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Ministry of Climate Change,  
Environment and Energy

# Training on Energy Statistics and Energy Balance

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**CBIT Maldives**

Capacity Building for Improved Transparency of Climate  
Change Mitigation and Adaptation Actions in the Maldives



# Fundamentals of Energy Statistics

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# Energy and Economy

- Energy is an amplifier of economic output
  - It replaces labour
  - Grant access to resources otherwise inaccessible
  - Convert natural resources to usable goods and services
  - Add value
- No energy = No economy
  - Relevant to the present day civilisation
- Economic development = Supply of cheap, reliable energy in an environmentally sustainable manner
- Hence the term 'energy - economy nexus'

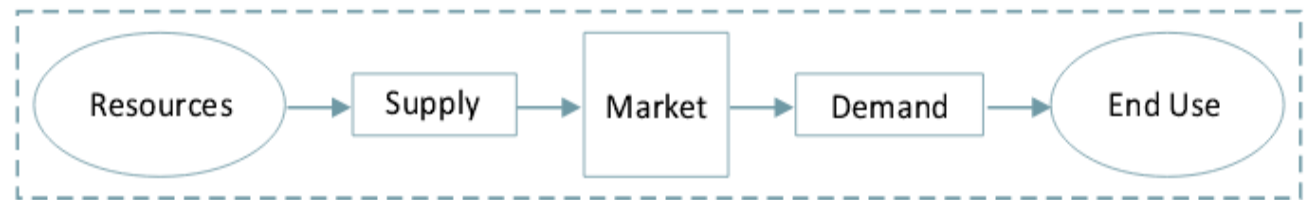
# A View From Afar...

- A national economy has a heavy dependence on energy
- It must be properly seen and understood
  - Where is it coming from?
  - Where did it went?
  - Most importantly, what did it do..? After going 'in to' the economy.??
- A picture of the energy-economy interplay (a snapshot)
  - It is also a movie (several snapshots in a sequence)
- A national energy balance provides all these and more
  - We have dubbed it the Maldivian Energy Balance (MEB)

# Importance of energy security

A well functioning economy has a secure energy system. To ensure energy security of a country, it is essential to:

- Develop and maintain energy infrastructure (from resource to market)
- Manage price volatility
- Attract investments (timely investments)
- Foster innovation and efficiency
- Build resilience into energy infrastructure
- Ensure environmental sustainability



# Importance of Energy Statistics

A functional energy system which ensures energy security of a country has a well laid Energy Information Management System (EIMS). Main functions of a such EIMS are:

- Monitor and manage energy resources and various aspects of energy supply and use
- Assure that policy decisions are informed by reliable and appropriate data
- Develop systems to produce quality and consistent energy information
- Ensure cross country compatibility and consistency of energy information
  - Note: **EI** – Energy Information, **EIA** – Energy Information Administration, **EIM** – Energy Information Management,  
**EIMS** – Energy Information Management System
  - These terms must be kept in mind



# Energy system of a country

The energy system in any country can be represented by:

- Energy resources
- Energy Supply including conversion/transport-transmission and distribution
- Energy Markets
- End Uses

# Energy flows

This energy flow diagram explains that, owing to various end uses of energy, a demand exists in the market, which is fulfilled by the energy supply using the available resources.



This follows the basic demand supply economic model valid for any scarce resource.



# Energy Resources

## Indigenous Resources

- Biomass
- Solar
- Wind..?

## Global Resources

- Crude Petroleum Liquids
- Coal
- Natural Gas
- Nuclear Energy

## Energy Supply

- Biomass
- Finished Petroleum Products
- Coal
- Electricity

# Primary Energy Supply

- Primary energy (PE) is an energy form found in nature that has not been subjected to any conversion or transformation process.
- It is energy contained in raw fuels, and other forms of energy received as input to a system.
- Primary energy can be non-renewable or renewable.
- Total Primary Energy Supply (TPES) is an important number which communicate the size of an energy system of a country
  - Hence the size of the economy too

# A Typical Primary Energy Supply Table

Source (ktoe)	2005	2010	2012	2013	2014	2015
Biomass	4,668.3	4,954.0	4,861.7	4,814.3	4,911.2	4,830.5
Petroleum	4,289.7	4,420.5	5,219.6	4,102.5	4,556.8	4,840.0
Coal	64.9	59.9	455.9	479.7	920.7	1,239.0
Major hydro	773.4	1,197.2	654.4	1,442.4	875.9	1,177.1
New Renewable Energy	71.0	179.7	180.6	286.7	301.2	365.9
<b>Total</b>	<b>9,867.3</b>	<b>10,811.4</b>	<b>11,372.2</b>	<b>11,125.7</b>	<b>11,565.8</b>	<b>12,452.4</b>
Share (%)						
Biomass	47.3	45.8	42.8	43.3	42.5	39
Petroleum	43.5	40.9	45.9	36.9	39.4	39
Coal	0.7	0.6	4.0	4.3	8.0	10
Major hydro	7.8	11.1	5.8	13.0	7.6	9
New Renewable Energy	0.7	1.7	1.6	2.6	2.6	3

# Secondary Energy

- Secondary energy refers to the more convenient forms of energy which are transformed from other, primary energy sources through energy conversion processes.
- Sometimes referred to as energy vectors or energy carriers (but these terms have a deeper meaning)
- The most common energy carrier is electricity
- Petroleum products (including LNG) dominate the secondary energy supply in the world, but very soon it will be overshadowed by electricity
- Hydrogen is seen as a probable new secondary energy form

# A Typical Secondary Energy Table

Source (ktoe)	2005	2010	2012	2013	2014	2015
Biomass	4,584.12	4,932.65	4,847.15	4,797.02	4,884.03	4,792.88
Petroleum	2,786.31	3,008.46	3,320.28	3,148.21	3,246.69	4,092.94
Coal	64.92	59.93	62.24	52.79	61.59	54.54
Electricity	623.74	791.93	895.04	907.68	944.12	1,009.72
<b>Total</b>	<b>8,059.1</b>	<b>8,793.0</b>	<b>9,124.7</b>	<b>8,905.7</b>	<b>9,136.4</b>	<b>9,950.1</b>
Share (%)						
Biomass	56.88	56.10	53.12	53.86	53.46	48.17
Petroleum	34.57	34.21	36.39	35.35	35.54	41.13
Coal	0.81	0.68	0.68	0.59	0.67	0.55
Electricity	7.74	9.01	9.81	10.19	10.33	10.15

# Energy Markets and End Uses

- Energy market is where the supplies and demands meet and transactions happen.
- Markets are complex phenomena which can have a global, regional or national and even sub-national character.
- The true consumer of a product or service.

Four main end use sectors

1. Industry
2. Transport
3. Other (including residential, commercial and many more things)
4. Non-energy uses (mostly solvents and feedstock for industries)

# The Need for an Energy Balance

Energy Balances offer a large portfolio of services to a country, especially to its planners. Some key needs met by an energy balance are as follows:

- Provide essential information for analysis and energy policy purposes,
- Base data for the construction of various energy indicators (e.g. consumption per capita)
- A basis for monitoring energy efficiency
- Monitor progress of energy policy targets (e.g. increasing the share of RE, reducing the growth of energy use and reducing dependency on energy imports)
- Growth or decline trends of energy demand and supply
- Linking with GDP to see the ultimate energy productivity index; Energy Intensity of Economy
- Flag energy security concerns (e.g. whether the country is heavily dependent on one resource)
- A dashboard for economic output of the country (when sector level data is available)
- Hinting on other structures of the economy (e.g. vehicle fleet and housing available, even hotel guest nights on offer)
- Maintaining greenhouse gas inventories
- To keep track of physical flow of energy products



# Nature of an Energy Balance

- It is a neat way to depict the energy-economy interplay
- Constituted by some basic energy ingredients
  - Energy supply
  - Energy demand
  - Energy waste
- Also some economic ingredients
  - Demography of the economy
  - Economic profile of the country
  - Energy input to economy (interaction between energy and economy)
  - Market prices of energy products and services

# Firstly, the Energy Ingredients of the EB...

# Type of Energy Data

- All types of energy sources

- Coal, crude oil, finished petroleum products, renewable energy, LP gas, fuel wood, wood waste, residues...
  - How much came ? From where ? During which period ? Stock position ?

- Types of transformation going on

- Crude oil to oil products and gas products
  - How much fuel went in ? How much electricity generated ?
- Coal or oil to electricity generation
  - How many tonnes of coal went in ? How much electricity generated ?

# Types of Energy Data...

- Who is using the energy supplied ?
  - Industrial concerns ? Transport system ? Buildings ?
  - Any fuel being used as a feedstock (non-energy use) ?
  - What amount of energy is wasted and lost ?
- Snapshot is the key word here
  - A careful and methodical noting down of transacted volumes of energy commodities at each transaction point
  - Within a pre-set period (usually a calendar year)

# EB is a Complex Matrix

- A matrix of many rows and many columns for a complex industrialised, and integrated country
- Columns represent groups of energy products that are available for use in the national territory
- Rows represent energy flows – from resources to final use
- Rows and columns should contain homogeneous information – a single unit of measurement.
  - Most countries manage with Joules and kWh

# Overview of energy supply and demand data

	Energy Resources	
Primary Energy	?	?
Conversions		
Energy Users	?	?

# Overview of energy supply and demand data

Nature of energy supply data is very different to the nature of energy demand data. Planners always view the supply side as the 'easy' part and the demand side the 'trouble'.

## Energy Supply Data

- All energy supply records e.g. how much fuel went to power generation facilities and how much electricity came out, how much petroleum was imported and what is left in the tanks ?.
- Units of measure and relevant aberrations are well understood and quantified.
- Most follow common templates, easy to harmonise for a national requirement.
- Commercial transactions well documented and reverse calculated to get energy data.

## Energy Demand Data

- Different users use different approaches to note down energy use (some does not have any)
- No one really knows what happens to the energy commodities purchased by a user
- Uncountable number of methods and varieties of data types
- No proper track record of final use



# The Complex Matrix

Singapore 2012 (ktoe)	Coal	Peat	Oilshale and Oil Sands	Crude Oil	Oil Products	Natural Gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels & Waste	Electricity	Heat	Heat Output from non-specified comb fuels	Total
Production	-	-	-	-	-	-	-	-	-	1.12	602.21	-	-	-	603.32
Imports	7.41	-	-	49,780.68	97,249.69	7,325.98	-	-	-	-	-	-	-	-	154,363.77
Exports	-	-	-	-300.90	-83,326.50	-	-	-	-	-	-	-	-	-	-83,627.40
International marine bunkers	-	-	-	-	-41,092.26	-	-	-	-	-	-	-	-	-	-41,092.26
International aviation bunkers	-	-	-	-	-6,849.58	-	-	-	-	-	-	-	-	-	-6,849.58
Stock changes	-	-	-	-	1,655.62	-	-	-	-	-	-	-	-	-	1,655.62
<b>Total primary energy supply</b>	<b>7.41</b>	<b>-</b>	<b>-</b>	<b>49,479.78</b>	<b>-32,363.03</b>	<b>7,325.98</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1.12</b>	<b>602.21</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>25,053.47</b>
Transfers	-	-	-	6,844.20	-6,844.25	-	-	-	-	-	-	-	-	-	-0.05
Statistical differences	-	-	-	-0.00	-782.46	548.40	-	-	-	-	-	-	-	-	-234.06
Main activity producer electricity plants	-	-	-	-	-1,278.28	-6,397.53	-	-	-	-1.12	-602.21	3,887.11	-	-	-4,392.02
Autoproducer electricity plants	-	-	-	-	-341.38	-337.22	-	-	-	-	-	147.66	-	-	-530.93
Main activity producer CHP plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Autoproducer CHP plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Main activity producer heat plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Autoproducer heat plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat pumps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electric boilers	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical heat for electricity production	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Gas works	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oil refineries	-	-	-	-56,323.98	54,761.94	-	-	-	-	-	-	-	-	-	-1,562.03
Coal transformation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liquefaction plants	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-specified (transformation)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy industry own use	-	-	-	-	-2,089.67	-9.99	-	-	-	-	-	-161.42	-	-	-2,261.08
Losses	-	-	-	-	-	-	-	-	-	-	-	-64.76	-	-	-64.76
<b>Final consumption</b>	<b>7.41</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>11,062.88</b>	<b>1,129.64</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3,808.60</b>	<b>-</b>	<b>-</b>	<b>16,008.53</b>
<b>Industry</b>	<b>7.41</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2,669.92</b>	<b>978.57</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,513.17</b>	<b>-</b>	<b>-</b>	<b>5,169.06</b>
Iron and steel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

# More Properties of an EB

- Compiled with respect to a clearly defined reference period (ideally a calendar year)
- A separate row is reserved for statistical difference, calculated as the numerical difference between the total supply of a fuel, electricity or heat and the total use of it
- Supply of primary and secondary energy as well as external trade in energy products, stock changes, final energy consumption and non-energy use should be clearly separated to better reflect the structure and relationships between energy flows and to avoid double-counting.

# Top Block – Energy Input to the Country

Supply-Use \ Resources		Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non-specified combustible fuels	Total
1	Indegeneous Supply															
2	Imports															
3	Exports															
4	Bunkers															
5	Stock Change															
6	<b>Total Primary Energy Supply (TPES)</b>															

# Total Primary Energy Supply (TPES)

- It is the most important indicator of the size of the energy industry of a country
  - Involves crude oil, finished oil products, natural gas, hydropower, coal, biomass, nuclear power and renewable energy in a developed country
  - Limited to finished oil products (including LP gas) and solar electricity in the Maldives
- In closely connected countries, cross border electricity and pipeline systems add severe complexities to energy balances
  - Involves concepts of 'net' imports after deducting exports.

# Energy Resources

- In the case of fossil fuel deposits found in the country under consideration, various other aspects come into play
  - Proven resources + exploration activities
  - Annual production volumes by mine / well
  - Losses, torches and flares
  - Crude supplied to local refineries vs. crude exported
  - Monitoring of stock levels

# Middle Block - Transformations

Supply-Use \ Resources		Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non-specified combustible fuels	Total
7	Transfers															
8	Statistical differences															
9	Electricity plants															
10	Captive Electricity plants															
11	CHP plants															
12	Captive CHP plants															
13	Heat plants															
14	Captive Heat plants															
15	Heat pumps															
16	Electric boilers															
17	Chemical heat for electricity generation															
18	Gas works															
19	Oil refineries															
20	Coal transformation															
21	Liquefaction plants															
22	Non-specified (transformation)															
23	Energy industry own use															
24	Losses															
25	<b>Final consumption</b>															

# Transformations

- Deals with energy conversion along the value chain
- Needs a considerable effort to report the operations of:
  - Power plants
  - Refineries
  - Gas processing plants
- Maldives case involve only the power plants
  - Type, installed capacity, available capacity, vintage
  - Annual generation vs. station use
  - Transmission losses



# Bottom Block – Energy Demand from Sectors

Supply-Use \ Resources		Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non-specified combustible fuels	Total
26	<b>Industry</b>															
27	Iron and steel															
28	Chemical and petrochemical															
29	Non-ferrous metals															
30	Non-metallic minerals															
31	Transport equipment															
32	Machinery															
33	Mining and quarrying															
34	Food, beverages and tobacco															
35	Paper, pulp and print															
36	Wood and wood products															
37	Construction															
38	Textiles and leather															
39	Non-specified (Industry)															



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# Bottom Block – Energy Demand from Sectors

Supply-Use \ Resources		Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non-specified combustible fuels	Total
40	<b>Transport</b>															
41	Road															
42	Domestic aviation															
43	Rail															
44	Pipeline transport															
45	Domestic navigation															
46	Non-specified (transport)															
47	<b>Other</b>															
48	Residential															
49	Commercial and public services															
50	Agriculture/forestry															
51	Fishing															
52	Non-specified (other)															
53	<b>Non-energy use</b>															
54	Non-energy use industry/transformation/energy															
55	Non-energy use in transport															
56	Non-energy use in other															
57	Memo: Non-energy use chemical/petrochemical															



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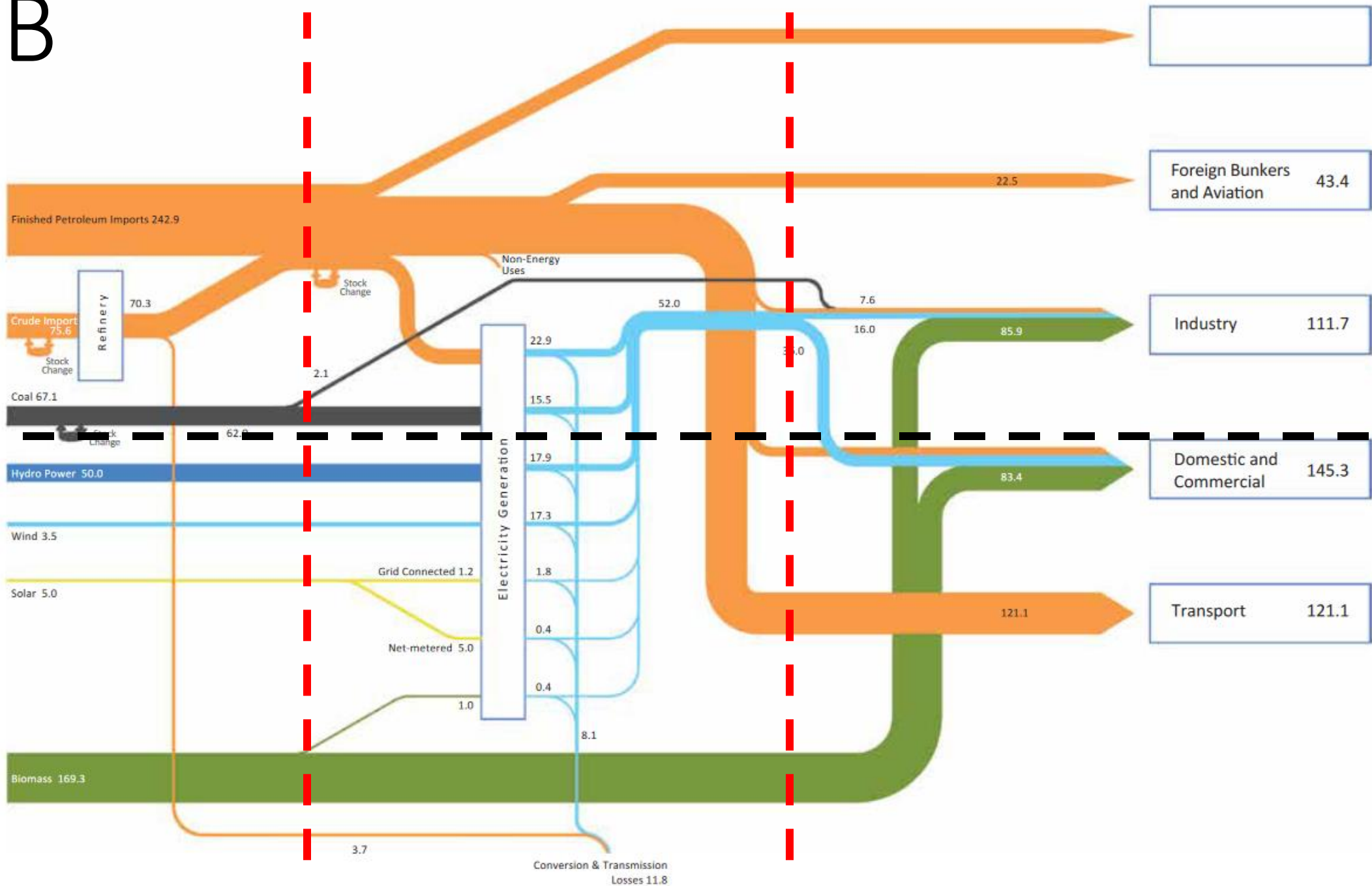
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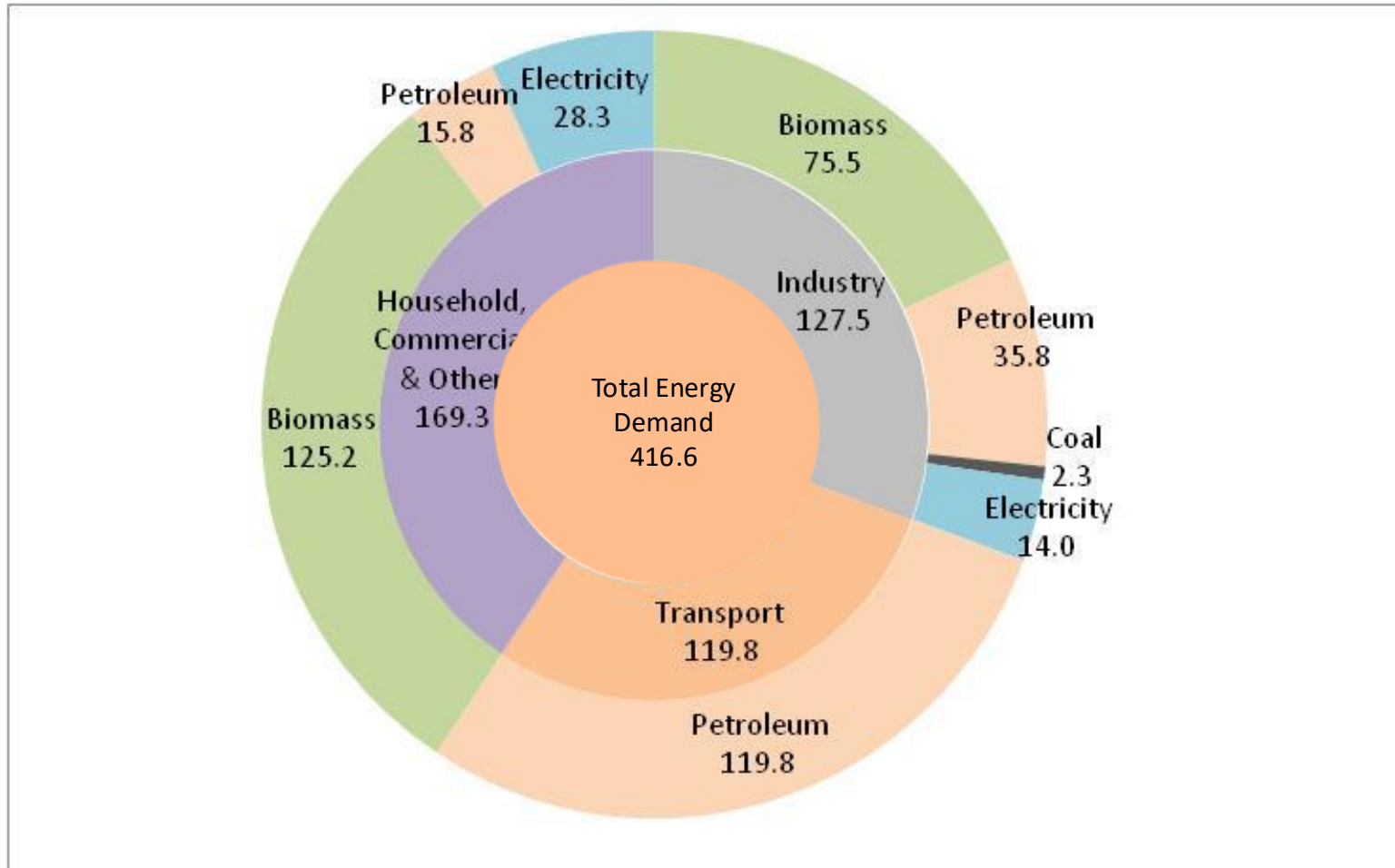
# Additional Rows

Supply-Use \ Resources		Coal	Peat	Oil shale and oil sands	Crude oil	Oil products	Natural gas	Nuclear	Hydro	Geothermal	Solar, Wind, Others	Biofuels and waste	Electricity	Heat	Heat output from non-specified combustible fuels	Total
58	<b>Electricity output in GWh</b>															
59	Electricity Generation from Electricity plants															
60	Electricity Generation from Captive Electricity plants															
61	Electricity Generation from CHP plants															
62	Electricity Generation from Captive CHP plants															
63	<b>Heat output in TJ</b>															
64	Heat Supplied from CHP plants															
65	Heat Supplied from Captive CHP plants															
66	Heat Supplied from Heat plants															
67	Heat Supplied from Captive Heat plants															
68	<b>Plant Efficiencies</b>															
69	Electricity plants															
70	Captive Electricity plants															
71	CHP plants															
72	Captive CHP plants															
73	Heat plants															
74	Captive Heat plants															

# SLEB



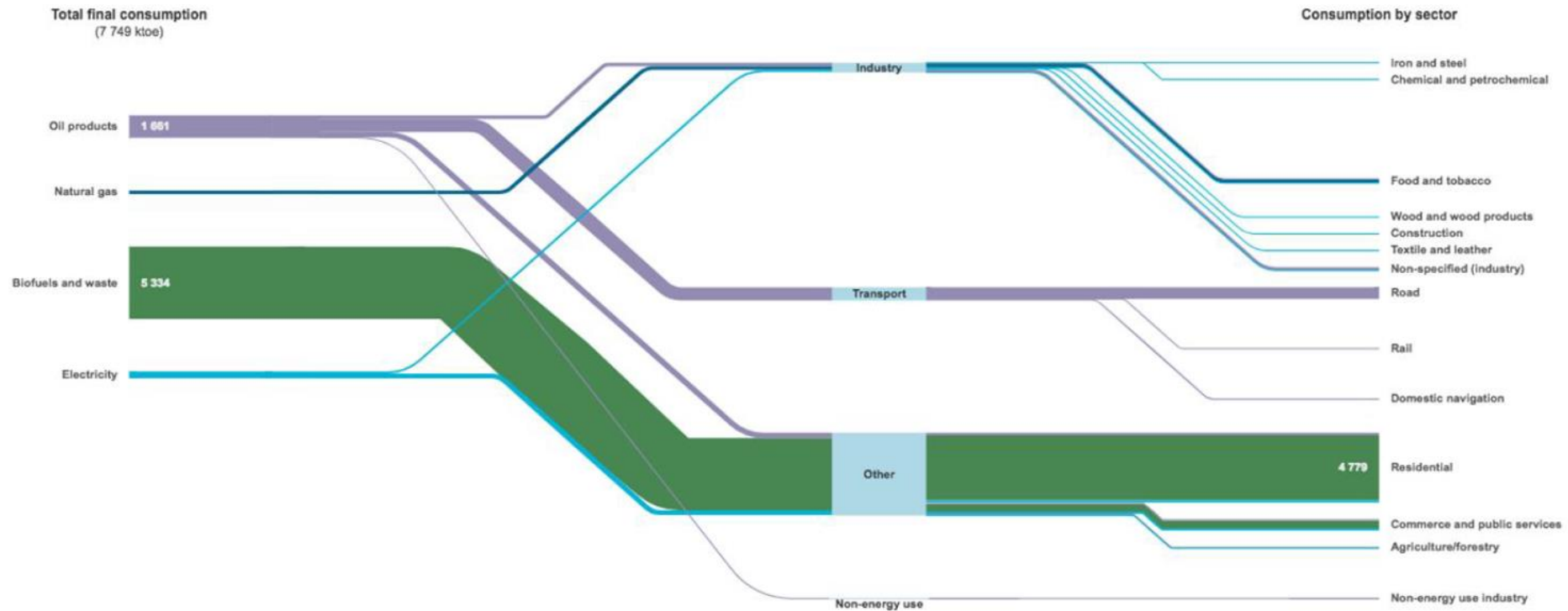
# Energy Supply & Demand Profile



# Consideration of the National Context

- Maldives, like many other countries in the region have simple economic profiles and simple energy systems
  - Operate in isolation from other countries
  - Relatively limited number of energy products in use
- Other complications could exist
  - Non-availability of an interconnected 'national' grid
  - Many loading / unloading points
  - Existence of a large informal sectors (both energy and economic)

# A Similar Economy from Africa



Source: International Energy Agency (IEA) from Energy Balance Flows © OECD/IEA [online]. [Accessed on September 10, 2017]. Available from: <http://www.iea.org/Sanke>

# A Simpler Matrix

Supply-Use \ Resources		Oil products	Solar, Wind, Others	Biofuels and waste	Electricity	Total
1	Indegeneous Supply					
2	Imports					
3	Exports					
4	Bunkers					
5	Stock Change					
6	<b>Total Primary Energy Supply (TPES)</b>					
7	Transfers					
8	Statistical differences					
9	Electricity plants					
10	Captive Electricity plants					
22	Non-specified (transformation)					
23	Energy industry own use					
24	Losses					
25	<b>Final consumption</b>					
26	<b>Industry</b>					
34	Food, beverages and tobacco					
37	Construction					
38	Textiles and leather					
39	Non-specified (Industry)					

Supply-Use \ Resources		Oil products	Solar, Wind, Others	Biofuels and waste	Electricity	Total
40	<b>Transport</b>					
41	Road					
42	Domestic aviation					
45	Domestic navigation					
46	Non-specified (transport)					
47	<b>Other</b>					
48	Residential					
49	Commercial and public services					
50	Agriculture/forestry					
51	Fishing					
52	Non-specified (other)					
53	<b>Non-energy use</b>					
54	Non-energy use industry/transformation/energy					
55	Non-energy use in transport					
56	Non-energy use in other					
57	Memo: Non-energy use chemical/petrochemical					
58	<b>Electricity output in GWh</b>					
59	Electricity Generation from Electricity plants					
60	Electricity Generation from Captive Electricity plants					
68	<b>Plant Efficiencies</b>					
69	Electricity plants					
70	Captive Electricity plants					



# Secondly, the Economic Ingredients of the EB...

# Demography and Characteristics

- Population and number of dwellings in relevant administrative units (smaller the unit, better it is)
- Mean temperatures (minimum and maximum in a given period – daily / weekly / monthly)
- Work patterns (open / close days), seasonal aspects such as crop cycles

# Economic profile of the country

- Major constituents of the GDP at market prices and factor cost prices must be known (a long term data set will be invaluable)
- Economic output from different sectors
  - Fisheries and tourism to be in focus
  - Ideally the sectors recognised in the smallest disaggregation

# Classifying an Entire Economy

- Main ISIC table with two-digit categorisation

Section	Divisions	Description
A	01-03	Agriculture, forestry and fishing
B	05-09	Mining and quarrying
C	10-33	Manufacturing
D	35	Electricity, gas, steam and air-conditioning supply
E	36-39	Water supply; sewage, waste management and remediation activities
F	41-43	Construction
G	45-47	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	49-53	Transportation and storage
I	55-56	Accommodation and food service activities
J	58-63	Information and communication
K	64-66	Financial and insurance activities
L	68	Real estate activities
M	69-75	Professional, scientific and technical services
N	77-82	Administrative and support service activities
O	84	Public administration and defence; compulsory social security
P	85	Education
Q	86-88	Human health and social work activities
R	90-93	Arts, entertainment and recreation
S	94-96	Other service activities
T	97-98	Activities of households as employers; undifferentiated goods and services producing activities of households for own use
U	99	Activities of extranational organisations and bodies

# Energy Input to the Economy

- Interaction between energy and economy, a fine depiction of how energy efficient a country is...
  - Energy intensity of economy (e.g. Joules which went into produce a million USD)
- Per capita use of energy
  - kgOE per capita in a given year
  - kWh per capita in a given year

# Market prices of energy products and services

- Carefully maintained records of energy prices during the period of interest
  - Every price revision of every fuel, electricity and energy supply must be recorded
  - Average price for the period of interest calculated on weighted basis
- It will be fruitful to record the international price movements too
  - A clear indication of taxation on energy and efficiency of the energy sector utilities can be elicited
  - Not forgetting the subsidies on energy commodities

# Understanding Energy Flows and Balances

Energy system of a country involves two main sets of players i.e. energy industry (or supply side) and end users (demand side). Although connected through a marketplace, these two groups are very unique in their attributes.

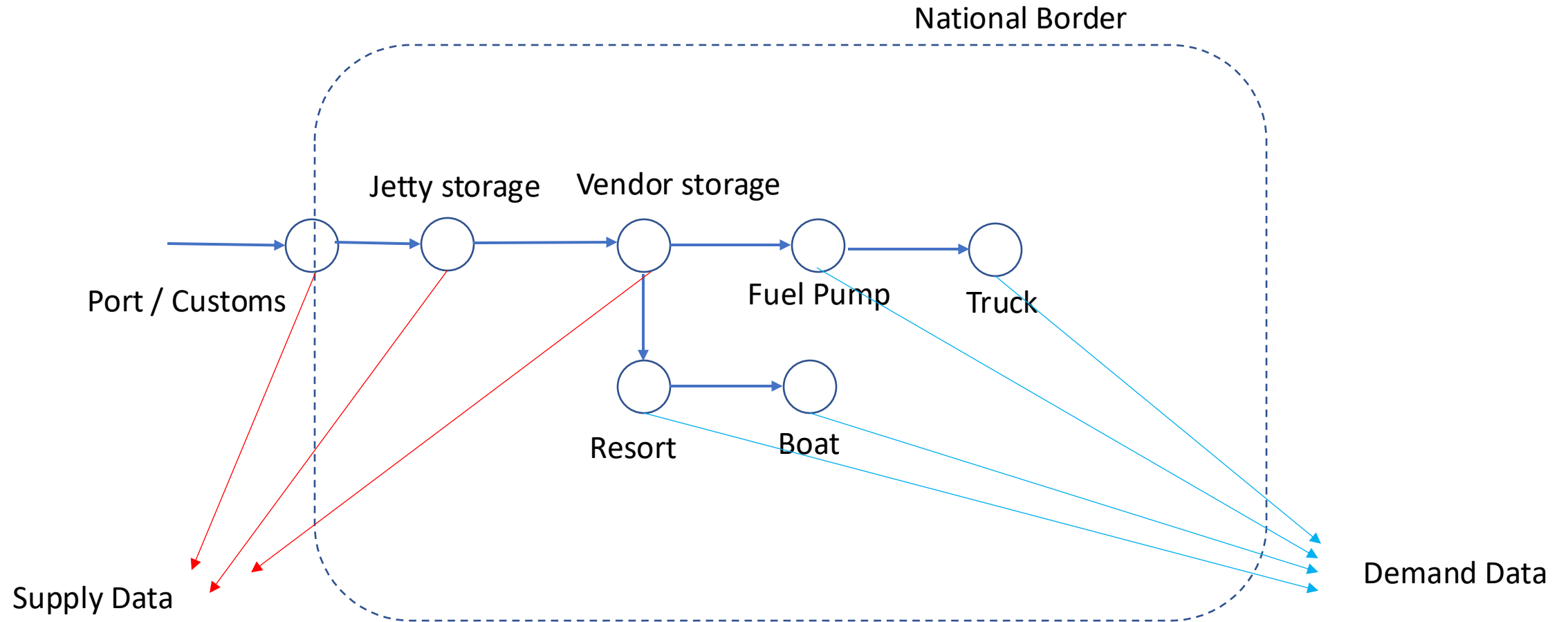
## Energy Industry (Supply Side)

- Includes power generation facilities, petroleum importers and storage facilities, informal sector.
- Knows the energy industry nomenclature quite deeply (deals with tonnes and GWh)
- Relatively lesser in number
- Commodity accounts, stock positions and releases are very well documented

## End Users (Demand Side)

- Four main categories (i.e. Industry, Transport, Non-energy uses and Other)
- Commercial transactions define energy uses (e.g. litres, kWh and LPG cylinders)
- Large number of users in any given sub sector
- Data are often aggregated and very difficult to untangle

# Sources of Energy Data





# Probable Sources of Data

- Ministry of Climate Change, Environment and Energy
- Maldives Utility Regulatory Authority
- Maldives Bureau of Statistics
- Ministry of Tourism
- Ministry of Finance
- Maldives Monetary Authority
- Waste Management Corporation
- Ministry of Transport and Civil Aviation
- STELCO
- FENAKA
- Ministry of Fisheries and Ocean Resources
- Maldives Transport and Contracting Company
- State Trading Organisation
- Oil Importers and Gas Importers
- Renewable Energy Equipment Vendors
- Maldives Ports Limited
- Maldives Customs Services
- Maldives Airport Company Limited
- Maldives Industrial Fisheries Company
- Domestic Airlines

# What type of data to be collected ?

- Electricity data
  - STELCO
  - FENAKA
  - Independent Power Producers
    - Generation
    - Use
    - Information about power plants
    - Information of small power producers
    - Fuel consumption in power plants
- Petroleum data
  - State Trading Organisation
  - Other Oil Companies
    - Imports
    - Exports
    - Uses
    - Pricing information
- Biomass data
  - Informal sector
  - Assumptions
    - Domestic / commercial
    - Industrial

There are many issues and challenges in securing good energy data. Some are affecting all countries, and some are specific to the Maldives. Some examples of these issues are:

- Energy industry is scattered and operates in isolation due to the geographic context of the country.
- Record keeping and data reporting is not yet practiced on a mandatory basis. Energy industry is not scheduled as yet.
- Incomplete (from an energy perspective) sources of administrative data, including the business register.
- Unreported facilities and events (e.g. Large captive power plants in industries and solar rooftop systems)
- Importation of energy commodities declared as some other good.
- Non-availability of actual vehicle fleet in operation.
- Non-energy uses reported as energy uses.
- Inconsistent reporting formats and frequencies.
- Unintended aggregation of different data streams.

# Thank You..!