

# Global Energy Walk – the Successful Paces of ContourGlobal



CONTOURGLOBAL®



# Agenda

## 1. Who is ContourGlobal?

## 2. Case Studies

- a) **Rwanda – Lake Kivu Methane Extraction to Power Generation**
- b) **Quad-gen – 90% Efficient Generation with negligible CO2 Emissions**
- c) **Large scale Power Plant Rehabilitation – CG Maritsa East 3**



# ContourGlobal at a Glance

- We develop, acquire and operate large, long-term contracted power generating stations for national grids and utilities primarily in developing markets
- We develop and operate innovative energy solutions for multinational companies in developing markets (ContourGlobal Solutions)
- Increasingly, we also pursue opportunistic acquisitions and development where we leverage our regional operating presence
- Key facts and figures:
  - Company headquartered in New York City
  - Significant U.S. investor base (educational endowments, pension funds and individual investors)
  - 2012 Revenue budget of \$1.0 billion
  - 1,500 employees globally at year-end 2011

# Global Footprint : The Americas, Caribbean, Europe and Africa



● Americas

US (1)  
Brazil (3)  
Colombia (2)

● Caribbean

St. Martin – France (1)  
Guadeloupe – France (1)

● Africa

Togo (1)  
Nigeria (3)  
Rwanda (1)

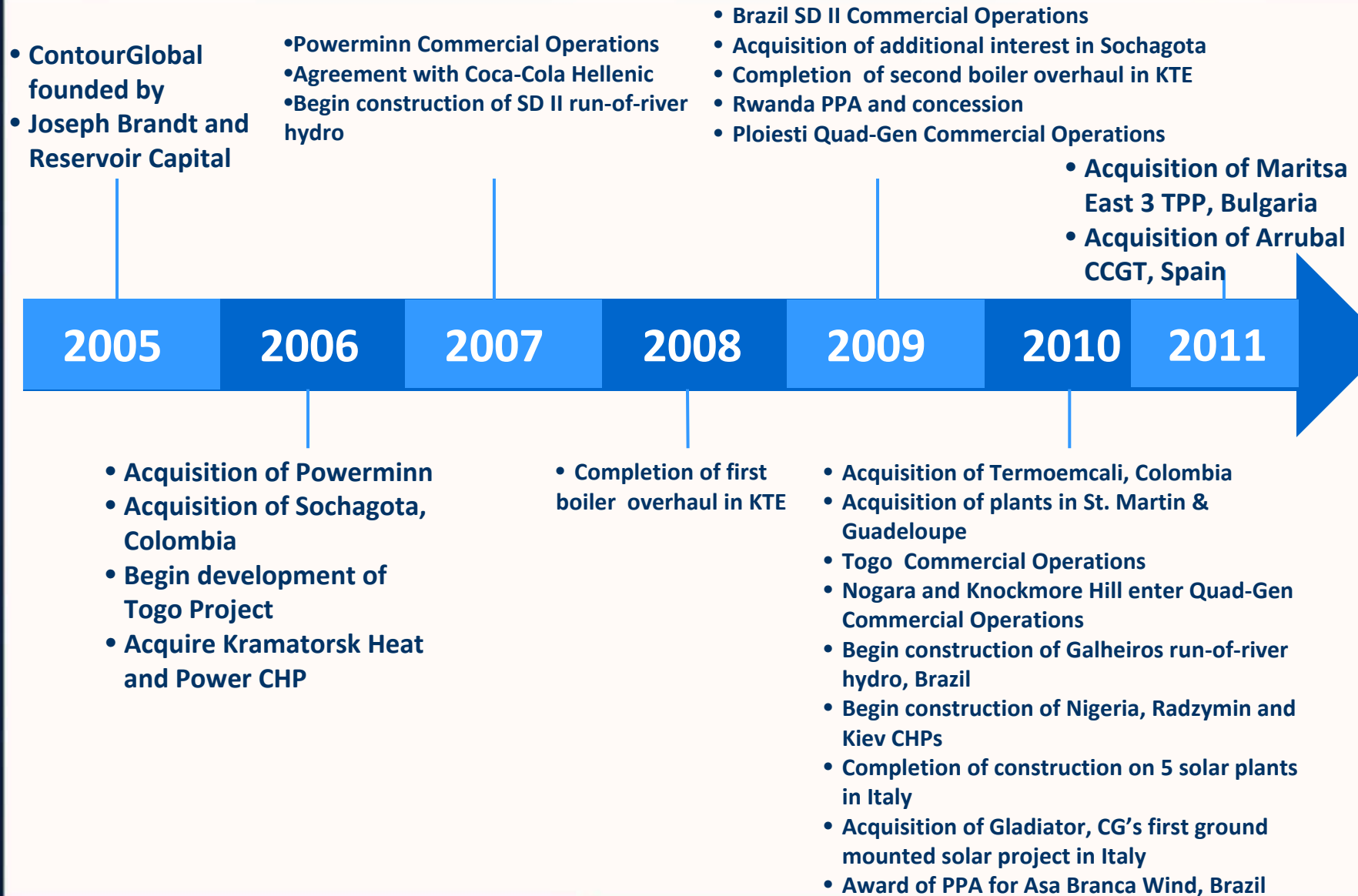
● Europe

France  
UK (1)  
Italy (1 + Solar)  
Poland (1)  
Ukraine (2)  
Bulgaria (1)  
Romania (1)  
Spain (1)

○ Offices

*\*Numbers in parenthesis represent our plants in operation or under construction*

# Company History and Milestones



# Our Commitments

- **Environmental Commitment**

- Environmental sustainability of our projects.
- We are committed to the UN Global Compact and the 10 Principles.
- We strive to avoid adverse impacts on the environment, or reducing, mitigating, or compensating for the impacts.

- **Social Responsibility**

- We are active members of the local community through education, training, and economic empowerment.

- **Responsibility to Our Employees**

- The bedrock of our Company.
- “Everybody Goes Home Safe, Everyday, Everywhere,”
- Our safety commitment goes directly to our partners, contractors and everyone who visits our sites.
- Safety Culture

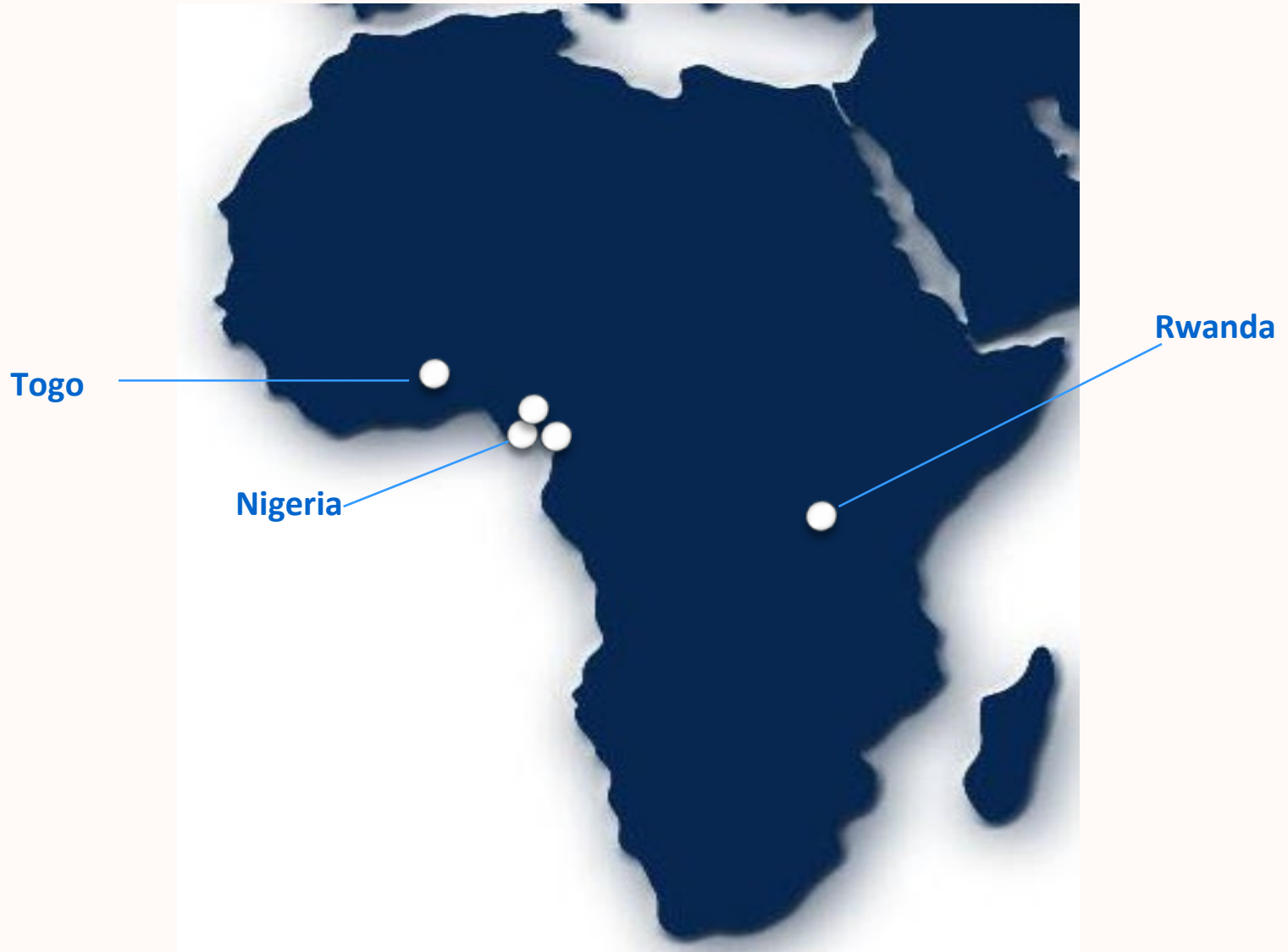


# Case Study No. 1:

## ContourGlobal - KivuWatt



# Africa





# Lake Kivu Methane Resource

- Location: Lake Kivu, on the border between the Republic of Rwanda and the Democratic Republic of Congo;
- App. 300 bn m<sup>3</sup> of dissolved CO<sub>2</sub> and 55-60 bn m<sup>3</sup> of methane gas;
- 41-45 bn m<sup>3</sup> currently commercially exploitable at a depth of 270-465 m;
- Gas reserves are naturally replenished at a rate between 125 - 250 mln m<sup>3</sup>/year
- Absent a controlled reduction of lake methane and carbon dioxide levels, there is a risk of a toxic release of large quantities of these gases within the next 150-200 years
- Use of this gas for electricity generation is most effective way to mitigate the risk of catastrophic release in an environmentally responsible matter



# Lake Kivu - Rwanda



# KivuWatt Highlights

## General Profile

- Integrated methane gas extraction and production facility with 100 MW of power generation
- 25 Year Power Purchase and Gas Concession Agreements signed March 2009
- Fuel is the methane gas extracted from deep waters of Lake Kivu through gas separation and sweetening process

## KivuWatt's mission is three-fold:

- Significantly lower Rwandan electricity costs
- Provide energy security through use of a renewable and local resource
- Mitigate the environmental hazards associated with the natural release of these gases -- and reduce the risk to the 2 million local residents

# KivuWatt Highlights



- Full compliance with stringent World Bank standards including extensive environmental studies and permitting activities
- Represents largest single private investment in the energy sector in Rwanda and the country's first ever project financing
- Project now over **40% complete**
- Gas extraction process represents first large scale commercial methane harvesting from Lake Kivu and will include a platform based Gas Extraction Facility and a 13 km export pipeline from the platform to the shore

# Commercial

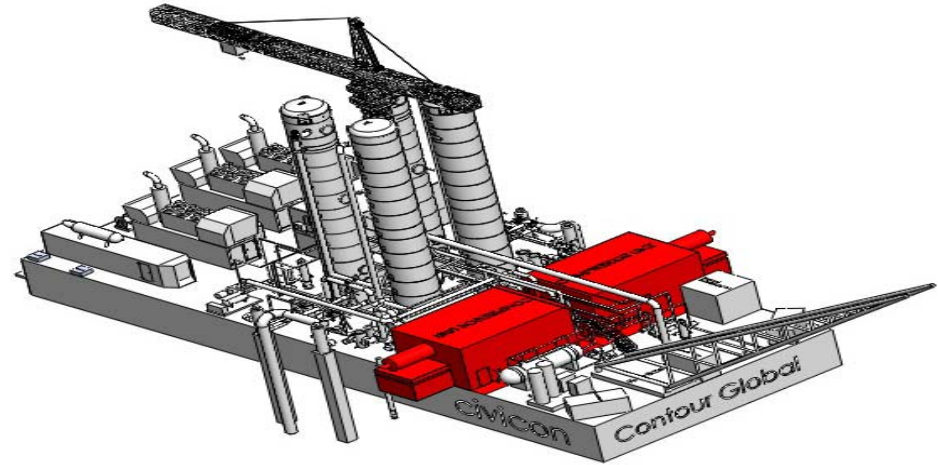


- \$142 million Phase I, 65% project debt / 35% CG equity:
- Lending group: EAIF and FMO, and the African Development Bank and BIO
- Groundbreaking nature of financing has been widely recognized in the international press and through the 2012 Award of Euromoney Project Finance Magazine's 2011 African Power Deal of the Year

# Technical Profile / Major Components

- **Gas extraction platform:**

64 x 25 m, serving as operations platform for extraction, processing, and shipment of methane gas to onshore power plant



- **Raw water risers:** Lift water and dissolved gas from deep waters
- **Gas separators:** Flash gas; degassed water returned to the lake
- **Wash Towers:** Sweeten gas
- **Gas Compressors:** Push sour gas through the wash towers / send sweet gas ashore
- **Export pipeline:** Transport sweet gas to onshore generating facilities
- **Power Generation:** Straightforward and involves use of 3 Wärtsilä 20V34SG biogas engines



Case Study No. 2:  
**ContourGlobal Solutions- Quad-Gen**

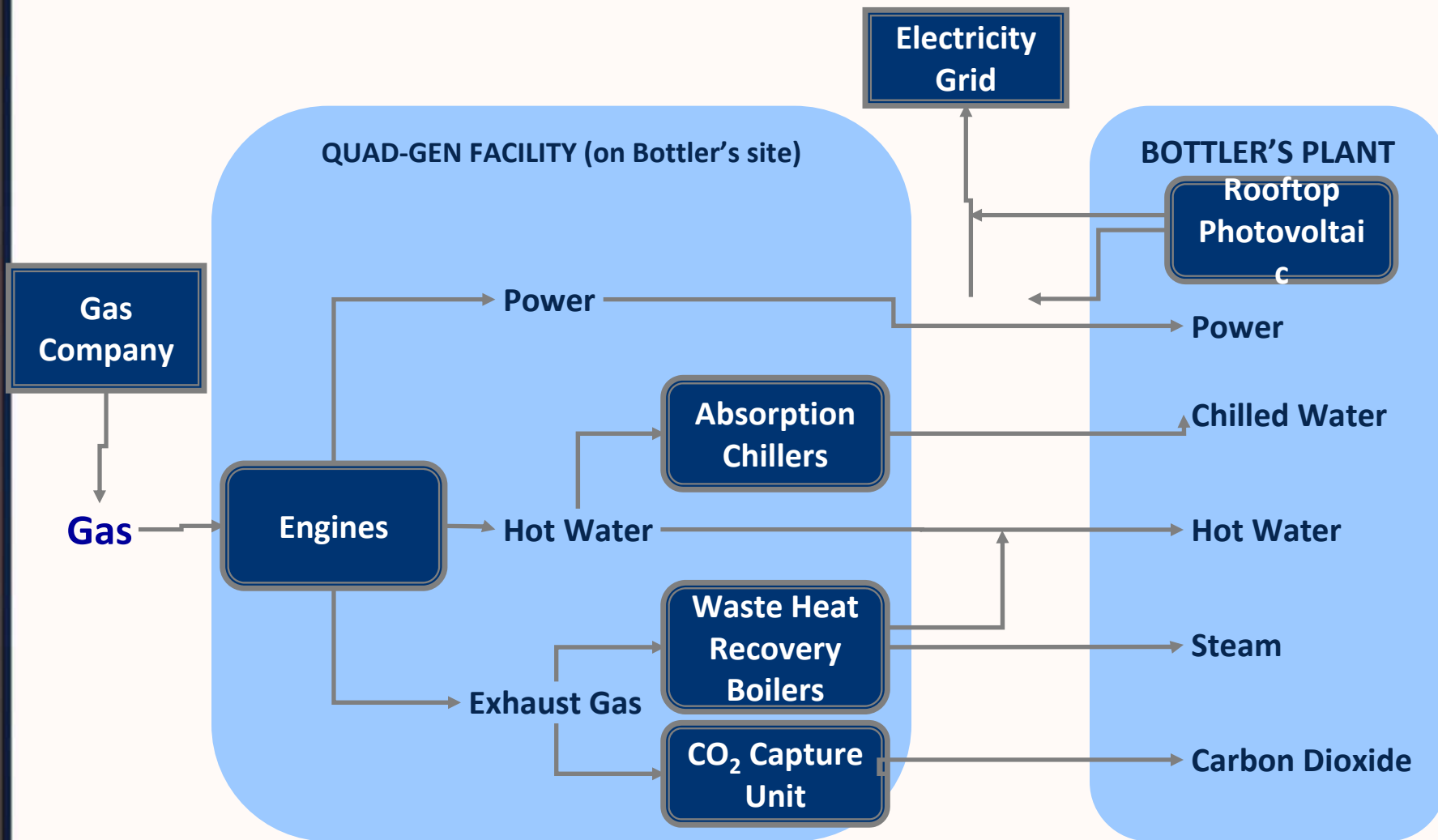
# Quad-Gen Plants

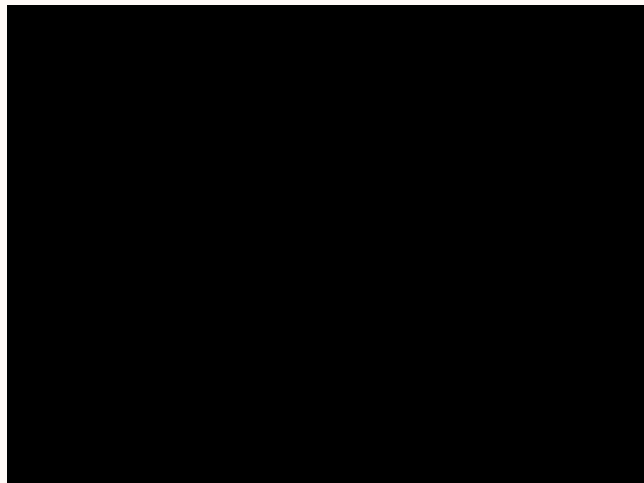


- ContourGlobal has in operation 6 Quad-Gen Plants with a further 3 under construction in 6 different countries for a major bottling company in Europe, as well as Africa.
- The projects are financed with US \$250M credit facility from OPIC.
- These clean and decentralized facilities provide energy services, including:
  - Low-cost steam and hot water
  - Low-cost electricity
  - Chilled water
  - Food-grade CO<sub>2</sub> for carbonation from the engine exhaust



# Quad-Gen







Case Study No. 3:

**Large scale Power Plant Rehabilitation;  
ContourGlobal Maritsa East 3**

# ContourGlobal Maritsa East 3 TPP today



- Gross Capacity 908 MW
- 4 Units: 227 MW each
- Lignite fired boilers (lower calorific value 1400-1700 kcal/ kg, sulfur content ab.2%, humidity 50-60%)
- Efficiency over 35%
- Availability over 85%
- First unit commissioned in 1978
- Bulk Materials Input:
  - Lignite 8 000 000 t/year
  - Limestone 500 000 t/year
  - Water 25 000 000 t/year

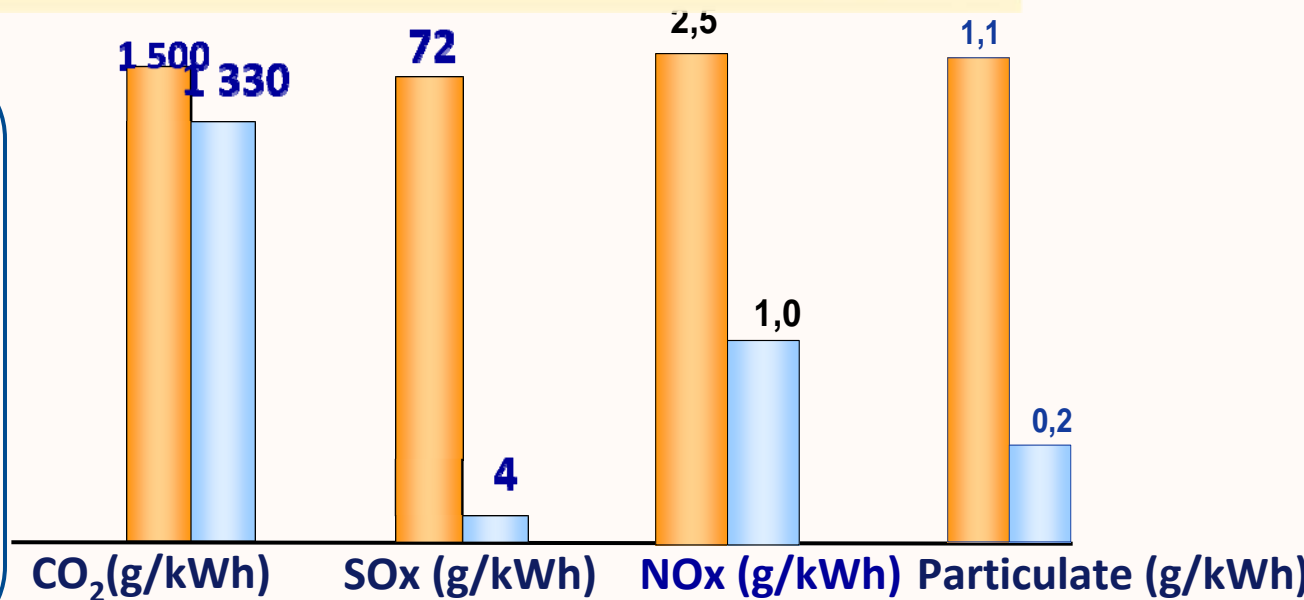
# The Goals of the Rehabilitation

- Extension of the operational life of the plant by minimum 15 years
- Increase of the capacity of each of the units – from 210 MW to 227 MW
- Increase of the efficiency and availability of the plant from 30% to over 35%
- Improve the plants reliability
- Full compliance with the requirements of the European Environment Legislation now and for the foreseeable future
- Improve the Health and Safety Environment for Workers and Contractors

# What has been achieved

|                | Before | After  |
|----------------|--------|--------|
| Gross Power    | 840MW  | 908 MW |
| Net Efficiency | 30%    | 35%    |

The first lignite power plant at the Balkans in full compliance with the European Environmental Standards



Drastic Emissions Reduction



# Environment Compliance



- The environmental management system has been ISO14001-2004 certified in 2009
- Electrostatic precipitators purify the flue gasses from dust ensuring efficiency of over 99,96%
- Flue Gas Desulphurization Units: 2 FGDs connected with 4 units (as per design)
- The wet process of the FGD provides a further decrease of the dust content in the gases ensuring a level of dust far below the law limit of 50 mg/Nm<sup>3</sup>

# Environmental compliance



## Improvement of ESP

- The flue gases emitted from the burning process enter into 2 electrostatic precipitators (1 for each side of the boiler) to be purified from dust
- A complete refurbishment of the above mentioned ESPs, involving the replacement of the last 2 fields and the reconstruction of the ash collecting system, ensures an increase of the efficiency of over 99,96%
- Moreover the wet process of the FGD provides a further decrease of the dust content in the gases ensuring a level of dust far below the law limit of 50 mg/Nm<sup>3</sup>





## Water Management and Water Consumption Reduction

- Two new make up water lines from Rozov Kladenets lake to cooling towers have been installed - 8 km each; the old ones had a leak rate of 50% of the flow
- A new Water management system recycles the water, which was previously in open circuits, in order to minimize consumption and discharge
- A new Buffer Pond with capacity of 30.000 m<sup>3</sup> has been constructed in the ash handling water management system to equalize the peaks and reduce the consumption of water

# Environmental Compliance - Why Waste?



- FGDs produce gypsum. Generally it is a by-product for the plant:
  - Option 1: dump it? Why?
  - **Option 2: dewater it and sell it as resource for gypsum wallboard factory**
- Result – introducing a new investor in Bulgaria (Knauf), thus turning the country from a gypsum importer into producer and exporter.

# Environmental Compliance - Less Ash



## Improvement of Ash Handling

- The ashes from the ESPs and the bottom of the boilers are collected by a wet handling system
- Two fully refurbished Dredger pump stations forward the collected ashes mixed with water through new ash pipelines to the ash lagoons



## Sprinkling System

- In the past, dust was blown out from the lagoons in windy days mainly during the spring-summer period
- As a part of the rehabilitation our sprinkling system has been constructed, trees have been planted around the lagoons and streets have been paved in order to prevent the dust

# Environmental compliance



## Dust suppression at the ash lagoons

- The ashes are temporarily collected in the ash lagoons for drying
- Finally the ashes are reclaimed in order to be disposed together with the overburden of the mines
- In the past, dust was blown out from the lagoons in windy days mainly during the spring-summer period
- As a part of the rehabilitation a sprinkling system has been constructed, trees have been planted around the lagoons and streets have been paved in order to prevent the dust spreading



# Health and Safety Improvements



## Improvement of Fire Fighting

- Complete review of fire fighting and detection equipment to comply with NFPA code



- The internal Fire Brigade team has been provided with the latest technologies capabilities and a practice field for training
- A new hydrant ring has been built
- All boxes for hoses and all hoses have been replaced

# Health & Safety - Results and goals



- Safety is our first priority
- “Zero accidents” goal has been set for the organization
- The continuous improvement of the H&S conditions has brought a progressive reduction of the accidents
- Safety management system has been certified according OSHAS ISO 18001-2007 since 2010
- Improved workplaces



**Thank you!**

