

Technology Fact Sheet for Mitigation

Technology Fact Sheet – Advanced Pulverized Coal (Single Unit) ⁱ

Sector	Power generation
Technology name	Advanced Pulverized Coal (Single Unit)
Subsector GHG emission (mn mt CO2 equivalent)	11.9 mn mt of CO ₂ equivalent from power generation
Background/short description of technology	Pulverized coal power generation starts by crushing coal into a fine powder that is fed into a boiler where it is burned to create heat. The heat produces steam that is used to spin one or more turbines to generate electricity. Subcritical plants make up the bulk of the U.S. pulverized coal system, with efficiencies for new plants usually around 37 percent. Pulverised sub-critical plants can be taken to be the benchmark for evaluating super critical, ultra super critical and IGCC plants. Advanced Pulverized Coal Facility is provided for a nominally 650 MW coal-fired supercritical steam-electric generating unit which employs a supercritical Rankine power cycle in which coal is burned to produce steam in a boiler, which is used to run a ST to produce electric power. The steam is then condensed to water and pumped back to the boiler to be converted to steam once again to complete the cycle. Based on: 1. Ngo, Christian and Joseph Natowitz, <i>Our Energy Future: Resources, Alternatives and the Environment</i>. 2. U. S. Energy Information Administration Office of Energy Analysis, <i>Updated Capital Cost Estimates for Electricity Generation Plants</i>, November 2010.
Implementation assumption, how the technology will be implemented and diffused across the sub-sector	Many of the new power plants in the pipe line are based on oil and are small as emergency measures for tackling the present shortages of electricity. One major problem had been the estimated shortage of gas. However, the present plants are very old and the same quantity of coal used in these plants can produce much more electricity using better technology. Also new discoveries and assessments of gas reserves indicate that the future supply of gas may not dwindle as fast as may have been thought so far. The revision of the existing Power Sector Master Plan is therefore necessary to take account of these new realities. The revision may thus include provisions for this technology. It should be noted, that of the 4 coal-based power generation technology, this one is ranked 2nd although there are little differences in the final scores of prioritised coal-based technologies. More emphasis is likely to be given, under coal based generation to dual unit advanced pulverized coal

	technology because the investment costs are somewhat lower while the power output becomes double of that for single unit plants (see later). The nominal capacity, heat rate and the emission factor that have been assumed for a single unit plant are 650 MW, 8,800 Btu/kwh and 206 lb of CO₂ emission per MMBtu
Reduction in GHG emission	The benchmark as argued should perhaps be the Pulverised sub-critical plant. Unfortunately it is difficult to get comparable figures for sub-critical plants. Hence we use the CT as the reference point. In fact, perhaps that is what it should be as the most prevalent mitigation friendly power generation technology in Bangladesh is the conventional combustion turbine. Hence the comparison may be with CT. Given this, the CO₂ emission actually increases, not reduced, if the APC single unit supercritical technology is used compared to the equivalent power generation with CT. The respective emissions are 2.87 mn mt for CT and 4.10 mn mt for APC single unit with supercritical technology. Thus, the increase in CO₂ emission is almost 43%.
Impact Statements – How this option impacts the country development priorities	
Country social development priorities	Each of the single unit APCs will produce nominally 650 MW. This is larger than even the NGCC typical plant size of 540 MW. Thus the additional output will allow more electricity to the citizens to consume allowing a better quality of life. With increased supply of electricity, and consequent access to it, the lighting for studies will improve leading to better education prospects as well as security. The process of women's empowerment will be better served as with increased access to electricity they may enjoy facilities to which their access was limited previously.
Country economic development priorities	<i>Productivity</i> may increase as with better supply of electricity new technology may be introduced or the run time of factories may lengthen. On the other hand, better supply may spur the establishment of new factories and facilities and various service centres. <i>Job creation</i> will be facilitated because of productivity increase or the establishment of new enterprises. Both direct and indirect job creation may happen. <i>Poverty</i> will be reduced as more and more jobs are created and

	people are gainfully employed. <i>BoP</i> may be negatively impacted; however, as the machineries need to be imported from abroad and more sophisticated technology may be costlier. However, for each case of new power generation technology, the marginal effect of import of newer technology equipments may not be large.
Country environment development priorities	The emission factors of SO ₂ and NO _x will be the same as for the pulverized coal technology. But for equivalent output of electricity, again the emission will be broadly decreased in dual unit APC. Thus there will be less emission and the air pollution will be comparatively less.
Other considerations and priorities	-
Costs	
Capital costs	The investment cost of a single unit APC is US\$ 3,167/kw. Given that the capacity of a single unit APC is 650 MW the price tag of a single unit APC is US\$ 3,167*650000 or 2.06 bn. For CT of equivalent capacity it is only US\$ 633.34 mn. Going for a coal-based supercritical technology as one unit establishment, is thus going to be extremely costly compared to gas-based generation.
Operation and maintenance costs	Fixed O&M costs are for single unit APC US\$ 35.97 per year per kw. Thus for a single unit estimated APC fixed cost is US\$ 23.38 mn. For a CT of comparable capacity, the fixed cost becomes US\$ 4.54 mn.
Fixed O&M	
Variable O&M	Variable O&M for single unit APC it is 4.25/Mwh and the total comes to US\$ 21.21 mn per year. For CT of equivalent power generation, the total variable O& M costs come to US\$73.41 mn. Thus CT variable O& M costs are much higher compared to APC single unit.
Cost of GHG reduction	The emission actually increases, not reduced, from equivalent CT-based generation. Hence the cost of reduction is redundant.

ⁱ This fact sheet has been extracted from TNA Report – Technology Needs Assessment and Technology Action Plans For Climate Change Mitigation– Bangladesh. You can access the complete report from the TNA project website <http://tech-action.org/>