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Energy Balance in Korea

Taesik Park
Korea Energy Economics Institute

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Briefs of Energy Statistics in Korea

- **Energy data reported prior to 1980**
 - *Electricity (Korea Electric Power Corporation)*
 - *Coal (Korea Coal Corporation)*
- **Overall energy data are available starting in the 1980s**
 - *Korea administration started to report Energy Balance in 1982*
 - *Thereafter, “Yearbook of Energy Statistics” began to be published*
- **Energy Balances are reported on basis of commodity balances**



Briefs of Energy Statistics in Korea

- **Commodities statistics are provided by**
 - *Coal : Korea Coal Association*
 - *Oil : Korea National Oil Corp.(KNOC)*
 - *Natural Gas : Korea Gas Corp.(KNOC), POSCO, K-Power*
 - *City Gas : Korea City Gas Association*
 - *Electricity : Korea Electric Power Corp.(KEPCO)*
 - *Heat : Korea District Heating Corp.(KDHC), SH Corp., GS Power*
 - *Renewable and Wastes : Korea Energy Management Corp.(KEMCO)*
- **Data collected from Reporting organization**
 - *Monthly basis(about 2 months later)*
 - *By means of network(Petro-net), fax, or publications*
 - *Korea administration started to use a new survey system in 2008 in order to collect reliable and detailed data, but it's still at a test run phase*

Briefs of Energy Statistics in Korea

- *The unit of account adopted into EB*
 - *1,000 toe on a gross calorific basis*
- **Conversion factors applied to EB**
 - *presented at Energy Fundamental Law*
 - *revised in 2006 (on the basis of 2 years' study)*
- **Primary energy conventions**
 - *Primary energy equivalent of nuclear, hydro, wind and solar photovoltaic: the amount of energy to generate an identical amount of electricity in conventional thermal power plants. (by partial substitution method)*
 - *Prior to 2007, 2,500 kcal / kwh (34.4%)*
 - *2,150 kcal / kwh (assuming an efficiency of 40%)*

National Energy Balance

- Energy flow (40 categories)

Supply	transformation	Final Energy Consumption	
Production	Electricity	Industry	Machinery
Import	District heating	Agri., Forest., Fishing	Others
(Petroleum production)	Gas manufacturing	Mining	Construction
(Petroleum imports)	Own use & losses	Manufacturing	Transport
Export		Food/Beverage	Rail
Intl' marine bunkers		Textile/Clothing	Road
Stock changes		Wood/product	Navigation
Opening stock		Pulp/Paper/Printing	Aviation
Closing stock		Petrochemical	Residential
Statistical difference		Non metallic	Commercial
Total Primary Supply		Iron & Steel	Public and others
		Non ferrous metal	

National Energy Balance

- Energy Commodities (36 categories)

Coal	Anthracite	Domestic, Imported
	Bituminous	Coking Coal, Steam Coal
Oil	Fuel oil	Gasoline, Kerosene, Diesel, B-A, B-B, B-C, JA-1, JP-4, Avi-gas
	LPG	Propane, Butane
	Non energy	Naphtha, Solvent, Asphalt, Paraffin wax, Pet-coke, Other
LNG		
City gas		
Hydro		
Nuclear		
Electricity		
Heat		
Renewable & Wastes		
Total		

National Energy Balance

- **Energy Conversion factors**

- *Included in “Energy Fundamental Law” (2006. Sep. 1)*
- *Based on gross calorific values*
- *Below figures are applied from 2007 data*

	Unit	GCV(kcal)		Unit	GCV(kcal)		Unit	GCV(kcal)
Crude oil	Kg	10,750	Naphtha	ℓ	8,050	Anthracite 1	Kg	4,650
Gasoline	ℓ	8,000	Solvent	ℓ	7,950	Anthracite 2	Kg	6,550
Kerosene 1	ℓ	8,800	Aviation-gasoline	ℓ	8,750	Steam coal	Kg	6,200
Kerosene 2	ℓ	8,950	Asphalt	ℓ	9,900	Coking coal	Kg	7,000
Diesel	ℓ	9,050	Lubricant	ℓ	9,250	Sub bituminous	Kg	5350
B-A	ℓ	9,300	Pet coke	ℓ	8,100	Cokes	Kg	7,050
B-B	ℓ	9,650	Derived fuel1	ℓ	8,850	Electricity	kWh	860
B-C	ℓ	9,900	Derived fuel2	ℓ	9,700			2,150
Propane	Kg	12,050	LNG	Kg	13,000	Fire wood	Kg	4,500
Butane	Kg	11,850	City gas	N m ³	10,550			

National Energy Balance

- **Comparing Energy consumption in NEB with one of IEA**
 - *Primary energy consumption in 2006 was 233.37 Mtoe according to national energy balance, while IEA showed 216.50 Mtoe. (8% gap)*
 - *Final energy consumption in NEB differs from IEA around 20%*

< Energy consumption in 2006 >

	National EB (M toe)	IEA EB (M toe)	Gap(A/B)
TPES	233.37	216.50	1.08
TFC	173.58	145.08	1.20

- **The gaps between KEB and IEA come from ;**
 - *Coverage of energy sources and transformation*
 - *Calorific values, definition etc.*

Difference between criteria of NEB and IEA

- Energy Coverage

	IEA EB	Excluded in NEB
Coal	Anthracite, Coking coal, Steam coal Sub-bituminous, Coke oven coke, COG, BFG, LDG	Sub-bituminous, Coke oven coke, COG, BFG, LDG
Oil	Crude, NGL, Other HC, Refinery Feedstock, Refinery gas, LPG, Naphtha, Aviation gasoline, Jet oil, Gasoline, Kerosene, Diesel, Heating oil, Solvent, Asphalt, Paraffin wax, Pet coke, Other	Crude, Refinery feedstock, Refinery gas
Electricity & Heat	Electricity only, CHP, Heat only Main activity producer, Auto producer	Auto producer
Renewables	Hydro, Wind, Tide, PV, Solar thermal, Geothermal, Industrial & Municipal waste, Biomass, Biogas, Biofuel	Biofuel, Industrial waste(incl. coal gas, refinery gas etc.)

Difference between criteria of NEB and IEA

● Conversion factors

	NEB (Kcal/kwh)	IEA EB (Kcal/kwh)
Nuclear	2,500 (34.4%) → 2,150 (40%)	2,606 (33.0%)
Hydro, PV, Wind	2,500 (34.4%) → 2,150 (40%)	860(100.0%)
Calorific base	gross	net
Petroleum	National factors	Average factors

● Energy flows

- *Definition of Intl' bunkering*
- *Coverage on transformation sector : petroleum refinery, auto-producer for electricity plants and heat plants, coal transformation, other (petro-chemical)*
- *Concept of transportation sector*
- *Agriculture and fishing excluded in industrial sector*
- *Non energy use : separate from industrial and transportation sector*

Difference between criteria of NEB and IEA

- **Intl' marine bunkers(Intl' bunkering)**

- *IEA : covers those quantities delivered to ships of all flags that are engaged in international navigation*
- *NEB : those ones delivered to ships of all flags and aircrafts of foreign flags that are engaged in international navigation as well as aviation*

- **Electricity, CHP and Heat plants**

- *IEA : Both main activity producer and auto producer plants are included*
- ✘ *for auto producer CHP plants, all fuel inputs to electricity production are taken into account, while only the part of fuel inputs to heat sold is considered.*
Fuel inputs for production of heat consumed within the auto producer's establishment are not included here
- *NEB : Auto producer plants are excluded and CHP plants are not classified separately*

Difference between criteria of NEB and IEA

- **Petroleum refineries**

- *IEA : the use of primary energy for the manufacture of finished petroleum products and the corresponding output*
- *NEB : Imports comprise the output of finished petroleum products in refineries, instead of excluding it in the transformation sector as well as crude oil*

- **Coal transformation**

- *IEA : Transformation of coal from primary to secondary fuels and from secondly to tertiary fuels(hard coal to coke, coke to BFG etc.)*
- *NEB : reports hard coal which is used for coke production purposes as final energy consumption in iron & steel manufacture.*

Coal transformation is not treated in transformation sector.

- ✘ *Coal transformation occurs at the plants which combine the coke production and iron manufacturing stages as well as the treatment and finishing of steel(integrated steel plants) in Korea.*

Difference between criteria of NEB and IEA

- **Other transformation**

- *IEA : includes the blending of other gases with natural gas, backflows from the petrochemical sector*
- *NEB : excludes other transformation in transformation sector*

- **Final consumption in transport sector**

- *IEA : includes all fuels used for transport except international marine bunkers*
- *NEB : excludes the fuels delivered to aircrafts of foreign flags that are engaged in international navigation*

Further activities for IEA questionnaires

- **Gathering more and detailed data**

- *Electricity, CHP, Heat : collecting auto producers' data (around 100 enterprises) from KPX(Korea power exchange) and KEMCO(Korea energy management corp.) and estimating fuel amount used for generating electricity*
- *Petroleum refineries : existing data (from KNOC)*
- *Coal transformation : gathering corresponding data from POSCO.(integrated steel company)*

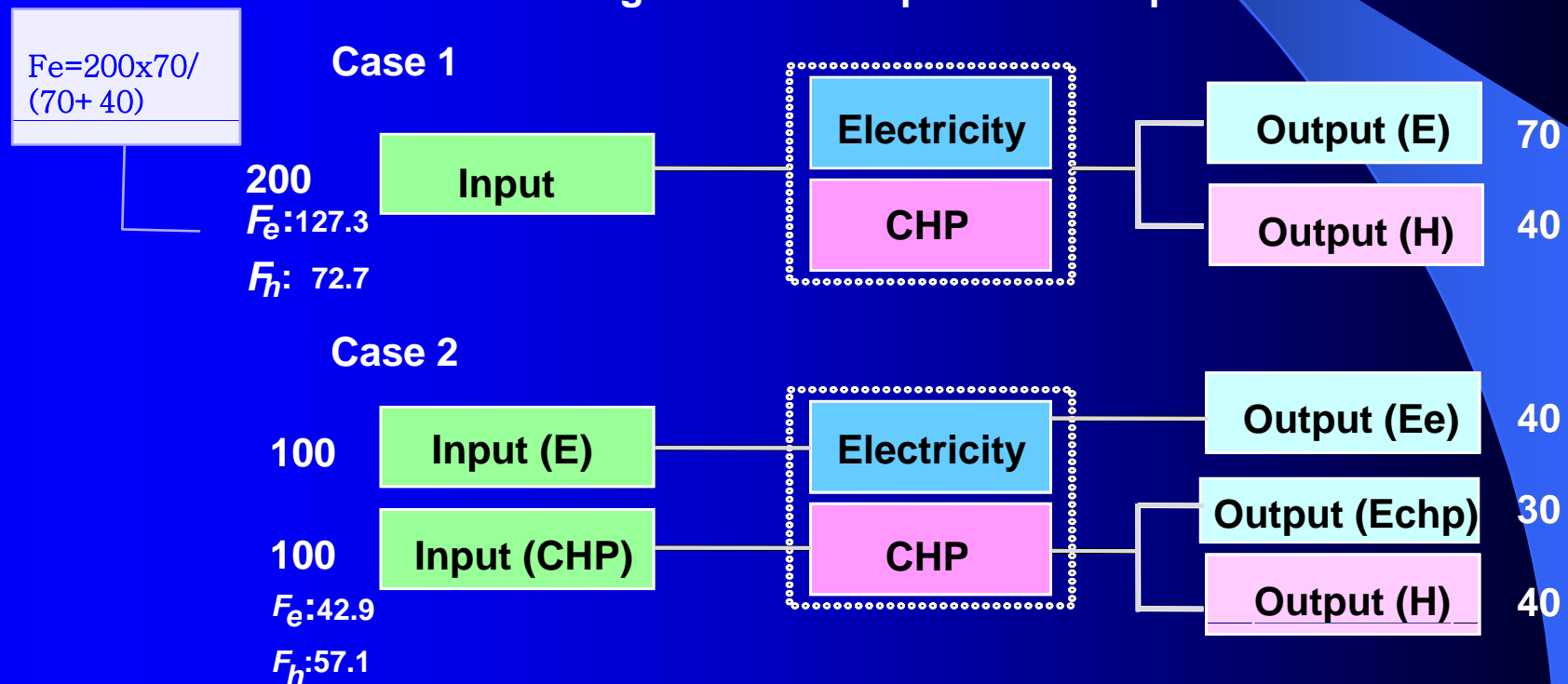
	Coking coal	Semi anthracite	cokes	COG	BFG	LDG/CF G
Production			+	+	+	+
Consumption	+	+	+	+	+	+
Cokes Oven	+			+	+	+
Furnace/		+	+	+	+	
Power generation				+	+	+
Other process			+	+	+	+

- *Backflow(other transformation) : existing data (from KNOC)*

Further activities for IEA questionnaires

- Estimate fuel consumption in auto producers' power plants
 - The auto producers' data contains electricity generated and kind of fuel, except of fuel consumption
 - Efficiency : Average Efficiency of Conventional Power Plants

< Allocating Fuel consumption in CHP plants >



Further activities for IEA questionnaires

- Petroleum refinery
- Treatment in an energy balance
 - Refinery Intake(Crude, Feedstock) : 100 unit
 - Refinery output : 30 unit
 - Refinery fuel(refinery gas, Residual) : 10 unit

	Crude	Feedstock	Petroleum products
Transformation sector			
Petroleum refinery	-	-	+
Energy Sector			
Own Use			-

Further activities for IEA questionnaires

- **Backflows to refineries from petrochemical sector**
- **Treatment in an energy balance**
 - *Gross delivers to petrochemical(naphtha) : 100 unit*
 - *Backflows to refinery : 30 unit*
 - *Input to refinery : 30 unit*

	Feedstock	Petroleum product	(Naphtha)
Transformation sector			
Petroleum refinery	-30	+30	
Petrochemical(other)	+ 30		-30
TFC			+70
Non energy			+70

Further activities for IEA questionnaires

- Treatment of Coal transformation in an energy balance

	Coking coal	Coke oven coke	COG	BFG/LDG
Transformation sector				
Coke oven	-	+	+	
Blast furnace()		-		+
Own Use			-	-

- Treatment of Biofuel in an energy balance

	Diesel	Biofuel
Production		+
Transformation		
Petroleum refinery	-	
Final Consumption		+

Issues to be solved

- **Improvement of data survey system**

- *Statistical List necessary for IEA questionnaires*
- *Improvement of data gathering methodology*
 - *Data reporting mechanism for basic energy statistics : Developing energy statistics manual*
- *Build up the survey system on consumption sector*
 - *Energy use in the petrochemical sector : petrochemical companies*
 - *Autoproducers' generation and sales of electricity and heat*
- *Institutional supports(legal basis)*

***Thank you
For your attention!***