DOCKETED	
Docket Number:	23-AFC-01
Project Title:	Morton Bay Geothermal Project (MBGP)
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Document Title:	Geothermal Resources Adequacy Declarations and Resumes
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DECLARATION OF

Abdel-Karim Abulaban, Ph.D., P.E.

I, Abdel-Karim Abulaban, Ph.D., P.E., declare as follows:

1. I am employed by the California Energy Commission as a Sr. Engineer, Water Resources.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I reviewed the documents filed into the proceeding's docket including the **Numerical Reservoir Simulation of the Salton Sea Geothermal Resource for Power Generation** by GeothermEx and the **Geothermal Resource Evaluation Testimony** submitted by Charlene Wardlow and Jesus Salera from the Department of Conservation. My review was based on my independent analysis of the Application for Certification for the project, supplementary testimony provided, data from reliable documents and sources, and my professional experience and knowledge.

4. It is my professional opinion that the referenced documents are valid and accurate with respect to the issues addressed therein.

5. I am personally familiar with the facts and conclusions related in the testimony and, if called as a witness, could testify competently thereto.

   I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 5/24/2023 Signed: 

At: Sacramento, California

AbdelKarim Abulaban

Tel. (916) 233-5006 (Mobile)
e-mail: akabulaban@aim.com

Education

Ph.D. Civil Engineering, University of Minnesota (*Hydrology and Water Resources)*.
Thesis title: Modeling the transport of sorbing chemicals in heterogeneous porous media.
M.S. Civil Engineering, Yarmouk University, Irbid, Jordan *(Water Resources).*
Thesis Title: Developing Intensity-Duration-Frequency Curves for Irbid Region.
B.S. Civil Engineering, Yarmouk University, Irbid, Jordan *(water resources stream).*
Senior Project: Design of Water Supply and Sewer Networks for the Northwestern Part of Irbid City (*population ~100,000)*.

Registration:

Registered Professional Engineer (Civil) - California (Lic. No. 76030)
Registered as a Qualified SWPPP Developer/Practitioner (QSD/QSP), California Stormwater Quality Association (CASQA) - Cert. # 1160.

Experience - Professional

Aug. 2022 - Present: ***Senior Engineer, Water Resources*** CA Energy Commission, Sacramento, CA, USA.	○ Suprvising the Geosciences Unit with staff comprised of engineering geologist and one civil engineer. ○ Direct staff in reviewing and evaluating the construction, operation, and maintenance of energy facilities and power plants to assess the potential impacts from those projects on human health and the environment. ○ Day-to-day administrative work from approvals of different kinds of requests by staff, to making sure staff are following the agency and state rules pertaining to their jobs.
June 2010 – Aug. 2022: ***Associate Civil Engineer*** CA Energy Commission, Sacramento, CA, USA.	○ Reviewing and evaluating the construction, operation, and maintenance of energy facilities and power plants to assess the potential impacts from those projects on human health and the environment. Analysis included the following technical areas: water supply, water quality, stormwater management, wastewater disposal, solid waste management and disposal, and noise. ○ Reviewing sensitive project sites that may have issues involoving flooding and stormwater management, discharges to impaired water bodies, depleted groundwater and surface water resources, and wastewater management and disposal methods. ○ Responding to soils or water resources issues that may arise during power plant operations. ○ Conducting investigations to determine if any violations of the program's regulations, the Energy Commission's conditions of certification, or the CA Environmental Quality Act (CEQA) have occurred. ○ Analysis of one of the largest solar projects in the world at the time for environmental impacts on soil and water resources. This project was designed to generate 500 megawatts using solar energy to generate steam that runs a turbine to generate electricity. ○ Analysis of another solar project, also one of the largest projects in the world, that uses photovoltaic (PV) technology and is designed to generate 1000 megawatts. ○ Analysis of a cutting-edge project that was proposing to minimize the

	green house impact of the project by injecting the generated CO2 gas underground for long term sequestration. The CO2 would have been injected to depths of 5000 ft. or more below ground surface. This project would have been the first of its kind in the US and would have set the stage for other projects to store CO2 in geologic formations to reduce green house gas emissions. The application was withdrawn because our analysis showed that it would have had significant impacts that the project proponent and financiers believed too costly to do.
Dec. 2006-May 2010: **Water Resources Engineer** CA Dept. Water Resources, Fresno, CA, USA.	o In charge of hydraulic modeling and sediment transport for the San Joaquin River restoration project. o Performed 1- and 2-D hydraulic analysis to support restoration of the San Joaquin River for the purpose of improving spawning/rearing habitat, enhancing floodplain connectivity, and improving riparian corridor.
Dec. 2001-Dec. 2006: **Retained Hydrologist** J.L. Nieber & Associates, Hydrologic Consultants, Lindstrom, Minnesota, USA.	o Performed hydrologic analysis and assessment of environmental impact of comtamination incidents on ground water resources, as well as design of remediation plans. o Contaminants analyzed included hydro-carbons, chlorinated solvents, as well as agrichemicals.
Dec. 90 – Dec. 93: **Retained Hydrologist**. BAUMGARTNER ENVIRONICS, INC, Olivia, Minnesota, USA.	o Performed assessment of the environmental impact of contamination incidents on groundwater resources, and design of action plans.
Jun. 84 - Sep. 84: **Civil Engineer** WESTON International, Inc, Irbid Wastewater Treatment Facility, Irbid, Jordan.	o Conducted material quality control, performing both laboratory and field quality control tests.

Experience - Academic

Sep. 2014-Jan 2015: Instructor CA State Univ., Sacramento Sacramento, CA	Teaching a graduate level course on groundwater hydrology. Class had 24 graduate students.
Sep. 2003-Sep. 2005: Assistant Professor, Hashemite University, Zarqa, Jordan.	Taught the following courses: - Water and Wastewater Treatment Mehods (Senior) – 1 semester - Wastewater Engineering (Senior level) – 2 semesters - Statics - 3 semesters - Engineering Drawing - 4 semesters - Visual Communication - 4 semesters
June – August, 96, 97, 98, 2000: Army High Performance Computing Research Center,	o The Summer Institute is a summer course offered to promising upper class students from member institutions. The summer course included a ground water flow and transport group that normally had about 4 students from different backgrounds. o Taught and helped teach the Summer Insitute course in hydrology

Minneapolis, Minnesota.	and transport in porous media. ○ Was part of the team that trained the students to use a particle tracking solute transport code which I developed. ○ Also trained the group to use the DoD's Ground Water Modeling System, GMS. ○ In the summer of 2000 I was fully in charge of the whole group. ○ More infromation about the projects can be on the Summer Institute web site at: http://www.arc.umn.edu/education/SummerInst/
August, 1997: Short course for practitioners, University of Minnesota, Minneapolis, Minnesota, USA.	○ Taught a short course on the application of the Department of Defense's Ground Water Modeling System, GMS, offered by the American Society of Agricultural Engineers and attended by about 40 professionals and academicians from around the United States as well as several countries around the world.
Mar. 88 - Dec. 92: Teaching Assistant, Dept. of Civil Engineering, University of Minnesota, Minneapolis, Minnesota.	○ Teaching assistant for the senior courses of Hydrology and Hydrologic Design, and Water Resources Engineering.
Sep. 84 - Sep. 86: Teaching Assistant, Civil Engineering Dept., Yarmouk University, Irbid, Jordan.	○ Teaching assistant for the courses of Statics, Engineering Graphics, Fluid Mechanics, Hydraulics, Sanitary Engineering, Applied Hydraulics, and Groundwater Hydrology.
Jan. 87 - Jun. 87: Instructor, Institute of Allied Health Sciences, Irbid, Jordan.	○ Teaching a senior level course on the principles of environmental engineering.

Experience - Research

i- Ground Water Flow and Transport:	
Oct. 93-Mar. 2002: **Research Associate** Biosystems and Agricultural Engineering Department, University of Minnesota, USA.	○ Modeling single and multi-phase flow and multicomponent transport in variably saturated heterogeneous porous media with chemical transformation such as adsorption and biodegradation. ○ I successfully developed a computer model based on the Random Walk Particle Tracking technique for this purpose. ○ The model was developed and implemented on a supercomputer platform through several grants from the Minnesota Supercomputer Center. This work was continued in a joint effort between the Biosystems and Agricultural Engineering Department and the Army High Performance Computing Research Center through a grant from the US Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS. ○ I also was involved in the modeling of flow and transport through preferential flow paths caused by unstable wetting

	fronts. Sample results for a simple scenario can be found on the World Wide Web by visiting http://www.arc.umn.edu/education/SummerInst/1996/

ii- Surface Water Hydrology:

Oct. 93- Jun. 95: **Post-Doctorate Associate** Department of Biosystems and Agricultural Engineering, University of Minnesota, Saint Paul, Minnesota, USA.	○ Analysis of the impact of and best management practices of surface tile inlets on the water quality in the Minnesota River basin.
Sep. 84 - Jun. 87: **Research Assistant** Civil Engineering Dept., Yarmouk University, Irbid, Jordan.	○ Development of Intensity-Duration-Frequency (IDF) Curves for design rain storms in Irbid Region. This research was supported by a grant from Yarmouk University.

Professional Development

CEQA Requirements and Compliance	○ Attended a one-day introductory workshop (2018) and an advanced workshop (2019) on CEQA (CA Environmental Quality Act) requirements and implementation.
ArcGIS Desktop III- GIS Workflow and Analysis	○ A 2-day hands-on workshop on how to utilize the analysis tools in ArcGIS; taught by staff from ESRI, Feb. 16-17, 2010.
Advanced HEC-RAS (Unsteady flow modeling using HEC-RAS)	○ A 3-day workshop organized and taught by Floodplain Management Association, Sacramento, CA, Nov 2-4, 2009.
Effective Workplace Writing	○ A 3-day workshop organized by CA Department of Water Resources, Sacramento, CA, Feb. 2008.
CAD Pilot Boot Camp	○ A 3-day workshop on Civil 3D administered by Central Visual Information Systems, Inc., Fresno, CA, July 2007.
Workshop on the application of WARMF (Watershed Analysis and Risk Management Framework)	○ A one-day workshop organized by California Water and Environmental Modeling Forum, Sacramento, CA, April 2007.
Workshop on "Anaerobic Treatment, Post Treatment and Agricultural Use of Treated Effluent	○ Workshop jointly organized by the Water and Environment Research and Study Center at the University of Jordan, the UNESCO-IHE Institute for Water Research, and Wageningen University, 18-22 April, 2004.
Workshop on Technology of Teaching	○ A 5-day workshop organized and conducted by the Dept. of Education at the Hashemite University. Jan. 2004

Computer Skills

Hardware Platforms	CRAY, SGI, HP, PC, MAC
Software Platforms	UNIX, X-WINDOWS, VAX VMS, DOS, WINDOWS
Software applied	HEC-RAS, HEC-HMS, HEC-1, HEC-2, GMS, SMS, WMS, CCHE2D, SRH-2D, MODFLOW, MT3D, FEMWATER,

	MODPATH, VARSAT2D, MS OFFICE.
Programming Languages	FORTRAN, C++
Numerical methods	Finite Element, Finite Difference, Finite Volume, Particle Tracking, Boundary Element, and Analytical Element methods.

Membership

American Geophysical Union, since 1989.
American Institute of Hydrology, since 2002.
Minnesota Groundwater Association, since 1990.

Honors

* Civil and Mineral Engineering Fellowship, University of Minnesota, 1987.
* Yarmouk University medal and the King's award for the first place in the class of 1987 graduates.

Publications

Abulaban, A. and J.L. Nieber (????). *Effects of equilibrium sorption hysteresis on the migration of solute plumes in porous media*. *(to be submitted).*

Hamasha, S.; Abu Allaban, M; **Abulaban A.** (2008). Modeling Atmospheric Turbidity at Zarqa Area Using Meteorological Data. JJP, 1:(1), 53-60.

Munjed Al-Sharif, J. Abu Ashour, **A. Abulaban**, and S. Al-Shar'a, (2007), Effect of Soil-Water Seperation Technique on the Estimation of Bacterial Adsorption onto Soil, Jordan Journal of Civil Engineering, Vol.(1), No. 2. pp. 295-302.

Peters, J.F., Howington, S.E., Maier, R.S., ***Abulaban, A***., and Nieber, J.L (2002). *Imbedding velocity autocorrelation into simulators for constituent transport through porous media*. Computational Methods in Water Resources: Proceedings of the Xivth International Conference on Computational Methods in Water ResourceProceedings, Delft, The Netherlands, pp.405-412.

Abulaban, A. and J.L. Nieber (2000). *Modeling plume behavior of non-linearly sorbing solutes in saturated heterogeneous porous media*. *Advances in Water Resources,* **23**, pp. 893-905.

Abulaban, A., J.L. Nieber, and D. Misra (1998). *Modeling plume behavior of non-linearly sorbing solutes in saturated homogeneous porous media*. *Advances in Water Resources,* **21** (6) pp. 487-498.

Nguyen, H.V., J.L. Nieber, and **A. Abulaban** (1998). *An improved method to model gravity-driven unstable flow in porous media*. International Workshop 'Soil Water Repellency: Origins, Assessment, Occurrence, Consequences, Modeling, and Amelioration', Wageningen, The Netherlands, September 2-4, 1998.

Wilson, B.N., E.C. Alexander, Jr., S. Magdalene, ***A. Abulaban***, M. Tomer, and J.W. Brown (1995). *Interim report on Minnesota River surface tile inlet research*. *Final Report for 1993-1995 Legislative Committee on Minnesota Resources (LCMR) Project*.

Abulaban, A. and S. Tekeli (1987). Development of Design Rainfalls for Irbid Region, *Report No. 9/86*, *Yarmouk University*, Irbid, Jordan.

Conference Presentations

Abulaban, A. and J. L. Nieber (1998). *Modeling the behavior of solute plumes with hysteretic equilibrium sorption in saturated porous media*. *American Geophysical Union: 1998 Spring Meeting, Boston, MA, May 26-29, 1998.*

Oduro, P., ***Abulaban, A***., Nieber, J., Peters, J., and Howington, S. (1998). *Modeling contaminant transport in heterogeneous porous media*. *Minnesota Water 98: Protecting Minnesota's Water Supplies.* Sixth Biennial Conference, Minnesota Water Resources Center, University of Minnesota, Saint Paul, MN.

Nguyen, H, Nieber, J.L., and **Abulaban, A. (1998).** *Simulation of Gravity-Driven Unstable Flow with a Highly Accurate Two-Phase Flow Simulator*. *American Geophysical Union: 1998 Fall Meeting, San Francisco, CA, Dec. 1998.*

Abulaban, A. and Nieber, J. L. (1997). *Effects of Equilibrium sorption hysteresis on the development of nonlinearly sorbing solute plumes in saturated porous media*. *American Geophysical Union: 1997 Fall Meeting, San Francisco, CA, Dec. 9-13, 1997*.

D. Misra, D. Chen, ***A Abulaban***, J. L. Nieber, and H. T. Davis. *Numerical Modeling of Contaminant Transport with Biodegradation in Heterogeneous Ground water Aquifers*. 1997 ASAE Annual International Meeting, August 10-14, 1997, Minneapolis, Minnesota.

Nieber, J.L., H.V. Nguyen, D. Misra, and **A. Abulaban**, 1996: *Modeling Flow and Solute Transport in Gravity-Driven Unstable Flow*. Annual Meeting of the Geological Society of America, Denver, Colorado, October 28-31, 1996.

Abulaban, A. and J. L. Nieber (1993). *Modeling the transport of sorbing solutes in heterogeneous porous media*. A*merican Geophysical Union: 1993 Fall Meeting, San Francisco, CA, Dec. 7-11, 1993.*

Abulaban, A., Andrecivic, R., and Foufoula-Georgio, E. (1990). Coupling of chemistry and transport to predict solute behavior, *Minnesota Water 1990: Facing the Environmental Challenges of the 1990s,* Minnesota Environmental Quality Board, Water Resources Research Center, Saint Paul, MN.

Invited Presentations

A. Abulaban, J.L. Nieber, J.F. Peters, and S. Howington, 2001. *Correlated Particle Tracking for Characterizing Non-Fickian Dispersion in Porous Media*. Annual Meeting of the American Institute of Hydrology, October 14-18, 2001, Bloomington, Minnesota.

Misra, D., J.L. Nieber, ***A. Abulaban***, and H.V. Nguyen, 1997. *Parametric study of three-dimensional solute transport in heterogeneous porous media, IN: Session on High Performance Computing in Porous Media Flows*, organized by: Dr. Dennis Parsons and Prof. Alvaro Coutinho, Fourth U. S. National Congress on Computational Mechanics, San Francisco, California, August 6-8, 1997.

Nieber, J.L., D. Misra, **A. Abulaban**, and H.V. Nguyen, 1996: *Modeling Water Flow and Solute Transport in Fingered Flow Processes*, Gordon Research Conference on Modeling of Flow in Permeable Media, Andover, New Hampshire, August 4-9, 1996.

Supercomputer and High Performance Computing Research

Nieber, J.L., **A. Abulaban**, M. Císlerová, and D. Misra, 1992: *Simulation of Unstable Gravity Driven Flow for Two-Phase Fluid Flow in Porous Media*, 1993 Annual Report of The Supercomputer Institute, University of Minnesota, 1200 Washington Ave. South, Minneapolis, Minnesota 55415, USA, pp:19-20.

References:

Available upon request.

DECLARATION OF

Charlene L Wardlow

I, Charlene L Wardlow, declare as follows:

1. I am employed by the California Geologic Energy Management Division (CalGEM), as the Geothermal Program Manager. I have 40 years in the field of geothermal energy.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I am personally familiar with the facts and conclusions related to the geothermal resources of the Salton Sea area and, if called as a witness, could testify competently thereto.

4. I reviewed relevant documents filed into the proceeding's docket including the **Numerical Reservoir Simulation of the Salton Sea Geothermal Resource for Power Generation** by GeothermEx, dated May 2023, and other studies assessing the geothermal resources of the Salton Sea area relied on by those in the field of geothermal energy.

5. Based on my review of production and injection well data, geologic and geophysical studies, and updated reservoir modeling, I coauthored testimony filed into the proceeding's docket title, **Geothermal Resource Evaluation Testimony**, dated May 18, 2023.

6. As concluded in the written testimony, based on all the information and studies I have reviewed, I concur with the various studies' findings, including the Salton Sea Geothermal Field Simulation by GeothermEx, that there is adequate commercial geothermal resource to support the three proposed geothermal projects, Black Rock Geothermal Project, Elmore North Geothermal Project, and Morton Bay Geothermal Project

   I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: May 25, 2023 Signed: Charlene L Wardlow

At: Sacramento, CA

Charlene L. Wardlow
715 P Street, MS 18-05, Sacramento, CA 95814
(916) 917-8898
Email: charlene.wardlow@conservation.ca.gov

EXPERIENCE

California Department of Conservation, Geologic Energy Management Division
Sacramento, CA May 2016 – present

Supervisory Oil and Gas Engineer, Geothermal Program Manager, and former Northern District Deputy
Direct the development, implementation and management of the Northern District and Division's geothermal program that includes the largest gas field in California, 2/3 of the state's underground gas storage facilities and the largest geothermal field in the world. Oversee District operations to ensure permits are issued timely; proposed and existing Underground Injection Control projects are professionally evaluated, and operations are following the Division's regulations. Collaborate with the State Oil and Gas Supervisor in the formulation and dissemination of oil, gas and geothermal regulatory plans, policies, standards, and controls.

Ormat Nevada Inc.
Reno, NV September 2006 - April 2016

Director of Business Development - September 2009 to current
- Spearheaded citing of a new power plant at Mammoth Lakes, CA coordinated with the USFS, BLM and Mono County agencies. Worked cooperatively with the local water district to address their concerns. Supported attorneys in the legal processes to win all appeals on the project;
- Lead successful permitting effort on two new geothermal power plant projects and Ormat's first US solar project in Imperial County, CA as well as expansion projects at existing facilities;
- Permitted Ormat's first exploration project in New Mexico resolving permit conditions that would have caused abandonment of the project before the first well was drilled;
- Collaborated on what would have been the first geothermal project in Indian Country. Developed and implemented multiple presentations for the Tribal Council and the Tribe's legal counsel, staff and cultural committee;

Environmental and Regulatory Affairs Administrator - September 2006 to August 2009
- Played key leadership and liaison role in assisting environmental staff with specific projects such as a settlement agreement with the Regional Water Quality Control Board and setting up compliance letters for new projects;
- Led Ormat's team in permitting and developing new geothermal energy projects in Imperial County and Mammoth Lakes, CA. Developed trusting, working relationships with county and state agencies and officials to bring projects to fruition.

Calpine Corporation
Middletown, CA 1981 – June 2006

Manager of Development Permitting - September 2001 – June 2006
- Lead permitting and environmental review required by federal, state and local agencies for development of power plants, transmission lines and well fields at Glass Mountain and The Geysers in California;
- Managed environmental budget for the Glass Mountain project and managed compliance during construction;
- Coordinated environmental due diligence team on potential acquisitions for geothermal division.
-

Environmental, Health and Safety Manager - April 1999 – September 2001

- Managed a staff of 17 environmental, health and safety (EHS) professionals responsible for 19 power plants and their associated well fields and the health and safety of about 400 Calpine employees at The Geysers; responsible for an EHS budget of more than $1 million.

Environmental Manager - 1991 – April 1999

- Oversaw the transfer of more than 400 permits and the regulatory review in concert with legal counsel to perform due diligence documentation for the acquisition of Pacific Gas & Electric's (PG&E) 14 power plants, Florida Power and Light's power plant and steam field and Unocal's well field at The Geysers in 1999, about $400 million in acquisitions.

Assistant Manager Environmental/Legislative Affairs - 1988 - 1991

- Lead environmental permitting effort to license (Sutter Project) the first power plant in California in almost 10-years, a 550-mw combined-cycle natural gas power plant; conducted numerous presentations to local community groups as part of public outreach for the project;
- Directed company efforts for a coal-fired power plant (Navajo South Project) southwest of Farmington, NM; coordinated team efforts for the NEPA review with the Bureau of Indian Affairs (BIA) and to secure other permits for the project. (Calpine's senior management decided to focus on natural gas and this project didn't go forward.)

Petroleum Engineer - 1981 - 1988

- Initiated major project to set up and organize database with data from more than 100 wells for five-year period that became instrumental for reservoir modeling and future projections;
- Worked closely with management in project budgeting, economics, acquisitions and growth planning; made numerous presentations to senior management that generated confidence in budget forecasts and company projections;
- Worked as production engineer responsible for 50 oil wells; performed reservoir engineering in oil field and geothermal and worked in drilling department to support two-rig operation for development of two new power plants.

EDUCATION

Master of Science in Petroleum Engineering
New Mexico Institute of Mining & Technology
Bachelor of Science in Geology
New Mexico Institute of Mining & Technology

DECLARATION OF
JESUS M. SALERA

I, Jesus M. Salera, declare as follows:

1. I am employed by the California Geologic Energy Management Division (CalGEM), as a Senior Oil and Gas Engineer, Supervisor. I have 26 years in the field of geothermal energy.

2. A copy of my professional qualifications and experience is attached hereto and incorporated by reference herein.

3. I am personally familiar with the facts and conclusions related to the geothermal resources of the Salton Sea area and, if called as a witness, could testify competently thereto.

4. I reviewed relevant documents filed into the proceeding's docket including the **Numerical Reservoir Simulation of the Salton Sea Geothermal Resource for Power Generation** by GeothermEx, dated May 2023, and other studies assessing the geothermal resources of the Salton Sea area relied on by those in the field of geothermal energy.

5. Based on my review of production and injection well data, geologic and geophysical studies, and updated reservoir modeling, I coauthored testimony filed into the proceeding's docket title, **Geothermal Resource Evaluation Testimony**, dated May 18, 2023.

6. As concluded in the written testimony, based on all the information and studies I have reviewed, I concur with the various studies' findings, including the Salton Sea Geothermal Field Simulation by GeothermEx, that there is adequate commercial geothermal resource to support the three proposed geothermal projects, Black Rock Geothermal Project, Elmore North Geothermal Project, and Morton Bay Geothermal Project.

   I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Dated: 5/26/2023 Signed: Jerry Salera Jesus M. Salera

At: Sacramento , California

Jerry Salera

Resumé - May 15, 2023

SENIOR OIL AND GAS ENGINEER (SUPERVISOR) - <5 years, CalGEM Northern District/Geothermal Program

- Supervise geothermal permitting process of well work and UIC Class V injection
- Supervise geothermal well injection surveillance and field inspections
- Provide technical information and support as District rep to UIC Roundtable and represent District in regular meetings with the EPA and the SWB/RWBs
- Support CalGEM's Geothermal Regulations update process

SENIOR OIL AND GAS ENGINEER (SUPERVISOR) - 7 years, CalGEM HQ UIC Program

- Supervised reviews of District UIC projects and compliance and analyzed statistical data to identify issues on UIC compliance
- Coordinated with the SWB/RWB on the processing of aquifer exemptions and other UIC-related initiatives like Legislature reporting and UIC compliance efforts
- Provided technical support and statistical data in the UIC Regulations update process
- Interfaced with the US EPA (Region 9) on CalGEM's Class II Program reporting requirements and prepared annual documentation for Grant support

ASSOCIATE OIL AND GAS ENGINEER – 6 months, CalGEM HQ UIC Program

- Reviewed UIC projects and MIT compliance

ENERGY AND MINERAL RESOURCES ENGINEER - 5 years, CalGEM District 6 (now Northern District)

- Performed witnessing of BOPE and well MIT testing, zone and well P&As and updated maps, well files and databases
- Conducted and documented well and lease inspections, sent out Notices of Violations (NOVs) and monitored compliance

SENIOR RESOURCE ENGINEER – <1 year, Caithness Energy, Coso Geothermal Field, CA

- Monitored production well performance and effects of injection well utilization
- Coordinated and implemented testing programs of production and injection wells
- Generated statistical data of reservoir performance

RESERVOIR ENGINEERING SUPERVISOR, RESERVOIR ENGINEER, MEASUREMENTS ENGINEER - <21 years, Philippine National Oil Company – Energy Development Corp. Geothermal Division, Makati, Philippines

- Supervised the monitoring of production and injection wells and proposed and coordinated well utilization strategies to optimize steam production for the power plants in 4 geothermal fields.
- Implemented and coordinated well testing programs to determine well and reservoir potential in geothermal exploration areas
- Planned and implemented well discharge stimulation campaigns for hard-to-discharge wells in newly explored areas.
- Participated in multi-disciplinary group studies of exploration areas, helped create and develop conceptual and reservoir models and performed resource assessment studies.

EDUCATION

- **University of Auckland, Geothermal Institute, New Zealand**
  - **Master's in Engineering (Engineering Science), 1987 -** Focus on Geothermal Reservoir Engineering.
  - **Diploma in Energy Technology (Geothermal), 1983**
- **B. S. Industrial Engineering 1981, University of the Philippines, Diliman**