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Renewable data collection in APEC

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APERC
Asia Pacific Energy Research Centre

APEC
Asia-Pacific Economic Cooperation

Outline

- Background
- Renewable questionnaire
  - Data analysis
  - Data processing
- Challenges
- Way forward

Background (1)

History

In 1992, EGEDA conducted the first trial data collection for 1990 annual data.

- Biomass energy for power generation was collected (termed commercial biomass).
- Biomass consumed in the residential sector (termed non-commercial biomass) was also collected but just as supplemental information.
- Table for non-commercial biomass was not even a part of the main data collection table.
- Most economies did not report non-commercial biomass

Revision in 2005, to include non-commercial biomass

Revision in 2016, to accommodate new renewable products and technologies and include district cooling

Revision in 2018, to reclassify hydro from "by size" to "by type"

Background (2)

Why revise?

To disaggregate products with the purpose of capturing more accurate and detailed information

To harmonise with other international organisations such as IRENA, IEA and UNSD

To accommodate new and renewable products and technologies

APEC renewable questionnaire: Supply

Table 1

APEC-ASEAN joint format for annual new and renewable energy data

Supply (Table 1)

		Fuelwood & woodwaste				Bagasse	Rice husks	Straw	Charcoal[2]	Other vegetal and agricultural waste	Other primary solid biomass	Biogas					Industrial waste			Municipal solid waste			Black liquor	Liquid Biofuels					Hydro					Geothermal		Solar			Tide, wave & ocean	Wind		
		Total	Wood and straw pellets / briquettes	Fuelwood	Woodwaste							Total	Landfill gas	Sewage sludge gas	Other biogases from anaerobic fermentation	Biogases from thermal processes	Total	Renewable	Non-renewable	Total	Renewable	Non-renewable		Total	Biogasoline	Biodiesels	Bio-jet kerosene	Other liquid biofuels	Total	- 1MW	1-10 MW	10+ MW	Pumped-hydro	Electricity	Heat	Photovoltaic	Thermal	Heat		Total	On-shore	Off-shore
		select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	GWh	GWh	GWh	GWh	GWh	GWh	select unit	GWh	GWh	select unit	GWh	GWh	GWh	GWh
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Q	R	S	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
Production[1]	(+) 1	0										0					0			0				0					0											0		
Imports	(+) 2	0										0					0			0				0																		
Exports	(-) 3	0										0					0			0				0																		
Stock change (opening-closing)	(+) 4	0										0					0			0				0																		
Gross inland deliveries (calculated)	(=) 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Statistical difference	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gross inland deliveries (observed)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL STOCKS on NATIONAL TERRITORY																																									
Total stocks on national territory - opening	8																																								
Total stocks on national territory - closing	9																																								

Notes:

1. This includes production of both primary and secondary energy. However, only quantities used for energy purposes should be reported. For example, only the amount of bagasse that are used as fuel should be reported and not all the amount of bagasse pr

2. Charcoal covers solid residue of the destructive distillation and pyrolysis of wood and other vegetal material.

Questionnaire for trade (import and export) is also provided; since 2002 biofuels exports reported (CDA; HKC; INA; MAS; PE; and USA).

Detailed energy balances, including renewables, are reported at: https://www.egeda.ewg.apec.org

APEC renewable questionnaire: Transformation

Table 2

APEC-ASEAN joint format for annual new and renewable energy data P.2

Transformation and energy sector use (Table 2)[1]

		Fuelwood & woodwaste				Bagasse	Rice husks	Straw	Charcoal[2]	Other vegetal and agricultural waste	Other primary solid biomass	Biogas					Industrial waste			Municipal solid waste			Black liquor	Liquid Biofuels					Hydro					Geothermal		Solar			Tide, wave & ocean	Wind		
		Total	Wood and straw pellets / briquettes	Fuelwood	Woodwaste							Total	Landfill gas	Sewage sludge gas	Other biogases from anaerobic fermentation	Biogases from thermal processes	Total	Renewable	Non-renewable	Total	Renewable	Non-renewable		Total	Biogasoline	Biodiesels	Bio-jet kerosene	Other liquid biofuels	Total	- 1MW	1-10 MW	10+ MW	Pumped-hydro	Electricity	Heat	Photovoltaic	Thermal	Heat		Total	On-shore	Off-shore
		select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	GWh	GWh	GWh	GWh	GWh	GWh	select unit	GWh	GWh	select unit	GWh	GWh	GWh	GWh
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Q	R	S	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
TOTAL TRANSFORMATION SECTOR	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Main Activity Producers	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Plants	4	0										0					0			0				0					0					0					0			
CHP Plants	5	0										0					0			0				0					0					0					0			
Heat Plants	6	0										0					0			0				0					0					0					0			
District Cooling Plants	7	0										0					0			0				0					0					0					0			
Autoproducers	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity Plants	9	0										0					0			0				0					0					0					0			
of Which off-grid	10	0										0					0			0				0					0					0					0			
CHP Plants	11	0										0					0			0				0					0					0					0			
of Which off-grid	12	0										0					0			0				0					0					0					0			
Heat Plants	13	0										0					0			0				0					0					0					0			
of Which off-grid	14	0										0					0			0				0					0					0					0			
District Cooling Plants	15	0										0					0			0				0					0					0					0			
Biofuels Processing[2]	16	0										0					0			0				0					0					0					0			
Charcoal Production	17	0										0					0			0				0					0					0					0			
Not Elsewhere Specified	18	0										0					0			0				0					0					0					0			
TOTAL ENERGY SECTOR	19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electricity, CHP and Heat Plants	19	0										0					0			0				0					0					0					0			
Biofuels Processing	20	0										0					0			0				0					0					0					0			
Not Elsewhere Specified	21	0										0					0			0				0					0					0					0			

Notes:

1. In this table, only inputs to transformation and energy sector use should be included. Transformation outputs like charcoal (except electricity) should be reported in Table 1. All input numbers should be positive.
2. Report here the amount of bio-fuels blended with motor gasoline and diesel.

In 2016 "district cooling plants" were added to capture use of renewable energy in the production of chilled water.

APEC renewable questionnaire: Final consumption

Table 3

APEC-ASEAN joint format for annual new and renewable energy data
Final consumption (Table 3)

P3

		Fuelwood & woodwaste				Bagasse	Rice husks	Straw	Charcoal[1]	Other vegetal and agricultural waste	Other primary solid biomass	Biogas					Industrial waste			Municipal solid waste			Black liquor	Liquid Biofuels					Hydro					Geothermal		Solar			Tide, wave & ocean	Wind		
		Total	Wood and straw pellets / briquettes	Fuelwood	Woodwaste							Total	Landfill gas	Sewage sludge gas	Other biogases from anaerobic fermentation	Biogases from thermal processes	Total	Renewable	Non-renewable	Total	Renewable	Non-renewable		Total	Biogasoline	Biodiesels	Bio-jet kerosene	Other liquid biofuels	Total	- 1MW	1-10 MW	10+ MW	Pumped-hydro	Electricity	Heat	Photovoltaic	Thermal	Heat		Total	On-shore	Off-shore
		select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	GWh	GWh	GWh	GWh	GWh	GWh	select unit	GWh	GWh	select unit	GWh	GWh	GWh	GWh
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Q	R	S	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM
FINAL CONSUMPTION	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						0				0			
TOTAL INDUSTRY SECTOR	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						0				0			
Iron and steel	3	0										0					0			0				0																	
Chemical and petrochemical	4	0										0					0			0				0																	
Non-ferrous metals	5	0										0					0			0				0																	
Non-metallic minerals	6	0										0					0			0				0																	
Transport equipment	7	0										0					0			0				0																	
Machinery	8	0										0					0			0				0																	
Mining and quarrying	9	0										0					0			0				0																	
Food, beverages and tobacco	10	0										0					0			0				0																	
Pulp, paper and print	11	0										0					0			0				0																	
Wood and wood products	12	0										0					0			0				0																	
Construction	13	0										0					0			0				0																	
Textile and leather	14	0										0					0			0				0																	
Not elsewhere specified	15	0										0					0			0				0																	
TOTAL TRANSPORT SECTOR	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						0				0			
Domestic air transport	17	0										0					0			0				0																	
Road	18	0										0					0			0				0																	
Rail	19	0										0					0			0				0																	
Inland waterways	20	0										0					0			0				0																	
Pipeline transport	21	0										0					0			0				0																	
Not elsewhere specified	22	0										0					0			0				0																	
TOTAL OTHER SECTOR	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						0				0			
Commercial and public services	24	0										0					0			0				0																	
Residential	25	0										0					0			0				0																	
Agriculture	26	0										0					0			0				0																	
Fishing	27	0										0					0			0				0																	
Not elsewhere specified	28	0										0					0			0				0																	

In 2015 final consumption cells for liquid biofuels were unlocked to allow the reporting of direct consumption.

APEC renewable questionnaire: Conversion factors

Table 4

APEC-ASEAN joint format for annual new and renewable energy data

Gross calorific values (Table 4a)

		Fuelwood & woodwaste				Bagasse	Rice husks	Straw	Charcoal[2]	Other vegetal and agricultural waste	Other primary solid biomass	Biogas					Industrial waste			Municipal solid waste			Black liquor	Liquid Biofuels				
		Total	Wood and straw pellets / briquettes	Fuelwood	Woodwaste							Total	Landfill gas	Sewage sludge gas	Other biogases from anaerobic fermentation	Biogases from thermal processes	Total	Renewable	Non-renewable	Total	Renewable	Non-renewable		Total	Biogasoline	Biodiesels	Bio-jet kerosene	Other liquid biofuels
		select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Q	R	S	Q	R	S	T	U	V	W	X	Y
Production	1																											
Imports	2																											
Exports	3																											
Average	4																											

Net calorific values (Table 4b)

		Fuelwood & woodwaste				Bagasse	Rice husks	Straw	Charcoal[2]	Other vegetal and agricultural waste	Other primary solid biomass	Biogas					Industrial waste			Municipal solid waste			Black liquor	Liquid Biofuels				
		Total	Wood and straw pellets / briquettes	Fuelwood	Woodwaste							Total	Landfill gas	Sewage sludge gas	Other biogases from anaerobic fermentation	Biogases from thermal processes	Total	Renewable	Non-renewable	Total	Renewable	Non-renewable		Total	Biogasoline	Biodiesels	Bio-jet kerosene	Other liquid biofuels
		select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit	select unit
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	Q	R	S	Q	R	S	T	U	V	W	X	Y
Production	5																											
Imports	6																											
Exports	7																											
Average	8																											

- ***Renewables have separate calorific values for production, imports and exports.***
- ***Calorific values are essential in producing an energy balance; the minimum requirement is the net average value.***

New products collected (1)

until 2014	2015	2016	from 2018
Fuel wood & woodwaste	Fuel wood & woodwaste	Fuel wood & woodwaste	Fuel wood & woodwaste
	Wood and straw pellets/briquettes	Wood and straw pellets/briquettes	Wood and straw pellets/briquettes
	Fuelwood	Fuelwood	Fuelwood
	Woodwaste	Woodwaste	Woodwaste
Bagasse	Bagasse	Bagasse	Bagasse
	Rice husks	Rice husks	Rice husks
	Straw	Straw	Straw
Charcoal	Charcoal	Charcoal	Charcoal
	Other vegetal and agricultural waste	Other vegetal and agricultural waste	Other vegetal and agricultural waste
Other biomass	Other primary solid biomass	Other primary solid biomass	Other primary solid biomass
Biogas	Biogas	Biogas	Biogas
	Landfill gas	Landfill gas	Landfill gas
	Sewage sludge gas	Sewage sludge gas	Sewage sludge gas
	Other biogases from anaerobic fermentation	Other biogases from anaerobic fermentation	Other biogases from anaerobic fermentation
	Biogases from thermal processes	Biogases from thermal processes	Biogases from thermal processes
Industrial waste	Industrial waste	Industrial waste	Industrial waste
		renewable	renewable
		non-renewable	non-renewable
Municipal solid waste	Municipal solid waste	Municipal solid waste	Municipal solid waste
	renewable	renewable	renewable
	non-renewable	non-renewable	non-renewable
	Black liquor	Black liquor	Black liquor

In 2015 fuelwood and waste, bagasse, charcoal, biogas, and municipal solid waste were disaggregated.

New products collected (2)

until 2014	2015	2016	from 2018
Liquid biofuels	**Liquid Biofuels**	**Liquid Biofuels**	**Liquid Biofuels**
Biogasoline	Biogasoline	Biogasoline	Biogasoline
Bioethanol	Biodiesels	Biodiesels	Biodiesels
Bio-jet	Bio-jet kerosene	Bio-jet kerosene	Bio-jet kerosene
biodiesels	**Other liquid biofuels**	**Other liquid biofuels**	**Other liquid biofuels**
Hydro	**Hydro**	**Hydro**	**Hydro**
	- 1MW	**- 1MW**	**Storage Hydro**
	1-10 MW	**1-10 MW**	**Run-of-river hydro**
	10+ MW	**10+ MW**	**Pumped-hydro**
	Pumped-hydro	**Pumped-hydro**	**Mixed (pumped and storage) hydro**
Geothermal	**Geothermal**	**Geothermal**	**Geothermal**
Electricity	Electricity	Electricity	Electricity
Heat	Heat	Heat	Heat
Solar	**Solar**	**Solar**	**Solar**
Photovoltaic	Photovoltaic	Photovoltaic	Photovoltaic
Thermal	Thermal	Thermal	Thermal
	Heat	**Heat**	**Heat**
Tide, wave & ocean	**Tide, wave & ocean**	**Tide, wave & ocean**	**Tide, wave & ocean**
Wind	**Wind**	**Wind**	**Wind**
	On-shore	**On-shore**	**On-shore**
	Off-shore	**Off-shore**	**Off-shore**

In 2015 solar heat was added and wind was separated into on/off-shore; in 2018 hydro was reclassified from size to type.

How are these different from IRENA? (1)

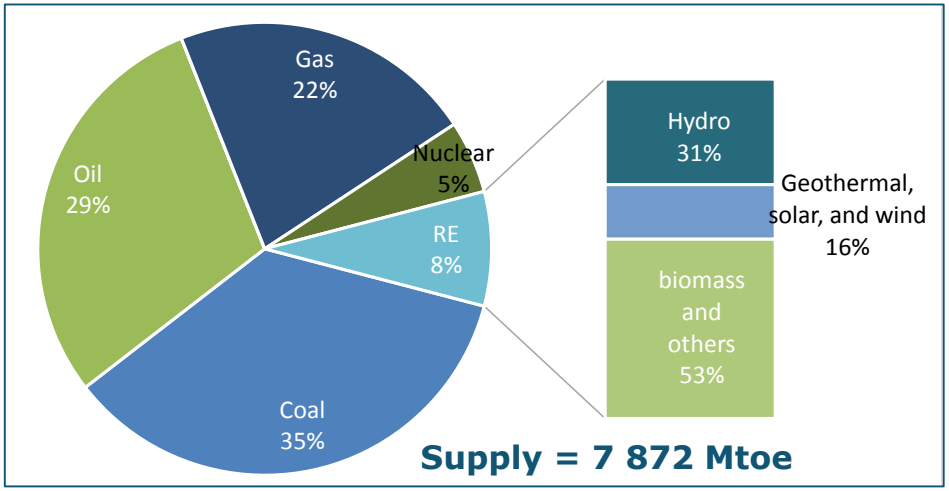
from 2018	IRENA
Fuel wood & woodwaste	**Fuel wood & woodwaste**
Wood and straw pellets/briquettes	Biomass pellets and briquettes
Fuelwood	Fuel wood
Woodwaste	Wood waste
	Energy crops
Bagasse	**Bagasse**
Rice husks	**Rice husks**
Straw	**Straw**
Charcoal	**Charcoal**
Other vegetal and agricultural waste	**Other vegetal and agricultural waste**
Other primary solid biomass	**Other primary solid biomass (animal waste)**
Biogas	**Biogas**
Landfill gas	Landfill gas
Sewage sludge gas	Sewage sludge gas
Other biogases from anaerobic fermentation	Other biogases from anaerobic fermentation
Biogases from thermal processes	Biogases from thermal processes
Industrial waste	
renewable	
non-renewable	
Municipal solid waste	**Municipal solid waste**
renewable	renewable
non-renewable	non-renewable
Black liquor	**Black liquor**

How are these different from IRENA? (2)

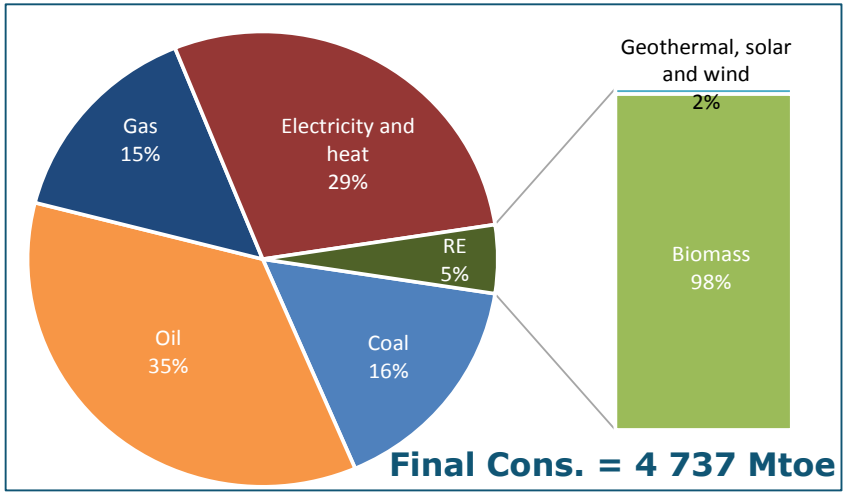
from 2018	IRENA
Liquid Biofuels	**Liquid Biofuels**
Biogasoline	Conventional biogasoline
	Advanced biogasoline
Biodiesels	Conventional biodiesels
	Advanced biodiesel
Bio-jet kerosene	Bio-jet kerosene
Other liquid biofuels	Other liquid biofuels
Hydro	**Hydro**
Storage hydro	Renewable hydro
Run-of-river hydro	Pumped-hydro
Pumped-hydro	Mixed hydro
Mixed hydro	
Geothermal	**Geothermal**
Electricity	Electricity
Heat	Heat
Solar	**Solar**
Photovoltaic	Photovoltaic
Thermal	Thermal
Heat	Concentrated solar power
	Other solar energy
Tide, wave & ocean	**Marine energy**
Wind	**Wind**
On-shore	On-shore
Off-shore	Off-shore

Data analysis

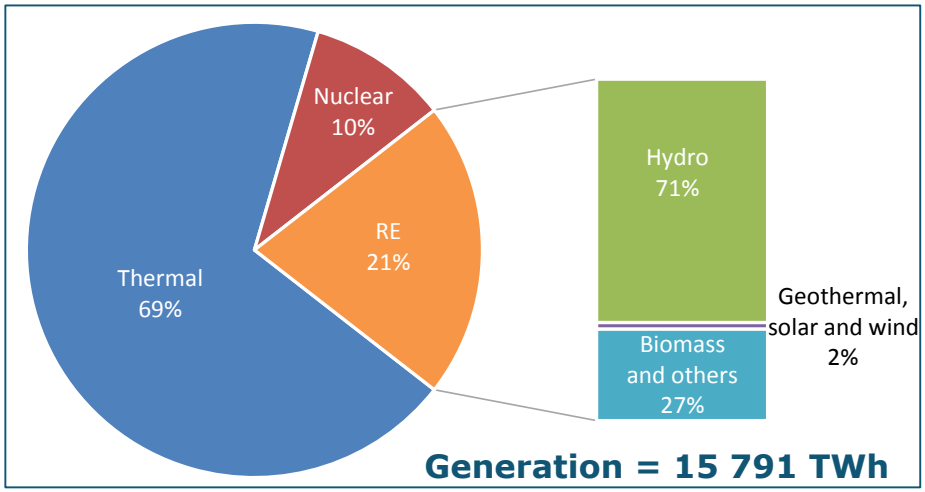
2016 Supply (Mtoe)



2016 Final consumption (Mtoe)



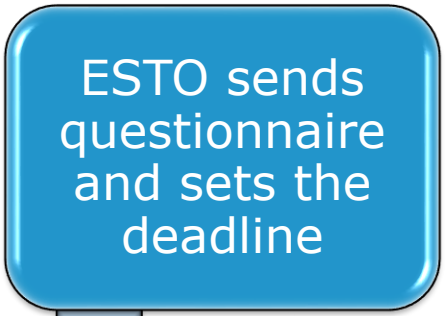
2016 Power generation (GWh)



- ***While the share of renewable energy remained modest at 8% of APEC supply and 21% of power generation, it grew 5.5% and 9.1% compared with 2015 which drove the increases in APEC supply and power generation, respectively.***
- ***Consumption increased by only 0.2%; biomass was the biggest among renewable sources.***

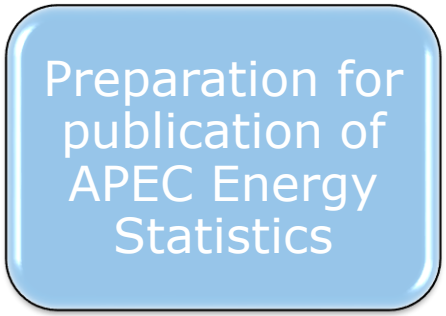
Source: APEC/EGEDA data

Data collection, processing, and publication



- Usually December (one year after end of the reference year)

- January-September (includes verification of data submitted)
- One economy can submit final data in September.



- October-November; ideally, publication is ready by November
- Or just before EGEDA Meeting

Data included in the publication are for Year-2, ideally Year-1.

Challenges

- Most economies report data on biomass products in the renewable questionnaire, although several economies aggregate them into "other biomass."
- Three economies have no estimate of biomass use in the residential sector such as firewood and wood waste, etc. (PRC, MAS, PNG)
- There are no data yet on modern biomass consumption in the residential, commercial and agriculture sectors.
- Data for renewable installations that are not grid-connected might not be estimated by some economies.
- Papua New Guinea provides no annual renewable data.

Way forward

A workshop on renewable energy to clarify methodologies to estimate modern and traditional biomass and renewable products

More detailed renewable data are expected to be needed in future collections.

The renewable manual needs to be revised accordingly.

Sustain collaboration with EGNRET and IRENA.

Thank you for your kind attention.
Your comments/suggestions would be highly appreciated.

http://aperc.ieej.or.jp/

APERC
Asia Pacific Energy Research Centre