



Republic of the Philippines  
DEPARTMENT OF ENERGY



ENERGY UTILIZATION MANAGEMENT BUREAU

Alternative Fuels and Energy Technologies Division

# Energy Technology and Energy Sector Resiliency

June 26, 2018  
Bonifacio Global City  
Taguig City





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## PRESENTATION OUTLINE

1. What is Energy technology and innovations?
2. Importance of Energy Technology and Innovation
3. DOE Alternative Fuels and Emerging Technology Programs & Initiatives
4. The technology and innovations process
5. Barriers to Technology and Innovation Development
6. Financing Energy Technologies and Innovations
7. Way Forward

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# What is Emerging Technology?

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## What is “emerging technology”?

**Emerging technologies** are technologies that are perceived as capable of changing the status quo. These technologies are generally new but include older technologies that are still controversial and relatively undeveloped in potential.

Emerging technologies are those technical innovations which represent progressive developments within a field for competitive advantage

[International Congress Innovation and Technology XXI: Strategies and Policies Towards the XXI Century, & Soares, O. D. D. (1997)]

**Energy Technology** are technology that promotes, enhances, or expands the diversity of available energy supply sources or means of transmission, increases energy efficiency, or reduces negative energy-related environmental effects: “energy technology” includes technology related to renewable sources of energy, conservation of energy, enabling technologies, efficient and effective use of hydrocarbons, and integrated energy systems



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## Importance of Emerging energy technology and innovations

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## Why should we embrace the adoption of Emerging Energy Technology and Innovation in the Philippine energy sector:

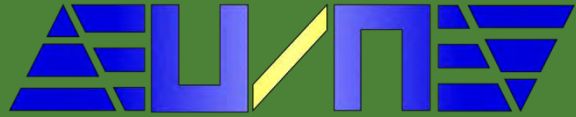
- Unique challenges in climate and geography
- Substantial diversity of natural resources but lacks the oil resource
- Energy security issues
- Limited funding and investment opportunities

## Emerging Energy Technology and Innovation can Present Solutions to:

- Reduce the costs of energy end-use forms to consumers
- Reduce costs of energy services and products by increasing end-use efficiency
- Reduce dependence on imported oil
- Increase the reliability and resiliency of energy systems
- Increase productivity of economic sector (industrial, commercial, agriculture and services)
- Reduce emission of pollutants related to energy use



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# DOE Alternative Fuels and Emerging Technology Programs & Initiatives

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Achieving energy security while meeting environmental challenges through the utilization of alternative fuels and emerging energy technologies

## Alternative Fuel Vehicles (AFVs)



Compressed Natural Gas (CNG)



AutoLPG Taxis

### Initiatives:

- Performance Testing of AFVs
- Prototyping of PNS compliant AutoLPG Jeepney
- Capacity building through development of technician's training module for AFV repair and maintenances
- Development of emergency response protocol for AFVs
- Development of policies for the development of support infrastructure such as:
  - EV Charging stations
  - AutoLPG/CNG refilling stations
- Legislative advocacy to provide incentives for AFVs



Electric & Hybrid Vehicles



AutoLPG and Electric Jeepneys



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Achieving energy security while meeting environmental challenges through the utilization of alternative fuels and emerging energy technologies

### Innovation and Emerging Technologies



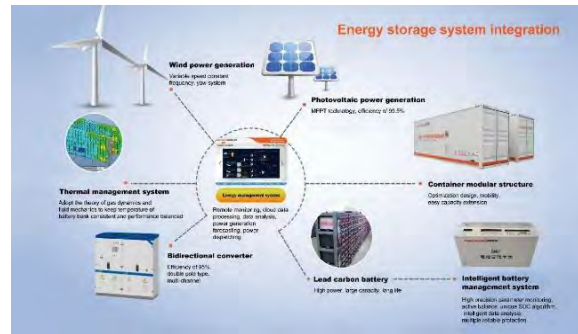
Electricity from human kinetics



Grass-based biomass fuel (Bugang/Napier) for domestic cooking to address deforestation and reduce indoor pollution



LPG-powered farm equipment to avoid fuel spillage and reduce emission



Battery Energy Storage System for Reliable Power Distribution System



Use of Smart controls and sensors at home for energy savings

DOE Alternative Fuels and Emerging Technology Programs & Initiatives

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Waste tire/plastic recycle to oil  
Alternative Fuel derived from waste rubber and plastics



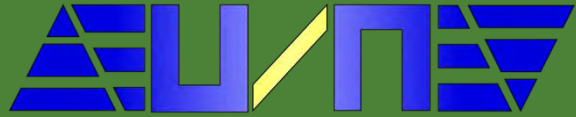
Ethanol Production from Pineapple leaves for Automobile Fuel



Use of FAST Electric Vehicle Charger will encourage use of EV for cleaner alternative



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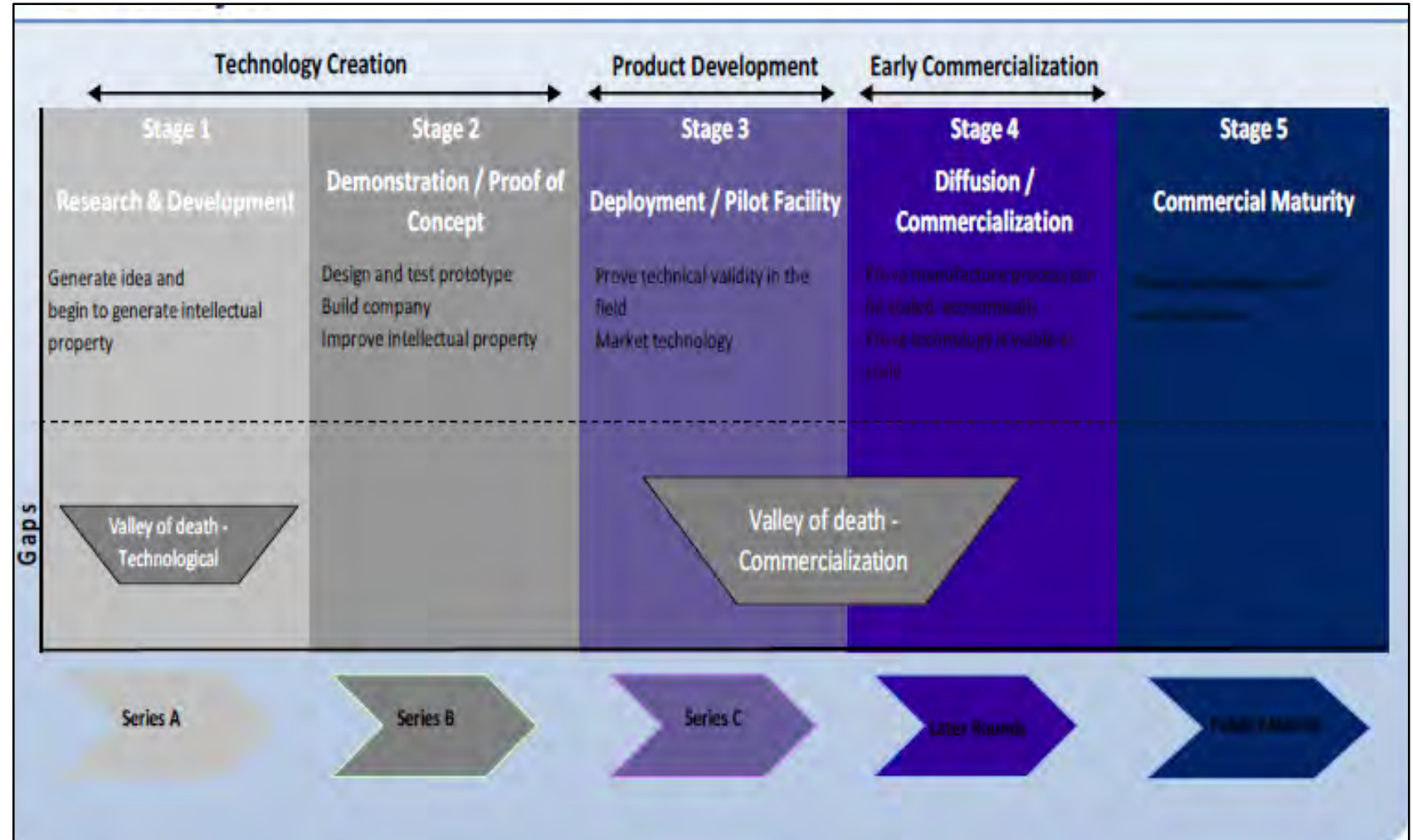
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## General Stages of Technology and Innovation Development:





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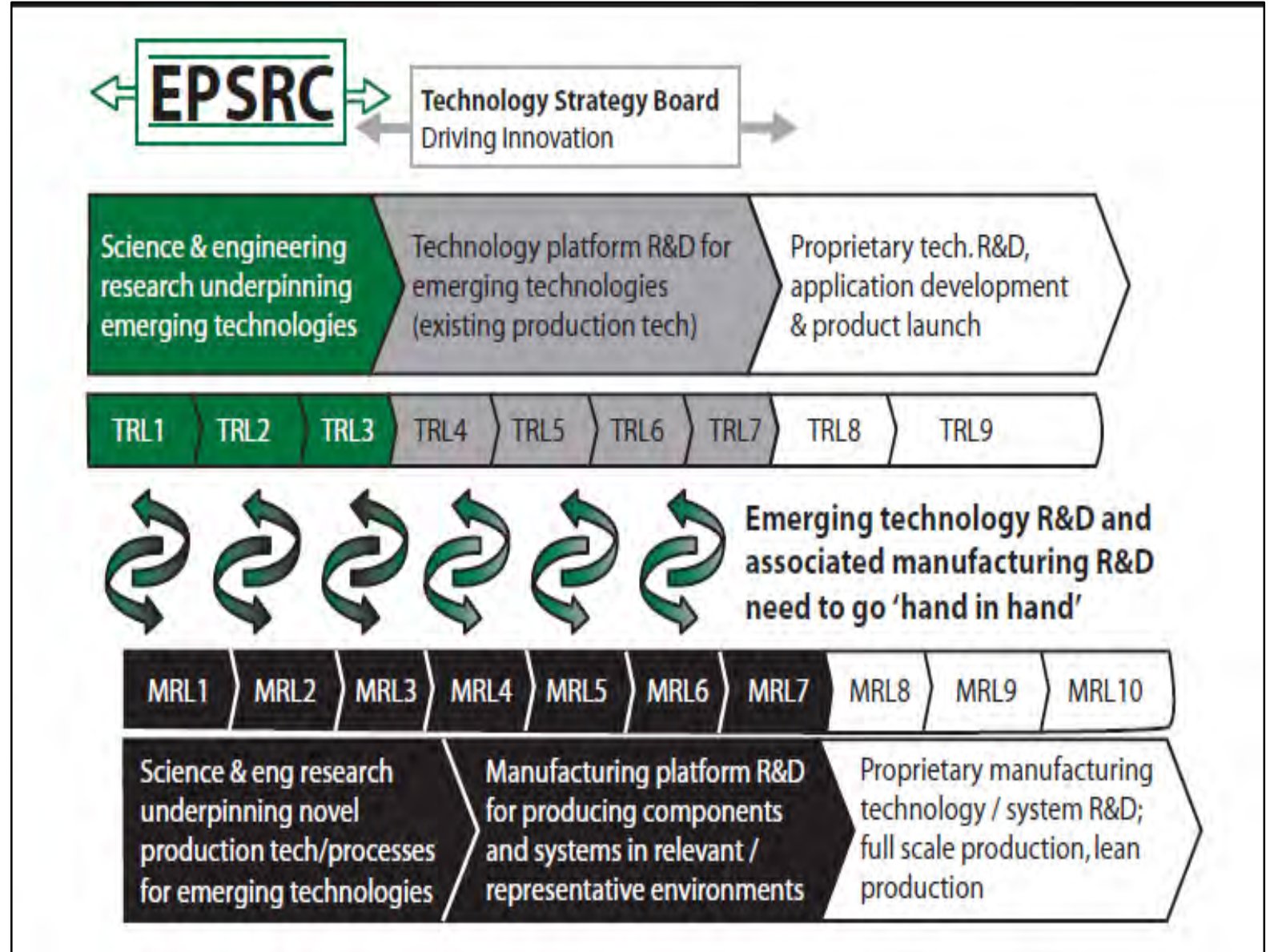
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## United Kingdom Stages of Technology and Innovation Development:



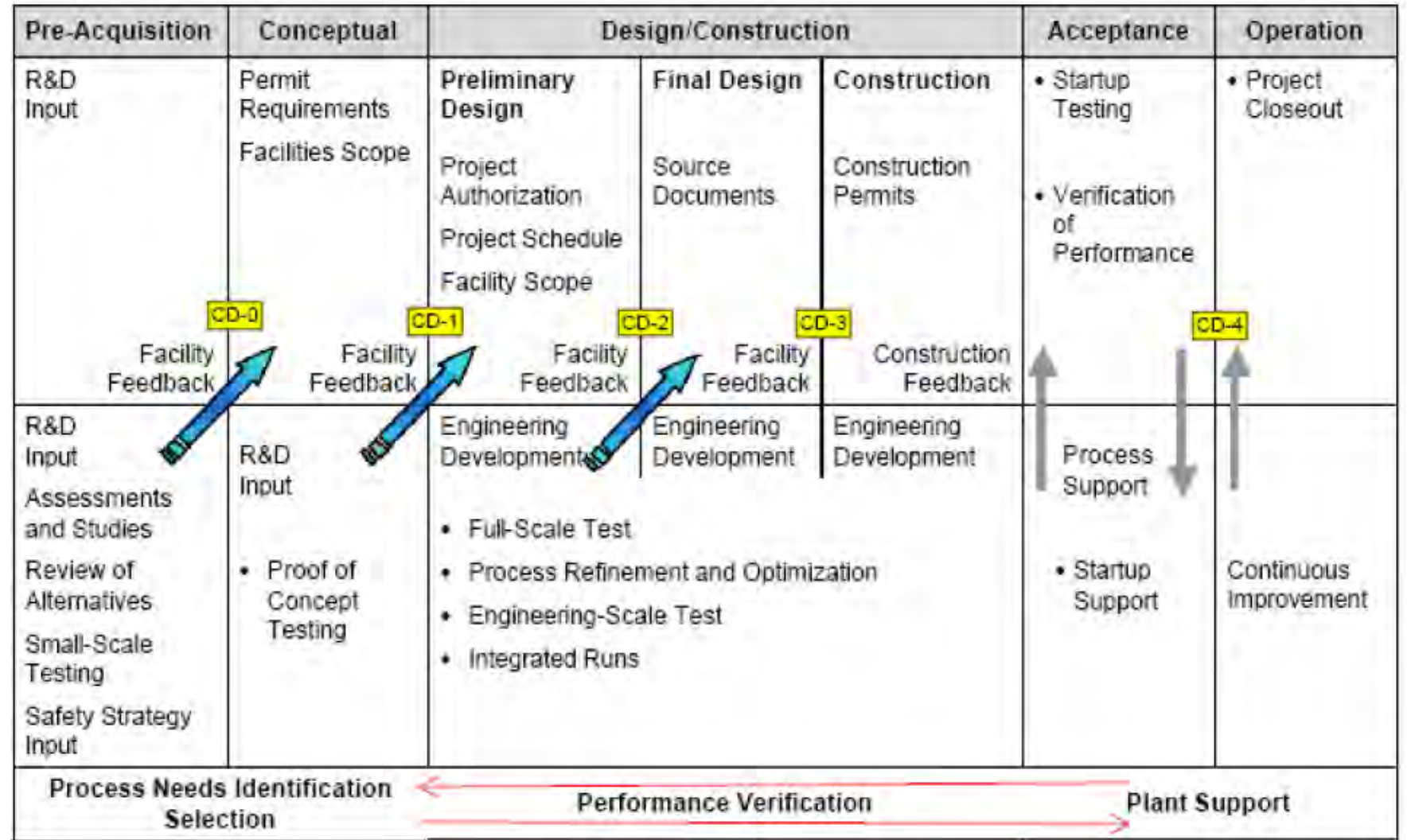




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## US-DOE Stages of Technology and Innovation Development:



Technology Development Phase





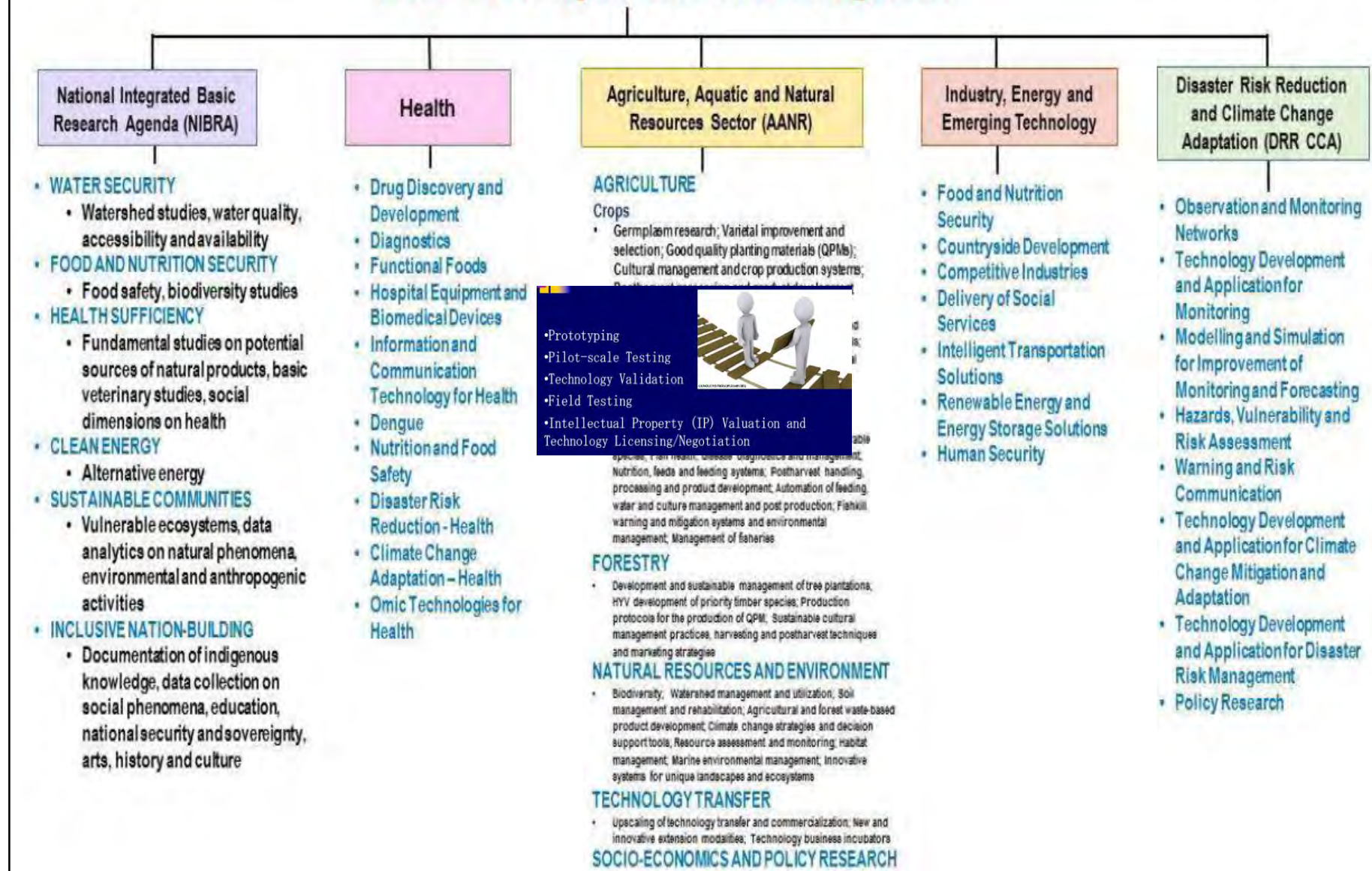
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# Philippine DOST Harmonized National Research and Development Agenda 2017-2022

## R&D Priority Areas and Programs





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# Barriers to Technology and Innovation Development

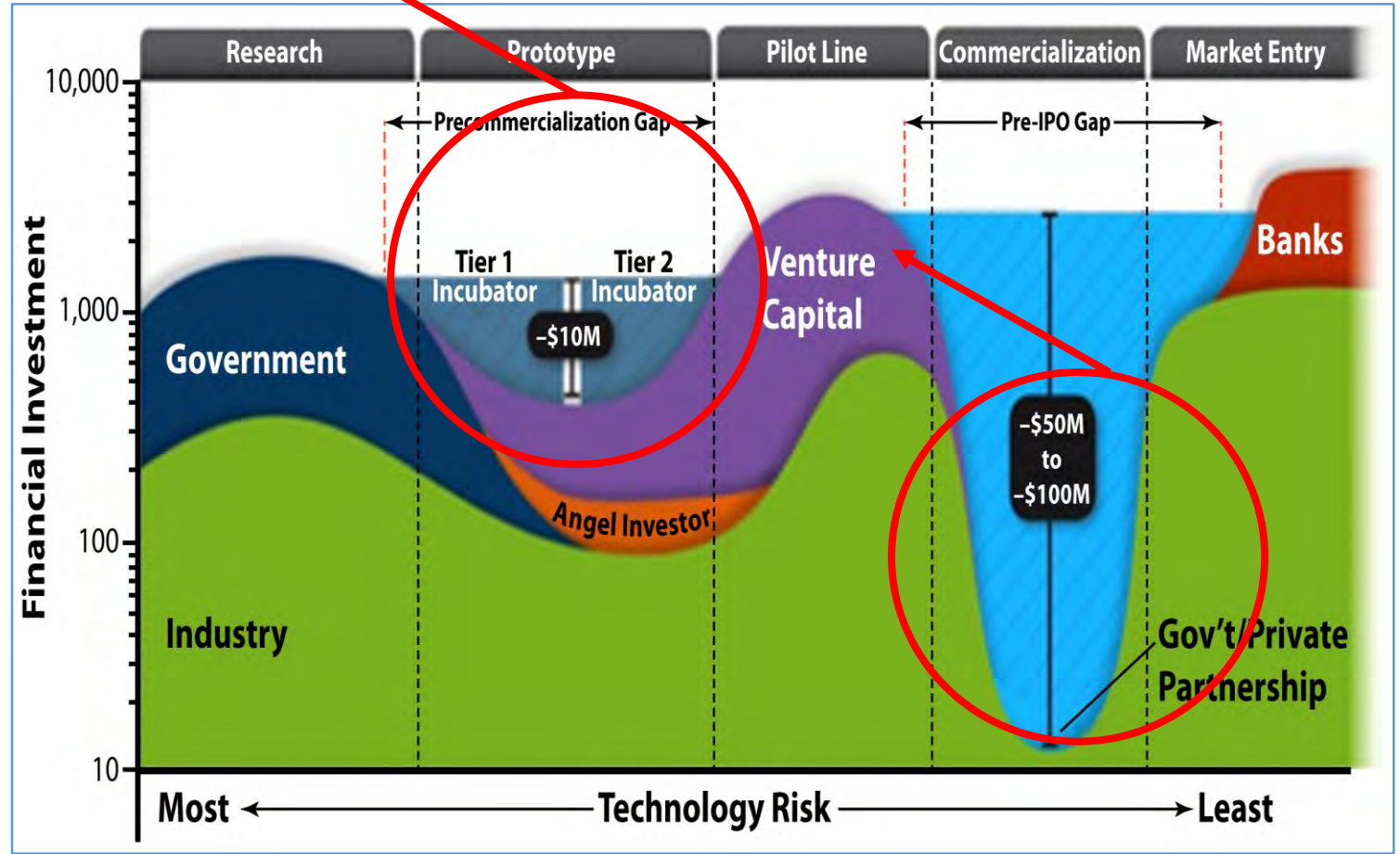
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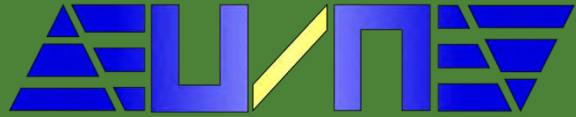
Technological Valley of Death

Commercialization Valley of Death





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# Financing the Commercialization of Energy Technologies and Innovations

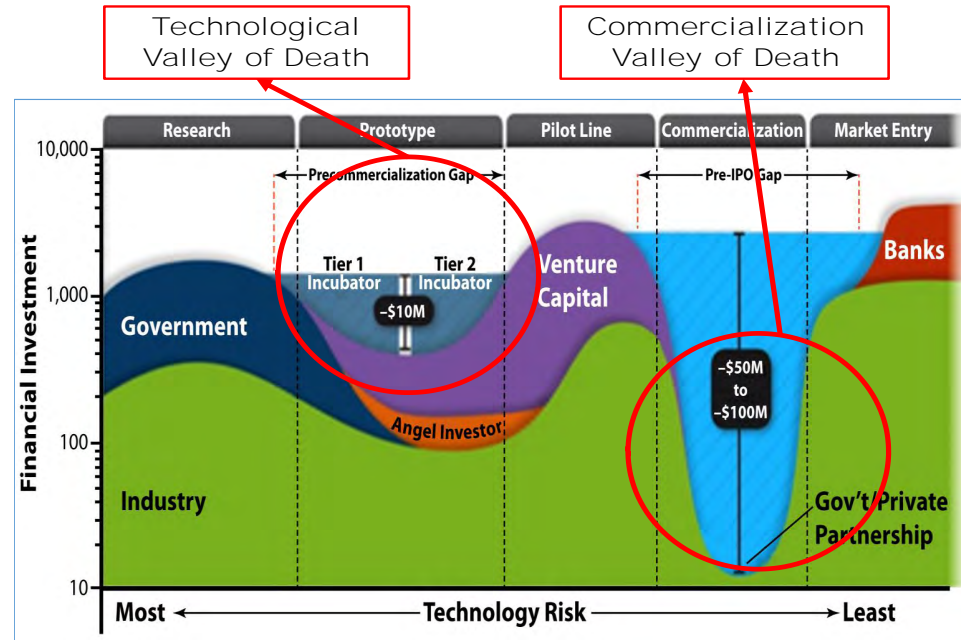
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Government as a First Adopter

Technology Funds



ASIAN GREEN BONDS

Venture Capital

Intellectual Property/Royalty

Commercial Loan/Green Loan Portfolio

Angel Investor



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# Financing the Commercialization of Energy Technologies and Innovations

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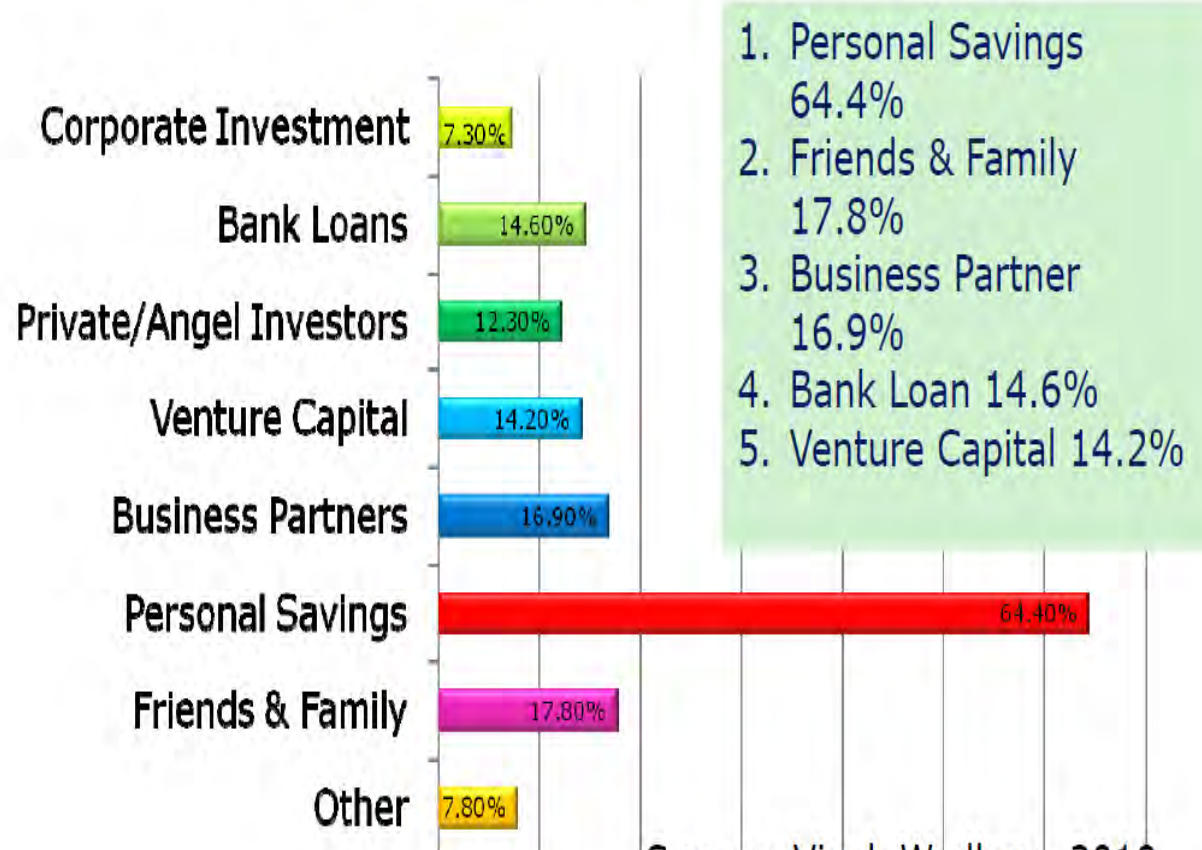
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## Sources of Funding for U.S. Startups

Personal Funds are the Norm



Source: Vivek Wadhwa, 2010



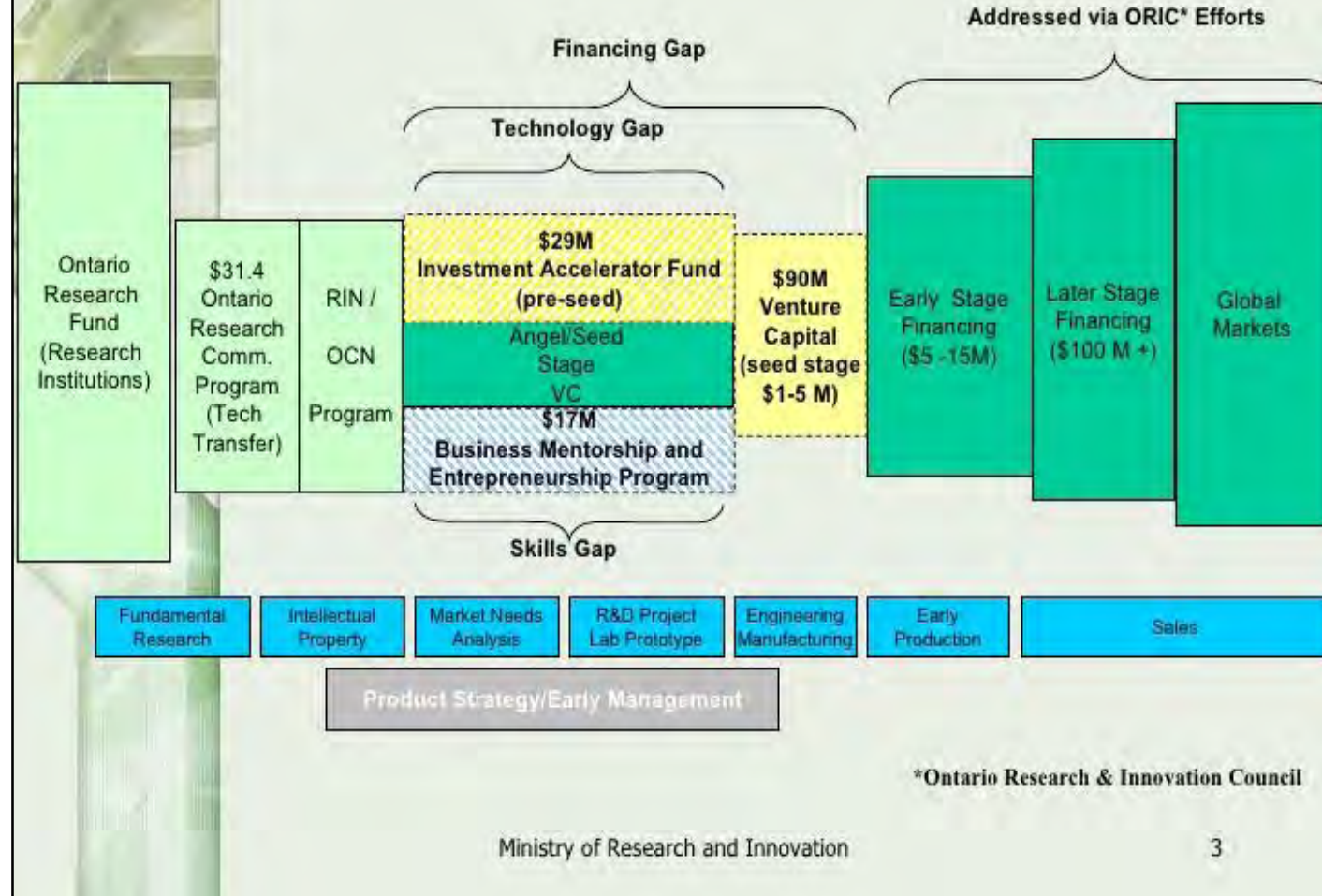
# Financing the Commercialization of Energy Technologies and Innovations

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## Addressing the Pre-Commercialization Finance, Skills and Technology Gaps





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# Financing the Commercialization of Energy Technologies and Innovations

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TECHNOLOGY APPLICATION AND PROMOTION INSTITUTE

**TECHNiCOM**  
*Technology Innovation for Commercialization*

**DOST's Grants-in-Aid (GIA) Program**

**DOST Technology Business Incubation (TBI) Program**

PHILIPPINE COUNCIL FOR INDUSTRY, ENERGY AND EMERGING TECHNOLOGY RESEARCH AND DEVELOPMENT (PCIEERD)

**FASTRAC**

Funding Assistance for Spin-off and Translation of Research in Advancing Commercialization Program

**DBP**

**CRUISE**  
Connecting Rural and Urban Intermodal System Efficiently

**FUSED**  
Financing Utilities for Sustainable Energy Development



**Alternative Fuels Program**

- Available GAA Funding to support the following activities fro promoting the adoption of energy technology and innovation:
1. Basic Research and Development
  2. Technology Validation
  3. Technology Performance Testing
  4. Technology Prototyping, Demonstration and Pilot Testing
  5. General Information Education and Awareness Campaign



## Lessons Learned

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## U.S. Strengths in Innovation

- **Government investments in R&D:** ~\$150B a year
- **Private investments in R&D:** ~\$270B a year
- **Research Universities:** some with a culture of innovation
- **Entrepreneurial spirit** and laws to support it
- **Talent:** from the U.S. and from around the world
- **Capital:** Broad, deep, and efficient capital markets with significant angel (\$22.5 Billion\*) and venture funding (\$28.4 Billion\*\*)

- Sources:

\* Jeff Sohl, UNH Center for Venture Research

\*\* 2012 Money Tree Report

## Other advanced countries are aggressively reforming their economies

Improving the performance of the innovation system as a whole by:

- Reducing the cost (and red tape) of doing business
- Strengthening linkages between universities and companies
  - Providing incentives for universities to commercialize and cooperate with the private sector
- Providing early stage financing





## Lessons Learned

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### R&D Expenditures as a Percentage of GDP

Japan (2001)	3.09
South Korea (1996)	2.82
USA (2002)	2.82
Australia (2000)	1.53
Singapore (1995)	1.13
New Zealand (1999)	1.03
Hong Kong (1996)	0.61
Malaysia (1996)	0.24
<b>Philippines (2002)</b>	<b>0.14</b>
Thailand (1996)	0.13
Indonesia (1994)	0.07

### NATIONAL R&D EXPENDITURES

0.14% of GDP  
R&D Expenditure  
(2002)

1.0% of GDP  
UNESCO  
Recommendation





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# Way Forward

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Increase R & D  
Funding

Collaborative  
Undertaking

**INCREASE FUNDING THROUGH GAA**

**SOLICITS GRANTS/ODA**



## ALTERNATIVE FUELS AND ENERGY TECHNOLOGY DIVISION

FORMULATES POLICIES, PLANS AND PROGRAMS RELATED TO NEW AND ADVANCED ENERGY TECHNOLOGIES (NAETs) AND ALTERNATIVE FUELS DEVELOPMENT TOWARDS A SOCIALLY AND ENVIRONMENTALLY RESPONSIVE AND EFFECTIVE UTILIZATION OF ENERGY RESOURCES

Joint R & D

Technology Validation/  
Demonstration

**STATE UNIVERSITIES AND COLLEGES**

**MOA with DOST on the Conduct of Energy Related Science and Technology Research and Development R & D**

**Individual Technology & Innovation Proponent**

**Private Sector Technology & Innovation Proponent**

**In-house Technology R & D and Policy Development**

**1<sup>st</sup> Philippines Energy Sector Innovation Challenge**

**Issuance of Supporting guidelines to Promote AFETs**

**Legislative Advocacy to Provide Incentives for AFETs**



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The way to  
innovative thinking

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*“Challenging the status quo  
based on a scientific way of  
thinking and with practicality in  
mind is the mother of all  
inventions and innovations”*

*-FGDomingoJr*



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THANK YOU FOR YOUR ATTENTION

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