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760 MW COMBINED CYCLE POWER PLANT PROJECT *JANUB* FOR ALI-BAYRAMLI

Project Developer : **AZERENERGY JSC**
CPEE CENTRE

Presented by
Prof. Nariman Rahmanov



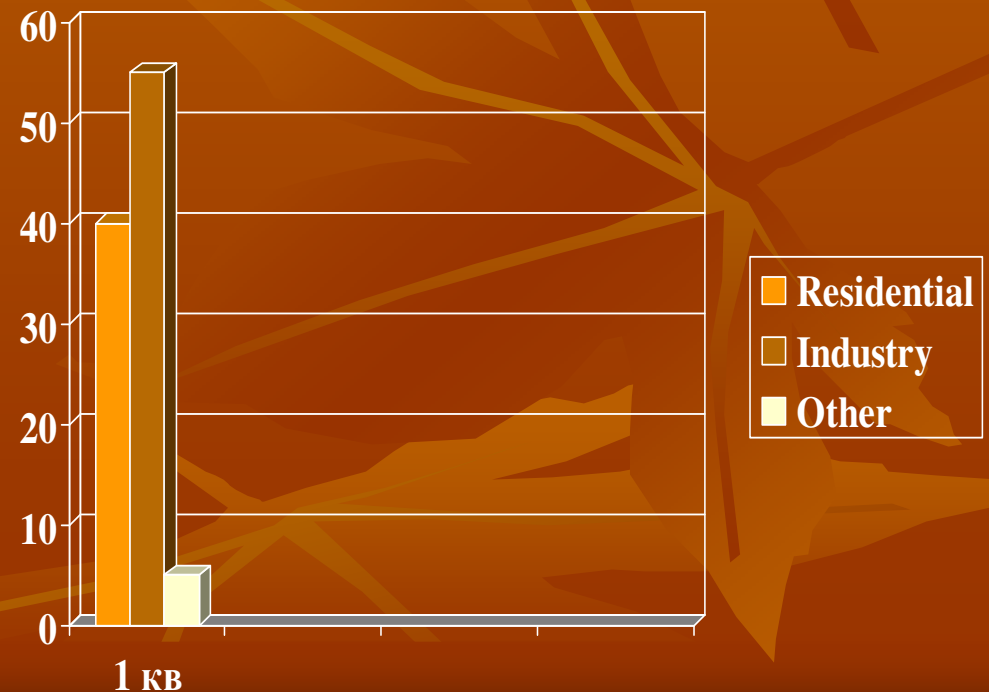
AZERENERGY SYSTEM GENERATION STRUCTURE

- **10 Thermal power plants with installed capacity 4500MW
(81% from total capacity of system)**
- **6 Hydro Power Plants with installed capacity 1000MW
(19% from capacity of system);**
- **Energy exchange between AzeEnergy with Russia, Iran
And Georgia (total average value about 500MW)**

Energy Consumption in Azerbaijan



- **Peak Values Demand in Winter**
4600MW
- **Annual Production (in 2006)**
23 mlrd kWh
- **Consumption structure:**
 - residential 40%
 - industry 55%
 - others 5%





760 MW COMBINED CYCLE POWER PLANT PROJECT FOR ALI-BAYRAMLI

- **Objective of the project :**
 - a) **Increase power generation in the AzerEnergy System**
 - b) **Reduce fuel consumption in whole Power System**



Objective of the project

- **The main objective of the project is to increase energy efficiency of AzerEnergy Power System by installing new gas-turbine power units in Ali-Bayramli instead of 50 years old low effective thermal power plant, which used oil and gas fuel. Acting Ali-Bayramli Thermal Power Plant has the highest level of fuel rate consumption per 1kWh (430G/kWh) of generated power in Azerbaijan. Therefore commissioning of new combined cycle gas-turbine units brings a 2 to 2.5 times reduction of fuel consumption and consequently a reduction of GHG emission from National Energy System.**

Technology to be employed



- As a result of different technology analysis, it has been offered the use of steam and gas plant (CCPP) using General Electric “9E” gas turbine based on the following principles as well as considering main requirements of new Ali-Bayramli Power Plant, that has high coefficient of efficiency and possibility to use gas and mazut:
 - 1. Each multiple-roll CCPP includes 2 units (blocks) of GT generators, 2 heat recovery steam generator units and one ST generator unit;
 - 2. The Power of each CCPP is 386,7 MW;
 - 3. The total power of new Ali-Bayramli CCPP is 760 MW;



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General Electric (GE) MS9001E CC Unit

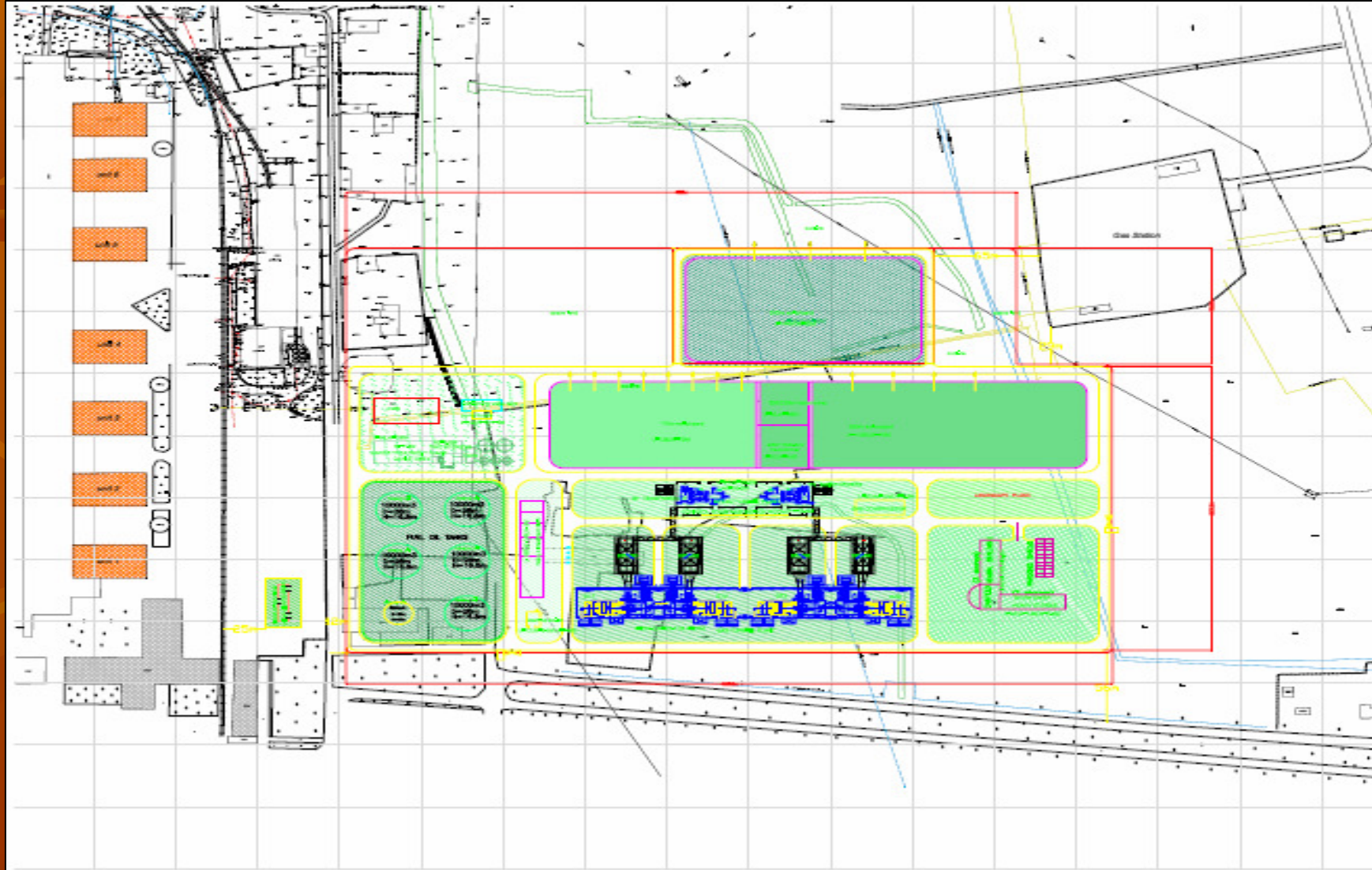




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PLANT LOCATION





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PLANT LOCATION

Ali_bayramli - Программа просмотра изображений и факсов

Ali-Bayramly

Beshdali

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Pointer 39°53'42.25" N 48°54'43.86" E elev 22 ft Streaming 100% Eye alt 26110 ft

пуск

Входящие - Outlook ... Ali_bayramli - Програ... Документ Microsoft ... EN 10:16

Expected environmental and social benefits



- Annual 3 167 098 tCO₂e/yr
- Up to and including 2012 : 12 668 392t-CO₂e (4 years)
- Up to a period of 10 years: 31 670 980t-CO₂e
- Up to a period of 7 years : 22 169 686 t-CO₂e
- Up to a period of 14 years: 44 339 372 t-CO₂e
- The baseline emission factor of 1.15t-CO₂/MWh for Ali-Bayramli CCGT power plant is used to assume the GHG emission reduction

Specific global & local environmental benefits



- **Contribution to the national energy security;**
- **Reduction of GHG emissions from traditional thermal power plant (It will reduce GHG emission by using new combined cycle power generation technology);**
- **Limited employment opportunity will be created for construction and maintenance of the plant ;**
 - Reduce power plant maintenance and equipment's replacement costs due to wear ;**
 - Tourism could indirectly increase due to a cleaner environment; This would contribute to an improvement of local economy**



Environmental strategy/ priorities of the Host Country - Azerbaijan

- The vision of sustainable development is based on the Preamble to the Constitution of Azerbaijan, that states: the protection for all the people of Azerbaijan and their entire native land; improve public welfare and advance the intellectual life of the people; enabling Azerbaijani to play a role in establishing a world order based on freedom,
- The national policy on environmental development that states the principles in environmental conservation;
- The policy of decentralization and liberalization of the power sector to create an open market encourages the private investor to help meet the growing demand for power. The proposed new CCGT power plant will be an important contribution to sustainable development



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Calculation of Baseline Emission Factor

Fuel	Net Generation GWh	Consumed fuel (10 ³ ton) (A)	Net Calorific Value, (Tj/10 ³ ton) (B)	Carbon Emission Factor, (IPCC; tc/Tj) (C)	Emission tCO ₂ (D)=A*B*C*44/12
Gas	4025,37	1796, 983	43,33	15,3	4 368 129,6
Oil (diesel fuel)	1229,68	548 632,85	40,19	21,1	1707451,4
Total	5255,050	2 345 616			6079551,7
Baseline emission factor, (tCO₂/GWh)					1157

Calculation of Emission Reduction

- Taking in consideration designed power of 760MW and working period 8000hours per year the total generation would be $2934 \times 2 = 5868$ GWh. To produce such amount of energy it would be consumed 1324 mln.m³ of gas with specific consumption of 228 Gr/kWh (kWh (268 dm³/kWh)).
- Taking in account that in 2006 the generated energy was 5255,05 GWh and consumed fuel was 2345616 t, the new plant for the same amount of fuel could produce 10287,8 GWh.

Calculation of Emission Reduction

- This means that designed PP would produce $(10287,8 - 5255,05) = 5032,7$ GWh more energy than existing Power Plant.
- Baseline emissions: 6 079 552 tones CO₂/yr
- Project emissions: 5255 GWh (taking in account the 2006 generation of existing plant) * 228 gr/kWh (or 228 T/GWh) = 1 198 140 tonnes gas used. This is equal to $(1\ 198\ 140/1000) * 43,33 * 15,3 * 44/12 = 2\ 912\ 454$ tCO₂
- Emission reductions are = $6\ 079\ 552 - 2\ 912\ 454 = 3\ 167\ 098$ t/CO₂

Additionality

- For acting TPP Baseline emissions: 6 079 552 tons CO₂/yr
- For new project emission is 2 912 454 tons CO₂/yr
For sustainable development Azerbaijan needs to replace old PP with increased energy efficiency and environmentally friendly technology;
- Alternative Power Generation Technologies:
Alternative technologies include hydro power, wind energy, solar thermal, photovoltaic and biomass energy. Due to acreage requirements, climatic considerations cost, reliability, and lead time, none of the alternative technologies noted is considered to be a viable alternative to the proposed project. Also on the current moment it is not possible to get such generation capacity(760MW) by renewable technology.



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Additionality

- Without CDM revenue Azerenergy financial abilities are limited by partial reconstruction or repairmen of existing equipment. In this case baseline emission factor will not be significantly changed.



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Thank`s to All of You

**For your Attention and
Patience!**