

Status of Nuclear Energy Program in the Philippines



4th ASEAN Nuclear Power Safety Research Annual Meeting (02-04 June 2021)

PHILIPPINE NUCLEAR RESEARCH INSTITUTE

June 02, 2021 | Virtual Meeting





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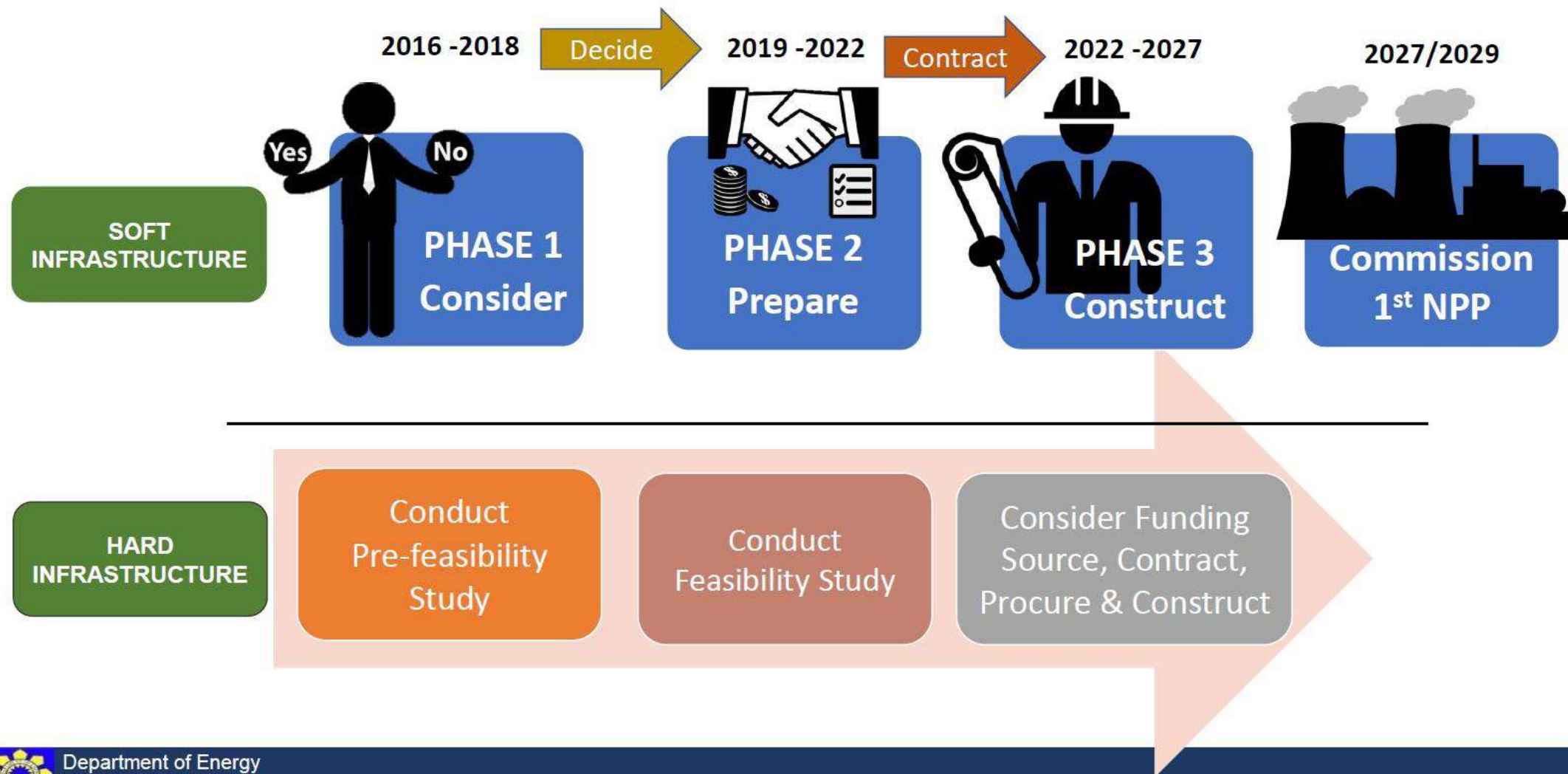
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Timeline for PH's Nuclear Energy Programme and Status in relationship to IAEA Milestones Approach.




Timeline (IAEA Milestones Approach)

Roadmap of the Philippine Nuclear Power Program




TIMELINE: PH NUCLEAR ENERGY PROGRAM


TECHNICAL ASSISTANCE
from IAEA
“Assessing the Development of
Nuclear Power Program in the
Philippines (Phase I)”

NEPIO created

2016


Energy
Planning Studies (EPS)
Pre-Feasibility
Studies 2017 of Nuclear
Infrastructure Issues

2017


National Position
DOE submitted the “National
Position to Embark on a NPP”
to the Office of the President.

INIR Mission started

2018


INIR Mission Report
Official Report for
Phase I turned over to the
Philippine Government.

IWP meeting

2019


CREATION OF NEP-IAC
President Rodrigo Duterte
signed the EXECUTIVE
ORDER NO. 116, S. 2020 on
24 July 2020

Report to
President

2020


NATIONAL POSITION
Proposed Executive Order
adopting a National Position
for a Nuclear Energy Program
sits on the President’s desk.

2021



INIR Mission

Integrated Nuclear Infrastructure Review

- A Self-Evaluation report was presented, outlining the progress made relative to the 19 nuclear infrastructure requirement issues specified by the IAEA
- The INIR Report outlined the following cornerstones:
 - **Policy**
 - **Legislative Framework**
 - **Public Acceptability**
 - **Alignment with International Standards**



IWP Meeting

Integrated Work Plan



The IWP Meeting between the IAEA and the DOE-NEPIO took place on **November 12 to 15, 2019** in Vienna, Austria.

- A total of 19 activities were identified for the years (2020-2021); 10 activities for 2020, 9 activities for 2021.
- The largest part of the activities relates to the
 - **National Position**
 - **Legal and Regulatory Framework**
 - **Human Resource Development**
 - **Stakeholders Involvement**



CREATION OF NEP-IAC



Creation of the Nuclear Energy Program Inter-Agency Committee

Executive Order No. 116, s. 2020

Signed by President Rodrigo Duterte on **24 July 2020**,
“Directing a Study for the Adoption of a National Position on Nuclear Energy Program, Constituting a Nuclear Energy Program Inter-Agency Committee, and for Other Purposes”



Objectives of the NEP-IAC*

Main

National position on a nuclear energy program
(EO 116, Section 1)

Specific

Prefeasibility study with expanded considerations
(EO 116, Section 4a)

National strategy for the nuclear energy program
(EO 116, Section 4b)

Review of existing **legal framework**
(EO 116, Section 4c)

Recommendations on **utilization of nuclear energy**
(EO 116, Section 4c)

Subcommittees to address various issues
(EO 116, Section 4d)

Guidelines and rules to implement EO effectively
(EO 116, Section 4e)



Composition of the NEP-IAC

Chairperson:

Vice-Chairperson:

Members:

Department of Energy (DOE)

Department of Science and Technology (DOST)

Department of Environment and Natural Resources (DENR)

Department of Finance (DOF)

National Economic and Development Authority (NEDA)

National Transmission Corporation (TransCo)

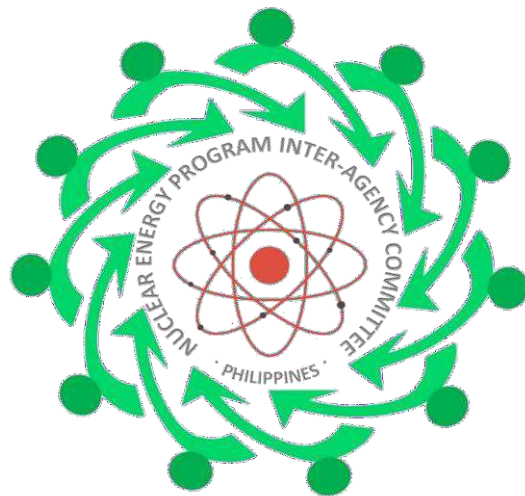
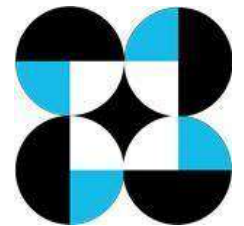
Department of Interior and Local Government (DILG)

Department of Foreign Affairs (DFA)

Philippine Institute of Volcanology and Seismology (PHIVOLCS)

Philippine Nuclear Research Institute (PNRI)

National Power Corporation (NPC)



Structure of the NEP-IAC

NEP-IAC Steering Team

(High-level representatives from government agencies)

NEP-IAC Secretariat

(Staff specifically recruited for this NEP-IAC, at least 1 secretariat staff should be assigned to each SC)

NEP-IAC Subcommittees

(TWG with members coming from relevant government agencies)

SC1

Management,
Policies, and
Financing

SC2

Nuclear 3S
and
Radiation
Protection

SC3

Legal and
Regulatory

SC4

Human
Resource
and
Stakeholder
Involvement

SC5

Siting,
Environment,
and
Emergency
Plan

SC6

Nuclear Fuel
and
Radioactive
Waste



Consultants, Contractors, Vendors, Suppliers

(May be requested to provide inputs/information and/or perform specific activities to support activities of SCs)



BUILDING A NATIONAL POSITION



- On **December 18, 2020**, the NEP-IAC submitted a comprehensive report to the President and the Proposed Executive Order adopting a **National Position for a Nuclear Energy Program**

Current status:

Awaiting the President's decision.



INFRASTRUCTURE NEEDED



Policy and National Position

Establishing an Executive Order Adopting a Nuclear Power Program (NPP)



Legal Framework

Reviewing and Amending the Legal Regulatory Framework



Alignment with International Standards

Coordination with the IAEA for the INIR and IWP, Country Nuclear Infrastructure Profile (CNIP)

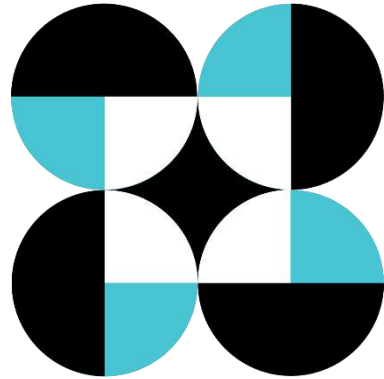


Stakeholder Involvement

Comprehensive and Strategic Communication Plan



Current Nuclear Regulatory Structure



DOST

Philippine Nuclear
Research Institute
(PNRI)

Nuclear
Regulatory
Division(NRD)

PNRI-NRD
regulatory functions
on nuclear and
radioactive
materials

DOH

Food and Drug
Administration (FDA)

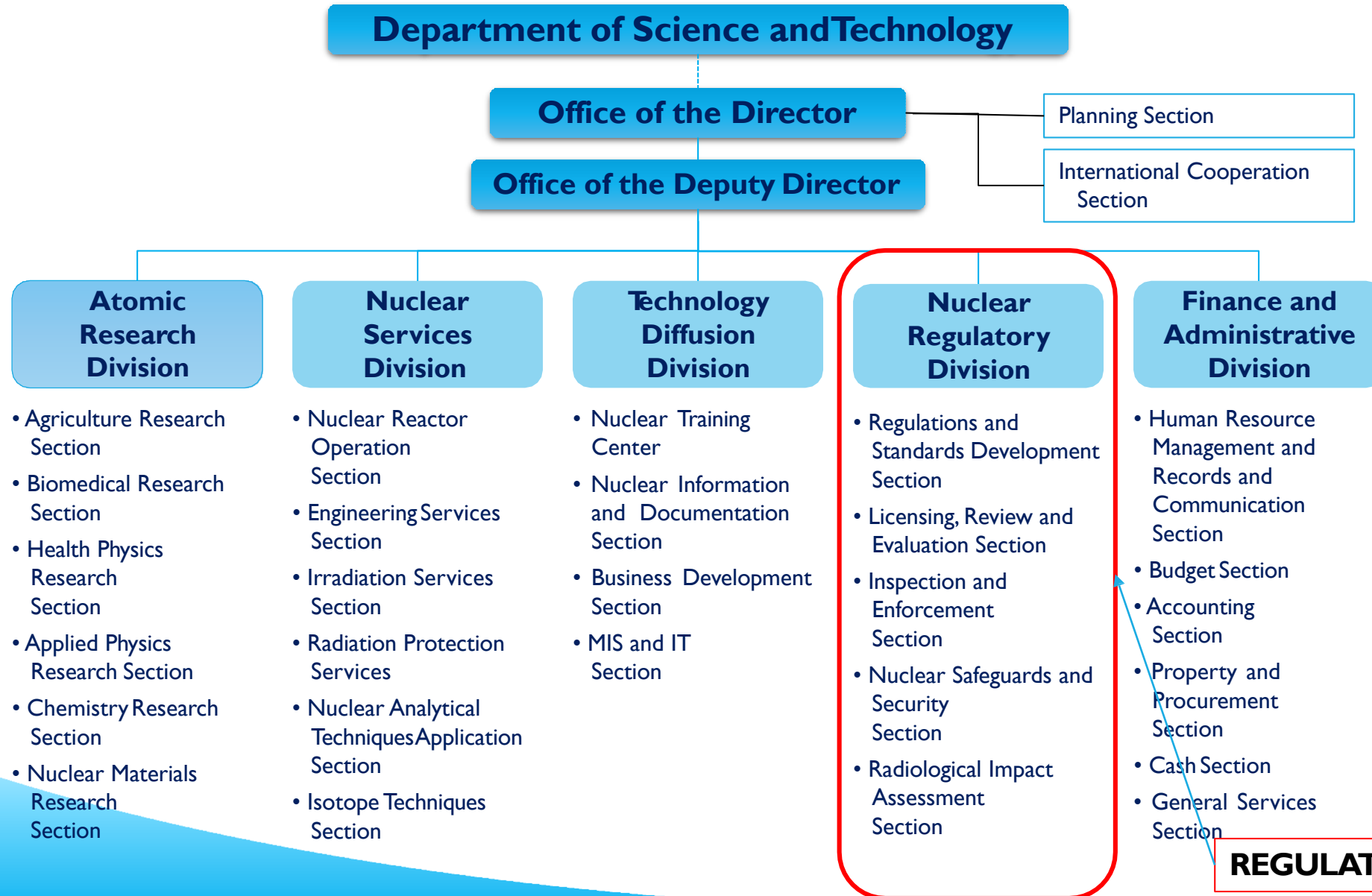
Center for Device
Regulation Radiation
Health and Research
(CDRRHR) -
**Radiation Regulation
Division**



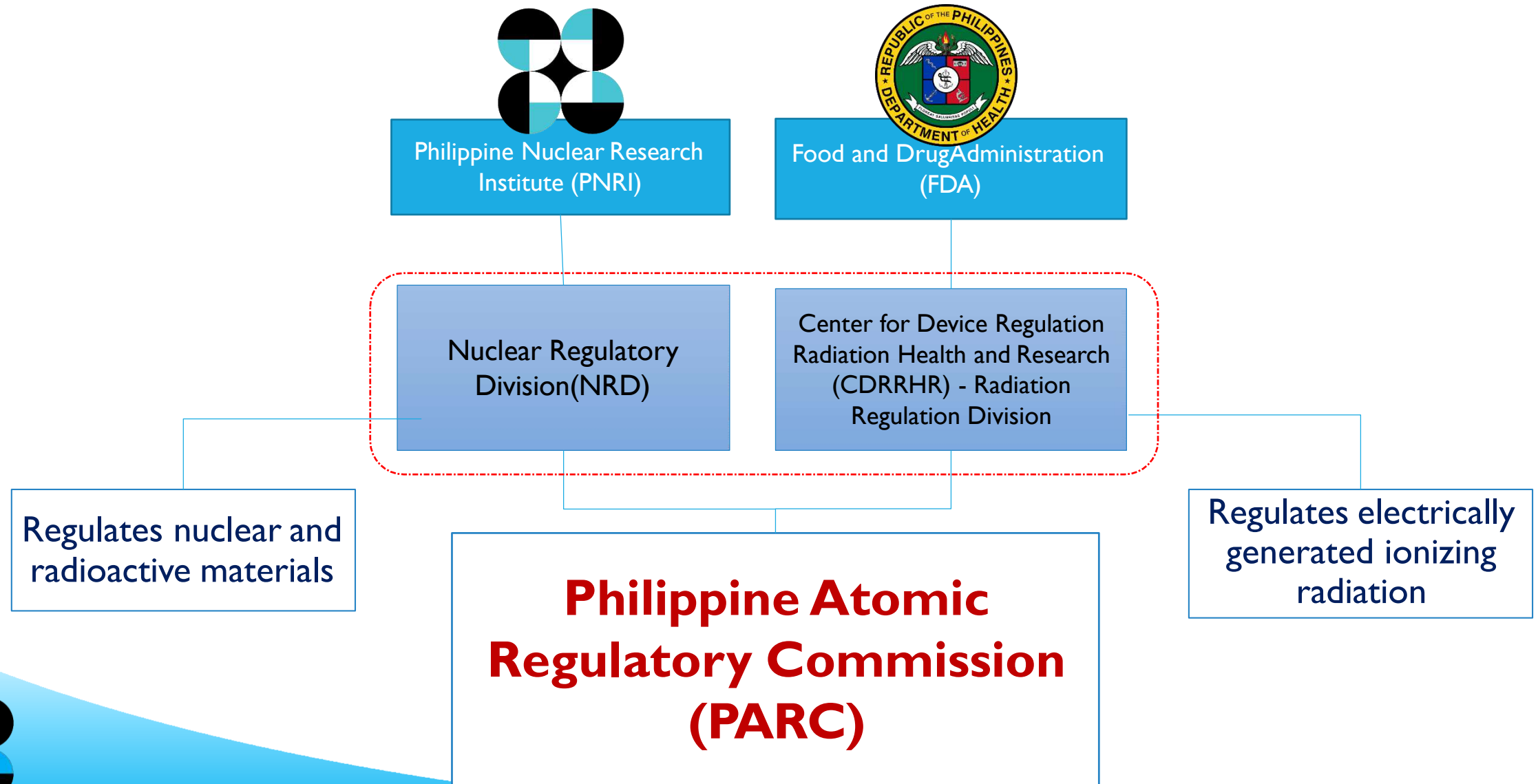
FDA-CDRRHR
regulatory functions
on electrically
generated ionizing
radiation



PNRI Organizational Structure



Creation of an Independent Regulatory Body





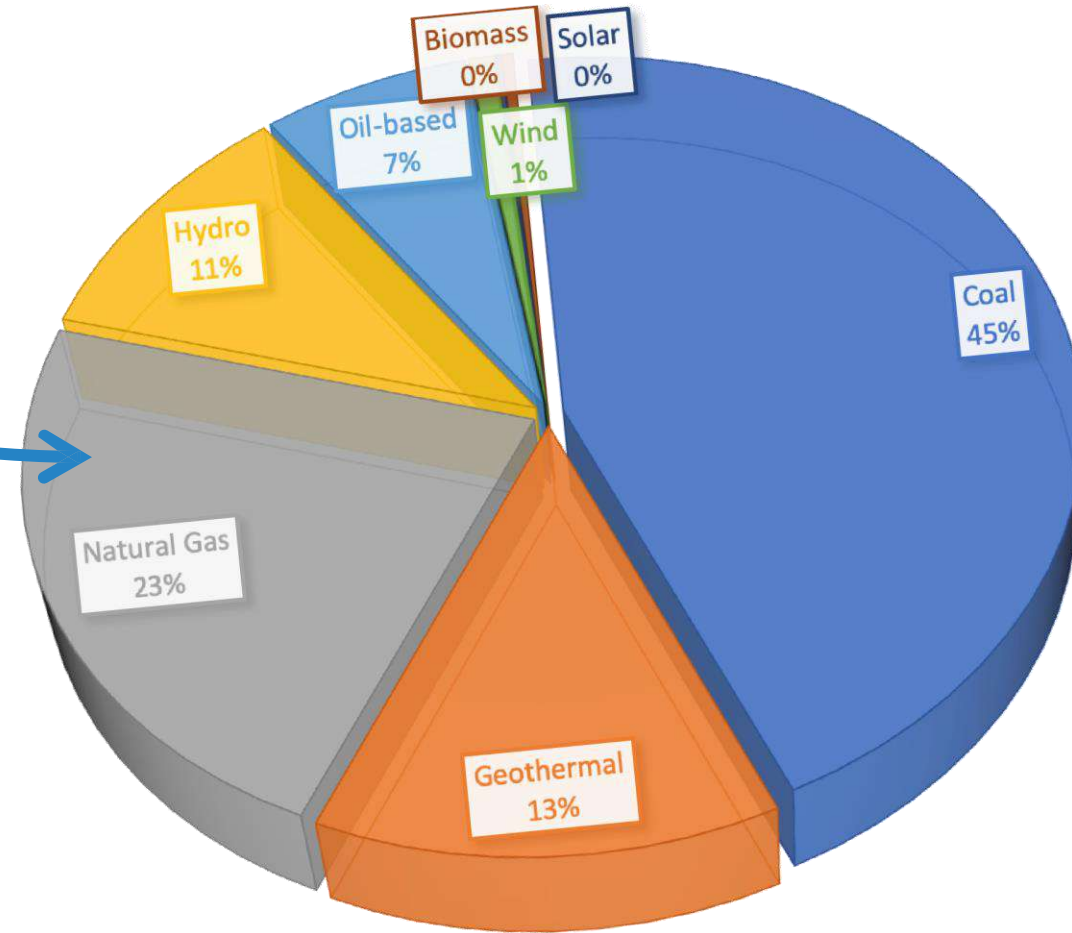
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Why the Philippines is considering Nuclear Energy



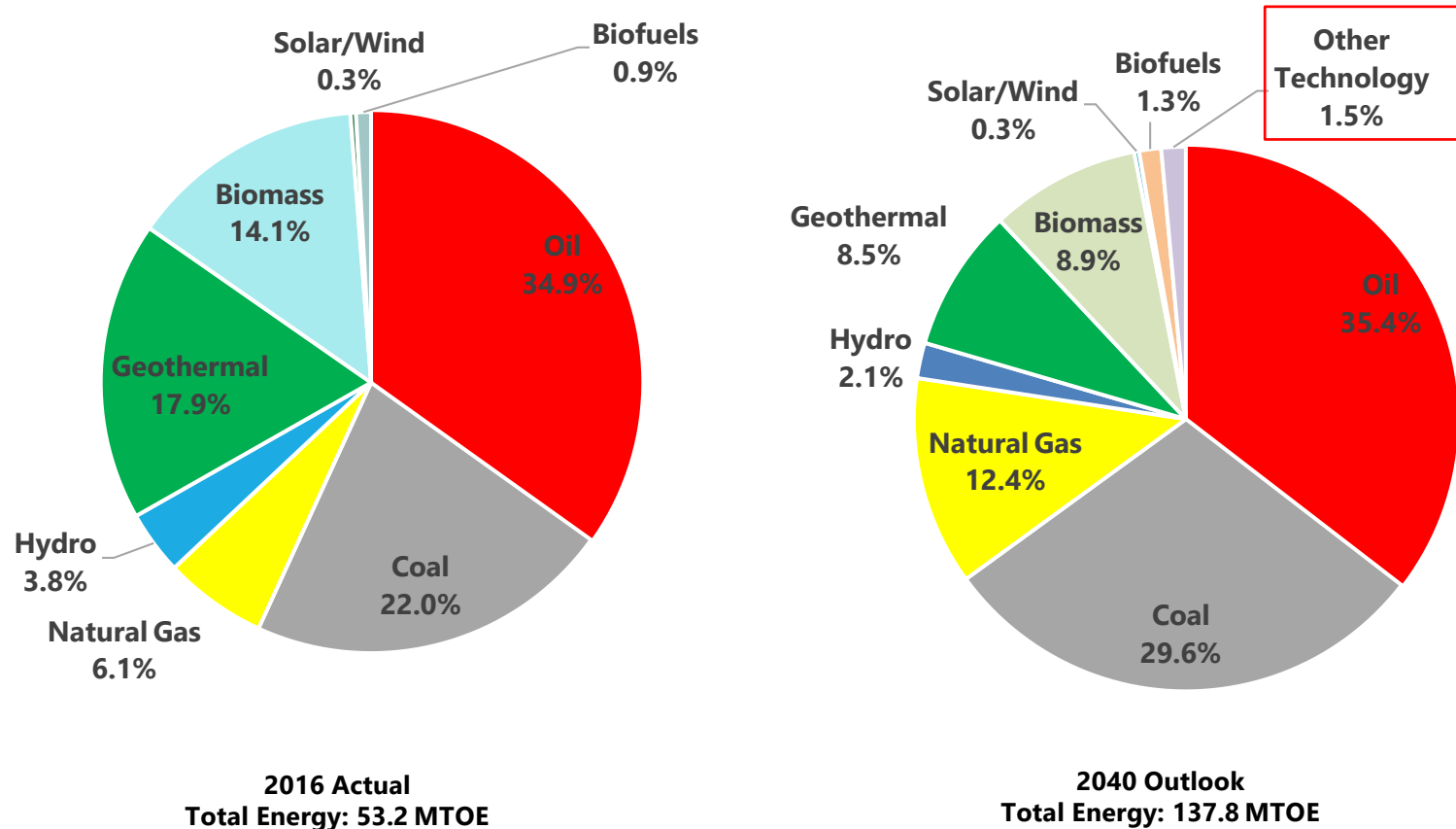
PHL ENERGY MIX

MALAMPAYA (the PH main NG source) is running out in 5 years.



Energy Demand and Supply Outlook by 2040

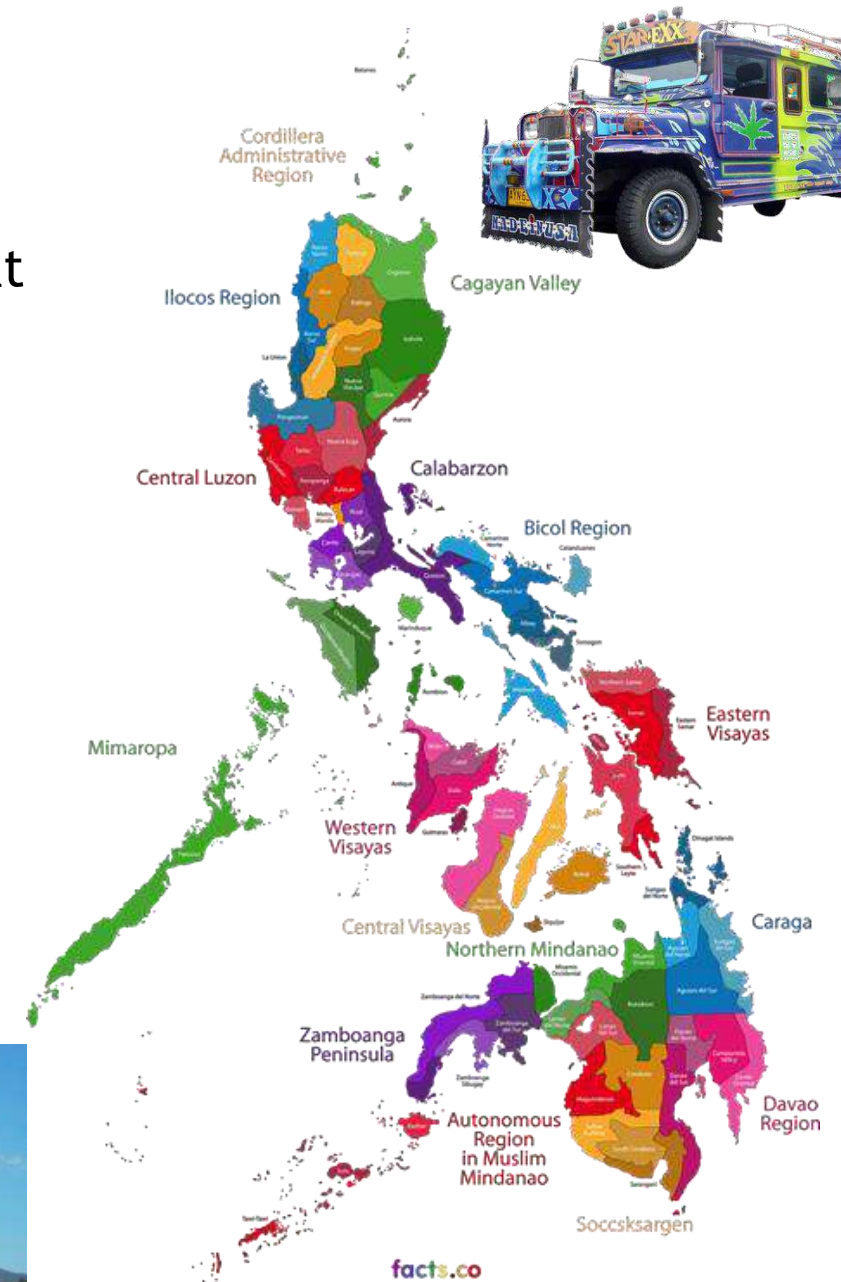
Primary Energy Mix 2016 and 2040



THE PHILIPPINES



- The Philippines is an archipelago that comprises 7,641 tropical islands
- Total land area: 300,000 sq km
- Population: 109.6 M (2020)
- Official languages: Filipino, English
- Religion: Christian (Catholic), Islam



Hazards in Philippines

- Earthquakes
- Volcanoes
- Typhoons
- Storm Surges
- Tsunamis
- Floods
- Landslides
- **Politicians**



THE PHILIPPINES

The Philippines faces multiple global and local challenges including, among others:

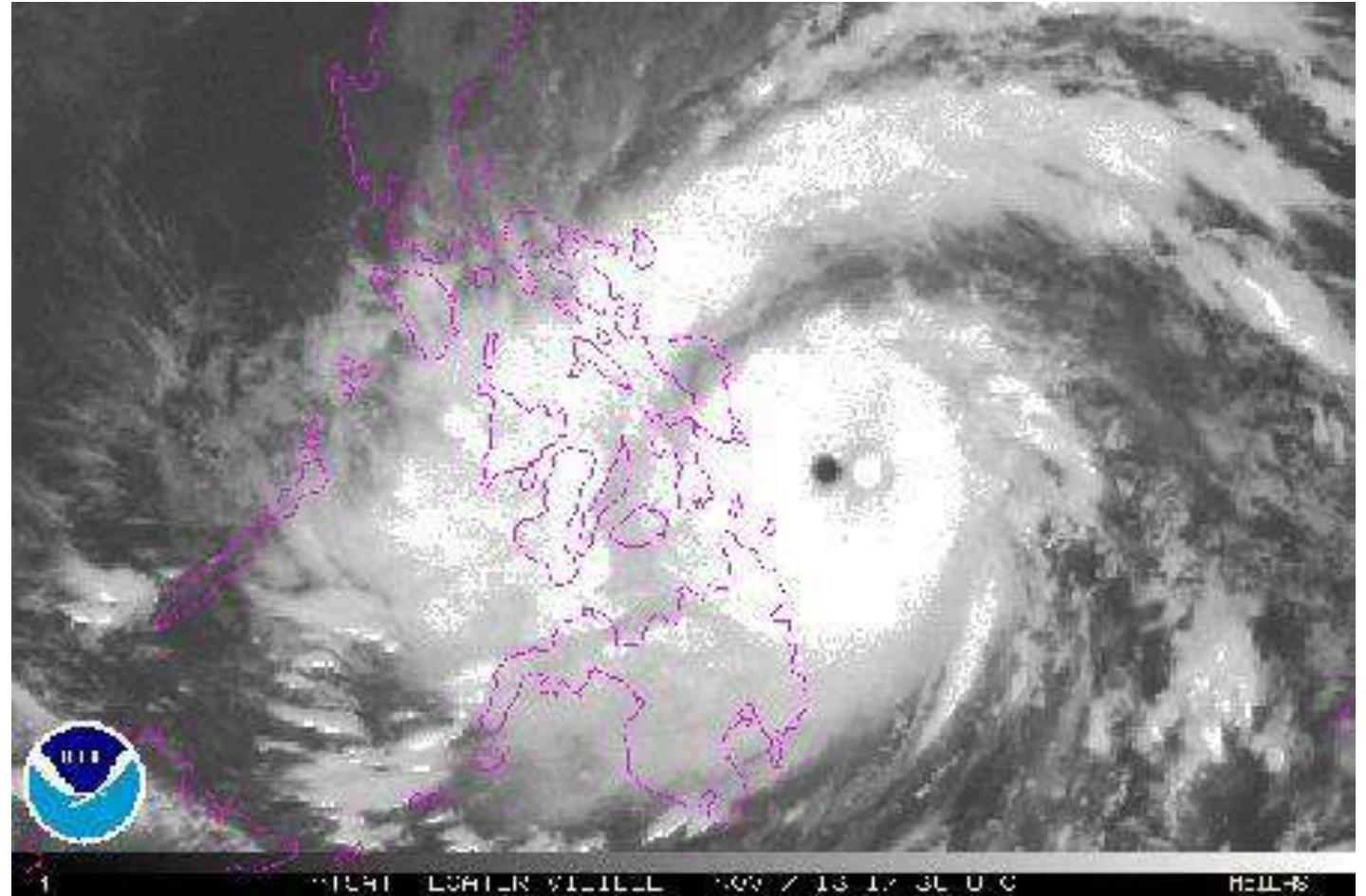
- **Natural disasters** such as volcanic eruptions, typhoons, and earthquakes
- Crimes related to illegal drugs, theft, robbery, and mugging
- **Terrorism** and violent extremism
- Environmental degradation and **climate change**
- Persistent poverty and increasing inequality



THE PHILIPPINES

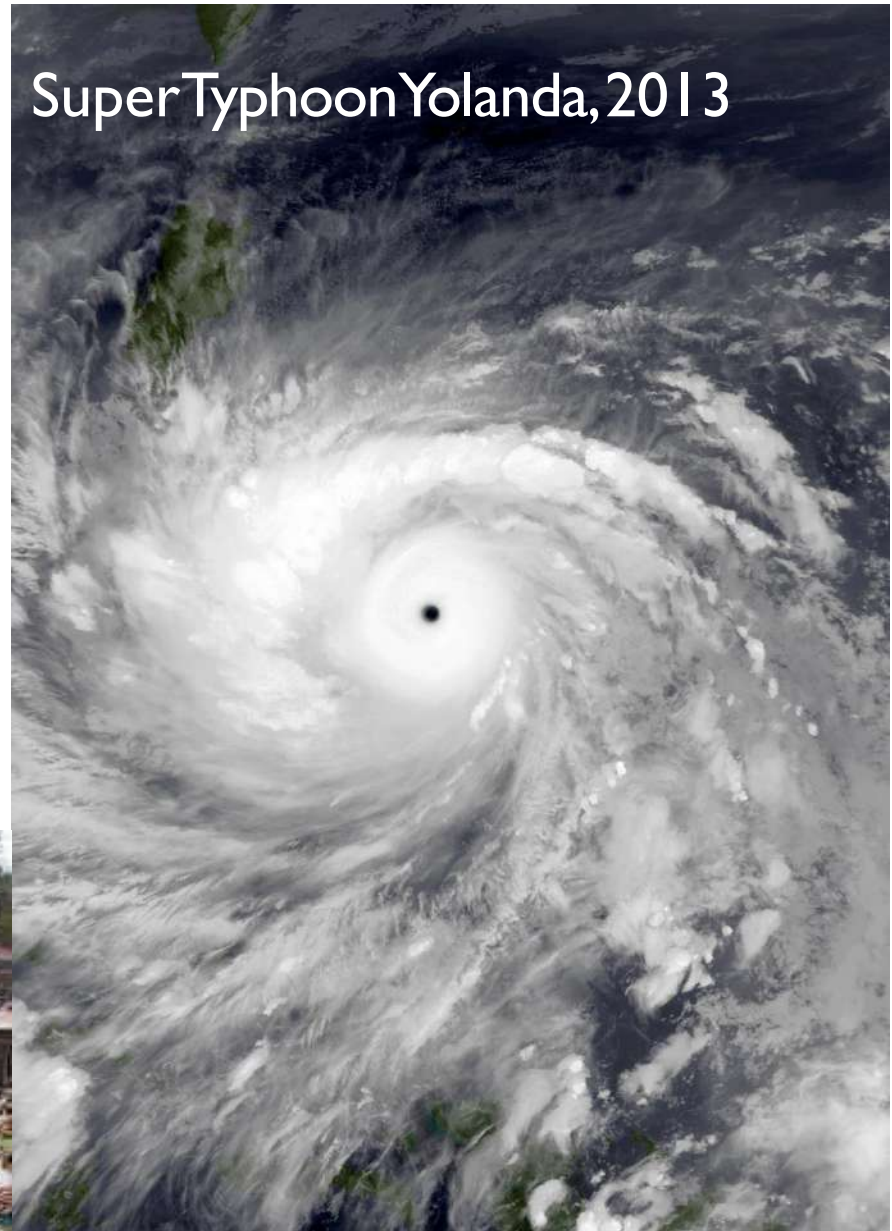
Located along the typhoon belt in the Pacific, the Philippines is visited by an average of **20 typhoons every year**, five of which are destructive.

Philippines - Asian Disaster Reduction Center



THE PHILIPPINES

- Typhoon Haiyan (Local: Yolanda)
- Typhoon Haiyan, one of the most powerful tropical storms on record, caused tremendous damage when it made landfall in the Philippines in November 2013.
- More than 6,000 people were killed. Thousands of homes were destroyed. Over 14 million Filipinos were affected.



Why Nuclear ?



A median Filipino family pays more than 10% of its monthly income for electricity!

High electricity costs **could be** reason why **79%** of PHL population supports nuclear power (DOE Survey, May 2019)

Nuclear is competitive with gas and coal but small volume favors energy security.

Why the PH is considering nuclear power

- ✓ Clean
No greenhouse emission, mitigates global warming
- ✓ Resilience to extreme weather
Unaffected by typhoons, floods, complements renewable sources wind and solar
- ✓ Safe
New technologies lower risks and implement lessons learned
- ✓ Will enhance industries & energy security
Lower electricity costs, lesser imports
- ✓ Strong International support
IAEA and best experiences from many nuclear countries





Top Philippine Scientists Support Nuclear Power as Part of Energy Mix

NAST STATEMENT ON NUCLEAR POWER
IN THE PHILIPPINES



Bataan Nuclear Power Plant

- Built at cost of US\$ 2.3 billion
- Corruption by Marcos government AND Westinghouse Corporation
- Completed but closed nearly 35 years ago, mainly due to "safety reasons"--not 1 watt produced
- 3 exact operating models for more than 30 years – Korea, Slovenia and Brazil



Situated close to (or on) a “dormant” volcano and a fault—the recurring reason given why the plant was mothballed



NPPs Similar to Bataan NPP



Kori 1 Nuclear Power Plant, South Korea



Angra 1 & 2 Nuclear Power Plants, Brazil



Krško Nuclear Power Plant, Slovenia
(formerly Yugoslavia)

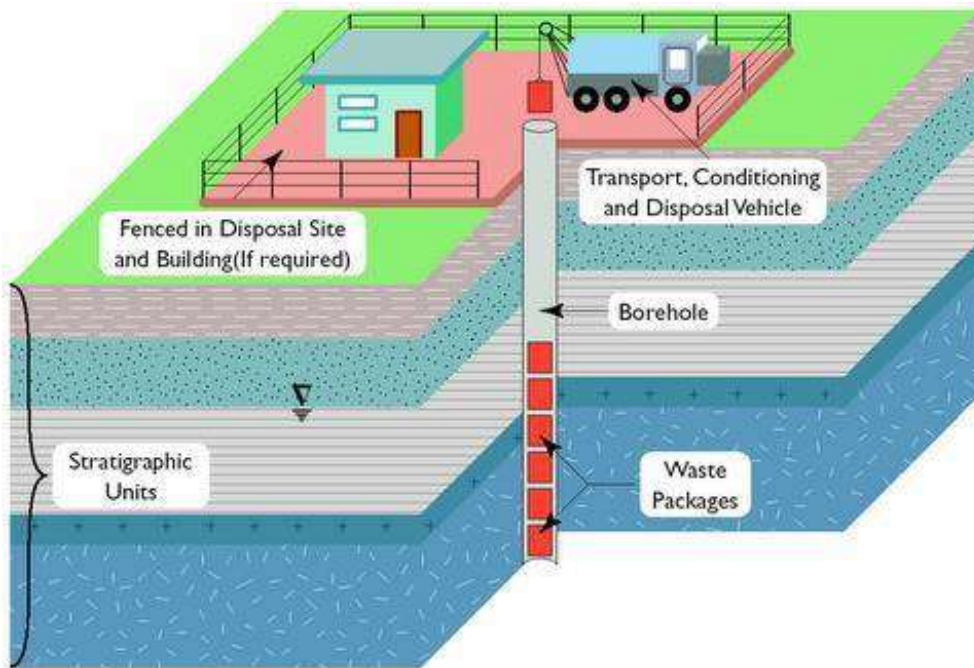
- Just like the Bataan NPP, the 3 NPP's are 600 MW(e) reactors built by **Westinghouse**.
- No grave problems have been encountered in their operation.



Waste Management

Borehole technologies

- PHL has technology to drill >2km deep boreholes (from geothermal industry)
- Place waste inside boreholes and plug with bentonite, which will prevent nuclides from reaching surface and groundwater
- Select an isolated island as borehole site which can adequately store ALL future waste SAFELY.



Nuclear waste: Achilles heel of nuclear has technological solution for PHL – deep boreholes



Deep borehole disposal in an isolated island



BATAAN NUCLEAR POWER PLANT: Building, Reviving, or both?

- New build for 1100 MW **\$6-9 billion**
- Revival of Bataan Nuclear Power Plant (BNPP)
~ **\$ 1 billion** – South Korea interested
- Requires 500-1000 workers during operation
(more during refueling)
- Nuclear operators and engineers could be trained in South Korea, USA, Brazil, Slovenia
- Fuel available from Canada, USA, Russia, Australia, Kazakhstan, etc.



SMALL MODULAR REACTORS

Ideal for isolated PHL islands not connected to grid



- Ongoing pre-feasibility with South Korea (almost completed) and Russia
- USA's NuScale (approved design by United States Nuclear Regulatory Commission (USNRC) awaiting construction) –meltdown proof
- China's high-temperature gas-cooled reactor (HTGR), South Korea, France, Brazil have SMR designs but none built
- Modular construction could increase output with demand but as yet **no estimates for costs**



Challenges

- Strong lobbies from **coal** and other energy players (e.g., LNG importers)
- Stakeholder concerns in locating new nuclear power plants
- Strong and decisive political will amidst high initial capital cost and construction timelines (national guarantees for liability)
- Mitigating regulatory and legislative challenges
- Rapid expansion of nuclear human resource base
- Possible BNPP re-opening versus new builds, SMR



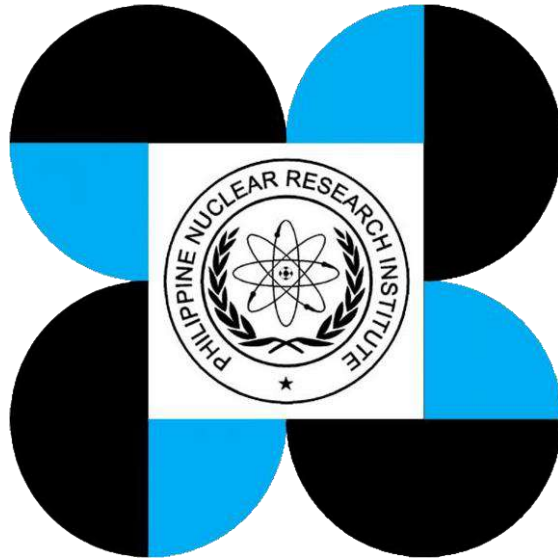
Way Forward

- **President's Executive Order on the adoption of National Position for Nuclear Energy Program**

President Duterte has strong political influence: his decision will have backing of 79% Filipinos * (SWVS Survey, 2019)

- **Certification, as urgent, of bills creating an independent Philippine Atomic Regulatory Commission**
- **Crafting of bills to provide legislative and financial framework of nuclear program and impact on existing laws (e.g. EPIRA)**
- **Consideration and Pre-feasibility of Small Modular Reactors**





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Thank You...

