

THE TRAINING PROGRAM IN GEOTHERMAL TECHNOLOGY OF
PHILIPPINE NATIONAL OIL COMPANY'S ENERGY DEVELOPMENT
CORPORATION

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Geothermal Division
PNOC-Energy Development Corporation

INTRODUCTION

Barely 9 years after the Philippine National Oil Company-Energy Development Corporation (PNOC-EDC) started serious exploration of the known geothermal resources of the Philippines, the country can now speak of a fast-growing number of Filipino specialists in the field of geothermal technology.

Initially, the country depended mostly on foreign consultants every inch of the way. However, PNOC-EDC, the lead government firm for the exploration and development of geothermal energy in the country, judiciously adopted, even in the yet early years of the program, a technology transfer scheme which is now showing signs that the Filipinos are indeed becoming increasingly self-reliant in the geothermal development field.

From over 30 Philippine-based and Auckland-based New Zealander consultants during the late 70's, PNOC-EDC has reduced this level to 10 bodies in 1984, with further reduction to 2 foreseeable at the start of 1986. The Government of New Zealand, recognizing the increasing technical capability of the Filipinos will terminate the consultancy portion of the Bilateral Aid Program at the end of 1985, therefore, limiting the New Zealand assistance to technical training to help the Philippines sustain its long-term high level manpower build-up.

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It is extremely difficult to quantify the degree of technology transfer received so far by the technical staff of PNOC-EDC. In 1983, Dr. Arturo P. Alcaraz, the acknowledged "Father of Philippine Geothermal Energy Exploration and Development" assessed the status of technology transfer in the Philippines in the following manner:

1. The Philippines has been the recipient of a fair amount of technology transfer in the area of geothermal energy exploration and development. Filipinos are now largely capable in the 3 main technologies involved in a full scale geothermal energy production.
2. In the exploration phase which demands expertise in geology, geochemistry and geophysics, the extent of knowledge acquired by the Filipinos is placed at 90%, the remaining 10% represents the fact that technology is an evolutionary process and therefore its transfer can never be completed.
3. For drilling management which involves largely the overseeing of programmed drilling operations, the Filipinos are rated as being 70% capable.
4. For engineering services or the design and construction of steam collection and effluent disposal systems, the extent of technology transfer is rated at 80%.

TECHNOLOGY TRANSFER - A MUST

To speed up technology transfer in all areas of operation, PNOC-EDC management elected to put the consultants directly in the LINE, whether they are funded under the bilateral aid

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programs or working within a commercial engagement. This arrangement has relieved them from their typical non-committal stance as plain advisers. The Filipino staff, is usually headed by an understudy who is carefully selected to work closely on a ONE-ON-ONE relationship with the expatriate supervisor or manager until the management is convinced that the Filipino counterpart can already take over.

While it would seem that New Zealand has been PNOC-EDC's steady source of technology, this is not to say it did not avail of the known expertise of other countries. P.V. Malixi, PNOC Vice-President who was at the helm of the program piloting it to success from 1976 to the time of his retirement in early 1985, has always stressed that "technology is an evolutionary process and is therefore not the sole or exclusive expertise of any one organization".

Over the years, technology transfer to PNOC-EDC geoscientists, engineers and technicians has been attained through the following:

1. Direct working experience with trained expatriates and Filipinos from PNOC and KRTA.
2. Exposure to various technology experts through scientific missions to the Philippines, or plain visits to the Philippines of experts from New Zealand, Iceland, Japan, Italy and the United States. They are literally "grabbed by the arm" when they happen to be around.

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3. Attendance in conferences and seminars on geothermal energy technology, both domestic and foreign. The accidental participation of this author to the International Workshop on Training Needs in Geothermal Technology of Developing Countries held at Laugarvatn, Iceland in July 1978 opened a new and fresh area of training and linkage with experts in Iceland that tremendously helped PNOC-EDC during the early years when it has to crash its training program to develop the much needed skill in its technical staff in the earliest time possible. From 1979 to 1983, the UNU/Iceland Course successfully graduated 11 Filipinos adequately trained in the fields of borehole geology, geochemistry, geophysics and reservoir engineering.

4. Availment of formal training on the science and engineering of geothermal technology from local and foreign venues, viz:
 - a) UNDP/NZ and RP-NZ Bilateral training program at the Geothermal Institute of Auckland University;

 - b) Short training assignments from 2 to 6 months with the Department of Scientific and Industrial Research, Ministry of Works and Development and the Electricity Department of New Zealand funded under the RP-NZ Bilateral Aid Program better known as the RP-NZ Geothermal Energy Cooperation Program (RP-NZ GECP);

 - c) UNU/Iceland-funded specialization courses at Orkustofnun, Reykjavik, Iceland;

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- d) JICA-funded geothermal overview course at the Kyushu University for supervisors and potential managers;
- e) Post-graduate course in geothermics at Pisa, Italy; and
- f) UNDP-funded Geothermal Reservoir Assessment and Management Course currently being conducted in the Philippines. Forty Filipinos have been participating in the course which was rated to be equivalent to a masteral program. The course covers lectures and practicum that commenced in early 1982. Expected completion of the course is end of 1986.

What is also considered as a key element to the successful transfer of technology to the technical personnel of PNOC-EDC is the fact that the company has done fairly well in its recruitment program. Its management has even agreed to the extent of over-staffing the organization so that training can be sustained over the long term without jeopardizing the work program.

A SUCCESS STORY

When people talk of the success story of PNOC's geothermal exploration and development program, they speak primarily in terms of the absolute figures, viz:

- 1) the first 3 MW semi-commercial geothermal power plant in Tongonan, Leyte which was rendered operational

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within a span of 9 months from the time the discovery well was drilled in October 1975 to the hook-up of the power station in early July 1977;

- 2) the 225-MW installed capacity in Tongonan, Leyte and Palinpinon, Negros Oriental which represents about 25% of existing installed capacity in the country; and
- 3) the high number of successful wells drilled todate - nearly 90% success rate in a total of 150 wells.

To PNOC, however, success is also defined in terms of the infrastructures it had put up, the ancillary industries that had thrived because of its operations, the employment opportunities that its projects had generated, and the social improvements it has introduced in its project areas.

Another aspect of success directly associated with the geothermal program is the development of indigeneous technical capability and transfer of technology which has been an on-going concern of PNOC since it ventured into the energy development field. PNOC now has a pool of geothermal operations experts, from geoscientific to reservoir engineering, thanks to the technical assistance of New Zealand, Iceland, Japan, Italy and the UNDP.

The Filipino people view the success of PNOC's training program in geothermal technology with high regard. Even a KRTA manager was heard expressing a sentiment of optimism about the success of the training program. He said, "It is now possible to foresee the time ahead when the present pupil takes up the role of the teacher in his own right." (1983,

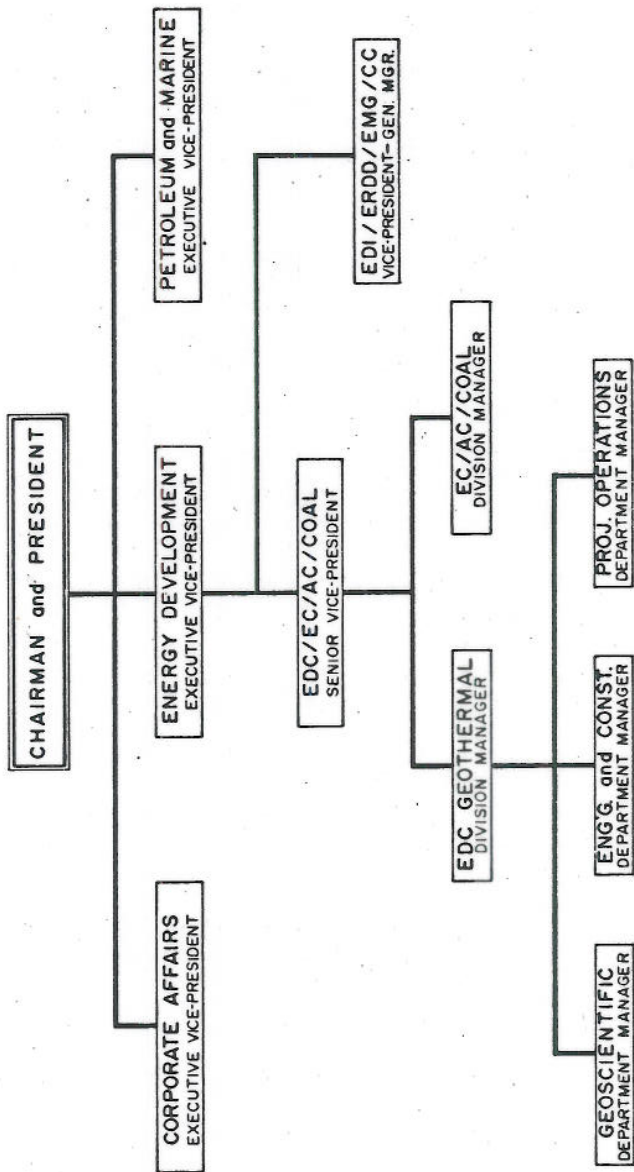
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Inauguration of Tongonan I Geothermal Power Station).

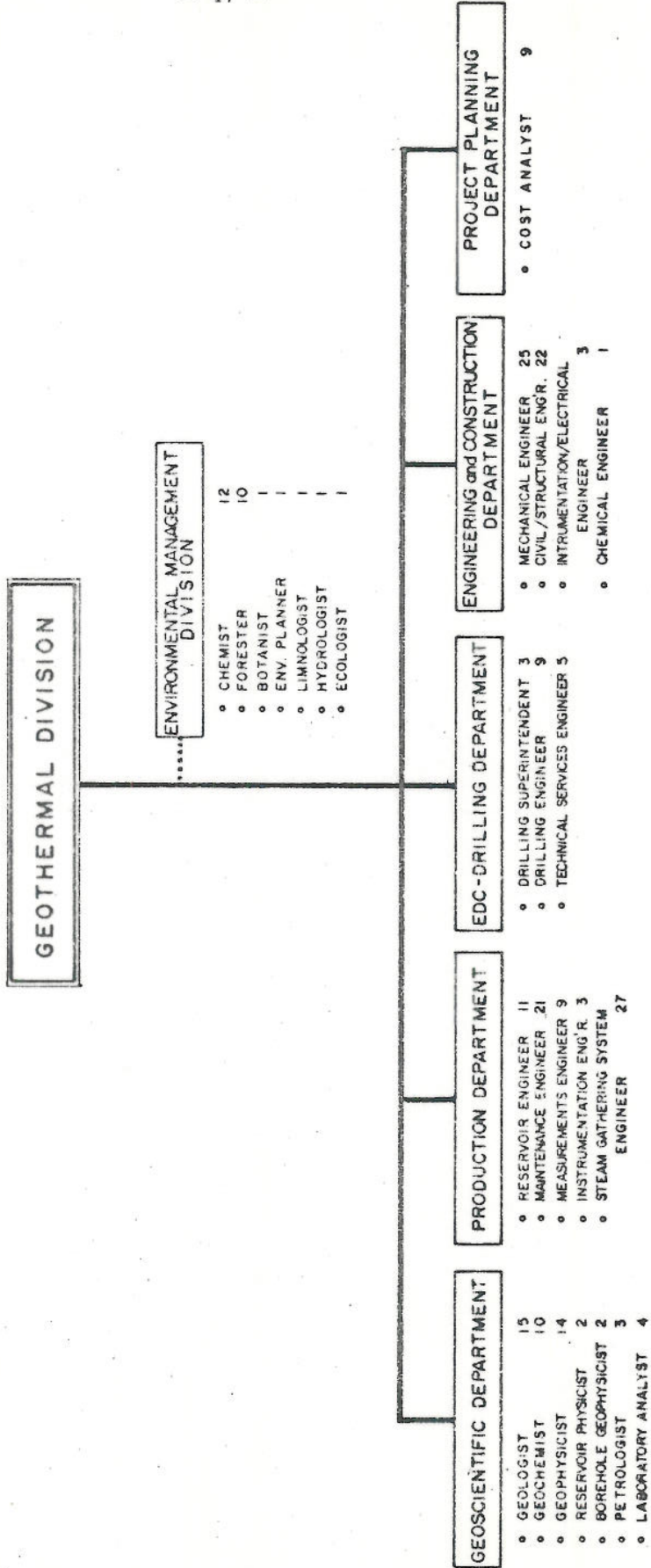
CONCLUDING STATEMENT

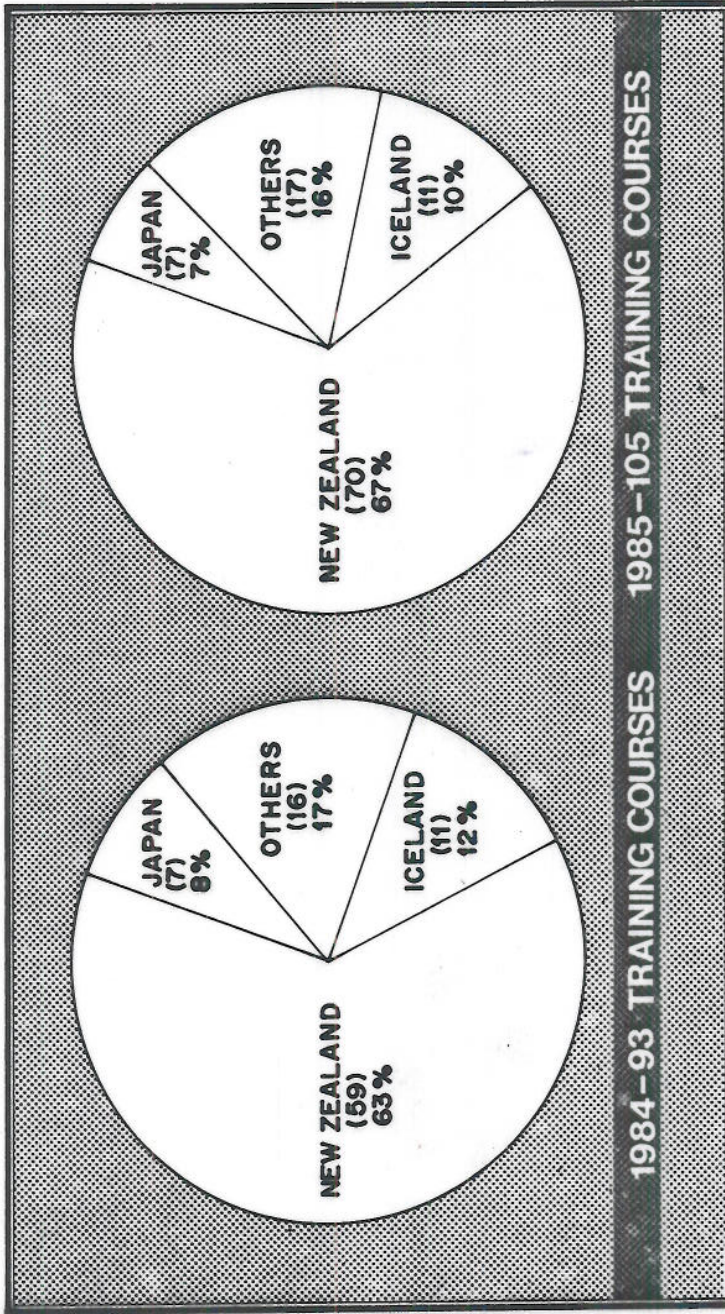
Despite this success, PNOC still maintains its belief that its management would always benefit from consulting with international experts who could render independent second opinions on important issues affecting project management and operations. Geothermal operations, just like any other exploration venture, involves tremendous financial risks. The decision for a minimum exploration drilling program involving 3 wells, for example, is already a US\$5 million or more worth of a decision. PNOC would prefer to approach this kind of a decision from all possible viewpoints in order to lessen if not minimized the risks involved.

EDC GEOTHERMAL DIVISION
WITHIN THE
PNOC ORGANIZATION

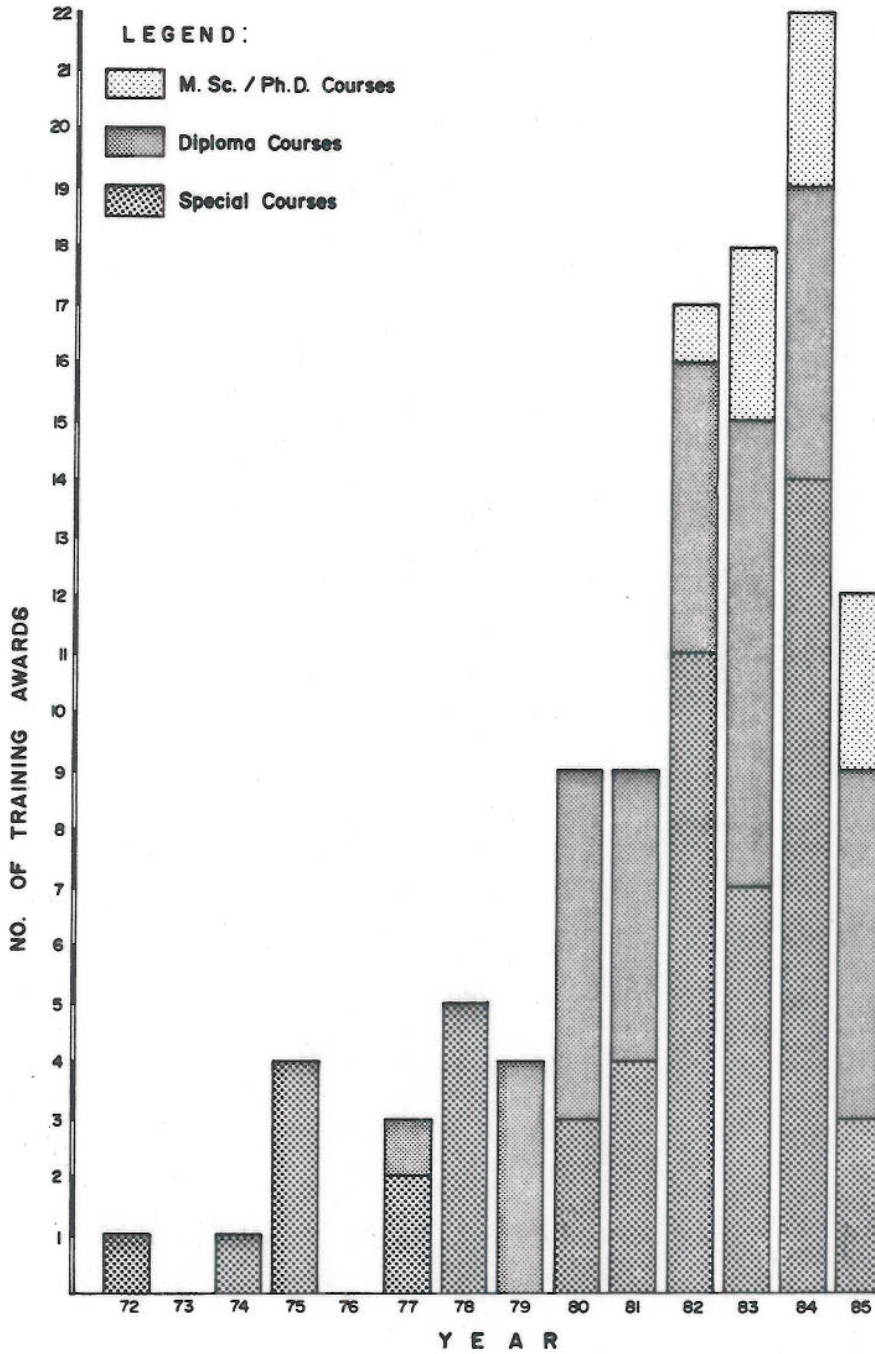


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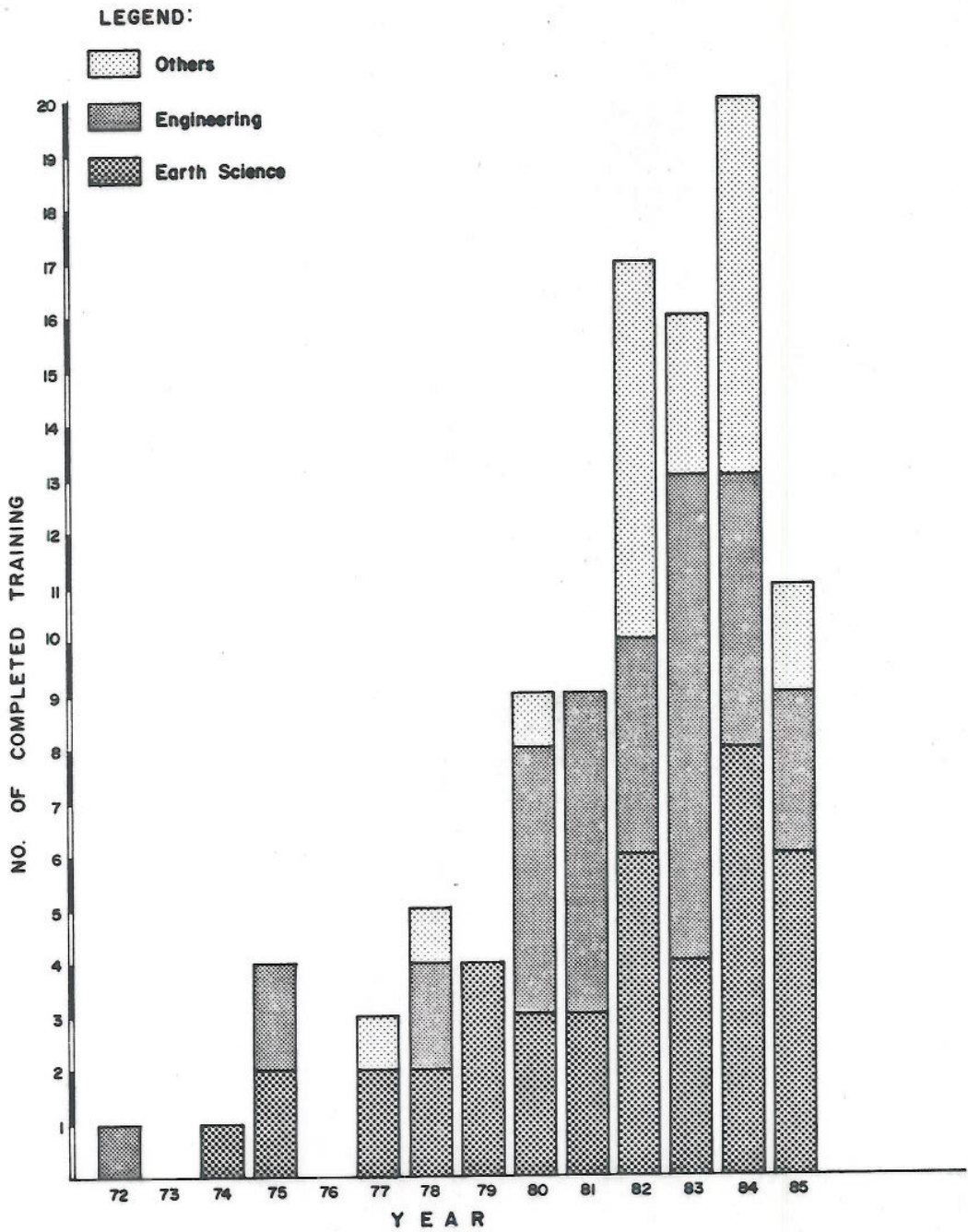




Foreign training courses availed of by EDC staff



FOREIGN TRAINING MIX
Yearly total availed of by EDC staff



FOREIGN TRAINING MIX
Yearly total availed of by EDC staff

PNOC ENERGY DEVELOPMENT CORPORATION
Geothermal Division

SUMMARY OF FOREIGN TRAINING AS OF DECEMBER 1985
(per discipline)

	NAME	SCHOOL/VENUE	PROGRAMME	DATE	PRESENT POSITION IN THE ORGANIZATION
I. Doctorate					
1) Ph.D. in Geochemistry	J.R. Ruaya (on-going)	Victoria University, New Zealand	RP-NZ GCEP	1986	Geochemist, Exploration, Head Office
II. Masterate					
1) M.Sc. in Geochemistry	J.R. Ruaya	Victoria University, New Zealand	RP-NZ GCEP	1984	Geochemist, Exploration, Head Office
2) M.Sc. in Petrology	H.P. Ferrer	Univ. of California, Riverside, USA	Fulbright-Hays	1982	Supervising Geologist, Explora- tion, Head Office
3) M.Sc. in Petrology	A.G. Reyes	Univ. of Auckland, New Zealand	RP-NZ GCEP	1985	Sr. Petrologist, Exploration, Head Office
4) M.Sc. in Geophysics	C.P. Ignacio	Univ. of Auckland, New Zealand	RP-NZ GCEP	1985	Geophysicist, Exploration, Head Office
5) Masters of Engineering in Energy Technology (Planning)	R.C.M. Malate	Asian Institute of Technology, Thailand	Shell Int'l	1983	Borehole Geophysicist, Explora- tion, Head Office
6) M.Sc. in Reservoir Physics	R.M. Castillo (on-going)	Univ. of Auckland, New Zealand	RP-NZ GCEP	1986	Reservoir Physicist, Exploration, Head Office
7) M.Sc. in Geophysics (Electrical Methods)	M.C. Vergara (on-going)	Victoria University, New Zealand	RP-NZ GCEP	1987	Supervising Geophysicist, Explo- ration, Head Office
8) M.Sc. in Structural Geology	L.F. Bayrante (on-going)	Univ. of Auckland, New Zealand	RP-NZ GCEP	1987	Geologist, Exploration, Head Office
9) M.Sc. in Reservoir Engineering	J.M. Salera (on-going)	Univ. of Auckland, New Zealand	RP-NZ GCEP	1987	Reservoir Engineer, Reservoir Engineering, LGP

PRESENT POSITION
IN THE ORGANIZATION

PROGRAMME

SCHOOL/VENUE

NAME

DATE

III. Diploma Course

A. Geoscientific

1) Geothermal Technology	R.C. Rodriguez	Univ. of Auckland, New Zealand	UNDP	1980	Geophysicist, Exploration, Head Office
2) Geothermal Technology	V.C. Clemente	Univ. of Auckland, New Zealand	UNDP	1981	Supervising Geochemist, Explora- tion, Head Office
3) Geothermal Technology	J.R. Ruaya	Univ. of Auckland	UNDP	1982	Geochemist, Exploration, Head Office
4) Geothermal Technology	A.C. Licup, Jr.	Univ. of Auckland	UNDP	1984	Wellsite Geologist, Geoservices Head Office
5) Geothermal Technology	B.C. Buñing	Univ. of Auckland	UNDP	1985	Borehole Geophysicist, Explora- tion, Head Office
6) Geothermal Technology	M.C. Vergara	Univ. of Auckland	RP-NZ GEC	1983	Supervising Geophysicist, Exploration, Head Office
7) Geothermal Technology	L.F. Bayrante	Univ. of Auckland	RP-NZ GEC	1984	Geologist, Exploration, Head Office
8) Geothermal Technology	J.S. Seastres, Jr.	Univ. of Auckland	RP-NZ GEC	1985	Geochemist, Exploration Head Office
9) Geothermal Technology	R.C. Gonzalez	Univ. of Auckland	RP-NZ GEC	1985	Wellsite Geologist, Geoservices, Head Office
10) Borehole Geology	A.G. Reyes	United Nations Univ/ National Energy Autho. of Iceland	UNU	1979	Sr. Petrologist, Exploration, Head Office
11) Geochemistry	A.S.J. Baltasar	UNU/National Energy Authority of Iceland	UNU	1980	Project Geochemist, Geoservices, BMGP

	<u>NAME</u>	<u>SCHOOL/VENUE</u>	<u>PROGRAMME</u>	<u>DATE</u>	<u>PRESENT POSITION IN THE ORGANIZATION</u>
12)	Geophysics D.B. Layugan	UNU/National Energy Authority of Iceland	UNU	1981	Geophysicist, Exploration, Head Office
13)	Geochemistry O.T. Jordan	UNU/National Energy Authority of Iceland	UNU	1982	Acting Supervisor, Geoservices, SNGP
14)	Geophysics C.P. Ignacio	UNU/National Energy Authority of Iceland	UNU	1982	Geophysicist, Exploration, Head Office
15)	Geothermics E.S.D. Olympia	International School of Geothermics, Pisa, Italy	UNESCO/Italian Government	1977	Geotechnical Assistant, Geoser- vices, Head Office
16)	Geothermics L.B. Villaseñor	International School of Geothermics, Pisa, Italy	UNESCO/Italian Government	1984	Geochemist, Exploration, Head Office
17)	Geothermal Technology E.M. Arevalo (resigned)	Univ. of Auckland, New Zealand	UNDP	1979	Project Geologist, SNGP (Resigned, 1982)
18)	Geothermal Technology R.O. Obusan (resigned)	Univ. of Auckland, New Zealand	UNDP	1979	Project Geologist, BMGP (Resigned, 1983)
19)	Geothermal Technology M.M. de Leon (resigned)	Univ. of Auckland, New Zealand	UNDP	1983	Geoservices Supervisor, BMGP (Resigned, 1984)
20)	Borehole Geology N.G. Bagamasbad (resigned)	UNU/National Energy Authority of Iceland	UNU	1979	Geoservices Supervisor, SNGP (Resigned, 1985)
B. Production & Geodata					
1)	Geothermal Technology W.N. Alopera	Univ. of Auckland	UNDP	1980	SGS Supervisor, Production, SNGP
2)	Geothermal Technology D.A. Maxino	Univ. of Auckland	UNDP	1981	Well Maintenance Supervisor, Production, SNGP
3)	Geothermal Technology A.D. Sarit	Univ. of Auckland	UNDP	1981	Reservoir Engineer, Reservoir Engineering, LGP

PRESENT POSITION
IN THE ORGANIZATION

	<u>NAME</u>	<u>SCHOOL/VENUE</u>	<u>PROGRAMME</u>	<u>DATE</u>	<u>PRESENT POSITION IN THE ORGANIZATION</u>
4)	Geothermal Technology	E.C. Peromingan Univ. of Auckland	UNDP	1982	Measurement Engineer, Production, LGP
5)	Geothermal Technology	J.M. Salera Univ. of Auckland	UNDP	1983	Reservoir Engineer, Reservoir Engineering, LGP
6)	Geothermal Technology	N.O. Rodis Univ. of Auckland	UNDP	1984	Reservoir Engineer, Reservoir Engineering, LGP
7)	Geothermal Technology	A.E. Amistoso Univ. of Auckland	RP-NZ GECF	1983	Reservoir Engineer, Reservoir Engineering, SNGP
8)	Geothermal Technology	A.T. Torrejos Univ. of Auckland	RP-NZ GECF	1984	Reservoir Engineer, Reservoir Engineering, SNGP
9)	Geothermal Technology	F.X.M. Sta. Ana Univ. of Auckland	RP-NZ GECF	1985	Reservoir Engineer, Reservoir Engineering, BMGP
10)	Geothermal Technology	P.P. Gerona Univ. of Auckland	RP-NZ GECF	1985	Reservoir Engineer, Reservoir Engineering, SNGP
11)	Borehole Geophysics/ Reservoir Engineering	Z.F. Sarmiento UNU/National Energy Authority of Iceland	UNU	1980	Supervising Reservoir Engineer, Reservoir Engineering, Head Off.
12)	Reservoir Engineering	D.C. Catigtig UNU/National Energy Authority of Iceland	UNU	1983	Superintendent, Production, BMGP
13)	Borehole Geophysics	M.C. Paete UNU/National Energy Authority of Iceland	UNU	1983	Supervising Measurement Engineer, Production, LGP
14)	Well Logging and Instrumentation	N.S. Maceda UNU/National Energy Authority of Iceland	UNU	1983	Equipment Engineer, Production, Head Office
15)	Reservoir Engineering	J.R. Regalado (resigned) UNU/National Energy Authority of Iceland	UNU	1981	Coordinator, Geodata, Head Office

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16)	Geothermal Technology R.A. Camales	Univ. of Auckland	UNDP	1980	Reservoir Analyst, Geodata, Head Office
17)	Geothermal Technology G.J. Batayola (resigned)	Univ. of Auckland	UNDP	1983	Reservoir Engineer (Resigned, 1985)
C. Drilling					
1)	Geothermal Technology G.G. Aznar	Univ. of Auckland	UNDP	1980	Drilling Superintendent, Drilling Department
2)	Geothermal Technology C.V. Parcon (resigned)	Univ. of Auckland	RP-NZ GECF	1982	Drilling Supervisor (Resigned, 1985)
D. Engineering & Construction					
1)	Geothermal Technology F.G. Varias	Univ. of Auckland	UNDP	1985	Supervising Inst. Engineer, E & C, Head Office
IV. Special Training/Courses					
A. Geoscientific					
1)	Volcanology and Geothermal Exploration O.S. Española	DSIR-New Zealand	NZ-Geothermal Assistance	1974	Manager, Exploration, Head Office
2)	Geothermal Geology and Petrology J.B. Pornuevo	DSIR/NZGS New Zealand	NZ-Geothermal Assistance	1978	Sr. Geologist, Exploration, Head Office
3)	Methods in Isotope Hydrology S.E. Garcia	Inst. of Radiohydro- metry, Munich, West Germany	Carl Duisberg Gesellschaft	1982	Project Geochemist, Geoservices, Head Office
4)	Petrological Laboratory Management & Techniques E.L. Bueza	Federal Inst. of Geosciences and Natural Resources Hannover, West Germany	Carl Duisberg Gesellschaft	1981	Petrologist, Exploration, Head Office

	NAME	SCHOOL/VENUE	PROGRAMME	DATE	PRESENT POSITION IN THE ORGANIZATION
5)	D.M. Rigor	International Inst. of Seismology and Earthquake Eng'g, Tsukuba, Japan	JICA	1982	Seismologist, Exploration, Head Office
6)	O.S. Española	Kyushu University Japan	JICA	1983	Manager, Exploration, Head Office
7)	C.M. Recio	Kyushu University Japan	JICA	1978	Manager, Geoservices, Head Office
8)	A.S.J. Baltasar	DSIR-Inst. of Nuclear Sciences, New Zealand	RP-NZ GCEP	1984	Project Geochemist, Geoservices, BMGP
9)	O.T. Jordan	DSIR-Inst. of Nuclear Sciences, New Zealand	RP-NZ GCEP	1984	Acting Supervisor, Geoservices, SNGP
10)	W.L. Sunga	DSIR-New Zealand	RP-NZ GCEP	1984	Sr. Chemist, Exploration, Head Office
11)	R.P. Solis	DSIR-New Zealand	RP-NZ GCEP	1984	Project Chemist, Geoservices, BMGP
12)	M.C. Zaide	Univ. of Auckland	RP-NZ GCEP	1983	Petrologist, Exploration, Head Office
13)	R.M. Castillo	DSIR-MWD New Zealand	RP-NZ GCEP	1982	Reservoir Physicist, Exploration Head Office
14)	C.C. Panem	Kyushu University Japan	JICA	1975	Geologist, Exploration, Head Off.
15)	E.J. Galia (resigned)	DSIR-New Zealand	NZ Geothermal Assistance	1977	Geochemist, SNGP (Resigned, 1981)
16)	V.C. Clemente, Jr.	DSIR	RP-NZ GCEP	1985	Supervising Geochemist, Exploration, Head Office

	<u>NAME</u>	<u>SCHOOL/VEHUE</u>	<u>PROGRAMME</u>	<u>DATE</u>	<u>PRESENT POSITION IN THE ORGANIZATION</u>
B. Project Management, Operations, Production and Geodata					
1) Geothermal Field Management	A.S. Teves	MWD, New Zealand	NZ Geothermal Assistance	1977	Manager, Project Operations, SNGP
2) Geothermal Field Management	E.B. Patanao	MWD, New Zealand	NZ Geothermal Assistance	1978	Manager, Project Operations, LGP
3) Geothermal Field Management	L.M. Ote	MWD-DSIR-NZED	RP-NZ GCEP	1984	Manager, Drilling Department
4) Geothermal Field Management	O.S. Abejo	MWD-DSIR-NZED	RP-NZ GCEP	1984	Superintendent, Production, LGP
5) Geothermal Field Management	F.A. Palafox	MWD-DSIR-NZED	RP-NZ GCEP	1983	Manager, Project Operations, BMGP
6) Geothermal Field Management	J.L. Achacoso	MWD-DSIR-NZED	RP-NZ GCEP	1983	Superintendent, Field Support, LGP
7) Geothermal Field Management	C.R. Catacutan	MWD-DSIR-NZED	RP-NZ GCEP	1982	Engineering Assistant, Project Operations, SNGP
8) Geothermal Field Management	A.S. Conui (resigned)	MWD-DSIR-NZED	RP-NZ GCEP	1982	Superintendent, Field Support, LGP (Resigned, 1985)
9) Well Testing and Measurement	O.S. Abejo	MWD	NZ Geothermal Assistance	1972	Superintendent, Production, LGP
10) Well Testing and Measurement	R.P. Lagasca	MWD	NZ Geothermal Assistance	1978	Superintendent, Production, SNGP
11) Maintenance, Instrumentation and Control	V.T. Manuel	Masonellan Company,	Supplier Trng.	1981	SGS Supervisor, Production, LGP

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12)	Production Monitoring and Control	F.V. Chavez MWD-DSIR-NZED	RP-NZ GEC	1983	Instrument Engineer, Production, LGP
13)	Production Monitoring and Control	A.V. Catacutan MWD-DSIR-NZED	RP-NZ GEC	1983	Acting Supervisor, Measurements, SNGP
14)	Production Monitoring and Control	E.C. Lucero MWD-DSIR-NZED	RP-NZ GEC	1984	Instrument Engineer, Production, SNGP
15)	Process Engineering and Control	A.R. Amador DSIR-MWD	RP-NZ GEC	1984	Process Engineer, Production, Head Office
16)	Process Engineering and Control	W.L. Ferrolino DSIR-MWD	RP-NZ GEC	1984	Supervising Inst. Engineer, Production, Head Office
17)	Geophysical Explora- tion Techniques	W.S. Loo DSIR	NZ Geothermal Assistance	1975	Acting Coordinator, Geodata, Head Office
18)	Flowmeter Orientation Training	F.B. de Lara (resigned) MWD-DSIR	RP-NZ GEC	1982	Measurement Engineer, Production BMGP
19)	Computer Database Management	J.M.O. Mercado (resigned) MWD-DSIR	RP-NZ GEC	1984	Geologic Analyst, Geodata, Head Office (Resigned, 1985)
C. Drilling					
1)	Cementing Operations	I.J. Tumanda CPC-Taiwan	CPC	1980	Drilling Engineer
2)	Pipe Inspection	N.M. Bulandres Vetco-Singapore	VETCO	1981	Sr. Drilling Engineer
3)	Geothermal Energy Technology	F.E. Mendita Kyushu University Japan	JICA	1978	Drilling Superintendent, Drilling Department
4)	Cementing Operations	A.L. Pioquinto (resigned) CPC-Taiwan	CPC	1980	Cementing Engineer (Resigned, 1985)
5)	Pipe Inspection	R.A. DyBucu (resigned) Vetco-Singapore	VETCO	1981	Drilling Engineer (Resigned, 1985)

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6) Geothermal Energy Technology	J.G. Galao (resigned) Kyushu University Japan	JICA	1982	Drilling Coordinator, Drilling Dept., Head Office (Resigned, 1985)
7) Geothermal Drilling Operations	J.G. Galao (resigned) MWD-New Zealand	NZ Geothermal Assistance	1975	Drilling Coordinator, Drilling Dept., Head Office (Resigned, 1985)
D. Engineering & Construction				
1) Corrosion Engineering	C.M. Ilaio MWD-DSIR	RP-NZ GECP	1982	Quality Assurance Engineer, E & C, Head Office
2) Geothermal Energy Technology	A.F. Vitente Kyushu University Japan	JICA	1975	Engineering Assistant, E & C, Head Office
E. Environmental Management Department				
1) Study Tour of Energy Projects on Environmental Procedures	P.E. Legaspi (resigned) MWD-NZED-DSIR NZFS-WVA	RP-NZ GECP	1982	Environmental Planning Supervisor (Resigned, 1985)
2) Study Tour of Energy Projects on Environmental Procedures	E.R. Collantes MWD-NZED-DSIR NZFS-WVA	RP-NZ GECP	1982	Environmental Chemist, Environmental Management Department
3) Study Tour of Energy Projects on Environmental Procedures	A.R. Villamarzo MWD-NZED-DSIR NZFS-WVA	RP-NZ GECP	1982	Ecologist, Environmental Management
4) Watershed Management	A.C. de Jesus MWD-DSIR-NZFS-WVA	RP-NZ GECP	1983	Supervisor, Watershed Management Environmental Management Dept.
5) Environmental Impact Assessment: Methods for Marine Environment	J.R.D. Garcia Marine Research Center, ENEA, La Spezia, Italy	ASEAN-EEC	1984	Limnologist, Environmental Mgt. Department

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	<u>NAME</u>	<u>SCHOOL/VENUE</u>	<u>PROGRAMME</u>	<u>DATE</u>	<u>PRESENT POSITION IN THE ORGANIZATION</u>
6)	Techniques on Chemical/Biological Degradation and Analysis of Oil and Oil Products E.R. Collantes	Dunstaffnage Marine Laboratory, Oban, Argyll, Scotland	ASEAN-EEC	1984	Environmental Chemist, Environmental Management Department
7)	Studies on Environmental Dimensions of Energy Policies (Biomass Energy) D.C. Babor	East-West Center Honolulu, Hawaii USA	East-West Center	1980	Chemical Engineer, Environmental Management Department
8)	Techniques and Procedures in Environmental Impact Assessment with the UK North Sea Oil and Gas Industry as Case Example D.C. Babor	Inst. of Offshore Engineering Heriot-Watt University Edinburgh, Scotland	ASEAN-EEC	1984	Chemical Engineer, Environmental Management Department
9)	Improved Methods for Conducting Toxicity Testing and Bioassay Extraction in the Determination of Trace Metals and Toxic Elements in Environmental Samples D.C. Abalos	Geochemical Environmental Laboratory, ENEA, Rome, Italy	ASEAN-EEC	1985	Lab Analyst, Environmental Mgt. Department
10)	Methods for Screening Terrestrial Organisms as Biological Monitors for Oil, Geothermal and Coal Pollutants A.R. Villamarzo	ENEL Laboratories, Rome, Italy	ASEAN-EEC	1984	Ecologist, Environmental Mgt. Department
11)	Study Tour of Energy Projects on Environmental Procedures M.C. Berbano	MWD-NZED-DSIR NZFS-WVD	RP-NZ GECF	1985	Manager, Environmental Mgt. Department