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ECONOMIC POTENTIAL OF GEOTHERMAL ENERGY USAGE IN AGRICULTURE AND AQUACULTURE:
THE CASE OF NEVADA

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ABSTRACT

Nevada is endowed with geothermally heated springs which can be utilized in agricultural and aquacultural production. This paper discusses current and potential uses of this resource and describes ongoing research in these areas.

INTRODUCTION

Geothermal usage has immense potential in Nevada. Six years ago, the U.S. government opened Federal lands to geothermal exploration. Today, there are about 600 leases covering a million acres of Federal land in Nevada (Nevada Bureau of Mines and Geology).

The three major uses of geothermal energy in Nevada are residential and commercial heating, agriculture and aquaculture. The most widespread use of geothermal energy today is for heating homes and buildings. However, usage of geothermal energy in agricultural and aquacultural production is novel. The primary objective of this paper is to discuss the development of the latter two uses in Nevada.

AGRICULTURAL USAGE

Geothermal energy is used as an input in Nevada's agricultural production. Gasohol has been produced in Wabuska, Nevada. Geothermally heated water from the Wabuska hot springs is the heat source to turn corn mash into alcohol. The major problem with alcohol production in this State is the unavailability of an inexpensive feed stock.

The search for an economical feed stock has produced three possible alternatives:

- (i) Jerusalem artichokes
- (ii) potatoes

(iii) fodder beets

Studies have shown the Jerusalem artichoke to be drought resistant, requiring minimal care, providing good yields and having by-products that are suitable for livestock. Potatoes have similar characteristics and yield about the same amount of alcohol per equivalent unit of production (Garthe). Fodder beets yield about the same amount of alcohol per unit as artichokes and potatoes. However, fodder beets are more susceptible to disease.

Geothermally heated water has also been used to heat greenhouses where vegetables and ornamentals are grown. Major concerns for these operations are the costs of an auxiliary heating unit and transportation costs to major marketing outlets.

WARM WATER AQUACULTURE

Nevada with its geothermal resource has potential for expanded aquacultural activity. Here, geothermal energy is used to heat holding ponds. Freshwater prawn Macrobrachium rosenbergii, catfish and striped bass are currently grown in ponds at the Fort Churchill power station in conjunction with the School of Veterinary Medicine at the University of Nevada, Reno.

(Prawn production in these ponds are estimated at 2,000 pounds (whole prawns) per acre (Onyeagbako). This is comparable to Hawaii's prawn yields of 2,500 pounds (whole prawns) per acre (State of Hawaii, 1978). Studies by Onyeagbako and Shang imply that the rate of return to freshwater prawn farming increases as the operation's size increases assuming normal management conditions.

Market test results (Taylor, and Liao and Smith) indicate that freshwater prawns is a favorable substitute for shrimp and an acceptable entree at seafood restaurants.

Reductions in production losses due to cannibalism and the development of less expensive feed are areas requiring further research in prawn production. Increasing net revenue from polyculture of freshwater prawns with catfish, bass and other fish is currently being investigated at the University of Nevada, Reno.

CONCLUSIONS

Geothermally heated water is an important input in Nevada's agricultural and aquacultural growth. Though in its early development, expanded geothermal usage seems to be potentially feasible. Multiple usage of the geothermal resource through cascading (e.g., combining both agriculture and aquaculture production from the same hot water input) can further increase this economic potential. A proposed venture is to combine greenhouse production with aquaculture. In this case, hot water is used more efficiently while increasing monetary returns attributed to geothermal energy.

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ALPHABETICAL INDEX OF AUTHORS

A

- Allen, Eliot M.:
HEATPLAN: A Microcomputer Program for Geothermal District
Heating Assesment563

B

- Batdorf, James A. and George M. Simmons:
Economical Advantages in Using Conventional Energy Supplements
in the Design of Geothermal District Heating Systems.....567
- Benoit, Walter R.:
An Explorationist Viewpoint of the High-Temperature Geothermal
Potential of the Cascade Range in Oregon.....227
- Bjelm, Leif and Lennart Scharnell:
Large Heat Pump Plants for District Heating Utilizing
Geothermal Energy.....573
- Black, Gerald L.:
Interpretations of the Central Oregon Cascades Heat Flow Anomaly.....117
- Blackett, Robert E., and Peter T. Kolesar:
Geology and Alteration of the Raft River Geothermal System, Idaho.....123
- Blackwell, David D. and John L. Steele:
A Summary of Heat Flow Studies in the Cascade Range.....233
- Bliem, C.J. Jr.:
The Raft River 5MW(e) Binary Geothermal-Electric Power
Plant - Operation and Performance.....3
- Bloomquist, K. Gordon:
Geothermal Resources in the Cascades: Accessible/Developable -
The Institutional Setting.....237
- Bodvarsson, Gudmundur S., K. Pruess, V. Stefansson and
E.T. Eliasson:
A Summary of Modeling Studies of the Krafla Geothermal
Field, Iceland.....391
- Bodvarsson, M.G. and S.M. Benson:
A Summary of Well Testing Activities at Lawrence Berkeley
Laboratory, 1975-1982.....397

C

- Carey, D.L., T.J. Nicholas, G.W. Hutterer,
P.K. DeJong and S.T. Grabacki:
The Unalaska Geothermal Exploration Project Introduction and
Land, Regulatory, and Environmental Aspects.....81
- Caskey, B.C. and G.E. Loeppke:
Lost Circulation in Geothermal Wells: Research and
Development Status.....403

Childs, F.W., L.D. Kiroi, R.D. Sanders and M.J. McLatchy: Description and Operation of Haakon School Geothermal Heating System.....	579
Ciancanelli, Eugene V.: Geology of Medicine Lake Volcano, California.....	129
Ciancanelli, Eugene V.: Geology of Newberry Volcano, Oregon.....	135
Cole, David R.: Time Estimates for Oxygen Isotopic Exchange During Mineral-Fluid Interaction In Hydrothermal Systems.....	283
Corwin, Robert F. and David V. Fitterman: Self-Potential Survey Results Makushin Volcano Geothermal Area, Unalaska Island, Alaska.....	87
Coury, Glenn: The Coury Heat Exchanger Process ¹ for the Removal of H ₂ S and Other Impurities From Geothermal Steam in Steam Stacking Applications.....	9
Cunniff, Roy A., Charlie Houghton and Prasan Chintawongvanich: New Mexico State University Campus Geothermal Demonstration Project - One Year Later.....	585

D

Diment, William H .and Thomas C. Urban: A Simple Method for Detecting Anomalous Fluid Motions in Boreholes From Continuous Temperature Log.....	485
Dolenc, Max R., Frank W. Childs, David W. Allman and Ray D. Sanders: An Evaluation of Direct Use Project Drilling Costs.....	589
Duffield, W.A.: Geologic Framework for Geothermal Energy in the Cascade Range.....	243

E

Epperson, I.J.: Beowawe Acid Stimulation.....	409
Epperson, I.J.: 1981 Interference Well Testing: Beowawe, NV.....	413

F

Finn, Carol and David Williams: Gravity Studies in the Cascade Range.....	247
Flynn, Thomas and Mayor Keith Larson: Drilling, Completion and Testing of Geothermal Wells CD-1 and CD-2, Caliente, Nevada.....	595
Flynn, Thomas and George Ghush, Jr.: Geologic and Hydrologic Research on the Moana Geothermal System Washoe County, Nevada.....	417

Franzson, Hoalti: The Svatsengi High-Temperature Field, Iceland Subsurface Geology and Alteration.....	141
Fridleifsson, Gudmundur Omar: Mineralogical Evolution of a Hydrothermal System.....	147
Fultz, L.A., E.J. Bell and D.T. Trexler: Volcanic Rock Petrochemistry as an Exploration Technique for Geothermal Engery.....	289

G

Gudmundsson, J.S.: Geothermal Soil Heating in Iceland.....	601
Gudmundsson, J.S.: Injection Testing in 1982 at the Svatsengi High-Temperature Field in Iceland.....	423
Gunnarsdottir, Maria J.: Pumice Insulation: A Practical Solution for Rural Geothermal Pipelines.....	607

H

Hamano, Hiroshi: Design of a Geothermal Power Plant with High Non-Condensable Gas Content.....	15
Hayashi, Masao and Hiroshi Takagi: Fracture Analysis at the Kirishima Geothermal Field, Southern Kyushu, Japan.....	153
Hoyer, Dan and Phil Shafer: Geothermal Permitting in Imperial County.....	351
Hulen, Jeffrey B and Dennis L. Nielson: Stratigraphy of the Bandelier Tuff and Characterization of High-Level Clay Alteration in Borehole B-20, Redondo Creek Area, Valles Caldera, New Mexico.....	163
Hulen, Jeffrey B.: Structural Control of the Baltazor Hot Springs Geothermal System, Humboldt County, Nevada.....	157

I

Intemann, Paul R. and R.D. Sharp: Values for Conductive Heat Transfer in Geothermal Technologies.....	491
Intemann, Paul R.: Towards Solving the Conflict Between Geothermal Resource Uses.....	357
Isselhardt, C.F., R. Motyka, J.S. Matlick, P.P. Parmentier and G.W. Hutterer: Geothermal Resource Model for the Makushin Geothermal Area, Unalaska Island, Alaska.....	97
Isselhardt, C.F., J.S. Matlick, P.P. Parmentier and R.W. Bamford: Temperature Gradient Hole Results from Makushin Geothermal Area, Unalaska Island, Alaska.....	93

J

- Janik, Cathy J., Nancy L. Nehring and Alfred H. Truesdell:
Stable Isotope Geochemistry of Thermal Fluids from Lassen
Volcanic National Park, California.....295
- Johnson, Keith E. and Eugene V. Ciancanelli:
Geothermal Exploration at Glass Butte, Oregon.....169

K

- Keller, George V. and Jimmy J. Jacobson:
Deep Electromagnetic Soundings Northeast of the Geysers
Steam Field.....497
- Keller, George V. and Jimmy J. Jacobson:
Megasource Electromagnetic Survey In The Bruneau-Grandview
Area, Idaho.....505
- Kepler, Hans, C.F. Pearson, R.M. Potter and J.N. Albright:
Microearthquakes Induced During Hydraulic Fracturing at
the Fenton Hill HDR Site: The 1982 Experiments.....429
- Kim, R.S. and E.A. Schaefer:
Design Consideration, Brine-Hydrocarbon Heat Exchanger Warm-Up
and Turbine Bypass Schemes for Heber Geothermal Binary Cycle
Demonstration Plant.....19
- Kobayashi, Hideo, Hirohide Hayamizu and Isao Matsunaga:
Evaluation of Artificial Fracture Volume Based on Vented
Water - Yakedake Hot Dry Rock Test Site.....435
- Kruger, Paul and Vasek Roberts:
Utility Industry Estimates of Geothermal Energy.....25
- Kunze, Jay F., Ray W. Gould and Ralph M. Wright:
The Economic Result of Geothermal Heat for Two Large
Greenhouses.....61
- Kunze, Jay F., Ben E. Lofgren:
Pilgrim Springs, Alaska Geothermal Resource Exploration,
Drilling, and Testing.....301

L

- La Fleur, Joe:
An Exploration Overview.....253
- Lippmann, M.J. and G.S. Bodvarsson:
A Modeling Study of the Natural State of the Heber Geothermal
Field, California.....441
- Loeppke, G.E. and B.C. Caskey:
A Full-Scale Facility for Evaluating Lost Circulation
Materials and Techniques.....449
- Lohse, Richard L. and Larry Icerman:
Temperature Gradient Drilling in the Mesquite-Anthony Area,
New Mexico.....513
- Lohse, Richard L. and Larry Icerman:
Thermal Anomaly Study for the Otero County Area, South Central
New Mexico.....175

Long, Gregg and David McClain: Economic Constraints to the Development of Geothermal Power in the Cascades.....	263
---	-----

M

Mangold, Donald C. and Chin Fu Tsang: A Study of Nonisothermal Chemical Transport in Geothermal Systems by a Three-Dimensional Coupled Thermal and Hydrologic Parcel Model.....	455
Mathews, Mark A., James Scott and Carol M. LaDelfe: A Preliminary Report on Fractured Igeous Rock Environment Test Pits.....	519
Matlick, J.S. and P.P. Parmentier: Geothermal Manifestations and Results of a Mercury Soil Survey in the Makushin Geothermal Area, Unalaska Island, Alaska.....	305
Matsubayashi, O.: Conduction Dominated Geothermal Regime in the Sengan Region, Northeastern Honshu, Japan.....	525
McCarthy, Kevin P.: A Helium Exploration Survey in the Animas Valley, Colorado.....	311
Moore, Joseph N., Michael C. Adams and Josef J. Stauder: Geochemistry of the Meager Creek Geothermal Field, British Columbia, Canada.....	315
Moore, James L. and Joseph G. La Fleur: Geothermal Energy - The Rational Geological Choice.....	361
Moorehead, Margaret A. and Barbara J. Priest: State and County Regulation of Small Geothermal Electrical Generation Facilities in Oregon.....	367
Motyka, Roman J.: Geochemical and Isotopic Studies of Waters and Gases from the Makushin Geothermal Area, Unalaska Island, Alaska.....	101
Murphy, Hugh, Hans Keppler and Zora Dash: Does Hydraulic Fracturing Theory Work in Jointed Rock Masses?.....	461

O

Onodera, Seibe: Comparison of Interpreted Results of resistivity Sounding Curves with Well Data in El Tatio Geothermal Field, Chile.....	529
--	-----

P

Parmentier, Paul P., John W. Reeder and Mitchell W. Henning: Geology and Hydrothermal Alteration of Makushin Geothermal Area, Unalaska Island, Alaska.....	181
Prideaux, D.L. and H. D. Hickman: Geothermal Energy on Tap - with Assurance.....	31
Priest, George R., Neil M. Woller and Stanley H. Evans: A Comparison of Two Newly Mapped Parts of the High Cascade- Western Cascade Transition Zone, Central Oregon.....	269

R

- Reader, John F. and Brian D. Fairbank:
Heat Flow in the Vicinity of the Meager Volcanic Complex,
Southwestern British Columbia..... 535
- Reed, Andrea W., Donald B. Hunsaker, Jr., R. Dickinson Roop
and J. Warren Webb:
Evaluation of Nepa-Based Environmental Commitments at Four
Geopressured Geothermal Design Wells..... 371
- Rex, Robert W.:
The Origin of the Brines of the Imperial Valley, California..... 321
- Riess, M.L. and P.F. Meiran:
Design of the Brine-Hydrocarbon Heat Exchanges for the Heber
Geothermal Binary Demonstration Power Plant..... 35
- Rowley, John C., R.A. Pettitt, I. Matsunaga, D.S. Dreesen,
R.W. Nicholson and A.R. Sinclair:
Hot Dry Rock Geothermal Reservoir Fracturing Initial Field
Operation - 1982..... 467
- Ryan, Gene P.:
Binary Generators - Tweaking More Bangs Per BTU..... 41

S

- Sackett, B.S. and E.F. Wahl:
Two Phase Flow in Surface Facilities..... 47
- Sageev, Abraham and Roland N. Horne:
Drawdown Pressure Transient Analysis of a Well Near a Steam Cap..... 473
- Sammel, Edward A.:
The Shallow Hydrothermal System at Newberry Volcano, Oregon:
A Conceptual Mutual..... 325
- Schumacher, Stephen E. and Bill Lewis:
50 MW Liquid Dominant Geothermal Power Plant Design..... 53
- Shannon, S.S. Jr., F. Goff, J.C. Rowley, R.A. Pettitt and
F.D. Vuataz:
Roosevelt Hot Springs/Hot Dry Rock Prospect and Evaluation
of the Acord 1-26 Well..... 541
- Sheinbaum, I., and A.V. Sims:
The Direct Chlorination Process for Hydrogen Sulfide Abatement..... 59
- Shore, Greg A.:
Application and Interpretation of Multiple Pole-Pole
Resistivity Survey, Mt. Cayley, B.C..... 545
- Shore, Greg A.:
Electrical Resistivity Survey Results from the Anahim
Volcanic Belt, B.C..... 551
- Sibbett, Bruce :
Structural Control and Alteration at Beowawe KGRA, Nevada..... 187
- Sifford, Alex and Eliot Allen:
Harney County, Oregon Geothermal Energy Plan..... 377
- Sinclair, David E.:
Federal Geothermal Leasing Data and Recent Regulation Changes..... 381

Smith, Gary A. and Edward M. Taylor: The Central Oregon High Cascade Graben: What? Where? When?.....	275
Stejskal, Joe and Roy A. Cunniff: San Bernardino Geothermal District Heating Project.....	615
Stenstedt, E.A. and W.A. Osterling: Ancillary Benefits of Geothermal Development.....	385
Sternfeld, Jeffrey, Mary Keskinen and Richard Blethen: Hydrothermal Mineralization of a Clear Lake Geothermal Well Lake County, California.....	193
Stone, Claudia: A "Residual Temperature Map" of Arizona.....	555
Swanson, R.K., J.S. Osoba and W.J. Bernard: Gulf Coast Geothermal - Down But Not Out.....	107

T

Tacchino, Giancarlo and Giacomo Cerisola: Corrosion and Erosion Effects of Endogenous Larderello Fluid on Metals Used in Ansaldo Geothermal Power-Plants.....	71
Tacchino, Giancarlo: Corrosion in Geothermal Plant: Choice and Use of Special Material.....	65
Taguchi, Sachihito and M. Hayashi: Past and Present Subsurface Thermal Structures of the Krishima Geothermal Area, Japan.....	197
Thomas, Donald M.: Status Summary of the HGP-a Generator Facility: 1983.....	75
Thompson, J.M., A.L. Grunder and Wes Hildreth: Selected Chemical Analyses and Geothermometry of Hot Waters from the Calabozos Caldera, Central Chile.....	331
Thussu, J.L., J.N. Moore and R.M. Capuano: Preliminary Geothermal Assessment of the Tattapani Thermal Area, Madhya Pradesh, India.....	337
Truesdell, Alfred H., Emanuel Mazar and Nancy L. Nehring: The Origin of Thermal Fluids at Lassen Volcanic National Park: Evidence from Noble and Reactive Gas Abundances.....	343

W

Waibel, Al: A Review of the Hydrothermal Mineralogy of Hawaii Geothermal Project Well-A, Kilauea, Hawaii.....	205
Wescott, Eugene M. and Donald, L. Turner: Geothermal Energy Resource Exploration of the Eastern Copper River Basin, Alaska.....	211
Wilt, M.J., K. Pruess, G.S. Bodvarsson and N.E. Goldstein: Geothermal Injection Monitoring with D.C. Resistivity Methods.....	477
Wood, Spencer H. and Willis L. Burnham: Boise, Idaho Geothermal System.....	215

Y

Yanagida, John F.: Economic Potential of Geothermal Energy Usage in Agriculture and Aquaculture: the Case of Nevada.....	619
--	-----