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Axel Preusse

Mine Gas Initiative NRW, Institute for Mine Surveying, Aachen University

Joerg Kraemer

Mine Gas Initiative NRW, Institute for Mine Surveying, Aachen University

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MINE GAS INITIATIVE NORTH RHINE-WESTPHALIA – PART OF ENERGY.AGENCY.NRW PLATFORM FOR ECONOMY, ENGINEERING AND RESEARCH

Axel Preusse¹ and Joerg Kraemer¹

ABSTRACT: An overview of the Mine Gas Initiative NRW, part of the EnergyAgency.NRW in North Rhine-Westphalia (NRW), Germany, is presented. It covers the role of the initiative in areas relating to energy production from mine gas, enhancement of mine security through utilisation of mine gas and enforcement of climate protection by avoiding methane emissions into the atmosphere. Achieved objectives and future developments will be presented.

INTRODUCTION

Motivation: In an effort to utilize methane is based on mainly three reasons. Firstly, methane is an energy source comparable to natural gas, with an energy content of 13.0 kWh per kg. Secondly, methane remains a safety risk, especially to underground coal mining. And thirdly, methane is 21 times more harmful to the climate than CO₂, which makes its utilization a priority for environmental protection. Additionally, profits can be generated from certificates according to the Clean Development Mechanisms of the Kyoto-Protocol.

EnergyAgency.NRW: Since 2007, the EnergyAgency.NRW (in German: EnergieAgentur.NRW) is the joint umbrella organisation of the former NRW Energy Agency and the NRW State Initiative On Future Energies. This merger has created a strategic platform with wide-ranging competence in the energy domain from research funding, technical development, demonstration and market launch to energy consultancy and continuous vocational training.

The EnergyAgency.NRW offers companies in North Rhine-Westphalia, by means of competence networks, platforms for strategic alliances. Furthermore, energy consultancy services are provided in the form of administrative and contract services as well as information and training services for specialists and private households. The agency also present seminars to people using electric and electronic devices and facilities raising awareness of potential savings from the rational use of energy.

In the field of renewable energies great efforts are made to advance technological innovations and to forge ahead with knowledge between science and industry. Companies from NRW are supported in specific matters relating to foreign trade. Overall EnergyAgency.NRW acts as a central contact point for all matters related to the subject energy.

Clean Development Mechanisms: Given the global warming potential of methane is about 21 times greater than carbon dioxide, the mechanisms of the Kyoto-Protocol gain increasing importance concerning the utilization of mine gas. Especially in countries that do not have a supporting framework like the Renewable-Energy-Law in Germany (in German: Erneuerbare-Energien-Gesetz, EEG), the economical realization of mine gas projects can be made possible by additionally gaining revenue from emission trading.

CLASSIFICATION OF COAL BOUND METHANE

Common definitions in Germany divide coal bound methane into two main groups (Figure 1). The first group – Coal Mine Methane (CMM) – describes methane in combination with mining activities – current as well as past. To further specify different types of origin, other terms are common. Coal Seam Methane (CSM) describes methane in active coal mines. To provide safety for the workers, some of this gas is extracted prior to mining and by ventilation during mining operations. The methane extracted from the mine may be utilized on site. The gas from mine ventilation, known as Ventilation Air Methane (VAM), is considered too dilute for utilization. The term Abandoned Mine Methane (AMM) describes gas

¹ Mine Gas Initiative NRW, Institute for Mine Surveying, Aachen University

extracted from abandoned mines via shafts or boreholes. This gas may be used for on site power and heat production.

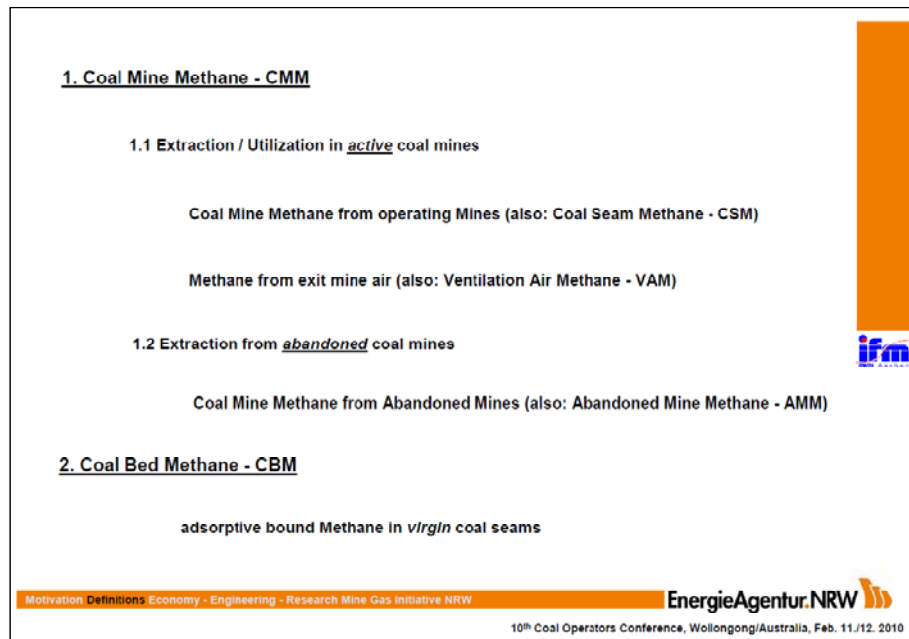


Figure 1 - Definitions

According to German legislation gas exploration and production is regulated separately to mining (i.e. in abandoned and virgin coalfields) requiring separate gas concession. Following the introduction of the Renewable-Energy-Law in 2000 there was a rush on gas licenses and at present almost 94 exploration and production licenses have been granted in North Rhine-Westphalia (Figure 2). According to provisional figures, 67 mining authorisations for mine gas utilisation had been awarded at the end of 2008.

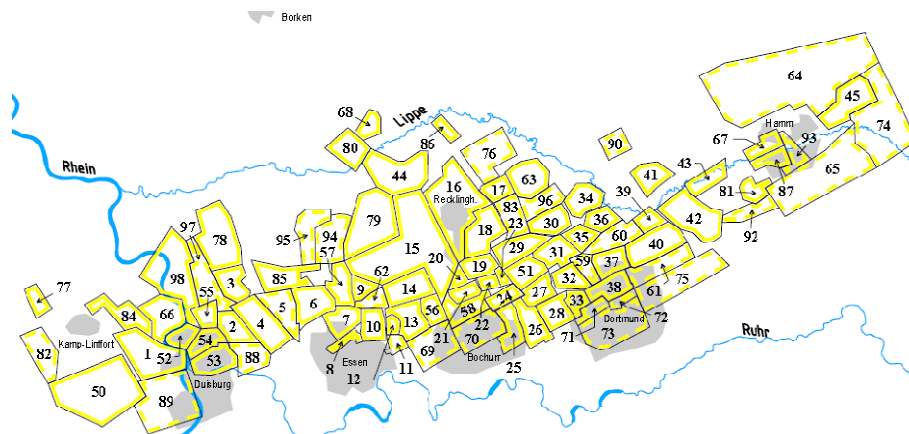


Figure 2 - 67 Mine Gas concessions for gas utilization from abandoned coal mines in North Rhine-Westphalia (27 concessions for exploration not shown) (Source: Bezirksregierung Arnsberg NRW Abt. 6)

Figures 3 and 4 summarise technologies, installed capacity and production capacity along with current research involving active and abandoned mines as well as current CBM-operations in North Rhine-Westphalia (Figure 5).

At the end of 2008 the provisional figures indicate that there were 128 unit-type co-generation power plant modules as well as a turbine set in service with electrical capacity totalling 170 megawatt. The 843 million kWh of electrical power generated in 2008 and the heat supply of 79 million kWh are capable of supplying about 220,000 households. The total mine gas potential exploited resulted in a CO₂-reduction of about 3.7 million tons in 2008.



Figure 3 - Current situation concerning active mines



Figure 4 - Current situation concerning abandoned mines

The second group of mine gas, known as Coal Bed Methane (CBM), refers to methane gas bound in virgin hard coal deposits. Due to strata composition, relatively deep coal layers and very moderate permeabilities in the German hard coal deposits, extraction of CBM has failed up to now, but is still a topic of discussion and research (see below).

RESEARCH AND DEVELOPMENT (R&D)

CMM

Apart from the conventional concept of utilization by power and heat production with co-generation plants, a great amount of research and development is still to be done.

Common aim of these efforts is an improvement in energy yield, a sustainable proceeding concerning the mine gas deposit in the sense of a deposit management and the recovery of new mine gas resources.

CBM

In times of rising costs for energy and a run out of resources it seems to be more necessary than ever to look for alternative energy sources. In this context CBM could become an important alternative to conventional natural gas. CBM provides an innovative usage of German hard coal deposits and could help Germany to become more independent from the import of fossil fuels. Due to that fact a multidisciplinary research community is exploring the productability of CBM in North Rhine-Westphalia in the R&D-project "CBM Muensterland" for one and a half year now.

This alliance already forecasted the technical and geological viability of CBM in the Muensterland area. The economical feasibility of CBM production will be assessed in the second phase of the project, which is currently anticipated.

Additional commercial CBM projects are also being considered. Figure 5 gives an overview of current CBM research activities in North Rhine Westphalia.

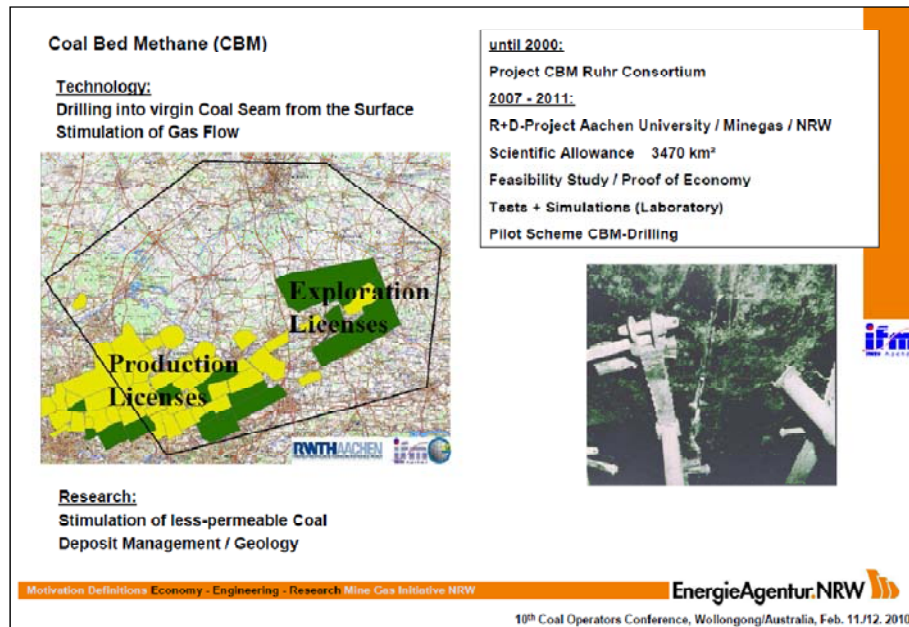


Figure 5 - Current CBM research-activities in North Rhine Westphalia

MINE GAS INITIATIVE NRW

Supported by the German Renewable-Energy-Law, utilization of mine gas in North Rhine-Westphalia has significantly increased since the beginning of the year 2000. In 2001, under the chairmanship of first Author, the Mine Gas Initiative NRW was founded as a part of the NRW State Initiative On Future Energies to further support this development. In 2007 the NRW State Initiative On Future Energies and the NRW Energy Agency were combined to form the new EnergyAgency.NRW.

The Mine Gas Initiative NRW supports the development of technology of mine gas extraction and utilisation and to intensify the technology transfer. The Mine Gas Initiative NRW is an interdisciplinary platform for information and communication for persons and groups from companies, governments and institutions of research and development, whose representatives meet regularly. It aims at the utilization of an innovative energy source, the environmental protection by reduction of harmful emissions and the improvement of mine safety. It also tries to introduce emission-trading into planning procedures.

INTERNATIONAL ACTIVITIES

The Mine Gas Initiative NRW provides national and international support for German companies by establishing and improving international contacts (Figure 6). It supports participations in national and international exhibitions. The Mine Gas Initiative NRW is open to all interested persons, groups and organizations. Selected members from the Mine Gas Initiative NRW are already partners or could be possible partners for international collaboration in the fields of mine gas extraction, mine gas utilization and emission trading.

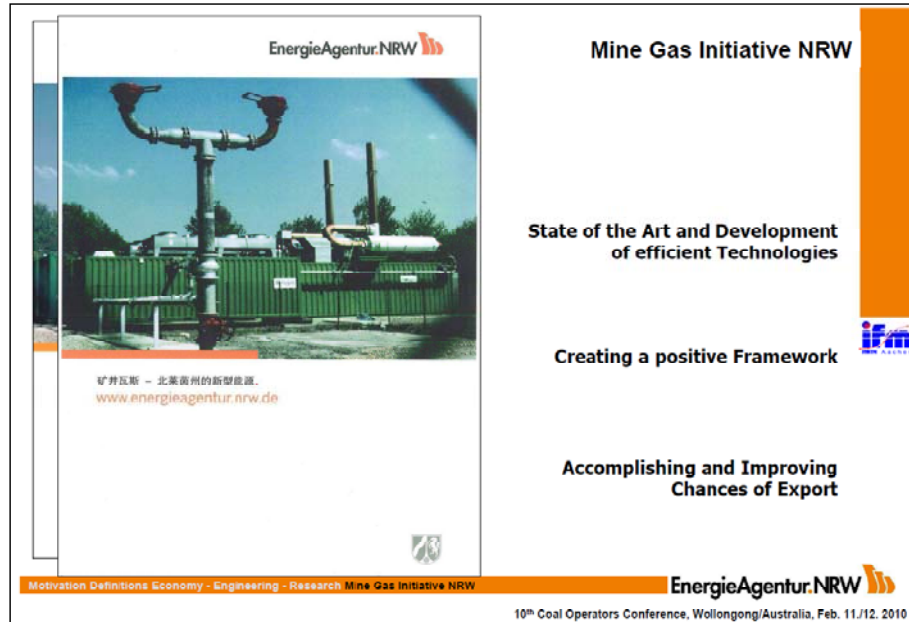


Figure 6 - Mine Gas Initiative NRW

In recent years the Mine Gas Initiative NRW focussed on the PR of China which led to the establishment of a “Frame Agreement between Shanxi-Province, PR China and Mine Gas Initiative NRW on the Topic of the Development of Mine Gas Projects in Shanxi Province...” in September 2009.

Furthermore RWE, as a representative enterprise of North Rhine-Westphalia, began to find cooperative partners in Shanxi province on Clean Development Mechanism projects since October 2008. After a year of negotiation and investigation of coal mine gas, RWE and Shanxi Dubao Energy Development Institute reached co-operation agreement. The intention of RWE and its cooperative partners in Shanxi Province is to establish a joint venture for clean energy and Clean Development Mechanism projects.

In 2008 an agreement between the University of Queensland, Australia, represented by the School of Engineering and the School of Physical Sciences/Earth Sciences, both part of the Energy & Environment Group, and RWTH Aachen University, Germany, represented by the Institute for Mine Surveying, Mining Subsidence Engineering and Geophysics in Mining and the Geological Institute, has been signed.

The Australian and German partners want to extend and intensify scientific co-operation in the field of Coal Bed Methane research and technologies. The co-operation also covers the exchange of expert personnel and will include research activities, development of technologies, information exchange and training.

The agreement falls under the umbrella of the Memorandum of Understanding between the State of North-Rhine Westphalia and the Australian States of Queensland and New South Wales, signed in November 2004. This Memorandum covers - among other things - collaborations concerning renewable energies.

SUMMARY

Mine gas is a new alternative energy source. There are large quantities of methane stored in abandoned and active mines. The extraction of the gas can be accomplished via old shafts or boreholes. From this energy source, electricity as well as heat can be produced. In Germany, mine gas is treated as a mineral resource under federal mining law and almost 70 mine gas concessions have been granted. The development of this new field of activity has shown encouraging results thus far. Interesting future fields are mine gas extraction from virgin coal deposits (CBM) and the implementation of the mechanisms according to the Kyoto-Protocol.

This paper explains the role of the Mine Gas Initiative NRW in North Rhine-Westphalia, Germany, part of the EnergyAgency.NRW (EnergieAgentur.NRW). Concerning mine gas utilization, it covers the motivation, definitions and fields of interest of economy, engineering and research – current and future. It also describes the work of the Mine Gas Initiative NRW, and its activities on all topics related to the utilization of mine gas, such as energy production, enhancement of mine security and enforcement of climate protection.

Hard coal mining in Germany has a long-lasting tradition spanning centuries. In this period huge expertise in dealing with all matters of underground mine gas problems in a safe way and in utilizing mine gas as energy source has been accumulated. To bring this expertise together the Mine Gas Initiative NRW was founded in 2001.

The Mine Gas Initiative NRW is open to interested persons, groups, companies and organizations. Selected members from the Mine Gas Initiative NRW are already partners or could be possible partners for international collaboration in the fields of mine gas extraction, mine gas utilization and emission trading.