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Legal possibilities of carbon capture and storage in Poland

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Problems with CCS

An obvious and widening discrepancy appears between the major aims of the climate policy of the European Union and situation of countries such as Poland, which, to the broad extent, take advantage of their domestic coal resources within their energy mix. The vicious circle connected with energy basket dominated by that resource consists in the fact that the more the coal is being relied on (and, at the same time, the more the energy security of a given country is increased – as even in case of insufficient domestic resources, coal is relatively cheap and can be purchased elsewhere), the biggest problem there appears with regard to compliance with targets of greenhouse gases emissions reductions. Assuming that the price for an emission quota attained 20 euro, the cost of production of energy from coal would double[1]. The aforementioned targets get more and more acute as the European Union policy in this respect, deliberately overlooking the impression which is hard to escape – that instead of being a global leader, it becomes the only one standing with regard to imposition of binding standards of reductions. The situation seems worse when we perceive the major weakness of the European Union – namely, the deepening dependence on import of energy resources jointly with the fact that the primary fossil fuels seem to be found in countries which due to various reasons are not of the desired level of credibility[2]. The European Union itself seems almost entirely deprived of significant energy sources, therefore, a policy which turns against coal unavoidably diminishes level of energy security not only of some countries, but of the European Union as a whole. There should be taken into account that according to estimations of the International Energy Agency, up to 2020 import needs of the European Union within the scope of natural gas will increase by 10-30%, depending on the adopted scenario[3]. According to the communica-

[1] D. Michalski, *Rynek emisji instrumentem walki ze zmianami klimatu*, Wspólnoty Europejskie, 3/2008, p. 38.

[2] T. Karásek, *EU Energy Policy, eastern enlargement and the concept of securitization* [in:] T. Karásek (ed.), *European Union in a New Security Environment*, Prague 2008, *passim*.

[3] J. Krzak, *Zaopatrzenie w gaz ziemny. Europa, Polska –*

tion of the European Commission on European energy policy[4], the level of dependence of the European Union on import of hydrocarbons will deepen, so that up to 2030 the dependence of the European Union on import of energy resources shall increase from the present level of 50% (which is already disturbing) up to 65%, within which the dependence on imported gas will rise from 57% to 84% and dependence on imported oil from 82% to 93%. All of these side effects are tolerated for the sake of climate policy, whose environmental basis is disputable (in particular as far as the anthropogenic influence on climate is concerned), not to mention obvious economic inefficiency of introduced legal regulations (entailing huge costs for the economy, *inter alia* competitive character of enterprises from the European Union, whereas producing very modest reduction effects – as V. Termini notices, even full achievement of emission reduction targets adopted in the climate and energy package up to 2020 will lead to feeble effects, estimated to amount to less than 4% worldwide greenhouse gases emissions[5]). Moreover, if we exclude coal from the equation, there seems to be no alternatives to growing dependence on imported fossil fuels, as nuclear energy gained a bad fame after Fukushima disaster and renewable energy sources are not able to replace gas, oil and coal, but only to supplement them. Achievement of the current goal of 20% share of energy from renewable sources at the level of European Union as a whole, up to 2020, is being implemented with a considerable difficulty, not to mention higher thresholds contemplated for longer time perspective.

Therefore, it seems that there actually is a necessity for an instrument that would balance these two considerations: drive for reduction of greenhouse gases and need to use coal as a source of energy. The response from the legislator at the level of the European Union consisted in CCS (Carbon Capture & Storage) technology. CCS is recommended by those who perceive use of conventional fuels as inevitable[6]. As the recital 4 of the directive on the geological storage of carbon dioxide[7] expressly states: *Carbon dioxide capture and geological storage (CCS) is a bridging technology that will contribute to mitigating climate change. It consists of the capture of carbon dioxide (CO_2) from industrial installations, its transport to a storage site and its injection into a suitable underground geological formation for the purposes of permanent storage.* The gas resulting from combustion of fossil fuels in electricity or electricity and heating plants contains up to 16% of CO_2[8], therefore, it could be technologically separated, captured and stored to avoid its emission which is perceived to be detrimental for the climate.

The idea is not entirely new. CCS is mainly used in the United States for the purpose of intensification of exploitation of oil fields – which allows for increase of use of resources by approximately 30%[9]. Experiences drawn from technology of enhanced oil recovery may not, however, be directly transferred to activity aimed at geological capture and storage of carbon dioxide. First and foremost, the actions of oil industry are of short-term character (10-13 years), whereas within CCS carbon dioxide should be stored for hundreds or even thousands years. Secondly, much bigger amounts of CO_2 than in case of enhanced oil recovery should be stored. Furthermore, whereas capacities and features of gas and oil layers are well recognized, other places where CO_2 could be stored are not[10]. Use of carbon dioxide for the purposes of enhanced oil recovery is also considered in Europe, to intensify exploitation of oil with regard to North Sea depleting resources. *While the potential for EOR is lower in Europe than in the USA, companies are showing increasing interest in North Sea opportunities. The large volumes of CO_2 required for EOR may be unavailable from a single plant, so a cluster of CO_2 producers will be needed, which in turn requires an infrastructure*

problemy dywersyfikacji [in:] M. Sobolewski (ed.), *Polityka energetyczna,* Warszawa 2010, p. 144-145.

[4] Communication from the Commission to the European Council and the European Parliament 'An Energy Policy For Europe', 10.01.2007, COM/2007/0001 final version.

[5] V. Termini, *Energy and European Institutions* [in:] S. Micossi, G.L. Tosato (eds.), *The European Union in the 21st century: perspectives from the Lisbon Treaty*, Brussels 2009, p. 116.

[6] C. Redgwell, *International Legal Responses to the Challenges of a Lower-Carbon Future: Climate Change, Carbon Capture and Storage, and Biofuels* [in:] D. N. Zillman, C. Redgwell, Y.O. Omorogbe, L.K. Barrera-Hernández (eds.), *Beyond The Carbon Economy: Energy Law in Transition*, Oxford 2008, p. 86.

[7] Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006, OJ L 140, 5.6.2009, p. 114, hereinafter referred to as 'CCS directive'.

[8] R. Tarkowski, *Geologiczna sekwestracja CO_2,* Kraków 2005, p. 25.

[9] E. Gąsiorowska, *Technologia CCS – szansa czy ślepa uliczka?* [in:] M. Sobolewski (ed.), *Polityka energetyczna*, Warszawa 2010, p. 232.

[10] R. Tarkowski, *Geologiczna sekwestracja CO_2,* Kraków 2005, p. 49.

to transport CO_2 from various emitters to receptors. It is accepted that the use of CO_2-EOR, coupled with carbon storage, is needed in the UK North Sea as many oil fields are already off plateau and in terminal decline. The method is technically feasible, but it is economically uncertain, especially offshore[11]. However, as it was noticed in the communication by the Commission on future of CCS technology[12], the potential of enhanced oil recovery in Europe is limited due to unfavorable geology which actually strongly limits the chances described by the Commission: *Enhanced oil (and in some cases gas) gas recovery is on the other hand able to store significant amounts of CO_2, while at the same time increasing oil production by on average 13%, which has a significant economic value. Moreover, oil and gas reservoirs are prime candidates for CO_2 storage for several reasons. First, the oil and gas that originally accumulated in traps did not escape, demonstrating the safety and reliability of such storage sites, provided that their structural integrity was not compromised as a result of exploration and extraction processes. Second, the geological structure and physical properties of most oil and gas fields have been extensively studied and characterized. Third, existing fields geology and characteristics are well known to the oil and gas industry to predict the movement, displacement behaviour and trapping of gases and liquids.* Another problem is technological aspect of introducing CCS into existing oil fields. As the European Parliament pesimistically noticed in its resolution concerning Carbon Capture & Storage[13]: *with only one project still being considered for NER300 funding and European Energy Programme for Recovery projects having been terminated or suspended — now has no effective policy to promote development of CCS flagship projects.*

As already mentioned, enhanced oil recovery through injection of carbon dioxide is nevertheless a different action than storage of carbon dioxide in order to prevent climate change. That is why currently CCS is in developmental stage. After the end of that stage (which is anticipated to take place around 2020), that development will be dependent primarily on the relation between prices of quotas of emission and costs of introduction of CCS technology[14]. It is worth mentioning that first attempts of use of CCS technology in electricity plan in Bełchatów resulted in drop of effectiveness of electricity generation by one third[15]. That factor seems well understood by the European legislator who has incrementally widened and sharpened the European Union Emissions Trading Scheme, *inter alia* by introduction of market stability reserve[16], which is destined to diminish the amount of emission quotas available on the market, or, as the latest actions to significantly reduce financing for coal-based electric power plants (including the decision of the European Investment Bank to prohibit lending for the construction of coal power plants that would emit more than 550 g CO2/kWh) suggests, introduction of significant restrictions of financing of coal-based electric power plants. Still, at present, when a quota allowing for emission of 1 ton of CO_2 is sold in consideration for a few euros, actually there does not exist any economic factor at all to apply CCS technology at a larger scale, apart from ideological assumptions which are far from being effective and convincing for private enterprises. That conclusion is drawn by the Commission, which in the already mentioned communication on future of CCS pointed out the following: *Today, with carbon prices closer to €5, and revenues from the NER300 significantly below initial expectations, it is clear that no rationale exists for economic operators to invest in demonstration CCS, as the additional investment and operational costs are not covered by the revenue accrued from the reduced emissions, through having to buy considerably fewer ETS allowances* (…) *In the absence of a policy strategy that makes CCS commercially viable or made mandatory, industry is likely to not to engage in large scale CCS.* Alas, at present there are no solutions to the financial problem that are likely to be enshrined by the

[11] B. Harrison, G. Falcone, *Carbon capture and seqestration versus carbon capture utilization and storage for enhanced oil recovery*, Acta Geotechnica, 9/2014, p. 30.

[12] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Future of Carbon Capture and Storage in Europe, 27.03.2013, COM (2013) 180 final.

[13] European Parliament resolution of 14 January 2014 on implementation report 2013: developing and applying carbon capture and storage technology in Europe (2013/2079(INI), (2016/C 482/02).

[14] W. Manteuffel, *Znaczenie pakietu klimatyczno-energetycznego dla rozwoju technologii w energetyce* [in:] G. Wojtkowska-Łodej (ed.), *Zmiany europejskiej polityki klimatycznej i energetycznej – konsekwencje dla polskiej gospodarki*, Warszawa 2009, s. 106.

[15] P. Bożyk, *Modele i scenariusze bezpieczeństwa energetycznego* [in:] P. Bożyk (ed.), *Bezpieczeństwo energetyczne Polski w ujęciu autonomicznym i zintegrowanym z Unią Europejską*, Warszawa 2013, p. 35.

[16] Decision (EU) 2015/1814 of the European Parliament and of the Council of 6 October 2015 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and amending Directive 2003/87/EC, OJ L 264, 9.10.2015, p. 1.

majority of the Member States. The European Commission invokes partial financing (approximately 50%) by NER300 programme, but the remaining amounts would have to be provided *by contributions of either the private sector or through public funding* so it does not solve the problem. Another idea consists in mandatory CCS certificate scheme that *could require carbon emitters (above a certain size) or suppliers of fossil fuels to buy CCS certificates equivalent to certain amount of their emissions or embedded emissions (in case the commitment is placed on the fossil fuel suppliers). Certificates could be given to the oil and gas industry, ensuring that the knowledge already contained in these sectors regarding geology and field expertise is contributing to identifying the best suited storage sites, including the possibility for enhanced oil and gas recovery, in so far as this ensures permanent CO_2 storage*. However, any mandatory solution similar to a former carbon tax concept certainly will not be easily accepted by the Member States, even if it is true what the European Parliament pointed out in the already mentioned resolution, i.e. that *without the financial support to develop CCS, the introduction of stringent emissions performance standards will be essential*. Financial question is one of factors that introduce a differentiation when juxtaposing CCS to promotion of renewable energy sources. As some authors point out: *While renewable energy policies are always a feasible (but sometimes more expensive) second-best policy in case of missing carbon prices, CCS policies cannot always guarantee to achieve ambitious mitigation targets: underground storage capacity, capture rates and the politically targeted carbon budget have to be sufficiently high and carbon leakage sufficiently low*[17]. In doctrine, the connection between use of CCS technology and use of renewable sources of energy was noticed[18].

Moreover, the technology itself is encumbered with many concerns not only derived from economic efficiency model, but – which is a paradox – especially of environmental nature. Naturally, it should be emphasized that all forms of energy have negative influence on sustainable development values[19]. As T. Lauriol wrote, the only form of energy that does not pollute the environment, is the one which is not produced[20]. However, the problem is worse when the method conceived to eliminate (or at least significantly mitigate) environmental concerns actually adds another, even more serious concerns of such nature. There are assumptions that after a long term like a few hundred years, CO_2 will not migrate towards surface, but will dissolve or enter into reaction with minerals and create a rock matrix[21]. However, there are also many fears based on potentially dangerous impact of concentrated carbon dioxide and harms that may be sustained by the environment due to leakage of stored CO_2. As it was noted by the doctrine: *Higher concentrations and long-term exposure to elevated CO_2 levels can be hazardous (CO_2 acts as an asphyxiant in the range of 7–10 per cent) and there are also hazards associated with handling CO_2 under pressure. Release of concentrated amounts of CO_2 may pose risks since CO_2 is denser than air and tends to accumulate in low-lying areas*[22]. Moreover, the authors also draw the attention to the following risk: *Combined with water CO_2 may form carbonic acid which may cause corrosion in pipelines (standard practice is to dehydrate CO_2 gas streams) and may degrade cement plugs used in well abandonments; possible risks associated with surface release include suffocation of humans or animals and ecosystem impacts such as damage to tree or grass root systems. Release of CO_2 in the subsurface may result in metal mobilization or changes to groundwater chemistry. Quantity-based risks include ground heave, induced seismicity, displacement of groundwater resources, and damage to hydrocarbon production*[23]. The aforementioned environmental concerns did not remain without impact on the substance on the relevant directive, which, preceding the more detailed considerations led afterwards in this article, are significantly discouraging for potential entrepreneurs to deal with

[17] M. Kalkuhl, O. Edenhofer, K. Lessmann, *The Role of Carbon Capture and Sequestration Policies for Climate Change Mitigation*, Environmental and Resource Economics 2015, no. 60, p. 75.

[18] T. Cockerill, *Carbon Capture and Storage Technologies – An Overview and Some Key Issues* [in:] K.E. Makuch, R. Pereira (eds.), *Environmental and Energy Law*, Oxford 2012, p. 263-264.

[19] G. Pring, A.S. Haas, B.T. Drinkwine, *The Impact of Energy on Health, Environment,and Sustainable Development: The TANSTAAFL Problem* [in:] D. N. Zillman, C. Redgwell, Y.O. Omorogbe, L.K. Barrera-Hernández (eds.), *Beyond The Carbon Economy: Energy Law in Transition*, Oxford 2008, p. 37.

[20] T. Lauriol, *Energy Law in France* (in:) M. Roggenkamp, C. Redgwell, A. Rønne, I. del Guayo, *Energy Law in Europe. National, EU and International Regulation*, Oxford 2007.

[21] R. Tarkowski, *Geologiczna sekwestracja CO_2*, Kraków 2005, p. 66.

[22] N. Bankes, M. Roggenkamp, *Legal Aspects of Carbon Capture and Storage* [in:] D. N. Zillman, C. Redgwell, Y.O. Omorogbe, L.K. Barrera-Hernández (eds.), *Beyond The Carbon Economy: Energy Law in Transition*, Oxford 2008, p. 348.

[23] N. Bankes, M. Roggenkamp, *Legal Aspects of Carbon Capture and Storage* [in:] D. N. Zillman, C. Redgwell, Y.O. Omorogbe, L.K. Barrera-Hernández (eds.), *Beyond The Carbon Economy: Energy Law in Transition*, Oxford 2008, p. 349.

CCS technology. Furthermore, they leave a wide leeway for the Member States as the extent of utilization of that technology is concerned, as well as the question whether to use CCS at all. As recital 19 of CCS directive stipulates: *Member States should retain the right to determine the areas within their territory from which storage sites may be selected. This includes the right of Member States not to allow any storage in parts or on the whole of their territory, or to give priority to any other use of the underground, such as exploration, production and storage of hydrocarbons or geothermal use of aquifers. In this context, Member States should in particular give due consideration to other energy-related options for the use of a potential storage site, including options which are strategic for the security of the Member State's energy supply or for the development of renewable sources of energy.* Therefore, the directive presents so-called precautionary approach, which some authors indicate as leading to the state of regulatory and financial uncertainty in Member States of the European Union with regard to application of CCS technology[24]. But we also have a third factor, apart from economic and environmental concerns, that hampers proliferation of Carbon Capture & Storage. Namely, CCS policies rely on favorable physical and technological conditions[25]. It is of vital importance to choose adequate place for safe storage of carbon dioxide, so as to minimize the risk of dangerous leakages, and that has to be done bearing in mind the eternal period of storage. As for such a long perspective there is a lack of experience, that task is enormously hard. Not to mention burdens connected with handling the site of storage of CO_2. Also, taking into account transportation issues, installations emitting carbon dioxide should be placed in proximity of such CCS sites. As it was proposed in the aforementioned communication on the future of CCS, to ensure such proximity, *it has been suggested to require new installations to be "CCS ready", which could avoid further „locking in" of CO_2 emissions from new installations*. Some reflections of that attitude are visible both at the level of the relevant directive as well as Polish implementation thereof, although there are far from stipulating such a strict requirement. Last, but not least – the directive presents quite an extraordinary approach, first elaborating on the developmental phase, and then suggesting that CCS technology should be treated as an ancillary and temporary solution. Recital 4 of the directive *in fine* expressly states that CCS *should not serve as an incentive to increase the share of fossil fuel power plants. Its development should not lead to a reduction of efforts to support energy saving policies, renewable energies and other safe and sustainable low carbon technologies, both in research and financial terms.* The same approach is visible in the above-mentioned resolution of the European Parliament which believes *that although CCS might offer part of the solution to reach the goals for limiting greenhouse gas emissions, it would be even better if the Member States could reach these goals without the use of CCS*. Logically, many entities, both public and private ones, will ask: why should we engage in providing encouraging legal framework (in case of public entities), or pursuing the activity encompassing utilization of CCS (in case of private entities) that is costly, environmentally uncertain and imposes heavy burdens on operators, while we know nothing about it and it is not worth efforts to learn as it is to be temporary and will not relieve us from decarbonization? Whether there exists a satisfactory answer to such question or not, shall be the subject of next parts of the present article.

Regulation of use of CCS technology at the level of European Union law

While the directive leaves great discretion for the Member States whether to use CCS, use it only within the limited scope or not to use it at all, as well as leaves open the question of financing, from the point a given Member State wishes to allow for CCS activity, significant amount of normative substance delivered by the directive has to be implemented into the national legal order. That may be another rather discouraging factor with regard to pursuing CCS technology. However, onerous as it is, such a shape of the directive is based on a precautionary approach, or more precisely, precautionary principle. It has to be noted that controversies around proper interpretation of that principle enshrined in article 191 section 2 of the Treaty on the Functioning of the European Union[26] pertain to all crucial elements of the principle in question, i.e. 1) the level of scientific

[24] Z.A. Makuch, S.Z. Georgieva, B. Oraee-Mirzamani, *Carbon Capture and Storage Liability* [in:] K.E. Makuch, R. Pereira (eds.), *Environmental and Energy Law*, Oxford 2012, p. 287.

[25] M. Kalkuhl, O. Edenhofer, K. Lessmann, *The Role of Carbon Capture and Sequestration Policies for Climate Change Mitigation*, Environmental and Resource Economics 2015, no. 60, p. 76.

[26] Treaty on the Functioning of the European Union, OJ C 83 of 30.03.2010, p. 47.

certainty that launches use of that principle – starting from the lack of full scientific certainty, thus, the state in which the adequate causal link between an activity and negative effects for the environment is almost certain, through justified character of suspicions relating to existence of such links, to suppositions within the scope of potential effects; 2) significance of negative effects justifying launch of the precautionary principle – from a reservation of serious character of damages to lack of such a reservation, and, last but not least 3) character of actions that the precautionary principle entails – from effective preventive measures to injunction of full resignation of taking up the investment. In my opinion, the precautionary principle should be applied in case of lack of full scientific certainty as to the risk of arising of serious damage, which would entail the necessity to implement effective preventive measures, without imposing a ban on a given activity[27]. In case of Carbon Capture & Storage, the environmental risk seems serious but uncertain as to the probability of occurrence, as well as nature and scope of negative consequences. Therefore, a field for application of the precautionary principle seems to appear there. The problem with practical implementation of the principle in question with regard to provisions of the directive concerning CCS is that the European legislator places onerous tasks on entrepreneurs who would like to occupy with Carbon Capture & Storing activity, thereby shifting the burden of the precautionary principle entirely upon them, without actually giving anything in reward. To make matters even less favorable, as recital 33 of the directive expressly states, the liability *for the storage site, including specific legal obligations, should be transferred to the competent authority,* ***if and when all available evidence indicates that the stored CO_2 will be completely and permanently contained***. Therefore, the duties of the operator of storage site may last for several dozens of years.

What is the scope of such duties? The operator has to present a financial security to cover a wide range of occurrences, like performance of closure and post-closure obligations, taking of corrective measures in case of leakages or significant irregularities, performance of obligations with regard to emission quotas in case of a leakage. The latter is perceived by the European Parliament with concern, as according to its standpoint, the obligation to cover emissions of greenhouse gases resulting from a leakage with emission quotas is too heavy burden for operators. The financial security shall be valid, in general, until the responsibility for the storage site is transferred to the competent authority. Moreover, there is also a financial contribution to be made by the operator. There is a wide array of circumstances in which the financial means may be withdrawn from such contribution. It is worth noting that such provisions contribute to increase of costs of use of Carbon Capture & Storage, so that it is discouraging not only for entities willing to perform the function of the operator of CCS storage site, but also for entities that would be the clients thereof, unless use of CCS will be made mandatory at some point in the future or the price for emission quotas will dramatically rise. The financial contribution to be made by the operator has to *cover at least the anticipated cost of monitoring for a period of 30 years. This financial contribution may be used to cover the costs borne by the competent authority after the transfer of responsibility to ensure that the CO_2 is completely and permanently contained in geological storage sites after the transfer of responsibility* (article 20 section 1 of CCS directive). The amount is to be determined by the Member States, however, from the regulations of the directive a conclusion may be drawn that the amount of such financial contribution will be significant.

The operator has also to perform detailed monitoring and reporting to relevant domestic authorities. As article 14 of the CCS directive states: *At a frequency to be determined by the competent authority, and in any event at least once a year, the operator shall submit to the competent authority: 1. all results of the monitoring pursuant to Article 13 in the reporting period, including information on the monitoring technology employed; 2. the quantities and properties of the CO_2 streams delivered and injected, including composition of those streams, in the reporting period, registered pursuant to Article 12(3)(b); 3. proof of the putting in place and maintenance of the financial security pursuant to Article 19 and Article 9(9); 4. any other information the competent authority considers relevant for the purposes of assessing compliance with storage permit conditions and increasing the knowledge of CO_2 behaviour in the storage site.* Of course, the operator has to take planned corrective and preventive measures, but also, in case of leakages or significant irregularities, *the competent authority may at any time require the operator to take the necessary corrective measures, as well as measures related to the protection of human health. These*

[27] More about the precautionary principle may be found at I. Przybojewska, *Znaczenie transeuropejskich sieci energetycznych dla zapewnienia bezpieczeństwa energetycznego*, Warszawa 2017, p. 300–326, jointly with the literaturę invoked therein.

may be additional to or different from those laid out in the corrective measures plan. The competent authority may also at any time take corrective measures itself (article 16 section 3 of CCS directive). After closure of a storage site, the operator remains liable for all the duties connected with the site, in particular for *monitoring, reporting and corrective measures, pursuant to the requirements laid down in this Directive, and for all obligations relating to the surrender of allowances in case of leakages pursuant to Directive 2003/87/EC and preventive and remedial actions pursuant to Articles 5 to 8 of Directive 2004/35/EC* [directive regulating responsibility for damage in the environment[28]] *until the responsibility for the storage site is transferred to the competent authority* (article 17 section 2 of CCS directive).

Conditions for transfer of responsibility (which actually constitutes conditional release from responsibility of an operator) are exhaustively mentioned in article 18 of CCS directive. They encompass cumulative fulfilment of the following premises: *(a)* ***all available evidence indicates that the stored CO_2 will be completely and permanently contained****; (b) a minimum period, to be determined by the competent authority has elapsed. This minimum period shall be* ***no shorter than 20 years, unless the competent authority is convinced that the criterion referred to in point (a) is complied with before the end of that period****; (c) the financial obligations referred to in Article 20 have been fulfilled; (d) the site has been sealed and the injection facilities have been removed*. As it can easily be noticed, the directive sets forth lengthy period after closure of a storage site to lapse before the operator may apply for transfer of responsibility, which is clearly disadvantageous for such entity. Moreover, the first condition, namely that referring to *all available evidence* which *indicates that the stored CO_2 will be completely and permanently contained* is vague and ambiguous, in particular bearing in mind lack of experience in this regard. It seems to be paying lip service to the precautionary principle, since it is hard to be implemented in practice in such a way not to jeopardize observance of that principle. Nobody knows actually how the notion of *all available evidence* shall be construed here and what would be deemed sufficient.

The transfer of responsibility does indeed, in the majority of cases, release an operator of a storage site from responsibility, however, as article 18 section 7 of the directive expressly states: *In cases where there has been fault on the part of the operator, including cases of deficient data, concealment of relevant information, negligence, wilful deceit or a failure to exercise due diligence, the competent authority shall recover from the former operator the costs incurred after the transfer of responsibility has taken place.* Even the transfer of responsibility does not end obligations with regard to monitoring of the storage site, which seem to last literally for eternity (but at least they no longer encumber the operator). As recital 35 of CCS directive reads: *After the transfer of responsibility, monitoring should be reduced to a level which still allows for identification of leakages or significant irregularities, but should again be intensified if leakages or significant irregularities are identified*.

Another issue announced by CCS directive is the question of assessment, for new large combustion plants, the readiness to provide for a CCS storage site. As recital 47 of the directive reads, the respective regulations should *require that all combustion plants of a specified capacity, for which the original construction licence or the original operating licence is granted after the entry into force of this Directive,* ***have suitable space on the installation site for the equipment necessary to capture and compress CO_2 if suitable storage sites are available, and if CO_2 transport and retrofitting for CO_2 capture are technically and economically feasible****. The economic feasibility of the transport and retrofitting should be assessed taking into account the anticipated costs of avoided CO_2 for the particular local conditions in the case of retrofitting and the anticipated costs of CO_2 allowances in the Community.* That is actually the only element of CCS directive that shall be implemented into domestic legal orders of the Member States which choose not to allow for CCS activity within their territories. Nevertheless, apart from the obligation to prepare 'CCS-ready assessment', the aforementioned requirement does not bring about a necessity of actual construction of Carbon & Capture infrastructure. By the way, as already mentioned, the perspectives for geological storage of CO_2 in Europe are poor, so if CCS were mandatory, construction of transportation infrastructure from plants to storage sites would be of crucial importance.

That is why among infrastructural projects of common interests, taking advantage of support of the European Union, carbon dioxide transport projects are introduced (article 4 of regulation on guidelines for trans-European energy infrastructure[29]). Specific crite-

[28] Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage, OJ L 143, 30.4.2004, p. 56.

[29] Regulation (EU) No 347/2013 of the European Parlia-

ria for such projects are as follows: *(i) the avoidance of carbon dioxide emissions while maintaining security of energy supply; (ii) increasing the resilience and security of carbon dioxide transport; (iii) the efficient use of resources, by enabling the connection of multiple carbon dioxide sources and storage sites via common infrastructure and minimising environmental burden and risks.*

From the considerations made hereinabove, there results a conclusion that CCS directive is stuck somewhere in between the interest of 'traditional' environment (other than climate), embodied by the precautionary principle, and the willingness to provide for another measure in pursuit of greenhouse gases emissions reductions. The outcome is that actually no interest is properly safeguarded, because even strict abiding by provisions of CCS directive may not be able to ensure with desired probability that no harm will be done to the environment due to Carbon Capture & Storage whereas, on the other hand, no incentive is assured for public and private entities wishing to allow for or engage in use of CCS technology.

Regulation of use of CCS technology at the level of Polish law

Polish legislator shares rather negative approach with regard to Carbon Capture & Storage; therefore, possibilities to employ CCS in Poland are very limited. At first glance, it may seem surprising, taking into account Polish energy mix. However, lack of certainty of Polish legislator as to the actual results of utilization of CCS technology is easy to perceive; moreover, still, at present the climate policy is not sharp enough to convince anybody to such a risky and expensive mechanism as CCS, even if somewhere coal constitutes the basic energy resource. Since ideological standpoint being the cornerstone of the climate policy of the European Union is not shared by domestic authorities, it was chosen to approach the question with noticeable caution and aloofness, similar in significant part of Member States.

That is why only CCS for demonstration purposes is decided to be allowed in the territory of Poland, and even that form of activity is encumbered with significant limitations. First and foremost, the area in which Carbon Capture & Storage is allowed makes taking advantage of such possibility technologically difficult and more expensive than in case of 'standard' CCS. According to the Regulation on areas in which localization of sites of geological storage of carbon dioxide is allowed[30], the only available place in this respect is Cambrian reservoir within exclusive economic zone of the Republic of Poland, within the scope of exploited geological layers of hydrocarbons jointly with surroundings. It means that only offshore CCS for demonstration purposes is allowed. Moreover, possibility of starting CCS activity even offshore is made conditional upon lack of dangers to public security, health and life of people as well as the environment (article 127a section 1 of Geological and mining law). If any entity is not sufficiently discouraged by that circumstance, it has to accept numerous and onerous duties Polish geological and mining law[31] imposes thereupon, directed by regulations at the level of the European Union.

Namely, geological storage of carbon dioxide requires concession which is granted for a period that takes into account the duty to maintain monitoring of the site after closure for a period not shorter than 20 years (article 21 section 4a of Geological and mining law). Naturally, geological storage of carbon dioxide is deemed to be an activity that may always significantly influence the environment[32], thus, requiring environmental assessment to be performed. Duties connected with monitoring and reporting are generally the same as in CCS directive. An interesting element is that the entity wishing to obtain the aforementioned concession has to indicate in the application proposed form and amount of security for performance of various duties connected with the site (article 27a section 1 point 8) of Geological and mining law). Thus, Polish legislator partially passes the question of financial security to a potential operator of site of geological storage of carbon dioxide. Enclosed to the application there should be also geological storage site development plan that

ment and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009 OJ L 115 25.4.2013, p. 39.

[30] Regulation of the Minister of the Environment of 3 September 2014 on areas in which localization of sites of geological storage of carbon dioxide is allowed, OJ 2014, item 1272.

[31] The Act of 9 June 2011 – Geological and mining law, uniform text OJ 2016, item 1131, with further amendments. CCS directive was implemented to Polish legal order by the Act of 27 September 2013 on amendment of the act – Geological and mining law and some other acts, OJ 2013, item 1238.

[32] Regulation of the Council of Ministers of 25 June 2013 amending the regulation on activities that may significantly influence the environment, OJ 2013, item 817.

comprises in particular plan of monitoring, plan of remedial actions and temporary plan of actions after closure of CCS site. Detailed requirements as to contents of these plans are referred to in the relevant regulation of the Minister of the Environment[33]. As for the financial security, its creation will safeguard performance of obligations connected with exploitation of geological storage site, as well as liquidation of a mining plant. The former is created, as provisions of Geological and mining law state, in order to satisfy conditions determined in the concession for geological storage of carbon dioxide, including covering costs of monitoring of site, costs of preventive and remedial actions as well as costs of settlement of emission in case of leakage and costs of compensations for damages that manifested itself up to closure of the site. The latter serves as a fund for covering expenses that occurred after closure, i.e. costs of removal of installations and infrastructure, costs of monitoring of a site within the period between closure and the lapse of at least 20 years, costs of preventive and remedial actions, costs of settlement of emission in case of leakage as well as costs of compensation for damages that manifested itself after closure of the site. Furthermore, having been awarded with concession, an entrepreneur must create also so-called 'security of means' which is destined for financing of performance of tasks of the national administrator of storage sites of carbon dioxide, *inter alia* related to monitoring of the site for a period not shorter than 30 years, as well as all other aforementioned costs, if they appear after the transfer of responsibility for the site to the administrator in question. There is quite a wide array of possible forms of financial security or 'security of means' – i.e. pecuniary means, bank guarantee, insurance guarantee and/ /or contract of insurance of civil liability. Nonetheless, the entrepreneur should make a proposition, but finally the form is determined by the body issuing concession. Securities shall be maintained (and supplemented from time to time) for the entire period of binding force of a concession. Detailed requirements as to securities are set forth in the relevant regulation of the Minister of the Environment[34]. As article 28d section 1 of Geological and mining law stipulates, the financial security related to obligations connected with exploitation of geological storage site, as well as liquidation of a mining plant is released within the period of two months after issuance of decision on transfer of liability.

Provisions of Polish geological and mining law to the great extent limit the possibility to pursue Carbon Capture & Storage. From my point of view, they are far better in safeguarding implementation of the precautionary principle. The balance between that principle and achievement of targets imposed with regard to greenhouse gases emissions reduction is not maintained, in favor of the precautionary principle, but definitely to the disadvantage of entities interested in application of CCS technology. Whether the choice is the right one, depends upon the opinion one may have about the shape of the European Union climate policy and its scientific basis, however, from perspective of economic analysis, it is not worth to sacrifice one crucial value for the sake of getting almost nothing instead. It should not be overlooked that the primary goal of climate policy of the European Union does not consist in attaining some theoretical percentage of reduction of emitted greenhouse gases, but actually in mitigation of climate change. Well, it is highly dubious whether a few percent less in worldwide emissions will actually influence climate.

Conclusion

Provisions of CCS directive also provide a good example of an answer to a question what may happen if the legislator hesitates between two values not necessarily in compliance with each other and gets trapped by ideology. Any of the values in question is not adequately safeguarded, although the rhetoric of CCS directive claims to the contrary. That is an instance indicating that sometimes, in presence of divergent values, there is no real possibility to apply integration of both of them – and the choice has to be made.

[33] Regulation of the Minister of the Environment of 8 May 2014 on detailed requirements that should be satisfied by the geological storage site development plan, OJ 2014, item 591.

[34] Regulation of the Minister of the Environment of 30 October 2015 on financial security and security of means related to geological storage of carbon dioxide, OJ 2015, item 2144.

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