



4th
**International
Geothermal
Conference:
Harnessing
&
Hybridization**
21st January, 2020

CONFERENCE PROCEEDINGS

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In association with



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Abstract Booklet Release-





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4th International Geothermal Conference: Harnessing and Hybridization

In today`s world scenario, increasing environmental pollution and deteriorating conventional resources, it is prudent to explore and establish alternate and sustainable sources of energy for human energy needs. The global scenario for energy sector is not very favorable as there is sudden increase in energy demand, climate change which is not possible to fulfil due to shortage of fossil fuel.

Because of these situations arising, many countries are involving themselves in the large scale exploration work in this field of geothermal where a great number of prospects are evolving. In the quest to increase its renewable energy portfolio, India proposes to harness 10,000 MW (10GW) of Geothermal energy by 2030 through active international collaboration with countries such as the US, Philippines, Mexico and New Zealand.

The Indian government`s ministry of new and renewable energy (MNRE) on 6 June released a, “draft Indian geothermal energy development framework”

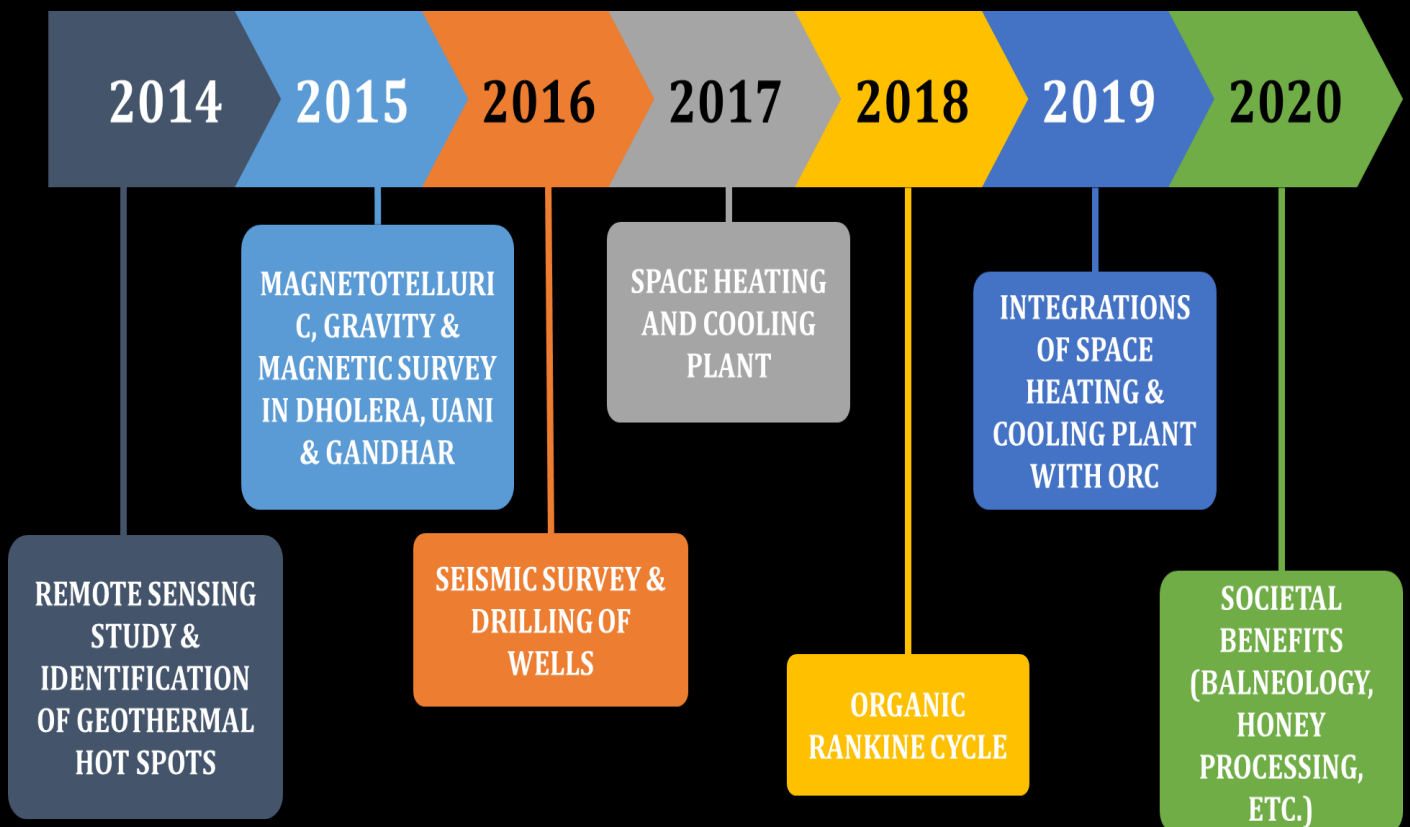
Centre of Excellence for Geothermal Energy wanted to create a unique platform through this 4th International Geothermal Conference for Geothermal Energy in India where it can initiate to put forward plethora of ideas from stalwarts of geothermal fraternity in India to discuss about hybriding and harnessing geothermal energy with other renewable energy source which can help India to meet its energy requirements in cleaner and greener form.



About Centre of Excellence for Geothermal Energy

In order to put Gujarat on unconventional energy basket in India, Government of Gujarat (GoG) took an initiative of establishing a centre dedicated to research and development activities in the area of exploration and exploitation of geothermal energy. In this light, with the support of GoG, PDPU establish Centre of Excellence for Geothermal Energy (CEGE) on 10th of October, 2013.

Major Milestones of CEGE-





About the Conference

Renewables are presently beginnings to fulfill the steeping scenario of global energy demand. To overcome the same situation, many countries are bending towards renewable energy resources. United Nations too issued a mandate for minimizing the usages of fossil fuels.

Geothermal Energy is a crucial aspect in the energy basket which provides a clean, bright and healthier form of energy at no extra cost to mother-nature. Comprehending the same motives, Centre of Excellence for Geothermal Energy is elated to announce 4th International Conference 2020. The objective is to bring together stalwarts of geothermal fraternity and examine the challenges lying ahead for harnessing and hybridization of Geothermal Energy with various forms of Renewable Energy.





The Preamble to the Conference

The preamble to the conference was delivered by Prof. Anirbid Sircar, Head CEGE. He highlighted different potential geothermal provinces of India, with a special focus on Puga region. He mentioned that the conference would focus on the various geothermal policies of India. He also talked about various obligations in geothermal energy production and discussed a few ways to tackle the financial obligations. He mentioned some of the challenges faced in the field: low technological advances, high costing, low understanding of resource potential, lack of institutional capacity, shortage of professional skills, lack of understanding of the legal framework and other social and cultural obligations. He ended the preamble by stating that despite of these obligations, geothermal resource exploration should not be stopped. He even encouraged the students present in the event to study and understand the production and exploration of geothermal energy and work for the advancement of the field in the future.





Overview of Geothermal Energy Harnessing

The guest of honor of the conference, Mrs. Kunzes Dolma, was welcomed upon the stage to share a few words with the audience. She drew attention to the fact that most of the fuel consumed in India is imported from foreign countries, and therefore, there is a need to use renewable energy. According to her, this could be done by using local fuels- in coastal regions, tidal and wind energy can be generated and on land, geothermal energy and solar energy can be used. She included that in this way, more employment could be generated, and even pollution could be reduced. She emphasized on the use of geothermal energy as it has the advantage of direct utilization in heating, cooking and other daily applications. In the end, she appreciated PDPU for its efforts in promoting geothermal energy.





“Glimpses of Work Done By CEGE”

Prof. Anirbid Sircar

(Centre of Excellence for Geothermal Energy, India)

Prof. Anirbid Sircar shared glimpses of work done by CEGE in the last five years. He appreciated Dr. Kriti Yadav, Coordinator, CEGE, and Mrs. Namrata Bist, Research Scientist, CEGE, for their contributions. He informed the participants regarding the research and project activities lined up for development purposes in near future. He enlightened the participants that CEGE had identified seven locations with geothermal resource potential and had worked at three places, namely, Dholera, Unai and Gandhar. He shared that three wells had been drilled in Dholera and the drilling of the fourth well in Unai would be finished in January 2020 itself. He mentioned that CEGE has also established a Geopark in Dholera which features honey processing unit, and conceptualized milk pasteurization unit, both of which use geothermal energy. Additionally, CEGE has also been effective in application of geothermal water in electricity generation using Kalina cycle technology in Unai. Prof. Anirbid Sircar highlighted the research gap in India through the following points. • No clear picture of subsurface geology and geothermal system. • Large gap between data and understanding of people. • No practical application of geothermal water. • Plan required for geothermal exploration. Lastly, he mentioned some of the achievements of CEGE which included a letter of appreciation from the education minister of Gujarat and several papers published in numerous well-known journals.





“World Geothermal Energy Harnessing”

Mrs. Kunzes Dolma

(United Nations University, Iceland)

The first keynote address was delivered by Mrs. Kunzes Dolma. In her address, she shared her views on “World Geothermal Energy Harnessing”. She discussed about various ways in which some countries are increasing the use of geothermal energy. She suggested that Enhanced Geothermal System (EGS) could generate geothermal power efficiently at any depth and that there needs to be more focus on direct utilization of geothermal energy for heating, cooling, etc., rather than only on its production. She stated that geothermal energy is not going to be a solution to power crisis, but it could be a game-changer in remote regions. Mrs. Kunzes Dolma explained this by giving examples of Alaska Chena power plant, Kenya, where 50% of electricity is generated from geothermal and Iceland, where it is directly used in aquaculture and district heating. She also mentioned the fact that solar energy, wind energy and other renewables create imbalance in the energy grid which causes the duck curve but use of geothermal energy may bring balance. She concluded that fossil fuels should remain in the subsurface where they belong, and geothermal energy must be utilized more as produces cheaper electricity while also being a clean source of energy.





“Study on geothermal potential of Bakreswar hot spring through geochemical investigations”

Dr. Hirok Choudhary

(National Institute of Technology, Durgapur)

Dr. Hirok Choudhary from National Institute of Technology Durgapur gave a talk on “Study on geothermal potential of Bakreswar hot spring through geochemical investigations.” He began by discussing the past and present energy scenario and why it is necessary to change the geothermal energy scenario. He highlighted the following advantages of using geothermal energy.

- Negligible environmental impact
- Low maintenance cost
- Less land requirement
- Proven technology for geothermal energy production
- Geothermal energy is a sustainable energy source

Furthermore, he discussed the geothermal potential of India. He mentioned the possibility of presence of geothermal energy in Andaman and Nicobar, in the northeast region and in some parts of Jammu and Kashmir and that there are more than 340 hot springs in India. He asserted that despite of having vast resources, India has not made any significant advancement in geothermal energy production. In his present study of Bakreswar hot spring site, West Bengal, it was found using geothermometry that the area was a liquid dominated low enthalpy geothermal system, it features high geothermal gradient, presence of magmatic intrusion and it lies over the SONATA and ONGC faults. He



enlightened the participants with the monitoring parameters in the exploration of geothermal energy and the experimental technique used to record geochemical data. According to his investigation, the binary type Kalina cycle power plant seemed to be suitable for production of geothermal power even after having low efficiency. He even described the schematic model of proposed geothermal power plant. Moreover, he shared that helium and argon gases could also be extracted from Bakreswar during geothermal power harnessing.





“Study of opportunities for strategic development of geothermal energy in India”

Mr. Mubasir Rasool,

(Jammu and Kashmir State Power Development Corporation)

Mr. Mubasir Rasool from Jammu and Kashmir State Power Development Corporation, India, presented his study of opportunities for strategic development of geothermal energy in India. According to him, the key elements of successful geothermal energy development were information (conceptual model, resource data, etc.), institutions (geothermal development company, etc.), policies and finance. He named some of the geothermal provinces of India Himalaya, Sohana, Cambay, SONATA, West coast, Godavari and Mahanadi. Potential uses of geothermal sources were also discussed, such as Binary power plant, refrigeration, green house, food processing, snow melting aquaculture and many more. Mr. Rasool also suggested some improvements for energy reforms which can be attained through bottoms-up approach, better infrastructure facilities, power evacuation system, public awareness campaigns, renewable purchase obligations from geothermal sources, etc. He recommended that current legislations and policies on geothermal energy development needs to be reviewed considering PESTLE (political, economic, social, technological, legal and environmental) factors to identify best way possible for its exploitation in India. Mr. Rasool concluded his presentation by stating that geothermal energy could become a significant player in energy mix of India by reducing greenhouse gas emissions and the operational renewable energy policies must be reviewed using PESTLE analysis which would help in pointing out the key lagging factors in the current policies.





Panel Discussion on “Framework of Geothermal Policies in India”

Moderator- Mr. Arun Singhal

(Editor DEW Journal)

The panel discussion was based on the theme of “Framework of geothermal policies in India”. The delegates of the panel were Prof. Anirbid Sircar, Mrs. Kunzes Dolma, Dr. Hirok Choudhary, Mr. Mubasir Rasool, Dr. Shibani Jha, Mr. Kamal Das and Mr. Gaurav Patel and the discussion was moderated by Mr. Arun Kumar Singhal, Chief Editor, DEW Journal. Firstly, Mr. Arun Kumar Singhal gave an overview of geothermal energy. According to him, by the end of 21st century, geothermal energy might have a share of around 30%. He discussed the geothermal potential of India and various initiatives taken by Ministry of New and Renewable Energy (MNRE) since last three decades, which includes formation of expert groups, working groups and committees in addition to providing financial support for harnessing geothermal energy. He also suggested that Iceland could be the best partner for India in exploration and exploitation of geothermal energy. Mr. Arun Singhal opened the discussion by questioning the delegates that why the concepts of harnessing geothermal energy are only in theories and why there are problems in its application in India. Mr. Kamal Das criticized the data-holders as they keep the information private and do not reveal it to the public. According to Mr. Hirok Chaudhary, India needs to be less dependent on foreign expertise and should use our own resources. Mrs. Kunzes Dolma then said that the problems are due to capital expenditure, availability of cheap coal and lack of information. Prof. Anirbid Sircar suggested that more awareness must be spread regarding geothermal energy, mode of oil exploration must be followed for geothermal exploration



and new incentives are needed. Mrs. Shibani Jha said that there is a lack of integrity in research in India and she agreed with Mr. Das that data should be made public as its study is necessary. Mr. Gaurav Patel suggested that there is a need to develop proper infrastructure in India itself rather than using foreign resources. Mr. Mubasir Rasool shared his opinion that the government has not made proper policies for geothermal harnessing and therefore the development in the field is difficult. Mr. Arun Singhal then asked the delegates to suggest plausible solutions that could be implied to overcome the several challenges that were discussed. Mr. Hirok Choudhary suggested that instead of having several private publications, there must be a hub or a society in which enthusiasts can exchange data as well as new ideas and collaborate with each other in order to make progress in the geothermal field. He also said that geothermal labs should be constructed on the various hot springs around the world, which would not only provide direct usage of geothermal energy but would also produce helium and argon. Prof. Anirbid Sircar said that collaboration should be made with multi-agencies or organizations such as IOCL, GAIL, Adani Gas, etc., so that they can come together to work for the cause. In the end, the delegates commented that the path of the advancement of the geothermal field is full of struggles and challenges, yet it has a bright future. To conclude the discussion, following important points were made.

- Data should not be confined and should be made accessible.
- New infrastructure, incentives and policies are required to make progress in the geothermal field.
- Instead of working individually, various universities and organizations should form an umbrella and work collectively for the sector.





“Experience sharing on Geothermal well drilling in Iceland”

Mr. Bjarni Richter

ISOR, Iceland

In skype presentation, Mr. Bjarni Richter, Iceland Geosurvey (ISOR), gave a presentation on case history of high temperature drilling in Hengill geothermal area in Iceland. He described the analysis of drilling performance of 77 high temperature geothermal production and reinjection 8 wells in the Hengill geothermal area drilling during 2001-2011. The geothermal power plant generates 303 MWe electricity and 133 MWt of low-pressure steam turbine. He described the geology and main structures in Hellisheidi which are mostly intrusions and it is volcanically active. He talked about typical casing programs-regular and large, vertical and directional. He also informed that about 80% of the wells drilled at Hellisheidi were productive. The summary of activity time break-down for drilling the 4-depth sections was as follows: • Active drilling is only 48% of the total time. • Drilling problems are only about 10% of the total time. • Running and cementing casing: 18% of the total time. • Well logging is carried out less than 10% of the total time He shared that about 31% of the holes encountered drilling problems due to lost circulation, formation collapse, etc. He discussed the success of geothermal drilling in high enthalpy system in Hellisheidi. In the conclusion to his presentation, Mr. Bjarni said that ISOR has an experience of 75 years. It has operations in geothermal exploration, drilling, well testing, etc. He said that the modal capacity of the wells surveyed was 3 MWe but for moderate-temperature and 100%- steam resources had modal capacities of 5.5-6 MWe. He also highlighted the fact that geothermal energy is



being directly utilized in Iceland for fish farming, greenhouse, and other such applications.





“Role of Geothermal Energy among Renewable Energy Alternatives and Potential Estimation of Geothermal Reservoirs: Challenges and Solutions”

Dr. Shibani Jha

BITS Pilani

Mrs. Shibani Jha gave a talk on “Role of geothermal energy among other renewables and potential estimation of geothermal reservoirs: challenges and solutions.” She shared the fact that usage of renewable energy in India is only 21% among other sources of energy. She compared the Indian and global scenario in which Indian reservoirs are at shallower depths. She also discussed some techno-economic and environmental aspects considered to promote renewable energy. She emphasized on the fact that geothermal energy has the highest energy index followed by hydro-energy, wind energy, biomass and solar energy. Mrs. Shibani said that it also has limitations due to some socio-economic factors such as employment; despite of these limitations, geothermal energy has the highest potential. She discussed the significance level of some promising geothermal fields: Puga (0.46), Chhumathang (0.27), Manikaran (0.23), Tattapani (0.10), Unhahre Khed (0.09) and Tapohan (0.07) and suggested that with gained experience, technology should be applied to access these areas. She also shared that she had developed a block heterogeneity model which predicts the probable feasibility of the field.





“Solar Geothermal Hybridization”

Mrs. Namrata Bist

Research Scientist, CEGE

Mrs. Namrata Bist, gave a presentation on “Hybrid solar and geothermal setup for exploitation of low enthalpy geothermal reservoirs.” She highlighted the need to switch to carbon-free resources for energy. She suggested that as solar energy has high energy radiation but is a function of time and position; while geothermal energy is available all the time and has low enthalpy, therefore both sources could be combined to provide increased efficiency. Her study focused on Cambay and Saurashtra areas, which featured low-medium enthalpy reservoirs. She discussed the design of enthalpy improvement of geothermal energy and the types of solar collector types with a special focus on Parabolic Trough Collector (PTC) which is the most efficient and cheaper. Design and thermal and optical efficiency investigation of PTC carried out by her was also discussed.





“Geothermal Energy potential of Hazad Member in South Cambay basin, Gujarat, India-An overview”

Mr. Kamal Kumar Das

(ONGC)

Mr. Kamal Kumar Das shared his views on “Geothermal energy potential of Hazad member in South Cambay basin, Gujarat”. He talked about the advantages of harnessing geothermal energy. • Opportunity to exploit geothermal energy from abandoned oil & gas wells in a basin using voluminous data available • Acquire knowledge of the subsurface geology, petrophysical parameters, thermal gradient, heat exchange capacity and overall lateral extent of the target reservoir in short period of time • Gain fairly good idea of crustal heat flow over a wide area using well logs and without other expensive geophysical campaigns • Accumulate data for doing long term reservoir simulation and strategy planning • Reduction in cost of drilling wells during model testing. Mr. K. K. Das discussed the international scenario of geothermal energy production and utilization. He presented a case study of Hazad member of South Cambay basin. He talked about lithofacies, temperature profile, thermal conductivity, thermal maturity, and temperature gradient distribution of the basin. He even talked about his proposed plan for installation of binary cycle power plant which included an electrical submersible plant, electrical and thermodynamic surface installation and how energy will be generated through this plant.





“Quantitative approximation of geothermal potential of Bakreswar geothermal area through helium exploration study”

Mr. Chiranjit Maji

NIT Durgapur

Mr. Chiranjit Maji, Department of Physics, NIT Durgapur, India, delivered a presentation on “Quantitative approximation of geothermal potential of Bakreswar geothermal area through the Helium- exploration study.” He discussed the science behind geothermal systems and provided knowledge about the origin of heat in geothermal resources. The objective of his study was to explore geothermal potential of Bakreswar using mathematical relations of radioactive disintegration process and online continuous measurement of Helium emanation through hot spring vent and designing proposed power plant to be installed at the site with the aim of power generation including Helium harnessing. Mr. Chiranjit discussed the geological setting of Bakreswar and gave an overview of the study area. He shared that there are seven hot springs at eastern end of SONATA geothermal province and the area is geologically complex, heterogeneous and extensively faulted and it features highly sheared, brecciated and mylonitic rocks, with high geothermal gradient. He then touched upon the methodology applied which included continuous online monitoring. They quantitatively estimated the volume of helium emanated from a hot spring per second and calculated the number of moles of gas emanated in unit second. He promoted geothermal harnessing as it also has an advantage of helium production.





“Space cooling using solar and geothermal”

Mr. Gaurav Patel

(GERMI)

Mr. Gaurav Patel, GERMI, shared his views about space conditioning using solar energy and geothermal energy. He discussed regarding air conditioning in global context. He threw light on the fact that around 30-40% of energy is produced using space conditioning. He also talked about the challenges that are faced in this method, such as ozone layer depletion, higher energy consumption, high wear and tear, higher emissions, etc. Mr. Gaurav Patel informed the audience about the availability of global energy resources. He concluded his presentation by stating that by hybridization of solar energy and geothermal energy in space conditioning, energy can be harnessed and utilized any time of the day.





“Resistivity methodology and its application”

Mr. L. D. Mohapatra

(AIMIL)

Mr. L. D. Mohapatra, Head – Geophysical Instrumentation Division, AIMIL, delivered a presentation on “Geological Exploration by electrical resistivity and induced polarization 11 method”. He talked about multi electrode resistivity imaging system which includes direct connection of seismic-type cables to SYSCAL unit and the methodology of its working. He also talked about the applications of this system: hydrogeological, mining and geotechnical investigations, estimation of true resistivity, several others. He discussed the induced polarization method which includes the use of IP transmitters and receivers and even shared his views regarding Full waver resistivity units and their benefits.





Student Presentations

1. Ms. Kamakshi and Mr. Milendra Pankheda, M. Tech, PDP

Ms. Kamakshi and Mr. Milendra Pankheda shared their views on “Exploration of geothermal energy in India and world”. They highlighted that Tattapani geothermal field is the most promising geothermal resource in central India, followed by Gujarat. They even presented a case study of geothermal field of Iceland, with a special focus on Reykjavik power plant.

2. Ms. Anika Gupta and Mr. Anubhav Tyagi, UPES, Dehradun

Ms. Anika Gupta and Mr. Anubhav Tyagi presented their ideas on “Introducing the use of Optical Fiber technology in Exploratory Drilling at Geothermal Prospects”. They talked about the advantages of the optical fiber method which includes low cost, high temperature susceptibility, etc. They discussed the future of fiber optical sensing and according to them progress can be made with greater understanding and evolution of technology.

3. Mr. Manthan Tala and Mr. Mitul Prajapati, L. D. College Gujarat

Mr. Manthan Tala and Mr. Mitul Prajapati shared their views on “Desalination of Harnessed Geothermal water”. They described the two most used desalination technology: Thermal (phase change) process and membrane process. They also talked about two main methods of heat extraction: Hydrothermal system and Hot dry rock method in which water is circulated through stimulated fractured rock.



4. Ms. Bhavya Ladani and Mr. Rohit Rughvani, SOT, PDPU

Ms. Bhavya Ladani and Mr. Rohit Rughvani presented their views on “Harnessing Geothermal energy – A cost effective and efficient renewable energy model.” They highlighted the fact that geothermal energy has a net thermal efficiency of 300-400%; it can reduce energy consumption and air pollution by 44% as compared to other sources; it can reduce costs up to 40-60%.





Valedictory Session

The conference concluded with a valedictory ceremony which was held to appreciate the participants of the conference. Mr. Arun Kumar Singhal awarded letters of appreciation to the students and encouraged them to acquire more practical knowledge in the field. Dr. Kriti Yadav gave a vote of thanks to all the delegates and dignitaries present in the event. Prof. Anirbid Sircar felicitated the organizing committee of the conference for their efforts. Prof. Anirbid Sircar extended a warm thanks to the delegates of the conference for their valuable presence and acknowledged everyone who contributed substantially to the success of the conference. He expressed his satisfaction with the interactive nature of the discussion while congratulating participants on the extensive networking that had taken place, which he hoped would continue going forward.





Conference Glimpse





NEWS Clippings of Conference

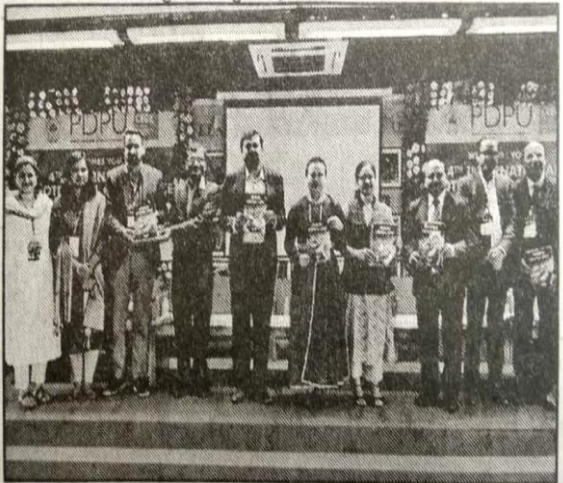
પીડીપીયુમાં ચોથી આંતરરાષ્ટ્રીય જિયોથર્મલ કોન્ફરન્સ યોજાઈ

ગાંધીનગર :

પીડીપીયુ ખાતે જીયોથર્મલ એનર્જી પર વિશ્વ કોન્ફરન્સ યોજાઈ હતી. જેમાં પેટ્રોન પ્રો. અનિરુદ્ધ સિરકર અને કન્વીનર ડૉ. કિર્તી ઘાઠવ હતા. આયોજક ટીમના સભ્યો નર્મતા બિરુટ (સંશોધન વૈજ્ઞાનિક), દિપક જાની, કુ. સુરભી સિંઘ, ધર્મેશ મોરબીયા, અભિજીત નિરંતરે, નિલેશ માલી અને હિનેન બહ ઉપસ્થિત રહ્યા હતા. કુ. કુંડેસ ડોલ્મા યુએનપુ આઈસલેન્ડ એ કોન્ફરન્સના મુખ્ય ગેસ્ટ રહ્યા હતા. જેમણે વિશ્વમાં જીયોથર્મલ એનર્જીના ઉપયોગો વિશે વિસ્તૃત માહિતી આપી હતી. કોન્ફરન્સના અન્ય વક્તાઓ આઈએસઓઆર આઈસલેન્ડ, જે.કે.એસપીડીસી જન્મુ એન્ડ



બી.આઈ.ટીસએસ. પિલાની એલએનટી અને એમિલ લી. માંથી ઉપસ્થિત રહ્યા હતા. કોન્ફરન્સમાં જીયોથર્મલ એનર્જી અને અન્ય ધુન:પ્રાપ્ય ઉર્જા સ્ત્રોતો જેવાકે, સૌર ઉર્જાનો એક સાથે કેવી રીતે ઉપયોગ કરી શકાય તેના ઉપર કોલ્સ કરવામાં આવ્યું હતું. કોન્ફરન્સમાં ઉપસ્થિત મુખ્યવક્તાઓ દ્વારા ભારતમાં જીયોથર્મલ એનર્જીની પોથીસી વિષય પર વિસ્તૃત ચર્ચા થઈ હતી. સંમેલનમાં યુ.પી.ઈ.એસ દહેરાદુન, પીડીપીયુ ગાંધીનગર અને એલ.ટી. કોલેજ અમદાવાદના વિદ્યાર્થીઓએ તેમના કોન્ફરન્સ પેપર રજૂ



પીડીપીયુ ખાતે આંતરરાષ્ટ્રીય જીયોથર્મલ કોન્ફરન્સનું આયોજન કરવામાં આવ્યું હતું. જેમાં તજજ્ઞો એકઠા થયા હતા અને ચર્ચા કરી હતી.

1/23/2020

Gujarat: Solar-geothermal model to be tested - The Economic Times

THE ECONOMIC TIMES

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BY PARTH SHASTRI, TNN | UPDATED: JAN 22, 2020, 02:26 PM IST

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Ahmedabad: After setting up a geothermal energy plant at Dholera last year, the Centre of Excellence for Geothermal Energy (CEGE) at PDPU will experiment with solar-geothermal hybrid model to improve energy output at the site. The plant is likely to be functional later this year.

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Prof Anirudh Sircar, the head of the CEGE, said that a researcher at the centre is working on bimodal parabolic trough collector (PTC) design. "The PTC can collect solar energy for 7 to 8 hours a day whereas geothermal energy will be available round the clock," he said. "Both the modes will be assimilated for amalgamated power generation. We believe that the capacity will increase from the current 20 kilowatts/hour (kWh) for geothermal to 50-60 kWh in the hybrid mode." Sircar said that a conceptual model has been developed.

Sircar was speaking on the sidelines of 4th International Geothermal Conference at PDPU on Tuesday. The conference was organized on theme of 'Harnessing and Hybridization'. National and international experts participated at the event.

"CEGE has identified Unai and Gandhar in the state along with Dholera for their potential to harness geothermal energy," said Sircar. "Temperature conditions at Unai are found to be better with the possibility of getting 100 kWh from the site. Helium is also found at the site." Other speakers at the event included Dr Kunezes Dolma from the United Nations University, Iceland, and Dr Hirok Choudhary from NIT Durgapur.

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Solar-geothermal model to be tested

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