GEOCAP
Geothermal Capacity Building Program Indonesia - Netherlands

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Dr. Kees van den Ende, DNV GL-Energy (former “KEMA”)

Course: Methods and Techniques in Geothermal Power Plant Inspections

ITB Bandung, 20&21 March 2017

Program of the course (1) Monday

I. Introduction – Kees van den Ende (former KEMA)
- Introduction to the program of the course
- Introduction of trainers and participants

II. Overview Power Plant Design – Theo van der Meer(UT)
- List of Geothermal Power Plant in Indonesia
- Methodology of power plant development
- Dry steam cycle
- Flash steam cycle (double and single)
- Binary cycle: Organic Rankine Cycle (ORC)
- Exercise: choose the right plant

Program of the course (2) Monday

III. Introduction of Power Plant – Jooned Hendrarsakti (ITB)

- Main component: Condenser
- Main component: Steam Ejector
- Main component: Cooling Tower
- Other components
- Exercise: Failure

Program of the course (3) Monday

IV. Standard of geothermal power plant design -

Jooned Hendrarsakti (ITB)

- Overview of relevant standards for geothermal power plant design
- Overview of material use, prescribed by these standards
- Overview of other requirements for inspections and maintenance in geothermal power plants Tools in power plant operations

Program of the course (4) Thuesday

V. Basic of maintenance and reliability in geothermal power plant

Jooned Hendrarsakti (ITB)

VI. Inspection techniques, Sampling and reporting

Frank Rasing(DNV GL) & Kees van den Ende (KEMA) & JanWillem Noteboom (DEKRA)

Failure mode (general introduction)

General visual guidelines for inspection:

- Identify high risk components
- Non-destructive and destructive techniques
- Specific attention to composite materials and coatings
- Exercise: failure cases: solve the problem!

Program of the course (5) Tuesday

- Reporting
  - Failure reporting
  - Failure database

VII. Day closure – All participants:

- **EXAM!**
- **DIPLOM?**

Kees van den Ende (KEMA):

- Innovation manager KEMA (Energy); since 2010 one of the 5 ‘founding partners’ of the GeoCap-program
- Teammanager of “New Energy Technologies”, department “KEMA Inspection&Materials”
- NNI (Standardization Institute of The Netherlands)
- Professor of “ Instituto Industrial de Maputo” in Mozambique
- Thesis at the University of Leiden (research at the IRI-Delft)
- Study at the University of Leiden
- Participant at the Olympic Games of Munchen (1972) (rowing)

Frank Rasing (DNV GL):

- Laboratory manager of the Material laboratory of DNV GL Energy
- Member of European district heating standardisation (casing and insulation)
- Inspector in power plant (Cooling water and FDU)
- Quality control of GRE chimney
- Failure investigation
- KEMA chemical laboratory (1990-1994)
- KEMA Material laboratory (1994- now)

DNV GL Global reach – local competence

150
years

400
offices

100
countries

15,000
employees

Our vision: global impact for a safe and sustainable future

MARITIME

OIL & GAS

ENERGY

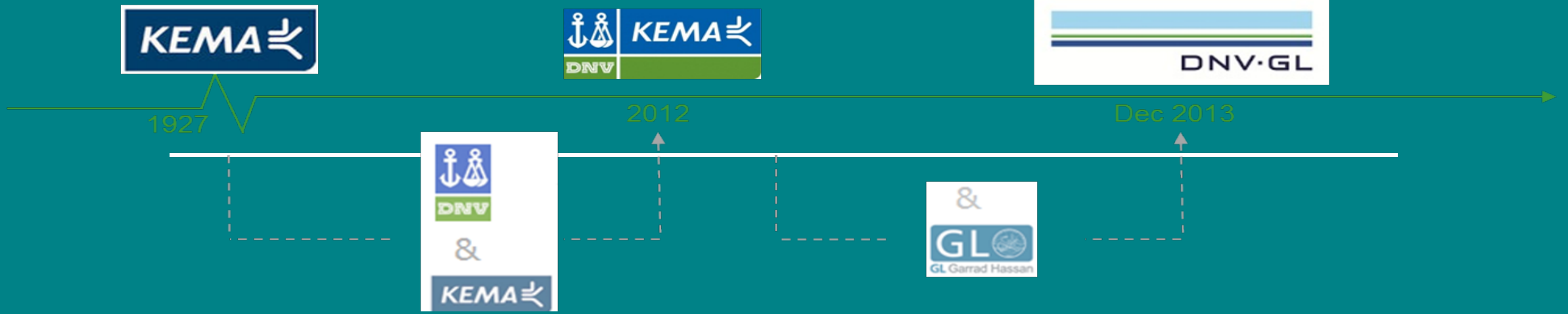
BUSINESS ASSURANCE

SOFTWARE

RESEARCH & INNOVATION

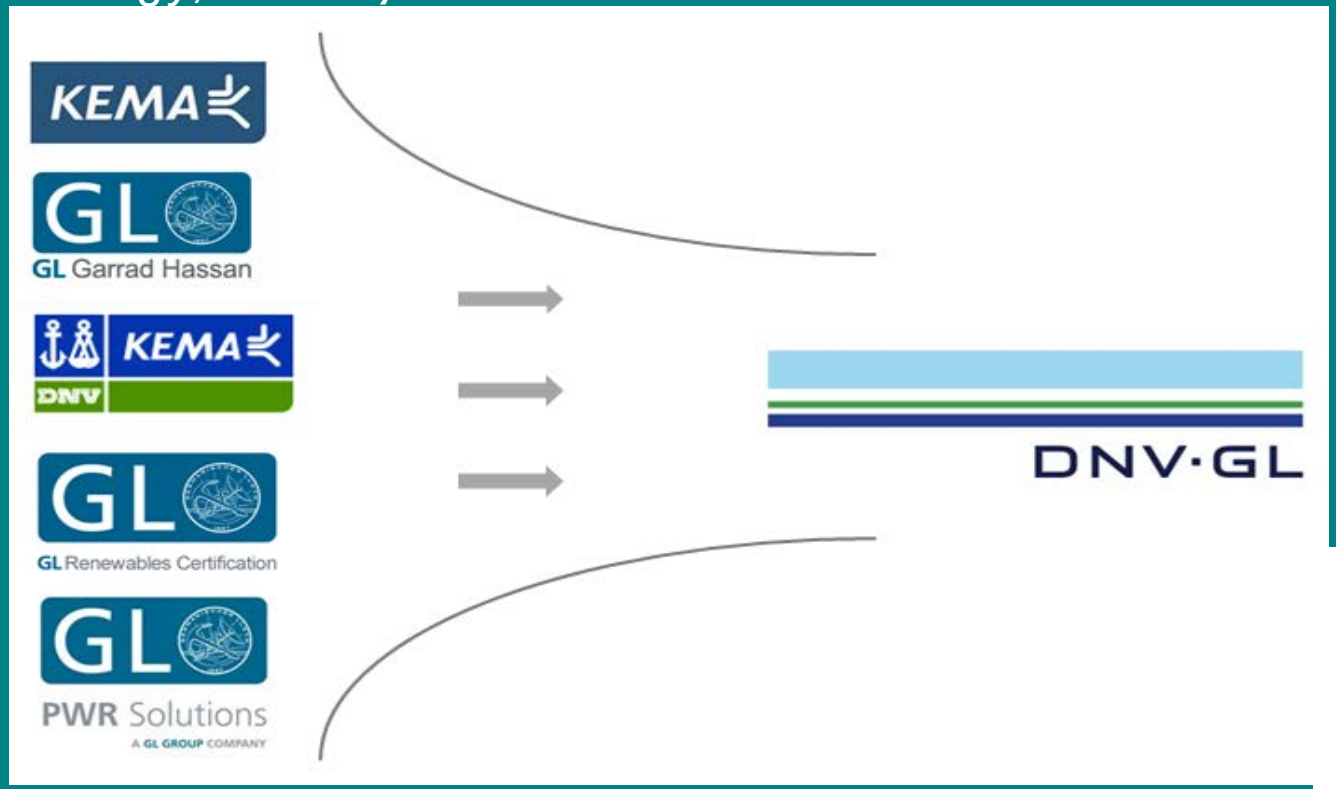
DNV GL – Energy: An Energy Power House

2,500 energy expert help customers throughout the electrical power industry realize efficient, reliable and clean energy for today and the future



COMBINING THE STRENGTH OF WELL-KNOWN BRANDS

DNV GL - Energy combines the strengths and rich heritage of a couple well-known brands in energy, **KEMA, GL Garrad Hassan** and G**L Renewables Certification**.



2500 energy experts help customers throughout the electrical power industry realise efficient, reliable and clean energy for today and the future

Theo van der Meer (Unv. Twente):

- Full Professor Thermal Engineering at UTwente (1999 – 2016)
- Educational director of the Master Program Sustainable Energy Technology at Utwente (2006 – 2016)
- Assistant/Associate professor at TUDelft (1976-1999)
- Research Fellow at University of Waterloo (1987-1988)
- Representing the Netherlands in Eurotherm and in the Assembly of International Heat Transfer Conferences
- Master in Applied Physics at TUDelft
- PhD at TUDelft

University of Twente

High Tech Human Touch

60
years

9000
Undergraduate students

Entrepreneurial University

Engineering Technology, UTwente

Master programs in:

- Mechanical Engineering
- Civil Engineering and Management
- Industrial Design Engineering
- Sustainable Energy Technology
- Construction Management and Engineering

Faculty of Geo-information and Earth observation

ITC is recognized worldwide for achievements in teaching, research and capacity development in the field of geo-information science and earth observation. We educate our students to be professionals, capable of acquiring knowledge and translating this into practical applications for solving real-world problems.

Faculty of Geo-information and Earth observation

Specializations:

- Applied Earth Sciences
- Geoinformatics
- Land Administration
- Natural Resources Management
- Urban Planning Management
- Water Resources and Environmental Management

Jooned Hendrarsakti (ITB):

- 2012, Geothermal Technology Study Program teaching utilization and direct use of geothermal
- 2006, Institut Teknologi Bandung (ITB) at Faculty of Mechanical and Aerospace Engineering.
- Engineer at PT. Pindad (2004) in cooling systems and quality management accessment.
- Computational Fluid Dynamic labs and Drying Research Center as research and teaching assistant (1997-2003)
- M.Sc in sedimentation computational fluid dynamics (1999), and Ph.D. in fiber dispersion interaction (2003). at Texas A&M University
- B.Sc in Mechanical Engineering (1997) with final project of designing a reflector to transfer solar energy produced by solar panels in moon surface to the Earth

Since 2008

The Master Degree Program in Geothermal Technology of ITB consists of two majors:

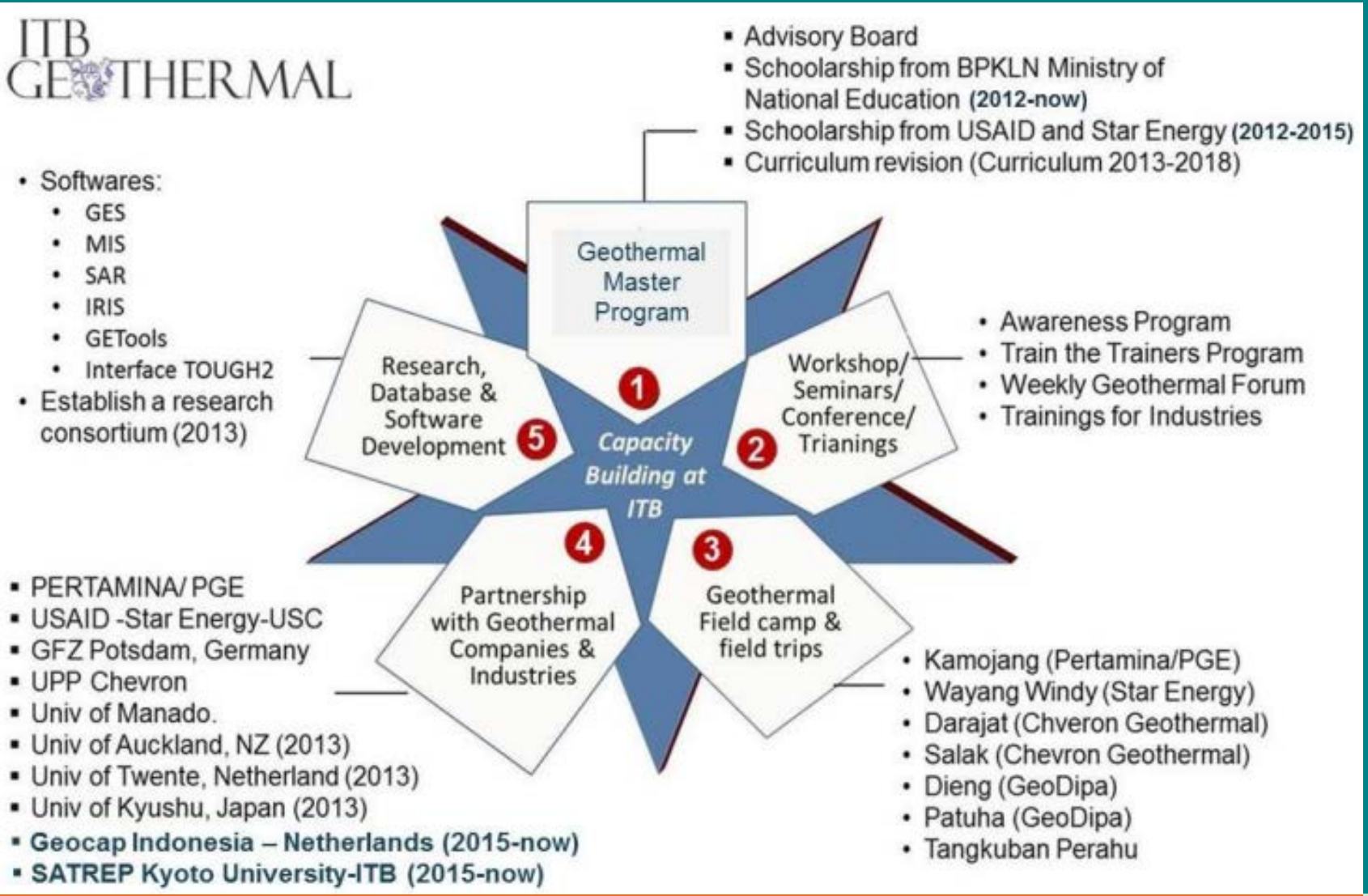
- Exploration Program
- Engineering Program

Website: www.geothermal@itb.ac.id

Master Syllabus

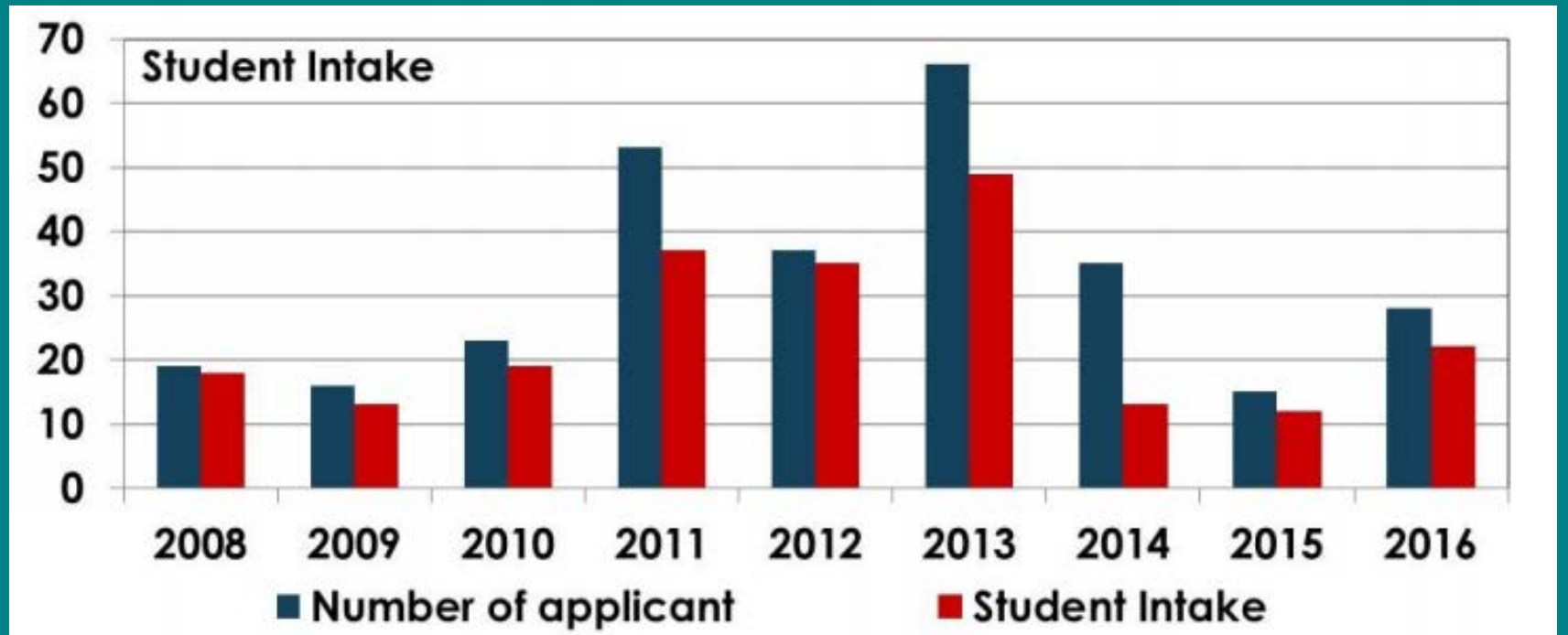
Geothermal Exploration Program	Geothermal Engineering Program	All
• Geology • Geochemistry • Geophysics • Elective Course	• Reservoir Engineering • Production Engineering • Geothermal Energy Utilization • Elective Course	• Geothermal System and Technology • Research Methodology • Geothermal Management and Economics • Evaluation of Geothermal Prospects (Feasibility Study) • Thesis

Geothermal Capacity Building at ITB



Saptadji, 2016

ITB Geothermal Master Program



- 28 students enrolled in 2012, 2013, 2014 received scholarship from USAID and Star Energy (under the cooperation of USAID-SE-USC-ITB).
- Since 2013 a number of students received scholarship from Ministry of Education - "Beasiswa Unggulan"

Saptadji, 2016

Jan Willem Noteboom (DEKRA MTI):

- Business Development Manager Advanced and Mechanized NDT team at DEKRA; member of ISO Working Group on UT standardisation
- Moving to DEKRA and transfer of NDT & AIM teams to DEKRA (2014)
- Several international working groups in The NL and abroad in the field of NDT and Asset Integrity, Chairman of the NIL-KINT NDT committee in The NL (2000-2017)
- Project Manager / Service Line Principal NDT & Plant Monitoring (2000-2013), internationalizing KEMA's services
- KEMA NDT Product team manager (1990-2000)
- KEMA NDT lab: Eddy Current and Acoustic technology (1981-1990)
- Background: MSc Technical Physics (Low Temperature Physics) at Delft University

Background DEKRA MTI Netherlands: **KEMA**

Sold: 2011

Dpt. Materials Testing & Inspection Sold: 2014

Founded 1927

Founded 1865

Founded 1925

Participants of the “Geothermal Inspectors” course, Bandung 2017

- Please give your:
  - Name
  - Origin/country
  - Background
  - Study
  - Occupation and company