

An aerial photograph of a ship's wake in the ocean. The water is a deep blue, and the white foam of the wake is prominent on the right side. The text is overlaid on the center of the image.

TC ENERGY SEAWAVE ENERGY PROJECT

Ghana

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Executive Summary

This project involves the establishment of a wave energy park in the Gulf of Guinea, about 17km off the coast of Ada (a suburb of Greater Accra), to generate 1,000 megawatts (MW/H power from sea waves, employing Wave Energy Converters (WEC) from the Swedish Company Seabased. The project involves the installation of generator units (WECs) and marine substations offshore; installation of an onshore sub-station to connect the national grid; and the laying of cables to link the offshore generating units and the onshore sub-station located about 100m from the shore.

The first phase of the project, which involved the installation of 6 WECs to generate 0.6 MW of electricity was successfully executed and test connected to the grid in May 2015. The plan is to gradually install, and bring on stream, about 1,000 WECs each year to achieve 1,000 MW of power by 2025.

Financing Requirement

The total cost of implementing the project is estimated at US\$ 2 Billion. The pilot phase was undertaken at a total cost of US\$ 10.5 Million, which was wholly financed by the present shareholders.

Model: Build, Own and Operate (“BOO”)

Sponsors: The project is sponsored by TC’S Energy Limited which currently has 3 Ghanaian shareholders.

Executive Summary

Off taker:

The sponsors have a fully executed 20-year Power Purchase Agreement (PPA) with the Electricity Company of Ghana (ECG), valued at approximately ***US\$20 billion*** over the duration of the PPA.

Original Equipment Manufacturer (OEM): The technology will be manufactured and supplied by Seabased AB. The project sponsors have patent to the “SEABASED” power generation technology in the whole of Africa.

Status

Power Transmission: Power generated from the energy park will be evacuated through the national grid of the Electricity Company of Ghana.

The project has successfully completed a pilot program and is positioned to generate power on a commercial scale. The sponsors have invested over US\$ 10 million for the acquisition of the project land and implementation of the pilot project.

The outstanding life span of the PPA is approximately 14 years.

Executive Summary

- The revenue generation capacity of the PPA is approximately \$1.0Bn / year at full capacity
- The technology is base is based on a modular and scalable design: power can be generated from very few
- WEC's as construction of the rest of the park is on going. Cost recovery is almost immediate
- The project is flexible to EPC contracting

Project Description

The Ada Seawave Technology Power Generation Project, is a \$2.0Bn build, own, operate project to be developed 17miles of the coast of the Gulf of Guinea, in Ghana West Africa. The project is promoted by TC Energy Limited (TCL) and Developed by TC Energy SPV (TCE).The project seeks to establish a wave energy park in the gulf of Guinea 17 Miles of the Coast of Ada in the Greater Accra region of Ghana. The project will employ renewable energy technology using wave energy converters (WEC) developed by the Swedish company Seabased. The project involves the installation of wave energy converters and offshore marine substations and the installation of on-shore substations located 100M from the shore.

Project Description

The power generating capacity of the project is 1000MW. The test phase of the project installed 6 units of wave energy converters acquired from the Swedish manufacturer sea based. The units generated 0.6Kw of power which was supplied to the grid under observation from the offtaker. ECG. This test run was accepted as satisfactory by ECG. The pilot phase was constructed at a cost of \$10.5M and financed by the project's promoters TCL. The project is supported by an off-take agreement/power purchasing agreement between TCL and the Electricity Corporation of Ghana. ECG will offtake up to 1000MW of power generated by the project. TCE plans to install 1000 Units of WECs per year to reach an output of 1000MW. The project is an iconic renewable energy project and the first of its kind in Ghana and West Africa.

The Opportunity

- Invest in a \$2,0Bn renewable energy power generating project in Ghana.
- World class Engineering and Procurement Contractor : Sinohydro PPA:
- 20-year power purchasing agreement from the Electricity Corporation of Ghana
- IPP : Independent power producer license in place
- World class technology supplier for wave energy converters
- Technology test run has been completed in Ghana; and the results accepted by ECG
- First sea wave power generation project in Ghana and West Africa –
- Debt to equity ratio : 75%:25%

Capital Stack

Delmorgan & Associates, United States

Deutsch Bank, United States

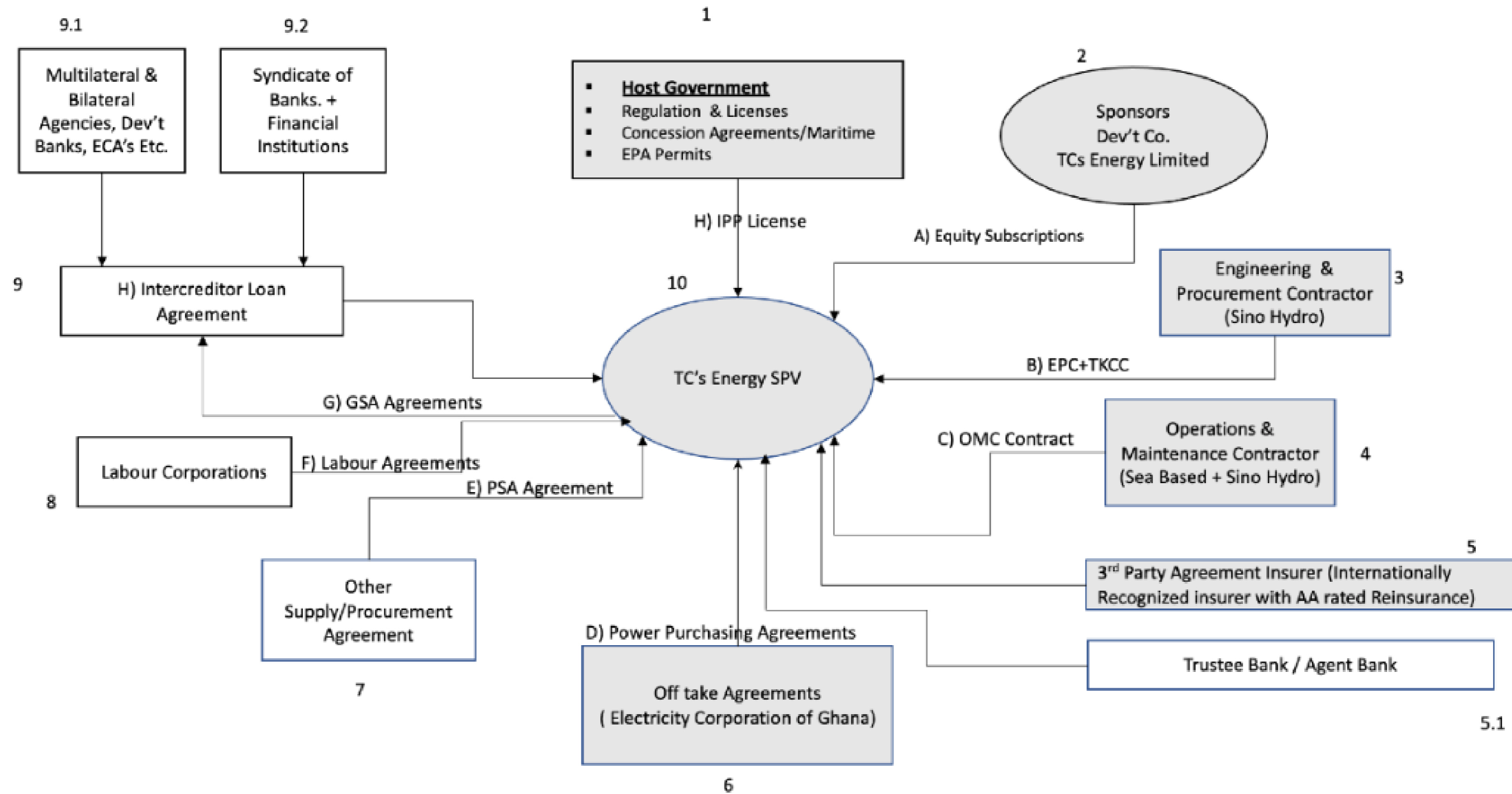
European Investment Bank

Standard Chartered Bank Ghana

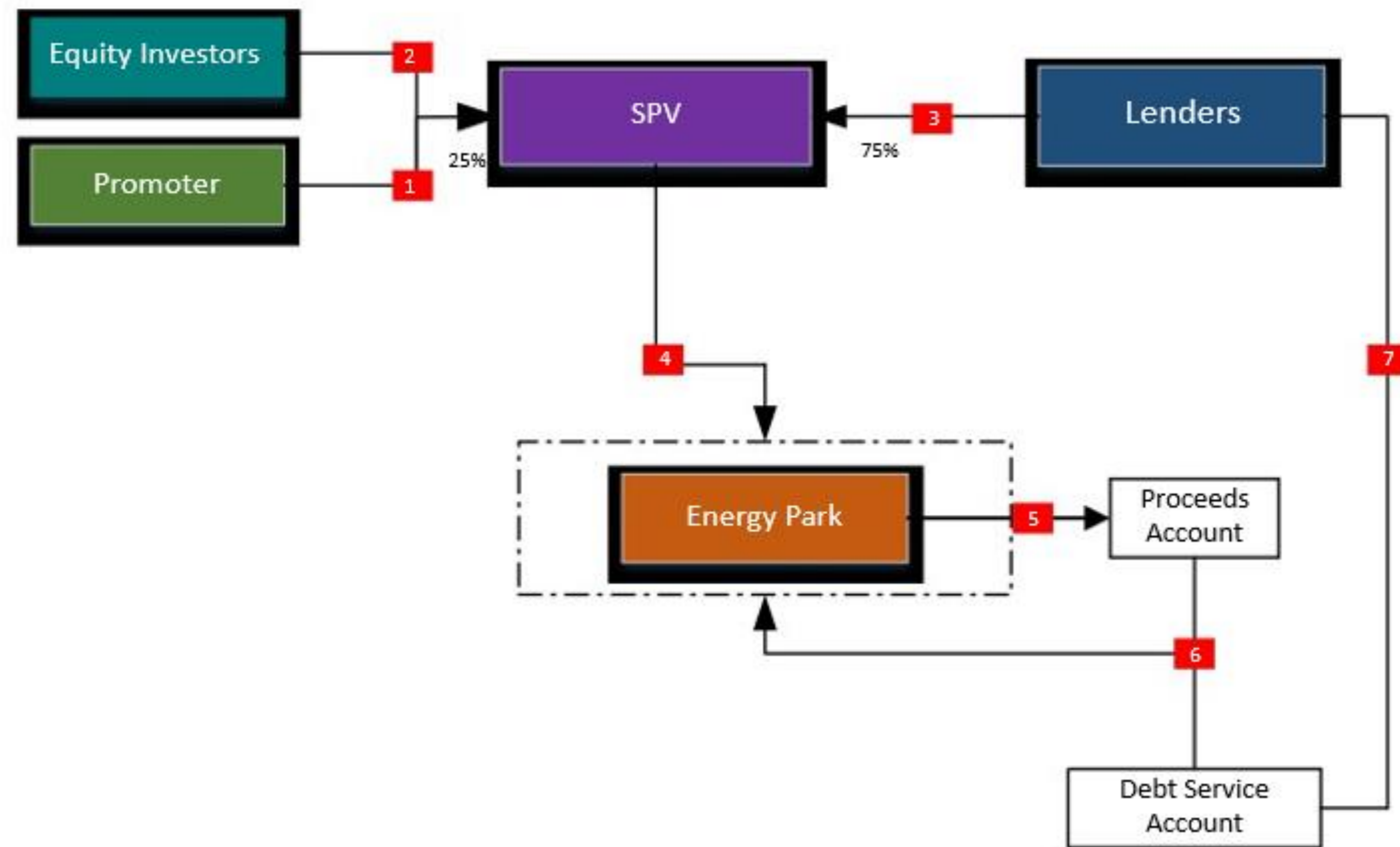
First Atlantic Bank Ghana

Swedish Export Dev't Corporation

Project Contract Structure



Transaction Structure



**Original
Equipment
manufacturer**

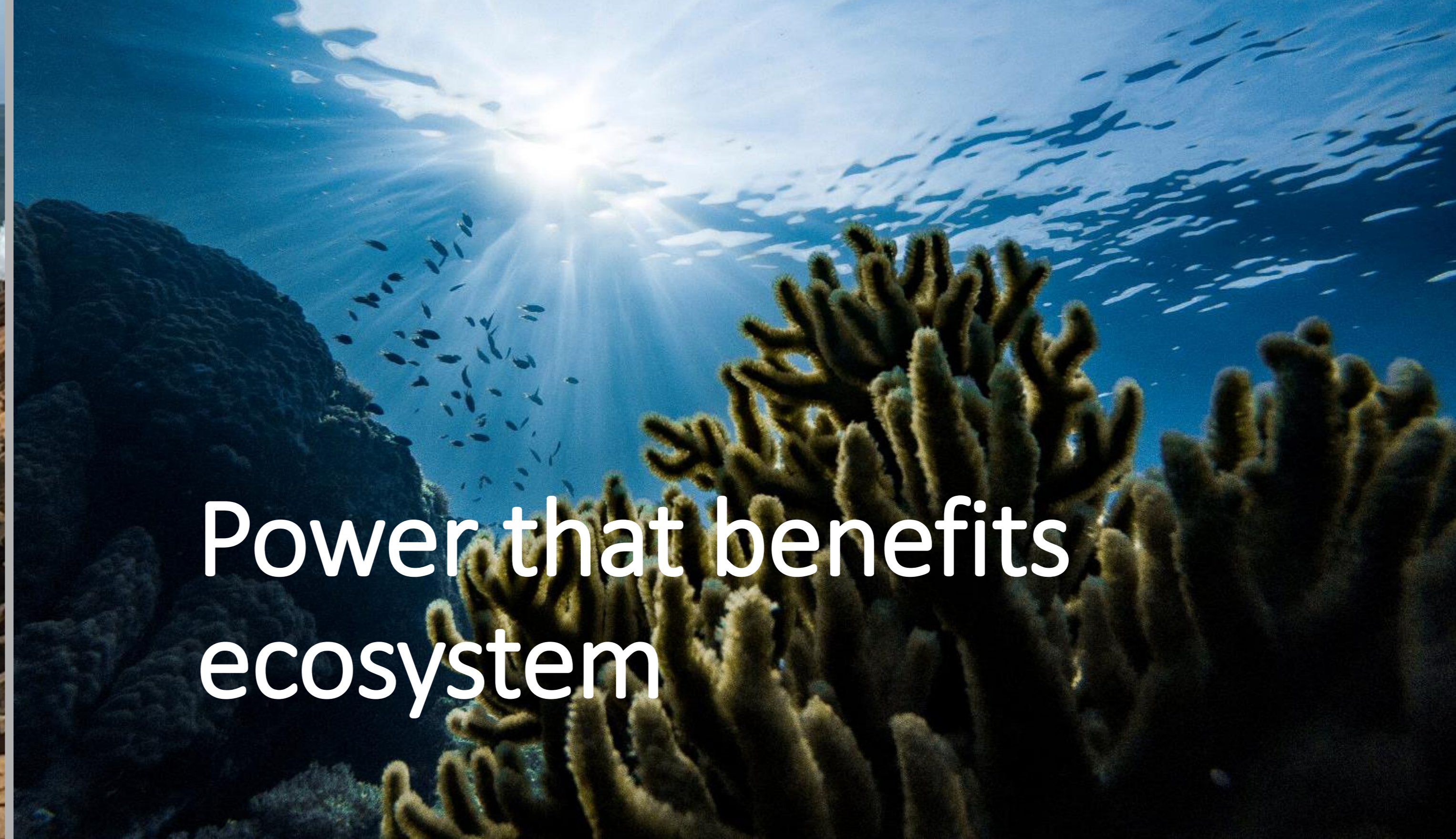


OEM

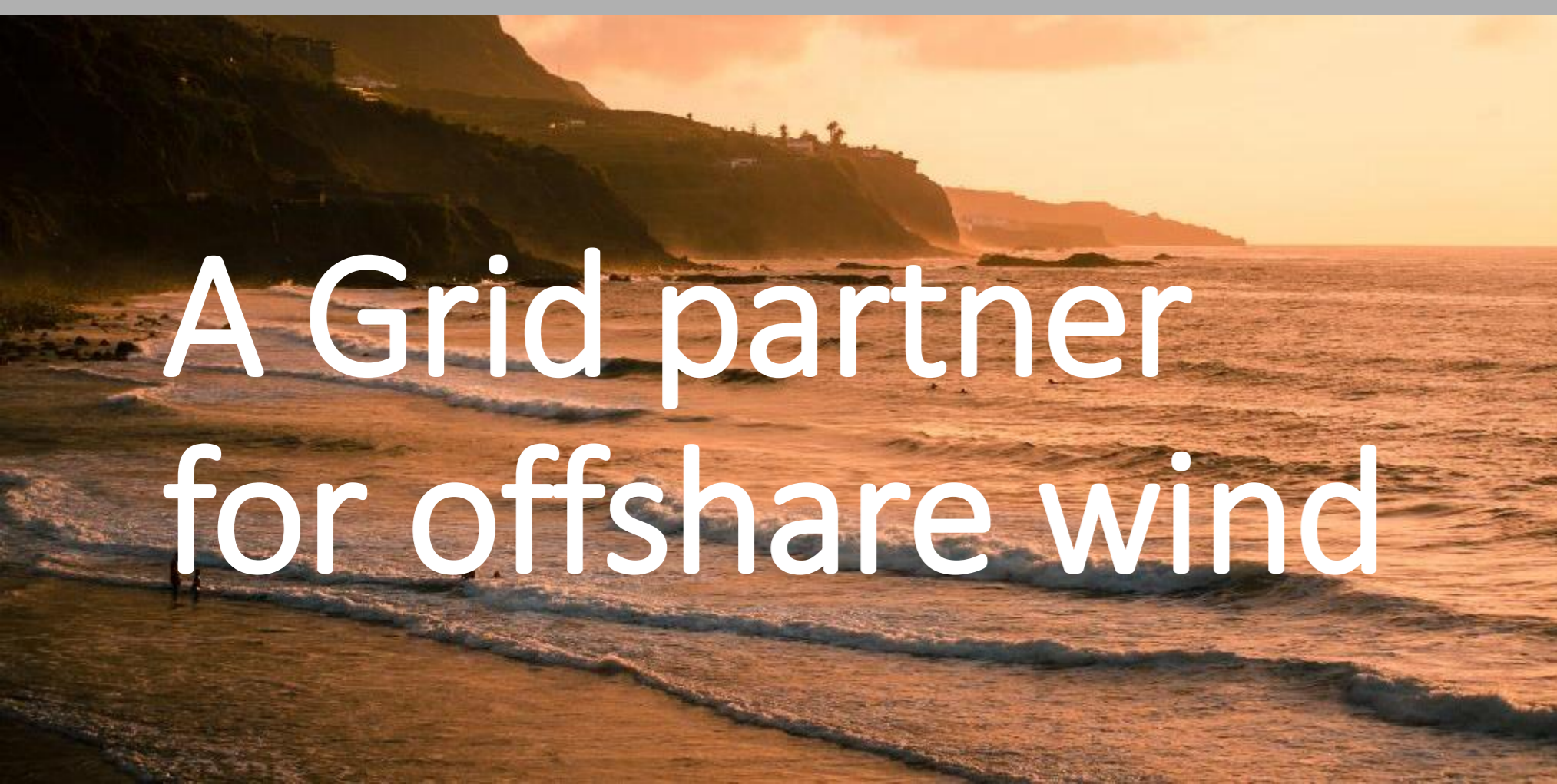
- Seabased is one of the worlds leading producers of Wave Energy Technology. The company is based in Sweden. Seabased is in partnership with TC Energy as the OEM. Seabased will also be part of the operations and maintenance operations with Sino Hydro. Seabased is focused on developing renewable energy technology that partners with nature to produce electrical power.



Let nature design
your renewable
energy strategy



Power that benefits
ecosystem



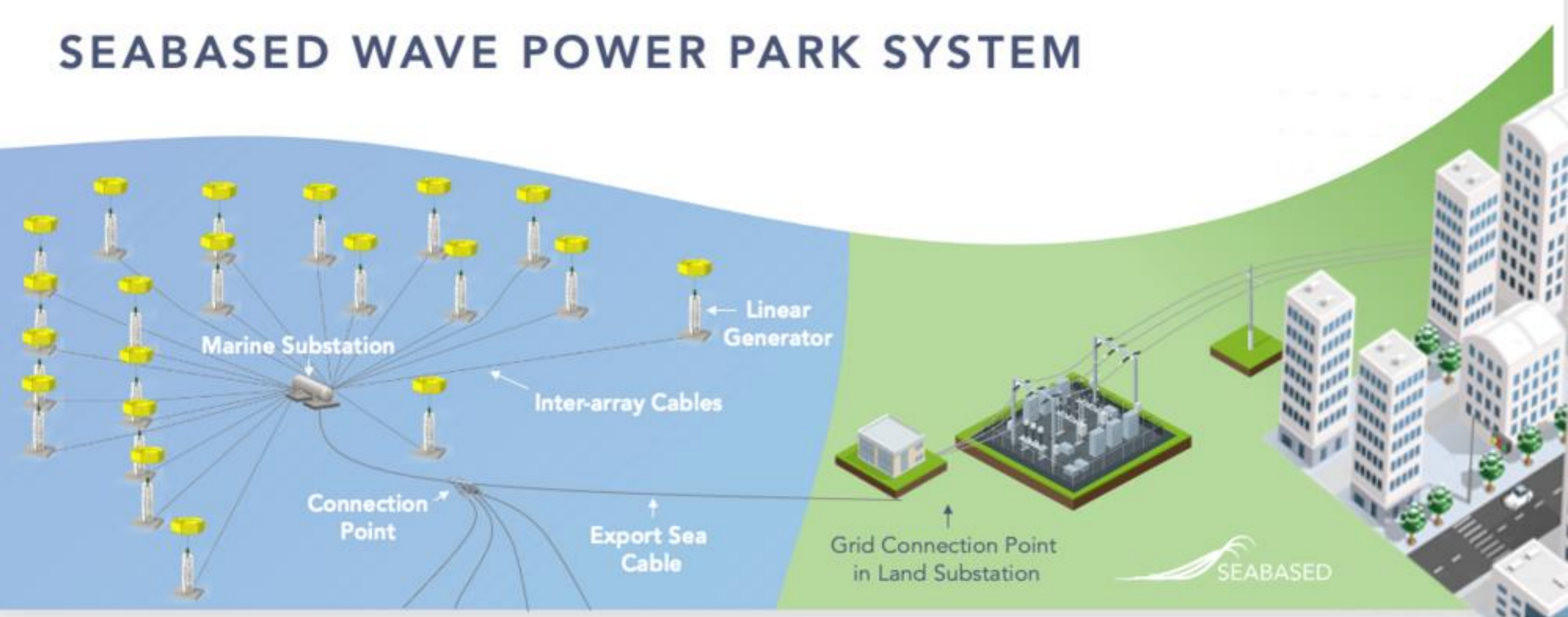
A Grid partner
for offshore wind

World leader in Wave Energy

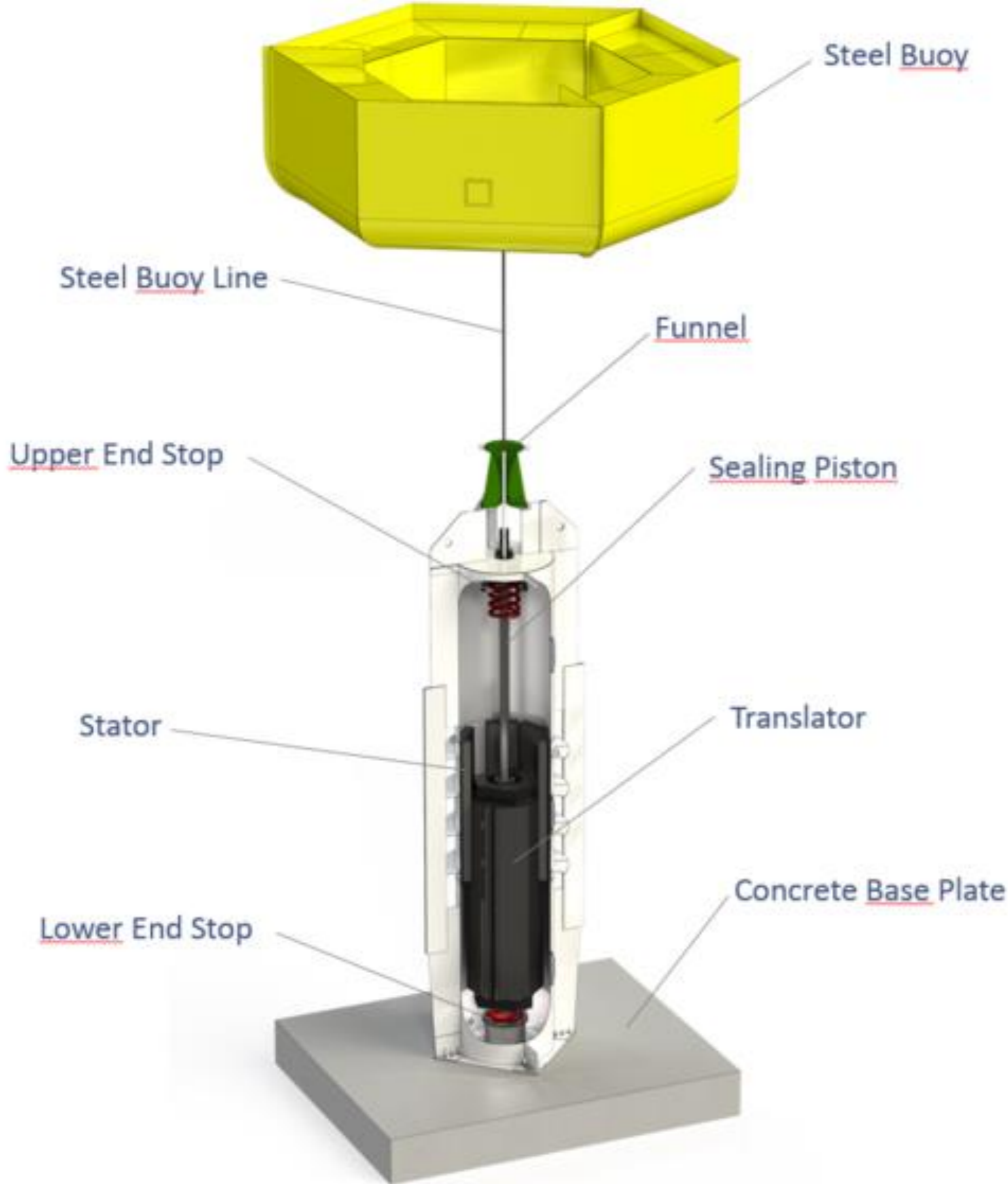


Seawave Technology Description

SEABASED WAVE POWER PARK SYSTEM



Seawave Technology Description _ Wave Energy Converter + Bouy



PROPRIETARY TECHNOLOGY THAT TICKS ALL THE BOXES

- ✓ **Large Market**
optimized for efficiency in medium wave climates
- ✓ **Plug & Play**
modular, enabling wave park expansion
- ✓ **Survivability**
robust and proven to withstand
- ✓ **Reliability**
few moving parts; low maintenance
- ✓ **Grid Compatible**
easy to integrate



The Opportunity

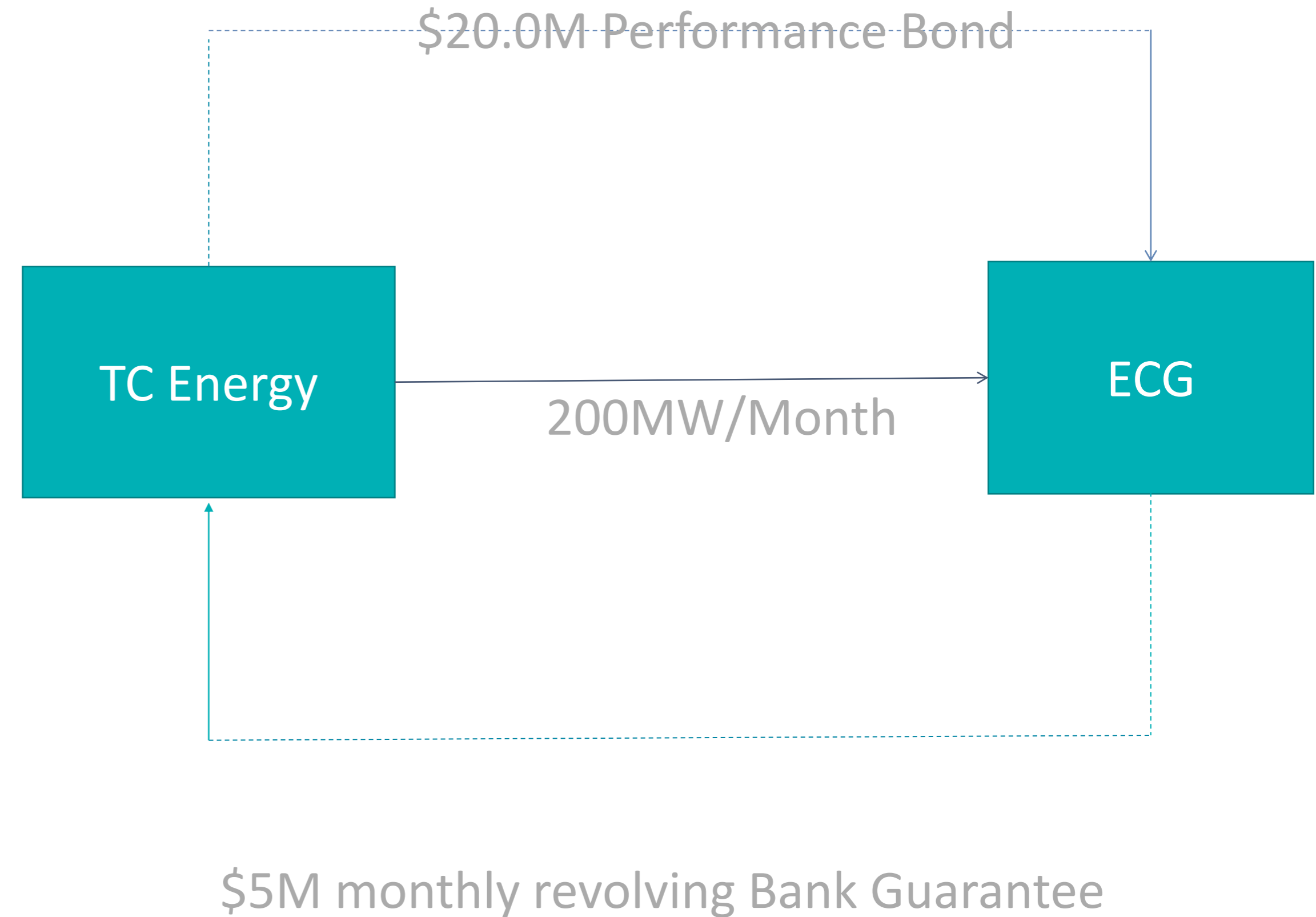
- Invest in a \$2,0Bn renewable energy power generating project in Ghana.
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- Technology test run has been completed in Ghana; and the results accepted by ECG
- First sea wave power generation project in Ghana and West Africa –
- Debt to equity ratio : 85%:15%

Power Structure in Ghana

- Invest in a \$2,0Bn renewable energy power generating project in Ghana.
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- World class technology supplier for wave energy converters
- Technology test run has been completed in Ghana; and the results accepted by ECG
- First sea wave power generation project in Ghana and West Africa –
- Debt to equity ratio : 75%:45%

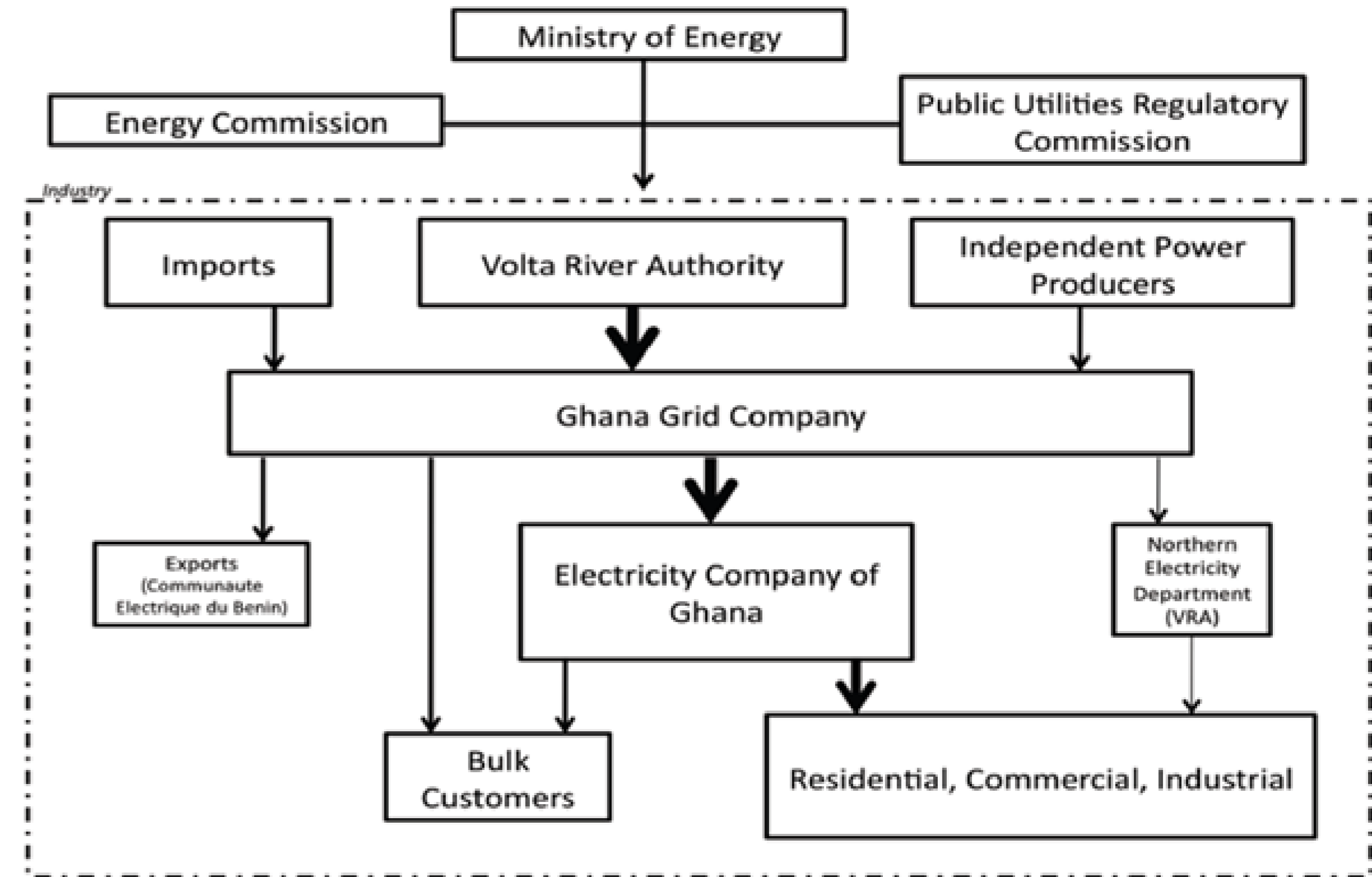
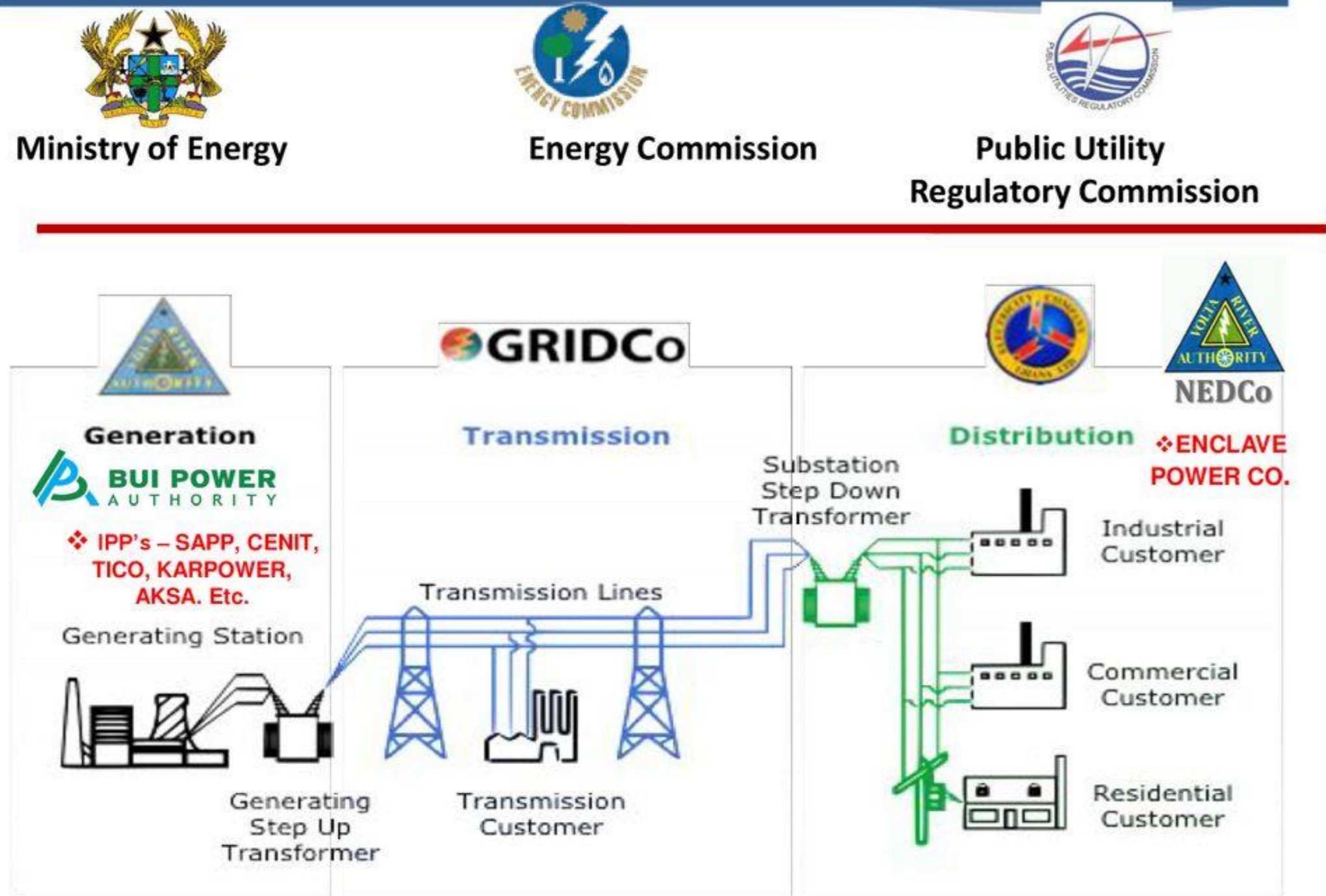
Core Structure of the PPA

- Duration : 20 years
- Annual Supply : 1000MW
- Tarif : 10\$/KW
- Commercial Operation date ; TBA
- Payment terms : Within 45 days after Billing
- Tenor of PPA: 20 years
- Effective Date : 2015
- Outstanding years : 13 years



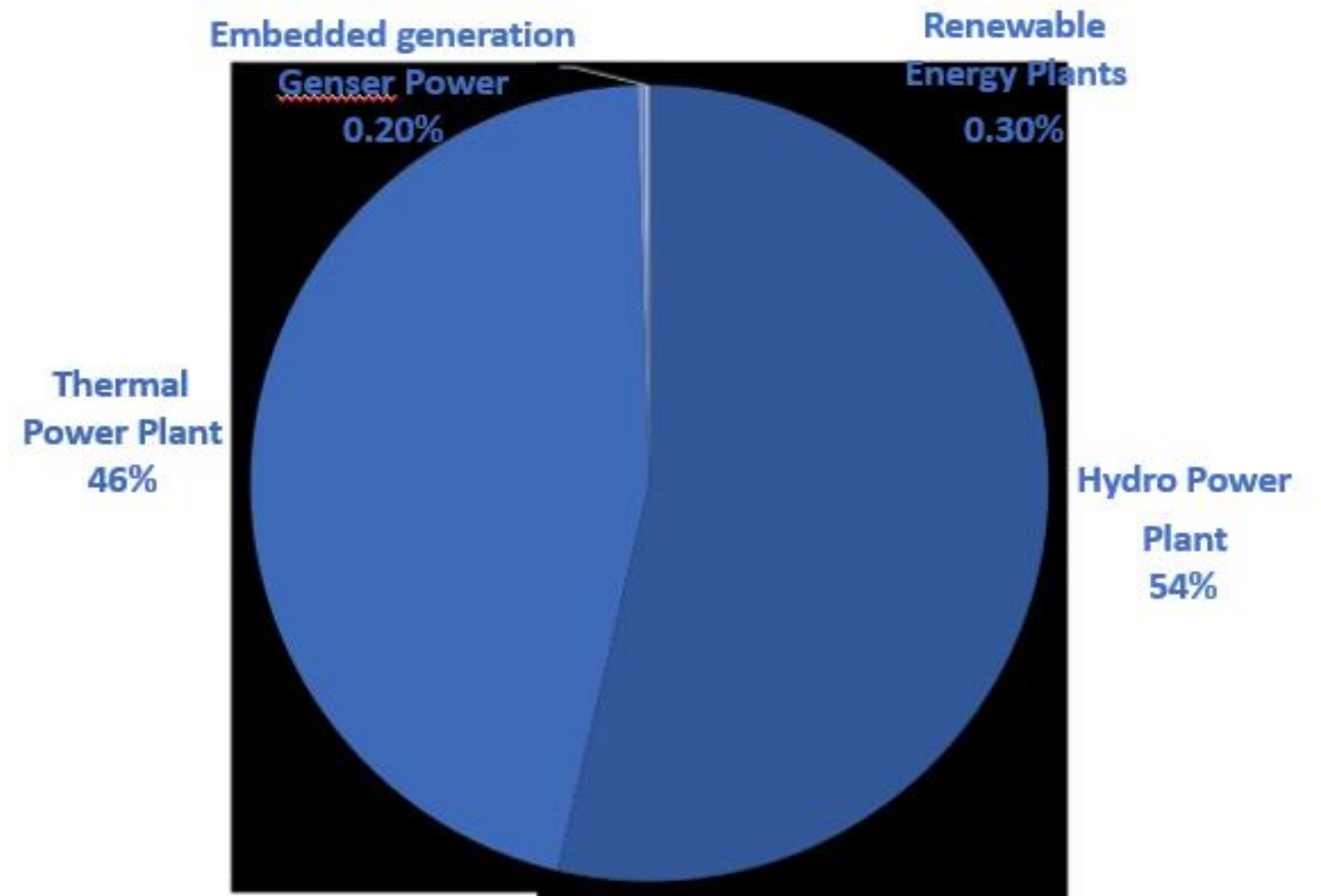
Structure of the Power Sector in Ghana

Institutional Framework of Power Sector of Ghana



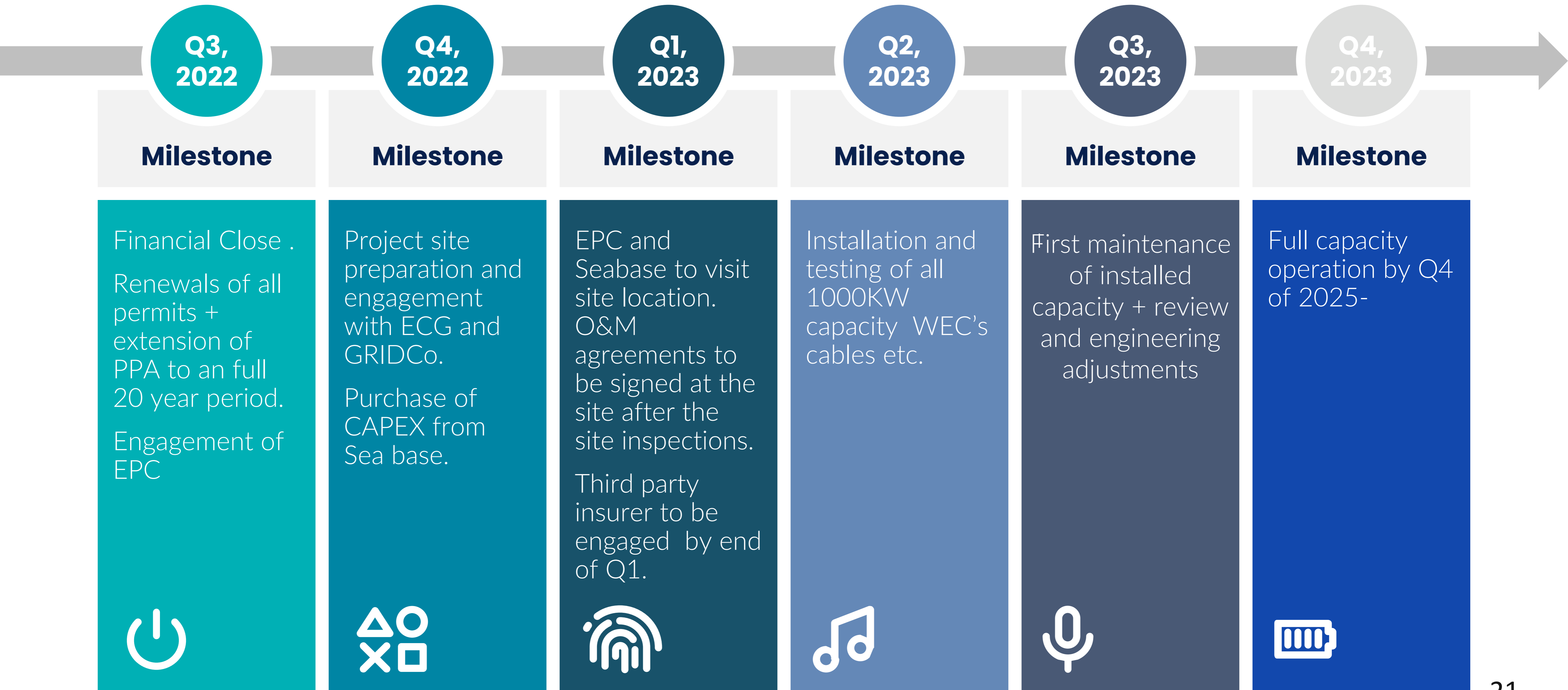
Power Sector : Installed Capacity

Generation Plant	Fuel Type	Installed Capacity/MW	Share%
Hydro Power Plant			
Akosombo	Hydro	1020	
Bui	Hydro	400	
Kpong	Hydro	160	
Subtotal		1580	54%
Thermal Power Plant			
Takoradi Power Company (TAPCO)	LCO/NG/Diesel	330	
Takoradi Intl. Company (TICO)	LCO/NG/Diesel	220	
Sunon-Asogli Power (SAPP)	NG	200	
Tema Thermal Plant 1	LCO/NG/Diesel	126	
Tema Thermal Plant 2	NG/Diesel	49.5	
CENIT Energy Ltd (CEL)	LCO/NG	126	
Takoradi T3	NG	132	
Mines Reserve Plant	NG/Diesel	40	
Osagyefo Power Barge	NG	125	
Subtotal		1348.5	45.80%
Renewable Energy Plants			
VRA	Solar	2.5	
Nogguchi	Solar	0.72	
Juabeng Oil mill	Biomass	1.2	
Others (off-grids & net-metered installations)	Solar	3.8	
Subtotal		8.2	0.30%
Embedded generation Genser Power	LPG	5	
Subtotal		5	0.20%
Total		2941.72	100.00%



PRODUCT ROADMAP

WRITE YOUR SUBTITLE HERE



Offtaker Information

The Electricity Company of Ghana is a limited liability Company wholly owned by the Government of Ghana. The Electricity

Company of Ghana Limited (ECG) was incorporated under the Companies Code, 1963 (Act 179) in February 1997. It began as the Electricity Department on 1st April 1947 responsible for distribution power in the entire country and later became the Electricity Division in 1962. It was subsequently converted into the Electricity Corporation of Ghana by (NLCD 125) in 1967.

- In 1987, the Northern Electricity Department (NED) was established under the Volta River Authority (VRA), to take over from ECG, the responsibility of electric power distribution in Northern part of Ghana.
- Since then ECG has been responsible for distribution of electricity in six political/administrative regions in southern Ghana namely, Ashanti, Central, Eastern, Greater Accra, Volta and Western Region.

Financial Assumptions

- The 1000MW wave energy park is estimated to cost US\$ 2 billion but would be executed in phases for 5 years. The project currently requires \$225M to execute its first phase of 135MW.
- Below is the breakdown of the cost component of the entire US\$2 billion.
- WEC Power Rating is 0.27 MW (270 kW/H);
- Operational Hours are 24hours, 347days (18days' annual maintenance);
- All monetary values are quoted in US\$;
- The project is scheduled to be executed in five phases, and expected to
- Total Installed Capacity: 4000 WECs, 200 LVMS and 40 MVMS
- The main revenue sources of the project are feed-in tariffs (FIT) and renewable obligation certificates (ROC). Other sources of income the company intends to explore in the medium term include revenue from sale of Carbon Credits under the Kiyoto Protocol.

Profit & Loss Projections -1

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Total revenue	299,517,102	599,034,204	898,776,000	898,776,000	898,776,000	898,776,000	898,776,000	898,776,000	898,776,000	898,776,000
Total cost of sales	89,855,131	89,855,131	89,855,131	89,855,131	179,710,261	269,632,800	269,632,800	269,632,800	269,632,800	269,632,800
Gross profit	209,661,971	509,179,073	808,920,869	808,920,869	719,065,739	629,143,200	629,143,200	629,143,200	629,143,200	629,143,200
Total Operating Cost	(17,011,504)	(17,220,848)	(17,319,003)	(17,423,745)	(17,517,397)	(17,611,597)	(17,706,350)	(17,801,658)	(17,897,527)	(17,993,959)
Operating profit	192,650,467	491,958,225	791,601,866	791,497,125	701,548,342	611,531,603	611,436,850	611,341,542	611,245,673	611,149,241
Depreciation	(26,335,500)	(48,835,500)	(48,835,500)	(48,835,500)	(48,835,500)	(48,835,500)	(48,848,686)	(48,862,143)	(48,875,878)	(48,889,896)
Profits before interest and tax	166,314,967	443,122,725	742,766,366	742,661,625	652,712,842	562,696,103	562,588,164	562,479,399	562,369,795	562,259,345
Interest paid on debt	-	(12,500,000)	(25,000,000)	(25,000,000)	(21,250,000)	(13,750,000)	(5,000,000)	-	-	-
Interest paid on overdrafts						-	-	-	-	-
Interest received on cash deposits	8,519,217	7,426,391	9,100,907	14,302,722	17,645,678	19,238,666	20,432,449	22,967,451	27,023,550	31,095,550
Profit before tax	174,834,185	438,049,116	726,867,273	731,964,346	649,108,519	568,184,768	578,020,614	585,446,850	589,393,345	593,354,895
Taxation	(43,708,546)	(109,512,279)	(181,716,818)	(182,991,087)	(162,277,130)	(142,046,192)	(144,505,153)	(146,361,712)	(147,348,336)	(148,338,724)
Profit after tax	131,125,639	328,536,837	545,150,455	548,973,260	486,831,390	426,138,576	433,515,460	439,085,137	442,045,009	445,016,171

Profit & Loss Projections -2

Year	2031	2032	2033	2034	2035	2036	2037	2038
Total revenue	898,776,000	898,776,000	898,776,000	898,776,000	898,776,000	898,776,000	898,776,000	898,776,000
Total cost of sales	269,632,800	269,632,800	269,632,800	269,632,800	269,632,800	269,632,800	269,632,800	269,632,800
Gross profit	629,143,200	629,143,200	629,143,200	629,143,200	629,143,200	629,143,200	629,143,200	629,143,200
Total Operating Cost	(18,090,958)	(18,188,530)	(18,286,677)	(18,385,405)	(18,484,716)	(18,584,616)	(18,685,108)	(18,786,196)
Operating profit	611,052,242	610,954,670	610,856,523	610,757,795	610,658,484	610,558,584	610,458,092	610,357,004
Depreciation	(48,904,203)	(48,918,805)	(48,933,708)	(48,948,919)	(48,964,443)	(48,980,287)	(48,996,458)	(49,012,962)
Profits before interest and tax	562,148,038	562,035,865	561,922,814	561,808,876	561,694,041	561,578,297	561,461,634	561,344,041
Interest paid on debt	-	-	-	-	-	-	-	-
Interest paid on overdrafts	-	-	-	-	-	-	-	-
Interest received on cash deposits	35,190,123	39,307,409	43,447,534	47,610,626	51,796,814	56,006,226	60,238,992	64,495,244
Profit before tax	597,338,162	601,343,274	605,370,349	609,419,503	613,490,855	617,584,523	621,700,627	625,839,286
Taxation	(149,334,540)	(150,335,819)	(151,342,587)	(152,354,876)	(153,372,714)	(154,396,131)	(155,425,157)	(156,459,821)
Profit after tax	448,003,621	451,007,456	454,027,761	457,064,627	460,118,141	463,188,392	466,275,470	469,379,464

Balance Sheet Projections-1

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Tangible Fixed Assets	1,016,299,500	1,867,464,000	1,818,628,500	1,769,793,000	1,720,957,500	1,672,122,000	1,623,434,861	1,574,737,595	1,526,029,994	1,477,311,844
Intangible Fixed Assets										
Total Fixed Assets	1,016,299,500	1,867,464,000	1,818,628,500	1,769,793,000	1,720,957,500	1,672,122,000	1,623,434,861	1,574,737,595	1,526,029,994	1,477,311,844
Total Current Assets	593,464,222	472,371,874	865,987,141	1,190,583,539	1,312,613,134	1,404,779,710	1,472,683,541	1,742,779,934	2,013,496,664	2,285,713,286
Total Assets	1,609,763,722	2,339,835,874	2,684,615,641	2,960,376,539	3,033,570,634	3,076,901,710	3,096,118,402	3,317,517,529	3,539,526,658	3,763,025,131
Total Current Liabilities	44,200,903	110,004,636	182,209,175	183,483,443	163,261,844	143,523,632	145,982,593	147,839,152	148,825,776	149,816,164
Long Debt	-	500,000,000	500,000,000	500,000,000	350,000,000	200,000,000	-	-	-	-
Equity	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000
Retained Profits	65,562,819	229,831,238	502,406,465	776,893,095	1,020,308,790	1,233,378,078	1,450,135,808	1,669,678,377	1,890,700,881	2,113,208,967
Total Equity and Liabilities	1,609,763,722	2,339,835,874	2,684,615,641	2,960,376,539	3,033,570,634	3,076,901,710	3,096,118,402	3,317,517,529	3,539,526,658	3,763,025,131

Balance Sheet Projections-2

Year	2031	2032	2033	2034	2035	2036	2037	2038
Tangible Fixed Assets	1,428,582,929	1,379,843,025	1,331,091,907	1,282,329,343	1,233,555,098	1,184,768,930	1,135,970,593	1,087,159,838
Intangible Fixed Assets								
Total Fixed Assets	1,428,582,929	1,379,843,025	1,331,091,907	1,282,329,343	1,233,555,098	1,184,768,930	1,135,970,593	1,087,159,838
Total Current Assets	2,559,439,829	2,834,684,739	3,111,456,506	3,389,763,672	3,669,614,826	3,951,018,607	4,233,983,705	4,518,518,858
Total Assets	3,988,022,758	4,214,527,764	4,442,548,413	4,672,093,016	4,903,169,924	5,135,787,537	5,369,954,298	5,605,678,695
Total Current Liabilities	150,811,980	151,813,259	152,820,027	153,832,316	154,850,154	155,873,571	156,902,597	157,937,261
Long Debt	-	-	-	-	-	-	-	-
Equity	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000	1,500,000,000
Retained Profits	2,337,210,778	2,562,714,506	2,789,728,386	3,018,260,700	3,248,319,770	3,479,913,967	3,713,051,702	3,947,741,434
Total Equity and Liabilities	3,988,022,758	4,214,527,764	4,442,548,413	4,672,093,016	4,903,169,924	5,135,787,537	5,369,954,298	5,605,678,695

Cash flow Projections-1

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Operating Profit / (Loss)	192,650,467	491,958,225	791,601,866	791,497,125	701,548,342	611,531,603	611,436,850	611,341,542	611,245,673	611,149,241
Cashflow from Operating Activities	167,626,429	423,631,835	657,453,275	609,780,306	518,151,061	448,847,974	469,390,658	466,836,388	464,883,961	463,800,905
Cashflow from Investing Activities	(1,042,635,000)	(900,000,000)	-	-	-	-	(161,546)	(164,877)	(168,277)	(171,746)
Cashflow from Financing Activities	1,442,956,398	330,657,972	(288,474,321)	(285,183,908)	(397,020,017)	(357,580,622)	(401,325,281)	(196,575,118)	(193,998,955)	(191,412,536)
Cashflow for the Period	567,947,827	(145,710,192)	368,978,955	324,596,398	121,131,044	91,267,351	67,903,831	270,096,393	270,716,729	272,216,623

Cashflow Projections-2

Year	2031	2032	2033	2034	2035	2036	2036	2038
Operating Profit / (Loss)	611,052,242	610,954,670	610,856,523	610,757,795	610,658,484	610,558,584	610,458,092	610,357,004
Cashflow from Operating Activities	462,713,518	461,620,130	460,520,704	459,415,208	458,303,608	457,185,871	456,061,962	454,931,847
Cash flow from Investing Activities	(175,288)	(178,902)	(182,590)	(186,355)	(190,198)	(194,119)	(198,122)	(202,207)
Cash flow from Financing Activities	(188,811,687)	(186,196,318)	(183,566,346)	(180,921,687)	(178,262,257)	(175,587,970)	(172,898,743)	(170,194,488)
Cash flow for the Period	273,726,543	275,244,909	276,771,767	278,307,166	279,851,154	281,403,781	282,965,097	284,535,153

