Prerequisites for tectonic brine mining, subsurface and above ground hurdles. Zero Carbon Lithium, examples from the Upper Rhine Graben and other prospective zones in Central and Eastern Europe.

The energy transition brings many challenges to the Energy Industry. While the world strives for decarbonisation and is looking for renewable energies, many challenges remain unresolved or are linked to fossil fuel development technologies and legislation. Regulators have not yet understood that Geothermal "GT" brines are reached by more costly drilling techniques as compared to conventional Oil and Gas "O&G" practices. New GT boreholes must be drilled with larger diameters at temperatures above 165° C, targeting fracture corridors (usually avoided) to get access to flow rates of more than 100 l/s (≥54 Mbbl/d) rates rarely reached in Oil wells. New materials are required for drilling and completion. MWD-LWD and WL logging tools are at their technical limits being deployed at temperatures above 200° C. Fully ceramic insulated tools and mud motors must be engineered increasing drilling and formation evaluation cost, that are beyond the cost of conventional oil and gas wells. During the O&G downturn, starting late 2014 and enhanced by the Pandemic, a major brain-drain in the industry occurred and specialists are absent in the labour market. Access to data and increasingly cumbersome permitting procedures, introduced to curb fossil fuel consumption, are delaying conventional energy projects as well as geothermal project execution, this leads to an explosion project cost. Tectonic brine mining bears geological and drilling related subsurface risks, in a low reward economic environment. The success rate of GT wells in the Upper Rhine Graben is 50 %, slightly higher than in O&G exploration. The search for Li brines is relatively new and databases are incomplete or barren of relevant information, exploration for Li or other battery mineral deposits should be leveraged by the educational institutions as well as the legislation. To facilitate the energy transition, the industry requires a stimulus in education, a dramatic reduction in bureaucracy as well as a complete workover of legal and fiscal terms. Investment can only be attracted in a clear and predictable business environment with well defined legal and fiscal terms, adopted to a low return and not risk-free industry. The Upper Rhine Graben may be one of the few areas in Europe where heat to power, district heating and tectonic brine mining aligns three value chains, including nearby off takers of LiHO from the car industry. A lot remains to be done and understood, consumers are uniformed, education lacks behind industry requirements, legislation and fiscal terms are from the last century or outdated systems.

Robert Gruenwald, Advisor Exploration & NBD, Renewables Geothermal, Lithium brine mining

Born on May 4, 1966 (German).

A M.Sc. graduate of the University of Bergen Norway in Structural and petroleum Geology, Robert Gruenwald joined Wintershall in 1994. He occupied various positions in Exploration & Production, Norway, Germany, Brazil, Libya, Romania, US & Canadian Arctic, Spain, Algeria, South Africa, Mozambique, Qatar and was most recently in charge of Exploration for Hunt Oil Company of Romania, Vulcan Energy in Germany, ADX in Austria and MS Intl. Solutions in Romania.

- Between 2002 and 2010 he was involved as Lead Geologist in Latin America in the Santos, Campos & Espirito Santo Basin offshore Brazil. His involvement as Project Manager yielded in the new Sighisoara Field discovery in Transylvania Sud, the generation of the prospect inventory for WIROM and the evaluation of the 10th Romanian Bid-round for ADX Energy.

- Between 1997 to 2001 he was Senior Operations Geologist for Wintershall Libya in the Sirte Basin and between 2008 to 2011, he was the Libya Exploration Asset Team Leader for REMSA Murzuq, Ghadames, Cyrenaica-Offshore and Kufra Basin.

- From 2011 until 2012 he was the Exploration Manager for Algeria.

- Between 2012 and 2015 he was the Asset Manager for Mozambique and headed the NV NBD team for Africa and Latin America.

- In 2016 he joined Qatar Petroleum International in the position of Head of International Exploration and Growth evaluating opportunities in GOM (Mexico and US), Albania, W-Africa, and concluding farm-ins in Brazil, Argentine, Mozambique, South Africa and Cyprus.

- In 2018 after M&A and DRO consulting for various companies in CIS, Africa and UK as partner of Exploration Excellence Ltd., he joined Hunt Oil Company of Romania in the position of the Exploration Manager.

- Since June 2020, he is involved with ADX Energy to support its Austrian and Romanian business activities and growth intentions within the region.

- Since November 2021, he acts as Director of MS Energy International Solutions S.R.L. to expand the Geothermal business activities, of the Hungarian based company, in Romania.

- From October 2022 until early 2024, he acted as Head of Drilling and Subsurface for Vulcan Energy Zero Carbon Lithium, Hybrid position.

- Since November 2023, he joined ADX Energy in the position of the AM for Upper Austria & international New Ventures, Hybrid position while maintaining the BD activities with MS E. Intl. Solutions in Hungary and Romania.

Building on more than 30 years of international experience based exploration success, with excellent management and leadership skills, inspires teams with vision and innovative processes to create focused delivery through rigorous risk management and quality assurance.
He has worked for various successful IOCs and NOCs across the world with a focus on the North Sea, Central and Eastern Europe, the Americas and Africa. He was instrumental in implementing global Basin Evaluation and PSA Workflows, supplying directions for various successful new country entries for major operators over the past decade. His in-depth knowledge within >200 HC provinces allow him to proactively select high impact exploration opportunity targets. His high motivation inspires technical teams to exceed expectations and support international growth strategies in global Exploration and M&A. He built strong trust based relationships with NOCs and regulators within complex PSC and EPSA environments through deep understanding of the E&P industry and focus on clear communication, value assurance and by doing the right thing. In his most recent position as Head International Exploration and Growth in QP, he secured various high value entries, adding significant 1P and multi TCF low risk prospective resources to the company's portfolio, while saving on multi MMUS$ value eroding engagements.