section connected to the grid has an average load of 476 kW and a peak load of 600 kW. The average daily energy consumption is 11,500 kWh, with an estimated annual consumption of 4,000,000 kWh. Section 10 has an average load of 150 kW.

Premium Poultry Solar Farm

Figure 2: Ground mount solar farm

6 units of 100 kW Huawei inverters are mounted at the solar farm.

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Key technical parameters

Table 2: System Design Input Parameters and Outputs

S/N	System Properties	
1	Solar Array Power	700 KWp*
2	PV Inverter Rating	600 KVA
3	Annual Production	1.190 GWh
4	Performance Ratio	82.10%
5	Yield (KWh/KWp)	1705.2
6	Average Operating Temperature	38.1 Degrees
7	Panel Tilt	15 Degrees
8	Azimuth	180 Degrees
9	Inter Row Spacing	5 meters
10	String Size	18

Hybrid solution

Power Generation

Three power sources are synchronized and utilized for power generation;

1. Grid
2. Diesel Generating Sets
3. Solar PV System

Grid

The grid comes into the facility through a 1MVA transformer that supplies the to the main system bus via 1600A line. The transformer is connected through an underground cable that connects the grid-in to the facility distribution system. The grid offers the cheapest power alternative for commercial tariff available to large commercial and industrial users. The major challenge with the grid is that the supply is not available and erratic

Diesel Generating Sets

Sets of diesel generating are used as backup to the unreliable grid which does not provide an assured source of energy supply. The generating sets are dispatched as shown in the table 3 below.

Dispatch A are the main generating sets powering the facility with a total capacity of 1.2 MVA, this interfaces with an ATS arrangement which switches automatically between the grid and the generators. Dispatch B serves as backup to dispatch A, they are manually coupled and does not support automatic switching between grid and generator.

Table 3: Premium Poultry Current Generator Dispatch Strategy

Generator Dispatch Strategy		
S/N	**A (KVA)**	**B (KVA)**
1	350	500
2	350	500
3	500	500*
Total	**1200**	**1000**

Solar PV System

The solar PV System comprises of the solar array and the PV inverters. The solar array converts the energy from the sun to DC voltage and power while the PV inverter converts the DC voltage from the AC voltage.

Solar Array

The solar array has a total rated power of 700KWp which comprises of 1848 units of 380W solar panels. The solar panels are sourced from JA Solar which are renowned for their efficiency and innovation. JA Solar is rated as a tier 1 solar module manufacturer for the last 5 years. For a project of this size, the solar module manufacturer must be bankable and be able to provide support going into the future.

The system comprises of 17 strings of 18 panels per PV inverter. From the datasheet provided the panel has a temperature coefficient of -0.300%/°C.

For a Voc of 48.71V for -0.300%/°C the voltage coefficient is 0.14613V/°C

Figure 6: Hybrid controller

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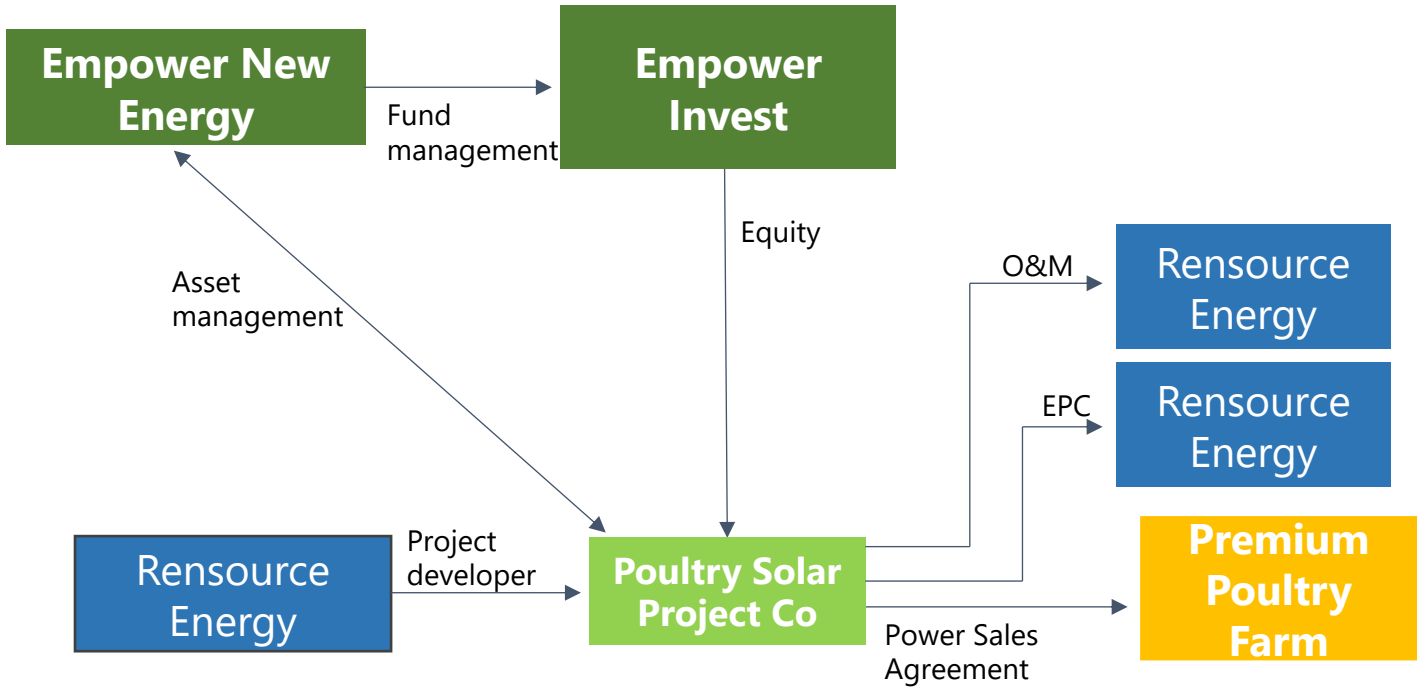
Premium Poultry Farm ownership and project structure



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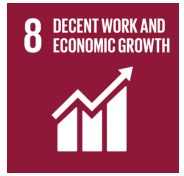
Premium Poultry Farm

	Empower 5 year target	Premium Poultry Farm
	USD 50 million investment	**USD 490,000**
	342.5 million households equiv. 146.25 GWh energy	**986 households equiv.** **0.74 GWh per year**
	5,000 jobs (of which 750 for women, 1,500 for people under 25)	**40**
	Reduce unpaid domestic work by 7.5 million hours	**n/a**
	80,000 MT of carbon p.a.	**400 tonnes p.a.** (based on replacing diesel)

Benefits of working with us

• Project partners

- A complete **financing solution** for renewable energy projects, tailored to the specific project
- Access to quality and best-practice **contract models:** Power Sales Agreement, EPC, O&M, and others
- **Empower Gateway**: Access to our interactive collaborative project due diligence and management platform
- Continuous support and consultations
- Shorter development-to-sale cycle

• Clients

- **Reduced energy costs** from day 1, flowing directly to bottom-line profits
- **Predictability** by locking in cost of electricity for 10-25 years
- Improved **environmental** performance and certified CO2 savings
- Complete **monitoring and maintenance** at no additional cost
- **Management** of financial, technology, performance and maintenance risks
- Option to include **battery storage** for enhanced reliability and solar power supply during evenings and nights

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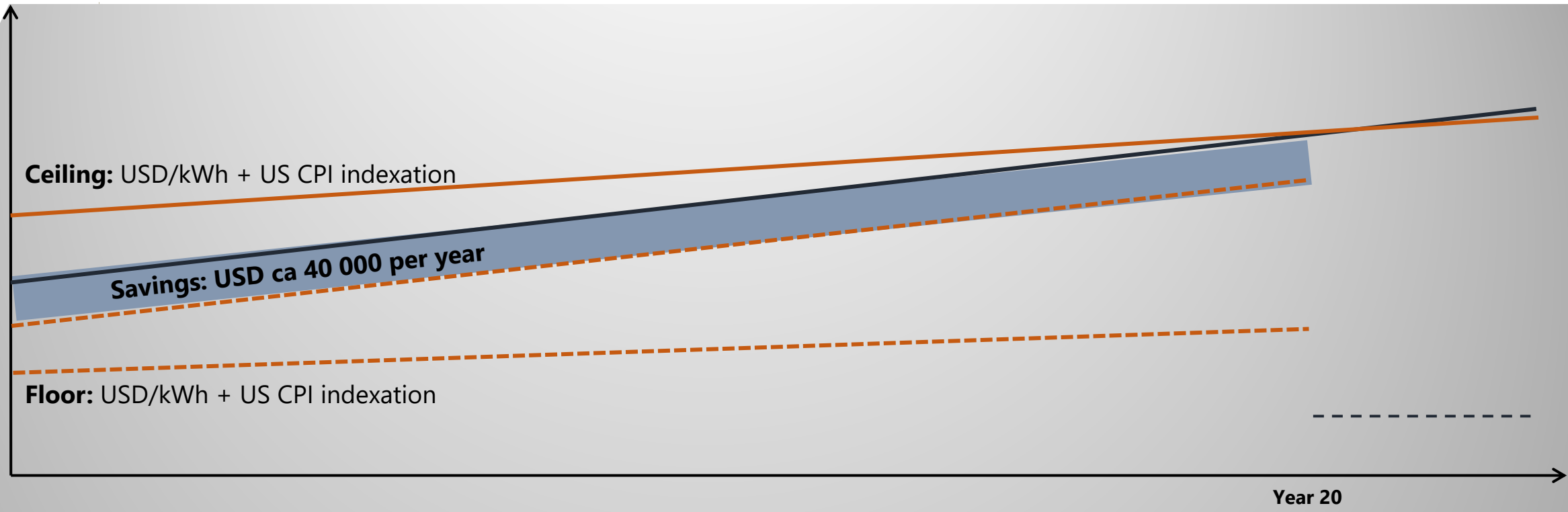
How do off-takers benefit from our solution?

Example from industrial customer Ghana (700 kWp)



- Grid tariff (prognosis)
- EmNEW tariff (20-year Power Sales Agreement) Cost-saving years 1-20: 20% discount on grid tariff
- EmNEW tariff ceiling
- EmNEW tariff floor
- Solar cost after year 20 (depending on negotiations after contract end)

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Communication and visibility

NIGERIAN TRIBUNE
SINCE 1949
WEBSITE WITH RICHEST CONTENT

Rensource, Premium Poultry Partner Empower To Deploy Solar To Poultry Farm

By Paul Omorogbe — On Dec 2, 2020

LATEST NEWS ECOSCOPE

Share

Rensource, a leading West African renewable energy services provider, announced on Tuesday its entrance into the provision of Commercial & Industrial (C&I) solar with a project in partnership with the Norwegian impact investment company, Empower New Energy, to deploy a 700 KWp solar photovoltaic plant to Nigeria´s largest egg producer,

4/12/2020

Norsk kapital skal varme Nigeria-egg

INVESTERER I NIGERIA

Norsk kapital skal varme Nigeria-egg

ENERGI: Med norske investorer på laget skal Terje Osmundsen-ledede Empower levere solenergi til Nigerias største eggprodusent.

Med norske investorer på laget skal Empower levere solenergi til Nigeria.....

Thank you for your attention

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