Plan, Review and Suggestion on Energy Policies Regarding Carbon Dioxide Reduction in Taiwan

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A. Introduction

CO_2 capture and sequestration technology can enhance reduction of CO_2 emission in most parts of the world; it is regarded as a solution with great potential on CO_2 reduction and placed at the center of research focus by many developed countries. Amongst the CO_2 quantitative reduction agreed by USA in the international treaties to fulfill by 2050, 45% will be achieved exactly with capture and geological sequestration technology. USA will also complete constructing the first 275MW, coal-based hydrogen production plant which produces zero CO_2 emission.

For the past decade, Taiwan Power Company already invested billions of NTD dollars into CO_2 capture-related research, but investment on resources related to CO_2 geological sequestration has yet to be seen.

B. Plan and review on energy policies regarding carbon dioxide reduction in Taiwan

(a) Comparative energy policies of Taiwan and developed countries

Comparison of Taiwan's second national energy conference resolution and 2006 national sustainable development conference in regards to CO_2 reduction energy policies with energy policies planning in developed countries:

1. Sameness

(1) Increase usage of natural gas and reduce usage of fossil oil and CO_2 emission.

(2) Increase usage of solar energy, wind, bio-diesel and bio-alcohol and other renewable energy sources.

(3) Planning adoption of economic incentives such as electricity bill price adjustment, emission trade market, restriction of total emission and carbon tax.

(4) Proportion of fossil oil usage account for more than 87% before 2025 while proportion of coal usage will steadily increase.

(5) Setting target amount and target year for CO_2 reduction as listed in the strategies above.

2. Difference

(1) Except usage of renewable energy and natural gas as can be seen from the technical aspect of CO_2 emission reduction, the rest of reduction plans remain as economic incentives. The related cost and technologies associated with this part have yet to be linked to those already under planning.

(2) The required cost, research, and fundamental structure related to CO_2 emission

reduction have yet to be fully planned.

(3) The contribution of CO_2 capture, sequestration and the success of research on reuse technologies have on CO_2 emission reduction have yet to be fully evaluated.

(4) The impact of not being able to introduce CO_2 capture, sequestration and reuse technologies in Taiwan has yet to be fully evaluated.

(5) The fundamental structure and strategies, which are required to embrace the energy era of hydrogen after 2010, have yet to be fully planned.

(b) Analysis of difference

The problems presented from the above analysis of difference include:

1. Economic incentives on CO_2 reduction only work best when replaceable technologies are already in place for consumers to choose. Under current technological conditions, strategies such as electricity bill price adjustment, Carbon tax and emission trade market can only exert effect on current and future energy users using BACT or BAT. Since the effect on emission reduction is limited, whether or not the goal can be achieved remains debatable.

2. Because the required cost, research, and fundamental structure for CO_2 emission reduction have yet to be fully planned, it is difficult to form the basis of discussion. Moreover, it raises debate about whether large-scale energy users should be approved due to their economic contributions.

3. Given current technologies and cost restrictions, crude oil remains the mainstream energy source of the century. And in this regard, CO_2 capture, sequestration technology is significant in reducing CO_2 emission. These technology, research, and fundamental structure have yet to be included and carried out in Taiwan, which seriously affects suitability of our energy policies.

4. If CO_2 capture and sequestration technology succeeds in developed countries, we should consider if Taiwan has the ability and conditions to meet the technology transfer. Since the measures and strategies for meeting and failing to meet the required conditions differ, plans on related research and strategies should be decided in advance.

(c) Fundamental structure and industrial opportunities of new energy technology

Current plans set out by governmental institutions and private organizations on reduction of carbon emission as required by international treaties include strategies of energy saving, economic incentives and management structure. This will lead to

investment on natural gas or sustainable energy sources such as biomass energy, wind power, solar power and such.

What Taiwan is currently doing is waiting to re-apply the research result of developed countries. However, the problem is whether Taiwan will have the technologies, equipment and environment necessary for the transfer of CO2 capture and sequestration technology and hydrogen storage technology.

C. Suggestions of the impact of CO_2 sequestration technology on Taiwan's policies

(a) Effects of CO_2 sequestration and certified technology on the structure and policies of energy usage

If development of CO_2 capture, sequestration and verification technology turns out to be successful, the implication it has on the global structure of energy usage might lead to several possible situations:

1. Requirement for using both CO_2 capture and sequestration technology while using fossil fuel in the future.
2. End users of fossil fuel can only use by ways of electricity and hydrogen.
3. End users can only use products of bio-energy when using liquid fuels such as gasoline and diesel.
4. In order to promote zero emission of CO_2, international treaties will regulate to have global carbon tax and international CO_2 emission trade system.
5. Liquid fuel from bio-energy and fossil fuel-based hydrogen and electricity become associated with competitive force of transportation tools in energy market.
6. Under regulations of international treaties, the deciding process for quota on CO_2 reduction is such that, countries without geological conditions for CO_2 sequestration must negotiate to find best possible price in CO_2 trade market. Also, countries which cannot purchase enough quota on reduction amount must pay carbon tax for the amount difference.
7. Countries without conditions for geological sequestration will need to seek replacement technologies for CO_2 sequestration if they do not wish to trade in CO_2 trade market or pay carbon tax. For example, they might work with countries possessing geological conditions for CO_2 sequestration and construct fossil fuel power plant in the country, then transport power and hydrogen for national usage upon CO_2 sequestration.
8. Each country will conduct its own technological research on hydrogen storage technology, and create the fundamental structure required step by step.

(b) Suggestions on policies

The main challenge of Taiwan is that geological conditions for CO_2 capture, sequestration and verification technologies require geological structures of underground gas field, oil field and salt-water layer. Whether or not Taiwan has met these conditions makes a significant difference on the required fundamental structure for energy users. Currently, the amount of natural gas fields and oil fields that are known to exist in Taiwan is not enough to store the amount of CO_2 that fire power plants produced in one year.

Nevertheless, CO_2 capture, sequestration and reuse technology remains an area which begs active research in Taiwan. Acquiring this specific technology will enable Taiwan to be in a stronger position in international conference on CO_2 emission reduction in the future. Specifically, Taiwan will not only have equal rights and obligations as other countries listed in appendix 1, but also be able to participate in the flexible mechanisms of Kyoto protocol, Clean Development Mechanism (CDM) and Joint Implementation (JI).

For the reasons above, it is recommended that research of CO_2 capture, sequestration and reuse technology should follow categories below and create technology roadmap:

1. Capacity survey and research of sequestration technology on CO_2 geological sequestration (underground gas field, oil field or salt water layer).
2. Research of: CO_2 ocean sequestration, mineral sequestration, evaluation of environmental impact and CO_2 reuse technology.
3. Research of hydrogen production from fossil fuels with CO_2 captures.
4. Fundamental construction and related technological research of hydrogen transport and storage such as various applications of fuel cell technology.
5. Enlarge the scale of fundamental construction and technological research on liquefied natural gas for uses in transportation tools.
6. Surveys of locations of CO_2 geological sequestration through international cooperation as well as capacity survey.
7. Government should form joint partnership with energy users such as CPC Corporation, Taiwan Power Company, Ltd. and China Steel with regards to research on CO_2 geological sequestration and actively participate in international events such as Carbon Sequestration Leadership Forum (CSLF).

(c) Suggestions regarding schedules of technological research

1. Short-term (before 2015):

In order to enhance CO_2 emission reduction in industries, the basis of research should include technologies related to coal gasification, CO_2 capture, combustion and

CO_2 reuse. As well, scale of the usage of natural gas and fundamental construction should be enlarged.

2. Long-term (before 2020):

The amount of CO_2 produced by the industry can be captured and sequestrated by means of geological sequestration so as to raise the industrial competitiveness in Taiwan. Another means is to undertake CO_2 geological sequestration abroad by through international cooperation of Clean Development Mechanism (CDM). As well, scale of the usage of natural gas and fundamental construction should be enlarged during the transitional period until the entry of hydrogen-oriented era.

D. Conclusion

To prevent the negative impact of international treaties of emission reduction on domestic industrial and economic development, Taiwan should actively invest in research and development in this area. While creating a roadmap of technological development and details of CO_2 emission reduction in the future, Taiwan should also involve itself internationally, keeping abreast of the technological development of CO_2 capture and geological sequestration.