

# How to efficiently implement CCS in Poland?

Political and legal frameworks

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**CCS**  
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## British Embassy Warsaw

The report has been prepared within the framework of the project "Carbon Capture and Storage as a preferred technology for mainstreaming the clean use of coal in Poland". The project has been supported by the British Ministry of Foreign Affairs Strategic Program Fund Low Carbon – High Growth, whose objective is to promote a low carbon economy, while maintaining high economic growth.

Cover design:

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## Political and legal frameworks

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The author would like to thank Paweł Świeboda, Ewa Gaşiorowska and Magdalena Jura for all comments and suggestions to the text of the report.

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*WORKING DRAFT*

*This report includes selected parts of the original version,  
which has been prepared in Polish.*

## **Introduction**

Despite all the efforts aimed at development and global deployment of sustainable energy, the world is going to depend on fossil fuels in the next decades. Green technologies are being developed and energy efficiency is one of the top priorities of energy policies all around the world. But to counteract global warming we will need to quickly reduce CO<sub>2</sub> emissions. In countries such as Poland, where electricity is produced mainly from coal and therefore a rapid increase in the use of renewable energy is more challenging, adaptation of clean coal technologies and transformation of the energy sector are a must. Carbon Capture and Storage (CCS) will have a key role to play here. In the opinion of the International Energy Agency presented in a report entitled "*Technology Roadmap. Carbon Capture and Storage*", CCS can bring up to a 100% reduction of CO<sub>2</sub> emissions generated during the coal burning process in power plants in a long-time perspective.

A Special Report on Carbon Dioxide Capture and Storage ordered by the Intergovernmental Panel on Climate Change (IPCC) includes estimates according to which CCS has a potential to reduce CO<sub>2</sub> emissions by 220-2,200 Gt in the 21<sup>st</sup> century which means that 15-55 per cent of worldwide efforts to mitigate climate change can be achieved with the use of the CCS technology. It also means that clean coal technologies, including CCS, are – next to energy efficiency and renewable energy – a major tool to lower the future reduction costs of greenhouse gases emissions and to increase energy security in a long-time perspective.

Taking into account the present status of work on the Carbon Capture and Storage technology, the political, institutional and regulatory framework as well as the public acceptance are – next to cost reduction – the biggest challenges in the CCS application process. The regulatory framework and public acceptance are closely connected with each other, and the introduction of appropriate legal acts should guarantee that the new

technology will not only be an effective tool to counteract climate change but also will be safe for people and the natural environment. An avant-garde political vision will also be needed in order to help the technology develop on a sufficiently big scale so that it will be able to really counteract an increase in greenhouse gases emissions. The political vision is important also because decisions about big investments have to be made as early as today although we will have to wait to see the results.

The energy sector faced a similar challenge in the 1970s when exhaust fume desulfurization technology was patented. At its initial stage, the technology was revolutionary and extremely expensive. Soon it turned out that a considerable reduction of cost was possible, and today exhaust fume desulfurization is commonly used in power plants.

More and more mechanisms and institutions are operating globally to develop and implement the CCS technology as fast as possible. These are, among others: the Zero Emission Fossil Fuel Power Plant Technology Platform, the IPCC's efforts aimed at the formulation of expertise and guidelines for the dissemination of the technology, the activity of the International Energy Agency (IEA) with its CCS roadmap and the meetings of the Carbon Sequestration Leadership Forum (CSLF), Global Carbon Capture and Storage Institute (GCCSI). Poland should actively engage in the work of the above institutions and discussion panels as well as in the construction of global mechanisms, thus influencing the development directions set by them.

Today one can hardly find a global energy company that is not interested in CCS. The majority of companies already have elements of the new technology at their disposal and successfully sell licences all over the world. The Polish industry is waiting for a clear political signal and a favourable regulatory framework which would support the implementation of the technology and minimise the risk related to investments in innovative technologies.

Without the CCS technology, Poland will not be able to fulfil its obligations to reduce greenhouse gases emissions under the EU's energy and climate package as well as under other international agreements. Poland's heavy dependence on coal will require using clean coal technologies as the

inevitable transformation of the economy towards a low-emission model will not happen at once. Therefore it is necessary that the CCS technology becomes reality in Poland as quickly as possible. The following activities should be pursued simultaneously in the nearest months:

- making a CCS technology impact assessment on the economy, environment and the population;
- creating appropriate financial mechanisms;
- stimulating research and development in the area of clean coal technologies;
- carrying out monitoring and tests (including bore-holes) on potential CO<sub>2</sub> storage sites and identifying locations where storage is safe;
- planning infrastructure for the transport of CO<sub>2</sub>;
- preparing and adopting relevant legislation as well as reviewing already existing legal acts;
- creating a necessary institutional framework;
- building public acceptance;
- incorporating CCS into medium and long-term economic and energy strategies of Poland;
- formulating a long-term policy connected with the objectives of the energy and climate package as well as a global post-Kyoto protocol.

It is important that the above points make up a whole strategy. Provisions should guarantee that the capture, transport and storage of CO<sub>2</sub> will be safe for the environment at each phase and that they will not pose danger to the population. Therefore the regulatory framework for CCS has to be based on three pillars:

- selection, verification and monitoring of a storage site;
- building of a CO<sub>2</sub> transport infrastructure and security;
- responsibility for any damage to the population and to the natural environment.

Provisions concerning CO<sub>2</sub> storage and the threat of leakage seem to be the biggest challenge due to the innovative nature of the CCS technology along with the related lack of appropriate legal solutions and public concerns resulting largely from a lack of knowledge about CCS.

The creation of an appropriate political framework will be of particular importance. A CCS strategy should be incorporated into an overall strategy

concerning the transformation of the Polish energy sector. The strategy should be formulated on the basis of a dialogue with key stakeholders representing scientific, business and NGOs circles. It is important that the political framework will favour the activity of such companies which operate in the area of so-called 'green technologies'. It is also important that the policy of the state will be cohesive with the directions set by the Community of 27 European countries in, among others, the energy and climate package of the European Union and international agreements.

This report is directed to politicians, representatives of public administration, NGOs, as well as industry and it has been written to prepare the basis for further discussion on Carbon Capture and Storage implementation in Poland and Europe. Most of its recommendations can be used to help create legal and political frameworks for CCS in other European Union Member States.

## **Polish "CCS Act"**

Deployment of Carbon Capture and Storage is a condition for Poland's fulfilment of its obligations to reduce the emissions of greenhouse gases.

The CCS Directive adopted in April 2009 does not include all the elements of the full CCS process. Some countries managed to develop appropriate legislative and regulatory framework for the safe capture, transport and storage of CO<sub>2</sub>. Therefore, while transposing EU legal acts into the Polish legal system, it is advisable to use solutions adopted by such countries which, like Poland, will have to adopt revolutionary solutions to "clean" the energy sector by using clean coal technologies.

This chapter includes a number of recommendations for a Polish legal act, which will ensure that CCS implementation in Poland is safe and efficient. The recommendations have been formulated on the basis of an analysis of the current acts and legislative proposals of Australia, Canada, Germany, Poland, the United States, the European Union and the United Kingdom.

### **1. Scope of the legal act**

The Polish legal act on CCS should, first of all, consolidate the already existing legislation concerning geology and mining, climate change and environmental protection, CO<sub>2</sub> emission allowances, the energy sector and transfer of raw materials for energy needs. It should also clearly divide the rights and obligations of the state administration and local self-governments.

The act should be applied to the running of business activity in the area of carbon dioxide capture, transport and storage in underground geological formations, including the examination and follow-up maintenance of all the installations and facilities for the capture, injection, storage and supervision. The legal act should determine the principles and conditions of:

- the issue of storage sites exploration permits, including the conditions which should be met by a storage site to be suitable for safe and permanent containment of CO<sub>2</sub>;

- the issue of storage permits which will determine, first of all, conditions that should be met by operators applying for the permit;
- the conditions for the building of a CO<sub>2</sub> transport infrastructure, including those concerning the construction of pipelines;
- the issue of CO<sub>2</sub> transport permits and principles for the collection of fees if the transport of CO<sub>2</sub> is a commercial activity;
- the inspection of storage sites, including long-term monitoring of CO<sub>2</sub> behaviour in geological formations;
- the rights of access to transport networks and storage sites of third parties;
- the withdrawal of storage permits;
- the closure of a storage site, including responsibilities and obligations after the closure of a storage site, i.e. a so called post-closure obligations;
- making available and expropriation of real estate for the needs of research, transport and injection; -
- the adoption of suitable principles of being responsible for any potential damage related to business activity in the area of CO<sub>2</sub> capture, transport and storage, in particular the determination if the principles are similar to so-called mining damage, risk responsibility or general principles of responsibility for damage regulated by the civil law;
- the cross-border transport and cross-border storage sites or those located in the neighbourhood of the EU Member States' borders;
- the financial obligations and penalties for the infringement of legal provisions as well as the costs incurred for the monitoring of a storage site during a "follow-up care" period;
- the operation of competent authorities designated by the act that should fulfil duties specified there;
- the protection of underground waters, human health and life and the natural environment, including the environmental impact assessment of the construction and operation of CO<sub>2</sub> capture, transport and storage facilities;
- the principles of informing the public about CCS-related issues, particularly about planned and carried out investments.

What is important, the act should include a set of detailed definitions so that the scope of the document will not raise any doubts. The most

important definition will be that of CO<sub>2</sub> (for the needs of injection and storage) which should be clearly classified as a greenhouse gas. This will make it possible to avoid misunderstanding as how to treat CO<sub>2</sub> - as goods, a pollutant, a toxic substance or waste, and consequently, to eliminate a threat of inconsistency with other international agreements and to avoid any additional burdens for the industry. Additionally, the act about the storage of CO<sub>2</sub> should define the minimum level of admissible pollution of a CO<sub>2</sub> stream which will be stored to minimise a risk of injecting other pollutants such as acid gases from industrial plants.

## **2. Exploration permit**

The Polish CCS act should include provisions to eliminate the risk of CO<sub>2</sub> leakage out of a storage site and negative effects of it on the natural environment and human health. To this end provisions should be prepared concerning the assessment of potential complexes for CO<sub>2</sub> geological storage by carrying out such activities which will interfere in sub-surface geological formations. The assessment should be made on the basis of an exploration permit. Permits should be granted according to objective non-discriminating criteria made known to the public, and their procedures should be open to all entities that have appropriate abilities.

Additionally, an exploration permit should include elements of a storage site assessment as well as the conditions to be met by the storage site so that the permanent containment of CO<sub>2</sub> will be safe for the surroundings. The assessment should determine if the storage site is able to receive a certain quantity of carbon dioxide with certain pollution. Therefore analyses prepared by an entity that has been granted a permit should include: a geological characterization of rocky layers, prospective unwanted effects of the operation, transport and storage as well as forecasts concerning the spatial division and stretching of rocky layers during a long-term storage as well as estimated pressure changes in the storage site. The exploration process should also result in the identification of the best places for the injection of CO<sub>2</sub>.

As far as the granting of CO<sub>2</sub> storage permits is concerned, it is necessary to update the Act on the Geological and Mining Law (Articles 15-18). First of

all, it should be emphasized that a potential storage complex is not a deposit of minerals. It also seems reasonable to forbid the granting of exploration permits by Voivodeship Marshals or Heads of Districts (the Geological and Mining Law includes such cases when the above are licence granting authorities). Only the Minister of Environment should be competent to issue permits which have to be adjusted each time to a local land development plan, and if there is not one, to a land conditions and management directions plan of a Municipality.

Article 18 of the Geological and Mining Law should be updated on the basis of Article 7 of the CCS Directive which says that applications for exploration permits should include at least the following information:

- the name and address of the potential operator;
- proof of the technical competence of the potential operator;
- the characterisation of the storage site and storage complex and an assessment of the expected security of the storage;
- the total quantity of CO<sub>2</sub> to be injected and stored, as well as the prospective sources and transport methods, the composition of CO<sub>2</sub> streams, the injection rates and pressures, and the location of injection facilities;
- a description of measures to prevent significant irregularities;
- a proposed monitoring plan;
- a proposed corrective measures plan;
- a proposed provisional post-closure plan;
- the information provided;
- proof that the financial security or other equivalent provision will be valid and effective before commencement of the injection.

### **3. Construction of a storage site**

The CCS act should specify in detail the conditions of the construction of a storage site for the needs of permanent containment of carbon dioxide. The storage should be forbidden outside the site accepted by a competent authority. The construction of a storage site should be based on a special plan accepted by a competent authority. The plan should include:

- a schedule of works (activities related to the construction, operation, closure and post-operation supervision);

- the information about making the land safe where the activities will be carried out (designation of safety zones);
- a technical specification/ characterisation of equipment used for its performance.

A constructed storage site should be formally accepted by a competent authority after checking if relevant measures have been taken to protect the natural environment and to restore the land to its former state, i.e. before the storage site was constructed.

#### **4. Storage permit**

The Act should specify in detail the conditions for the issue of storage permits which will guarantee the security of the storage process. A storage permit at a particular site should be granted first of all to the holder of the exploration permit. Additionally, the act should determine what detailed information should be included in an application for a permit or in a permit itself such as at least the following:

- the name and address of the operator;
- the precise location and delimitation of the storage site and storage complex, and information concerning the hydraulic unit;
- the requirements for storage operation, the total quantity of CO<sub>2</sub> authorised to be geologically stored, the reservoir pressure limits, and the maximum injection rates and pressures;
- the requirements for the composition of the CO<sub>2</sub> stream and the CO<sub>2</sub> stream acceptance procedure and, if necessary, further requirements for injection and storage in particular to prevent significant irregularities;
- the approved monitoring plan, the obligation to implement the plan and requirements for updating it as well as the reporting requirements;
- the requirement to notify the competent authority in the event of leakages or significant irregularities, the approved corrective measures plan and the obligation to implement the corrective measures plan in the event of leakages or significant irregularities;

- the conditions for closure and the approved provisional post-closure plan;
- any provisions on changes, review, updating and withdrawal of the storage permit;
- the requirement to establish and maintain the financial security or any other equivalent.

Additionally, the act should determine the criteria for the acceptance of an environmentally safe installation for the capture and verification of a CO<sub>2</sub> stream before injection. To increase the security and for the needs of a more effective inspection, each storage site should be operated by one operator only. Using the storage site for mutually contradictory purposes should not be allowed.

The act should determine the duration of the permit. In general, permits should be granted for an unlimited period of time provided all the requirements are met but in certain cases (such as a reduced capacity of the site), permits should be issued for a period of 5 years with a possibility of prolongation if the storage process goes undisturbed and all the obligations arising out of the permit are satisfied.

Provisions should be adopted in the event an operator who has been granted a permit does not comply with its requirements. A competent authority should have a right to issue an administrative decision that would make the operator obliged to take any measures deemed necessary by that competent authority to fulfil the permit's requirements or (in the case of abandonment of actions) take certain measures or order the fulfilment of the provision's requirements to any external parties on behalf of the operator (and at his cost).

Also it is necessary to update the Geological and Mining Law (Article 2) in its part concerning storage of substances in orogenic belts without reservoirs, including underground excavation sites. The Geological and Mining Law needs to be supplemented with the requirements of the CCS Directive. In this context, like in the case of exploration permits, Articles 15-17 of the Geological and Mining Law should be updated concerning the issue of licences and financial securities.

## 5. Transport

To provide safe and efficient transport of CO<sub>2</sub> from the place of capture to the place of injection, a suitable infrastructure has to be built throughout the territory of the European Union (mainly for transport by pipelines and trucks). Therefore it is important that legal acts related to the implementation of the CCS technology clearly specify the principles of the construction of transport networks for captured carbon dioxide. The transport by pipelines which is considered the cheapest due to Poland's geographical location and also the most rational generates various regulatory problems, concerning mainly the purchase of land over a big area.

Due to necessary third-party access to transport networks (included in the CCS Directive), one should introduce appropriate regulations concerning the technical specifications of pipelines so that their construction will allow the use by more than one operator.

Additionally, to guarantee security and to accelerate the construction of necessary infrastructure, the Polish CCS act should determine the principles and conditions of the issue of permits for the transport of carbon dioxide. To run business activity in the area of the transfer of CO<sub>2</sub> from capture to injection installations, the operator (not always the same as the storage site operator) should apply for a set of the following licences:

- an infrastructural licence (for the construction and maintenance of infrastructure to handle CO<sub>2</sub>),
- a licence for the construction and maintenance of pipelines,
- a permit for the appraisal of a greenhouse gas (appraisal of the CO<sub>2</sub> quality),
- a licence of a greenhouse gas holding,
- special competence related to the operating of a greenhouse gas.

## **6. Monitoring and inspections of storage sites**

The act should introduce regulations to provide monitoring and inspections of storage sites to guarantee safety to the natural environment and human health both at the injection phase and afterwards. The operator, acting on the basis of a monitoring plan (included in the permit), is the one to be responsible for the monitoring of a storage site at the operational phase; he should guarantee that a current appraisal is made whether the injected CO<sub>2</sub> behaves in an expected way or whether there is any migration or leakage of it or if a given leakage has harmful effects on the environment or human health. The operator should send a report on monitoring to a competent authority at least once a year.

A competent authority should be designated to currently inspect a storage site; the authority should have the following duties:

- to develop a system and make routine and non-routine inspections of all storage complexes;
- to react in the event of having noticed any irregularities and make the operator obliged to take any necessary corrective measures;
- to take corrective measures on one's own in particular cases;
- to make changes, review, update and withdrawal of the storage permit;
- to issue a new storage permit or close the storage site in the event of withdrawing the storage permit;
- to take over the responsibility for the storage site until it is closed;
- to keep a register of all operating and closed storage complexes.

The rights and duties of a competent authority should be exercised by inspectors designated by that authority for each project. The act should determine the requirements to be met by a candidate inspector such as sufficient knowledge (eg. a person with special background), skills and experience to become a project inspector (a person can be an office worker or an administration specialist although it is not a must).

By virtue of the act, a designated inspector should have access to each extraction zone and to each structure, aeroplane, shipping unit or building within the extraction zone if he has grounds to think that any of the above is used in connection with the actions related to:

- the operation of prospective storage sites or injection places;
- the preparation of CO<sub>2</sub> for transport;
- the processing, compression or pre-injection storage of CO<sub>2</sub>;
- the injection of CO<sub>2</sub>;
- the storage of CO<sub>2</sub>.

Additionally, the Polish CCS act should specify a catalogue of significant irregularities. If:

- carbon dioxide has leaked or is leaking out of the storage site or there is a significant risk of such a situation in the future;
- carbon dioxide has leaked during injection or there is a significant risk of such a situation in the future;
- carbon dioxide injected into the storage site has behaved or is behaving in a way other than planned or there is a significant risk of such a situation in the future;
- the injection or storage has had or has a negative impact on the geotechnical integrity of the geological formation or its geological structure or there is a significant risk of such a situation in the future;
- an identified storage site has become unsuitable for permanent containment of a certain quantity of a greenhouse gas injected in a given place,

a competent minister or a subordinated authority should have a possibility to use a catalogue of rights with immediate effect and not subject to suspension for the duration of a law case. If a decision of the competent authority is appealed against, the competent minister should:

- order the taking of protective measures by way of supervisory decisions;
- stop further injection of carbon dioxide.

As supervisory actions (if significant irregularities have been noticed), a plenipotentiary designated by a competent authority should have a right to enter the operator's premises and carry out actions necessary to restore the correct status there.

## **7. Third-party access to transport networks and storage sites**

The act should specify in detail third-party rights to use CO<sub>2</sub> transport networks and storage sites. It should impose on the operators of transport networks and storage sites of carbon dioxide an obligation to provide other entrepreneurs with the connection to the networks and access to the carbon dioxide storage sites (according to technical, fair and non-discriminating criteria). The connection and access should result from technical and economic possibilities which are appropriate, transparent and free of discrimination. Operators should cooperate with each other in this area to use the networks and storage sites in the most beneficial way.

The act should make it possible for the operator to refuse the connection or access if he proves that the grounds for such a refusal are insufficient transport abilities or inadequate storage site capacity or any legal obligations imposed on him. At the same time the act should specify that the operator who cannot make the pipeline or storage site available at the moment, will be obliged to take measures to increase transport abilities and storage site capacity if it is viable for him (from the economic point of view) or the applicant entity takes over the costs of such modernization.

To lessen the risk of a dispute between operators at a later time, as early as at the phase of issue of transport permits, the flow capacity of the network and the storage site capacity should be determined for the needs of making them available. Additionally, the risk of a dispute can be minimised by provisions establishing the principles of making storage sites available by auctioning and the principles of signing agreements between the operators. Analogous solutions have been included in the Energy Law, i.e. third-party access to gas transport networks and warehouses. They can offer a pattern for provisions related to CCS.

## **8. Closure of a storage site**

The act should clearly determine who, in what order and in what circumstances takes care of the storage site after its closure. It seems practical to divide the period into three phases:

1. After the end of CO<sub>2</sub> injection, a competent authority shall issue the operator a certificate to confirm the injection process has been completed (in accordance with safety requirements). Since that time the operator will supervise the storage site for a period of 20 years to identify and counteract any irregularities.
2. 20 years after the issue of the first certificate, the operator shall transfer his responsibilities for a post-closure obligations of the storage site to a competent authority, and the competent authority shall issue a certificate closing the storage site. The competent authority shall issue consent for the transfer of responsibilities in case long-term security of the storage of carbon dioxide has been provided and the operator has paid a fee for a post-closure obligations of the storage site. The amount of the fee should be determined by a competent minister by means of a regulation and with the consent of the Council of Ministers. The fee should cover any foreseeable costs of the supervision for at least 30-year-long period up to the time of the transfer of responsibilities.
3. The competent authority shall take a post-closure obligations of the storage site for a period of 30 years after the issue of a closing certificate; the care shall consist in the supervision of the storage site and the whole injection installation to determine the behaviour of carbon dioxide after the injection period.

The act should introduce a certificate issue system to confirm a safe and law-compliant completion of an injection process and closure of the storage site. Certificates should confirm that:

- a certain quantity of carbon dioxide was injected into a given site or sites for a specified period of time and also that the part was an identified storage site of CO<sub>2</sub> during that period of time;
- the carbon dioxide injection operations were authorized by means of injection permits and satisfied the requirements of the CCS act and other regulations during that period of time;
- actions to inject carbon dioxide were terminated.

Additionally, such certificates can include information what technical improvements have been made.

A closing certificate should be issued only in the situation when a competent authority is sure the actions to inject CO<sub>2</sub> have been terminated and if it is convinced that (on the basis of professional analyses) the injected carbon dioxide will behave in an expected way for a period of at least 30 years after the issue of the certificate and that there is no significant risk that the injected CO<sub>2</sub> will have a negative impact on the geological formation or structure. A competent minister has to be convinced that there is no significant risk that the injected carbon dioxide will have a negative impact on the environment and human health and safety.

### **9. Making a real estate available for the needs of research, transport and injection of CO<sub>2</sub>**

Due to a need to provide safe CO<sub>2</sub> transport and injection installation and taking into account extensive rights of the public concerning the reduction of CO<sub>2</sub> emissions and a big scale of the operation, the act should regulate issues of making a real estate available and expropriated for the needs of research of CO<sub>2</sub> storage sites, transport and injection as well as property laws such as the ownership of CO<sub>2</sub>, ownership of a storage object, ownership of injection objects, facilities and inspection as well as the ownership of land surrounding the storage object.

The act should also determine the scope of rights and obligations of land owners where the research of storage sites will be carried out. Provisions should be introduced to determine that the owner or any other entitled user of a real estate is obliged to tolerate any actions taken for the needs of research such as: necessary measurements, examination of the base, the ground, groundwater and other similar works carried out on the basis of a special certificate if such actions are taken to achieve a public objective. The act should specify that if for research reasons it is necessary to enter a private real estate, it can be done with the owner's or user's consent and the research can be done only at his presence (or his plenipotentiary's presence). After the research is over, the entity which has carried out the research should restore the real estate back to its former state and if there is any damage to the real estate, the owner should have a right to claim for compensation.

The act should also include a possibility to expropriate a real estate for the needs of carbon dioxide transport and storage. The Act on Real Estate Management says that provisions about expropriation are applied to real estates situated in the areas devoted to the achievement of public objectives or for which a decision has been issued about the location of a public objective investment. In accordance with the Act, a public objective is, among others, the construction and maintenance of objects and facilities used for the protection of the environment, water reservoirs and other water facilities that serve the purposes of water supply, control of flows and protection against floods as well as the control and maintenance of waters and land melioration facilities owned by the State Treasury or local self-governments. It seems that the construction of carbon dioxide transport networks and injection facilities can be considered a public objective investment. Additionally, one should pay attention to the Act on Land Planning and Development (Article 4) concerning the location of public objective investments.

The storage of CO<sub>2</sub> will require a new system of permits that should be modelled on the Geological and Mining Law. As injected CO<sub>2</sub> will become an element and a part of surrounding lands, legal implications are that the injected CO<sub>2</sub> will belong to the land owner. Therefore the act should determine if, in such a case, the ownership is separate or not.

## **10. Cross-border storage sites and transport**

Cross-border CO<sub>2</sub> storage sites and transport networks will have a stimulating impact on the competitiveness of the energy market therefore the act should determine the conditions under which the operators are to render access. Assuming that all the transport networks and storage sites within the territory of the EU Member States meet the requirements of the CCS Directive, their mutual availability should follow free-market principles. However it seems justifiable that a competent authority in a given EU Member State should have a possibility to monitor the cross-border transport networks and storage sites and to react if any irregularities appear or if there is a dispute between the storage site's or transport network's operator and a third party in which the operator refuses to render CO<sub>2</sub>

transport or storage services to that third party. The act should include provisions concerning the settlement of such disputes. A settlement decision should be immediate and be consulted with a competent authority of the engaged EU Member State.

## **11. Financial obligations and penalties**

The CCS act should regulate financial obligations related to the security of the whole CO<sub>2</sub> capture, transport, injection and storage process and the protection of the natural environment (resulting from Annex I to the CCS Directive). The obligations should be divided into at least three phases:

1. At the injection phase a full financial obligation and responsibility for the security and inspection of the objects should be borne by the operator.
2. Within 20 years of the completion of injection (i.e. since the moment of the issue of a certificate confirming the completion of the injection up to the moment of the issue of a closing certificate) a full financial obligation and responsibility for the security and inspection of the objects should be borne by the operator.
3. Within 30 years after the issue of a closing certificate and paying a fee for a follow-up care by the operator, a full financial obligation and responsibility for the security and inspection of the objects should be borne by a competent authority.

The Act should also regulate a system of penalties for the operator who:

- carries out an activity exceeding the conditions included in the permit;
- does not monitor the storage site which is required by the permit;
- is guilty of negligence of safety requirements resulting from the act;
- has not fulfilled any obligations included in the permit.

The act should determine appropriate penalties.

## **12. Competent authority**

The act should introduce provisions consolidating the scope of activities, rights and major obligations of various ministries. The Minister of Environment should be responsible for the administration of the legal framework for the capture and storage of carbon dioxide and be competent to issue any additional provisions concerning the contents of the act. The Minister of Environment should also be competent to submit to the European Commission any applications and other materials important in the decision-making process about the storage of CO<sub>2</sub>.

The Minister of Environment should transfer part of his competence concerning technical issues to the Chief Geologist of Poland. Competences concerning fees should be transferred to the Energy Regulatory Office, except for the ones related to legislation and the issue of warrants.

The Minister of Economy should point out directions concerning the activity and the way of running the activity related to CO<sub>2</sub> transport.

To this end a company should be established which, under the supervision of the Minister of Economy, will construct and make available (against payment) a network of pipelines for carbon dioxide transport purposes.

To deal with the inspection of CO<sub>2</sub> capture and injection facilities, the supervision of storage sites and a follow-up maintenance as well as the construction of infrastructure, the inspection and the provision of security of CO<sub>2</sub> transport, a State Treasury company should be established, i.e. the National Administrator for Carbon Dioxide Capture, Transport and Storage.

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A legal act concerning Carbon Capture and Storage will be key for the development of this technology in Poland. It is essential that it eliminates any potential barriers to CCS application in Poland. Its comprehensive character and transparency should form a solid framework for the activity of the industry and become a stimulus for its even bigger engagement in the transformation of the Polish energy sector towards low emissions. The legal

act should also guarantee the security of the technology so as to ease any concerns of the public and facilitate winning public acceptance through information campaigns.

## **Political frameworks**

Due to the heavy dependence of some of the biggest world economies on energy generated from high-emission coal, the CCS technology (after its commercial scale development and deployment) will be one of key tools of counteracting global warming. The technology (after laboratory tests and pilot phases) has entered the phase of construction of demonstration installations. As there is a need to take fast and strong actions against climate change, CCS cannot be developed in a standard way – we need commercial scale power plants as soon as possible. What is more, development of new low-emission sectors of the economy, including the construction of infrastructure for CO<sub>2</sub> capture, transport and storage will be connected with creation of new markets and new 'green' jobs. Both factors have substantial meaning for low-carbon transition, which is to take place, whether we like it or not.

We can observe the beginnings of a low-emission revolution on a global scale. The Government of the United States has intensified actions to accelerate the implementation of new energy technologies related not only to the technological development but also to a special system of training for present employees and education of future ones. What is important, being aware of the revolutionary character and scale of changes, the U.S. government has decided to start strategic cooperation with China in key areas and to take 7 meaningful initiatives: a research centre for clean energy, electrical vehicles, an action plan on improving energy efficiency, partnership for renewable energy, a "21<sup>st</sup> coal" initiative mainly connected with the development of CCS projects, a gas initiative and a cooperation programme on energy. If Europe does not want to lag behind, it will have to respond to the challenge.

It is clear already today which countries of the European Union will become leaders in concrete new solutions due to their location and potential. Countries lying in the north will specialise in renewables and potentially offshore the storage of CO<sub>2</sub>. The south of Europe has good conditions for the development of solar energy production. Central and Eastern Europe should use its potential related to onshore storage of CO<sub>2</sub>, the production of biomass and generation of geothermal energy. Due to its external and

internal conditions, Poland's flagship project should be onshore storage of CO<sub>2</sub>.

The transformation of the Polish energy sector is a must. Half of power plants have more than 30-year-old equipment. As far as political directions set at the forum of the European Union are concerned, it is necessary that the future modernisation is achieved with innovative "clean" technologies. There is no doubt that the energy policy should be connected with the climate policy and key ministries should closely cooperate to develop solutions which will stimulate climate-friendly economic development of Poland and improve the competitiveness of Polish enterprises on the European market in the long term.

Due to the fact more than 90 per cent of electricity in Poland is produced from coal, Poland will have to use the Carbon Capture and Storage in order to reduce CO<sub>2</sub> emissions up to the time when Poland will be able to produce most of its electricity from renewable energy sources.

Therefore it is necessary to work out a „Polish CCS Strategy“ which would result in effective implementation of a technology that may substantially reduce CO<sub>2</sub> emissions in Poland in the 21st century. This Strategy should include the following:

### **Impact assessment of the CCS technology application on a commercial scale**

A report by McKinsey & Company entitled *“Assessment of Greenhouse Gas Emissions Abatement Potential in Poland by 2030”* published in December 2009 showed that CCS has a potential to reduce CO<sub>2</sub> emissions in Poland by 15 per cent to 2030.

The Polish CCS Strategy should have a solid base in the form of a professional and comprehensive impact assessment of the CCS technology applied on commercial scale for the Polish economy, the reduction of CO<sub>2</sub> emissions in Poland, the competitiveness of Polish enterprises, jobs, the natural environment, the standard and quality of life of the Polish society, prices for electricity and the energy security. The assessment should

present at least two scenarios: (1) what happens if CCS is not applied; (2) what happens if CCS is applied including additional variations such as the introduction of a ban on building of new energy blocks without CCS. The impact assessment of the CCS technology can be used to plan actions to minimise the risk related to the introduction of a new policy and to maximise related benefits.

### **Selection of sites for CO2 storage**

Research carried out under the international 6PR CASTOR and 6 PR EU GeoCapacity projects has shown that Poland has a potential to store 92 Gt of carbon dioxide. Additionally, the results achieved under the RECOPOL and MOVECBM projects have shown that the storage of CO2 in deep deposits of coal is doable and – what is more important – safe, as monitoring has not shown any alarming or dangerous changes in the concentration of CO2.

The Polish Geological Institute is implementing a project entitled *„Assessment of formations and structures for safe CO2 geological storage, including monitoring plans”* under which tests will be carried out in 2010 (of CO2 injection and monitoring) in recognised structures for the storage of carbon dioxide captured in the Bełchatów Power Plant. Based on the above results by the end of 2010 it will be possible to precisely assess the potential and security of storage in such structures. Similar tests should be made almost at the same time for other structures identified as potentially safe for CO2 storage.

### **Infrastructure construction plan**

International experience and specific conditions of Poland show a favourable environment for the construction of a network of pipelines for CO2 transportation. Therefore one of key elements of the Polish CCS Strategy should be a CO2 transport network plan which would connect all presently operating and planned power plants with already identified and prospective storage sites of CO2 in the territory of Poland and other EU Member States. The European Union plans to draw up a similar plan for the

whole Community to provide a possibility of cross-border transport of CO<sub>2</sub> and to enhance its competitiveness.

### **Regulatory framework**

The creation of a solid regulatory framework will guarantee safety of the capture, transport, injection and permanent storage of carbon dioxide. Suitable legislation and additional provisions will create a framework for the operation of enterprises which will decide about big investments related to implementation and deployment of the CCS technology.

Understanding the necessity to considerably reduce carbon dioxide emissions in the energy sector, numerous representatives of the Polish, European and world-wide industry are ready to make substantial investments in the innovative CCS technology. In those countries where an appropriate regulatory framework for CCS has already been created, investors are supported by law which gives them a bigger freedom of activity. This makes them able to faster develop more competitive solutions. Entrepreneurs unsure of a future legal order suspend investments in such countries which lack appropriate legal provisions.

### **Financial framework**

The Polish CCS Strategy should include incentives to increase investments in the carbon dioxide capture and geological storage technology and to create an appropriate framework for the financing of measures which have to be taken by public administration and institutions. Large financial investments are necessary both at the phase of the construction of CCS demonstrative plants and in the case of each innovative technology. Part of the costs will have to be borne by the industry itself, the remaining costs will have to be paid by international organizations and states. Organizations and states which care about an efficient development of the CCS technology should first of all provide:

- proceeds for the appraisal of CO<sub>2</sub> storage potential in their territories;
- financing of large-scale demonstrative projects;

- proceeds for the planning of transport infrastructure;
- a system of direct and tax-related incentives to enhance the development and tests of the CCS technology.

In addition to businesses' own resources (mainly credits) for CCS projects, Poland can tap the European Energy Programme for Recovery (EEPR) where EUR 1,050,000.00 has been provided for the CCS technology as well as the European Trading Scheme (ETS) where a share of proceeds from the auctioning of emission allowances will be earmarked to "clean technologies". Also so called New Entrants Reserve (NER 300) where 300 free-emission allowances are to be allocated to RES and CCS can be used. It will be also possible to consume proceeds from structural funds and the Cohesion Fund in a long-time perspective, provided that Poland is a beneficiary of such funds beyond 2013.

It will be necessary to create new financial mechanisms to support first CCS projects and to formulate additional incentives for the industry so that as many CCS blocks as possible will be constructed over the shortest possible time. The provision of suitable funds from the State Budget is also worth considering to balance the gap between the price for the purchase of emission allowances and the price for CO<sub>2</sub> capture so that investors will not generate losses on the introduction of clean coal technologies at the first phase of the technology commercialisation. As time passes, when the price for emission allowances grows (up to EUR 30-40 per tonne), the co-financing with public money will not be necessary and the building of new CCS blocks will become economically viable.

### **Public acceptance**

Informing the public about innovative technologies is a must. Any concerns and social protests can result from a lack of knowledge about new technologies that reduce CO<sub>2</sub> emissions. Building popular trust in Carbon Capture and Storage has to be a part of the long-term Polish CCS Strategy under which it will be necessary to precisely plan various types of information and education campaigns. The campaigns should include such elements as: training sessions for public administration and local self-governments, education at schools and universities, a series of

publications/handouts to answer questions from the public (related mainly to the elimination of threats and risk management), education of managers in the energy sector and the creation of an innovative information portal.

The public will play a major role in the decision-making process about the construction of CO<sub>2</sub> injection, storage and transport infrastructure. Therefore it is important that before the construction of the above starts, the public is well informed about any potential threats, ways how to counteract them, costs, control mechanisms of the transport networks and storage sites, and first of all, about the benefits from the application of the CCS technology in Poland.

## **Research and development**

One of the biggest challenges faced by the teams working on the development of Carbon Capture and Storage is limitation (and in a long-time perspective elimination) of a decrease in power plant efficiency due to the connection to a CCS installation. Development of the CCS technology is a necessary condition for its commercialisation. Today it is estimated that the efficiency of demonstrative plants will decrease by 10 per cent therefore it is necessary to intensify measures to work out more efficient solutions.

The Polish CCS Strategy should guarantee sources of financing for future research projects to improve the CCS technologies. One of the sources should be the 7<sup>th</sup> Framework Programme in the area of research and development for the years 2007-2013 under which EUR 2.35 billion has been allocated to the so called "energy" area. Two thematic blocks have been identified in this area, proceeds from which can be used for the needs of Polish CCS projects such as: "*CO<sub>2</sub> Capture and Storage Technologies for Zero Emission Power Generation*" and "*Clean Coal Technologies*". Also a EU programme on "*Competitiveness and Innovation*" can be used under which EUR 727 million has been allocated to an "energy" component. Funds for research and development investments in the area of low-emission technologies have also been provided under the "*Operational Programme of Infrastructure and the Environment*" and the "*Operational Programme of Innovative Economy*" for the years 2007-2013. A long-term CCS Strategy

should not only improve the absorption of the above funds but also enhance the potential of public and private partnership projects.

### **Cooperation with stakeholders**

With the application of the CCS technology requiring simultaneous actions in various areas, good cooperation of key ministries will be necessary. It is also extremely important to tighten the public administration's relations with key stakeholders representing the world of science, business and non-governmental organisations. To this end, the Polish CCS Strategy should delegate tasks to each ministry and to fix deadlines for their carrying out. Then a network of independent institutes, organisations and companies should be established which have knowledge and skills that can be used in the planning and implementing of the strategy.

### **Actions in the international arena**

The CCS technology is the only solution for many countries to essentially reduce CO<sub>2</sub> emissions in a short and medium-term perspective therefore the international exchange of experience will play an extremely important role. To strengthen the position of Polish institutes and enterprises, the Polish CCS Strategy should include an action plan of the Republic of Poland in the international arena, particularly in such organisations as: the European Union, the United Nations Organization, the Zero Emission Fossil Fuel Power Plant Technology Platform, the International Energy Agency and the Carbon Sequestration Leadership Forum.

Poland should actively engage in the work of the above mentioned institutions and also influence their development directions. Poland should also start close cooperation with the Global Carbon Capture and Storage Institute (GCCSI) whose activity is focused on the deployment of the biggest possible number of large-scale CCS installations.

### **Institution responsible for the implementation of the strategy**

To provide appropriate management of all the above actions, the Polish CCS Strategy should recommend the establishment of a State Treasury company, the National Administrator for Carbon Dioxide Capture, Transport and Storage (KA WTS). The company's structure should allow to successfully achieve the Strategy objectives whose elements should be delegated to separate teams. The teams should be obliged to implement the tasks in a fixed-time period. Every year the company should present two reports: (1) a report on progress in each area listed in the Strategy; (2) a comprehensive report concerning the CCS technology development potential in Poland.

## **Conclusion**

Although known in the world for many years, Carbon Capture and Storage needs to be improved so that its use will help not only to reduce CO<sub>2</sub> emissions and fight global warming but also to develop a new branch of the energy sector, to increase competitiveness of clean coal technologies and to create new 'green' jobs.

All countries in the world face a big challenge, i.e. economic transformation towards low emissions. Poland has an incredible chance to become a leader of the technology which will be one of the most important elements of the transformation. This will require large investments of labour and money but can generate profits in a long-term perspective not only of financial but also prestigious nature. Thanks to the specialisation in clean coal technologies, Poland can strengthen its position in a newly shaped global order and thus have more influence on the life of future generations, i.e. increase the living standards of the Polish, European and world-wide community.

To make the above scenario come true, firm political decisions are needed. The Polish CCS Strategy should be prepared and efficient measures should be undertaken simultaneously in order to:

- make an impact assessment of the CCS technology application,
- select CO<sub>2</sub> storage sites, plan infrastructure construction,
- create a regulatory and financial framework,
- build public acceptance,
- invest into research and development, start close cooperation with key stakeholders,
- take strong actions in the international arena and create a strong institutional framework.

Lack of implementation of these activities may prove to be very risky in terms of Poland's energy security and dependence of external energy supplies. Therefore, it is extremely important (not only in the context of Poland's own interest, but also globally) to make an effort and establish Carbon Capture and Storage as one of the most important Polish flagship projects.

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