Annex III. Project Ideas

A.1 Project Title

Installation of Advanced Pulverized Coal (Double Unit)

A.2 Introduction/Background (Briefly describe the project and how it developed):

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.

The APC double unit has the same features as for APC single unit above with the provision that the rated nominal capacity is 1300 MW. But as we shall see, not everything gets doubled including costs.

A.3 Purpose and Objectives (What will the project accomplish? What are the objectives and are they measurable? :

Major objective of Advanced Pulverized Coal (Double Unit) project is to increase power generation.

A.4 Relationship to the country's sustainable development priorities

Under sustainable development framework, the government of Bangladesh emphasizes on green growth, efficiency improvement of the energy sector etc. that will lead to reduced GHG emission. Thus, the implementation of this project will contribute to the country's strive in achieving energy security.

A.5 Project Deliverables e.g. Value/Benefits/Messages (Why it is important and necessary?):

Establishment of 1300 MW capacity Advanced Pulverized Coal (Double Unit) plant.

A.6 Project Scope and Possible Implementation (How broad is the project? How feasible is it? Is it related to current or past projects?) :

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 gas 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. While new gas-based plants may be set up, clean coal technology is an attractive alternative from two points in view.
First, the country has some, though not very abundant, coal reserves. This need to be utilized well and highly efficient technologies such as IGCC may be utilized for the purpose.
Secondly, while there may be improved situation related to gas reserves, dependence on coal is likely to increase in future in which case efficient but also cleaner technologies (because coal is the dirtiest fuel from CO_2 emission point of view) needs to be employed to make the most of the scarce resource. And in that case global support leveraged by UNFCCC (in the form of Green climate funding) is likely to be available if the case is made well.

It should be noted, that out of the four coal-based power generation technology, this one is ranked 4th although there are little differences in the final scores among the prioritized 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. In fact, one Bangladeshi coal-based plant is having a similar capacity of nearly 1300 MW.

The nominal capacity, heat rate and the emission factor that have been assumed for a Double unit plant are 1300 MW, 8,800 Btu/kwh and 206 lb of CO_2 emission per MMBtu.

A.7 Timelines (What are the timelines e.g. one quarter, one year, multiple years?) :

Multiple years

A.8 Budget/Resource requirements (What is the budget? How is the project to be funded? (Staff, Engage consultants, partnership, etc.) :

Capital Costs:
The investment cost of a double unit APC is US$ 2,844/kw. Given that the capacity of a double unit APC is 1300 MW the price tag of a double unit APC is US$ 2.844*130000 or 3.70 bn. For CT of equivalent capacity it is only US$ 1.26 bn. Going for a coal-based supercritical technology as one unit establishment, is thus going to almost 3 times costly investment compared to benchmark gas-based generation.

Operational and Maintenance Costs:

Fixed O&M: Fixed O&M costs are for double unit APC US$ 29.67 per year per kw. Thus for a double unit APC fixed cost is US$ 35.06 mn. For a CT of comparable capacity, the fixed cost becomes US$ 9.07 mn.

Variable O&M: Variable O&M for double unit APC it is 4.25/Mwh and the total comes to US$ 42.4 mn per year. For CT of equivalent power generation, the total variable O& M costs come to US$146.72 mn. Thus CT variable O& M costs are almost three times as much compared to APC double unit.

A.9 Measurement/Evaluation (What tangible evaluation of accomplishments are there?):

A.10 Possible Complications/Challenges (What are the potential challenges and complications?):

- High cost; nearly US$ 4bn for a double unit (1300 MW) plant; coals transport, and other infrastructure will raise costs further
- Present power sector master plan may need revision for emphasis on NGCC;
- Private sector foreign direct investment not allowed at the moment
- A proven but somewhat complex technology, particularly its size may lead to major managerial difficulties both technically and otherwise, regularity of supply of primary fuel may be a critical bottleneck if supply chains are not contractually spread over several years in future and proper coal handling facilities not created beforehand which will raise costs further; IPR may also be a problem
- Capacity to technologically manage such very large, modern generation unit is practically non-existent.

A.11. Responsibilities and Coordination

- Ministry of Power, Energy and Mineral Resources
- Ministry of Finance
- Ministry of Planning
- Ministry of Environment
- Bangladesh Energy Regulatory Commission
- Power Division
- Power Cell
- Bangladesh Power Development Board (BPDB)
- Power Grid Company of Bangladesh (PGCB)

The power division of the Ministry of Power, Energy and Mineral Resources will lead implementation of the project, while other institutions like Ministry of Planning and Ministry of Finance will coordinate with the development partners and private sectors for generating funds for project implementation.