APPENDIX A

OMTI for Electricity Supply Industry

Theme	Objective	Measurement	Target	Initiative
Financial				
F1 Public Debt	F1.1 government electricity loan	Investment ratio		
		No. of acceptance loan		
	F1.2 investor payback guarantee	Pay back level		1. Product trade-off
F2 Asset Utilization	F2.1 asset charging	Congestion rent		
	F2.2 return on asset/ overall equipment effectiveness	Asset capacity		

Theme	Objective	Measurement	Target	Initiative
Financial				
F3 Electricity Tariff	F3.1 maximizing profit	Electricity price		
		Output level		
	F3.2 financial withholding	Price cap		
	F3.3 quantity withholding	VOLL price		
		Marginal cost		
	F3.4 rate rebalancing	Contact relate with government policy		

Theme	Objective	Measurement	Target	Initiative
Financial				
F4 Investment	F4.1 PPA	Plant investment ratio		
		Technology investment ratio		
	F4.2 entry barrier	Installed capacity		
		Government support fund		
		Government support policy		

Theme	Objective	Measurement	Target	Initiative
Financial				
F5 National Resource Management	F5.1 foreign resource dependency	Resource dependency ratio		
		Foreign electricity purchase/ sale ratio		
		Fuel purchase contact		
	F5.2 native resource dependency	Resource dependency ratio		
		No. of support policy		
		Public petition		

Theme	Objective	Measurement	Target	Initiative
Customer				
C1 Government	C1.1 Social welfare	Level of service		
		Electricity price		
		Power pricing policy		
		Power usage policy		
	C1.2 Social satisfaction	Government turnover level		
		Government image		

Theme	Objective	Measurement	Target	Initiative
Customer				
C2 Industrial sector	C2.1 economic welfare	Government support policy		
	C2.2 promote buying power	Government support policy		
		Politic stability level		
		Impact on disaster		

Theme	Objective	Measurement	Target	Initiative
Customer				
C3 Investor	C3.1 investor retention	Investment support fund		
		Government support policy		
	C3.2 investor competition ability	Installed capacity level		
		Price cap level		

Theme	Objective	Measurement	Target	Initiative
Customer				
C4 Stakeholder	C4.1 company profit and debt	Public petition level		
		New technology investment		
		Company turnover		
	C4.2 stakeholder retention	Politic confidential		
		Disaster level		
		Stock price		

Theme	Objective	Measurement	Target	Initiative
Customer				
C5 general public	C5.1 social satisfaction	Voltage support		
		Energy fund for environmental impact		
		New technology usage		
		Government support law and policy		
		Political confidential level		
		Social petition		

Theme	Objective	Measurement	Target	Initiative
Internal Business Process				
I1 Asset management	I1.1 Asset capacity	Asset valuation level		
		Asset limitation level		
	I1.2 Asset monitoring	Demand to using asset		
		Asset capacity level		
		Asset charging ratio		

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Theme	Objective	Measurement	Target	Initiative
Internal Business Process				
I2 Power quality	I2.1 level of service	Outage duration time		
		SAIFI/SAIDI		
		Spinning reserve level		
		Fault generation		
		Switching error		
	I2.2 Transmission stability	Loss rate		
		FD/VD		
		SAIFI/SAIDI		
		Voltage sag		
		Voltage variation		

Theme	Objective	Measurement	Target	Initiative
Internal Business Process				
I3 Network Operation	I3.1 generator operation (SCADA)	Marginal generation cost		
		Price cap level		
		VOLL price		
		Market competition		
	I3.2 transmission operation (Smart Grid)	Physical transmission limited		
		Transmission congestion rent		
		System interruption ratio		
		System outage ratio		
		No. of contract for transmission congestion cost		

Theme	Objective	Measurement	Target	Initiative
Internal Business Process				
I4 Plant Scheduling and availability	I4.1 plant availability	Back start capacity		
		Load duration curve		
		Unit commitment		
		Overnight cost		
	I4.2 system capacity	Spinning reserve level		
		FD/VD ratio		
		Congestion rent ratio		

Theme	Objective	Measurement	Target	Initiative
Internal Business Process				
I5 Demand side management	I5.1 energy efficiency	No. of new plant		
		Energy biding ratio		
		No. of long-term purchase contact		
	I5.2 optimizing energy resource	System brownout ratio		
		No. of long-term purchase contact		

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Theme	Objective	Measurement	Target	Initiative
Internal Business Process				
I6 Market regulation	I6.1 entry barrier	No. of support policy		
		Opportunity level		
	I6.2 pricing control	Price cap		
		No. of petition		
		No. of contract		
	I6.3 scope of authority	No. of petition from		
		No. Of license		
	I6.4 operation monitoring	Accuracy of information that send from licensor		
		Amount of missing information		

Theme	Objective	Measurement	Target	Initiative
Internal Business Process				
I7 Integrated resource planning	I7.1 reliability of supply	Amount of delivering cost of electricity service		
		Resource usage ratio		
	I7.2 country development plan	Local employment ratio		
		Level of power transparency		
		Level of environmental impact		

Theme	Objective	Measurement	Target	Initiative
Learning and Growth				
L1 law and bill	L1.1 law adjustment	No. of government policy		
		Amount of law for investor exception		
	L1.2 staff development	No. of staff training		
		Customer petition on billing service		

Theme	Objective	Measurement	Target	Initiative
Learning and Growth				
L2 standard	L2.1 standard development	No. Of case study from observation staff		
		Amount of training course		
		No. of training staff		
		No. Of new standard		
		Amount of customer satisfaction by using that standard		

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Theme	Objective	Measurement	Target	Initiative
Learning and Growth				
L3 Information Technology (IT)	L3.1 IT process development	Staff satisfaction ratio on IT development		
		Customer service time		
		customer satisfaction		
		Staff service time per one job		
	L3.2 Information transfer	Time of transferring information		
		Amount of information transfer in one time		

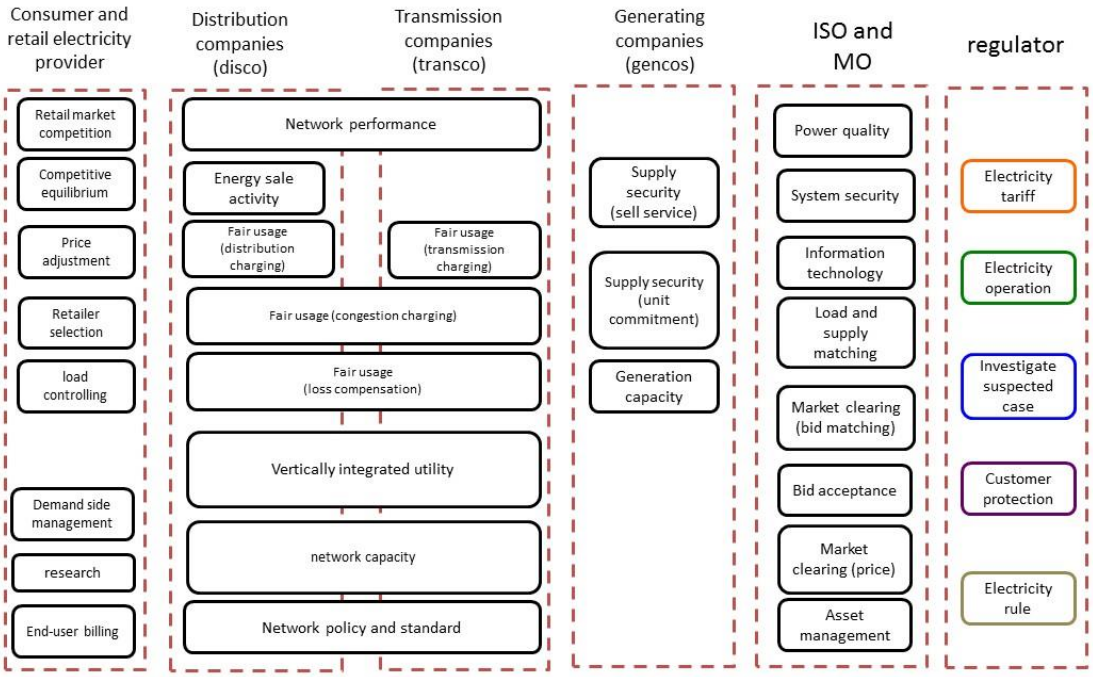
Theme	Objective	Measurement	Target	Initiative
Learning and Growth				
L4 Technology	L4.1 manufacturer motivation	No. of government support fund		
		Government support policy		
		No. of new technology that applied to the manufacturer		
	L4.2 staff development	No. of interest topic that present by staff		
		Amount of staff observation		
		No. of new technology that evaluate by staff		
	L4.3 public corporation	No. of new technology that applied to the public		

Theme	Objective	Measurement	Target	Initiative
Learning and Growth				
L5 Environmental impact	L5.1 public concentration	No. of public petition		
		Level of environmental impact per one generator/ transmission bus		
	L5.2 industry motivation	Clean energy support fund		
	L5.3 environmental standard	Amount of training cost for environmental standard		
		No. of environmental act		

Theme	Objective	Measurement	Target	Initiative
Learning and Growth				
L6 Educational institutes	L6.1 research motivation	No. of research topic that come from education institutes		
		No. of staff observation on each topic		
		Government research fund		
		No. of government support policy on each research topic		

APPENDIX B

Task Template, Communication plan, CM 1 and CM 2 worksheet



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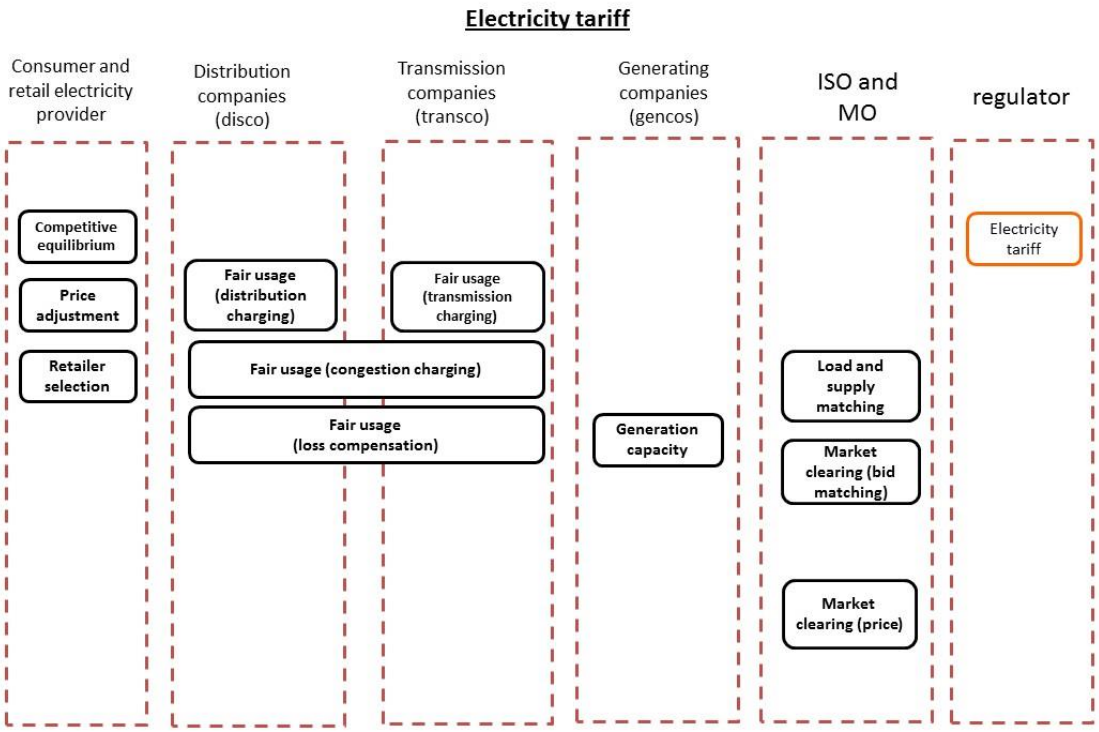
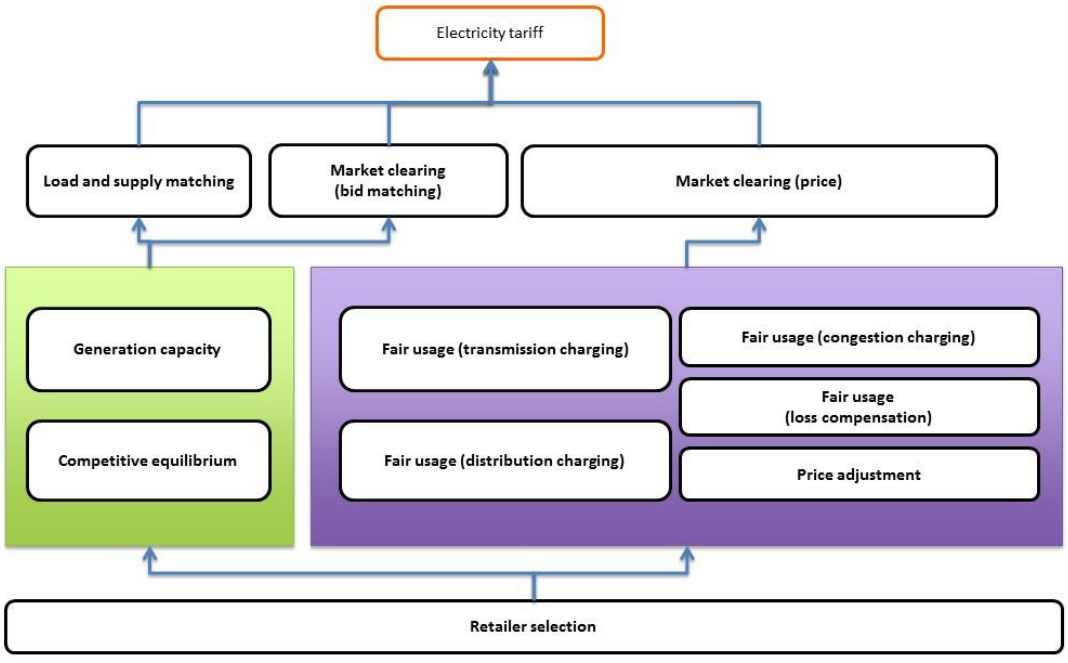
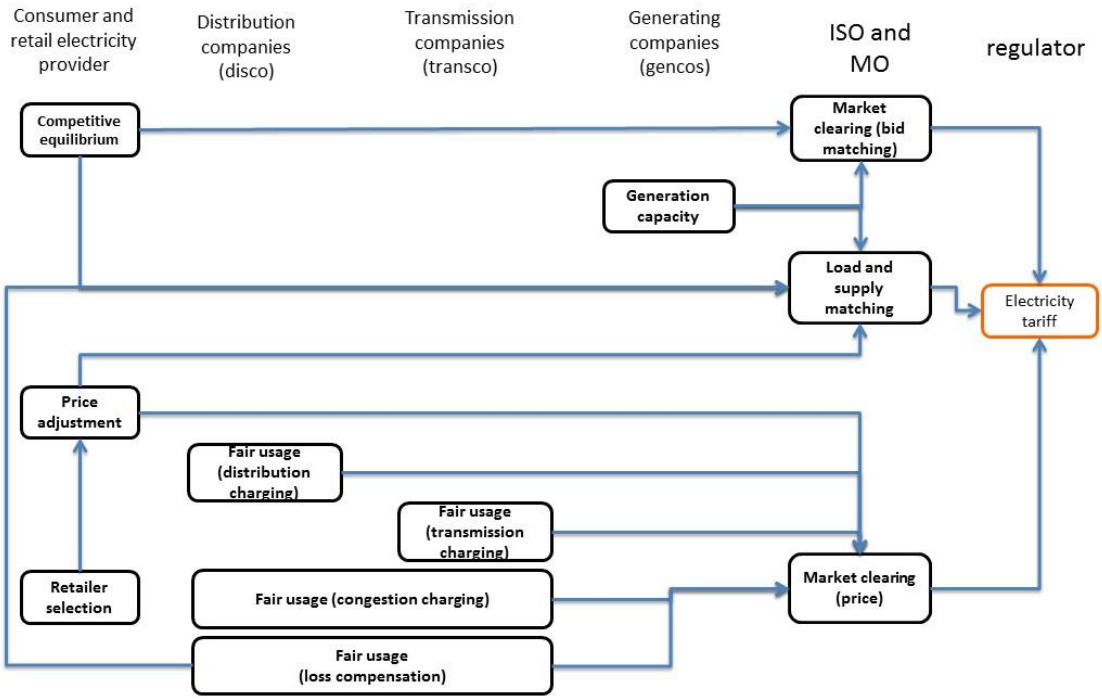

Electricity tariff
Consumer and retail electricity provider
Distribution companies (disco)
Transmission companies (transco)
Generating companies (gencos)
ISO and MO
regulator
Competitive equilibrium
Price adjustment
Retailer selection
Fair usage (distribution charging)
Fair usage (transmission charging)
Fair usage (congestion charging)
Fair usage (loss compensation)
Generation capacity
Load and supply matching
Market clearing (bid matching)
Market clearing (price)
Electricity tariff


Electricity tariff
Load and supply matching
Market clearing (bid matching)
Market clearing (price)
Generation capacity
Competitive equilibrium
Fair usage (transmission charging)
Fair usage (congestion charging)
Fair usage (loss compensation)
Fair usage (distribution charging)
Price adjustment
Retailer selection



CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Supply bid matching (market clearing)**
information object	Information receive task : ① Generation capacity ② Competitive equilibrium
Agents Involved	**Generating company (gencos):** send information to regulator **Retail electricity provider:** send information to regulator **Market operator (MO):** receive information from gencos and retail electricity provider **Market operator (MO):** send information to ISO **Independent system operator (ISO):** send information to regulator **regulator:** receive information from ISO
Communication Plan	Electricity Tariff
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Generation capacity**
Agent Involved	1. Sender (genco): plant info., fuel source, generation type, generation capacity, max capacity Receiver (MO): plant info., fuel source, generation type, generation capacity, max capacity
Information Items	MO request information from Genco 1. Role: fuel source, generation type, generation capacity act as a core object, while plant info. and max capacity are the support object 2. Form: - plant info. and generation type are data string - fuel source is data string and chart - generation capacity present in both data string and chart - max capacity present in the form of data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : MO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : genco To : MO
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Competitive equilibrium**
Agent Involved	1. Sender (retail electricity provider): retailer info., competitive level Receiver (MO): retailer info., competitive level
Information Items	MO request information from retail electricity provider 1. Role: competitive level act as a core object, while retailer info. is the support object 2. Form: - competitive level present in both data string and chart - retailer info. present in the form of canned text and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present previous operation result Reference : N/A From : retail electricity provider To : MO
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : MO To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : MO To : retail electricity provider
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Load and supply matching**
information object	Information receive task : ① Competitive equilibrium ② Generation capacity ③ Price adjustment ④ Predicting loss compensation (fair usage)
Agents Involved	**Generating company (gencos):** send information to ISO **Retail electricity provider**: send information to regulator **Distribution companies (disco):** send information to regulator **Transmission companies (transco):** send information to regulator **Independent system operator (ISO):** receive information from gencos, retail electricity provider, disco and transco **Independent system operator (ISO):** send information to regulator **regulator**: receive information from ISO
Communication Plan	Electricity Tariff
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Competitive equilibrium**
Agent Involved	1. Sender (retail electricity provider): retailer info., competitive level Receiver (ISO): retailer info., competitive level
Information Items	ISO request information from retail electricity provider 1. Role: competitive level act as a core object, while retailer info. is the support object 2. Form: - competitive level present in both data string and chart - retailer info. present in the form of canned text and chart 3. Medium : command line interface
Message Specification	
REPORT-SIMULATION-MESSAGE	Type : REPORT Content : competition level in specific area Reference : N/A From : retail electricity provider To : ISO
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : ISO To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : ISO To : retail electricity provider
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Generation capacity**
Agent Involved	1. Sender (genco): plant info., fuel source, generation type, generation capacity, max capacity Receiver (ISO): plant info., fuel source, generation type, generation capacity, max capacity
Information Items	ISO request information from Genco 1. Role: fuel source, generation type, generation capacity act as a core object, while plant info. and max capacity are the support object 2. Form: - plant info. and generation type are data string - fuel source is data string and chart - generation capacity present in both data string and chart - max capacity present in the form of data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : genco To : ISO
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Price adjustment**
Agent Involved	1. Sender (retail electricity provider): electricity price, customer type, fair adjustment (Ft), load duration curve Receiver (ISO): electricity price, customer type, fair adjustment (Ft), load duration curve owner (ISO): PDP 2. Sender (genco): generation debt and generation capacity Receiver (ISO): generation debt and generation capacity
Information Items	ISO compline information from genco and retail electricity provider 1. Role: electricity price, customer type, fair adjustment (Ft), load duration curve act as a core object, while PDP, generation debt and generation capacity are the support object 2. Form: - customer type is data string - electricity price, fair adjustment (Ft), load duration curve, generation debt and generation capacity present in both data string and chart - PDP present in the form of data string, canned text and chart 3. Medium : command line interface
Message Specification	
REPORT-SIMULATION-MESSAGE	Type : REPORT Content : price simulation Reference : Ft formula From : retail electricity provider To : ISO
REPORT-FACTORS-MESSAGE	Type : REPORT Content : Ft simulation factors Reference : N/A From : retail electricity provider To : ISO
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : retail electricity provider, genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : ISO To : retail electricity provider, genco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Predicting loss compensation (fair usage)**
Agent Involved	1. Sender (disco): loss rate, FD, VD, load duration curve, distribution info., line info. Receiver (ISO): loss rate, FD, VD, load duration curve, distribution info., line info. 2. Sender (transco): loss rate, FD, VD, load duration curve, distribution info., line info. Receiver (ISO): loss rate, FD, VD, load duration curve, distribution info., line info.
Information Items	ISO compline information from disco and transco 1. Role: loss rate act as a core object, while FD, VD, load duration curve, distribution info. and line info. is the support object 2. Form: - distribution info. and line info. are data string - loss rate, FD, VD and load duration curve present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present loss compensation information Reference : N/A From : disco, transco To : ISO
REPORT-FACTORS-MESSAGE	Type : REPORT Content : loss compensation factors Reference : N/A From : disco, transco To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : loss prediction Reference : N/A From : ISO To : disco, transco
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Monitoring price (market clearing)**
information object	Information receive task : ① Price adjustment ② Distribution charge ③ Transmission charge ④ congestion charge ⑤ Predicting loss compensation (fair usage)
Agents Involved	**Retail electricity provider**: send information to regulator **Distribution companies (disco)**: send information to regulator **Transmission companies (transco)**: send information to regulator **MO**: receive information from gencos and retail electricity provider
Communication Plan	Electricity Tariff
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Price adjustment**
Agent Involved	1. Sender (retail electricity provider): electricity price, customer type, fair adjustment (Ft), load duration curve Receiver (MO): electricity price, customer type, fair adjustment (Ft), load duration curve owner (MO): PDP 2. Sender (genco): generation debt and generation capacity Receiver (MO): generation debt and generation capacity
Information Items	MO compline information from genco and retail electricity provider 1. Role: electricity price, customer type, fair adjustment (Ft), load duration curve act as a core object, while PDP, generation debt and generation capacity are the support object 2. Form: - customer type is data string - electricity price, fair adjustment (Ft), load duration curve, generation debt and generation capacity present in both data string and chart - PDP present in the form of data string, canned text and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : retail electricity provider, genco To : MO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : MO To : retail electricity provider, genco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Distribution charge**
Agent Involved	1. Sender (disco): customer no., distribution cost Receiver (MO): customer no., distribution cost, distribution info., line info.
Information Items	MO request information from disco 1. Role: distribution cost act as a core object, while customer no., distribution info. And line info. are the support object 2. Form: - customer no., distribution info. And line info. are data string - distribution cost present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present distribution charge information Reference : N/A From : disco To : MO
REPORT-FACTORS-MESSAGE	Type : REPORT Content : distribution charge factors Reference : N/A From : disco To : MO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : distribution charge level Reference : N/A From : MO To : ISO, disco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Transmission charge**
Agent Involved	1. Sender (transco): customer no., transmission cost Receiver (MO): customer no., transmission cost, transmission info., line info.
Information Items	MO request information from transco 1. Role: transmission cost act as a core object, while transmission info., line info. are the support object 2. Form: - while transmission info., line info are data string - transmission cost present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present transmission charge information Reference : N/A From : transco To : MO
REPORT-FACTORS-MESSAGE	Type : REPORT Content : transmission charge factors Reference : N/A From : transco To : MO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : transmission charge level Reference : N/A From : MO To : ISO, disco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**congestion charge**
Agent Involved	1. Sender (disco): congestion cost, distribution info. Receiver (MO): congestion cost, distribution info. 2. Sender (transco): congestion cost, transmission info. Receiver (MO): congestion cost, transmission info.
Information Items	Market operator (MO) request information from disco and transco 1. Role: congestion cost act as a core object, while, distribution info. and transmission info. are the support object 2. Form: - distribution info. and transmission info. is data string - congestion cost present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present transmission charge information Reference : N/A From : transco To : MO
REPORT-FACTORS-MESSAGE	Type : REPORT Content : transmission charge factors Reference : N/A From : transco To : MO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : transmission charge level Reference : N/A From : MO To : ISO, disco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Predicting loss compensation (fair usage)**
Agent Involved	1. Sender (disco): loss rate, FD, VD, load duration curve, distribution info., line info. Receiver (MO): loss rate, FD, VD, load duration curve, distribution info., line info. 2. Sender (transco): loss rate, FD, VD, load duration curve, distribution info., line info. Receiver (MO): loss rate, FD, VD, load duration curve, distribution info., line info.
Information Items	Market operator(MO) compline information from disco and transco 1. Role: loss rate act as a core object, while FD, VD, load duration curve, distribution info. and line info. is the support object 2. Form: - distribution info. and line info. are data string - loss rate, FD, VD and load duration curve present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present loss compensation information Reference : N/A From : disco, transco To : ISO
REPORT-FACTORS-MESSAGE	Type : REPORT Content : loss compensation factors Reference : N/A From : disco, transco To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : loss prediction Reference : N/A From : ISO To : disco, transco
Control over message	

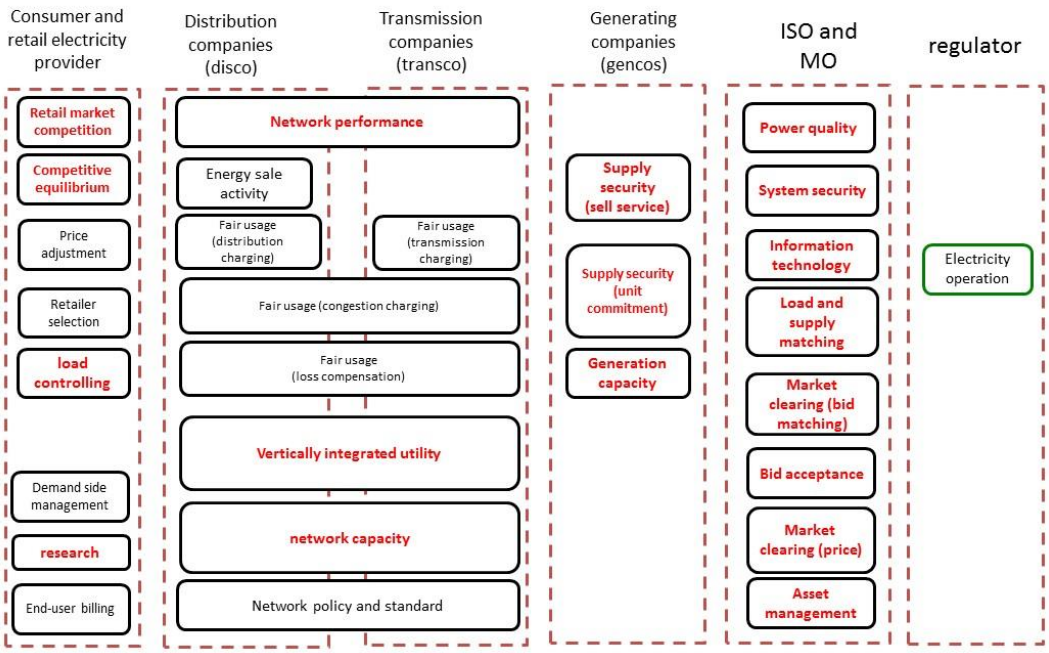
CM-1

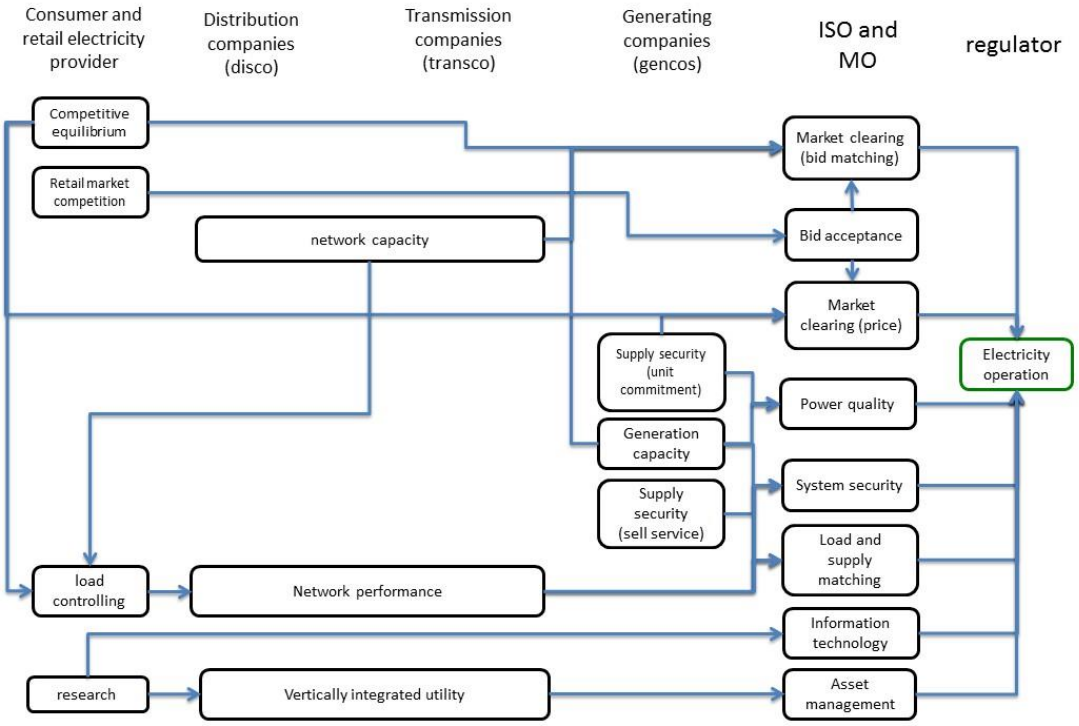
communication model	transaction description worksheet CM-1
transaction identifier/name	**Monitoring price adjustment**
information object	Information receive task : ① Retailer selection
Agents Involved	**Consumer :** send information **Retail electricity provider**: receive information
Communication Plan	Electricity Tariff
Constraints	
Information Exchange Specification	

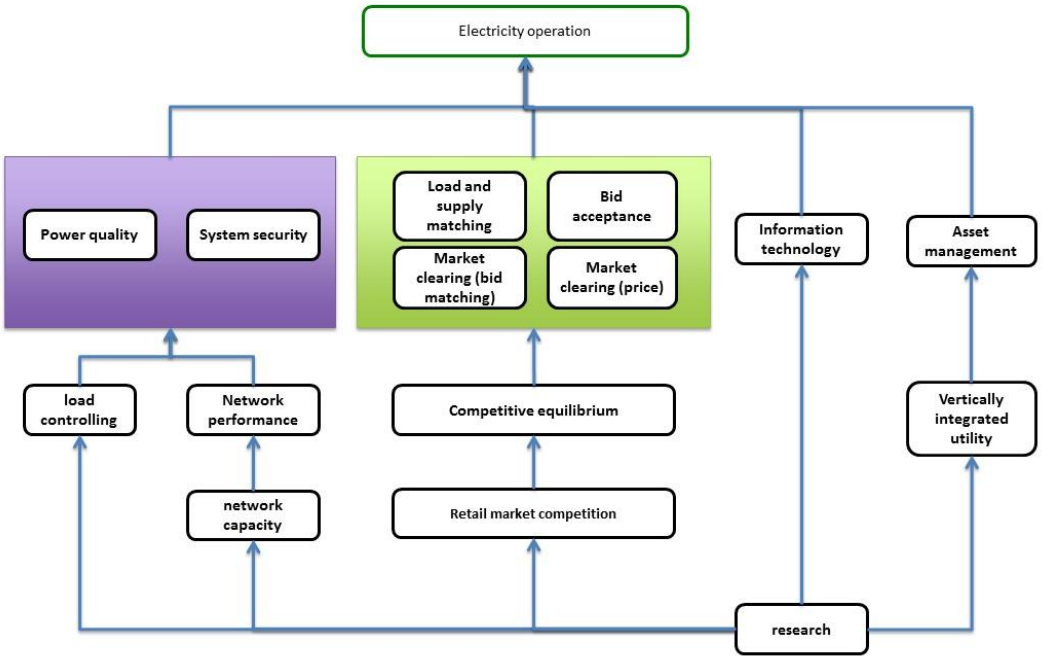
CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Retailer selection**
Agent Involved	1. Sender (disco): electricity price, retailer info. Receiver (ISO): electricity price, retailer info.
Information Items	ISO receive the information from disco 1. Role: electricity price act as a core object, while retailer info. is the support object 2. Form: - retailer info. is data string - electricity price present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : disco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : disco To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : selected result Reference : N/A From : ISO To : disco, regulator
Control over message	

Electricity operation




Consumer and retail electricity provider
Distribution companies (disco)
Transmission companies (transco)
Generating companies (gencos)
ISO and MO
regulator
Competitive equilibrium
Retail market competition
network capacity
Market clearing (bid matching)
Bid acceptance
Market clearing (price)
Supply security (unit commitment)
Generation capacity
Supply security (sell service)
Electricity operation
Power quality
System security
Load and supply matching
load controlling
Network performance
Information technology
research
Vertically integrated utility
Asset management


Electricity operation
Power quality
System security
Load and supply matching
Bid acceptance
Market clearing (bid matching)
Market clearing (price)
Information technology
Asset management
load controlling
Network performance
Competitive equilibrium
Vertically integrated utility
network capacity
Retail market competition
research

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Supply bid matching (market clearing)**
information object	Information receive task : ① **Bid acceptance** ② **Competitive equilibrium** ③ **Network capacity** ④ **Generation capacity**
Agents Involved	**Generating company (gencos)**: send information to ISO **Retail electricity provider**: send information to ISO **Distribution companies (disco)**: send information to ISO **Transmission companies (transco):** send information to ISO **Market operator (MO)**: send information to ISO **Independent system operator (ISO):** send information to regulator **regulator**: receive information from ISO
Communication Plan	Electricity operation
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Bid acceptance**
Agent Involved	1. Sender (genco): generation capacity, max capacity, bidder info. Receiver (ISO): generation capacity, max capacity, bidder info. 2. Sender (ISO): bidder info., PDP, generation technology, bidder info. Receiver (regulator): bidder info., PDP, generation technology, bidder info.
Information Items	ISO gent information from genco 1. Role: bidder info. And generation capacity act as a core object, while max capacity, PDP, generation technology are the support object 2. Form: - bidder info. is data string - while max capacity, PDP, generation technology present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present bidder information Reference : N/A From : genco To : ISO
NOT-ACCEPTE-MESSAGE	Type : REJECT-TD. Content : reject bidder Reference : N/A From : regulator To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : biding result Reference : N/A From : ISO To : genco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Competitive equilibrium**
Agent Involved	1. Sender (retail electricity provider): retailer info., competitive level Receiver (MO): retailer info., competitive level
Information Items	MO request information from retail electricity provider 1. Role: competitive level act as a core object, while retailer info. is the support object 2. Form: - competitive level present in both data string and chart - retailer info. present in the form of canned text and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present previous operation result Reference : N/A From : retail electricity provider To : MO
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : MO To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : MO To : retail electricity provider
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Network capacity**
Agent Involved	1. Sender (disco): line info., load curve in area, distributor no., amount of customer, petition level Receiver (ISO): line info., load curve in area, distributor no., amount of customer, petition level 2. Sender (transco): line info., load curve in area, distributor no., amount of customer, petition level Receiver (ISO): line info., load curve in area, distributor no., amount of customer, petition level
Information Items	ISO compline information from disco and transco 1. Role: load curve in area and petition level act as a core object, while line info., distributor no., amount of customer is the support object 2. Form: - while line info., distributor no., amount of customer are data string - load curve and petition level present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : transco, disco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : ISO To : transco, disco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Generation capacity**
Agent Involved	1. Sender (genco): plant info., fuel source, generation type, generation capacity, max capacity Receiver (ISO): plant info., fuel source, generation type, generation capacity, max capacity
Information Items	ISO request information from Genco 1. Role: fuel source, generation type, generation capacity act as a core object, while plant info. and max capacity are the support object 2. Form: - plant info. and generation type are data string - fuel source is data string and chart - generation capacity present in both data string and chart - max capacity present in the form of data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : genco To : ISO
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Monitor market price (market clearing)**
information object	Information receive task : ① Competitive equilibrium ② Bid acceptance ③ Supply security (unit commitment)
Agents Involved	**Generating company (gencos)**: send information to ISO **Retail electricity provider**: send information to ISO **Independent system operator (ISO):** send information to regulator **Market operator (MO)**: send information to ISO **regulator**: receive information from ISO
Communication Plan	Electricity operation
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Competitive equilibrium**
Agent Involved	1. Sender (retail electricity provider): retailer info., competitive level Receiver (MO): retailer info., competitive level
Information Items	MO request information from retail electricity provider 1. Role: competitive level act as a core object, while retailer info. is the support object 2. Form: - competitive level present in both data string and chart - retailer info. present in the form of canned text and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present previous operation result Reference : N/A From : retail electricity provider To : MO
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : MO To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : MO To : retail electricity provider
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Bid acceptance**
Agent Involved	1. Sender (genco): generation capacity, max capacity, bidder info. Receiver (ISO): generation capacity, max capacity, bidder info. 2. Sender (ISO): bidder info., PDP, generation technology, bidder info. Receiver (regulator): bidder info., PDP, generation technology, bidder info.
Information Items	ISO gent information from genco 1. Role: bidder info. And generation capacity act as a core object, while max capacity, PDP, generation technology are the support object 2. Form: - bidder info. is data string - while max capacity, PDP, generation technology present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present bidder information Reference : N/A From : genco To : ISO
NOT-ACCEPTE-MESSAGE	Type : REJECT-TD. Content : reject bidder Reference : N/A From : regulator To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : biding result Reference : N/A From : ISO To : genco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Supply security (unit commitment)**
Agent Involved	1. Sender (genco): unit comitment, electricity production Receiver (ISO): generation capacity, max capacity, bidder info. 2. Sender (ISO): bidder info., PDP, generation technology, bidder info. Receiver (regulator): bidder info., PDP, generation technology, bidder info.
Information Items	ISO request information from genco 1. Role: unit commitment, electricity production act as a core object, while generation capacity, max capacity, bidder info. and PDP are the support object 2. Form: - bidder info. and PDP is data string - unit commitment, electricity production, generation capacity, max capacity present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO, genco
REPORT-FACTORS-MESSAGE	Type : INFORM Content : unit commitment result Reference : N/A From : regulator To : ISO, genco
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Power quality (PQ)**
information object	Information receive task : ① **Supply security (unit commitment)** ② **Generation capacity** ③ **Network performance**
Agents Involved	**Generating company (gencos):** send information to ISO **Distribution companies (disco):** send information to ISO **Transmission companies (transco):** send information to ISO **Independent system operator (ISO):** send information to regulator **regulator:** receive information from regulator
Communication Plan	Electricity operation
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Supply security (unit commitment)**
Agent Involved	1. Sender (genco): unit comitment, electricity production Receiver (ISO): generation capacity, max capacity, bidder info. 2. Sender (ISO): bidder info., PDP, generation technology, bidder info. Receiver (regulator): bidder info., PDP, generation technology, bidder info.
Information Items	ISO request information from genco 1. Role: unit commitment, electricity production act as a core object, while generation capacity, max capacity, bidder info. and PDP are the support object 2. Form: - bidder info. and PDP is data string - unit commitment, electricity production, generation capacity, max capacity present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO, genco
REPORT-FACTORS-MESSAGE	Type : INFORM Content : unit commitment result Reference : N/A From : regulator To : ISO, genco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Generation capacity**
Agent Involved	1. Sender (genco): plant info., fuel source, generation type, generation capacity, max capacity Receiver (ISO): plant info., fuel source, generation type, generation capacity, max capacity
Information Items	ISO request information from Genco 1. Role: fuel source, generation type, generation capacity act as a core object, while plant info. and max capacity are the support object 2. Form: - plant info. and generation type are data string - fuel source is data string and chart - generation capacity present in both data string and chart - max capacity present in the form of data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : genco To : ISO
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Network performance**
Agent Involved	1. Sender (disco): loss rate, line info., network duration ratio, network duration by case Receiver (ISO): loss rate, line info., network duration ratio, network duration by case 2. Sender (transco): loss rate, line info., network duration ratio, network duration by case Receiver (ISO): loss rate, line info., network duration ratio, network duration by case
Information Items	ISO compline information from disco and transco 1. Role: loss rate, network duration ratio, network duration by case act as a core object, while line info. is the support object 2. Form: - line info. is data string - loss rate, network duration ratio, network duration present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : disco, transco To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : network performance indicator Reference : N/A From : disco, transco To : ISO
REQUEST-MESSAGE	Type : REJECT-TD. Content : ask for new information Reference : N/A From : ISO To : disco, transco
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**System security**
information object	Information receive task : ① **Supply security (unit commitment)** ② **Supply security (sell service)** ③ **Network performance**
Agents Involved	**Generating company (gencos):** send information to ISO **Distribution companies (disco):** send information to ISO **Transmission companies (transco):** send information to ISO **Independent system operator (ISO):** send information to regulator **regulator:** receive information from ISO
Communication Plan	Electricity operation
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Supply security (unit commitment)**
Agent Involved	1. Sender (genco): unit comitment, electricity production Receiver (ISO): generation capacity, max capacity, bidder info. 2. Sender (ISO): bidder info., PDP, generation technology, bidder info. Receiver (regulator): bidder info., PDP, generation technology, bidder info.
Information Items	ISO request information from genco 1. Role: unit commitment, electricity production act as a core object, while generation capacity, max capacity, bidder info. and PDP are the support object 2. Form: - bidder info. and PDP is data string - unit commitment, electricity production, generation capacity, max capacity present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO, genco
REPORT-FACTORS-MESSAGE	Type : INFORM Content : unit commitment result Reference : N/A From : regulator To : ISO, genco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Supply security (sell service)**
Agent Involved	1. Sender (genco): contact info. Wholesale electricity price, maintenance time Receiver (ISO): contact info. Wholesale electricity price, maintenance time
Information Items	ERC Staff compline information from EGAT, MEA and PEA 1. Role: previous information (Supply) and initial simulation act as a core object, while PDP is the support object 2. Form: - previous information is data string - initial simulation present in both data string and chart - PDP present in the form of data string, canned text and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO, genco
REPORT-FACTORS-MESSAGE	Type : INFORM Content : service level result Reference : N/A From : regulator To : ISO, genco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Network performance**
Agent Involved	1. Sender (disco): loss rate, line info., network duration ratio, network duration by case Receiver (ISO): loss rate, line info., network duration ratio, network duration by case 2. Sender (transco): loss rate, line info., network duration ratio, network duration by case Receiver (ISO): loss rate, line info., network duration ratio, network duration by case
Information Items	ISO compline information from disco and transco 1. Role: loss rate, network duration ratio, network duration by case act as a core object, while line info. is the support object 2. Form: - line info. is data string - loss rate, network duration ratio, network duration present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : disco, transco To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : network performance indicator Reference : N/A From : disco, transco To : ISO
REQUEST-MESSAGE	Type : REJECT-TD. Content : ask for new information Reference : N/A From : ISO To : disco, transco
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Load and supply matching**
information object	Information receive task : ① Generation capacity ② Supply security (unit commitment) ③ Network performance
Agents Involved	**Generating company (gencos):** send information to ISO **Distribution companies (disco):** send information to ISO **Transmission companies (transco):** send information to ISO **Independent system operator (ISO):** send information to regulator **regulator**: receive information from ISO
Communication Plan	Electricity Operation
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Generation capacity**
Agent Involved	1. Sender (genco): plant info., fuel source, generation type, generation capacity, max capacity Receiver (ISO): plant info., fuel source, generation type, generation capacity, max capacity
Information Items	ISO request information from Genco 1. Role: fuel source, generation type, generation capacity act as a core object, while plant info. and max capacity are the support object 2. Form: - plant info. and generation type are data string - fuel source is data string and chart - generation capacity present in both data string and chart - max capacity present in the form of data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : genco To : ISO
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Supply security (unit commitment)**
Agent Involved	1. Sender (genco): unit comitment, electricity production Receiver (ISO): generation capacity, max capacity, bidder info. 2. Sender (ISO): bidder info., PDP, generation technology, bidder info. Receiver (regulator): bidder info., PDP, generation technology, bidder info.
Information Items	ISO request information from genco 1. Role: unit commitment, electricity production act as a core object, while generation capacity, max capacity, bidder info. and PDP are the support object 2. Form: - bidder info. and PDP is data string - unit commitment, electricity production, generation capacity, max capacity present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO, genco
REPORT-FACTORS-MESSAGE	Type : INFORM Content : unit commitment result Reference : N/A From : regulator To : ISO, genco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Network performance**
Agent Involved	1. Sender (disco): loss rate, line info., network duration ratio, network duration by case Receiver (ISO): loss rate, line info., network duration ratio, network duration by case 2. Sender (transco): loss rate, line info., network duration ratio, network duration by case Receiver (ISO): loss rate, line info., network duration ratio, network duration by case
Information Items	ISO compline information from disco and transco 1. Role: loss rate, network duration ratio, network duration by case act as a core object, while line info. is the support object 2. Form: - line info. is data string - loss rate, network duration ratio, network duration present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : disco, transco To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : network performance indicator Reference : N/A From : disco, transco To : ISO
REQUEST-MESSAGE	Type : REJECT-TD. Content : ask for new information Reference : N/A From : ISO To : disco, transco
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Information technology**
information object	Information receive task : ① **Monitoring research**
Agents Involved	**Generating company (gencos):** send information to ISO **Retail electricity provider:** send information to ISO **Distribution companies (disco):** send information to ISO **Transmission companies (transco):** send information to ISO **Independent system operator (ISO):** send information to regulator **Market operator (MO):** send information to regulator **regulator:** receive informa tion from ISO and MO
Communication Plan	Electricity Operation
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Monitoring research**
Agent Involved	1. Sender (consumer): research info., research solution, research adoption level Receiver (ISO): research info., research solution, research adoption level 2. Sender (ISO): research adoption level, research problem Receiver (regulator): research adoption level, research problem
Information Items	ISO compline information from consumer and send to regulator 1. Role: research adoption level act as a core object, while research info., research solution and research problem are the support object 2. Form: - research info., research solution and research problem are data string - research adoption level present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : consumer To : ISO, regulator
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO
TESTING-MESSAGE	Type : ORDER Content : research project testing Reference : N/A From : ISO To : genco, disco, transco and retail electricity provider
REPORT-RESULT-MESSAGE	Type : INFORM Content : research result Reference : N/A From : ISO To : regulator
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Asset management**
information object	Information receive task : ① **Vertically integrated utility**
Agents Involved	**Distribution companies (disco):** send information to ISO **Transmission companies (transco):** send information to ISO **Independent system operator (ISO):** send information to regulator **regulator**: receive informa tion from ISO
Communication Plan	Electricity Operation
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Vertically integrated utility**
Agent Involved	1. Sender (disco): asset info. Asset usage ratio, asset depreciation expense Receiver (ISO): asset info. Asset usage ratio, asset depreciation expense 2. Sender (transco): asset info. Asset usage ratio, asset depreciation expense Receiver (ISO): asset info. Asset usage ratio, asset depreciation expense
Information Items	ISO request information from disco and transco 1. Role: Asset usage ratio, asset depreciation expense act as a core object, while asset info. is the support object 2. Form: - asset info is data string - Asset usage ratio, asset depreciation expense present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : disco, transco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : ISO To : disco, transco
RESULT-MESSAGE	Type : INFORM Content : Ft simulation factors Reference : N/A From : ISO To : disco, transco
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Bid acceptance**
information object	Information receive task : ① **Retail market competition**
Agents Involved	**Retail electricity provider**: send information to MO **Market operator (MO)**: receive information from retail electricity provider **regulator**: receive informa tion from gencos and retail electricity provider
Communication Plan	Electricity Operation
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Retail market competition**
Agent Involved	1. Sender (retail electricity provider): retailer info., customer info., distribution ability, competitive level Receiver (ISO): retailer info., customer info., distribution ability, competitive level
Information Items	ISO compline information from retail electricity provider 1. Role: distribution ability, competitive level act as a core object, while retailer info., customer info. are the support object 2. Form: - retailer info., customer info. is data string - distribution ability, competitive level n present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present previous operation result Reference : N/A From : retail electricity provider To : ISO
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : ISO To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : ISO To : retail electricity provider
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Network performance**
information object	Information receive task : ① **Load controlling**
Agents Involved	**Retail electricity provider**: send information to ISO, Disco and Transco **Distribution companies (disco):** receive information from retail electricity provider **Transmission companies (transco):** receive information from retail electricity provider **Independent system operator (ISO):** receive information from retail electricity provider **regulator**: receive information from ISO
Communication Plan	Electricity Tariff
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Load controlling**
Agent Involved	1. Sender (retail electricity provider): retailer info., load curve Receiver (ISO): retailer info., load curve Receiver (MO): retailer info., load curve
Information Items	ISO and MO request information from retail electricity provider 1. Role: load curve act as a core object, while retailer info. is the support object 2. Form: - retailer info. is data string - load curve present in both data string and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present load controlling information Reference : N/A From : retail electricity provider To : ISO, MO
NOT-ACCEPTE-MESSAGE	Type : REJECT-TD. Content : reject controlling order Reference : N/A From : MO, ISO To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : MO, ISO To : retail electricity provider
REPORT-FACTORS-MESSAGE	Type : INFORM Content : load controlling order Reference : N/A From : ISO To : retail electricity provider
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Load controlling**
information object	Information receive task :
Agents Involved	**Generating company (gencos):** send information to retail electricity provider **Retail electricity provider**: send information to ISO, Disco and Transco **Distribution companies (disco):** send information to retail electricity provider **Transmission companies (transco):** send information to retail electricity provide **Independent system operator (ISO):** send information to regulator **regulator**: receive informa tion from ISO
Communication Plan	Electricity Tariff
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Network capacity**
Agent Involved	1. Sender (disco): line info., load curve in area, distributor no., amount of customer, petition level Receiver (ISO): line info., load curve in area, distributor no., amount of customer, petition level 2. Sender (transco): line info., load curve in area, distributor no., amount of customer, petition level Receiver (ISO): line info., load curve in area, distributor no., amount of customer, petition level
Information Items	ISO compline information from disco and transco 1. Role: load curve in area and petition level act as a core object, while line info., distributor no., amount of customer is the support object 2. Form: - while line info., distributor no., amount of customer are data string - load curve and petition level present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : transco, disco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : ISO To : transco, disco
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Generation capacity**
Agent Involved	1. Sender (genco): plant info., fuel source, generation type, generation capacity, max capacity Receiver (ISO): plant info., fuel source, generation type, generation capacity, max capacity
Information Items	ISO request information from Genco 1. Role: fuel source, generation type, generation capacity act as a core object, while plant info. and max capacity are the support object 2. Form: - plant info. and generation type are data string - fuel source is data string and chart - generation capacity present in both data string and chart - max capacity present in the form of data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : genco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : genco To : ISO
Control over message	

CM-2

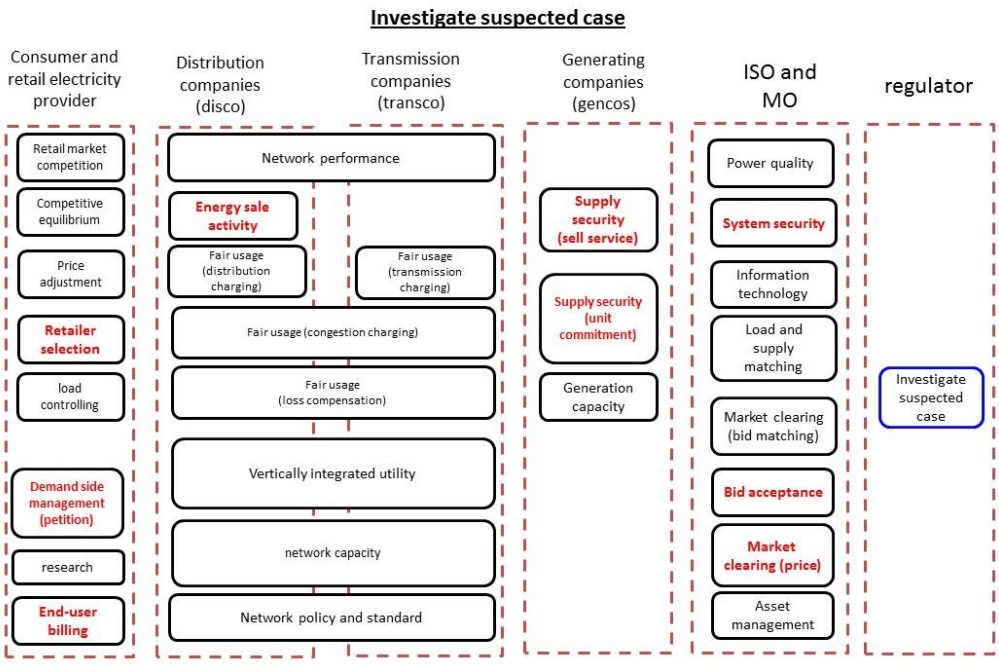
communication model	Information Exchange Specification worksheet CM-2
Transaction	**Competitive equilibrium**
Agent Involved	1. Sender (retail electricity provider): retailer info., competitive level Receiver (ISO): retailer info., competitive level
Information Items	ISO request information from retail electricity provider 1. Role: competitive level act as a core object, while retailer info. is the support object 2. Form: - competitive level present in both data string and chart - retailer info. present in the form of canned text and chart 3. Medium : command line interface
Message Specification	
PRESENT-MESSAGE	Type : REPORT Content : present previous operation result Reference : N/A From : retail electricity provider To : MO
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : MO To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : MO To : retail electricity provider
Control over message	

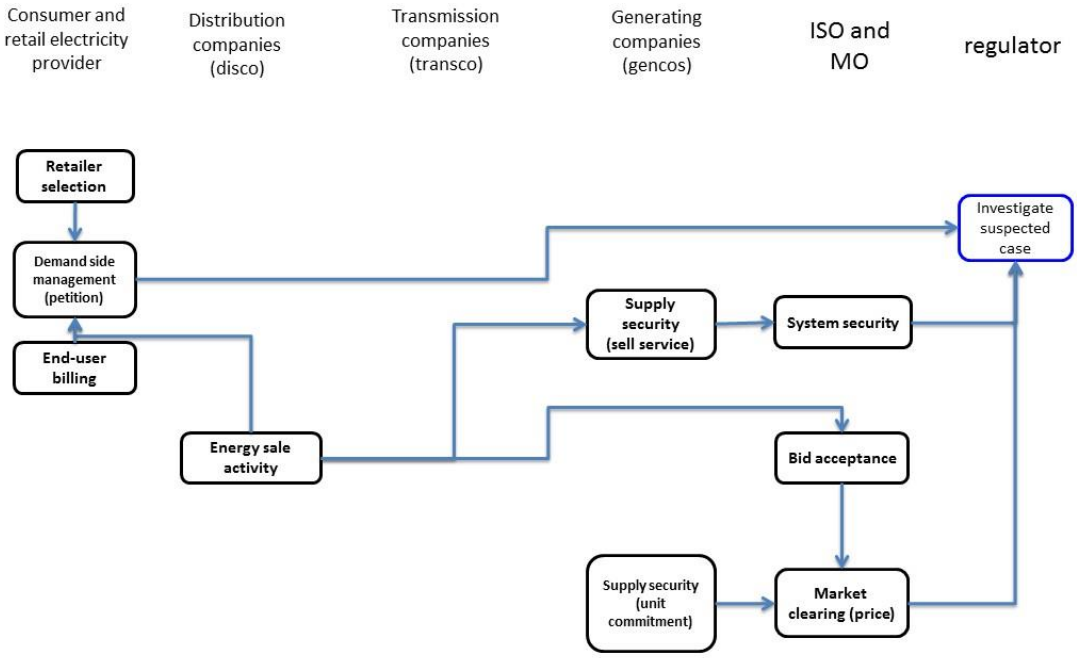
CM-1

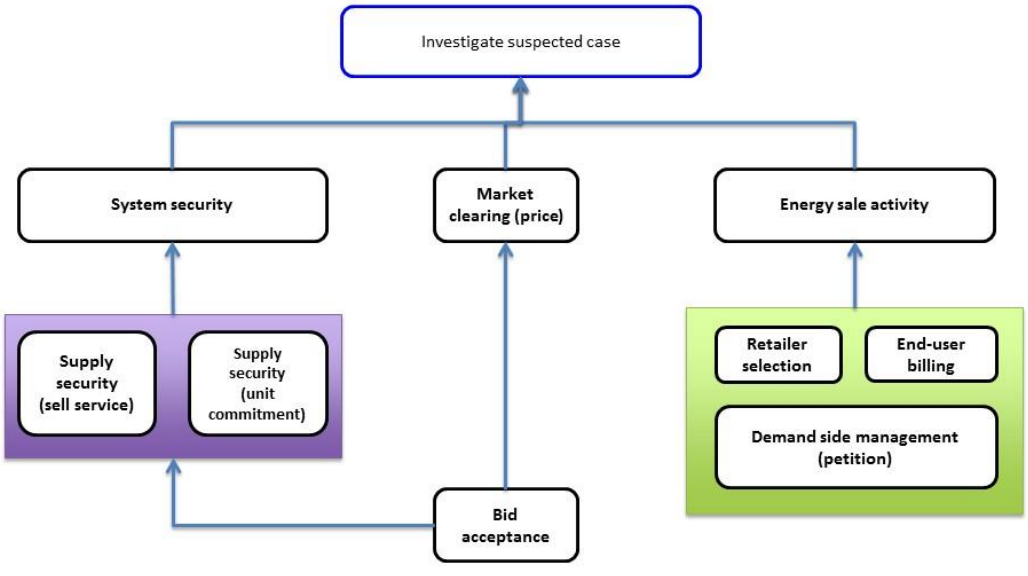
communication model	transaction description worksheet CM-1
transaction identifier/name	**Vertically integrated utility**
information object	Information receive task : ① **research**
Agents Involved	**Retail electricity provider**: send information to ISO, Disco and Transco **Distribution companies (disco)**: receive information from retail electricity provider **Transmission companies (transco):** receive information from retail electricity provider **Independent system operator (ISO):** receive information from retail electricity provider **regulator**: receive informa tion from ISO and retail electricity provider
Communication Plan	Electricity Tariff
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Monitoring research**
Agent Involved	1. Sender (consumer): research info., research solution, research adoption level Receiver (ISO): research info., research solution, research adoption level 2. Sender (ISO): research adoption level, research problem Receiver (regulator): research adoption level, research problem
Information Items	ISO compline information from consumer and send to regulator 1. Role: research adoption level act as a core object, while research info., research solution and research problem are the support object 2. Form: - research info., research solution and research problem are data string - research adoption level present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : consumer To : ISO, regulator
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : regulator To : ISO
TESTING-MESSAGE	Type : ORDER Content : research project testing Reference : N/A From : ISO To : genco, disco, transco and retail electricity provider
REPORT-RESULT-MESSAGE	Type : INFORM Content : research result Reference : N/A From : ISO To : regulator
Control over message	




Consumer and retail electricity provider
Distribution companies (disco)
Transmission companies (transco)
Generating companies (gencos)
ISO and MO
regulator
Retailer selection
Demand side management (petition)
End-user billing
Energy sale activity
Supply security (sell service)
System security
Investigate suspected case
Bid acceptance
Supply security (unit commitment)
Market clearing (price)


Investigate suspected case
System security
Market clearing (price)
Energy sale activity
Supply security (sell service)
Supply security (unit commitment)
Retailer selection
End-user billing
Demand side management (petition)
Bid acceptance

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**Demand side management (petition)**
information object	Information receive task : ① **Retailer selection** ② **End-user billing** ③ **Energy sale activity**
Agents Involved	**Retail electricity provider**: send information to regulator **Distribution companies (disco)**: send information to retail electricity provider **Retail electricity provider**: receive information from disco **regulator**: receive information from retail electricity provider
Communication Plan	Investigate suspected case
Constraints	
Information Exchange Specification	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Retailer selection**
Agent Involved	1. Sender (disco): electricity price, retailer info. Receiver (ISO): electricity price, retailer info.
Information Items	ISO receive the information from disco 1. Role: electricity price act as a core object, while retailer info. is the support object 2. Form: - retailer info. is data string - electricity price present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : disco To : ISO
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : disco To : ISO
REPORT-FACTORS-MESSAGE	Type : INFORM Content : selected result Reference : N/A From : ISO To : disco, regulator
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**End-user billing**
Agent Involved	1. Sender (consumer): electricity price, billing info. Consumer petition Receiver (retail electricity provider): electricity price, billing info. Consumer petition
Information Items	Retail electricity provider request information from consumer 1. Role: electricity price, billing info. Consumer petition act as a core object 2. Form: - electricity price, billing info. Consumer petition are data string 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : consumer To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : retail electricity provider To : consumer
FINAL-DECISION-MESSAGE	Type : ORDER Content : end user billing result Reference : N/A From : regulator To : retail electricity provider
REPORT-FACTORS-MESSAGE	Type : INFORM Content : end user billing policy Reference : N/A From : regulator To : retail electricity provider
Control over message	

CM-2

communication model	Information Exchange Specification worksheet CM-2
Transaction	**Energy sale activity**
Agent Involved	1. Sender (disco): promotion info., consumer target, activity progress Receiver (retail electricity provider): promotion info., consumer target, activity progress
Information Items	Disco send information to retail electricity provider 1. Role: activity progress act as a core object, while promotion info. and consumer target are the support object 2. Form: - promotion info. and consumer target are data string - activity progress present in both data string and chart 3. Medium : command line interface
Message Specification	
RECEIVE-MESSAGE	Type : REQUIRE Content : get information Reference : N/A From : disco To : retail electricity provider
MORE-INFORMATION-MESSAGE	Type : REQUEST Content : request more information Reference : Committee order From : retail electricity provider To : disco
FINAL-DECISION-MESSAGE	Type : ORDER Content : end user billing result Reference : N/A From : regulator To : retail electricity provider, disco
REPORT-FACTORS-MESSAGE	Type : INFORM Content : end user billing policy Reference : N/A From : regulator To : retail electricity provider, disco
Control over message	

CM-1

communication model	transaction description worksheet CM-1
transaction identifier/name	**System security**
information object	Information receive task : ① **Supply security (sell service)**
Agents Involved	**Generating company (gencos):** send information to ISO **Independent system operator (ISO):** send information to regulator **Independent system operator (ISO):** receive information from gencos **regulator:** receive information from ISO
Communication Plan	Investigate suspected case
Constraints	
Information Exchange Specification	

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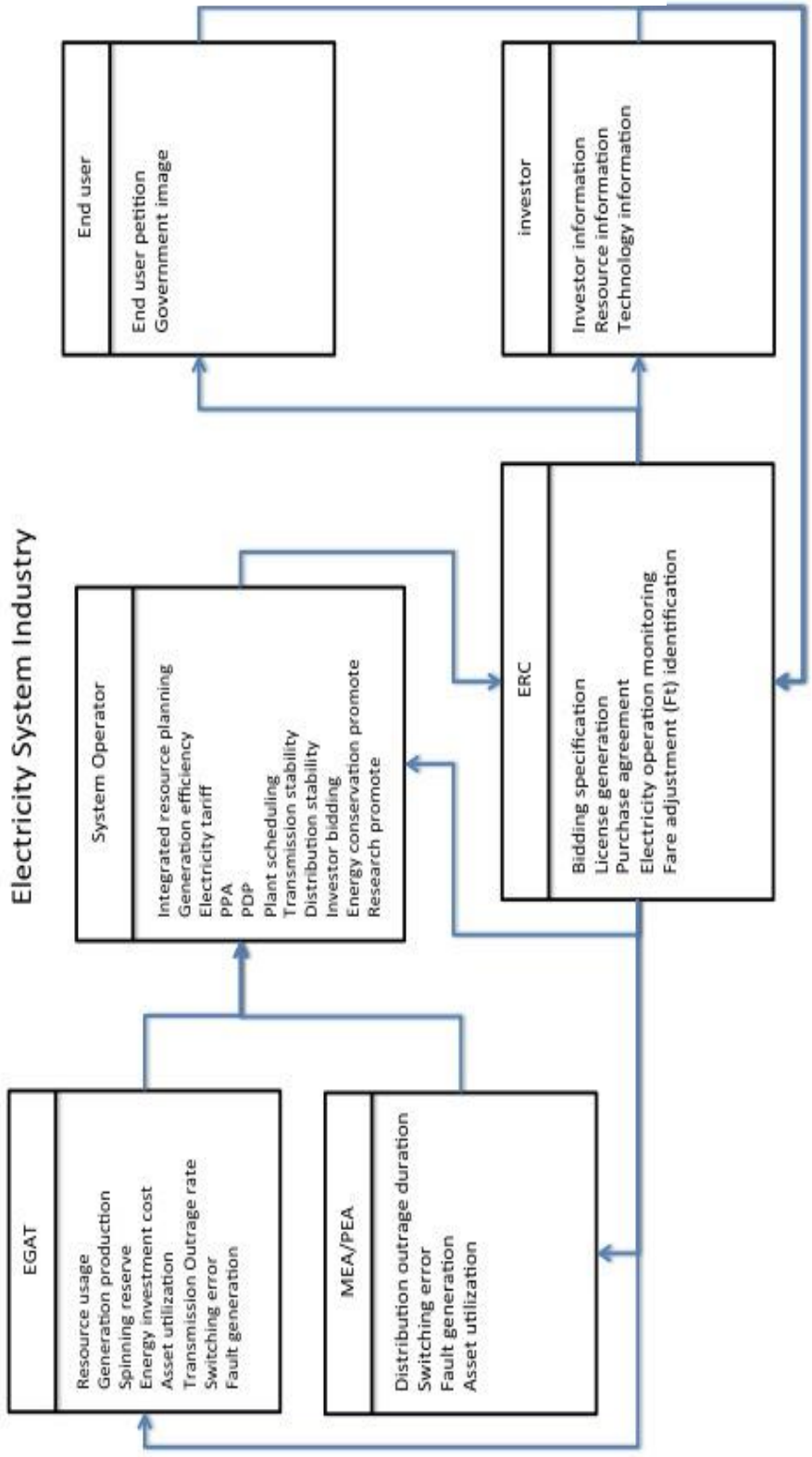
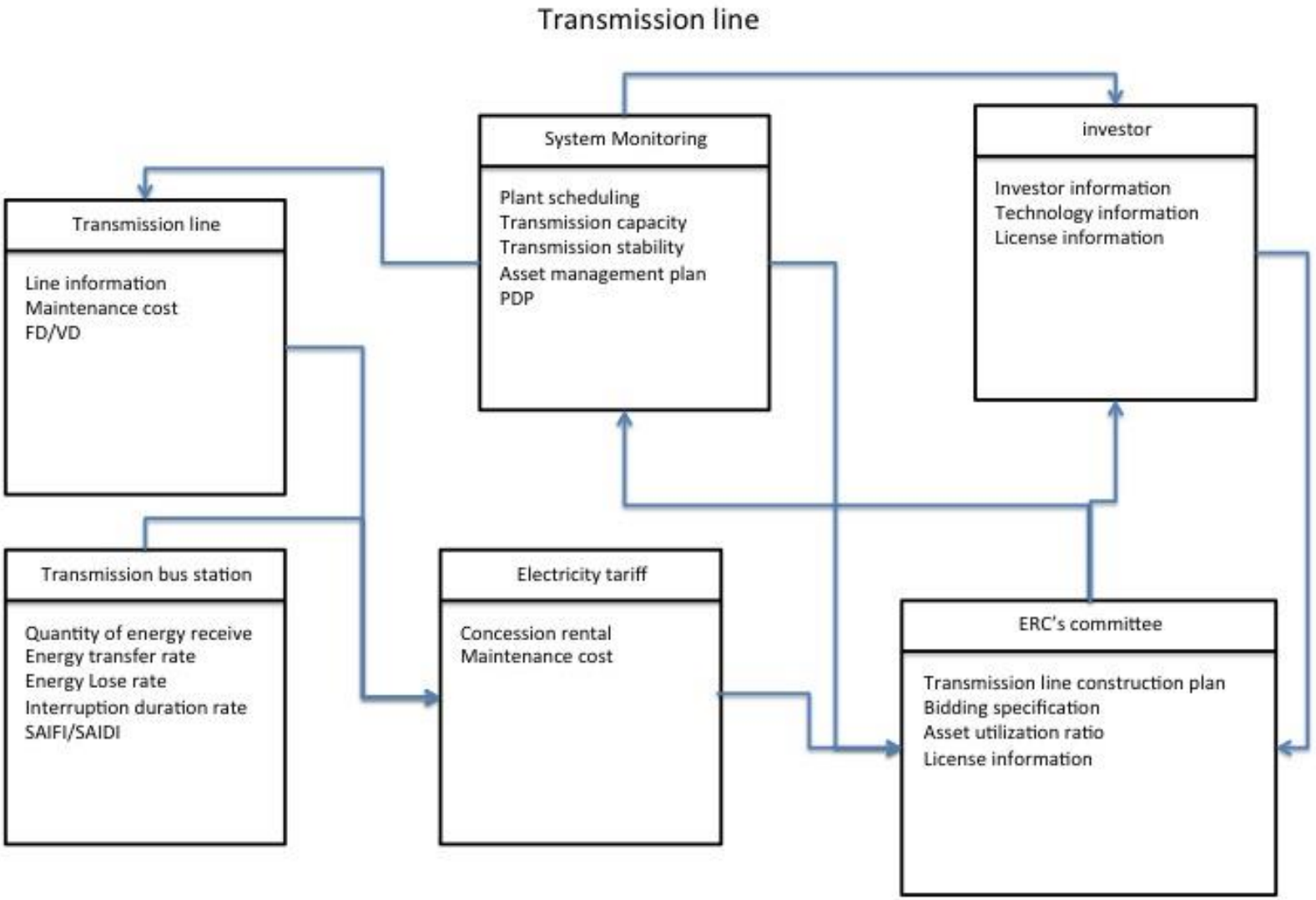
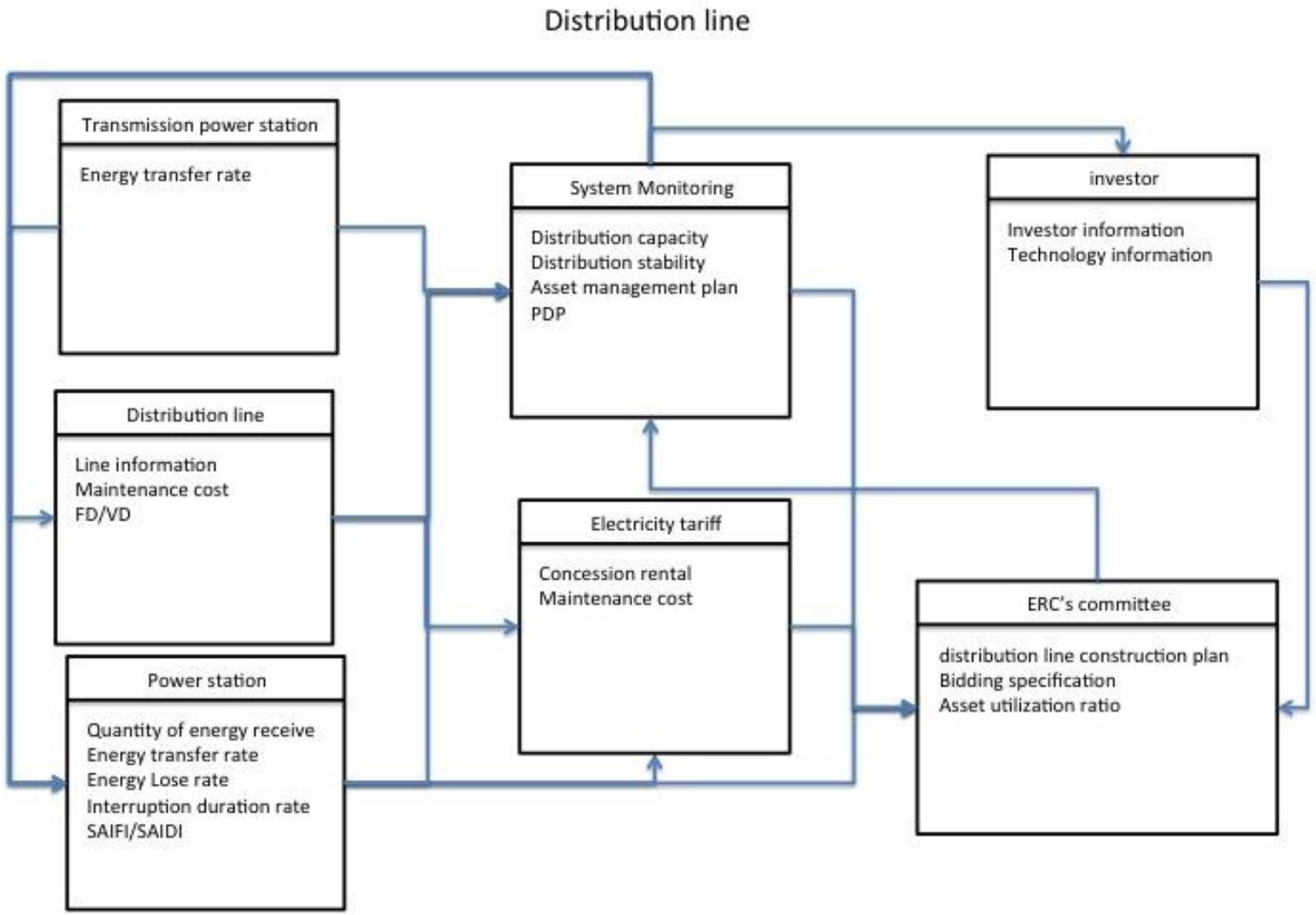
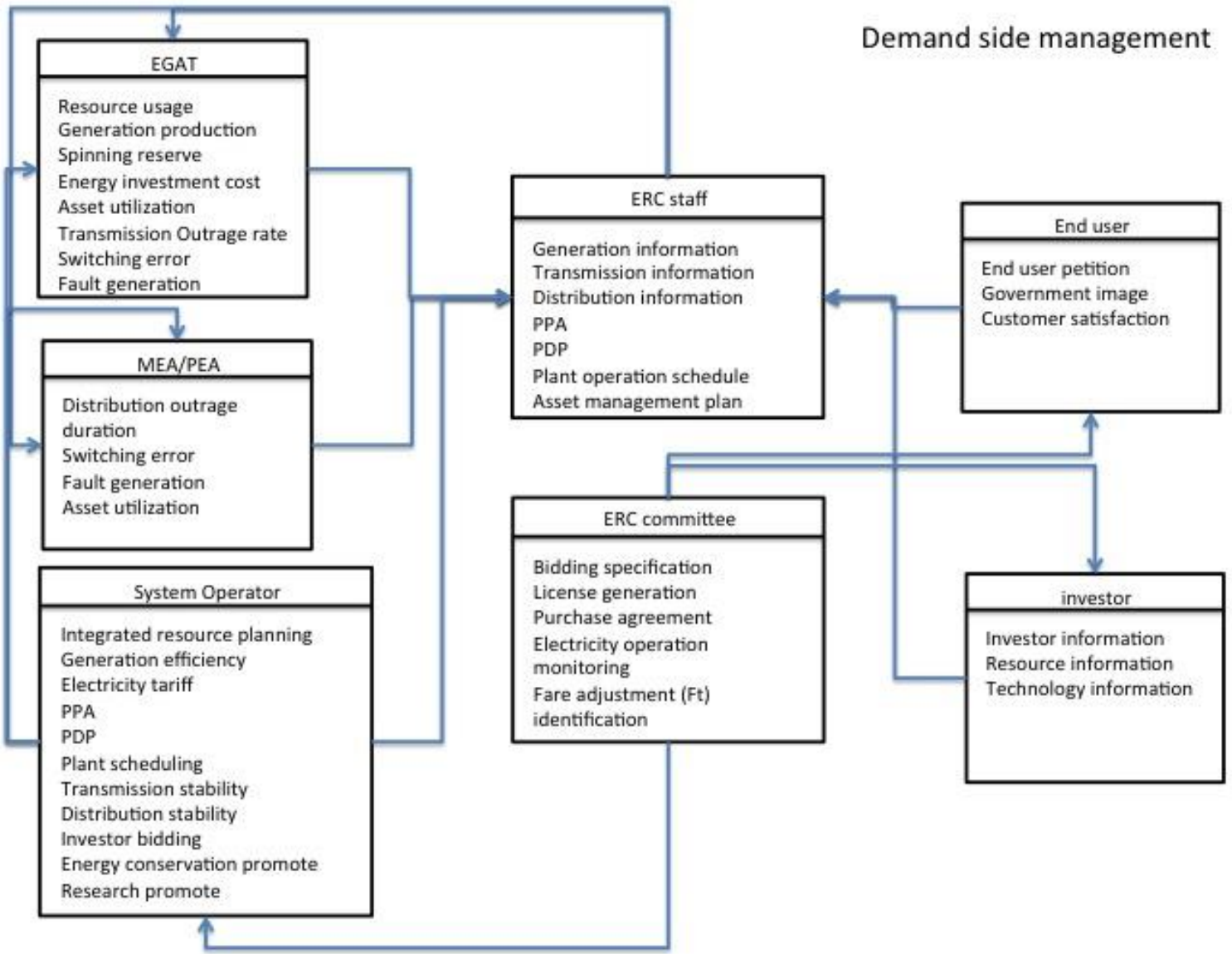
APPENDIX C

Common Information Modelling




Transmission line
System Monitoring
Plant scheduling
Transmission capacity
Transmission stability
Asset management plan
PDP
investor
Investor information
Technology information
License information
Transmission line
Line information
Maintenance cost
FD/VD
Transmission bus station
Quantity of energy receive
Energy transfer rate
Energy Lose rate
Interruption duration rate
SAIFI/SAIDI
Electricity tariff
Concession rental
Maintenance cost
ERC's committee
Transmission line construction plan
Bidding specification
Asset utilization ratio
License information


Distribution line
Transmission power station
Energy transfer rate
System Monitoring
Distribution capacity
Distribution stability
Asset management plan
PDP
investor
Investor information
Technology information
Distribution line
Line information
Maintenance cost
FD/VD
Electricity tariff
Concession rental
Maintenance cost
ERC's committee
distribution line construction plan
Bidding specification
Asset utilization ratio
Power station
Quantity of energy receive
Energy transfer rate
Energy Lose rate
Interruption duration rate
SAIFI/SAIDI


Demand side management
EGAT
Resource usage
Generation production
Spinning reserve
Energy investment cost
Asset utilization
Transmission Outrage rate
Switching error
Fault generation
MEA/PEA
Distribution outrage duration
Switching error
Fault generation
Asset utilization
System Operator
Integrated resource planning
Generation efficiency
Electricity tariff
PPA
PDP
Plant scheduling
Transmission stability
Distribution stability
Investor bidding
Energy conservation promote
Research promote
ERC staff
Generation information
Transmission information
Distribution information
PPA
PDP
Plant operation schedule
Asset management plan
ERC committee
Bidding specification
License generation
Purchase agreement
Electricity operation monitoring
Fare adjustment (Ft) identification
End user
End user petition
Government image
Customer satisfaction
investor
Investor information
Resource information
Technology information

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Publications	R. Rodprasert, T. Chandarasupsang, N. Chakpitak, "Developing Strategic National Energy Framework with Balance Scorecard (BSC)", 2012 SKIMA Conference, No. 73, 2012.	
	R. Rodprasert, T. Chandarasupsang, N. Chakpitak and P.P. Yupapin, "3D Energy Framework Strategy by Balanced Scorecard", Life Science Journal, Vol. 11 No.2 15 Jan 2014, page 209-220.	
	R. Rodprasert, T. Chandarasupsang, N. Chakpitak and P.P. Yupapin, "Alternative Design Approach for Energy Management System", Life Science Journal, Vol. 11 No.2 15 Jan 2014, page 221-234.	
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