



**ROLES AND CONTRIBUTION
OF UNIVERSITIES IN
MANAGING CONTROVERSIAL
ISSUES IN COMMUNITY :
CASE STUDY OF UMP'S
INVOLVEMENT IN LYNAS
PROJECT**

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26 August 2013**

KNOWLEDGE & UNIVERSITY IN SOCIETY



“...university's place as a paramount player in a global system increasingly driven by knowledge, information and ideas. Knowledge is replacing other resources as the main driver of economic growth and education has increasingly become the foundation for individual prosperity and social mobility”

Harvard President Drew Faust

KNOWLEDGE & UNIVERSITY IN SOCIETY



“...universities are unique communities within society; and therefore the university perpetually integrates with society, shaping its future.”

Hiroshi Matsumoto, President Kyoto University





LYNAS Issues : Investment Big Question

- * **Acceptance**
(not in my backyard?)
- * **Social, Economics & Politics**
(merits and interests?)
- * **Health, Safety & Environment**
(risks and concerns?)

INVESTMENT MERITS & RISKS



INVESTMENT IN MALAYSIA

- systems and procedures in place;
- not as easy as several quarters claimed;
- All related agencies has their own respective rules and regulations;
- In LYNAS's case, it took ~ 6 years before approval was secured.

Perception (or Politics?) vs Science



"Science may be vital, but the people with scientific knowledge seem less connected than ever to the people with power"

The Guardian (2012)



STEM CELL RESEARCH, BIRTH CONTROL AND GLOBAL WARMING

USA Today (2007)



ACID RAIN SCIENCE AND POLITICS IN JAPAN

Kenneth E. Wilkening (2011)



LYNAS (Gebeng) and RAPID (Pengerang)

Parliament Hansard on PSC Lynas (2012)



INTRODUCING RARE EARTH



| | | | |
|---|--|---|---|
|  Sc |  Y |  La |  Ce |
|  Pr |  Nd |  Sm |  Eu |
|  Gd |  Tb |  Dy |  Ho |
|  Er |  Tm |  Yb |  Lu |

ABOUT RARE EARTH MINERALS

ARE NOT REALLY RARE ;

**WIDELY SPREAD THROUGH OUT THE EARTH'S
CRUST IN SMALL CONCENTRATIONS;**

CANNOT BE MINED ECONOMICALLY.

Why rare earth?



Green Economy – Climate Change, Alternative and Conservative Energy



Strategic – “Middle East has Oil, China has Rare Earth” (Deng Xiao Peng 1987)



Human Capital Development – High Technology Experts

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Rare Earth Elements

Rare Earth Elements consist of a group of fifteen elements known as the Lanthanides. The lanthanides are located in block 5d of the [periodic table](#) from lanthanum to lutetium

| Rare Earth Elements | | | | | | | | | | | | | | | | Y 39 | | |
|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------------------|----------------|----|-----------------|
| La | Ce | Pr | Nd | Pm | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | Lanthanum (La) | | | |
| 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | Cerium (Ce) | | | |
| Lanthanides | | | | | | | | | | | | | | | Praseodymium (Pr) | | | |
| H | | | | | | | | | | | | | | | He | Neodymium (Nd) | | |
| Li | Be | | | | | | | | | | | B | C | N | O | F | Ne | Samarium (Sm) |
| Na | Mg | | | | | | | | | | | Al | Si | P | S | Cl | Ar | Europium (Eu) |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr | Gadolinium (Gd) |
| Rb | Sr | Y | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn | Sb | Te | I | Xe | Terbium (Tb) |
| Cs | Ba | Lu | Hf | Ta | W | Re | Os | Ir | Pt | Au | Hg | Tl | Pb | Bi | Po | At | Rn | Dysprosium (Dy) |
| Fr | Ra | An | Lr | | | | | | | | | | | | | | | Holmium (Ho) |
| | | | | | | | | | | | | | | | Erbium (Er) | | | |
| | | | | | | | | | | | | | | | Thulium (Th) | | | |
| | | | | | | | | | | | | | | | Ytterbium (Yb) | | | |
| | | | | | | | | | | | | | | | Lutetium (Lu) | | | |
| | | | | | | | | | | | | | | | Yttrium (Y) | | | |

Rare Earths cannot be substituted in many applications



RARE EARTHS: LANTHANIDES PLUS YITTRIUM – UNIQUE PROPERTIES

Rare Earth Elements

| | | | | | | | | | | | | | | |
|----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Rare Earth Elements | | | | | | | | | | | | | | Y 39 |
| La 57 | Ce 58 | Pr 59 | Nd 60 | Pm 61 | Sm 62 | Eu 63 | Gd 64 | Tb 65 | Dy 66 | Ho 67 | Er 68 | Tm 69 | Yb 70 | Lu 71 |
| Lanthanides | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| H | | | | | | | | | | | | | | | | | He |
| Li | Be | | | | | | | | | | | B | C | N | O | F | Ne |
| Na | Mg | | | | | | | | | | | Al | Si | P | S | Cl | Ar |
| K | Ca | Sc | Ti | V | Cr | Mn | Fe | Co | Ni | Cu | Zn | Ga | Ge | As | Se | Br | Kr |
| Rb | Sr | Y | Zr | Nb | Mo | Tc | Ru | Rh | Pd | Ag | Cd | In | Sn | Sb | Te | I | Xe |
| Cs | Ba | Lu | Hf | Ta | W | Re | Os | Ir | Pt | Au | Hg | Tl | Pb | Bi | Po | At | Rn |
| Fr | Ra | Ac | Th | Pa | U | Np | Pu | Am | Cm | Bk | Cf | Es | Fm | Mn | Uu | Uu | Uu |

- **Chemical**
 - Unique electron configuration
- **Catalytic**
 - Oxygen storage and release
- **Magnetic**
 - High magnetic anisotropy and large magnetic moment
- **Optical**
 - Fluorescence, high refractive index
- **Electrical**
 - High conductivity
- **Metallurgical**
 - Efficient hydrogen storage in rare earths alloys

Rare Earths underpin new materials technology required to sustain the needs of today's society



Energy efficiency through lower consumption

Environmental protection through lower emissions

Smaller yet more powerful digital technology



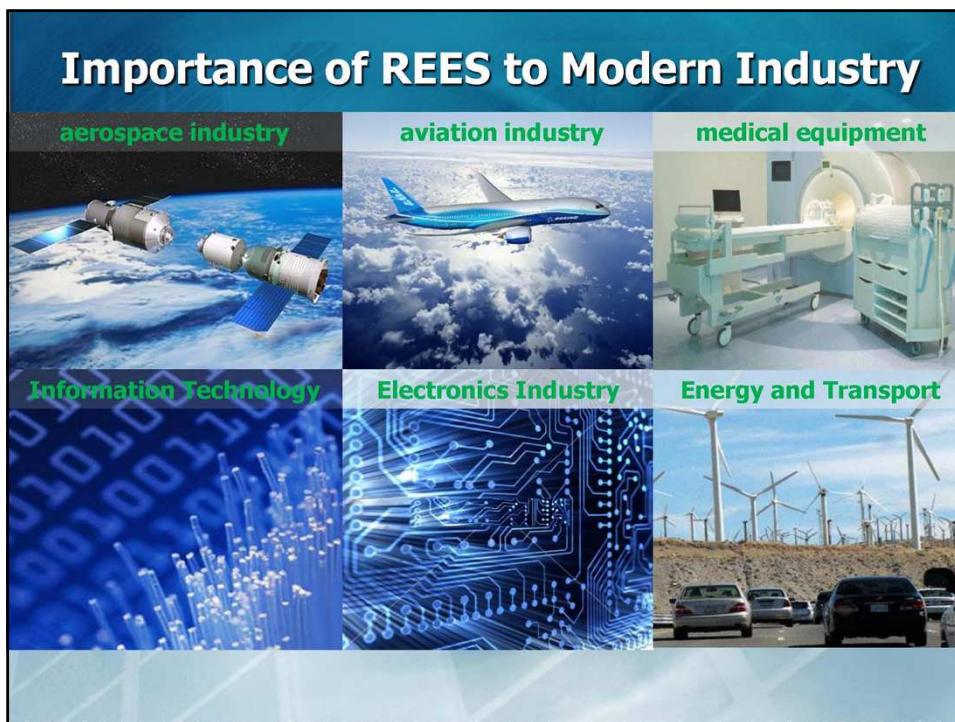
- Compact Fluorescent Lights
- Hybrid vehicle
- Weight reduction in cars



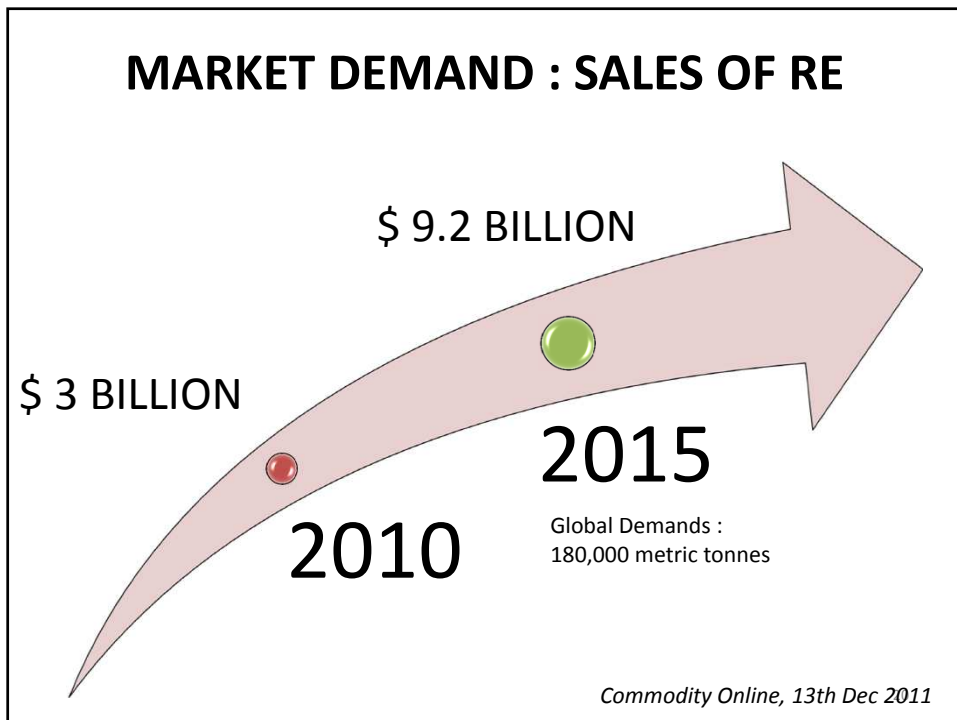
- Wind turbine
- Auto catalytic converter
- Diesel additives



- Flat panel displays
- Disk drives
- Digital cameras

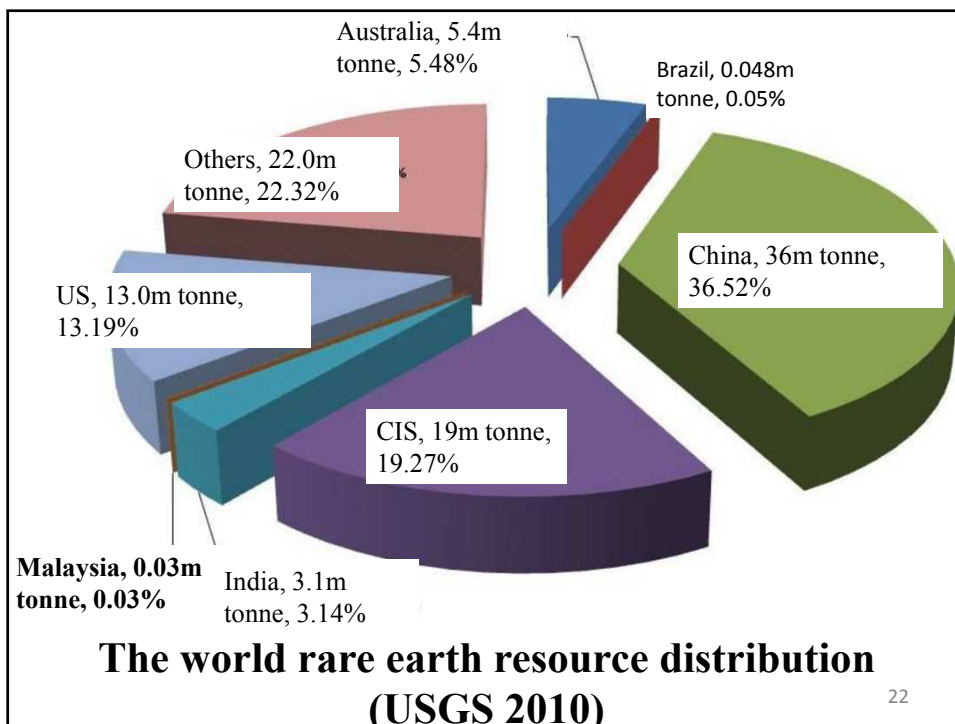


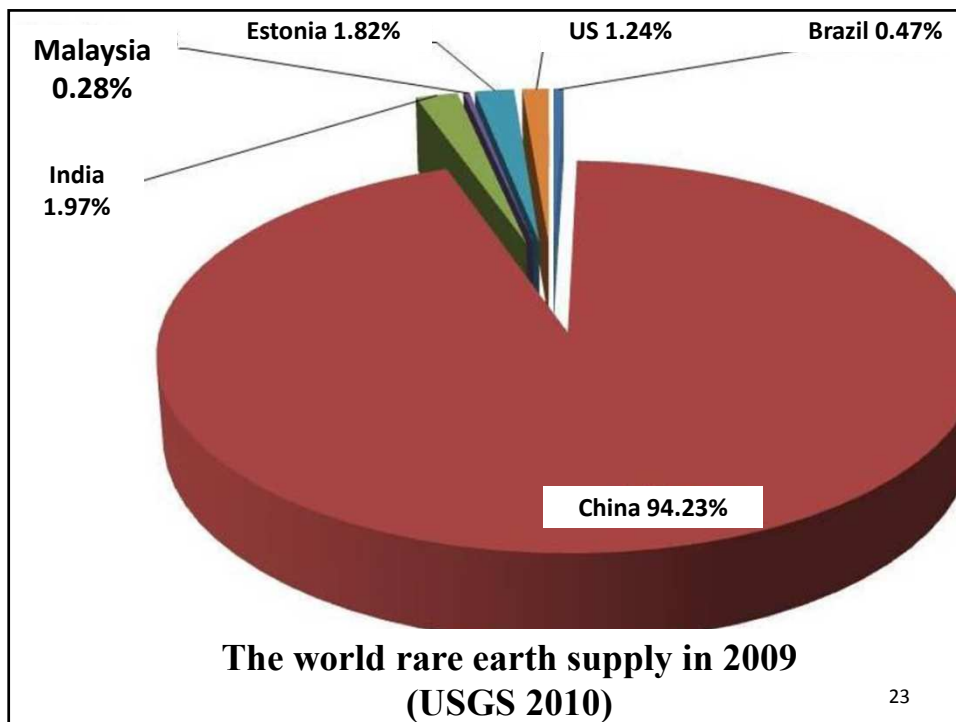




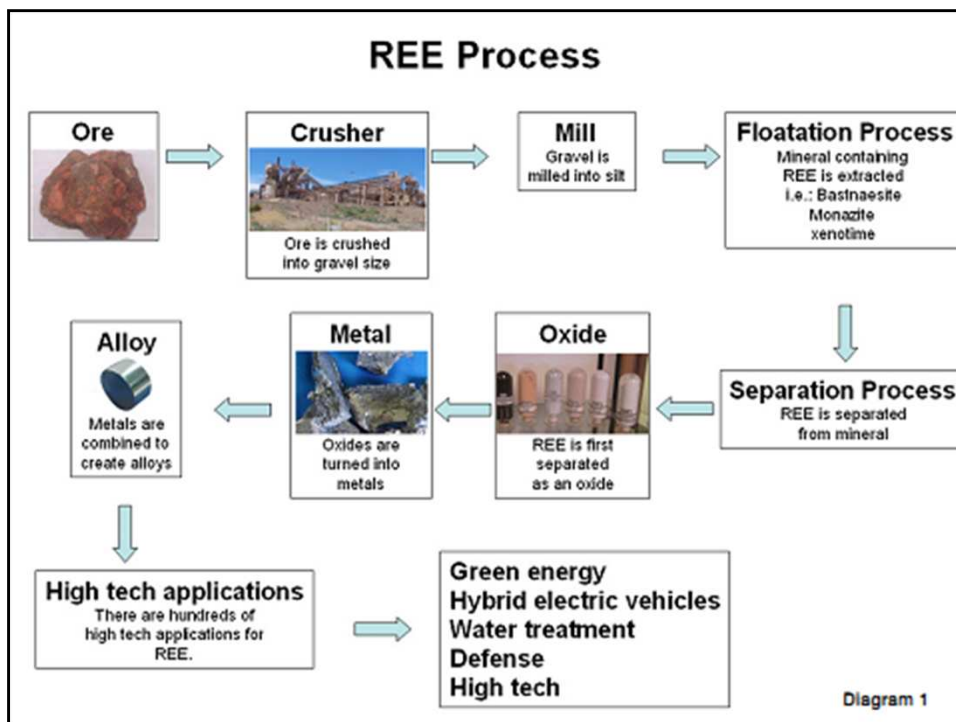
Rare Earth Demand

| | | |
|--|---|---|
| <p>1. CERIUM Flat-screen displays; fiber optics Estimated 2015 demand in tons: 70,200</p>  | <p>2. LANTHANUM Oil refining; metal-hydride batteries for electric vehicles Demand: 48,500</p>  | <p>3. NEODYMIUM Hybrid/electric vehicles; wind turbines Demand: 36,900</p>  |
| <p>4. YTTRIUM Smartphones; flat-screen displays Demand: 14,050</p>  | <p>5. DYSPROSIUM Magnetic resonance imaging; smartphones Demand: 2,200</p>  | <p>6. TERBIUM Hybrid/electric vehicles; smartphones; flat-screen displays Demand: 550</p>  |





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COMPARISONS

**A.R.E. BUKIT MERAH
&
L.A.M.P. [LYNAS] GEBENG**

A.R.E. BUKIT MERAH CHRONOLOGY

(based on Dr Meor Yusoff's presentation captured in PSC Report)



ASIAN RARE EARTH (ARE) – Establishment and Objective

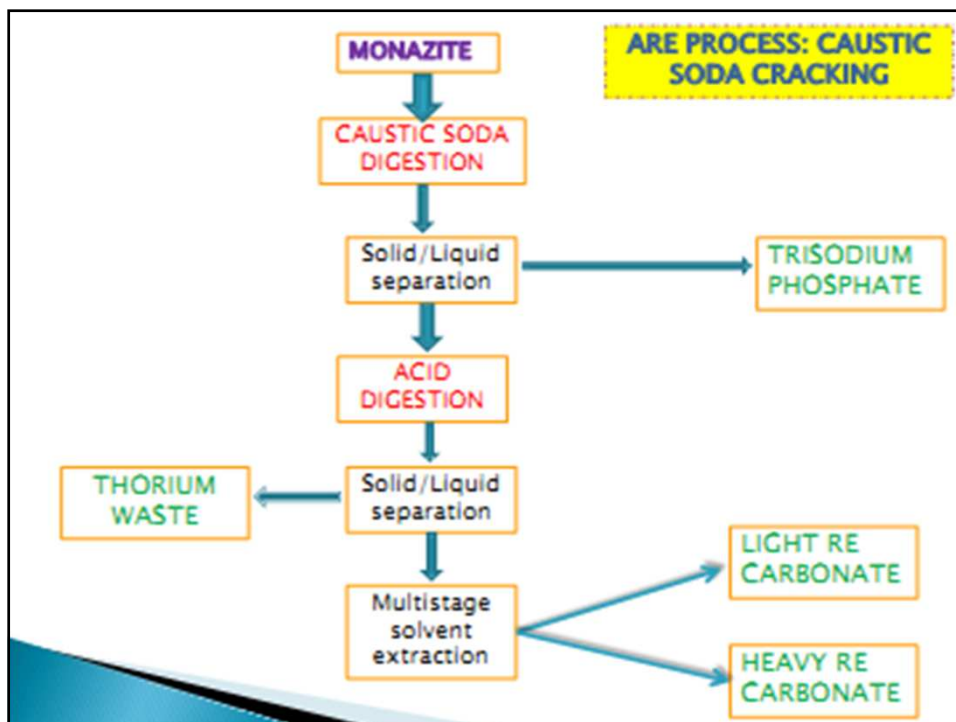
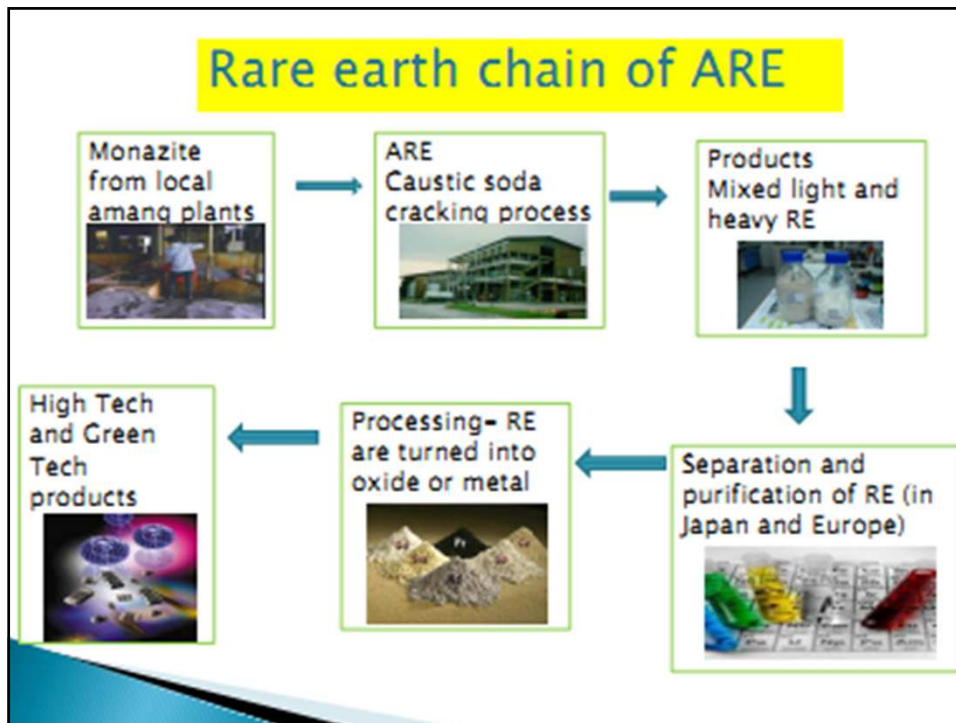
- **23 Nov 1979** – ARE was incorporated, the company a joint venture between the Japanese (Mitsubishi Chemicals Ltd) and Malaysian (BEH minerals, Tabung Haji and individuals) investors to **recover rare earth compounds from local monazite**



ASIAN RARE EARTH (ARE) – operating license

- **Apr 1982** – ARE started its operation at 7.2 km Jalan Lahat in Bukit Merah Industrial Estate with initial license issued by Health Ministry
- **8 Nov 1985** – **Stop of operation order by the AELB as the company operate without license.**
- **16 Jan 1987** – AELB issued a Class A license (interim operation) to the ARE





ARE: Public Protests

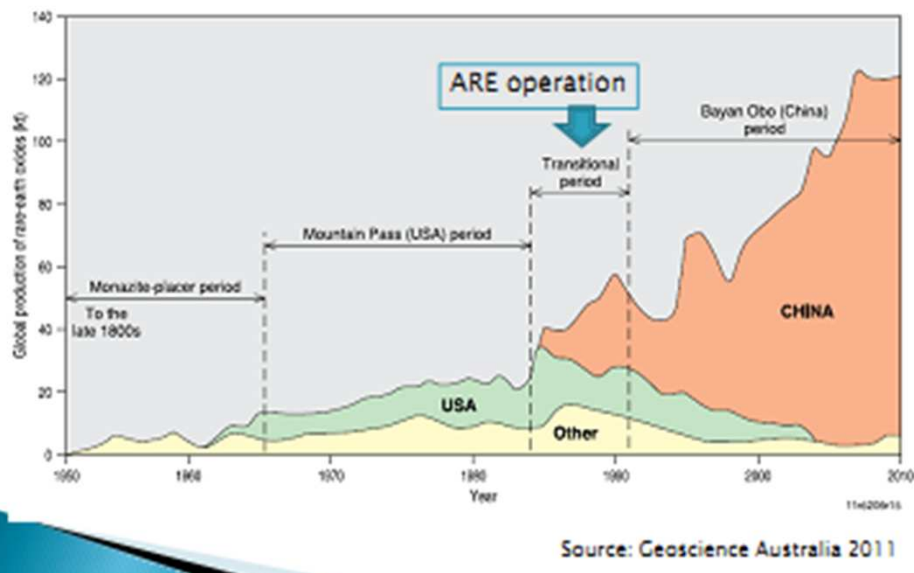
- ▶ 1984: residents of Papan and nearby towns sign a protest letter and send it to the Prime Minister, Perak Menteri Besar, the Minister of Health and the Minister of Science, Technology and Environment
- ▶ 1986: Representatives from seven areas (Bukit Merah, Lahat, Taman Badri Shah, Menglembu, Papan, Falim and Guntong) form the Perak Anti-radioactive Committee (PARC)
- ▶ 1987: About 10,000 people participated in a rally condemning the ARE for its operation



ARE - COURT CASES

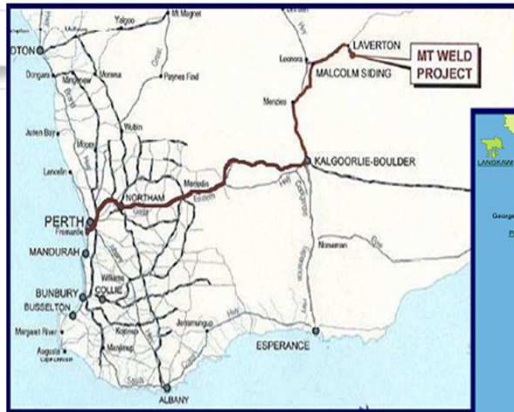
- ▶ **Feb 1985** – Residents of Bukit Merah sued the ARE claiming its operation endangered their life. The case was heard at the Ipoh High Court.
- ▶ **11 Jul 1992** – Ipoh High court issued order for the ARE to stop operation and transferred all wastes to the LTSF.
- ▶ **23 Dec 1993** – The Supreme Court overturned the High Court decision on 2 grounds. The Court was of the opinion that ARE's experts were more believable in terms of the results of the tests conducted by them showing that radiation was within permissible levels. Secondly, the Supreme Court said that the residents should have gone back to the AELB to ask that it revoke ARE's licence, because AELB has the power to do so under the Atomic Energy Licensing Act.

14 Jan 1994: ARE announce its closure citing the low price of RE as the main reason



**LYNAS ADVANCED MATERIALS PLANT
[L.A.M.P]**

LYNAS CORPORATION



• Mount Weld to Fremantle = 1000km

Gebeng, Malaysia, has exceptional infrastructure required for a Rare Earths separation facility

PROCESSING HUB WITH EXCEPTIONAL INFRASTRUCTURE

INDUSTRIAL INFRASTRUCTURE

- > Energy, chemicals, water, industrial land

KNOWLEDGE INFRASTRUCTURE

- > Engineering, trade skills and services

GOVERNMENT INFRASTRUCTURE

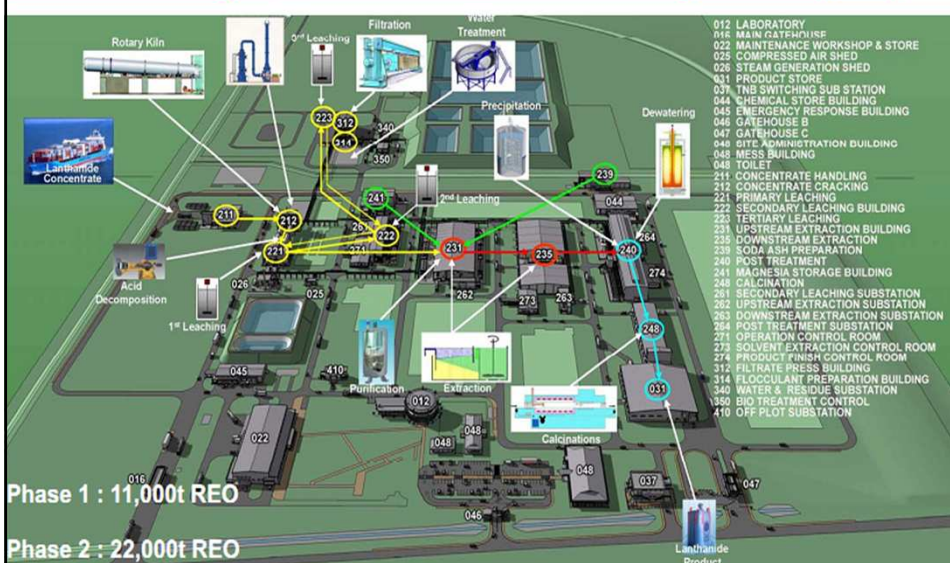
- > Including FDI incentives
(12 years tax exemption for pioneer status)



The products are set for Phase 1; Lynas has product flexibility in Phase 2

| PHASE 1 – 11,000t REO PRODUCTS | ANTICIPATED VOLUMES (tpa) |
|--|---------------------------|
| Ce carbonate | 2,600 |
| La carbonate | 1,350 |
| Ce / La carbonate | 4,000 |
| Nd / Pr oxide | 2,700 |
| SEG + Heavy Rare Earths | 480 |
| PHASE 2 – ADDITIONAL 11,000t REO PRODUCTS. Phase 2 will provide additional flexibility, with capacity to produce up to the following approximate volumes: | |
| Ce carbonate, oxide | 5,200 |
| La carbonate, oxide | 2,700 |
| Nd oxide and Pr oxide | 2,700 |
| Separated SEG + Heavy Rare Earths | 480 |

The Lynas Advanced Materials Plant (LAMP) is built to international environmental performance standards – gas, water and solids management



BASIC FACTS vs MYTHS

Chemical plant vs nuclear power plant;

LYNAS, Gebeng is not the same as Asian Rare Earth, Bukit Merah;

Radioactivity of Raw Material (Mount Weld vs Bukit Merah) ~ 30 – 40 x

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COMPARISON ON RAW MATERIAL AND RESIDUES ARE VS LYNAS PLANT

| Plant | ARE and MAREC | | Lynas | |
|---------------------|---------------|-------------|------------------|-------------|
| Mineral | Monazite | | Carbonatites | |
| Radioactive content | Uranium ppm | Thorium ppm | Uranium ppm | Thorium ppm |
| | 5,000 | 80,000 | 29 | 1,600 |
| Residue | Thoria | | Synthetic Gypsum | |
| Radioactive content | Uranium ppm | Thorium ppm | Uranium ppm | Thorium ppm |
| | 7,000 | 360,000 | 22.5 | 1,614 |

BASIC FACTS vs MYTHS

Low socio economy benefits (~ 350 employees vs thousands employees)

Tax incentive (12 years vs typical 10 years)

Raw material and WLP (classified as low level NORM)

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BASIC FACTS vs MYTHS

Avoid building the plant in Australia and came to Malaysia (feasibility);

Chased out from China & Terengganu (market control & time);

WLP commercialization (6 Bq/g to 1 Bq/g → UK's Health Protection Agency : road construction)

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BASIC FACTS vs MYTHS

Radioactivity of Residue (Lynas vs ARE : 60x);

Radioactivity Rain from Stack (0.002 mSv/yr vs permissible 1 mSv/yr);

Traveling of Radon and Thoron gases (very short half life);

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Dewan Rakyat, Parlimen Ke 12, Penggal ke 5

Rumusan PSC

JAWATANKUASA BERPUASHATI :

L.A.M.P adalah kilang kimia; bukan loji nuklear atau perlombongan;

Telah memenuhi keperluan standard dan perundangan di Malaysia;

Telah menyediakan sistem kawalan yang diperlukan.

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Rumusan PSC

JAWATANKUASA SYORKAN :

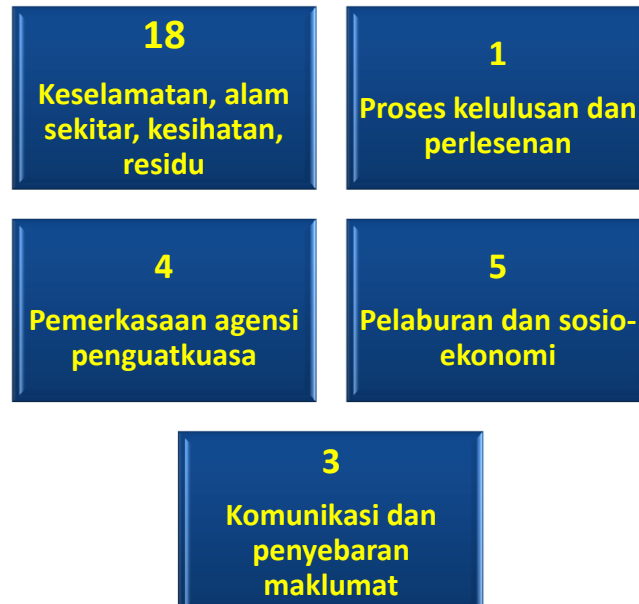
T.O.L dikeluarkan agar L.A.M.P beroperasi secara berperingkat dan terhad;

Satu jawatankuasa pemantauan berterusan dibentuk;

Kesemua 31 syor dilaksanakan sewajarnya.

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31 Syor PSC LYNAS



LESSONS LEARNT



High level of awareness of public on HS&E;

Risks are real, need to be understood and can be managed;

Scientific-based facts vs. emotions / perceptions;

The synergy of science and politics – maturity & complementary;

LESSONS LEARNT



Community engagement is very important;

Malaysia HS&E standards comparable to the world standard;

Can be a model country where risks can be managed efficiently, reliably and with integrity.

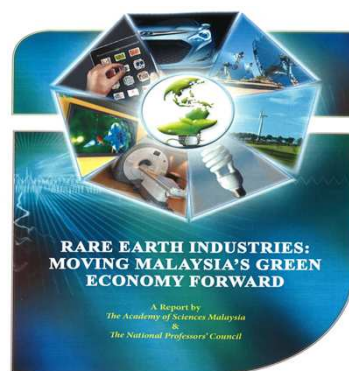
UMP'S ROLES



PARLIAMENT SELECT COMMITTEE L.A.M.P



ASM COMMITTEE ON RARE EARTH



AWARENESS SESSIONS FOR IPT'S STUDENTS

UMP'S ROLES



PROFESSORIAL TALK WITH COMMUNITY

PROFESSORIAL TALK WITH COMMUNITY



MEDIA ENGAGEMENT

MEDIA ENGAGEMENT




INTELLECTUAL DISCOURSE


INTELLECTUAL DISCOURSE

UMP'S ROLES

RARE EARTH RESEARCH CENTERS, UMP



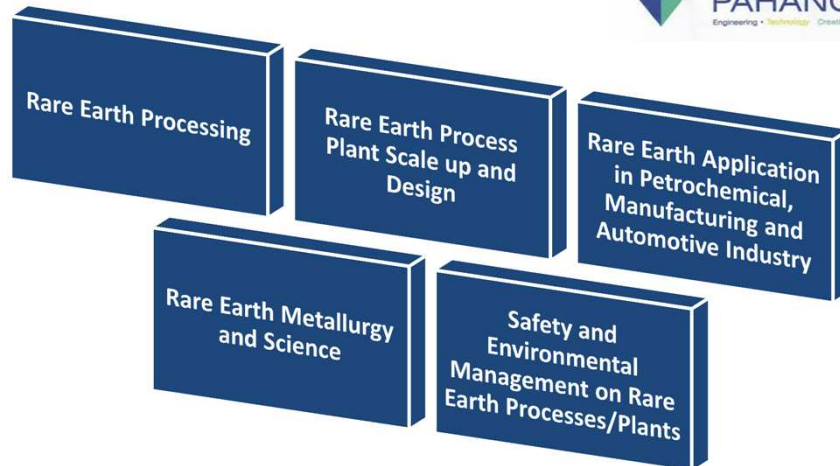
| | |
|--|--|
| RADIOACTIVE AIR MONITORING CENTER | <ul style="list-style-type: none"> 2 AMS stations AELB Karlsruhe Institute Tech |
| RARE EARTH RESEARCH CENTER | <ul style="list-style-type: none"> UMP-LYNAS Chair Peking Univ; local universities Nuclear Malaysia |



**Universiti
Malaysia
PAHANG**

Engineering • Technology • Creativity

RARE EARTH R&D AREAS AT UMP



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What Next?

all relevant parties need to work closely and put the national agenda above all interests in investment decision;

Public understanding, awareness and engagement are vital in minimizing conflicts ;

scientific community can play significant roles in educating the public research and dissemination of knowledge, without fear or favour.



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