

IEA RENEWABLES DATA SYSTEM

**IEA Data TRAINING WORKSHOP in South Africa
Pretoria, South Africa, 11-13 October, 2010**

Alex Blackburn

Energy Statistics Division



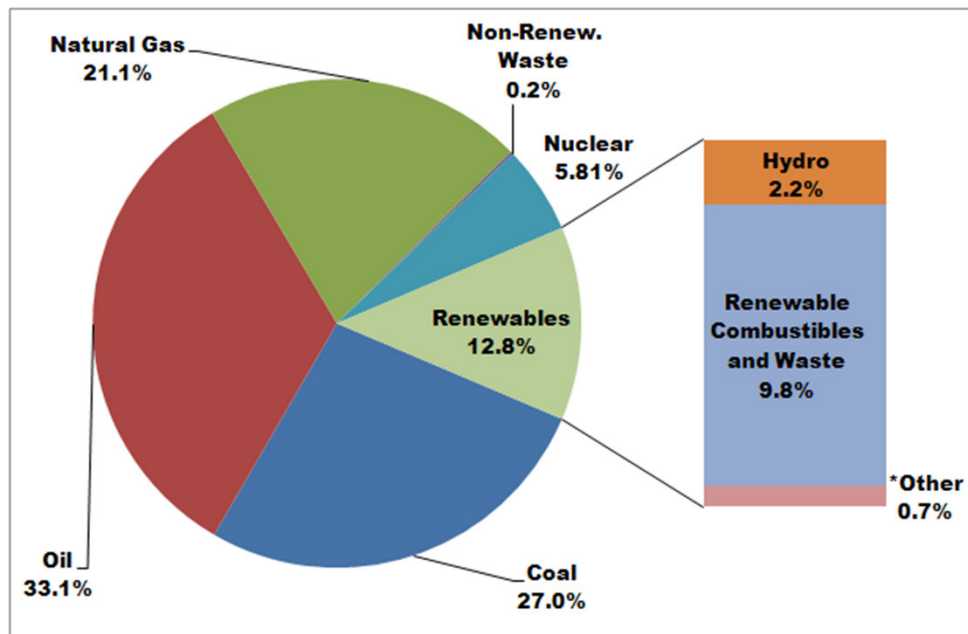
International
Energy Agency

OVERVIEW

- **Renewable energy markets**
- **Renewables energy sources**
- **IEA annual questionnaire**
- **On-going challenges**
- **Uses of the data**

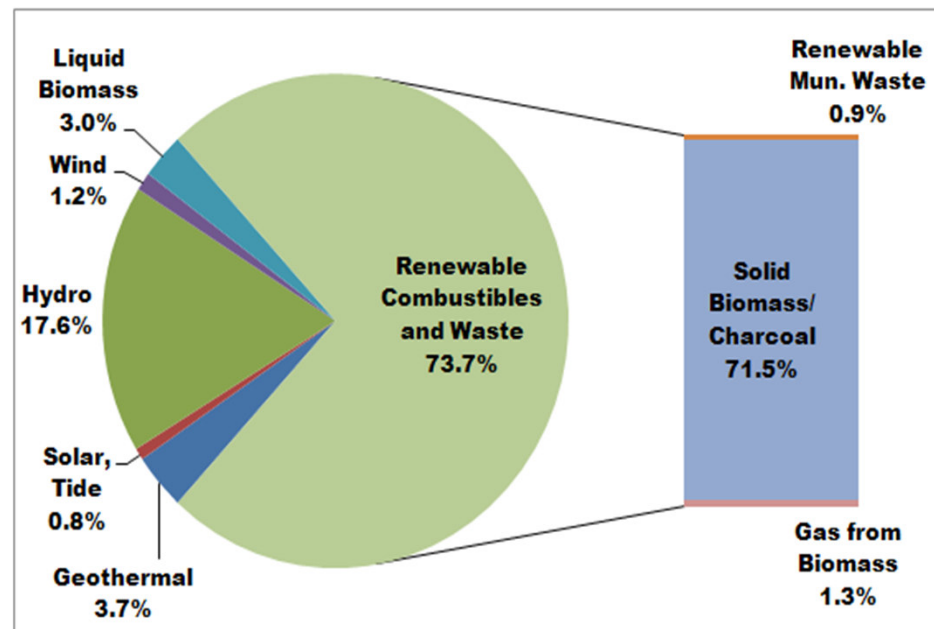
RENEWABLE FUELS IN THE WORLD, 2008

TPES



12,267 Mtoe

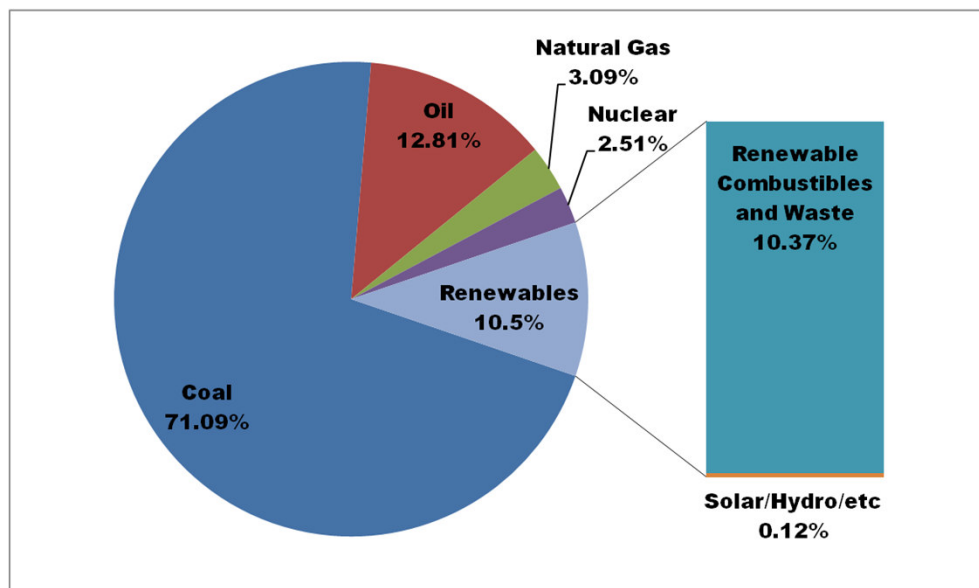
Renewables



1,567 Mtoe

RENEWABLE FUELS IN SOUTH AFRICA, 2008

TPES*



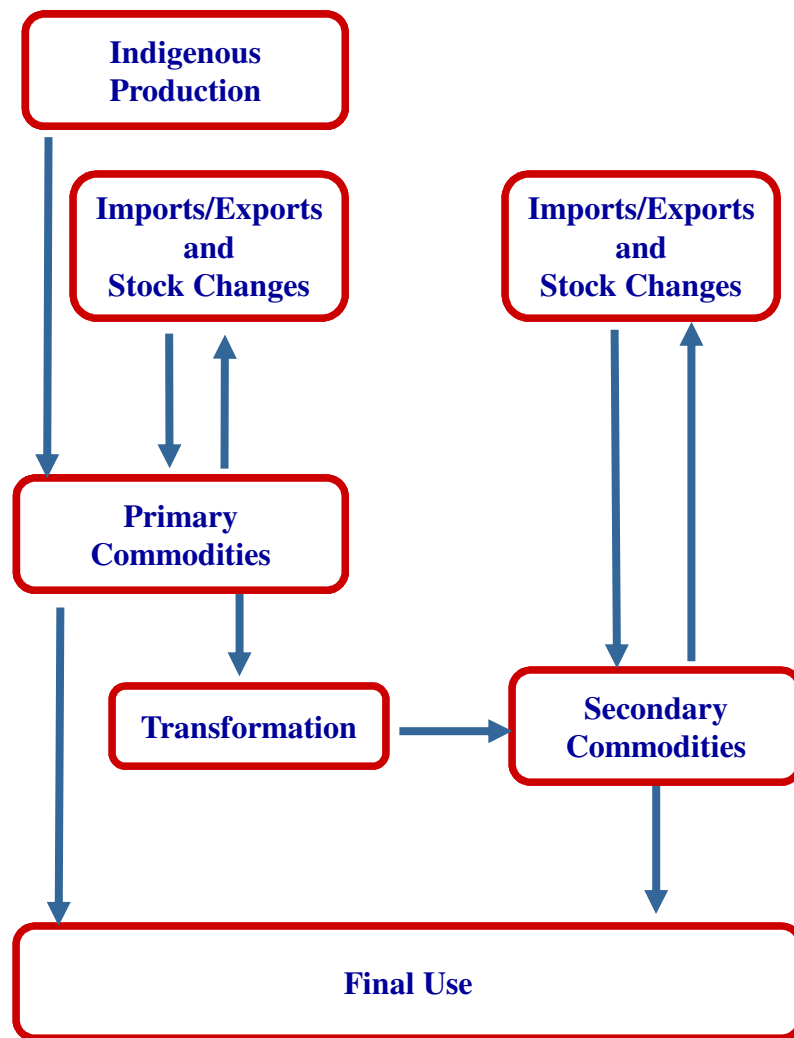
134.4 Mtoe

Renewables

Total: 17.2 Mtoe
•Of which: 98.9% is solid biomass or charcoal

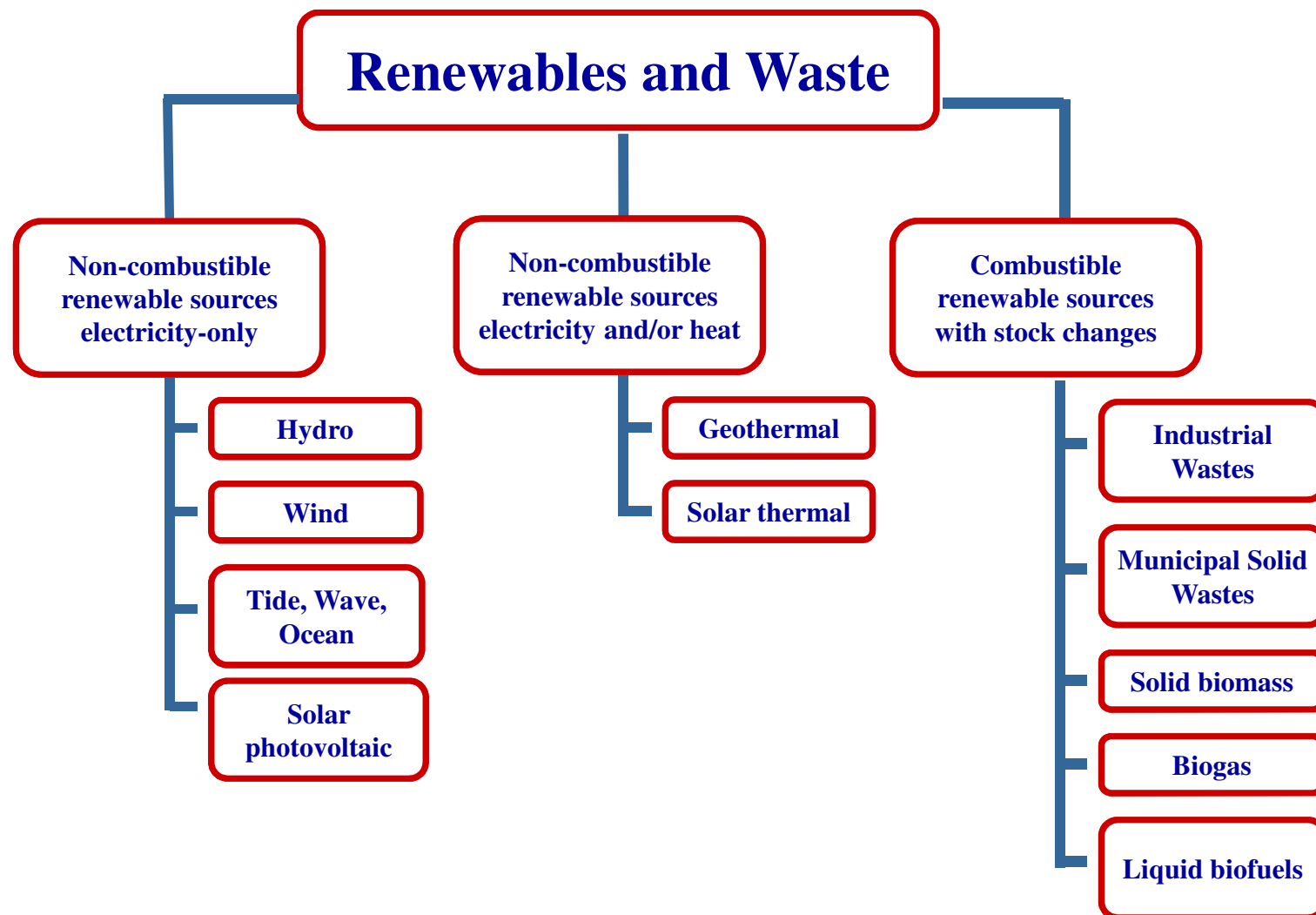
*** Doesn't include electricity trade**

CONVENTIONAL ENERGY FLOW



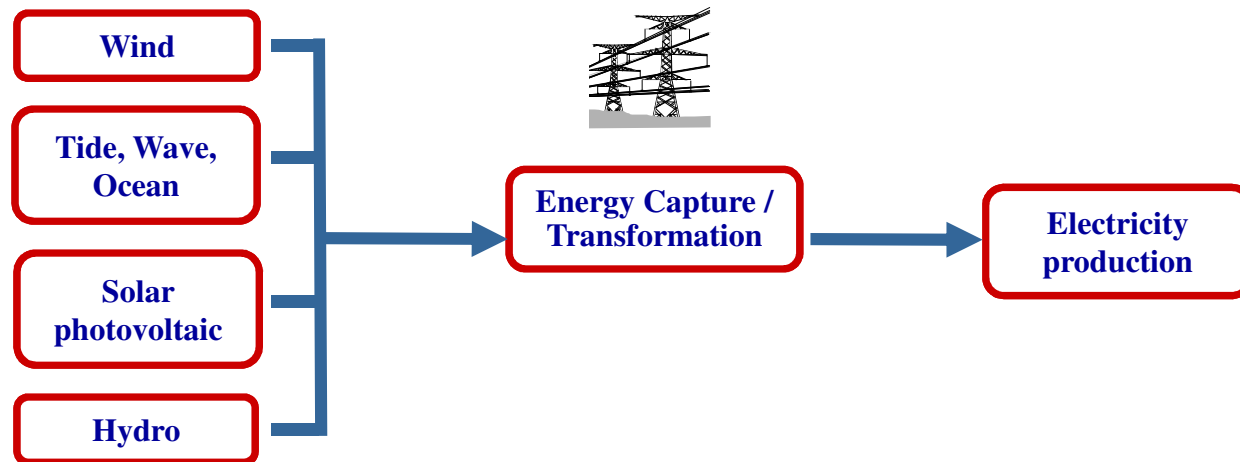
**Does not
apply to all
renewable
and waste
energy
sources**

RENEWABLE ENERGY CLASSIFICATION



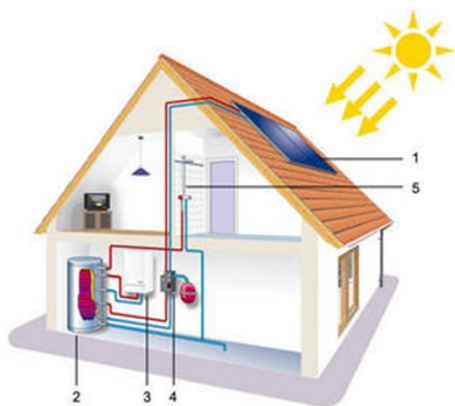
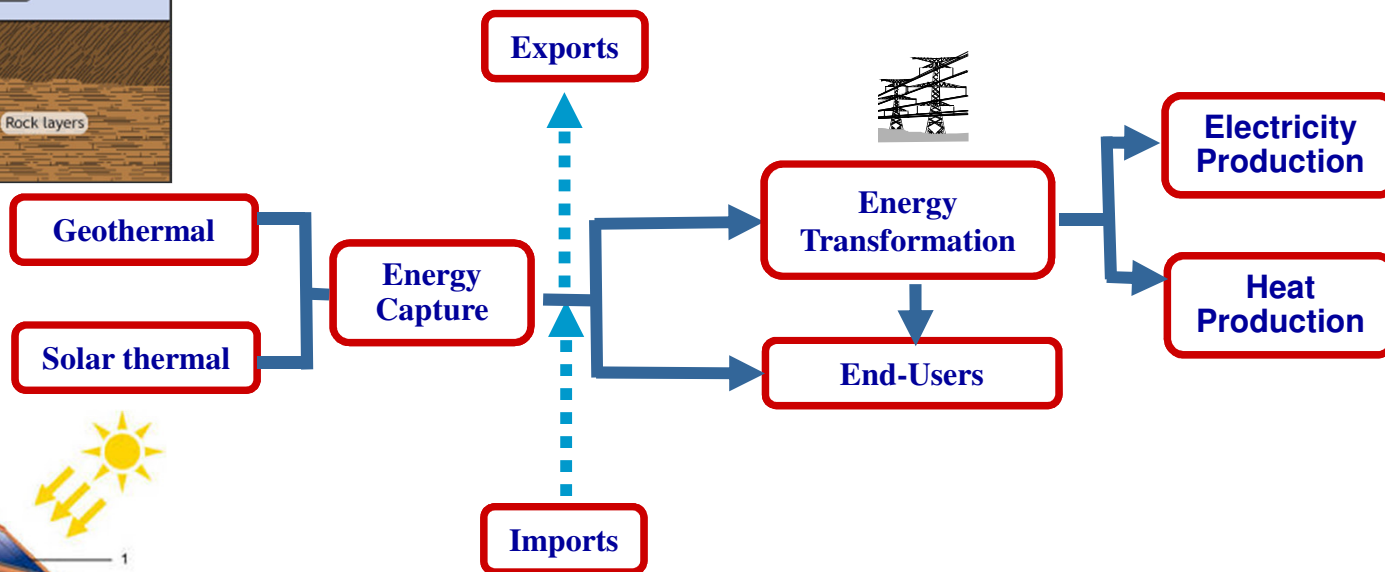
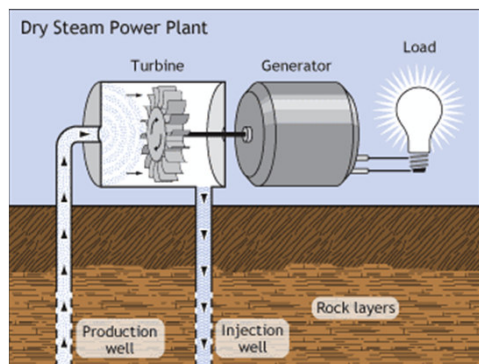
NON-COMBUSTIBLE RENEWABLE ENERGY SOURCES

**FIRST PRACTICAL
POINT OF
MEASUREMENT**



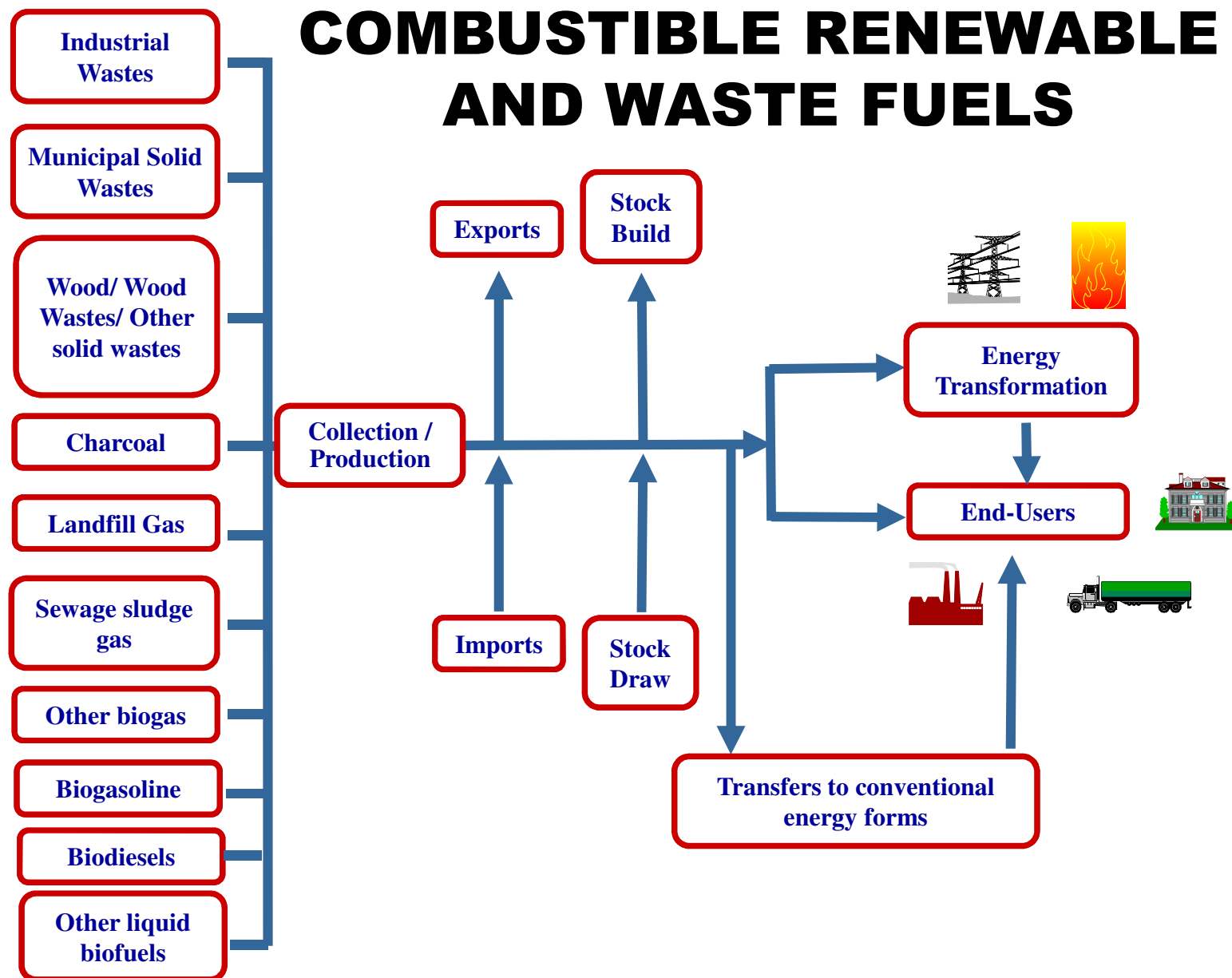
PRIMARY ENERGY FORM = ELECTRICITY

OTHER NON-COMBUSTIBLE RENEWABLE ENERGY SOURCES



PRIMARY ENERGY FORM = HEAT

COMBUSTIBLE RENEWABLE AND WASTE FUELS



COMBUSTIBLE RENEWABLE AND WASTE FUELS

■ **Industrial waste**

- **Non-renewable origin**
- **Solid, liquid or gaseous products combusted directly (e.g. tyres)**

■ **Municipal solid wastes**

- **From households, industry, hospitals**
- **Renewable: the portion which is biodegradable material**
- **Non-Renewable: the portion which is non-biodegradable**

■ **Solid biomass - organic, non-fossil material**

- **Wood, wood wastes and other solid wastes**
- **Charcoal**

COMBUSTIBLE RENEWABLES

■ **Biogasoline**

- **Bioethanol (ethanol from waste)**
- **Biomethanol (methanol from waste)**
- **BioETBE (ethyl-tertio-butyl-ether) from bioethanol**

■ **Biodiesels**

- **Methyl-ester from vegetable or animal**
- **Biodimethylether (dimethylether from biomass)**
- **Fischer Tropsh from biomass**
- **Cold pressed bio-oil (oil from oil seed)**

■ **Other Liquid Biofuels**

■ **Biogas**

- **Landfill gas, sewage sludge gas, other biogas**

TYPES OF ELECTRIC AND HEAT PLANTS

	Electricity Only	CHP	Heat Only
Main Activity Producer	Report all production and all fuel used	Report all electricity and heat produced and all fuel used	Report all heat produced and all fuel used
Autoproducer		Report all electricity produced and heat <u>sold</u> with corresponding fuel used	Report heat <u>sold</u> and corresponding fuel used

STRUCTURE OF ANNUAL QUESTIONNAIRE

- **Table 1: Gross Electricity and Heat Production**
- **Table 2: Supply, Transformation, Energy Sectors, End-Use**
- **Table 3: Technical Characteristics of Installations**
 - **Net Maximum Capacity (electricity)**
 - **Solar Collectors Surface**
 - **Liquid Biofuels Plants Capacity**
 - **Average Net Calorific Values**
- **Table 4: Production of Wood, Wood Wastes, and Other Solid Wastes**

TABLE 1. GROSS ELECTRICITY AND HEAT PRODUCTION

South Africa		MAIN ACTIVITY PRODUCER PLANTS			AUTOPRODUCER PLANTS			TOTAL	
2008		ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	MAIN ACTIVITY PRODUCER	AUTOPRODUCER
ELECTRICITY Unit: MWh		A	B	C	D	E	F	G (= A+B+C)	H (= D+E+F)
Total	1	3,908,000	0		437,000	0		3,908,000	437,000
Hydro	2	3,854,000			178,000			3,854,000	178,000
Hydro-1 MW	3	0			0			0	0
Hydro 1-10 MW	4	0			0			0	0
Hydro 10+ MW	5	1,082,000			178,000			1,082,000	178,000
Pumped Hydro	6	2,772,000			0			2,772,000	0
Geothermal	7	0	0		0	0		0	0
Solar Photovoltaic	8	22,000			0			22,000	0
Solar Thermal	9	0			0			0	0
Tide, Wave and Ocean	10	0			0			0	0
Wind	11	32,000			0			32,000	0
Industrial Waste	12	0	0		0	0		0	0
Municipal Waste (Renew)	13	0	0		0	0		0	0
Municipal Waste (Non-Ren)	14	0	0		0	0		0	0
Wood/Wood Wastes	15	0	0		259,000	0		0	259,000
Landfill Gas	16	0	0		0	0		0	0
Sludge Gas	17	0	0		0	0		0	0
Other Biogas	18	0	0		0	0		0	0
Other Liquid Biofuels	19	0	0		0	0		0	0
HEAT Unit: TJ									
Geothermal	20								
Solar Thermal	21								
Industrial Waste	22								
Municipal Waste (Renew)	23								
Municipal Waste (Non-Ren)	24								
Wood/Wood Wastes/Other	25								
Landfill Gas	26								
Sludge Gas	27								
Other Biogas	28								
Other Liquid Biofuels	29								
	30								

N.B. the IEA only has the hydro data directly from ESKOM; the rest are either estimated or from secondary sources

TABLE 1. GROSS ELECTRICITY AND HEAT PRODUCTION

South Africa		MAIN ACTIVITY PRODUCER PLANTS			AUTOPRODUCER PLANTS			TOTAL	
		ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	MAIN ACTIVITY PRODUCER	AUTOPRODUCER
2008									
ELECTRICITY Unit: MWh		A	B	C	D	E	F	G (= A+B+C)	H (= D+E+F)
Total	1	3,908,000	0		437,000	0		3,908,000	437,000
Hydro	2	3,854,000			178,000			3,854,000	178,000
Hydro-1 MW	3	0			0			0	0
Hydro 1-10	4	0			0			0	0
Hydro 10+	5	1,082,000			178,000			1,082,000	178,000
Pumped Hydro	6	2,772,000			0			2,772,000	0
Geothermal	7	0	0		0	0		0	0
Solar Photovoltaic	8	22,000			0			22,000	0
Solar Thermal	9	0			0			0	0
Tide, Wave and Ocean	10	0			0			0	0
Wind	11	32,000			0			32,000	0
Industrial Waste	12	0	0		0	0		0	0
Municipal Waste (Renewable)	13	0	0		0	0		0	0
Municipal Waste (Non-Renewable)	14	0	0		0	0		0	0
Wood/Wood Wastes/Other Solid Wastes	15	0	0		259,000	0		0	259,000
Landfill Gas	16	0	0		0	0		0	0
Sludge Gas	17	0	0		0	0		0	0
Other Biogas	18	0	0		0	0		0	0
Other Liquid Biofuels	19	0	0		0	0		0	0
HEAT Unit: TJ									
Total	20		0			0		0	0
Geothermal	21		0			0		0	0
Solar Thermal	22		0			0		0	0
Industrial Waste	23		0			0		0	0
Municipal Waste (Renewable)	24		0			0		0	0
Municipal Waste (Non-Renewable)	25		0			0		0	0
Wood/Wood Wastes/Other Solid Wastes	26		0			0		0	0
Landfill Gas	27		0			0		0	0
Sludge Gas	28		0			0		0	0
Other Biogas	29		0			0		0	0
Other Liquid Biofuels	30		0			0		0	0

TABLE 1. GROSS ELECTRICITY AND HEAT PRODUCTION

South Africa		MAIN ACTIVITY PRODUCER PLANTS			AUTOPRODUCER PLANTS			TOTAL	
		ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	MAIN ACTIVITY PRODUCER	AUTOPRODUCER
2008									
ELECTRICITY Unit: MWh		A	B	C	D	E	F	G (= A+B+C)	H (= D+E+F)
Total	1	3,908,000	0		437,000	0		3,908,000	437,000
Hydro	2	3,854,000			178,000			3,854,000	178,000
Hydro-1 MW	3	0	X		0	X		0	0
Hydro 1-10 MW	4	0			0			0	0
Hydro 10+ MW	5	1,082,000			178,000			1,082,000	178,000
Pumped Hydro	6	2,772,000			0			2,772,000	0
Geothermal	7	0	0		0	0		0	0
Solar Photovoltaic	8	22,000			0			22,000	0
Solar Thermal	9	0	X		0	X		0	0
Tide, Wave and Ocean	10	0			0			0	0
Wind	11	32,000			0			32,000	0
Industrial Waste	12	0	0		0	0		0	0
Municipal Waste (Renew)	13	0	0		0	0		0	0
Municipal Waste (Non-Renew)	14	0	0		0	0		0	0
Wood/Wood Wastes/Other Solid Wastes	15	0	0		259,000	0		0	259,000
Landfill Gas	16	0	0		0	0		0	0
Sludge Gas	17	0	0		0	0		0	0
Other Biogas	18	0	0		0	0		0	0
Other Liquid Biofuels	19	0	0		0	0		0	0
HEAT Unit: TJ									
Total	20		0	0		0	0	0	0
Geothermal	21		0	0		0	0	0	0
Solar Thermal	22		0	0		0	0	0	0
Industrial Waste	23		0	0		0	0	0	0
Municipal Waste (Renew)	24		0	0		0	0	0	0
Municipal Waste (Non-Renew)	25		0	0		0	0	0	0
Wood/Wood Wastes/Other Solid Wastes	26		0	0		0	0	0	0
Landfill Gas	27		0	0		0	0	0	0
Sludge Gas	28		0	0		0	0	0	0
Other Biogas	29		0	0		0	0	0	0
Other Liquid Biofuels	30		0	0		0	0	0	0

TABLE 1. GROSS ELECTRICITY AND HEAT PRODUCTION

South Africa		MAIN ACTIVITY PRODUCER PLANTS			AUTOPRODUCER PLANTS			TOTAL	
		ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	MAIN ACTIVITY PRODUCER	AUTOPRODUCER
2008									
ELECTRICITY Unit: MWh		A	B	C	D	E	F	G (= A+B+C)	H (= D+E+F)
Total	1	3,908,000							000
Hydro	2	3,854,000							000
Hydro-1 MW	3	0							0
Hydro 1-10 MW	4	0							0
Hydro 10+ MW	5	1,082,000							000
Pumped Hydro	6	2,772,000							0
Geothermal	7	0							0
Solar Photovoltaic	8	22,000						22,000	0
Solar Thermal								0	0
Tide, Wave and Ocean								0	0
Wind								32,000	0
Industrial Waste						0		0	0
Municipal Waste (Renew)						0		0	0
Municipal Waste (Non-Renew)						0		0	0
Wood/Wood Wastes/Other Solid						0		0	259,000
Landfill Gas						0		0	0
Sludge Gas						0		0	0
Other Biogas						0		0	0
Other Liquid Biofuels						0		0	0
HEAT Unit: Tj									
Total	20		0	0		0	0	0	0
Geothermal	21		0	0		0	0	0	0
Solar Thermal	22		0	0		0	0	0	0
Industrial Waste	23		0	0		0	0	0	0
Municipal Waste (Renew)	24		0	0		0	0	0	0
Municipal Waste (Non-Renew)	25		0	0		0	0	0	0
Wood/Wood Wastes/Other Solid Wastes	26		0	0		0	0	0	0
Landfill Gas	27		0	0		0	0	0	0
Sludge Gas	28		0	0		0	0	0	0
Other Biogas	29		0	0		0	0	0	0
Other Liquid Biofuels	30		0	0		0	0	0	0

Hydro is broken down by plant size and electricity from pumped storage is reported separately

Hydro

Hydro-1 MW

Hydro 1-10 MW

Hydro 10+ MW

Pumped Hydro



TABLE 1. GROSS ELECTRICITY AND HEAT PRODUCTION

South Africa		MAIN ACTIVITY PRODUCER PLANTS			AUTOPRODUCER PLANTS			TOTAL	
2008		ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	ELECTRICITY (ONLY)	CHP	HEAT (ONLY)	MAIN ACTIVITY PRODUCER	AUTOPRODUCER
ELECTRICITY Unit: MWh		A	B	C	D	E	F	G (= A+B+C)	H (= D+E+F)
Total	1	3,908,000	0		437,000	0		3,908,000	437,000
Hydro	2	3,854,000			178,000			3,854,000	178,000
Hydro-1 MW	3	0			0			0	0
Hydro 1-10 MW	4	0			0			0	0
Hydro 10+ MW	5	1,082,000			178,000			1,082,000	178,000
Pumped Hydro	6	2,772,000			0			2,772,000	0
Geothermal	7	0	0		0	0		0	0
Solar Photovoltaic	8	22,000			0			22,000	0
Solar Thermal	9	0			0			0	0
Tide, Wave and Ocean	10	0			0			0	0
Wind	11	32,000			0			32,000	0
Industrial Waste	12	0	0		0	0		0	0
Municipal Waste (Renew)	13	0	0		0	0		0	0
Municipal Waste (Non-Renew)	14	0	0		0	0		0	0
Wood/Wood Wastes/Other Solid Wastes	15	0	0		259,000	0		0	259,000
Landfill Gas	16	0	0		0	0		0	0
Sludge Gas	17	0	0		0	0		0	0
Other Biogas	18	0	0		0	0		0	0
Other Liquid Biofuels	19	0	0		0	0		0	0
HEAT Unit: TJ									
Total	20		0	0		0	0	0	0
Geothermal	21		0	0		0	0	0	0
Solar Thermal	22		0	0		0	0	0	0
Industrial Waste	23		0	0		0	0	0	0
Municipal Waste (Renew)	24		0	0		0	0	0	0
Municipal Waste (Non-Renew)	25		0	0		0	0	0	0
Wood/Wood Wastes/Other Solid Wastes	26		0	0		0	0	0	0
Landfill Gas	27		0	0		0	0	0	0
Sludge Gas	28		0	0		0	0	0	0
Other Biogas	29		0	0		0	0	0	0
Other Liquid Biofuels	30		0	0		0	0	0	0



TABLE 2. SUPPLY, TRANSFORMATION, ENERGY SECTORS AND END USE

		SOLID BIOMASS	
		Wood/Wood Wastes/Other Solid Wastes	Charcoal
South Africa		TJ (NCV)	1000 tonnes
2008		F	G
Indigenous Production	1	596,466	1,626
Total Imports (Balance)	2	0	0
Total Exports (Balance)	3	0	357
Stock Changes (National Territory)	4	0	0
Inland Consumption (Calculated)	5	596,466	1,269
Statistical Differences	6	0	0
Transformation Sector	7	206,626	0
Main Activity Producer Electricity Plants	8	0	0
Main Activity Producer CHP Plants	9	0	0
Main Activity Producer Heat plants	10	0	0
Autoproducer Electricity Plants	11	3,730	0
Autoproducer CHP Plants	12	0	0
Autoproducer Heat plants	13	0	0
Patent Fuel Plants (Transformation)	14	0	0
BKB Plants (Transformation)	15	0	0
Gas Works (Transformation)	16	0	0
For Blended Natural Gas	17	0	0
For Blending to Motor Gasoline/Diesel	18	0	0
Charcoal Production Plants (Transformation)	19	202,896	0
Non-specified (Transformation)	20	0	0

TABLE 2. SUPPLY, TRANSFORMATION, ENERGY SECTORS AND END USE

		SOLID BIOMASS	
		Wood/Wood Wastes/Other Solid Wastes	Charcoal
South Africa		TE (1000 tonnes)	1000 tonnes
2008		F	G
Total Final Consumption	34	389,840	1,269
Final Energy Consumption	35	389,840	1,269
Industry Sector	36		0
Iron and Steel	37	0	0
Chemical (including Petrochemical)	38	0	0
Non-Ferrous Metals	39	0	0
Non-Metallic Minerals	40	0	0
Transport Equipment	41	0	0
Machinery	42	0	0
Mining and Quarrying	43	0	0
Food, Beverages and Tobacco	44	0	0
Paper, Pulp and Printing	45	0	0
Wood and Wood Products	46	0	0
Construction	47	0	0
Textiles and Leather	48	0	0
Non-specified (Industry)	49	74,496	0
Transport Sector	50	0	0
Rail	51	0	0
Road	52	0	0
Domestic Navigation	53	0	0
Non-specified (Transport)	54	0	0
Other Sectors	55	315,344	1,269
	56		0
Residential	57	315,344	1,269
	58	0	0
Fishing	59	0	0
Non-specified (Other)	60	0	0

TABLE 3. CAPACITY

South Africa

Unit = MWe

2008 (or other data:)		ELECTRICAL CAPACITY
NET MAXIMUM CAPACITY CLASSIFICATION BY TECHNOLOGY		A
Hydro	1	0
Hydro-1 MW	2	0
Hydro 1-10 MW	3	0
Hydro 10+ MW	4	0
Pumped Hydro	5	0
Geothermal	6	0
Solar Photovoltaic	7	0
Solar Thermal	8	0
Tide, Wave and Ocean	9	0
Wind	10	0
Industrial Waste	11	0
Municipal Waste	12	0
Wood/Wood Wastes/Other Solid Wastes	13	0
Landfill Gas	14	0
Sludge Gas	15	0
Other Biogas	16	0
Other Liquid Biofuels	17	0

SOLAR COLLECTORS SURFACE

Unit = 1000 m²

Solar collectors surface (1000m ²)	18	0
--	----	---

LIQUID BIOFUELS PLANTS CAPACITY

Unit = tonnes/year

Biogasoline	19	0
Biodiesels	20	0
Other Liquid Biofuels	21	0

AVERAGE NET CALORIFIC VALUE

Unit = kJ/kg

Biogasoline Average Net Calorific Value	22	0
Biodiesel Average Net Calorific Value	23	0
Other Liquid Biofuels Average Net Calorific Value	24	0
Charcoal Average Net Calorific Value	25	0

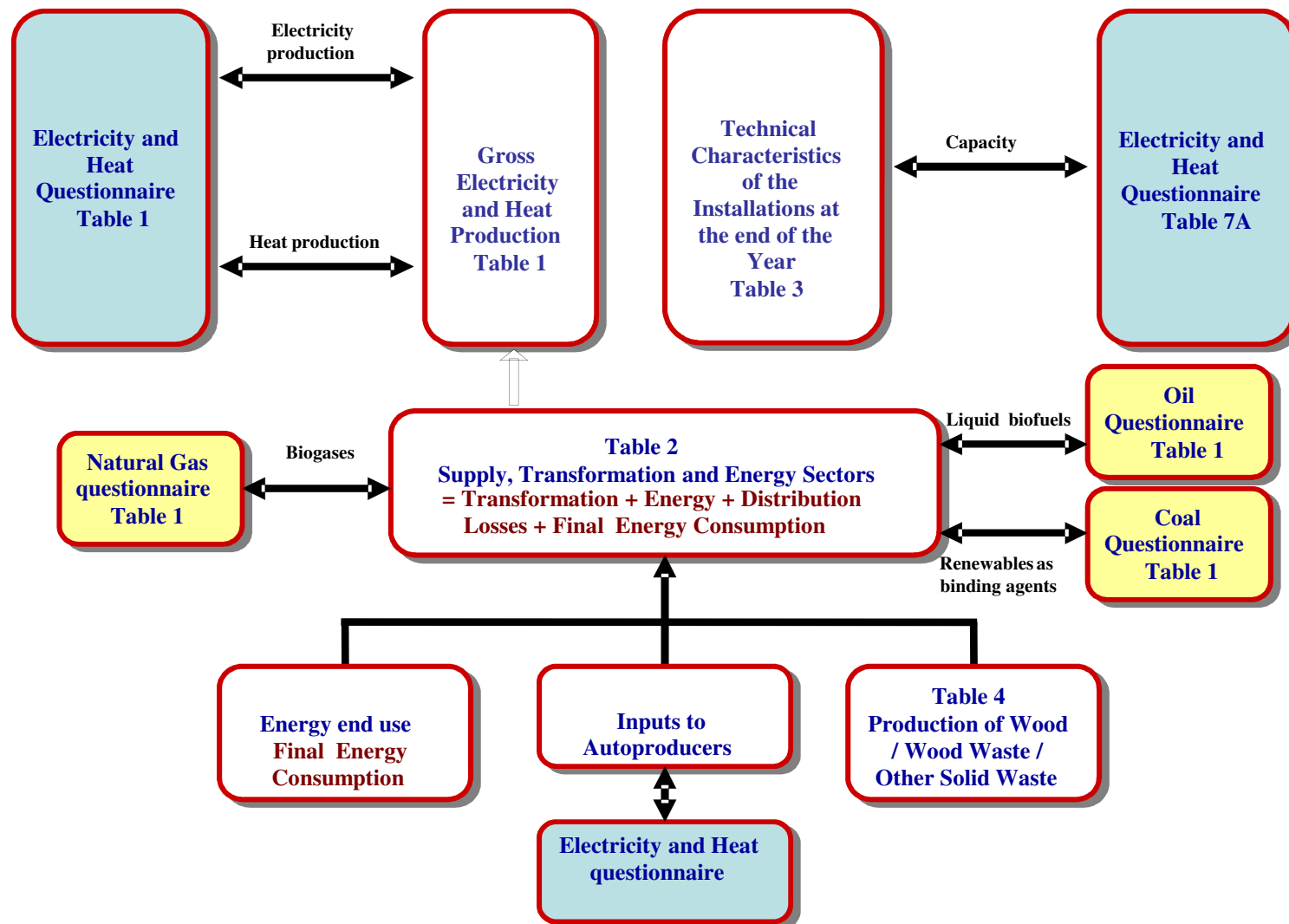
TABLE 4. PRODUCTION OF WOOD, WOOD WASTE AND OTHER SOLID WASTES

South Africa

Unit = TJ (net)

2008		A
Wood/Wood Wastes/Other Solid Wastes	1	596,466
Memo: Wood (TJ-net)	2	518,240
Memo: Vegetal Waste (TJ-net)	3	78,226
Memo: of which: Wood Waste (TJ-net)	4	0
Memo: Black Liquor (TJ-net)	5	0
Memo: Other Solid Biomass (TJ-net)	6	0

INTERRELATIONSHIP OF QUESTIONNAIRES



DATA QUALITY CHECKS

- **Integers, negative numbers, sums**
- **Percentage differences with prior year**
- **Comparisons to other questionnaires**
- **Calorific values**
- **Statistical difference**
- **Transformation efficiency rates**
- **Shifts in product classification**
- **Breaks in series**

SOUTH AFRICA DATA ISSUES AS SEEN FROM THE IEA

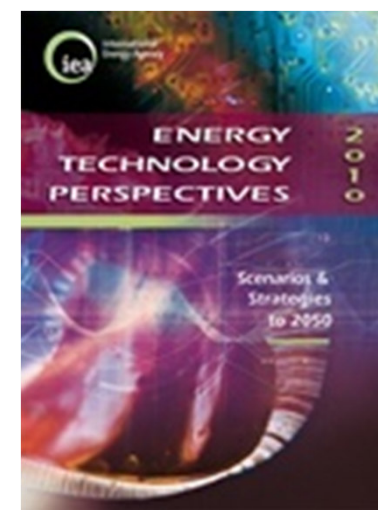
- **Data currently come from many sources, often secondary**
- **Hydro data come from a national source (ESKOM)**
- **Are all renewable energy data captured? (i.e. all non-commercial data)**
- **Are capacity data available?**

ONGOING CHALLENGES

- **Scattered production/consumption data**
- **Not all renewable and waste energies flows through conventional systems**
- **Multitude of individual small installations**
- **Small players for which there are no accurate measurement**

RENEWABLES DATA ARE WIDELY NEEDED AND USED

- **Renewables Information book**
- **Electronic online files**
- **Energy balances**
- **CO₂ emissions**
- **Data support for other IEA divisions/other organisations**
- **Country reviews**
- **Analysis**
 - **Assessing security of supply**
 - **Evolution of efficiencies**
 - **Environmental impacts**
- **Making policy and business decisions**



IEA RENEWABLE STATISTICS

Annual questionnaire

- **Detailed supply and demand commodity balance of renewable energy sources**

Mini-questionnaire

- **Preliminary production, consumption, trade and stock change data**

THE ANNUAL QUESTIONNAIRE CYCLE



THANK YOU

Questions welcome.



International
Energy Agency