

ADB: Contributing to Enabling CCS Demonstration in Developing Asia

**Examining Technology Pathways and Business
Models for Scaling-up CCS,
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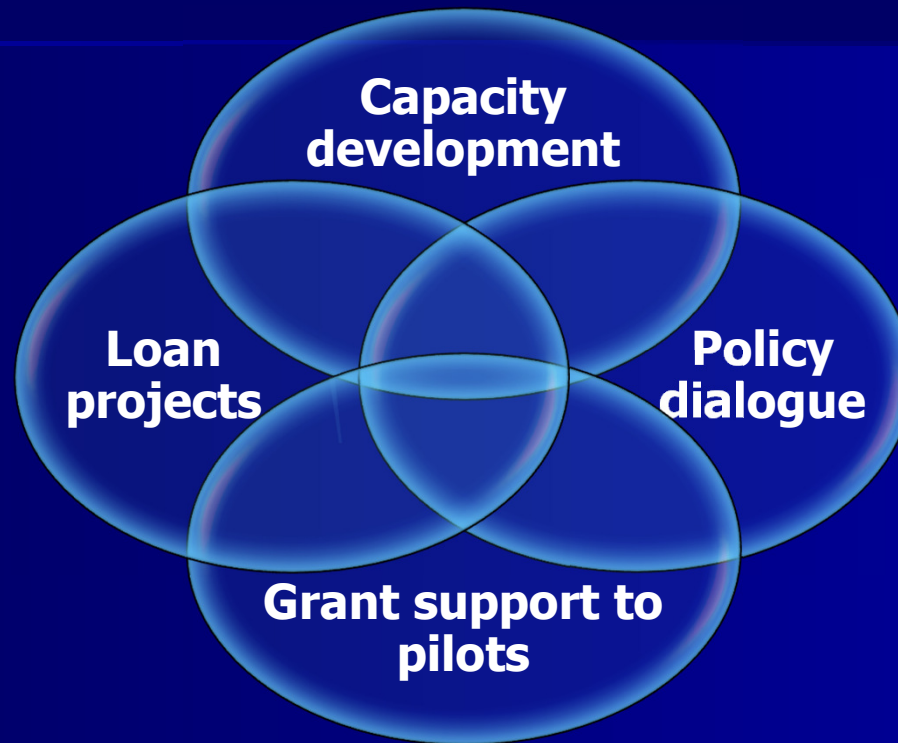
Background of ADB's Support for CCS promotion

- Asia is leading the global GHG emissions growth: China with the world's largest emissions from energy use and Southeast Asia with emissions growth twice the global average.
- To date, no business case exists for investing in commercial-scale CCS project. In the absence of fiscal, regulatory and/or financial incentives, it is unlikely that power plants and industrial facilities will invest in large-scale CCS.
- To ensure low-carbon growth in carbon intensive emerging economies of the Region, CCS must be demonstrated and deployed in carbon-intensive emerging economies of the Asia Pacific Region.
- ADB's Energy Policy 2009: CCS as a clean technology approach to be promoted as it becomes technically feasible and economically viable.

ADB's Support for CCS (1): Phased Approach

- **Phased-approach to facilitate the lowering of knowledge/capacity barriers to CCS development**
- **Providing**
 - **Strategic upstream analysis**
 - **Support for formulation of a roadmap for CCS demonstration**
 - **Grant financing to CCS pilot and demonstration projects**
 - **Policy advisory support**

ADB's Support to CCS (2) 4-pronged and inter-locked



ADB seeks to pave the way for low emission technologies and promote environmentally sustainable investment decisions by financing demonstration projects, engaging in policy dialogue and strengthen capacity of relevant stakeholders

ADB's Support for CCS (3): CCS Fund

ADB has established a CCS Fund in 2009 to implement our strategies to support DMCs to develop CCS projects

ADB CCS Fund -- Highlighted activities

Total funds:	\$41.3 M	2009-10	<ul style="list-style-type: none"> • Strategic Analysis on pre-combustion CCS PRC • Key Policy Issues and Barriers for CCS in emerging economies • Financing of CCS
Available funds (2014):	\$31.9 M	2011	<ul style="list-style-type: none"> • Study on CCS for Natural Gas-based Power Plants using CCS-Ready Approach PRC
		2012	<ul style="list-style-type: none"> • CCS regional reports and for a (INO, PHI, PRC, THA & VIE) • Roadmap for CCS Demonstration and Deployment PRC
Key Contributors:	<ul style="list-style-type: none"> •UK Gov't (\$24 M) •Global CCS Inst. (\$17 M) 	2013	<ul style="list-style-type: none"> • Study on pre-combustion carbon capture technology (IND, INO, Malaysia, THA, VIE)
			<ul style="list-style-type: none"> • Support to pilot CCS projects in INO & PRC

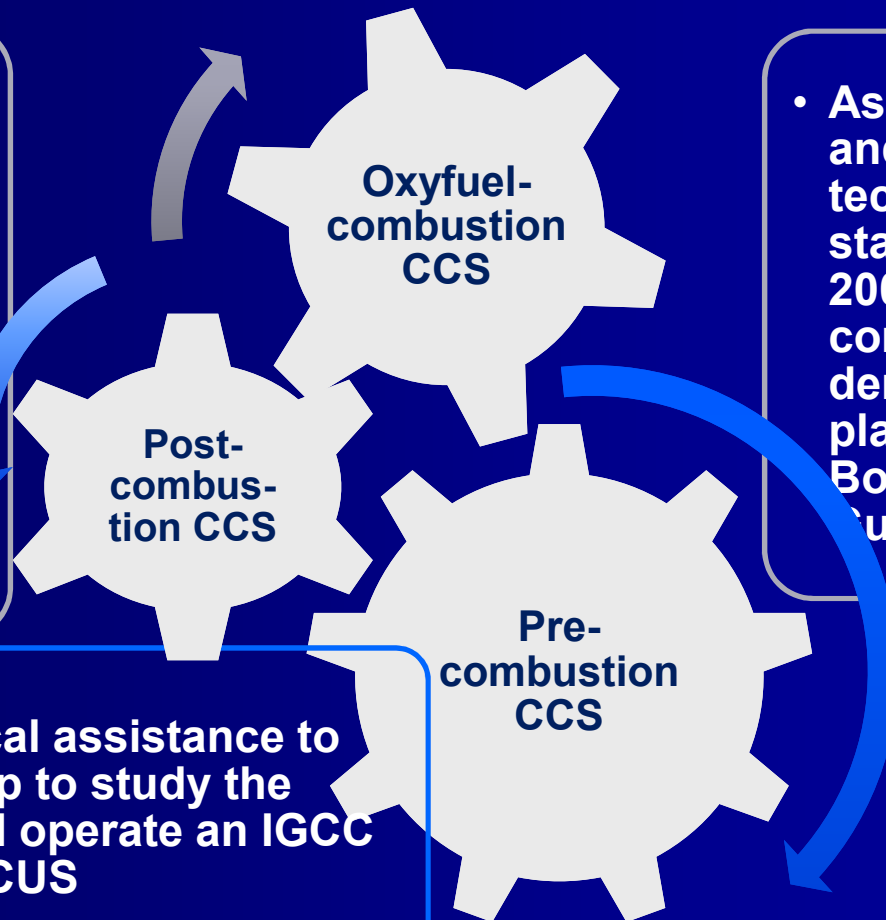
Capacity Development Approach for CCS Development in the PRC

Upstream analysis and pilot testing of available technologies for energy companies and dissemination of lessons learnt.

- Strengthening capacity of Datang International to assess, pilot-test, and apply post-combustion method in gas-fired power plant and to establish CCS-ready criteria power plants

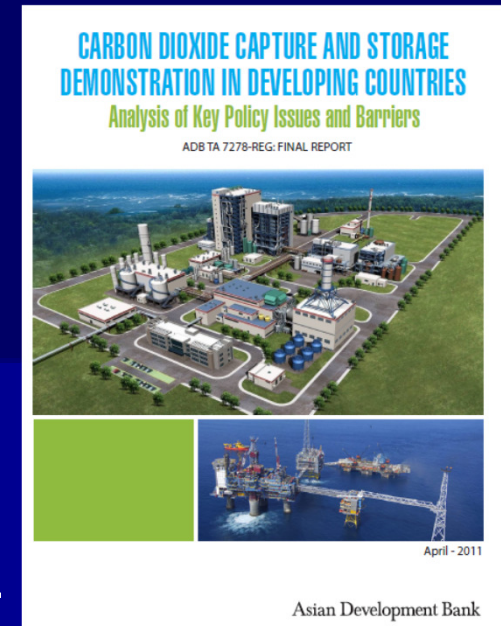
- Assess feasibility and establish technical standards for a 200MW oxy-fuel combustion CCS demonstration plant (Dongfang Boiler & Shenhua Huohua)

- Financial and technical assistance to China Huaneng Group to study the technology, build and operate an IGCC power plant with a CCUS



Key Policy Issues and Barriers to CCS in Emerging Economies Countries

- Low Policy Priority for DMC governments
- Unfair cost comparison between LCOE of power plants “with” & “without CCS”
- CCS is not included in the low-carbon technology portfolio supported by governments
- No economic drivers / Commercial gap due to
 - High LCOE
 - Regulatory uncertainty
 - Lack of fiscal and financial support mechanisms
 - Fuel subsidies & no carbon penalty
- Public Awareness



CCUS Pilot Project in PRC



- Project will pilot test (i) CO₂ capture, liquefaction and compression of up to 100,000 tons of CO₂, (ii) partial utilization of CO₂ for EOR at Dagang oilfield, and (iii) geological sequestration of CO₂ in a depleted oil well
- Key stakeholders
 - China Huaneng Group: Majority shareholder of Tianjin IGCC and developer
 - Huaneng Clean Energy Research Institute: Technology developer
- Role of financiers:
 - ADB: Provision of \$800k for due diligence and inter-regional knowledge sharing & provision of \$11 million for support across the project chain
 - Ministry of Science and Technology: grant support by government
- Progress
 - MoU among stakeholders was signed for the pilot activities in QIV 2013
 - Engineering for the project complete; site preparation has started
 - Project due diligence is ongoing

Location of the project sites



Distance between point source and oilfield:
Approx. 20km



PRC – Develop CCS Roadmap

- ADB supports the Department of Climate Change in elaborating its Roadmap for CCS Demonstration and Deployment
- Includes following major outputs
 - Time bound action plan for demonstration (up to 2020) and deployment (up to 2025)
 - A policy and regulatory framework with an accompanying set of incentives
 - Shortlist and ranking of early-stage CCS demonstration projects
 - Suitable business models for implementing early-stage projects

Aims to support the development of an effective enabling environment for CCS demonstration and possible deployment

Support to Roadmap for CCS Demonstration for PRC

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Financability Considerations – Risk

Concern	Comment
Lack of Commerciality	<ul style="list-style-type: none">■ Current carbon price insufficient to overcome capital and operating cost hurdles
Revenue Risk	<ul style="list-style-type: none">■ Private sector unwilling/unable to underwrite forward carbon price
Technical Risk	<ul style="list-style-type: none">■ Technologies often unproven at scale or still immature■ Differing risk perceptions along CCS chain CCS<ul style="list-style-type: none">■ Capture■ Transport■ Storage
Regulatory Risk	<ul style="list-style-type: none">■ Regulatory regimes immature/under development
Counterparty Risk	<ul style="list-style-type: none">■ Occurs in cases where EmitterCo, CaptureCo, TransportCo and StorageCo/EORCo are not the same entity/consortium<ul style="list-style-type: none">■ Includes volume/deliverability and credit risks

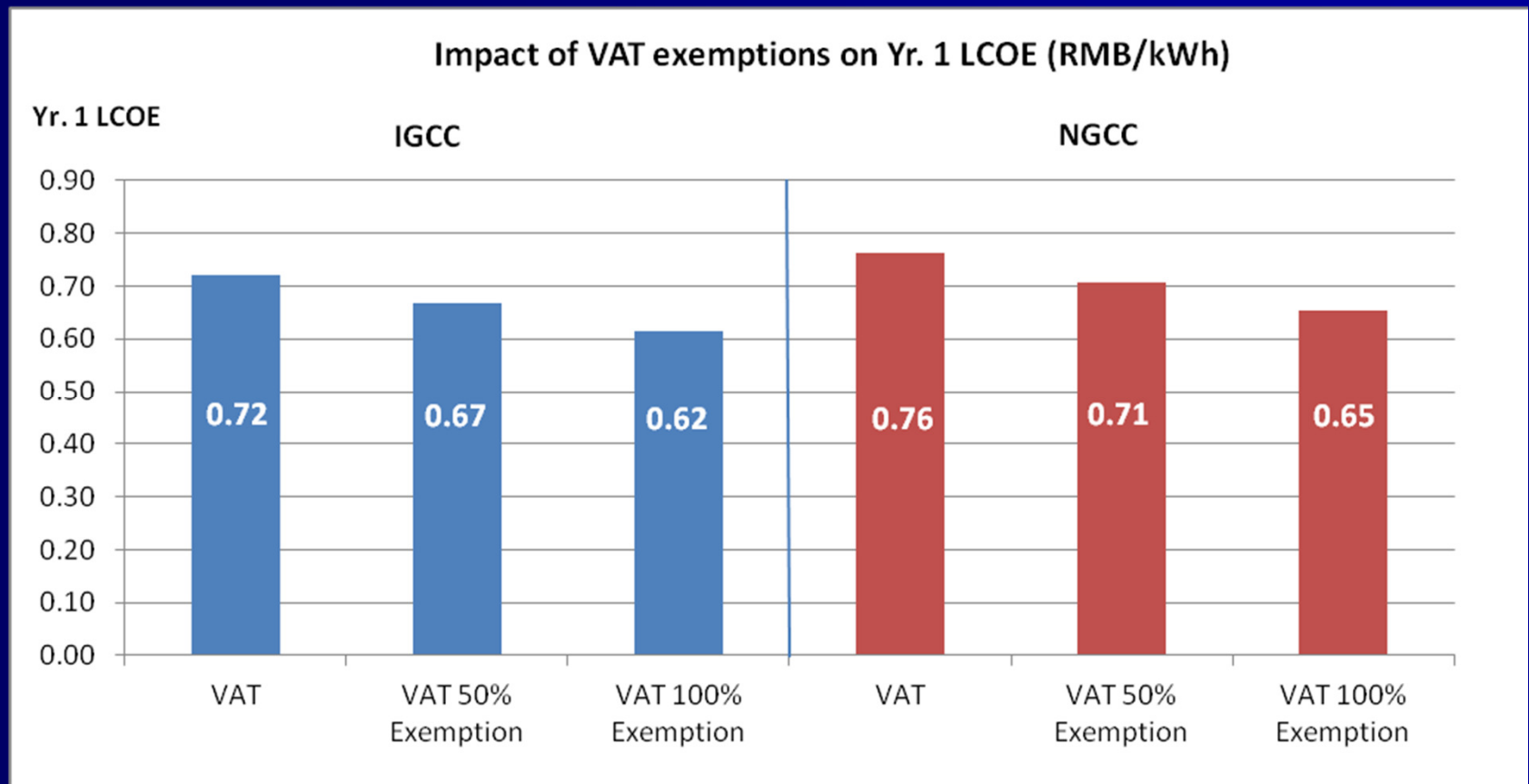
Source: ADB Consultants' Report TA 8133-PRC

Key Findings of ADB TAs re CCS financing (1)

- Finance costs can contribute to 40-50% of overall cost of power generation
- Applying CCS finance assumptions to base power plant significantly increases cost of power
- If the benchmark tariff for coal-fired power plants without CCS is applied to those with CCS, makes them financially unviable.
- Compared on a clean kWh, CCS already today could compete with other clean energy technologies

Key Findings of ADB TAs re CCS financing (2)

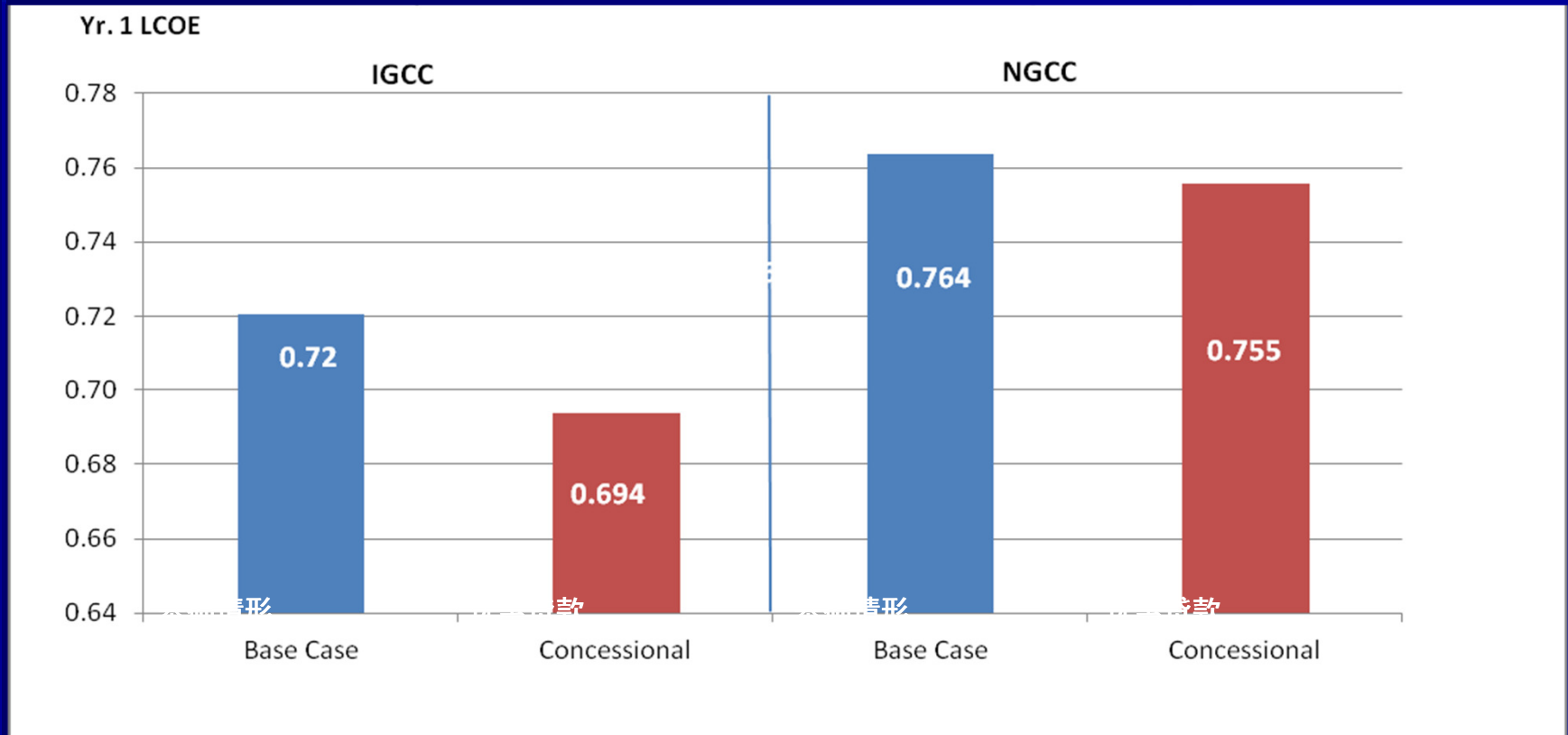
VAT Exemption Effect



Source: ADB Consultants' Report TA 8133-PRC

Key Findings of ADB TAs re CCS financing (3)

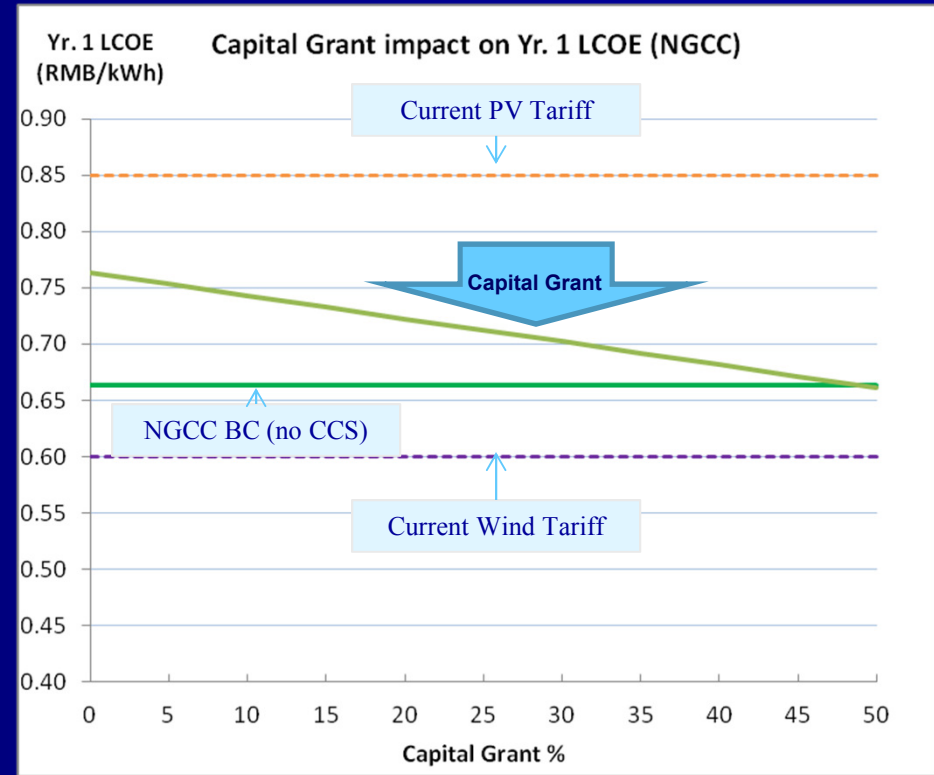
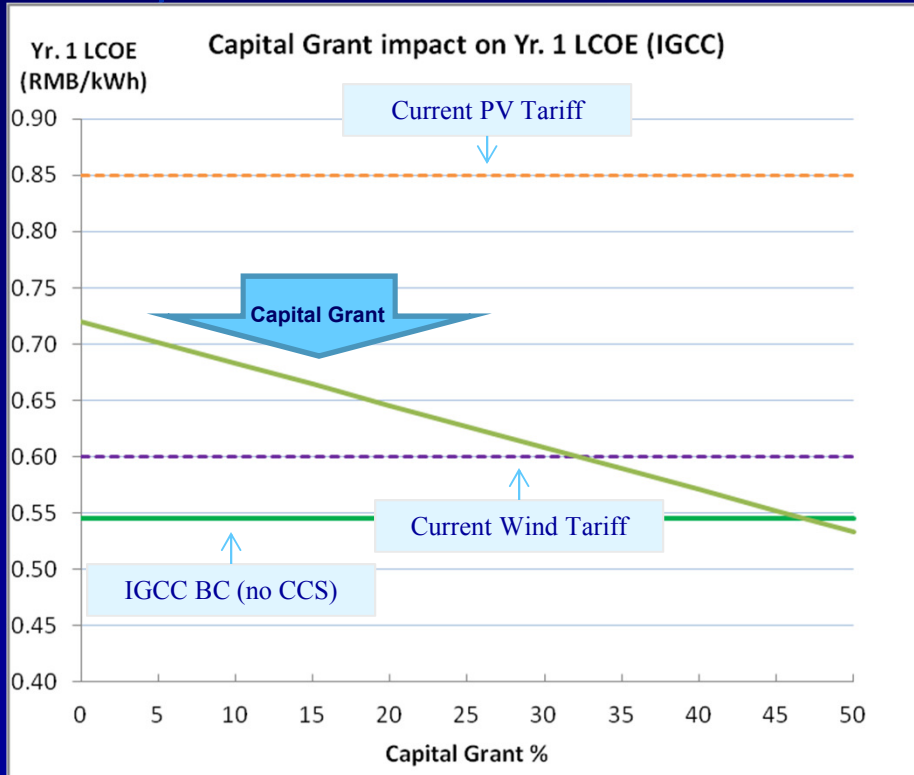
Concessional Finance – ADB LIBOR-based lending Effect



Source: ADB Consultants' Report TA 8133-PRC

Key Findings of ADB TAs re CCS financing (4)

Capital Grant Effect



Source: ADB Consultants' Report TA 8133-PRC

Building a Business Case for CCS project in Emerging Economies



A multi-pronged strategy is required to make first-of-its kind demonstration projects financially viable

THANK YOU.

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