BENIN GHANA NIGERIA TOGO

USAID/NARUC WEST AFRICA REGIONAL PARTNERSHIP

Integrating Clean Energy Regulation into Evolving Energy Markets

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West African Gas Pipeline Authority (WAGPA) presentation

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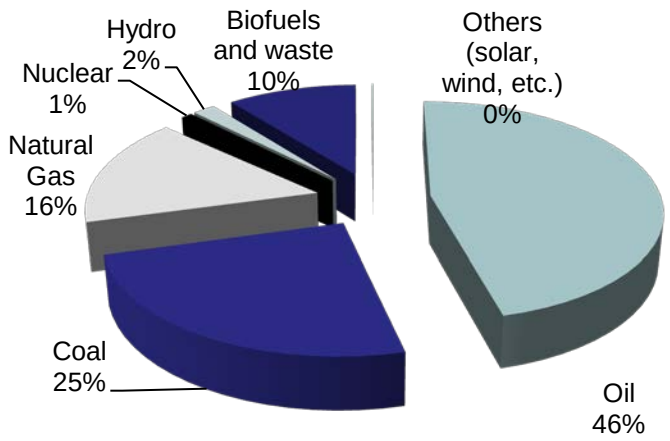
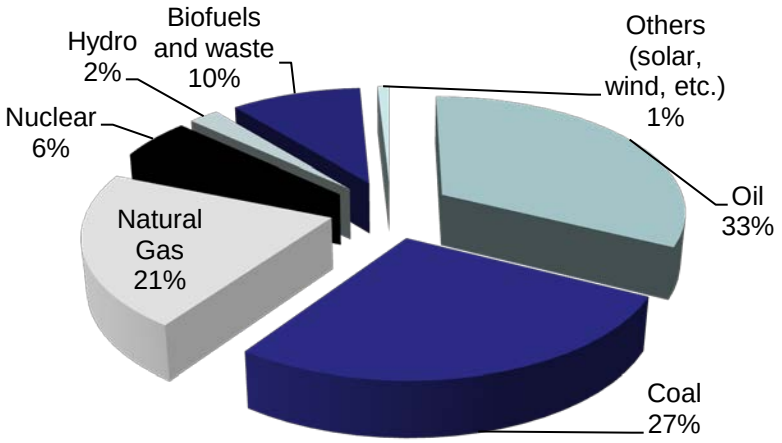
OUTLINE OF THE PRESENTATION

1. WORLD ENERGY SUPPLY
2. NATURAL GAS
3. NATURAL GAS RESERVES IN WEST AFRICA
4. WEST AFRICAN GAS PIPELINE (WAGP)
5. NATURAL GAS AND RENEWABLES

1. WORLD ENERGY SUPPLY

1974	2010





	1974	2010
Total primary energy supply (Mtoe)	**6 107**	**12 717**
Fossil fuels (oil, coal, natural gas)	**87%**	**81%**
Renewable (Hydro, solar, wind, etc.)	**12%**	**13%**

Over the period (1974-2010) the total ***primary energy mix has doubled, fossil fuels has decreased by 6% and renewables have increased only by 1%****!*
Problems **:** Depletion of fossil fuels and global warming.

Solution: Renewable and environment-friendly sources but fossil fuels will continue to play a dominant role in the world's energy supply for decades to come !

2. NATURAL GAS

- ***Advantages:***
  - Better efficiency in power plants compared to coal and oil
  - Better combustion compared to coal and oil
    - ✓ Less carbon dioxide emission (45% less than coal and 30% less than oil)
    - ✓ Less nitrogen oxides emission (80% less than coal)
    - ✓ Negligible sulphur dioxide emission
    - ✓ No by products
  - Less expensive
  - Relatively abundant in every region throughout the world
- ***Disadvantages:***
  - Non renewable
  - Carbon dioxide emission
  - Natural gas is mostly methane, a greenhouse gas which Global Warming Potential is 21 times that of carbon dioxide
  - Leakage (contributes to greenhouse emissions; can be cause of explosion)
- ***Replacing coal and oil by natural gas is a good transition from fossil fuels to renewables***

3. NATURAL GAS RESERVES IN WEST AFRICA

- ***Proven reserves (10^9 m^3)*** as of 1 January 2012
  - Bénin: 1
  - Côte d'Ivoire: 28
  - Ghana: 23
  - Nigeria: 5 292
- ***Total***
  - 5 344 .10^9 m^3 (99% in Nigeria!) or
  - 189. 10^{12} cf or
  - 30. 10^6 GWh (55% efficiency) or
  - **30 000 MW for 1 000 000 hours (more than 100 years!)**

4. WEST AFRICAN GAS PIPELINE (WAGP)

- ***Treaty:*** Signed in Dakar on 31 January 2003 by the Presidents of the four State Parties (Bénin, Ghana, Nigeria and Togo) in presence of the Executive Secretary of ECOWAS

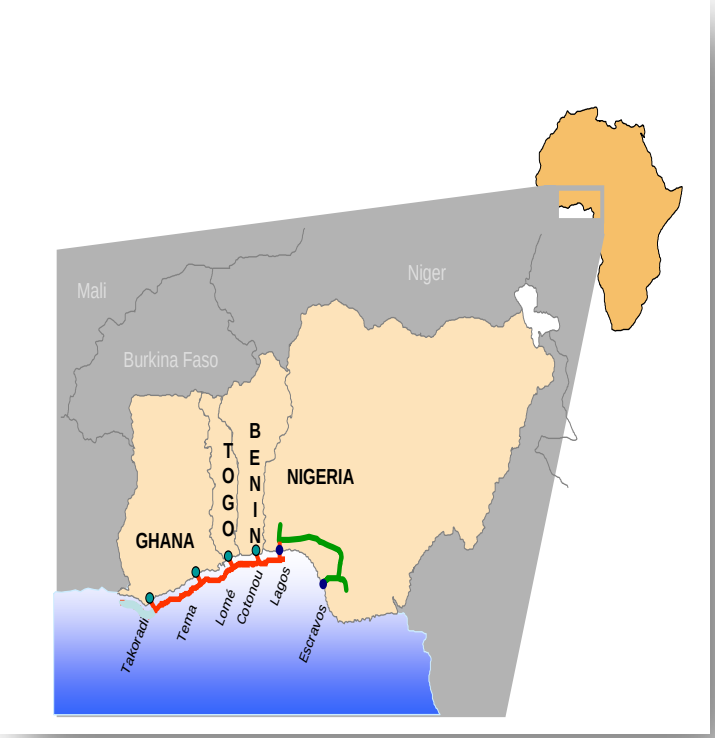
- ***Purpose:*** Transport Natural Gas from Nigeria to Bénin, Togo and Ghana for power plants companies and heat-using industries

- ***Length :*** 681 km of which 56 km of 30" pipeline from Itoki to Lagos beach; 569 km of 20" offshore pipeline from Lagos to Takoradi, Ghana

- ***Delivery points:*** Cotonou (Benin), Lome (Togo), Tema & Takoradi (Ghana)

- ***Pipeline Capacity:*** Initial (2 compressors) 170 MMscf/day & Final (6 compressors) 474 MMscf /day i.e. 2500 MWe

- ***Operating Pressure:*** 40-50 Barg (free flow) & 140 -148 Barg (full compression)



4. WEST AFRICAN GAS PIPELINE (WAGP) (Ctd)

- ***Stakeholders (four States Parties, WAPCo, Buyers and Shippers)***
  - The four States Parties :
    - ✓ The Republic of Bénin, the Republic of Ghana, the Federal Republic of Nigeria and the Republic of Togo
  - West African Gas Pipeline Company Limited (WAPCo)
    - ✓ Shareholders: Chevron (36.9%), NNPC (24.9%), Shell (17.9%), VRA (16.3%), Bengaz (2%) & Sotogaz (2%)
  - Buyers: Volta River Authority (VRA) and Communauté Electrique du Bénin (CEB)
    - ✓ VRA (Ghana): 123,212 MMBtu/d
    - ✓ CEB (Bénin and Togo) : 5,200 MMBtu/d for each country
  - Shippers (N-Gas)
- ***Regulator:***
  - WAGP Authority or WAGPA): regulates transport through WAGP

4. WEST AFRICAN GAS PIPELINE (WAGP) (Ctd)

- ***Demand in the buyer countries (Bénin, Ghana and Togo)***

Country	Location	Power plants	Installed Capacity (MW)			Type	Ownership
			Existing	Planned	Total		
Benin	Cotonou	TAG Cotonou	25	50	75	GT/CCGT	CEB
		CAI	80			GT	BENIN GOVT
		WAPP		400	400	CCGT	IPP
Togo	Lome	TAG Lome	25	50	75	GT/CCGT	CEB
		ContourGlobal	100		100	DE	CGT (IPP)
Ghana	Tema	TT1PP	110		110	GT	VRA
		Sunon Asogli	200	1 410	1 610	CCGT	SAPL (IPP)
	Takoradi	Takoradi 1 (T1)	330		330	CCGT	VRA
		Takoradi 2 (T2)	220	110	330	CCGT	TICO (VRA/TAQA)
		Takoradi 3 (T3)	132	132	264	CCGT	VRA
Total			1 222	2 152	3 294		

GT: Gas Turbine (Single Cycle) CCGT: Combined-Cycle Gas Turbine DE: Diesel Engines

CEB: COMMUNAUTE ELECTRIQUE DU BENIN, MAIN PRODUCER AND SOLE TRANSPORTER OF ELECTRIC ENERGY IN BENIN AND TOGO

VRA: VOLTA RIVER AUTHORITY, MAIN PRODUCER OF ELECTRIC ENERGY IN GHANA

- ***Present Gas demand:*** *244 000 MMBtu/day*
- ***Demand in 2020 (only for power):*** *659 000 MMBtu/day*
- ***Demand in 2020 (power & industry):*** *706 000 MMBtu/day*

4. WEST AFRICAN GAS PIPELINE (WAGP) (Ctd)

- ***Delivered gas price***

  - Delivered gas price: $9 per MMBtu (equivalent of oil : 51 $ per barrel)

- ***Extension***

  - The Treaty on the WAGP Project provides for possible extension to other countries (Article XV states "*This Treaty shall be open for accession by states other than the State Parties on terms to be approved by the State Parties*")

  - In the final communiqué of 42nd Ordinary Session of the Authority of ECOWAS Heads of State and Government in Yamoussoukro, Côte d'Ivoire, on 27 and 28 February 2013, the "… *Authority instructs the President of the Commission to pursue the efforts aimed at extending and improving the efficiency of* ***interconnectivity projects in all the countries of the Region, including the West African Gas Pipeline****."*

5. NATURAL GAS AND RENEWABLES

- ***Natural gas***

  - Safe to produce, transport, store, and use
  - Less expensive
  - Flexible to use
  - Relatively climate-friendly (cleanest fossil fuel)

- ***Renewables***

  - Environmentally friendly
  - Available in limitless quantities
  - Subject to natural fluctuations

- ***Natural gas is the perfect partner for renewable source when the latter cannot produce enough to meet the demand.***

THANKS!

QUESTIONS PLEASE?