CURRICULUM/SYLABUS EDUCATION AND TRAINING ON ELECTRICITY, NEW, RENEWABLE ENERGY AND ENERGY CONSERVATION

Unit Code	:	BPE-KRS-ENE-137-000
Unit Title	:	**TRAINING OF TRAINERS FOR GEOTHERMAL RESOURCE ASSESSMENT IN SEDIMENTARY BASINS FOR LOW / MEDIUM ENTHALPY RESOURCES**
Description of Unit:		The curriculum and syllabus aims at introducing course participants to the generic knowledge of the types of exploration data that are relevant to geothermal exploration in sedimentary basins. There will be able to apply this knowledge to solve practical problems related to geothermal exploration in sedimentary basins, and to form their own independent opinion about the geothermal potential, based on data and information from various sources.
Duration	:	**48 Lesson Hours (1 LH = 45 minutes)**

I. Goal	:	To enhance participants knowledge and skills on assessing the geothermal potential in sedimentary basins for low and medium enthalpy resources using seismic interpretation techniques, petrophysical analysis and doublet performance software tools.
II. Objective	:	By the end of the lessons, the trainees are expected to be able to explain and practice the basics of the types of exploration data that are relevant to geothermal exploration in sedimentary basins: Log Analysis, Seismic Interpretation, Geothermal Model Building, Geothermal Production, and implement exercises, discussion and comprehensive test.
III. Prerequisite	:	The target groups of this course are practitioners (industry) and trainers / lecturers (academia). Those wishing to enroll should hold at least a BSc in geology, geophysics, geochemistry or comparable.

IV. Curriculum :

1.	Introduction	4	LH
	1.1 Geothermal Systems; Classification and Conceptual Model		
	1.2 Non – volcanic Sedimentary Geothermal System Potential in Indonesia		
	1.3 Pre-test		
2.	Log Analysis	10	LH
	2.1 Theory Sonic, Neutron, Density, Gamma, Resistivity, FMI		
	2.2 Integration With Core Data		

2.3	Porosity Log Calculation		
2.4	Permeability Log Derivation		
2.5	Secondary Porosity		
2.6	Bottom Hole Temperature Correction		
2.7	Water Composition, Salinity		
2.8	Estimating Flow Properties		
2.9	Exercise: Simulation		

3. Seismic Interpretation 　　　　　　　　　　10　LH
   3.1 Theory Basics, Passive vs. Active Seismic, Reflection Data
   3.2 Processing/Imaging
   3.3 Interpretation of Horizons and Faults, Checkshots
   3.4 Application of Sonic Log, Time-Depth Conversion
   3.5 Exercise: Simulation

4. Geothermal Model Building 　　　　　　　　10　LH
   4.1 Theory Building 2.5D and 3D Models From Various Data Sources (well, seismic, magnetic)
   4.2 Populating a Model with Properties (NG, Temperature, Permeability, Dual Permeability),
   4.3 Interpolation Algorithms (IDW, Kriging, Simulation)
   4.4 Temperature Modeling
   4.5 Role of Uncertainty
   4.6 Exercise: Simulation

5. Geothermal Production 　　　　　　　　　　10　LH
   5.1 Theory Pre-Drill Prediction of Well Performance using DoubletCalc 1D and 2D
   5.2 Influence of Flow Barriers
   5.3 Influence of Heterogeneity
   5.4 Well Planning
   5.5 Assessment of Uncertainties
   5.6 Exercise: Simulation

6. Discussion 　　　　　　　　　　　　　　　　4　LH
   6.1 Question/Answer
   6.2 Comprehensive Test

LEARNING OUTCOME	:	After completing this training, participants will have gained generic knowledge of the types of exploration data that are relevant to geothermal exploration in sedimentary basins.

Learning Outcome 1	:	Understand the Introduction

Assessment Criteria : Able to:

1.1   Explain Geothermal Systems; Classification and Conceptual Model

1.2   Explain Non – volcanic Sedimentary Geothermal System Potential in Indonesia

1.3   Implement Pre-test

Learning Outcome 2	:	Understand the basics of petrophysical Log Analysis

Assessment Criteria : Able to:

2.1   Explain Theory Sonic, Neutron, Density, Gamma, Resistivity, FMI

2.2   Explain Integration With Core Data

2.3   Explain Porosity Log Calculation

2.4   Explain Permeability Log Derivation

2.5   Explain Secondary Porosity

2.6   Explain Bottom Hole Temperature Correction

2.7   Explain Water Composition, Salinity

2.8   Explain Estimating Flow Properties

2.9   Implement Exercise: Simulation

Learning Outcome 3	:	Understand the Seismic Interpretation

Assessment Criteria : Able to:

3.1   Explain Theory Basics, Passive vs. Active Seismic, Reflection Data

3.2   Explain Processing/Imaging

3.3   Explain Interpretation of Horizons and Faults, Checkshots

3.4   Explain Application of Sonic Log, Time-Depth Conversion

3.5   Implement Exercise: Simulation

Learning Outcome 4	:	Understand the Geothermal Model Building

Assessment Criteria : Able to:

4.1   Explain Theory Building 2.5D and 3D Models From Various Data Sources (well, seismic, magnetic)

4.2   Populate a Model with Properties (NG, temperature,

permeability, dual permeability)
4.3	Explain Interpolation Algorithms (IDW, Kriging, Simulation)
4.4	Explain Temperature Modeling
4.5	Assess Role of Uncertainty
4.6	Exercise: Simulation

Learning Outcome 5 : Understand the Geothermal Production

Assessment Criteria : Able to:

5.1	Explain Theory Pre-Drill Prediction of Well Performance using DoubletCalc 1D and 2D
5.2	Explain Influence of Flow Barriers
5.3	Explain Influence of Heterogeneity
5.4	Explain Well Planning
5.5	Explain Assessment of Uncertainties
5.6	Exercise: Simulation

Assesment Outcome 6 : Implement Discussion

Assessment Criteria : Able to implement:

6.1	Question/Answer
6.2	Comprehensive Test

Learning Strategy :
- Learning strategy and training purpose have to be match either in theory and practice. Learning process and assesment have to be in sequence of subjects.

- For subjects with a minimum of 9 lesson hours, will be done in team teaching with the number of trainers is 2 (two) people.

Practical Strategy :
- Practice with desinged methods and techniques, including simulation and exercises.

- If required the number of teachers on the implementation of practice can be more than 2 (two) people, adapted to the urgency and the number of groups. It may be accompanied by trainer or trainer assistant or may be both.

References : -

Supporting Data	:	-
Supporting Facilities	:	- Laptop - Over head projector - White board - Clip board (one each group): 4 clip boards - Stationaries
V. Institution	:	Human Resources Development Center of Electricity, New, Renewable Energy and Energy Conservation and Geothermal Capacity Building Programme Indonesia – Netherlands (GEOCAP)

Assigned in Jakarta
On,   October 2017

Head Of Human Resource Development Center for Electricity, New, Renewable Energy and Energy Conservation

Ir. Umi Asngadah, M.T
NIP 19600623 198903 2 001

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