

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

Final Report

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APPENDICES

Appendix-A List of Collected Drawing and Documents

Appendix-A List of Collected Drawing and Documents**Table A.1 Summary of All Collected Data**

DOCUMENT TYPE	PETRO-BANGLA	GTCL	TGTDCL	BAPEX	BGFCL	BGDCL	JGTDCL	BGSL	PGCL	SGFL	GOB/MoCO MMN	TOTAL
LIST OF PIPELINE & VALVE STATIONS		1				2	1					4
FUTURE PLAN	1											1
REPORT	1											1
COVER SHEET		8										8
ALIGNMENT SHEET	28	257	37				20	5				347
ROUTE PLAN/ACQUISITION/MOUZA		26	31				1					58
LOCAL DISTRIBUTION NETWORK			11									11
PFD/P&ID				6	29		7					42
PIPING DRAWINGS		57	3				1		6			67
PLOT PLAN		46										46
LIST OF GF FACILITIES				1	1							2
LOCATION OF WELLS AND SALES METERS					13							13
GAS/CONDENSATE DATA				8								8
OPERATIONAL INFORMATION					13							13
LIST OF CP SYSTEM		3				8			12			23
SPECIFICATIONS	11	66			8	5	7		2	1		100
STANDARD DRAWINGS		43	31			4			28			106
OTHERS											12	12
Summary	41	507	113	15	64	19	37	5	48	1	12	862

Source: Prepared by JST

Table A.2 Summary of All Collected Data

BAPEX	DESIGN DATA FOR ALL GF	PRODUCTI ON DATA (8 JULY 2017)	GAS, CONDENSATE ANALYSIS	PFD / P&ID
BEGUMGANJ GF	X	X	X	X
FENCHUGANJ GF	X	X	X	X
RUPGANJ GF	X	X	X	X
SALDANADI GF	X	X	X	
SEMTANG GF	X	X	X	X
SHAHBAZPUR GF	X	X	X	X
SRIKAL GF	X	X	X	X
SUNDALPUR GF	X	X	X	

BGFCL	DESIGN DATA FOR ALL GF	PRODUCTI ON DATA (2012 TO 2017)	GAS, CONDENSATE ANALYSIS	PFD / P&ID	GAS PRESSURE, FLOW RATE	LOCATION			
						WELL	PROCESS PLANT	SALES METER-ING	TIE-IN
BAKHRABAD GF	X	X	X	X	X	X	X		
HABIGANJ GF	X	X	X	X	X	X	X	X	
MEGHNA GF	X	X	X		X	X	X		
NARSINGDI GF	X	X	X		X	X	X	X	
TITAS #17	X			X					
TITAS 6	X			X		X	X	X	X
TITAS 7 & 8	X			X					
TITAS 9 & 10	X								
TITAS GF	X	X	X	X	X				
LOCATION-I	X			X					
LOCATION-J	X			X					

Source: Prepared by JST

Table A.3 Number of Collected Drawings for Pipelines

OPERATING COMPANY (*1)	PIPELINE	ALIGNMENT DRAWING	ROUTE MAP (*)	TOTAL
PETRO BANGLA	NORTH SOUTH PIPELINE	28		28
	PETROBANGLA TOTAL	28		28
GTCL	ASHUGANJ TO BAKHRABAD GAS TRANSMISSION PIPELINE	20		20
	ASHUGANJ-MONOHOLDI GAS TRANSMISSION LOOP LINE	12	2	14
	BAKHRABAD-SIDDHIRGANJ PIPELINE	36	1	37
	C-F-B PIPELINE	81	1	82
	DHANUA TO ELENGA PIPELINE	30		30
	DHANUA(GAZIPUR) TO AMINBAZAR (SAVAR) TRANSMISSION LINE	18		18
	DHANUA-ELENGA AND WEST BANK OF BANGABANDHU BRIDGE-NALKA GAS TRANSMISSION PIPELINE		21	21
	HATIKUMRUL SIRAJCONJ TO EAST BANK OF ATRAI RIVER, NATORE (SECTION A)	12		12
	MAZGAON(GK-CANAL), NATORE TO BHERAMARA, KUSHTIA (SECTION D)	10		10
	RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE	15		15
	TITAS GAS FIELD TO AB PIPELINE	3		3
	WBBB TO NALKA PIPELINE	9		9
	WEST BANK OF ATRAI RIVER TO BONPARA NATORE PIPELINE	11		11
	WEST BANK OF JAMUNA BRIDGE-NALKA, HATIKUMRUL-ISHWARDI-BHERAMARA GAS TRANSMISSION PIPELINE		1	1
GTCL TOTAL	257	26	283	
TGTDCCL	GAS SUPPLY TO HARIPUR 360MW POWER STATION UNDER HDFFP	1		1
	JOYDEVPUR-TANGAIL PIPELINE		15	15
	MONOHOLDI VALVE STATION TO NARSINGDHI VALVE STATION-12 PARALLEL/LOOP LINE		8	8
	MONOHOLDI-NARSINGDI TRANSMISSION PIPELINE		8	8
	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPGCL/03	5		5
	NARSINGDI-GHORASHAL THIRD PARALEL LINE	2		2
	NARSINGDI-GHORASHAL-JOYDEVPUR PIPELINE	14		14
	NARSINGDI-SIDDHIRGANJ TRANSMISSION PIPELINE	12		12
	SAVAR-MANIKGANJ PIPELINE	1		1
	TONGI-JOYDEVPUR DISTRIBUTION MAIN LINE	2		2
TGTDCCL TOTAL	37	31	68	
JGTDCL	BIBIYANA GF (SOUTH PAD) TO BIBIYANA PS-3, PARKUL	7		7
	BIBIYANA TO AUSHKANDI PIPELINE	1		1
	PATIBAGH DRS TO JALALPUR VALVE STATION PIPELINE	6		6
	SREEMONGAL TO BHAIRABBAZAR DRS		1	1
	SREEMONGAL TO BHAIRABBAZAR DRS PIPELINE (6"*500PSIG*12.455KM)	6		6
JGTDCL TOTAL	20	1	21	
BGFL	BAKHRABAD TO DEMRA 20" GAS PIPELINE	5		5
	BGFL TOTAL	5		5
GRAND TOTAL		347	58	405

- (*1) As shown in collected data/documents.
 (*2) Shown number represents, in principle, the quantity of collected drawings or images.
 (*3) ROUTE MAP includes Route Plan, Mouza Map, Land Acquisition Plan and Route Survey Map, Route Planning, etc.
 Source: Prepared by JST

Table A.3 Number of Collected Data for Various Stations

OPERATING COMPANY	NAME OF STATION	P&ID	PFD	PFD/P&ID	PIPING DRAWINGS	PP	TOTAL
GTCL	ADAMPUR VALVE STATION				1		1
	AGMS PLANT				2		2
	ASHUGANJ B.BARIA					2	2
	ASHUGANJ MANIFOLD STATION					4	4
	ASHULIA CGS				1		1
	B.BZRIA					1	1
	BANGABANDHU BRIDGE MANIFOLD STATION				2		2
	BHERAMARA CGS				3		3
	BIBIYANA TBS					1	1
	BKB GAS FIELD				2		2
	BKB GAS FIELD END				2		2
	BLOCK VALVE STATION MLV-1 & MLV-2					1	1
	BOGORA					1	1
	BONPARA DRS				1		1
	BRMS				3		3
	CHITTAGONG CGS					1	1
	DEMRA CGS				2	1	3
	DEWANBAG					1	1
	ELENGA					1	1
	GOURIPUR					1	1
	GOURIPUR, DAUKDKANDI, COMILLA					1	1
	HATIKUMRUL				1		1
	HATIKUMRUL SCRAPER STATION				1		1
	HATIKUMRUL VALVE STATION				1		1
	HOBIGONJ SCRAPER TRAP/MANIFOLD STATION				1		1
	ISHWARDI METERING STATION				1		1
	KAROIBARI VALVE STATION				1		1
	KHALKULA VALVE STATION				1		1
	KHATIHATA GTCL GMS				2		2
	KHATIHATA METERING STATION				4		4
	KTL-2 SCRAPER STATION				3		3
KUTUMBPUR					1	1	
MLV-1 (KACHINA) VALUKA				1	1	2	

OPERATING COMPANY	NAME OF STATION	P&ID	PFD	PFD/P&ID	PIPING DRAWINGS	PP	TOTAL
	MLV1 MLV2					1	1
	MONAHARDI					1	1
	MONOHOLDI METERING STATION				3		3
	MUCHAI COMPRESSOR STATION				2		2
	Muchai Residetial Area					10	10
	MUCHAI, BAHUBAL, HABIGANJ					1	1
	MUCHAI, HABIGANJ					1	1
	NALKA STATION				1	2	3
	PAKSHY VALVE STATION				1		1
	RAJSHAHI					1	1
	SHAZIR BAZAR					1	1
	SIRAJGANJ					1	1
	SOKHIPUR BLOCK VALVE STATION MLV-2					2	2
	TIE-IN TO MONOHOLDI-NARSINGDI PIPELINE				1		1
	UDBARIA VALVE STATION				1		1
	VALUKA BLOCK VALVE STATION MLV-1					1	1
	VS-3				2		2
	VS-3				2		2
	WBBB STATION					5	5
	WEST BANK OF BANGABANDHU BRIDGE MANIFOLD STATION				1		1
	MLV-2 (SHALGRAMPUR) SOKHIPUR				1	1	2
	MUCHAI SCRAPPER STATION				1		1
	HOBIGONJI SCRAPPER TRAP/MANIFOLD STATION				1		1
	KTL-2 SCRAPER STATION				3		3
	MUCHAI SCRAPER TRAP STATION				1		1
	GTCL TOTAL				57	46	103
TGTDCL	DEMRA CGS				1		1
	MUNSEFER CHAR DRS				1		1
	NARSINGDI VS-12				1		1
	TGTDCL TOTAL				3		3
JGTDCL	BHAIRABGONG DRS	1					1
	NABIGONJ DRS				1		1
	PIROPUR DRS	1					1
	SYLHET POWER PLANT CMS	1					1
	SHAHJALAL FERTILIZER CMS	4					4
	JGTDCL TOTAL	7			1		8

OPERATING COMPANY	NAME OF STATION	P&ID	PFD	PFD/P&ID	PIPING DRAWINGS	PP	TOTAL
PGCL	BAGHABARI DRS				1		1
	BOGRA TBS				1		1
	HATIKUMRULTBS				1		1
	ISHWARDI DRS				1		1
	RAJSHAHI TBS				1		1
	ULLPARA DRS				1		1
	PGCL TOTAL				6		6
BAPEX	BEGUMGANJ GF			1			1
	FENCHUGANJ GF			1			1
	RUPGANJ GF			1			1
	SEMTANG GF			1			1
	SHAHBAZPUR GF			1			1
	SRIKAL GF			1			1
	BAPEX TOTAL				6		6
BGFCL	BAKHRABAD GF	10	1	1			12
	HABIGANJ GF			1			1
	TITAS #17		1				1
	TITAS #17 BRAHMANBARIA		1				1
	TITAS 6		1				1
	TITAS 7 & 8	1					1
	TITAS 9 & 10		1				1
	TITAS GF			6			6
	TITAS LOC-E	1	2				3
	TITAS LOC-I		1				1
	TITAS LOC-J		1				1
	BGFCL TOTAL	12	9	8			29
GRAND TOTAL	19	9	14	67	46	155	

Source: Prepared by JST

Table A.4 Number of Collected Data for Various Stations

AS: ALIGNMENT SHEET CP: LIST OF CP SYSTEM GCD: GAS/CONDENSATE DATA
LD: LOCAL DISTRIBUTION NETWORK MS: MATERIAL SPECIFICATIONS
OI: OPERATIONAL INFORMATION PP: PLOT PLAN RP: ROUTE PLAN/ACQUISITION/MOUZA MAP
SD: STANDARD DRAWINGS SLD: SINGLE LINE DIAGRAM

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
1	BAPEX	GCD	MONTHLY ROUTINE ANALYSIS REPORTON GAS, CONDENSATE & WATER	BEGUMGANJ GF AUGUST 2015
2	BAPEX	GCD	MONTHLY ROUTINE ANALYSIS REPORTON GAS, CONDENSATE & WATER	FENCHUGANJ GF JUNE 2017
3	BAPEX	GCD	MONTHLY ROUTINE ANALYSIS REPORTON GAS, CONDENSATE & WATER	RUPGANJ GF JULY 2017
4	BAPEX	GCD	MONTHLY ROUTINE ANALYSIS REPORTON GAS, CONDENSATE & WATER	SALDANADI GF JULY 2017
5	BAPEX	GCD	MONTHLY ROUTINE ANALYSIS REPORTON GAS, CONDENSATE & WATER	SEMTANG GF JULY 2017

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
6	BAPEX	GCD	MONTHLY ROUTINE ANALYSIS REPORT ON GAS, CONDENSATE & WATER	SHAHBAZPUR GF JULY 2017
7	BAPEX	GCD	MONTHLY ROUTINE ANALYSIS REPORT ON GAS, CONDENSATE & WATER	SRIKAL GF JULY 2017
8	BAPEX	GCD	MONTHLY ROUTINE ANALYSIS REPORT ON GAS, CONDENSATE & WATER	SHAHJADPUR GF NOVEMBER 2015
9	BAPEX	LIST	INFORMATION/DATA FOR JIKA	
10	BAPEX	PFD/P& ID	PFD FENCHUGANJ GF	HOCEC
11	BAPEX	PFD/P& ID	PFD BEGUMGANJ GF 20MMSCFD TEG DEHYDRATION TYPE NATURAL GAS PLANT	ZICOM 180-03-PFD-001/2/3/4/5/6
12	BAPEX	PFD/P& ID	P&ID RUPGANJ GF WELLHEAD GAS PROCESSING FACILITY	KOCKEN D-1013-DWG-P10-011(1/2/3 OF 3)
13	BAPEX	PFD/P& ID	PFD SEMTANG GF 30MMSCFD TEG DEHYDRATION TYPE NATURAL GAS PLANT	ZICOM ZEBP-092-03-PFD-001/2/3/4/5/6/7/8 & 20
14	BAPEX	PFD/P& ID	PFD SHAHBAZPUR GF GAS PROCESSING PLANT	SPEC ENERGY PS-PFD-001/2/3/4/5 & PS-PFD-007/8/9/10
15	BAPEX	PFD/P& ID	PFD SRIKAL GF 60MMSCFD SILICAGEL DEHYDRATION TYPE NATURAL GAS PROCESS PLANT	ZICOM 240-0201-EMPR-DW00-0101/2/3/4/5/6
19	BGDCL	CP	LOCATION OF THERMO ELECTRIC GENERATOR (TEG) OPERATED CP SYSTEM	
16	BGDCL	CP	BANCHARAMPUR TBS; PROPOSED TP	
17	BGDCL	CP	PROPOSED REGULATING STATION AT BIZRA	
18	BGDCL	CP	BKB GAS FIELD; PROPOSED TP	
20	BGDCL	CP	TEG OPERATED CP SYSTEM, LOCATION	
21	BGDCL	CP	GOURIPUR DRS; PROPOSED TP	
22	BGDCL	CP	LOCATION MAP OF PROPOSED PLACE FOR CNG DISTRIBUTION CO. AT BORBESHABARI, HOMERA, COMILA SHOWING EXISTING PIPELINE FROM GOURIPUR TO BANCHARAMPUR	
23	BGDCL	CP	SALDA GF TBS; PROPOSED TP	
24	BGDCL	LIST	GAS TRANSMISSION PIPELINE- LIST	
25	BGDCL	LIST	STATIONS/OFF-TAKES UNDER TRANSMISSION PIPELINE-LIST	
26	BGDCL	MS	TECHNICAL SPECIFICATION FOR CATHODIC PROTECTION MATERIALS	
29	BGDCL	MS	TECHNICAL SPECIFICATION FOR COAT AND WRAPPING MATERIALS	
28	BGDCL	MS	TECHNICAL SPECIFICATION FOR LINE PIPE	
27	BGDCL	MS	TECHNICAL SPECIFICATION FOR PIPE FITTINGS	
30	BGDCL	MS	TECHNICAL SPECIFICATION FOR VALVES	
31	BGDCL	SD	GALVANIC ANODE CP SYSTEM DESIGN	
32	BGDCL	SD	IMPRESSED CURRENT GROUND BED CP SYSTEM DESIGN	
33	BGDCL	SD	TYPICAL GALVANIC ANODE INSTALLATION	
34	BGDCL	SD	TYPICAL TEST POINT INSTALLATION	
60	BGFCL	LIST	DESIGN DATA_ALL GAS FIELDS	DESIGN DATA
42	BGFCL	LOCATION	NARSINGDI GF_WELL LOCATIONS	WELL LOCATIONS
35	BGFCL	LOCATION	BAKHRABAD GF_WELL LOCATIONS	WELL LOCATIONS

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
		ION		
36	BGFCL	LOCAT ION	BAKHRBAD GF_PROCESS PLANT LOCATIONS	PROCESS PLANT LOCATIONS
37	BGFCL	LOCAT ION	HABIGANJ GF_WELL LOCATIONS	WELL LOCATIONS
38	BGFCL	LOCAT ION	HABIGANJ GF_PROCESS PLANT LOCATIONS	PROCESS PLANT LOCATIONS
39	BGFCL	LOCAT ION	HABIGANJ GF_SALES METERING LOCATIONS	SALES METERING LOCATIONS
40	BGFCL	LOCAT ION	MEGHNA GF_WELL LOCATIONS	WELL LOCATIONS
41	BGFCL	LOCAT ION	MEGHNA GF_PROCESS PLANT LOCATIONS	PROCESS PLANT LOCATIONS
43	BGFCL	LOCAT ION	NARSINGDI GF_PROCESS PLANT LOCATIONS	PROCESS PLANT LOCATIONS
44	BGFCL	LOCAT ION	TITAS GF_WELL LOCATIONS	WELL LOCATIONS
45	BGFCL	LOCAT ION	TITAS GF_PROCESS PLANT LOCATIONS	PROCESS PLANT LOCATIONS
46	BGFCL	LOCAT ION	TITAS GF_SALES METERING LOCATIONS	SALES METERING LOCATIONS
47	BGFCL	LOCAT ION	TITAS GF_TIE-IN LOCATION AND VALVE STATION	LOCATION
54	BGFCL	MS	TECHNICAL SPECIFICATIONS; DRILLS AND NOZZLES	DRILLS AND NOZZLES
49	BGFCL	MS	TECHNICAL SPECIFICATIONS; WELLHEAD CONTROL PANEL WITH ACCESSORIES	WELLHEAD CONTROL PANEL
50	BGFCL	MS	TECHNICAL SPECIFICATIONS; DOWNHOLE COMPLETION EQUIPMENT	DOWNHOLE COMPLETION EQUIPMENT
48	BGFCL	MS	TECHNICAL SPECIFICATIONS; CASING AND TUBING	CASING AND TUBING
52	BGFCL	MS	TECHNICAL SPECIFICATIONS; LINER HANGER AND SETTING TOOLS	LINER HANGER AND SETTING TOOLS
53	BGFCL	MS	TECHNICAL SPECIFICATIONS; MUD & COMPLETION CHEMICALS	MUD & COMPLETION CHEMICALS
51	BGFCL	MS	TECHNICAL SPECIFICATIONS; CASING , TUBING & CEMENTING ACCESSORIES	CASING , TUBING & CEMENTING ACCESSORIES
55	BGFCL	MS	TECHNICAL SPECIFICATIONS; WELLHEAD AND X-MAS TREE	WELLHEAD AND X-MAS TREE
66	BGFCL	OI	NARSINGDI GF_SALES METERING STATION	OI
56	BGFCL	OI	BAKHRBAD GF_PRODUCTION RECORD (JAN2012-JUNE 2017)	GAS PRODUCTION RECORD
57	BGFCL	OI	BAKHRBAD GF_SALES METERING STATION	OI
58	BGFCL	OI	BAKHRBAD GF_PLANT INLET PRESSURE AND PIPE DIAMETER	OI
59	BGFCL	OI	BAKHRBAD GF_SALES LINE PRESSURE AND PIPE DIAMETER	OI
61	BGFCL	OI	GAS COMPOSITION_ALL GAS FIELDS	GAS COMPOSITION
62	BGFCL	OI	HABIGANJ GF_PRODUCTION RECORD (JAN2012-JUNE 2017)	GAS PRODUCTION RECORD
63	BGFCL	OI	MEGHNA GF_PRODUCTION RECORD (JAN2012-JUNE 2017)	GAS PRODUCTION RECORD
64	BGFCL	OI	MEGHNA GF_PLANT INLET PRESSURE AND PIPE DIAMETER	OI

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
65	BGFCL	OI	MEGHNA GF__SALES LINE PRESSURE AND PIPE DIAMETER	OI
67	BGFCL	OI	NARSINGDI GF_PRODUCTION RECORD (JAN2012-JUNE 2017)	GAS PRODUCTION RECORD
68	BGFCL	OI	TITAS GF_PRODUCTION RECORD (JAN2012-JUNE 2017)	GAS PRODUCTION RECORD
69	BGFCL	OI	TITAS GF SALES LINE PRESSURE AND PIPE DIAMETER	OI
70	BGFCL	P&ID	P&I DIAGRAM WELLHEAD METERING AND FIRST STAGE REDUCTION	ESCHER
72	BGFCL	P&ID	P&I DIAGRAM INTERCOOLERS EX-1A/B AND 2ND STAGE REDUCTION STATION	ESCHER
74	BGFCL	P&ID	P&I DIAGRAM INLET FILTER SEPARATOR----	ESCHER
75	BGFCL	P&ID	P&I DIAGRAM TOWERS AND SWITCHING VALVES SKIDS	ESCHER
76	BGFCL	P&ID	P&I DIAGRAM REGENERATION GAS COMPRESSOR K1	ESCHER
77	BGFCL	P&ID	P&I DIAGRAM REGENERATION GAS HEATER H-2	ESCHER 7078-117
78	BGFCL	P&ID	P&I DIAGRAM REGENERATION GAS SCRUBBER V-4 AND FLASH DRUM V-3	ESCHER 7078-118
71	BGFCL	P&ID	P&I DIAGRAM SALES GAS METERING AND DUST FILTER F-2	ESCHER
73	BGFCL	P&ID	P&I DIAGRAM INLET FREE LIQUID KNOCKOUT AND THREE PHASE FREE HC----	ESCHER
79	BGFCL	P&ID	P&I DIAGRAM REGENERATION GAS/AIR COOLER HEX 2A/B	ESCHER
80	BGFCL	P&ID	SCHEMATIC DIAGRAM OF TITAS 7 & 8 PROCESS PLANT	
81	BGFCL	P&ID	PIPING AND INSTRUMENT DIAGRAM DEW POINT CONTROL SYSTEM (TRAIN-"A") PLANT	HYUNDAI 99006-R-103
89	BGFCL	PFD	PROCESS MIMIC PANEL LAYOUT DRAWING FOR LOCATION-I	ZICOM 252-0201-EMIN-DW00-02 04
90	BGFCL	PFD	PROCESS MIMIC PANEL LAYOUT DRAWING FOR LOCATION- J	ZICOM 252-0201-EMIN-DW00-02 04
82	BGFCL	PFD	BAKHRABAD GAS DEHYDRATION AND HYDROCARBON RECOVERY PLANT PROCESS FLOW DIAGRAM	SEAMORE 84360-0108
83	BGFCL	PFD	GAS TREATMENT PLANT TITAS 9 & 10	ESCHER 7080 100 (SHEET 1 OF 3)
84	BGFCL	PFD	PFD GAS PROCESS PLANT-GENERAL (SHEET 2 OF 2)	PIETRO FIORENTINI 00-P-DC-03
85	BGFCL	PFD	PFD GAS PROCESS PLANT-GENERAL (SHEET 1 OF 2)	PIETRO FIORENTINI 00-P-DC-03
86	BGFCL	PFD	SEPARATION AND GLYCOL DEHYDRATION LANT	MALONEY STEEL 863 Z
87	BGFCL	PFD	PROCESS FLOW DIAGRAM GAS DEHYDRATION PLANT	HYUNDAI 99006-R-001
88	BGFCL	PFD	PIPING AND INSTRUMENT DIAGRAM DEW POINT CONTROL SYSTEM (TRAIN-"B") PLANT	HYUNDAI 99006-R-104
91	BGFCL	PFD/P&ID	BAKHRBAD GF_PRODUCTION FLOW NETWORK	OI, 2 sheets
93	BGFCL	PFD/P&ID	TITAS GF_PRODUCTION FLOW NETWORK, LOCATION-A	OI LOCATION-A to J
99	BGSL	AS	AS BUILT SURVEY MAP: BAKHRABAD TO DEMRA 20" GAS PIPELINE	400-08-419 to 423 (SHEET NO.20)
104	GOB/Mo COMMN	OTHER	CROSS SECTION	2 sheets

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
106	GOB/Mo COMMN	OTHER	GA JASHIMUDDIN ROAD INTERSECTION AT UTTARA	3 Sheets
109	GOB/Mo COMMN	OTHER	NO IMAGE	
110	GOB/Mo COMMN	OTHER	NO IMAGE	
111	GOB/Mo COMMN	OTHER	BRT STATION TYPE A	
112	GOB/Mo COMMN	OTHER	BRT STATION TYPE B	
113	GOB/Mo COMMN	OTHER	ENTRY/EXIT TO UNDERPASS AND STATION	
114	GOB/Mo COMMN	OTHER	BRT STATION LAYOUT PLAN FOR 4 LANE BRT	
115	GOB/Mo COMMN	OTHER	BRT STATION LAYOUT PLAN TYPE A, B AND C	
360	GTCL	AS	ROUTE ALIGNMENT AND LONGITUDINAL SECTION SECTION D: MAJGAON NATORE TO BHERAMARA KUSHITA 17KM	32/41 – 41/41
187	GTCL	AS	C-F-B PIPELINE ROUTE MAP	ST 28 - 75
313	GTCL	AS	DHANUA TO ELENGA PIPELINE ALIGNMENT	SHEET 1-30
373	GTCL	AS	WBBB TO NALKA PIPELINE ALIGNMENT	SHEET 1/9 - 9/9
186	GTCL	AS	C-F-B PIPELINE ROUTE MAP	ST 27, 59-75
116	GTCL	AS	20" 60km HIGH PRESSURE GAS TRANSMISSION PIPELINE FROM DHANUA(GAZIPUR) TO AMINBAZAR (SAVAR)	1-17
133	GTCL	AS	20" 60km HIGH PRESSURE GAS TRANSMISSION PIPELINE FROM DHANUA(GAZIPUR) TO AMINBAZAR (SAVAR)	COVER SHEET
134	GTCL	AS	ASHUGANJ-MONOHOLDI GAS TRANSMISSION LOOP LINE	COVER SHEET
135	GTCL	AS	ASHUGANJ-MONOHOLDI GAS TRANSMISSION LOOP LINE	AS (1/11-11/11
269	GTCL	AS	CONSTRUCTION OF 22KM*1000PSIG PIPELINE FROM WEST BANK OF ATRAI RIVER TO BONPARA NATORE	13-23 of 41
293	GTCL	AS	CONSTRUCTION OF 30"*59.762M*1000PSIG HIGH PRESSURE NATURAL GAS TRANSMISSION PIPELINE FROM ASHUGANJ TO BAKHRABAD UNDER GAS TRANSMISSION CAPACITY EXPANSION	SHEET NO.1-20
344	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 000 TO KP 2000
345	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 000 TO KP 2000M
346	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 2000 TO KP 4000
347	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 4000 TO KP 6000
348	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 6000 TO KP 8000
349	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL	KP 8000 TO KP 10000

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
			THICKNESS GAS PIPELINE CONSTRUCTION	
350	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 10000 TO KP12000
351	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 12000 TO KP 14000
352	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 14000 TO KP 16000
353	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 16000 TO KP 18000
354	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 18000 TO KP 20000
355	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 20000 TO KP 22000
356	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 22000 TO KP 24000
357	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	KP 26000 TO KP 28000
358	GTCL	AS	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	PIG LAUNCHER TO 20" HOOK UP LINE
281	GTCL	AS	CONSTRUCTION OF 30"*25.00KM*1000PSIG HIGH PRESSURE NATURAL GAS TRANSMISSION PIPELINE FROM HATIKUMRUL SIRAJCONJ TO EAST BANK OF ATRAI RIVER, NATORE	01/41 to 12/41
148	GTCL	AS	BAKHRABAD-SIDDHIRGANJ PIPELINE PROJECT	3585-000-01-A3-1020 to 1050
370	GTCL	AS	TITAS GAS FIELD TO AB PIPELINE-PLAN AND LONGITUDINAL PROFILE	SHEET NO. 1/3 – 3/3
359	GTCL	COVER SHEET	ROUTE ALIGNMENT AND LONGITUDINAL SECTION SECTION D: MAJGAON NATORE TO BHERAMARA KUSHITA 17KM	COVER SHEET
268	GTCL	COVER SHEET	CONSTRUCTION OF 22KM*1000PSIG PIPELINE FROM WEST BANK OF ATRAI RIVER TO BONPARA NATORE	COVER SHEET
477	GTCL	COVER SHEET	CONSTRUCTION OF 30"*59.762M*1000PSIG HIGH PRESSURE NATURAL GAS TRANSMISSION PIPELINE FROM ASHUGANJ TO BAKHRABAD UNDER GAS TRANSMISSION CAPACITY EXPANSION	COVER SHEET
343	GTCL	COVER SHEET	GAS SUPPLY FROM RASHIDPUR TO HOBIGANJ GAS TRANSMISSION LOOP LINE PROJECT 30"*14.3MM WALL THICKNESS GAS PIPELINE CONSTRUCTION	COVER SHEET
280	GTCL	COVER SHEET	CONSTRUCTION OF 30"*25.00KM*1000PSIG HIGH PRESSURE NATURAL GAS TRANSMISSION PIPELINE FROM HATIKUMRUL SIRAJCONJ TO EAST BANK OF ATRAI RIVER, NATORE	COVER SHEET
184	GTCL	COVER SHEET	BAKHRABAD-SIDDHIRGANJ PIPELINE PROJECT	COVER SHEET

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
185	GTCL	COVER SHEET	BAKHRABAD-SIDDHIRGANJ PIPELINE PROJECT	COVER SHEET
487	GTCL	COVER SHEET	PIG LAUNCHER, PIG RECEIVER, VALVE STATION & HOOK UP SECTION AT BRMS	COVER SHEET
382	GTCL	CP	NAME OF CATHODIC PROTECTION STATIONS	CATHODIC PROTECTION
383	GTCL	CP	PART-A OPERATION, MAINTENANCE AND DEVELOPMENT WORKS OF CP SYSTEM----	CATHODIC PROTECTION
384	GTCL	CP	PART-B OPERATION, MAINTENANCE AND DEVELOPMENT WORKS OF CP SYSTEM----	CATHODIC PROTECTION
385	GTCL	LIST	1. DATA/INFORMATION ABOUT GAS TRANSMISSION/DISTRIBUTION PIPELINES 2. OFF-TAKES UNDER TRANSMISSION PIPELINES	TRANSMISSION, STATION
386	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR CP EQUIPMENT	CP EQUIPMENT
387	GTCL	MS	TECHNICAL REQUISITION FOR CP MATERIALS	CP MATERIALS
395	GTCL	MS	TECHNICAL REQUISITION FOR CP MATERIALS	CP MATERIALS
409	GTCL	MS	SPECIFICATION FOR SHOP AND FIELD PAINTING	SHOP AND FIELD PAINTING
396	GTCL	MS	TECHNICAL REQUISITION FOR SCADA	SCADA
391	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR FIELD INSTRUMENTS	FIELD INSTRUMENTS
393	GTCL	MS	SPECIFICATION FOR FIELD INSTRUMENTATION	FIELD INSTRUMENTS
388	GTCL	MS	DATA SHEET FOR PRESSURE GAUGE	PRESSURE GAUGE
389	GTCL	MS	DATA SHEET FOR PRESSURE TRANSMITTER	PRESSURE TRANSMITTER
397	GTCL	MS	TYPICAL INSTRUMENT HOOKUP DETAILS FOR REMOTE MOUNTED PRESSURE TRANSMITTER	REMOTE MOUNTED PRESSURE TRANSMITTER
392	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR RTU	RTU
394	GTCL	MS	SPECIFICATION FOR REMOTE TERMINAL UNIT (RTU)	RTU
390	GTCL	MS	DATA SHEET FOR TEMPERATURE TRANSMITTER	TEMPERATURE TRANSMITTER
437	GTCL	MS	SPECIFICATION FOR 3-LAYER POLYETHYLENE EXTERNAL COATING OF LINE PIPE	3-LAYER POLYETHYLENE EXTERNAL COATING OF LINE PIPE
423	GTCL	MS	DATA SHEET FOR FULL BORE 30" PIPELINE BALL VALVE	BALL VALVES
399	GTCL	MS	DATA SHEET FOR BALL VALVES	BALL VALVES
404	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR BALL VALVES 2" AND ABOVE	BALL VALVES BELOW 2" AND MISCELLANEOUS VALVES
405	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR BALL VALVES 2" AND ABOVE	BALL VALVES 2" AND ABOVE
410	GTCL	MS	SPECIFICATION FOR BALL VALVES 2" AND ABOVE	BALL VALVES 2" AND ABOVE
411	GTCL	MS	SPECIFICATION FOR BALL VALVES BELOW 2" AND MISCELLANEOUS VALVES	BALL VALVES BELOW 2" AND MISCELLANEOUS VALVES
415	GTCL	MS	TECHNICAL REQUISITION FOR BALL VALVES 2" AND ABOVE	BALL VALVES 2" AND ABOVE

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
416	GTCL	MS	TECHNICAL REQUISITION FOR BALL VALVES BELOW 2" AND MISCELLANEOUS VALVES	BALL VALVES BELOW 2" & MISCELLANEOUS VALVES
424	GTCL	MS	DATA SHEET FOR FULL BORE 30" PIPELINE BALL VALVES	FULL BORE 30" PIPELINE BALL VALVES
436	GTCL	MS	SPECIFICATION FOR PIPELINE BALL VALVES	PIPELINE BALL VALVES
422	GTCL	MS	DATA SHEET FOR BARRED TEE	BARRED TEE
429	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR BARRED TEE	BARRED TEE
435	GTCL	MS	SPECIFICATION FOR BARRED TEE	BARRED TEE
444	GTCL	MS	TECHNICAL REQUISITION FOR BARRED TEE	BARRED TEE
402	GTCL	MS	DATA SHEET FOR CHECK VALVES	CHECK VALVES
438	GTCL	MS	SPECIFICATION FOR CONCRETE WEIGHT COATING OF LINEPIPE	CONCRETE WEIGHT COATING
439	GTCL	MS	SPECIFICATION FOR CONCRETE WEIGHT COATING OF LINE PIPE	CONCRETE WEIGHT COATING OF LINE PIPE
398	GTCL	MS	TYPICAL INSTRUMENT HOOKUP DETAILS FOR GAS OPERATED VALVE	GAS OPERATED VALVE
433	GTCL	MS	SPECIFICATION FOR INDUCTION BENDS	INDUCTION BENDS
421	GTCL	MS	DATA SHEET FOR INDUCTION BENDS	INDUCTION BENDS
428	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR INDUCTION BENDS	INDUCTION BENDS
434	GTCL	MS	SPECIFICATION FOR INDUCTION BENDS	INDUCTION BENDS
443	GTCL	MS	TECHNICAL REQUISITION FOR INDUCTION BENDS	INDUCTION BENDS
401	GTCL	MS	DATA SHEET FOR INSULATING JOINTS	INSULATING JOINTS
407	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR INSULATING JOINTS	INSULATING JOINTS
413	GTCL	MS	SPECIFICATION FOR INSULATING JOINTS	INSULATING JOINTS
418	GTCL	MS	TECHNICAL REQUISITION FOR INSULATING JOINTS	INSULATING JOINTS
425	GTCL	MS	DATA SHEET FOR PIG SIGNALLERS	PIG SIGNALLERS
426	GTCL	MS	DATA SHEET FOR PIG SIGNALLERS	PIG SIGNALLERS
431	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR PIG SIGNALLERS	PIG SIGNALLERS
446	GTCL	MS	TECHNICAL REQUISITION FOR PIG SIGNALLERS	PIG SIGNALLERS
420	GTCL	MS	DATA SHEET FOR 30" LINE PIPE	30" LINE PIPE
427	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR LINE PIPE	LINE PIPE
432	GTCL	MS	SPECIFICATION FOR LINE PIPE	LINE PIPE
442	GTCL	MS	TECHNICAL REQUISITION FOR LINE PIPE	LINE PIPE
440	GTCL	MS	SPECIFICATION FOR EXTERNAL POLYURETHANE COATING OF INDUCTION BENDS, VALVES AND OTHER PIPE SPECIALS	EXTERNAL POLYURETHANE COATING OF INDUCTION BENDS, VALVES AND OTHER PIPE SPECIALS
430	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR PIPELINE VALVES	PIPELINE VALVES
445	GTCL	MS	TECHNICAL REQUISITION FOR PIPELINE VALVES	PIPELINE VALVES
408	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR PIPING BULK MATERIALS	PIPING BULK MATERIALS
414	GTCL	MS	SPECIFICATION FOR PIPING BULK MATERIALS	PIPING BULK MATERIALS
419	GTCL	MS	TECHNICAL REQUISITION FOR PIPING BULK	PIPING BULK

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
			MATERIALS	MATERIALS
400	GTCL	MS	DATA SHEET FOR PLUG VALVES	PLUG VALVES
406	GTCL	MS	SUPPLIER DATA REQUIREMENTS LIST(SDRL) FOR PLUG VALVES	PLUG VALVES
412	GTCL	MS	SPECIFICATION FOR PLUG VALVES	PLUG VALVES
417	GTCL	MS	TECHNICAL REQUISITION FOR PLUG VALVES	PLUG VALVES
441	GTCL	MS	SPECIFICATION FOR HEAT SHRINK SLEEVES AND COATING REPAIR	HEAT SHRINK SLEEVES AND COATING REPAIR
403	GTCL	MS	PIPELINE VALVE LIST	LIST
457	GTCL	PD	ISOMETRIC DRAWING(BHERAMARA CGS)	BHERAMARA CGS
488	GTCL	PD	CONSTRUCTION OF 82KM 30"*1000PSIG HIGH PRESSURE NATURAL GAS TRANSMISSION PIPELINE UNDER WEST BANK OF JAMUNA BRIDGE -NALKA-HATIKUMUMRUL-ISHWARDI-BEHERAMARA GAS TRANSMISSION PIPELINE PROJECT	BHERAMARA CGS
489	GTCL	PD	CONSTRUCTION OF 82KM 30"*1000PSIG HIGH PRESSURE NATURAL GAS TRANSMISSION PIPELINE UNDER WEST BANK OF JAMUNA BRIDGE -NALKA-HATIKUMUMRUL-ISHWARDI-BEHERAMARA GAS TRANSMISSION PIPELINE PROJECT	ISHWARDI METERING STATION
490	GTCL	PD	CONSTRUCTION OF 82KM 30"*1000PSIG HIGH PRESSURE NATURAL GAS TRANSMISSION PIPELINE UNDER WEST BANK OF JAMUNA BRIDGE -NALKA-HATIKUMUMRUL-ISHWARDI-BEHERAMARA GAS TRANSMISSION PIPELINE PROJECT	PAKSHY VALVE STATION
528	GTCL	PD	AS BUILT PIPING DIAGRAM OF LOCATION-3 TO KHATIHATA GTCL GMS	LOCATION-3 TO KHATIHATA GTCL GMS
529	GTCL	PD	(SIMPLIFIED PIPING DIAGRAM OF) KHATIHATA METERING STATION	KHATIHATA METERING STATION
530	GTCL	PD	(SIMPLIFIED PIPING DIAGRAM OF) KHATIHATA METERING STATION	KHATIHATA METERING STATION
531	GTCL	PD	AS BUILT PIPELINES AT KTL-2 SCRAPER STATION (BEFORE MODIFICATION)	KTL-2 SCRAPER STATION
532	GTCL	PD	AS BUILT PIPELINES AT KTL-2 SCRAPER STATION (BEFORE MODIFICATION)	KTL-2 SCRAPER STATION
533	GTCL	PD	AS BUILT GAS PIPELINES AT KTL-2 SCRAPER STATION	KTL-2 SCRAPER STATION
534	GTCL	PD	PIPING CONFIGURATION OF TRANSMISSION LINE/SALES LINE AT BKB GAS FIELD END	BKB GAS FIELD END
535	GTCL	PD	PIPING CONFIGURATION OF TRANSMISSION LINE/SALES LINE AT BKB GAS FIELD END	BKB GAS FIELD END
536	GTCL	PD	AS BUILT PIPING DIAGRAM OF HOBIGONJ SCRAPER TRAP/MANIFOLD STATION	SCRAPER TRAP/MANIFOLD STATION
537	GTCL	PD	AS BUILT PIPING DIAGRAM OF MONOHOLDI METERING STATION	MONOHOLDI METERING STATION
538	GTCL	PD	PIPING CONFIGURATION OF MUCHAI COMPRESSOR STATION	MUCHAI COMPRESSOR STATION
539	GTCL	PD	AS BUILT PIPING DIAGRAM OF MUCHAI SCRAPER TRAP STATION	MUCHAI SCRAPER TRAP STATION
540	GTCL	PD	VS-3 PIPE NETWORK	VS-3
541	GTCL	PD	AS BUILT VS-3 PIPELINE NETWORK	VS-3
542	GTCL	PD	PROPOSED TIE-IN POINT 16"*20" EXPANDER ON MONOHOLDI-NARSINGDI PIPELINE	MONOHOLDI-NARSINGDI PIPELINE

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
544	GTCL	PD	LINE DIAGRAM OF BKB-DEMRA PIPELINE	BKB-DEMRA PIPELINE
545	GTCL	PD	AS BUILT SIMPLIFIED SCHEMATIC PROCESS FLOW DIAGRAM OF ASHULIA CITY GATE STATION	ASHULIA CITY GATE STATION
448	GTCL	PD	PIG RECEIVER PIPING DETAILS AT BHERAMARA CGS	PIG RECEIVER PIPING
449	GTCL	PD	PIG LAUNCHER PIPING, DETAILS AT HATIKUMRUL	PIG LAUNCHER PIPING
450	GTCL	PD	HATIKUMRUL SCRAPER STATION	SCRAPER STATION
458	GTCL	PD	PIPING CONFIGURATION OF TRANSMISSION LINE/SALES LINE AT BKB GAS FIELD END	BKB GAS FIELD END
459	GTCL	PD	AS BUILT PIPING DIAGRAM OF AGMS PLANT	AGMS PLANT
460	GTCL	PD	AS BUILT GAS PIPELINES AT KTL-2 SCRAPER STATION	KTL-2 SCRAPER STATION
461	GTCL	PD	AS BUILT PIPING DIAGRAM OF MUCHAI SCRAPER STATION	MUCHAI SCRAPER STATION
462	GTCL	PD	AS BUILT PIPING DIAGRAM OF MONOholdI METERING STATION	MONOholdI METERING STATION
463	GTCL	PD	(PROPOSED TIE-IN TO MONOholdI-NARSINGDI PIPELINE)	TIE-IN TO MONOholdI-NARSINGDI PIPELINE
464	GTCL	PD	PIPING CONFIGURATION OF MUCHAI COMPRESSOR STATION	MUCHAI COMPRESSOR STATION
465	GTCL	PD	VS-3 PIPE NETWORK	VS-3
466	GTCL	PD	AS BUILT VS-3 PIPELINE NETWORK	VS-3
467	GTCL	PD	AS BUILT PIPING DIAGRAM OF HOBIGONJI SCRAPER TRAP/MANIFOLD STATION	HOBIGONJI SCRAPER TRAP/MANIFOLD STATION
468	GTCL	PD	SIMPLIFIED PIPING DIAGRAM OF AGMS PLANT	AGMS PLANT
469	GTCL	PD	PIPING CONFIGURATION OF TRANSMISSION LINE/SALES LINE AT BKB GAS FIELD END	BKB GAS FIELD END
470	GTCL	PD	AS BUILT PIPING DIAGRAM OF LOCATION-3 TO KHATIHATA GTCL GMS	KHATIHATA GTCL GMS
471	GTCL	PD	KHATIHATA METERING STATION	KHATIHATA METERING STATION
472	GTCL	PD	KHATIHATA METERING STATION	KHATIHATA METERING STATION
473	GTCL	PD	AS BUILT GAS PIPELINES AT KTL-2 SCRAPER STATION (BEFORE MODIFICATION)	KTL-2 SCRAPER STATION
474	GTCL	PD	AS BUILT GAS PIPELINES AT KTL-2 SCRAPER STATION (BEFORE MODIFICATION)	KTL-2 SCRAPER STATION
496	GTCL	PD	DEMRA CGS	DEMRA CGS
475	GTCL	PD	BONPARA DRS PIPING DETAILS	VALVE STATION
476	GTCL	PD	UDBARIA VALVE STATION PIPING DETAILS	VALVE STATION
478	GTCL	PD	PIG LAUNCHER PIPING DETAILS AT HATIKUMRUL	HATIKUMRUL
479	GTCL	PD	KHALKULA VALVE STATION PIPELINE DETAILS	KHALKULA VALVE STATION
482	GTCL	PD	PIG LAUNCHER, PIG RECEIVER, VALVE STATION & HOOK UP SECTION AT BRMS (02 OF 05)	ADAMPUR VALVE STATION
483	GTCL	PD	PIG LAUNCHER, PIG RECEIVER, VALVE STATION & HOOK UP SECTION AT BRMS (01 OF 05)	PIG LAUNCHER STATION
484	GTCL	PD	PIG LAUNCHER, PIG RECEIVER, VALVE STATION & HOOK UP SECTION AT BRMS (04 OF 05)	PIG RECEIVER STATION
485	GTCL	PD	PIG LAUNCHER, PIG RECEIVER, VALVE STATION & HOOK UP SECTION AT BRMS (05 OF 05)	BRMS
486	GTCL	PD	PIG LAUNCHER, PIG RECEIVER, VALVE STATION &	KAROIBARI VALVE

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
			HOOK UP SECTION AT BRMS (03 OF 05)	STATION
451	GTCL	PD	PIPING GENERAL ARRANGEMENT FOR WEST BANK OF BANGABANDHU BRIDGE MANIFOLD STATION	
452	GTCL	PD	PIPING GENERAL ARRANGEMENT FOR MLV-2 (SHALGRAMPUR) SOKHIPUR	
453	GTCL	PD	PIPING GENERAL ARRANGEMENT FOR WEST BANK OF BANGABANDHU BRIDGE MANIFOLD STATION	
454	GTCL	PD	PIPING GENERAL ARRANGEMENT FOR MLV-1 (KACHINA) VALUKA	
455	GTCL	PD	PIPING GENERAL ARRANGEMENT FOR NALKA STATION	
456	GTCL	PD	PIPING GENERAL ARRANGEMENT FOR WEST BANK OF BANGABANDHU BRIDGE MANIFOLD STATION	
585	GTCL	PP	FOUNDATION GA-PIPE SUPPORT AND ANCHOR	
584	GTCL	PP	WEST BANK BANGABANDHU BRIDGE STATION PIG TRAP FOUNDATION & PIPE SUPPORT GA	
598	GTCL	PP	HAZARDOUS AREA DRAWING BLOCK VALVE STATION (MLV 1)	
599	GTCL	PP	HAZARDOUS AREA DRAWING BLOCK VALVE STATION 2 (MLV 2)	
600	GTCL	PP	HAZARDOUS AREA DRAWING FOR WBBB STATION	
601	GTCL	PP	HAZARDOUS AREA DRAWING FOR NALKA STATION	
543	GTCL	PP	LAYOUT OF CGS, CTG PLANT	CTG PLANT
497	GTCL	PP	PROPOSED HOUSING AREA	Muchai Residietial Area
498	GTCL	PP	LOCATION: KUTUMBPUR, CHANDINA, COMILLA	KUTUMBPUR
499	GTCL	PP	PROPOSED HOUSING AREA	Muchai Residietial Area
500	GTCL	PP	MASTER PLAN FOR PROPOSED RESIDENTIAL COMPLEX AT ASHUGANJ MANIFOLD STATION	ASHUGANJ MANIFOLD STATION
501	GTCL	PP	PROPOSED HOUSING AREA (WITH DIMENSIONS)	Muchai Residietial Area
502	GTCL	PP	LOCATION: GOURIPUR, DAUKDKANDI, COMILLA	GOURIPUR, DAUKDKANDI, COMILLA
503	GTCL	PP	PP AND TOPO SURVEY LAYOUT	Muchai Residietial Area
504	GTCL	PP	KEY MAP	Muchai Residietial Area
505	GTCL	PP	LOCATION: MUCHAI, BAHUBAL, HABIGANJ	MUCHAI, BAHUBAL, HABIGANJ
506	GTCL	PP	KEY MAP (PLOT SCHEDULE)	Muchai Residietial Area, 4 sheets
510	GTCL	PP	PROPOSED HOUSING AREA	Muchai Residietial Area
511	GTCL	PP	PLAN DRAWING FOR ASHUGANJ B.BARIA	ASHUGANJ B.BARIA
512	GTCL	PP	PP DRAWING FOR ASHUGANJ B.BARIA	ASHUGANJ B.BARIA
513	GTCL	PP	MASTER PLAN FOR PROPOSED RESIDENTIAL COMPLEX AT ASHUGANJ MANIFOLD STATION	ASHUGANJ MANIFOLD STATION
514	GTCL	PP	MASTER PLAN FOR PROPOSED RESIDENTIAL COMPLEX AT ASHUGANJ MANIFOLD STATION	ASHUGANJ MANIFOLD STATION
515	GTCL	PP	MASTER PLAN FOR PROPOSED RESIDENTIAL COMPLEX AT ASHUGANJ MANIFOLD STATION	ASHUGANJ MANIFOLD STATION
516	GTCL	PP	LOCATION: B.BZRIA	B.BZRIA
517	GTCL	PP	SITE PLAN OF TBS BIBIYANA	BIBIYANA TBS
518	GTCL	PP	LOCATION: BOGORA	BOGORA
519	GTCL	PP	LOCATION: DEMRA	DEMRA
520	GTCL	PP	LOCATION: DEWANBAG	DEWANBAG
521	GTCL	PP	PP DRAWING FOR ELENGA	ELENGA

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
522	GTCL	PP	LOCATION: GOURIPUR, DAUKDKANDI, COMILLA	GOURIPUR
523	GTCL	PP	LOCATION: MONAHARDI	MONAHARDI
524	GTCL	PP	PP DRAWING FOR MUCHAI, HABIGANJ	MUCHAI, HABIGANJ
525	GTCL	PP	LOCATION: RAJSHAHI	RAJSHAHI
526	GTCL	PP	SHAZIR BAZAR	SHAZIR BAZAR
527	GTCL	PP	LOCATION: HATIKUMURUL, SIRAJGANJ	SIRAJGANJ
577	GTCL	PP	VALUKA BLOCK VALVE STATION MLV-1 DHAUNUA-ELENGA PIPELINE SITE LAYOUT	
578	GTCL	PP	SOKHIPUR BLOCK VALVE STATION MLV-2 DHAUNUA-ELENGA PIPELINE SITE LAYOUT	
579	GTCL	PP	SOKHIPUR BLOCK VALVE STATION MLV-2 DHAUNUA-ELENGA PIPELINE SITE LAYOUT	
580	GTCL	PP	WEST BANK BANGABANDHU BRIDGE STATION 30" PIPELINE TIE-IN CIVIL LAYOUT	
581	GTCL	PP	WEST BANK BANGABANDHU BRIDGE STATION 30" PIPELINE TIE-IN CIVIL LAYOUT	
582	GTCL	PP	NALKA STATION 30" PIPELINE TIE-IN CIVIL LAYOUT	
583	GTCL	PP	FOUNDATION GA-MISC EQUIPMENT TEG FOUNDATION	
586	GTCL	PP	BLOCK VALVE STATION MLV-1 & MLV-2 RETAINING WALL GA	
447	GTCL	RP	P&ID HATIKUMRUL-ISHWARDI-BHERAMARA GAS TRANSMISSION PIPELINE SECTION	HATIKUMRUL-ISHWAR DI-BHERAMARA
267	GTCL	RP	C-F-B PIPELINE ROUTE MAP	
556	GTCL	RP	MOUZA MAP PIPELINE ALIGNMENT (1 OF 21)	1/21 to 21/21
146	GTCL	RP	ASHUGANJ-MONOHOLDI GAS TRANSMISSION LOOP LINE	KEY MAP(1/2 -2/2)
491	GTCL	RP	PROJECT SCHEMATIC	
602	GTCL	SLD	ELECTRICAL SINGLE LINE DIAGRAM BLOCK VALVE STATION FOR MLV1 (SODAWANDAPUR) SIRAJGANJ	
603	GTCL	SLD	ELECTRICAL SINGLE LINE DIAGRAM BLOCK VALVE STATION FOR MLV1 KACHINA	
604	GTCL	SLD	ELECTRICAL SINGLE LINE DIAGRAM BLOCK VALVE STATION FOR SHALGRAMPUR	
547	GTCL	SPEC	7. COMMUNICATION SYSTEM	COMMUNICATION SYSTEM
621	GTCL	SPEC	SPECIFICATION FOR MECHANICAL AND PIPING INSTALLATION AND TESTING	MECHANICAL AND PIPING INSTALLATION AND TESTING
622	GTCL	SPEC	PIPELINE WALL THICKNESS CALCULATIONS	PIPING DESIGN
620	GTCL	SPEC	SPECIFICATION FOR PIPING CLASSES	PIPING CLASSES
546	GTCL	SPEC	6. SCADA SYSTEM	SCADA
596	GTCL	SD	TYPICAL DEEPWELL ANODE GROUNDED INSTALLATION	DEEPWELL ANODE GROUNDED INSTALLATION
595	GTCL	SD	TYPICAL TEST STATION INSTALLATION DETAILS	TEST STATION INSTALLATION
587	GTCL	SD	TYPICAL DETAILS-BOUNDARY WALL AND GATES	BOUNDARY WALL AND GATES
588	GTCL	SD	TYPICAL DETAILS-BOUNDARY WALL AND GATES	BOUNDARY WALL AND GATES
589	GTCL	SD	TYPICAL DETAILS-BOUNDARY WALL AND GATES	BOUNDARY WALL AND GATES
618	GTCL	SD	TYPICAL DRAWING CROSS SECTION FOR WBBB TO	WBBB TO NALKA

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
			NALKA	
592	GTCL	SD	TYPICAL DETAILS-DRAINAGE	DRAINAGE
616	GTCL	SD	TYPICAL DRAWING P3/P4 INTERFACE DRAWING AT DHANUA AND ELENGA	INTERFACE DRAWING
617	GTCL	SD	TYPICAL DRAWING P3/P4 INTERFACE DRAWING AT SIRAJGANJ	INTERFACE DRAWING
494	GTCL	SD	WEST BANK BANGABANDHU BRIDGE STATION	PIG TRAP FOUNDATION & PIPE SUPPORT GA
615	GTCL	SD	STANDARD DETAILS FOR PIPELINE CROSSING-PLAN AND PROFILE	PIPELINE CROSSING-PLAN AND PROFILE
613	GTCL	SD	STANDARD DETAILS TYPICAL RAILWAY CROSSING (NON-OPEN CUT)	RAILWAY CROSSING (NON-OPEN CUT)
495	GTCL	SD	BLOCK VALVE STATION MLV-1 & MLV-2 RETAINING WALL GA	RETAINING WALL GA
548	GTCL	SD	HDD SALDA RIVER PLAN AND PROFILE	RIVER CROSSING
549	GTCL	SD	HDD TONGI-1 RIVER PLAN AND PROFILE	RIVER CROSSING
550	GTCL	SD	HDD TONGI-2 RIVER PLAN AND PROFILE	RIVER CROSSING
551	GTCL	SD	HDD BONGSI RIVER PLAN AND PROFILE	RIVER CROSSING
552	GTCL	SD	HDD SAFARI RIVER PLAN AND PROFILE	RIVER CROSSING
553	GTCL	SD	HDD LANGALIA RIVER PLAN AND PROFILE	RIVER CROSSING
554	GTCL	SD	TYPICAL DRAWING HDD ENTRY LAYOUT	RIVER CROSSING
555	GTCL	SD	TYPICAL DRAWING P2/P4 INTERFACE DRAWING	RIVER CROSSING
611	GTCL	SD	STANDARD DETAILS TYPICAL ROAD CROSSING (NON-OPEN CUT)	ROAD CROSSING (NON-OPEN CUT)
612	GTCL	SD	STANDARD DETAILS TYPICAL ROAD CROSSING (OPEN CUT)	ROAD CROSSING (OPEN CUT)
591	GTCL	SD	TYPICAL DETAILS-ROADS	ROADS
590	GTCL	SD	TYPICAL DETAILS-SECURITY FENCING	SECURITY FENCING
593	GTCL	SD	TYPICAL DETAILS-SERVICE PLATFORM	SERVICE PLATFORM
481	GTCL	SD	WORK PROCEDURE FOR TRENCHING	TRENCHING
492	GTCL	SD	FOUNDATION GA-MISC EQUIPMENT	TEG FOUNDATION
493	GTCL	SD	FOUNDATION GA-MISC EQUIPMENT	TIE-IN CONCRETE PIT
480	GTCL	SD	ANNEXURE-01 SYMBOLS	SYMBOLS
614	GTCL	SD	STANDARD DETAILS TYPICAL WATER COURSE CROSSING (OPEN CUT)	WATER COURSE CROSSING (OPEN CUT)
605	GTCL	SD	ELECTRIAL INSTALLATION DETAILS (EARTHING SYSTEM)	EARTHING SYSTEM
597	GTCL	SD	ELECTRIAL LOAD LIST BLOCK VALVES FOR WEST BANK OF BANGABANDHU BRIDGE TO NALKA	ELECTRIAL LOAD LIST
606	GTCL	SD	TYPICAL INSTRUMENT HOOK-UP DETAIL FOR DEIRECT MOUNTED PRESSURE GAUGE	INSTRUMENT HOOK-UP
619	GTCL	SD	TYPICAL INSTRUMENT HOOKUP DETAILS FOR DIRECT MOUNTED PRESSURE GAUGE	DIRECT MOUNTED PRESSURE GAUGE
608	GTCL	SD	TYPICAL INSTRUMENT HOOK-UP DETAIL FOR GAS OPERATED VALVE	INSTRUMENT HOOK-UP
607	GTCL	SD	TYPICAL INSTRUMENT HOOK-UP DETAIL FOR REMOTE MOUNTED PRESSURE TRANSMITTER	INSTRUMENT HOOK-UP
609	GTCL	SD	TYPICAL INSTRUMENT HOOK-UP DETAIL FOR THERMOELECTRIC GENERATOR (TEG)	INSTRUMENT HOOK-UP
594	GTCL	SD	TYPICAL EXOTHERMIC WELDING INSTALLATION DETAILS	EXOTHERMIC WELDING INSTALLATION
610	GTCL	SD	PIPE SUPPORT STANDARD	PIPE SUPPORT

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
623	JGTDCL	AS	20"*1000PSIG*10KM BIBIYANA GF (SOUTH PAD) TO BIBIYANA PS-3, PARKUL	BIBIYANA GF (SOUTH PAD) TO BIBIYANA PS-3, PARKUL, 7 sheets
638	JGTDCL	AS	6"*1150PSIG*4946.04METER BIBIYANA TO AUSHKANDI PIPELINE	BIBIYANA TO AUSHKANDI
644	JGTDCL	AS	AS LAID DWG OF 6"*500PSIG*17.561KM PIPELINE FROM PATIBAGH DRS TO JALALPUR VALVE STATION	PATIBAGH DRS TO JALALPUR
645	JGTDCL	AS	AS LAID DWG OF 6"*500PSIG*17.561KM PIPELINE FROM PATIBAGH DRS TO JALALPUR VALVE STATION	PATIBAGH DRS TO JALALPUR VALVE STATION
646	JGTDCL	AS	AS LAID DWG OF 6"*500PSIG*17.561KM PIPELINE FROM PATIBAGH DRS TO JALALPUR VALVE STATION	4 sheets
651	JGTDCL	AS	AS LAID DWG OF 6"*500PSIG*12.455KM PIPELINE FROM SREEMONGAL TO BHAIRABBAZAR DRS	SREEMONGAL TO BHAIRABBAZAR DRS 6 sheets
630	JGTDCL	LIST	Data / Information about Gas Transmission/ Distribution Pipelines.	
633	JGTDCL	MS	THERMO ELECTRIC GENERATOR	TEG
659	JGTDCL	MS	Thermo Electric Generator	TEG
632	JGTDCL	MS	Sect.7 Technical Spec for Ball Valves	BALL VALVES
631	JGTDCL	MS	Steel (M.S) line pipe confirming to API 5L×56	PIPE
634	JGTDCL	MS	MS Fittings	FITTING
643	JGTDCL	P&ID	P&ID OF SYLHET POWER PLANT CMS AT KUMARGAON, SYLHET, BANGLADESH	Sylhet 150 MW power plant CMS
639	JGTDCL	P&ID	PLANT CMS 70 MMSCFD AT SHAHJALAL FERTILIZER PROJECT	70 MMSCFD CMS, 4 sheets
657	JGTDCL	P&ID	AS LAID P&ID OF BHAIRABGONG DRS AT MLV	BHAIRABGONG DRS AT MLV
658	JGTDCL	P&ID	AS LAID MODIFICATION (P&ID) OF PIROPUR DRS	PIROPUR DRS
637	JGTDCL	PD	Nabiganj Gas Supply & Distribution.tif	
650	JGTDCL	RP	AS LAID DWG OF 6"*500PSIG*12.455KM PIPELINE FROM SREEMONGAL TO BHAIRABBAZAR DRS	SREEMONGAL TO BHAIRABBAZAR DRS
636	JGTDCL	SPECIFICATIONS	Technical Specification for RMS For Fertilizer	RMS for Fertilizer
635	JGTDCL	SPECIFICATIONS	Design Basis - RMS FOR Bibiyana-3, 400 MW RMS	RMS
660	PETROBRANGLA	AS	NORTH/SOUTH PIPELINE ROUTE ALIGNMENT AND PROFILE; METRE 93492.03 TO METRE 96873.08	5854-P-392 to P419
688	PETROBRANGLA	FUTURE PLAN	SDG Action Plan through National Mid-Term and Long-Term Development Plans	COVER SHEET TO BE TRANSLATED
689	PETROBRANGLA	MS	TECHNICAL SPEC-CATHODIC PROTECTION MATERIALS	PART OF SPEC BOOKLET
697	PETROBRANGLA	MS	TECHNICAL SPEC-COMMERCIAL AND INDUSTRIAL GAS PRESSURE REGULATOR	PRESSURE REGULATOR
696	PETROBRANGLA	MS	TECHNICAL SPEC-METERS	METER
695	PETROBRANGLA	MS	TECHNICAL SPEC-DOMESTIC REGULATOR & OTHERS	REGULATOR
690	PETROBRANGLA	MS	TECHNICAL SPEC-ODORIZER AND OTHER MATERIALS	ODORIZER AND OTHER MATERIALS
698	PETROBRANGLA	MS	TECHNICAL SPEC-BALL VALVES	BALL VALVES

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
694	PETROB ANGLA	MS	TECHNICAL SPEC-FORMED BENDS	FORMED BENDS
692	PETROB ANGLA	MS	TECHNICAL SPEC-MISCELLANEOUS FITTINGS	MISCELLANEOUS FITTINGS
691	PETROB ANGLA	MS	TECHNICAL SPEC-LINE PIPE UPTO 150 PSIG	LINE PIPE UPTO 150 PSIG
693	PETROB ANGLA	MS	TECHNICAL SPEC-TAPE AND PRIMER	TAPE AND PRIMER
699	PETROB ANGLA	MS	TECHNICAL SPEC-RELIEF VLVES	RELIEF VLVES
700	PETROB ANGLA	REPOR T	Technical Assistance to Review the Approach for Increasing the Efficiency of Gas Utilization in Certain Major Users	
712	PGCL	CP	DATA/INFORMATION ABOUT VARIOUS STATIONS/OFF-TAKES UNCGS/TBS/DRSDER TRANSMISSION PIPELINES	
701	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	G: BAGHABARI-ISHWARDI(Epz) 8"TRANSMISSION LINE
702	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	E: BERA TOWN DISTRIBUTION NETWORK
703	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	B: BOGRA DISTRIBUTION NETWORK
704	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	I: ISHWARDI TOWN DISTRIBUTION NETWORK
705	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	H: PABNE TOWN DISTRIBUTION NETWORK
706	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	J: RAJSHAHI TOWN DISTRIBUTION NETWORK
707	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	F: SHANTHIA TOWN DISTRIBUTION NETWORK
708	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	A: SIRAJIGANJ DISTRIBUTION NETWORK
709	PGCL	CP	LIST OF PIPE TO SOIL POTENTIAL (PSP) REGARDING TEST POST POINT	C: ULLAPARA DISTRIBUTION NETWORK
710	PGCL	CP	NAME AND LOCATION OFTR/TEG SET AND CP TEST POST (DETAILED)	
711	PGCL	CP	LIST OF TR/TEG SET	
714	PGCL	MS	TECHNICAL SPECIFICATION FOR GAS PIPELINE AND GAS CONNECTION MATERIALS (COPY OF DC-ID 648-660)	
713	PGCL	MS	COVER SHEET FOR TECHNICAL SPECIFICATION FOR GAS PIPELINE AND GAS CONNECTION MATERIALS	
715	PGCL	PD	PIPING SCHEMATICS FOR ULLPARA DRS	ULLPARA DRS
716	PGCL	PD	PIPING SCHEMATICS FOR BAGHABARI DRS	BAGHABARI DRS
717	PGCL	PD	CP SYSTEM CONFIGURATION: BOGRA TBS	BOGRA TBS
718	PGCL	PD	CP SYSTEM CONFIGURATION: HATIKUMRULTBS	HATIKUMRULTBS
719	PGCL	PD	PIPING SCHEMATICS FOR ISHWARDI DRS	ISHWARDI DRS

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
720	PGCL	PD	CP SYSTEM CONFIGURATION: RAJSHAHI TBS	RAJSHAHI TBS
722	PGCL	SD	TYPE 1 POTENTIAL TEST FACILITY	
723	PGCL	SD	TYPE 2 ABOVEGROUND ISOLATING JOINT TEST FACILITY	
724	PGCL	SD	TYPE 3: ZINK EARTH ELECTRIRODE TEST FACILITY	
725	PGCL	SD	TYPE 4: RIVER CROSSING MAGNESIUM ANODE TEST FACILITY	
726	PGCL	SD	TYPE 5: STEEL CASED PIPELINE CROSSING TEST FACILITY	
727	PGCL	SD	TYPE 6: DRAIN POINT TEST FACILITY AT CP STATION	
728	PGCL	SD	TYPE 7: FOREIGN SERVICE CROSSING TEST FACILITY	
729	PGCL	SD	TYPE 8: PERMANENT MAGNESIUM ANODE TEST FACILITY	
730	PGCL	SD	VERTICAL IMPRESSED CURRENT GROUNDBED	
731	PGCL	SD	HORIZONTAL IMPRESSED CURRENT GROUNDBED	
721	PGCL	SD	POTENTIAL TEST FACILITY OF CATHODIC PROTECTION SYSTEM	
746	PGCL	SD	SLAB, RCC SUPPORT AND FENCING FOUNDATION DETAILS	
747	PGCL	SD	CHAIN LINKED FENCING & GI PIPE GATE DETAILS	
748	PGCL	SD	DETAILS OF AREAL MARKER POST	
742	PGCL	SD	RAIL/ROAD CROSSING AND RIGHT OF WAY DETAILS	
743	PGCL	SD	KHAL CROSSING	
732	PGCL	SD	TYPICAL CROSS SECTION OF PIPE LAYING TRENCH	
734	PGCL	SD	VALVE PIT COVER DETAILS	
735	PGCL	SD	DETAIL DRAWING OF VALVE PIT CONSTRUCTION	
744	PGCL	SD	DETAILS OF RCC COATING	
745	PGCL	SD	DETAILS FOR CONCRETE COATED PIPE	
736	PGCL	SD	NEW RISER DETAILS	
737	PGCL	SD	NEW RISER HEADER (20MM)	
738	PGCL	SD	RISER HEADER (25MM) CONSTRUCTION, ABOVE GROUND	
739	PGCL	SD	RISER PERMANENTLY KILLING	
740	PGCL	SD	RISER SHIFTING BY CHANGING SERVICE TEE	
741	PGCL	SD	RISER SHIFTING BY KEEPING SERVICE TEE UNCHANGED	
733	PGCL	SD	BUTT WELDING DETAILS	
749	SGFL	MS	SCHEDULE OF MATERIALS FOR WORKOVER OF THREE WELLS (KTL-1, RP-2 & RP-6) OF SYLHET GAS FIELDS LIMITED	WORKOVER FOR WELL
750	TGTDCL	AS	GAS SUPPLY TO HARIPUR 360MW POWER STATION UNDER HDFP	HARIPUR 360MW POWER STATION
751	TGTDCL	AS	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ PIPELINE	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ
752	TGTDCL	AS	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ PIPELINE	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ
753	TGTDCL	AS	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ PIPELINE	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
754	TGTDCL	AS	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ PIPELINE	
755	TGTDCL	AS	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ PIPELINE	MYMENSINGH M&R STATION CHAR RAGHURAMPUR-RPDCL AT SHANMVUGANJ
758	TGTDCL	AS	NARSINGDI-GHORASHAL THIRD PARALEL LINE	
793	TGTDCL	AS	TONGI-JOYDEVPUR DISTRIBUTION MAIN LINE	
794	TGTDCL	AS	TONGI-JOYDEVPUR DISTRIBUTION MAIN LINE	
781	TGTDCL	AS	NARSINGDI-SIDDHIRGANJ TRANSMISSION PIPELINE	12 sheets
759	TGTDCL	AS	ROUTE MAP NARSHINGDI-GHORASHAL-JOYDEVPUR PIPELINE	NARSINGDI-GHORASHA L PARALLEL SECTION
760	TGTDCL	AS	ROUTE MAP NARSHINGDI-GHORASHAL-JOYDEVPUR PIPELINE	NARSINGDI-GHORASHA L PARALLEL SECTION
761	TGTDCL	AS	ROUTE MAP NARSHINGDI-GHORASHAL-JOYDEVPUR PIPELINE	NARSINGDI-GHORASHA L PARALLEL SECTION
762	TGTDCL	AS	ROUTE MAP NARSHINGDI-GHORASHAL-JOYDEVPUR PIPELINE	GHORASHAL-JOYDEVP UR SECTION, 11 sheets
756	TGTDCL	AS	NARSINGDI-GHORASHAL THIRD PARALEL LINE	
757	TGTDCL	AS	NARSINGDI-GHORASHAL THIRD PARALEL LINE	
795	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 10
796	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 15
797	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 16
798	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 20
799	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 21
800	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 22
801	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 27
802	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 28
803	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 17
804	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 26
805	TGTDCL	LD	MAP OF ROAD NETWORK WITH LANDMARKS IN THE MDMD5 AREA; DISTRIBUTION NETWORK	GRID 9
815	TGTDCL	PD	LAND ACQUISITION PLAN FOR CONSTRUCTION OF 20" DN*1000PSIG PARALLEL/LOOP LINE FROM MONOHOLDI VALVE STATION TO NARSINGDHI VALVE STATION-12	MUNSEFER CHAR
816	TGTDCL	PD	LAND ACQUISITION PLAN FOR CONSTRUCTION OF 20" DN*1000PSIG PARALLEL/LOOP LINE FROM MONOHOLDI VALVE STATION TO NARSINGDHI VALVE STATION-12	NARSINGDI VS-12
806	TGTDCL	PD	DEMRA CGS	
773	TGTDCL	RP	MONOHOLDI-NARSINGDI TRANSMISSION PIPELINE	MONOHOLDI-NARSING DI, 8 sheets
807	TGTDCL	RP	LAND ACQUISITION PLAN FOR CONSTRUCTION OF 20" DN*1000PSIG PARALLEL/LOOP LINE FROM MONOHOLDI VALVE STATION TO NARSINGDHI VALVE STATION-12	8 sheets

ID NO.	OWNER	DOC TYPE	DOCUMENT TITLE	DOC/SHEET NO. OR KEY WORD
848	TGTDCL	RP	ROUTE SURVEY PLAN JOYDEVPUR-TANGAIL	J-T 22/38 – 34/38 OF 38
860	TGTDCL	RP	ROUTE SURVEY PLAN JOYDEVPUR-TANGAIL	J-T 36 OF 38
861	TGTDCL	RP	ROUTE SURVEY PLAN JOYDEVPUR-TANGAIL	J-T 36A OF 38
862	TGTDCL	RP	ROUTE SURVEY PLAN JOYDEVPUR-TANGAIL	J-T 36B OF 38
820	TGTDCL	SD	STANDARD DRAWING OF TYPICAL CABLE & TYPICAL PIPELINE CROSSING	CABLE & PIPELINE CROSSING
840	TGTDCL	SD	STANDARD DRAWING OF VALVE PIT	VALVE PIT
831	TGTDCL	SD	STANDARD DRAWING OF RCC REINFORCED CEMENT COATING OVER PIPELINE	RCC REINFORCED CEMENT COATING
832	TGTDCL	SD	STANDARD DRAWING OF RCC REINFORCED CEMENT COATING OVER PIPELINE	RCC REINFORCED CEMENT COATING
822	TGTDCL	SD	STANDARD DRAWING OF CONCRETE FOUNDATION SHELL (SET ON WEIGHT) AND ROAD CROSSING WITHOUT CASING	CONCRETE FOUNDATION SHELL (SET ON WEIGHT) AND ROAD CROSSING, 2sheets
826	TGTDCL	SD	STANDARD DRAWING OF MAJOR RAILWAY CROSSING WITH STEEL CASING PIPE	RAILWAY CROSSING, 4 sheets
821	TGTDCL	SD	DIMENSION OF RIGHT OF WAY(ROW)	RIGHT OF WAY(ROW)
833	TGTDCL	SD	MAJOR RIVER CROSSING BY HORIZONTAL DIRECTIONAL (HDD) METHOD	RIVER CROSSING BY HDD
834	TGTDCL	SD	MAJOR RIVER CROSSING BY HORIZONTAL DIRECTIONAL DRILLING (HDD) METHOD	RIVER CROSSING BY HDD
824	TGTDCL	SD	STANDARD DRAWING OF MAJOR PUBLIC ROAD CROSSING WITH STEEL CASING PIPE	PUBLIC ROAD CROSSING WITH STEEL CASING PIPE
825	TGTDCL	SD	STANDARD DRAWING OF MAJOR PUBLIC ROAD CROSSING WITH STEEL CASING PIPE	PUBLIC ROAD CROSSING WITH STEEL CASING PIPE
819	TGTDCL	SD	STANDARD DRAWING OF TRENCHES FOR LOW & HIGH PRESSURE GAS PIPELINE	TRENCHES FOR LOW & HIGH PRESSURE GAS PIPELINE
817	TGTDCL	SD	STANDARD DRAWING OF VALVE PIT	VLVE PIT, 6 sheets
841	TGTDCL	SD	STANDARD DRAWING OF VALVE PIT COVER	VALVE PIT COVER
830	TGTDCL	SD	WATER COURSE CROSSING BY OPEN METHOD	WATER COURSE CROSSING
843	TGTDCL	SD	STANDARD DRAWING OF SCRAPER TRAP	SCRAPER TRAP
844	TGTDCL	SD	STANDARD DRAWING OF SCRAPER TRAP	SCRAPER TRAP
818	TGTDCL	SD	CONSTRUCTION OF 12"*1000PSIG*13KM GAS TRANSMISSION PIPELINE FROM MYMENSINGH M&R STATION TO RURAL POWER COMPANY LIMITED, SHOMOVUGON-BOM FOR VALVE STATION	BILL OF MATERIALS
847	TGTDCL	SD	STANDARD DRAWING OF BUTT WELDING NOZZLE WITH WELDING NECK (W/N) FLANGE RAISED FACE (R/F)	BUTT WELDING NOZZLE
842	TGTDCL	SD	STANDARD DRAWING OF TYPICAL PIG LAUNCHER AND PIG RECEIVER FOR PIPELINE TEST	PIG LAUNCHER AND PIG RECEIVER
845	TGTDCL	SD	STANDARD DRAWING OF SCRAPER SIGNALER/QUICK CLOSING DOOR	SCRAPER SIGNALER
846	TGTDCL	SD	DETAILS OF VALVE STATION	DETAILS OF VALVE STATION

Source: Prepared by JST

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

Final Report

APPENDICES

Appendix-B Demonstration of Gas and Power Network Infrastructure Management System

Appendix B-1 Manuals for Gas and Power Network Infrastructure Management System

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

Demonstration of Bangladesh Gas and Power Network Soft Infrastructure

November 2017

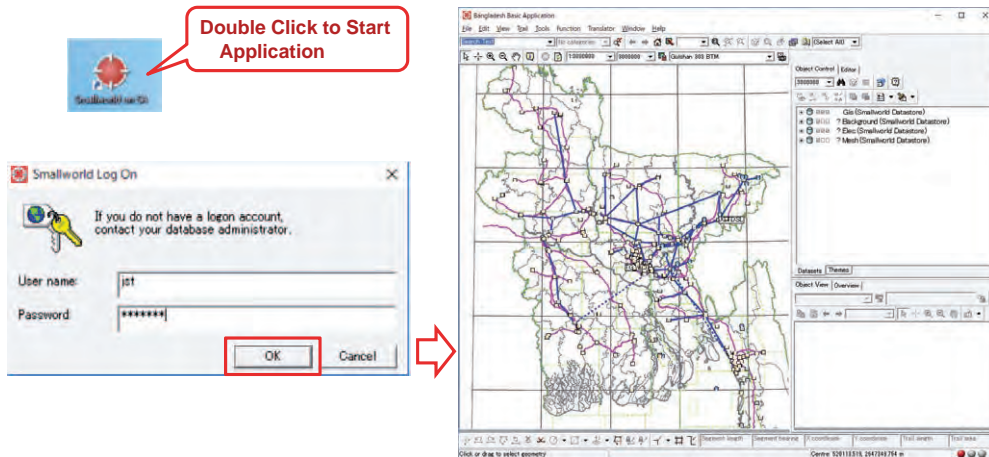
Nippon Koei Co., Ltd.
Chiyoda U-Tech Co., LTD.

Contents

1. To start Smallworld
2. World: Geographic World, Schematic World, and Internal World
3. Object
4. Query and Export data to Excel
5. Version Management
6. Input Physical Fields, Geometry and Create Object
7. Connection of Objects
8. Internal World
9. Network Trace
10. Data Model Change
11. ACE (Application Configuration Environment) and Style

To Start Application

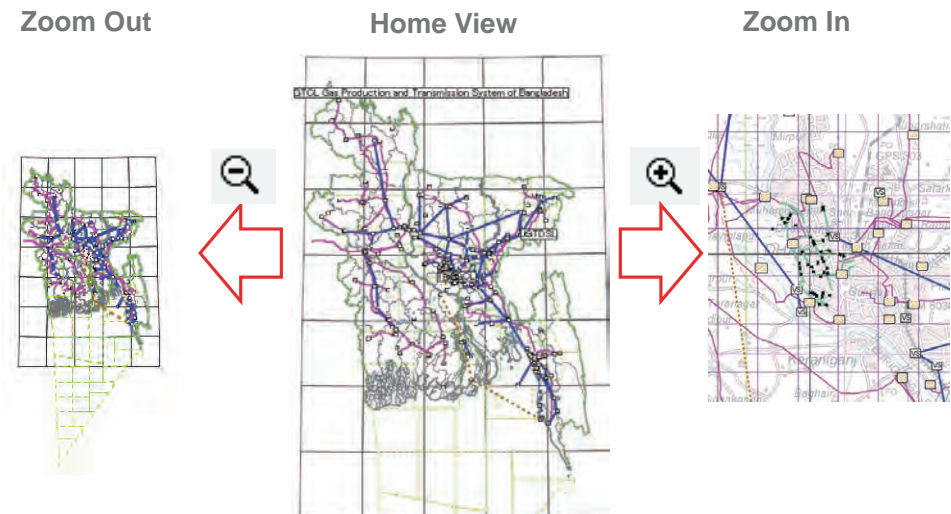
To start Smallworld, please double click Smallworld icon in the desktop.



Bangladesh gas/power map appears in Smallworld

Geographic World

Zoom In/Out is smoothly managed with zoom icon.



Change to “Schematic World”



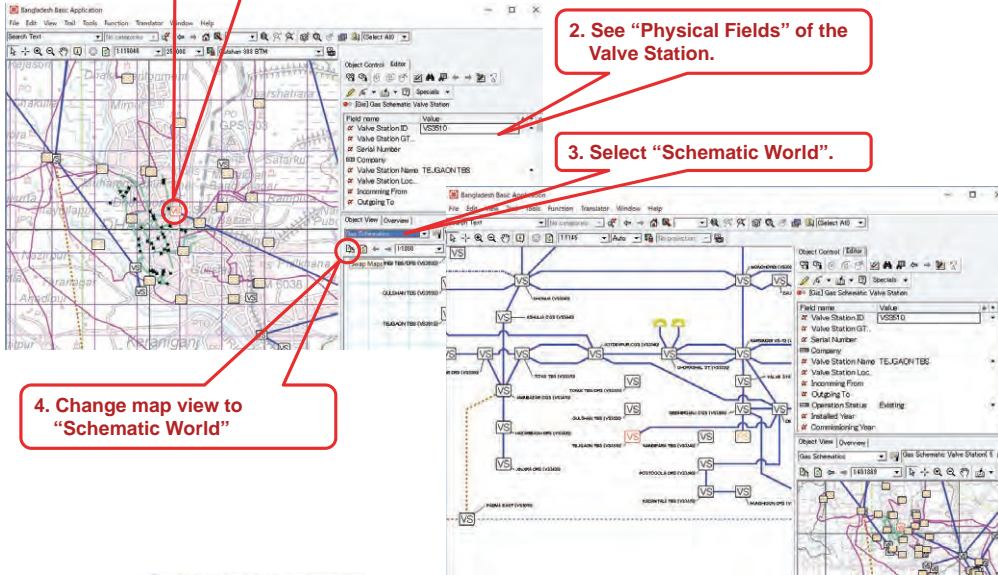
1. Select a Valve Station.

“Schematic World” is a logical map simplifying connections.

2. See “Physical Fields” of the Valve Station.

3. Select “Schematic World”.

4. Change map view to “Schematic World”



Change to “Internal World”



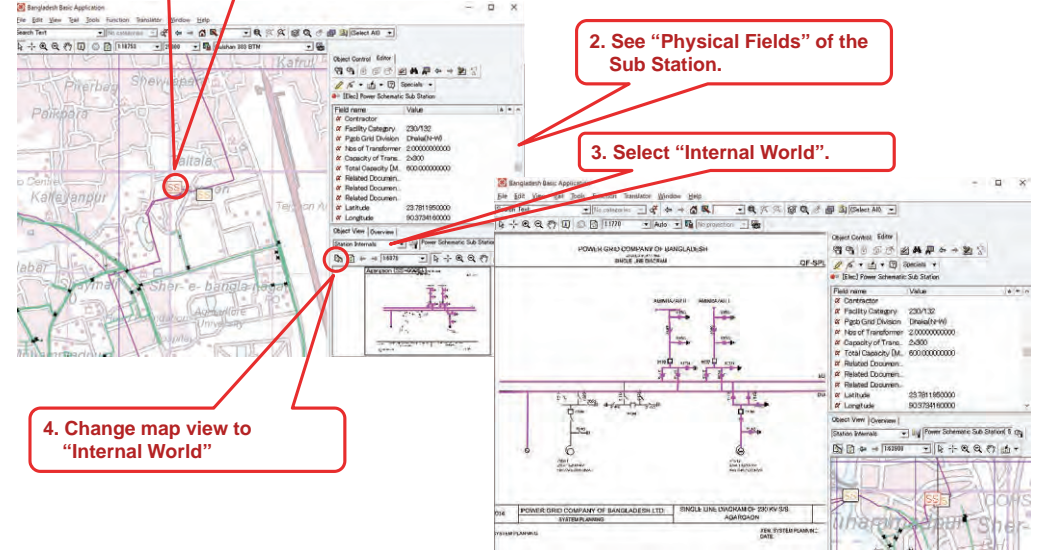
1. Select a Sub Station.

“Internal World” is detailed map showing facility inside.

2. See “Physical Fields” of the Sub Station.

3. Select “Internal World”.

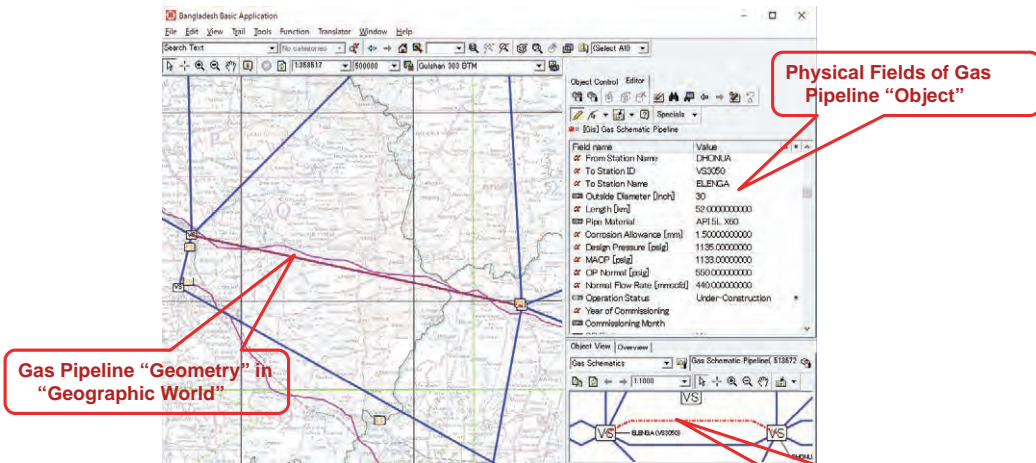
4. Change map view to “Internal World”



A Real World Object (RWO)



A "thing" in the real world is related one-to-one to an "Object" in Smallworld.



Gas Pipeline “Geometry” in “Geographic World”

Physical Fields of Gas Pipeline “Object”

Gas Pipeline “Geometry” in “Schematic World”

Object, Geometry, and World

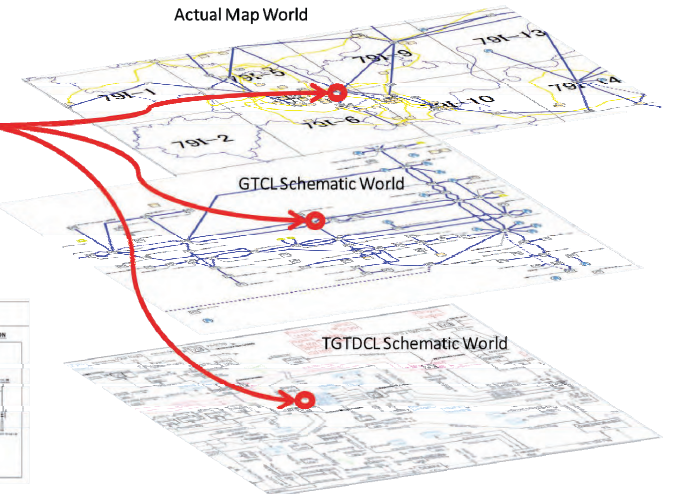


Single Object can exist in various Geometries and different Worlds.

Valve Station Object

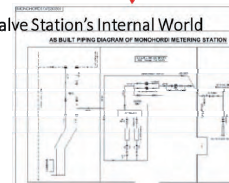
Field name	Value
Valve Station ID	VS3320
Company	
Valve Station Name	NARSHIGDI VS-12
Operation Status	Existing
Commissioning Year	
Commissioning Month	
Flow Rate	
MACP [PSIG]	
CP Normal [PSIG]	
CP Minimum [PSIG]	

Actual Map World



GTCL Schematic World

Valve Station's Internal World



TGTCL Schematic World

Object Examples (1)



Gas Valve Station

Physical Fields of Gas Valve Station "Object"

Gas Valve Station "Geometry" in "Geographic World"

Gas Valve Station "Geometry" in "Schematic World"

Internal World of Gas Valve Station "Object"

Object Examples (2)



Power Sub Station and Transmission Line

"Physical Fields" of Transmission Line "Object"

Transmission Line "Geometry" in "Geographic World"

"Physical Fields" of Sub Station "Object"

Sub Station "Geometry" in "Geographic World"

"Internal World" of Sub Station "Object"

Export Object List to Excel



1. Select target Object

2. Click 'Browse' button

3. Click 'Export to Microsoft Excel' button

Table of large data records in SW can be prepared and exported in Excel.

Valve Station ID	Valve Station Name	Valve Station Location	Incoming From	Outgoing To	Dimension	Installed Year
VSI010	KALASHHTLA 232 MANFOLD					
VSI100	MADAH OS					
VSI100	HOEDONUM					
VSI040	KHATHATA M					
VSI050	ASHUGONJ G					
VSI000	VALVE STATION					
VSI070	JOTDSL SYST					
VSI080	JOTDSL SYST					
VSI080	MUNSHIBAZAR					
VSI090	BARABARAD					
VSI200	KUTAMBARUR					
VSI200	ELIRA TBS					
VSI200	FEN TBS					
VSI100	CHITTAGONH					
VSI200	COMILLA DRG					
VSI2070	CHANDPUR TE					
VSI2000	MATLAB TBS					
VSI2000	LAKSHMIPUR					
VSI2100	NASRABAD H					
VSI2110	KALURHAT H					
VSI2120	MOKESHKHAL					
VSI2130	KHAGRACHAR					
VSI2140	VS RING COCN					

Spatial Query (1)



Spatial Query can select objects existing in a certain area, region, division, etc.

1. Select a Division Area

2. Select a Division Area

1. Check to selectable Division Area

Spatial Query (2)



2. Run a Spatial Query

1. Select a Query

2. Run a Query

Name	Dataset	Type	Run
PS in Selected Area	Elec	Script	Interrupt
VS in Selected Area	Gis	Script	New...

Spatial Query (3)



3. See the Result of Spatial Query

Export to Excel

PSMP Name	Grid Connection [kV]	Output [MW]	MMCDF 2017	MMCDF 2025	MMCDF 2035	Coef
Ghorasal (Polash, Nonshindi) 210.	132.00	672.00	4.00	0.00	0.00	C
Ghorasal (Polash, Nonshindi) 2x5.	132.00	70.00	16.00	0.00	0.00	C
Ghorasal 100 MW GRPP (Aggre.	132.00	100.00	21.00	0.00	0.00	C

Version Management (1)



“Alternative” is a version of dataset in updating management. Several “Alternative” can be maintained for each step of dataset updating work.

1. Make “Alternative” to avoid accidental changes of original data.

- 1. Select “Dataset”
- Gas: “Gis”
- Power: “Elec”

1. Select “Dataset”

2. Make “Alternative”.

3. Input “Alternative” name.

Version Management (2)



- 2. Make “Dataset” writable
- 3. Make “Checkpoint” for recovery point.

1. Double Click to move to “Alternative”.

2. Make writable.

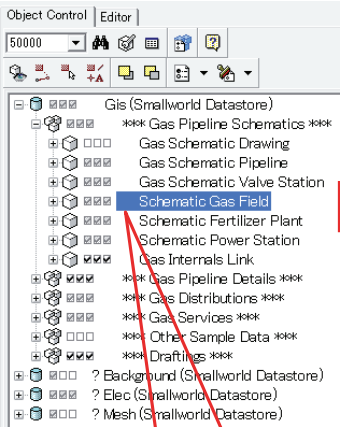
3. Make “Checkpoint”.

4. Input “Checkpoint” name.

Input Physical Fields (1)

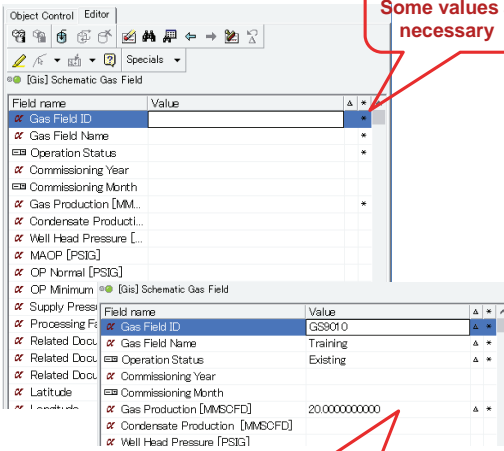


Select Gas Field "Object"



Double Click Object Name to open "Object Editor" of Gas Field

Gas Field "Object Editor"



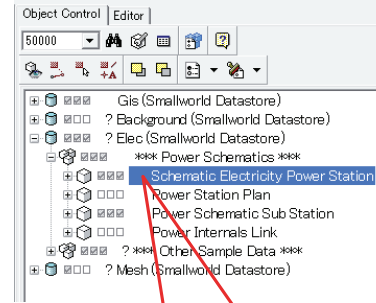
Mandatory Fields (*)
Some values are necessary

Input "Physical Fields"

Input Physical Fields (2)

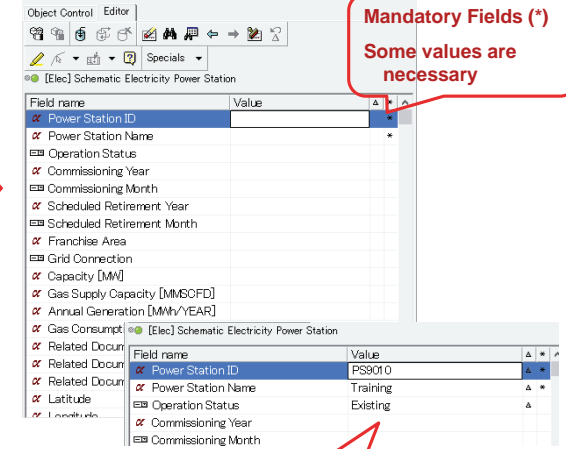


Select Power Station "Object"



Double Click Object Name to open "Object Editor" of Power Station

Power Station "Object Editor"



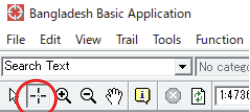
Mandatory Fields (*)
Some values are necessary

Input "Physical Fields"

Input Geometry and Create Object (1)



Let's create Object (Gas Field, Valve Station, Power Station, Transmission line, etc.)



1. "Trail" Mode

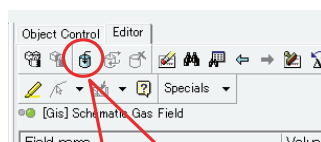


2. Put a "Trail" Point

Gas Field "Object Editor"



3. Set "Geometry"



4. Insert an "Object"

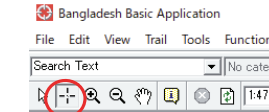
New Gas Field "Object"

Next: Try to create a new Valve Station by the same manner.

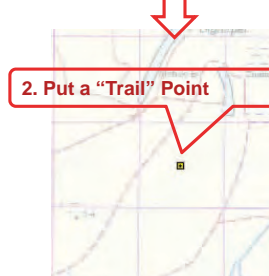
Input Geometry and Create Object (2)



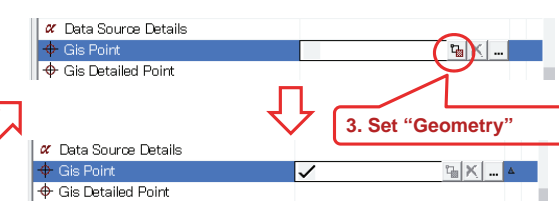
Power Station "Object Editor"



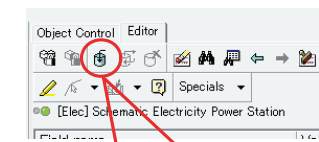
1. "Trail" Mode



2. Put a "Trail" Point



3. Set "Geometry"



4. Insert an "Object"

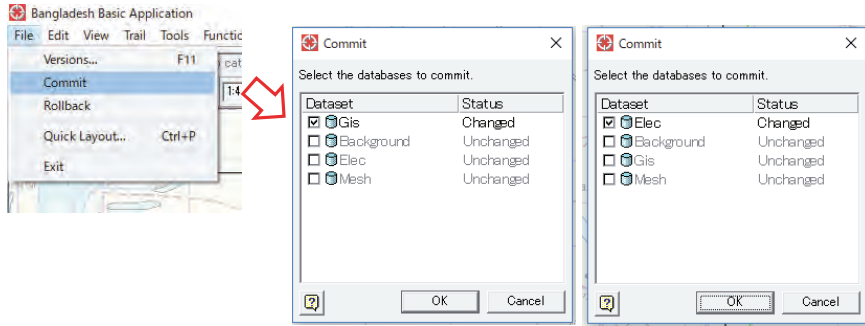
New Power Station "Object"

Next: Try to create a new Sub Station by the same manner.

Commit Database after Edit



“Commit” is the saving of edited contents in a dataset in update management.

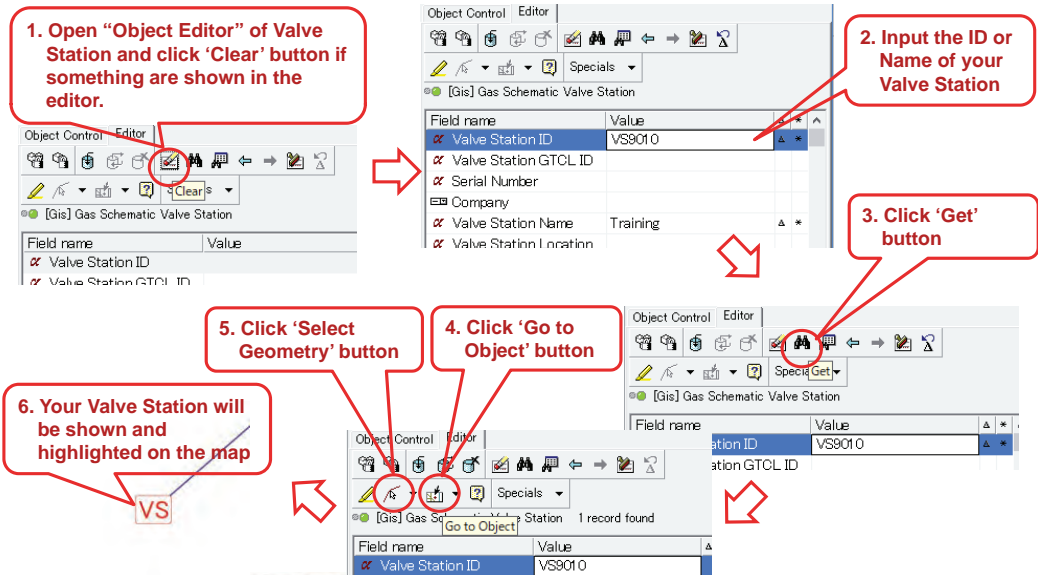


Finally: Create 'End' checkpoint after today's all editing work is completed.

Finding Objects in a map by ID or name



If you miss your new Valve Station location, it can be searched through “Get” bottom.

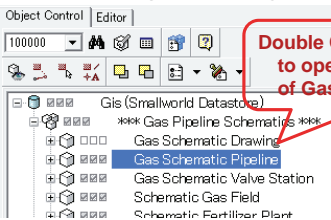


Connect Point Objects by Chain Object (1)



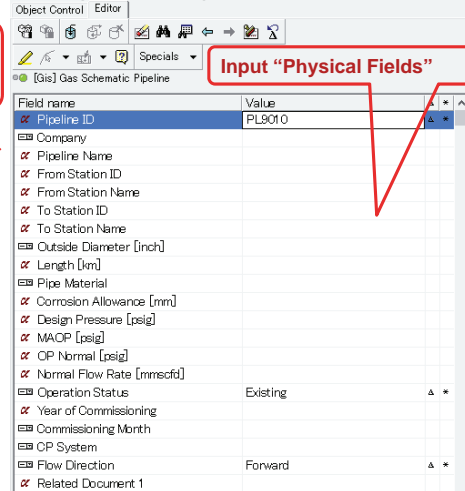
Making and identification of connection between objects and objects is important in network infrastructure management.

Select Gas Pipeline “Object”



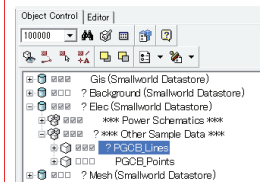
Double Click Object Name to open “Object Editor” of Gas Pipeline

Gas Pipeline “Object Editor”



Input “Physical Fields”

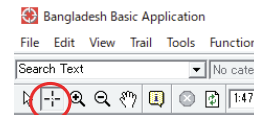
Try to create a new Power Transmission Line by the same manner.



Connect Point Objects by Chain Object (2)



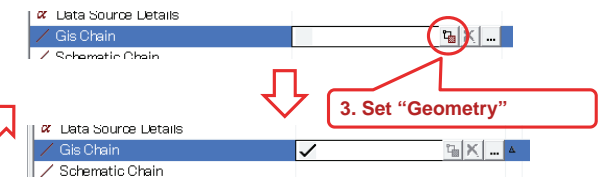
Power Station “Object Editor”



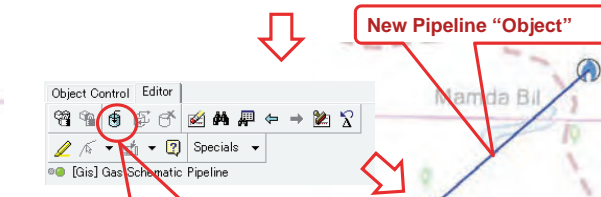
1. “Trail” Mode



2. Put a “Trail” Line to Connect Gas Field and Valve Station



3. Set “Geometry”

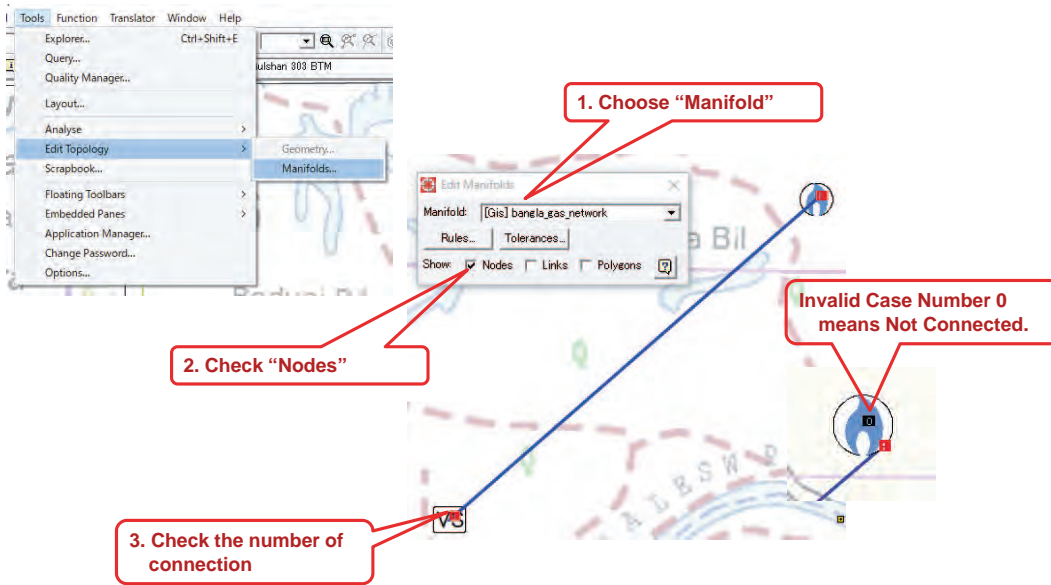


New Pipeline “Object”

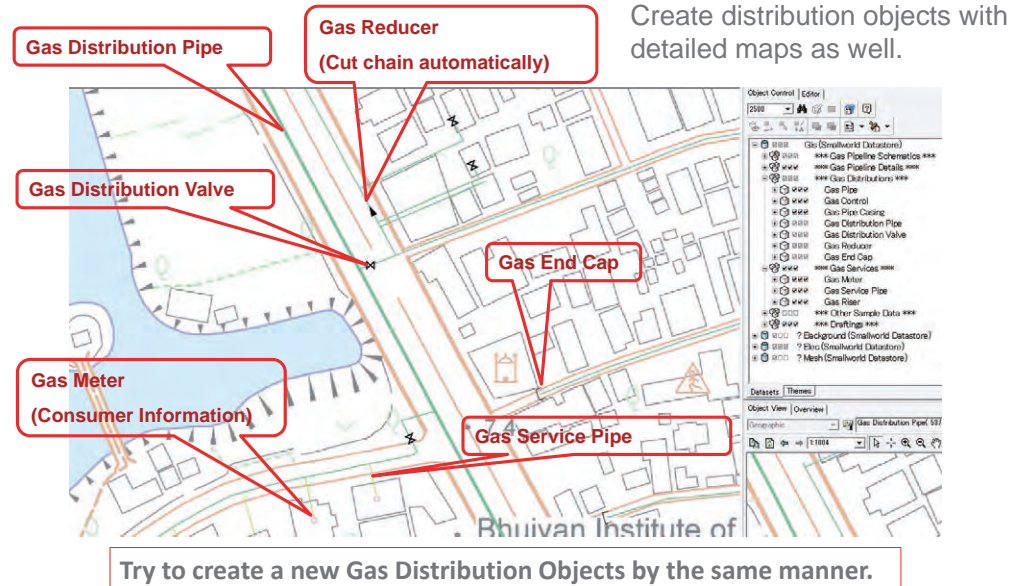
4. Insert an “Object”

Try to create a new Power Transmission Line by the same manner.

Check Connectivity of Objects



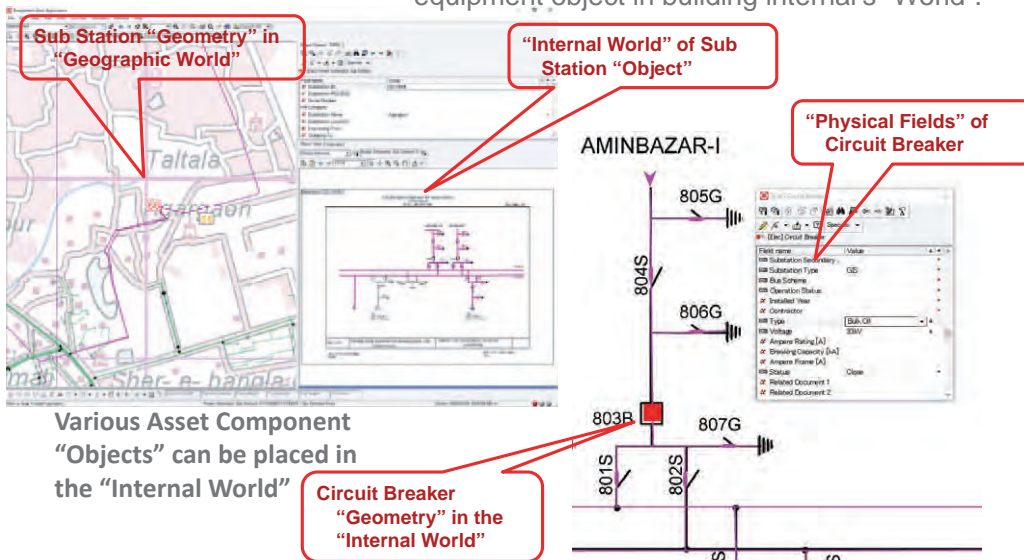
Input Gas Distribution Objects



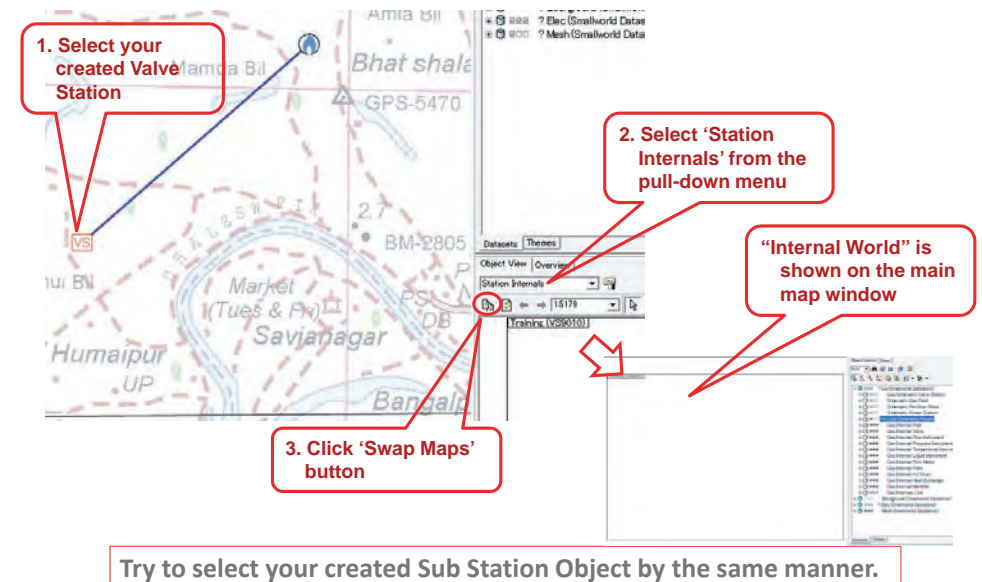
Internal World



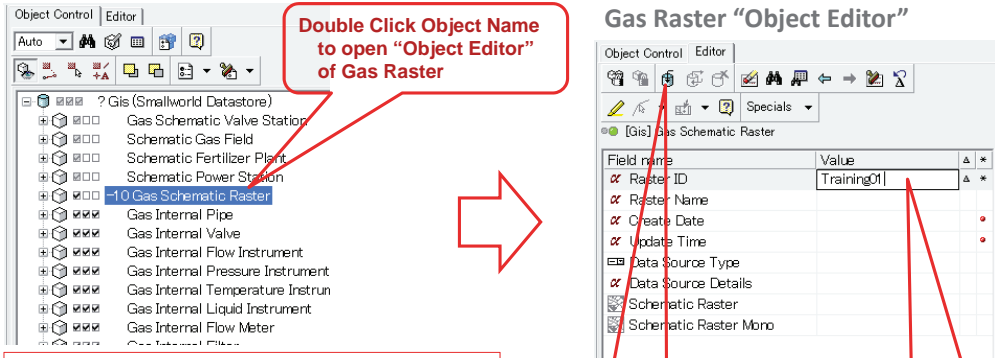
Each Station type object can have own facility/equipment object in building internal's "World".



Start Editing Internal World



Load a raster to Internal World (1)



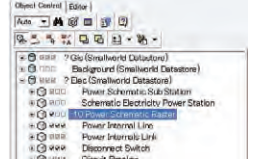
Double Click Object Name to open "Object Editor" of Gas Raster

Gas Raster "Object Editor"

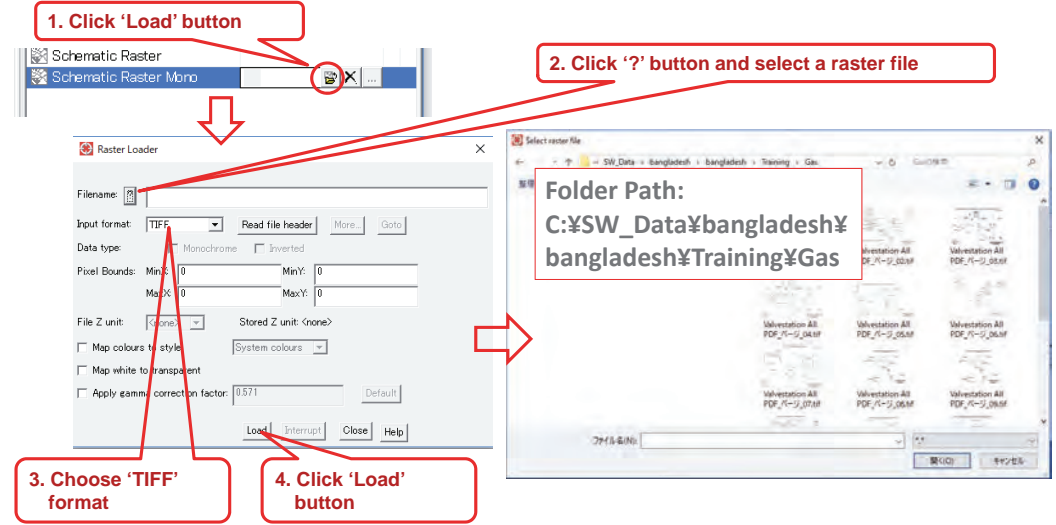
1. Input "Raster ID"

2. Click 'Insert' button

Try to create a new Power Raster Object in your Sub Station internal by the same manner.



Load a raster to Internal World (2)



1. Click 'Load' button

2. Click '?' button and select a raster file

3. Choose 'TIFF' format

4. Click 'Load' button

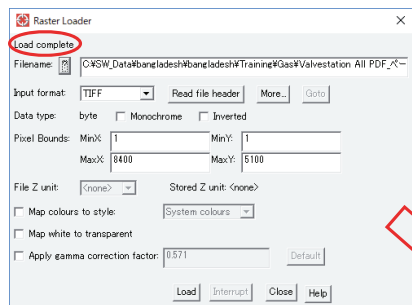
Folder Path:
C:\SW_Data\bangladesh\bangladesh\Training\Gas

Try to load a new Power Raster Geometry by the same manner.
(Folder Path: C:\SW_Data\bangladesh\bangladesh\Training\Power)

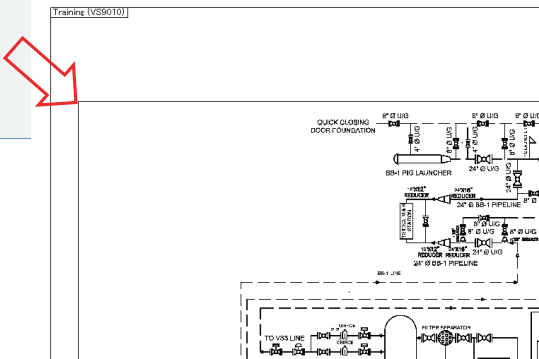
Load a raster to Internal World (3)



Raster data (such as drawings, single line diagram) can be used in Internal World.



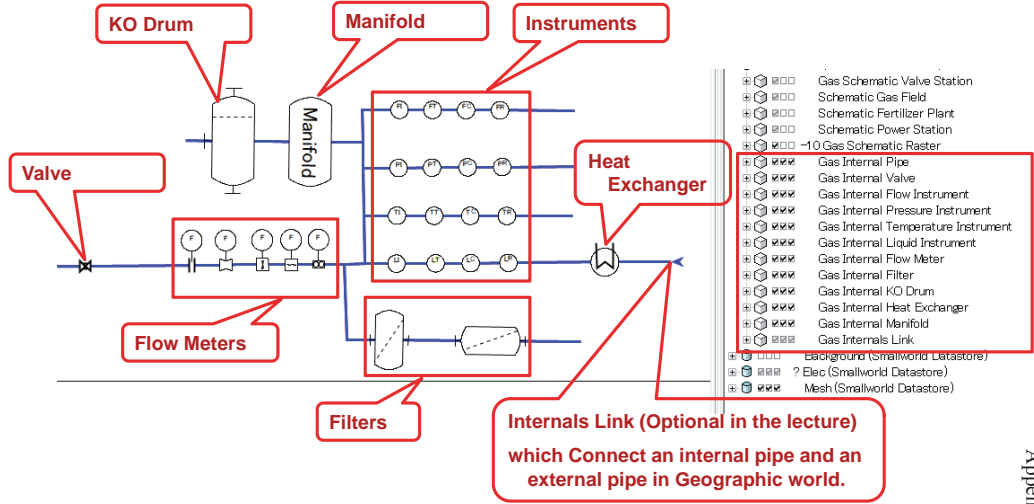
When 'Load complete' new raster will be shown on your "Internal World".



Input Gas Internal Objects

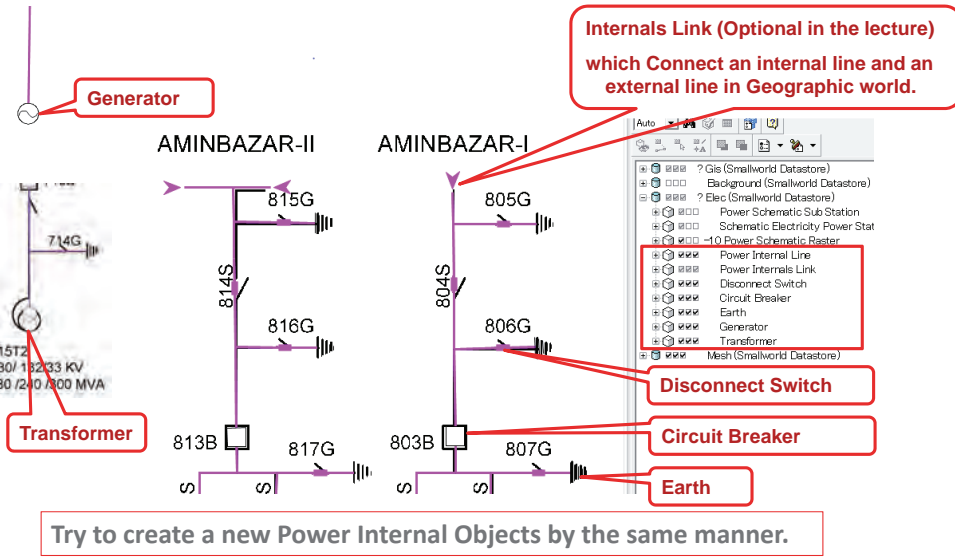


Lets input Objects in Internal World.



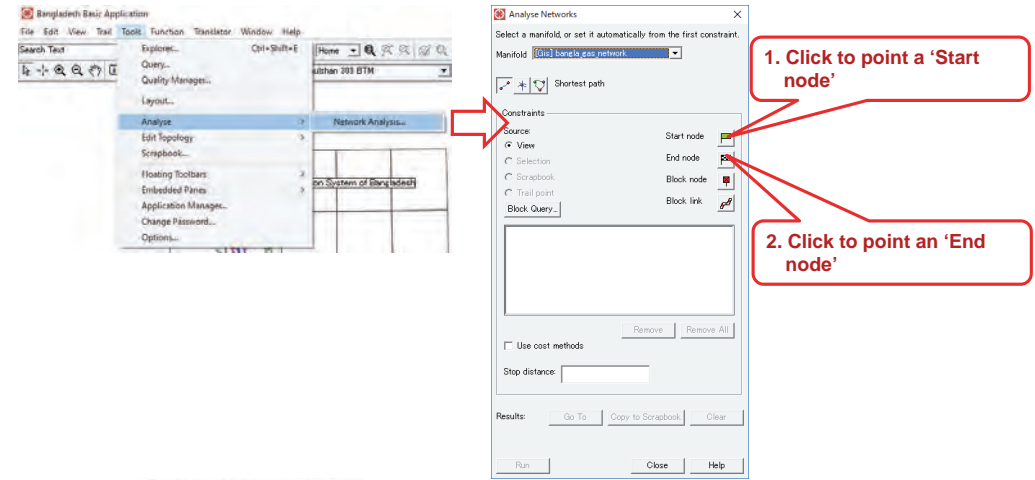
Internals Link (Optional in the lecture) which Connect an internal pipe and an external pipe in Geographic world.

Try to create a new Gas Internal Objects by the same manner.

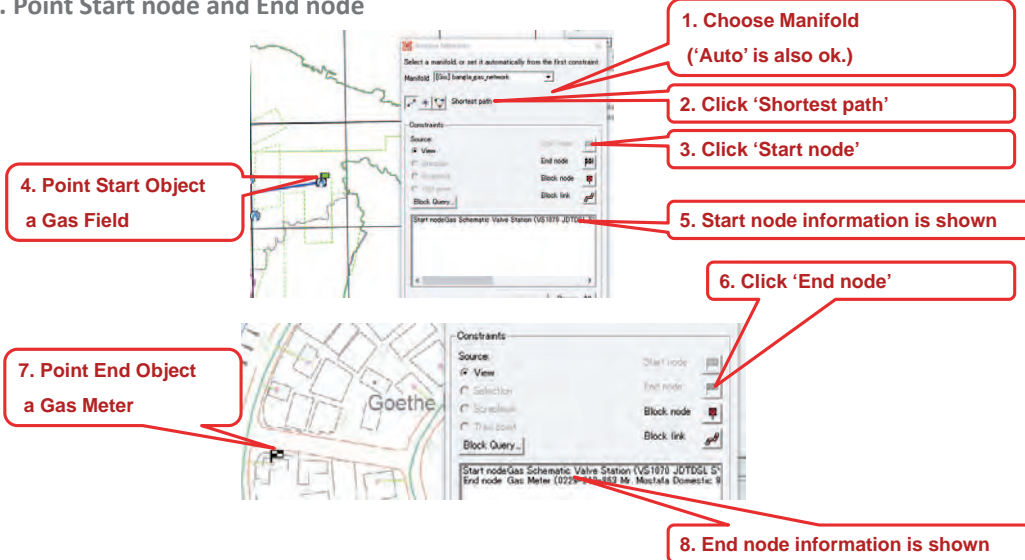


“Network trace” is a function that chases facilities connected each other. It is used to find optimum path at various network condition.

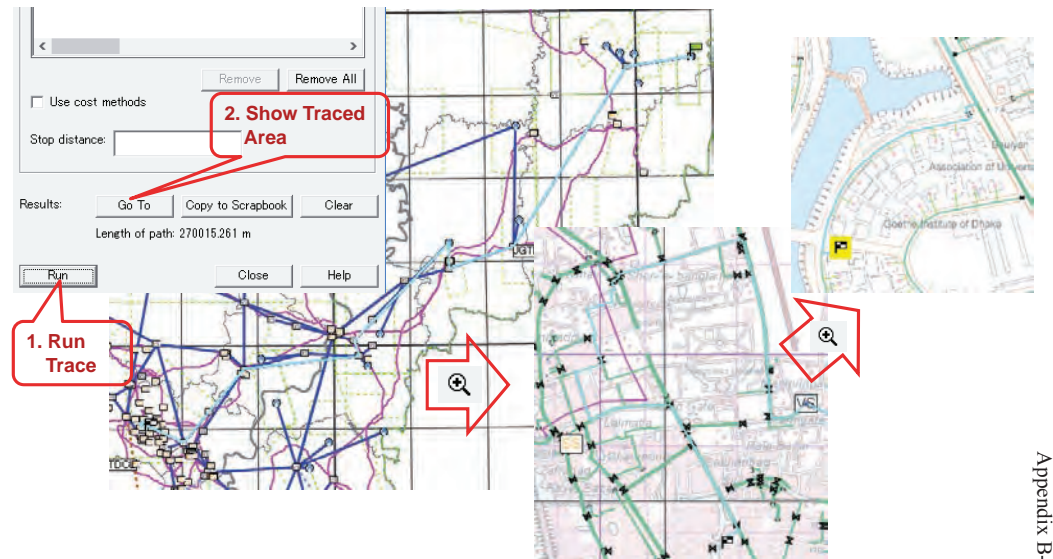
1. Start Network Trace Menu



2. Point Start node and End node



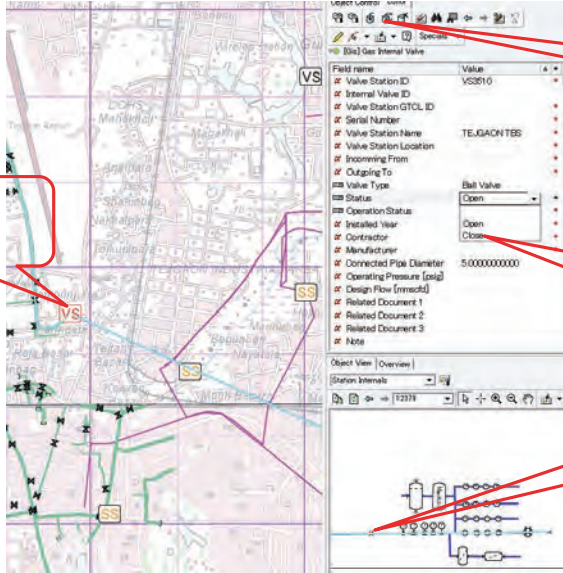
3. Run network trace



Network Trace (4)



4. Close a valve on the traced root



1. Select a Valve Station on the traced root

4. Update the Valve Object

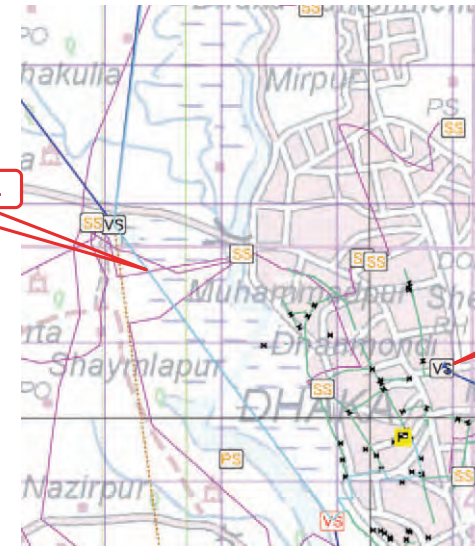
3. Change 'Status' form 'Open' to 'Close'

2. Select a Valve of Internal World on the traced root

Network Trace (5)



5. Run trace again and traced root will be changed bypassing closed Valve Station.



The new traced root.

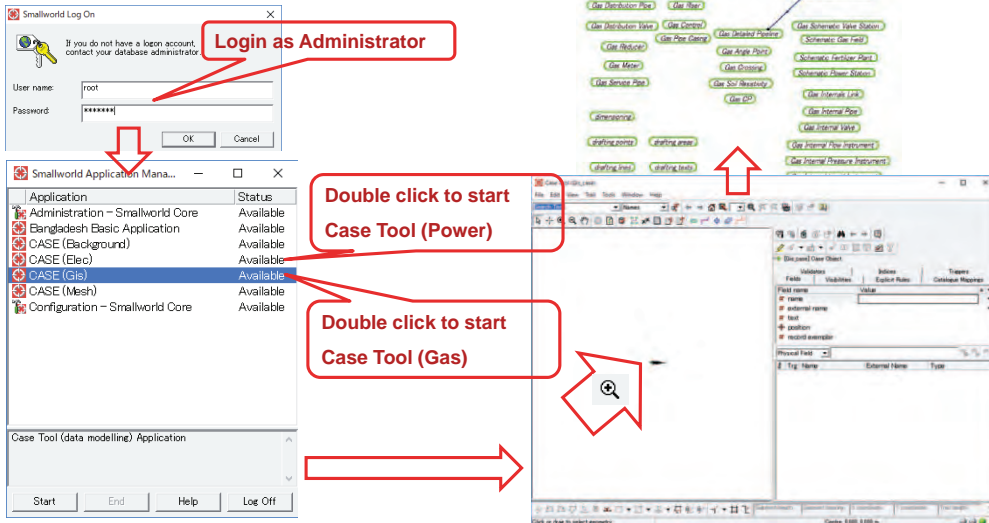
The closed Valve Station is bypassed.

Data model change preparation (1)



Data model construction using "Case Tool"

1. Start Case Tool.



Login as Administrator

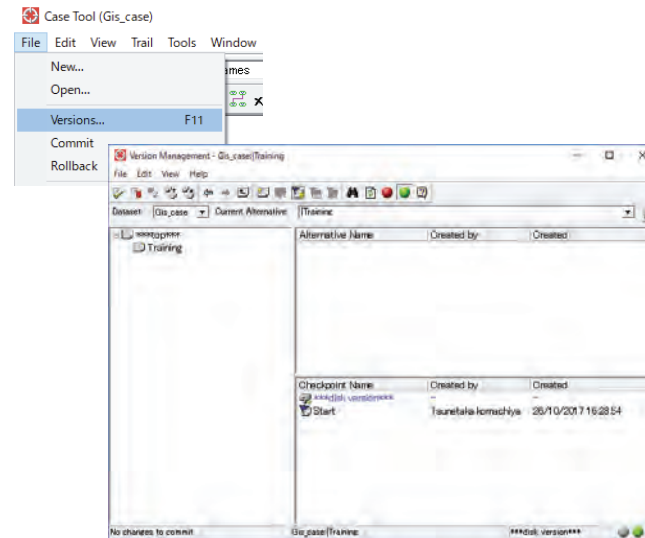
Double click to start Case Tool (Power)

Double click to start Case Tool (Gas)

Data model change preparation (2)



2. Make an "Alternative" and a "Checkpoint" for Training Purpose.



In production environment, "Sub Alternatives" are usually used only test purpose. Only "Top Alternative" should be used to keep consistency with the target "Dataset".

Case Object Editor



1. Click a target "Object"

2. Name
Used in system, Usually not shown to users.

3. External Name
Shown to users.

4. Type
Various types of fields.

Trg	Name	External Name	Type
	id	ID	id
	internal_valve_id	Internal Valve ID	ds_char_vec(50)
	station_id	Valve Station ID	ds_char_vec(10)
	gtr_id	Valve Station GTCL ID	ds_char_vec(50)
	serial_no	Serial Number	ds_char_vec(50)
	station_name	Valve Station Name	ds_char_vec(100)
	station_location	Valve Station Location	ds_char_vec(100)
	incoming_from	Incoming From	ds_char_vec(100)
	outgoing_to	Outgoing To	ds_char_vec(100)
	type	Valve Type	code_valve_type
	status	Status	code_valve_status
	operation_status	Operation Status	code_operation_status
	installed_year	Installed Year	ds_int
	contractor	Contractor	ds_char16_vec(50)
	manufacturer	Manufacturer	ds_char16_vec(50)
	connected_pipe_diameter	Connected Pipe Diameter	ds_double
	operating_pressure	Operating Pressure [caig]	ds_double
	design_flow	Design Flow [mrecd]	ds_double
	related_document_1	Related Document 1	ds_char16_vec(255)
	related_document_2	Related Document 2	ds_char16_vec(255)
	related_document_3	Related Document 3	ds_char16_vec(255)
	create_date	Create Date	ds_date
	update_time	Update Time	ds_time
	data_source_type	Data Source Type	code_data_source_type
	data_source_details	Data Source Details	ds_char_vec(250)
	note_id	Note ID	text_id
	internal_point	Internal Point	code
	note	Note	text field(note_id)

Add a new Field with Case Field Editor (1)



1. Add a new field and open "Case Field Editor"

1. Input a new "Field Name"

2. Click 'Create Field' button

Attribute Name	Value
Name	manager_name
External name	Manager Name
Text	
Field Type	
Field Size	
Key	No
Mandatory	Yes
Default value	
Unset value	
Stored unit	
Generator	
Print width	
Help text	
Domains	0
Update Trigger	

Add a new Field with Case Field Editor (2)



2. Set Field Type.

1. Click 'Set Field Type' button

2. Choose 'ds_char_vec' (One of a 'String' type)

3. Designate 'Field Size' required only for 'String' type

Type	Description
String	
ds_char_vec	Vector of 8-bit characters with case depende...
ds_char16_vec	Vector of 8-bit characters with case independ...
ds_char16_vec	Vector of 16-bit characters with case depend...
ds_char16_cannon...	Vector of 16-bit characters with fully canonic...
Integer	
Float	
Boolean	
Date	
Character	
Integer Vector	
Float Vector	

Attribute Name	Value
Name	manager_name
External name	Manager Name
Text	
Field Type	ds_char_vec
Field Size	50
Key	No
Mandatory	Yes
Default value	

Add a new Field with Case Field Editor (3)



3. Set 'Mandatory' to 'No', and update "Field".

1. Change 'Mandatory' from 'Yes' to 'No'.
If 'Mandatory' is 'Yes', user always have to input a value for this field.

2. Click 'Update' button

3. Click 'Verify' button

4. Check if result is "COMPLETE" or not.

Attribute Name	Value
Name	manager_name
External name	Manager Name
Text	
Field Type	ds_char_vec
Field Size	50
Key	No
Mandatory	No
Default value	
Unset value	
Stored unit	
Generator	
Print width	
Help text	
Domains	0
Update Trigger	

Report Preview: Checking the definition of Field g_internal_valve.manager_name(physical) Definition of Field g_internal_valve.manager_name(physical) COMPLETE

Add a new Field with Case Field Editor (4)



4. Change Fields display order

1. Select "Visibilities" tab

2. Select target field

3. Move up the position of the field

4. Click 'Apply' button

Verify Changes and Commit Case Dataset



1. Click 'Verify' button of "Objet Editor"

2. Check if result is "COMPLETE" or not.

3. Create 'End' "Checkpoint" after verification

Apply to Database (1)



1. Open 'Apply to Database' menu

1. Select a target "Object"

2. Click 'Apply' button

3. Click 'Versions ...' button

4. Make 'End' Checkpoint after last modification and make Writable.

Apply to Database (2)



2. Apply Changes to Gis Dataset.

1. "Apply Changes"

2. "Apply Log" is generated.

3. Make 'After Apply' Checkpoint.

In production environment, applying to "Sub Alternatives" is only for test purpose. Only "Top Alternative" should be applied and merge changes to each "Sub Alternative" after the apply.

Check Apply Result



1. Double Click to restart Application

2. Select an Internal Valve in Gas Valve Station Internals

3. Check if a new Physical Field "Manager Name" is added

Object Control Editor Fields:

Field name	Value
Incoming From	
Outgoing To	
Valve Type	Ball Valve
Status	Close
Operation Status	Existing
Installed Year	
Contractor	
Manufacturer	
Connected Pipe Diameter	5.000000000000
Operating Pressure [psig]	
Design Flow [mmcsfd]	
Manager Name	
Related Document 1	
Related Document 2	

Administration Application



Application includes various administration tools

Double Click to start Administration Application

Double Click to start ACE Configuration Menu

Double Click to Style Designer

Provides administration tools:

- ACE Configuration
- Authorizat...
- Coordinate Systems
- Extensible Enumerato...
- SOC Configur...
- Styles
- System Bookmarks
- System Preferences
- System Themes
- Text Translator
- Unit Display
- Version Managemen...

ACE Configuration



ACE = Application Configuration Environment
 ACE dataset has various system configuration information.
 (Object visibility for each scales, etc.)

1. Select ACE name

2. Click 'Object Configuration' button

Object Configuration (Just see in this lecture)

Objects	Edit	Auto	500	2500	5000	10000	25000	50000
*** Gas Pipeline Schematics ***								
Gas Schematic Drawing	*	***	***	***	***	***	***	***
Gas Schematic Pipeline	*	***	***	***	***	***	***	***
Gas Schematic Valve Station	*	***	***	***	***	***	***	***
Schematic Gas Field	*	***	***	***	***	***	***	***
Schematic Fertilizer Plant	*	***	***	***	***	***	***	***
Schematic Power Station	*	***	***	***	***	***	***	***
Gas Internals Link	*	***	***	***	***	***	***	***
*** Gas Pipeline Details ***								
Gas Detailed Pipeline	*	***	***	***	***	***	***	***
Gas Angle Point	*	***	***	***	***	***	***	***
Gas Crossing	*	***	***	***	***	***	***	***
Gas Soil Resistivity	*	***	***	***	***	***	***	***
Gas CP	*	***	***	***	***	***	***	***

Accessible: Shown on Object Control Menu in Application
Visible: Geometry Shown in the map at the scale
Hittable: Trail Snapped to Geometry in the map at the scale
Selectable: Geometry Selectable in the map at the scale

Style Configuration



Colors, sizes, shapes (solid, dashed, etc.) are modified as necessary in Style configuration.
 Styles can be changed according to field values or scales.

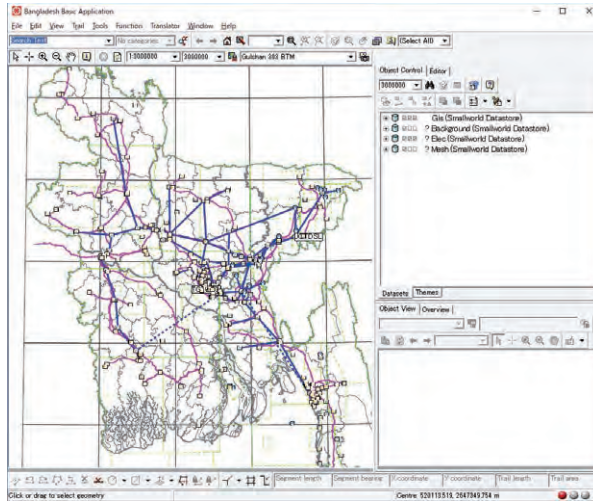
1. Select ACE name

2. Object name

(Just see in this lecture)

ACE	Default	Style group	Auto operation_status	500 operation_status	2500 operation_status	5000 operation_status	10000 operation_status	25000 operation_status	50000 operation_status
System Styles									
Gas Schematic Drawing	Proposed								
Gas Schematic Pipeline	JICA Proposed								
Schematic Gas Field	Planned								
Schematic Fertilizer Plant	Under-Construction								
Schematic Power Station	Existing								
Gas Internals Link	Abandoned								
Gas Pipeline Details	Others								
Gas Distributions	Unknown								
Gas Services									
Other Sample Data									
Draftings									
Background (Smallworld Data)									
Elec (Smallworld Datasore)									
Mesh (Smallworld Datasore)									
GAS SCHEMATIC PIPELINE	Auto								
GIS CHAIN	0								
Gas Pipeline Schematics	Proposed								
JICA Proposed	Planned								
Under-Construction	Existing								
Abandoned	Others								
Unknown									
GAS SCHEMATIC PIPELINE SCHEMATIC CHAIN	Auto								
500 operation_status	2500 operation_status	5000 operation_status	10000 operation_status	25000 operation_status	50000 operation_status				

Thank You!!



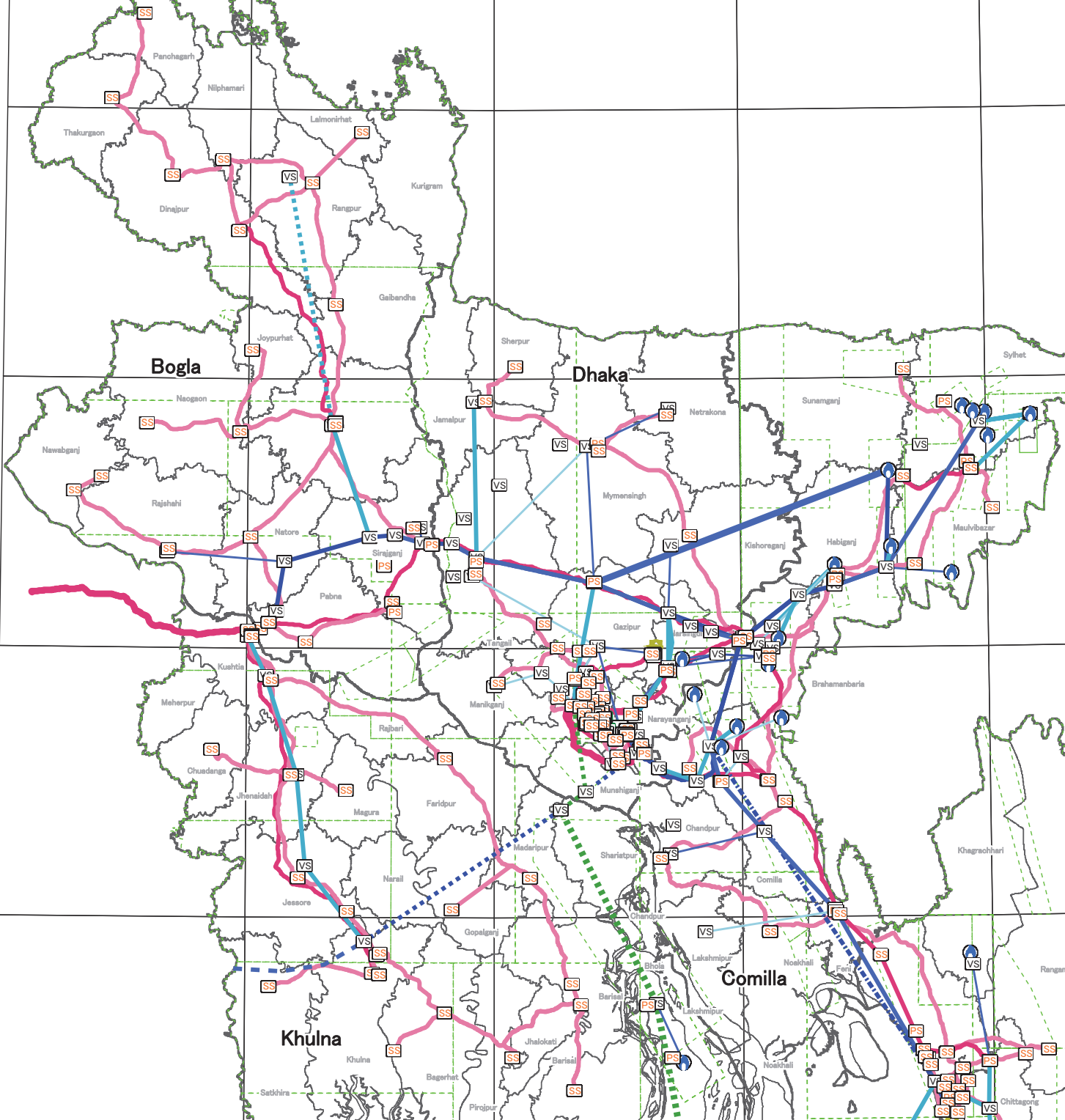
Data Collection Survey on Computerization of Gas and Power Network Infrastructure

Final Report

APPENDICES

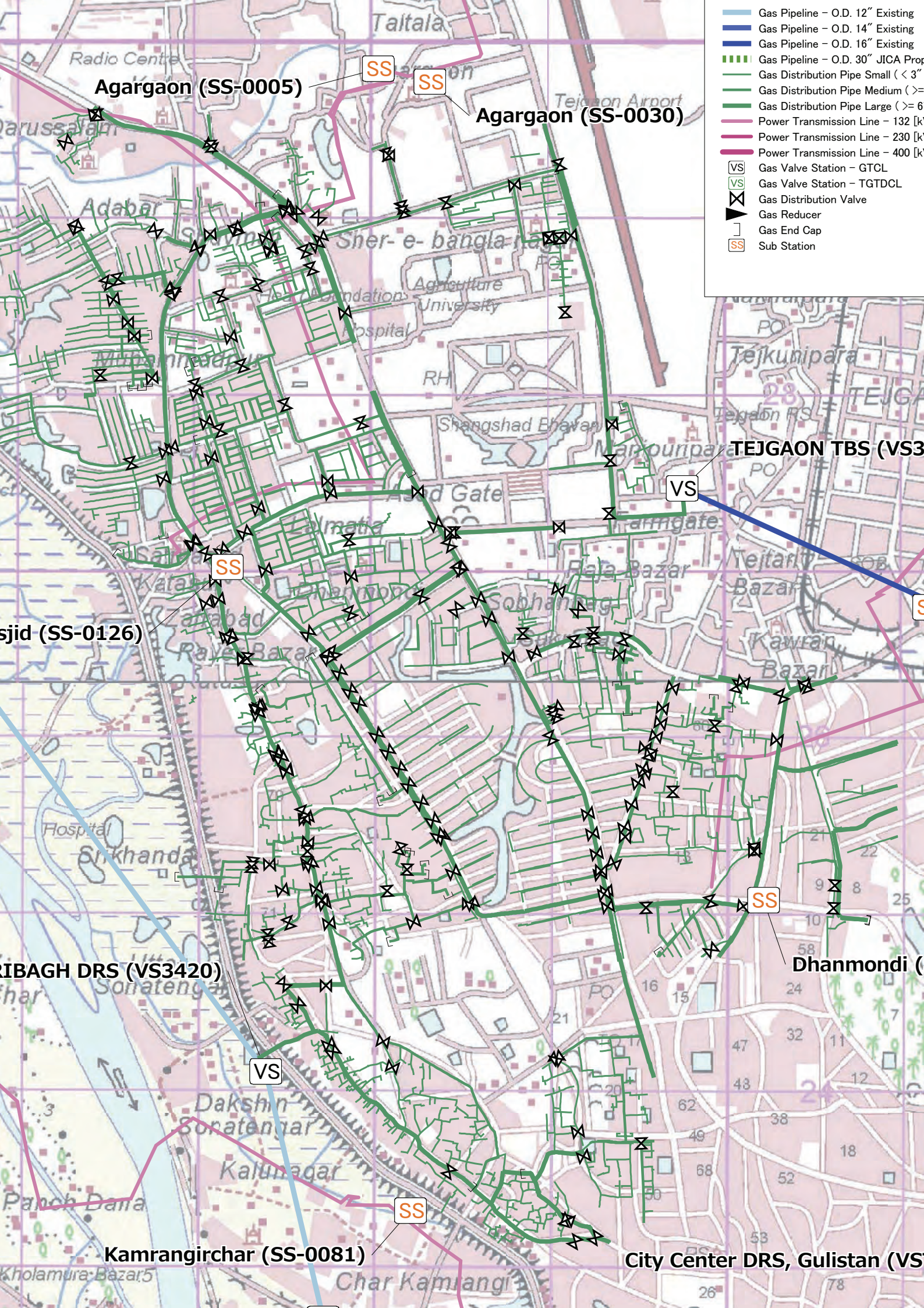
Appendix-B Demonstration of Gas and Power Network Infrastructure Management System

Appendix B-2 Energy Sector Maps prepared in Smallworld Demonstration



Legend

- as Pipeline – 12" Existing
- as Pipeline – 14" Existing
- as Pipeline – 16" Existing
- as Pipeline – 20" Existing
- as Pipeline – 20" Proposed
- as Pipeline – 24" Existing
- as Pipeline – 24" Planned
- as Pipeline – 30" Existing
- as Pipeline – 30" Proposed
- as Pipeline – 30" JICA Proposed
- as Pipeline – 30" Under-Construction
- as Pipeline – 36" Existing
- as Pipeline – 36" JICA Proposed
- as Pipeline – 42" Planned
- as Block
- ower Transmission Line – 132 [kV]
- ower Transmission Line – 230 [kV]
- ower Transmission Line – 400 [kV]



- Gas Pipeline - O.D. 12" Existing
- Gas Pipeline - O.D. 14" Existing
- Gas Pipeline - O.D. 16" Existing
- - - Gas Pipeline - O.D. 30" JICA Prop.
- Gas Distribution Pipe Small (< 3")
- Gas Distribution Pipe Medium (>= 3")
- Gas Distribution Pipe Large (>= 6")
- Power Transmission Line - 132 [kV]
- Power Transmission Line - 230 [kV]
- Power Transmission Line - 400 [kV]
- VS Gas Valve Station - GTCL
- VS Gas Valve Station - TGTDCI
- ✕ Gas Distribution Valve
- ▶ Gas Reducer
- Gas End Cap
- SS Sub Station

Agargaon (SS-0005)

Agargaon (SS-0030)

TEJGAON TBS (VS3)

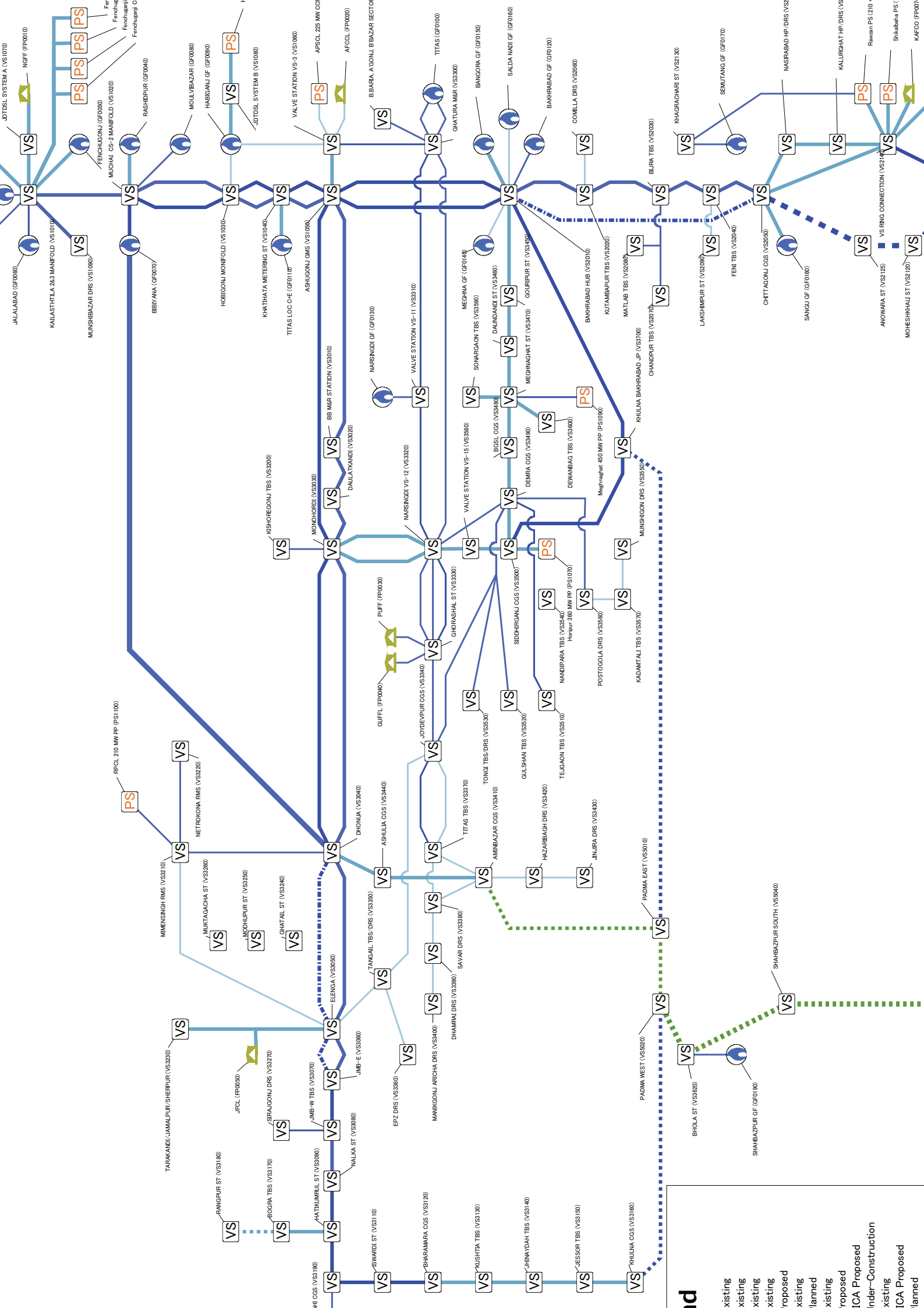
ssjid (SS-0126)

IBAGH DRS (VS3420)

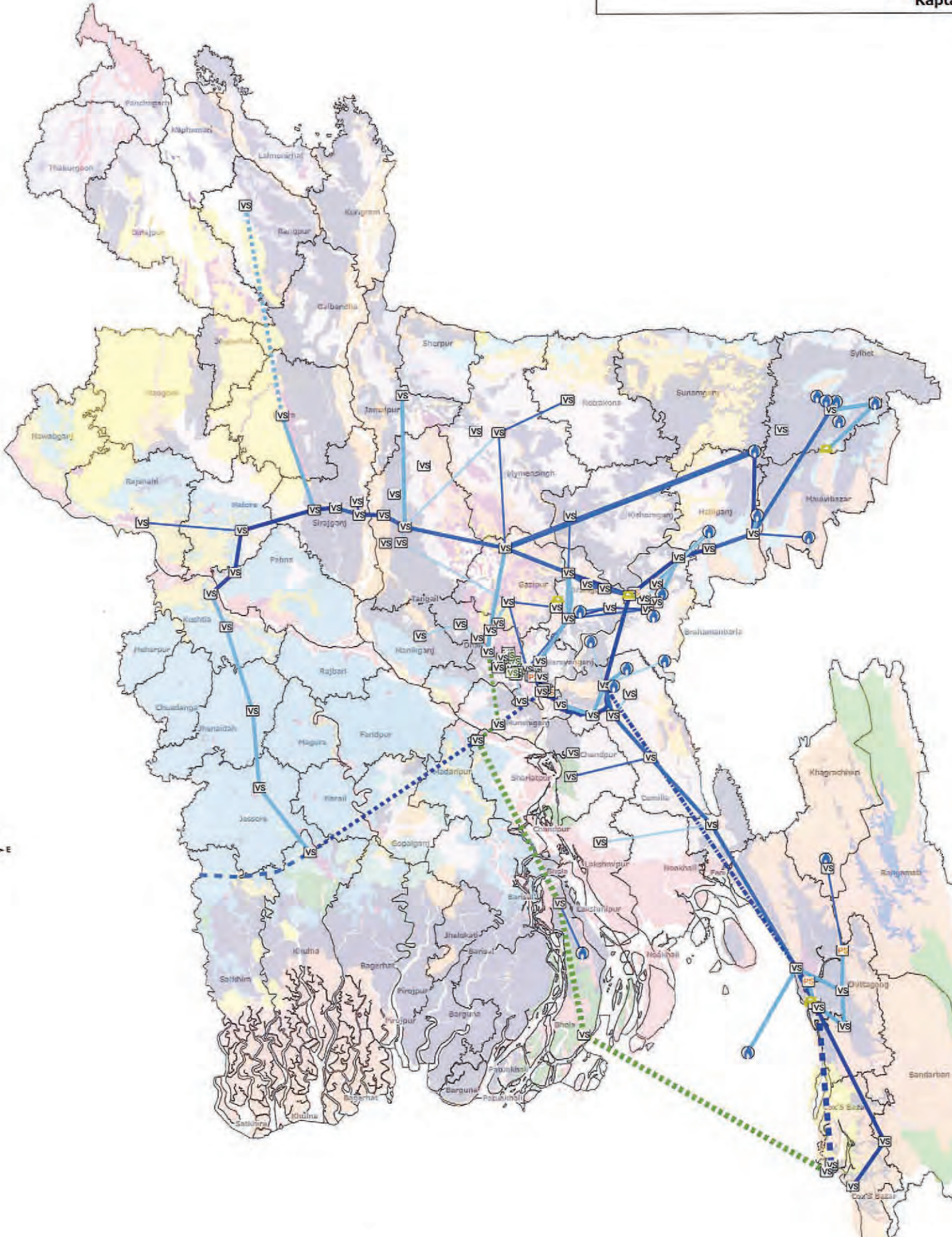
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Kamrangirchar (SS-0081)

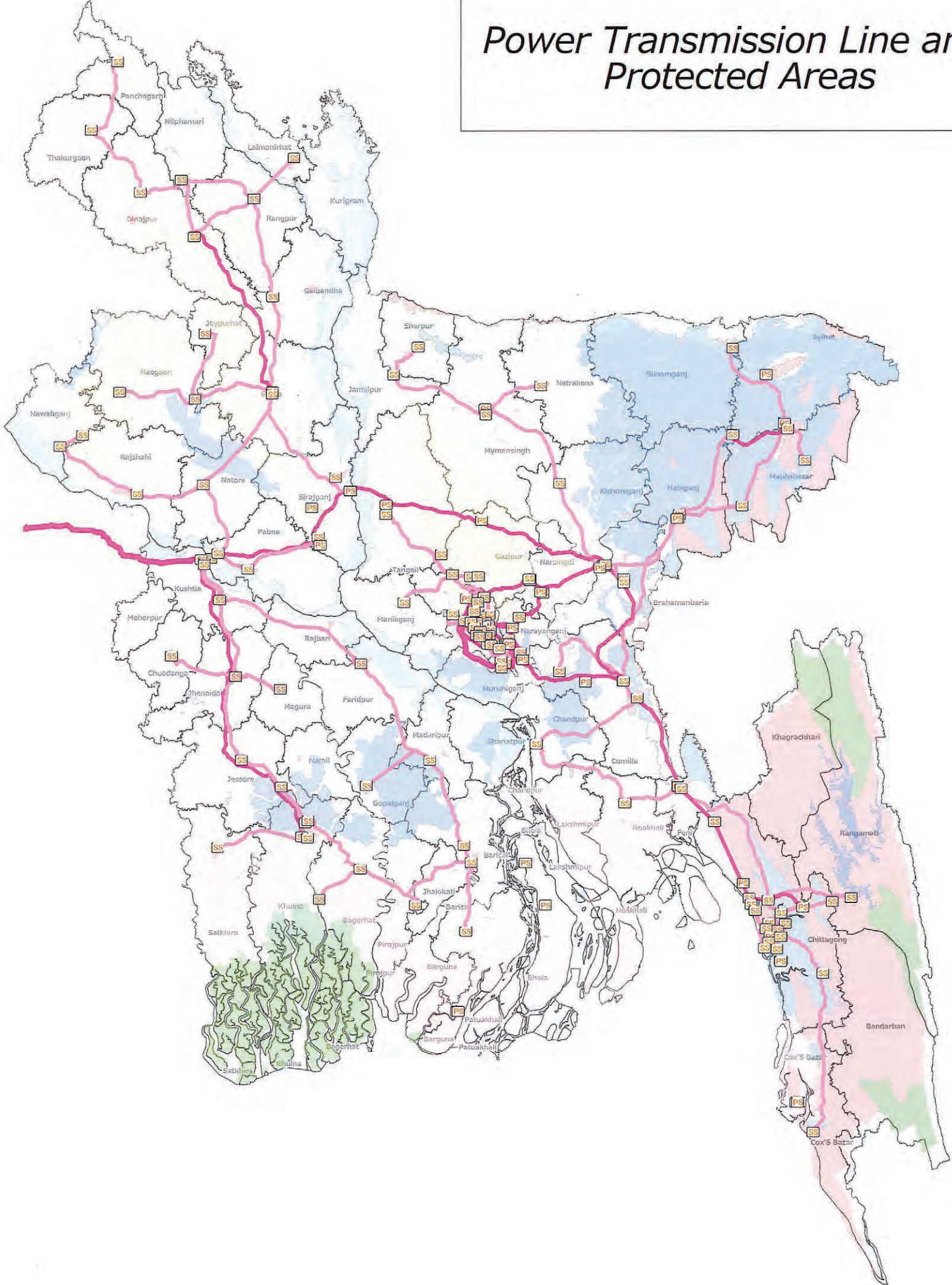
City Center DRS, Gulistan (VS



Acid Sulphate
 Brown Hill
 Shallow Red-Brown Terrace
 Deep Red-Brown Terrace
 Brown Mottled Terrace
 Shallow Grey Terrace
 Deep Grey Terrace
 Grey Valley
 Sand
 Water
 Reserved
 Kaptan



Power Transmission Line and Protected Areas



Mesh Constrained Area >
Inundated Area
Food Area

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

Final Report

APPENDICES

Appendix-C Smallworld Physical Fields

Appendix-C Smallworld Physical Fields

Physical Fields are the attribute items of respective type of Objects in Smallworld. List of Smallworld Physical Fields are arranged as follows.

C.1 Common Fields

(1) Common Physical Fields of All Facilities

Attribute Name	Attribute Type	Description
ID	System ID	System unique identifier of object
Name	String	Facilities' specific name
Operation Status	String	One of 'Proposed','Planned','Under-Construction','Existing',and'Abandoned'
Commissioning Year	Integer	The year of commisioning
Commissioning Month	Integer	The month of commisioning
Related Document 1	String	Attached document's file path
Related Document 2	String	Attached document's file path
Related Document 3	String	Attached document's file path
Latitude	Float	Latitude value of object's location
Longitude	Float	Longitude value of object's location
Elevation	Float	Elevation value of object's location
Latitude Temp	Float	Temporary latitude value of object's location
Longitude Temp	Float	Temporary longitude value of object's location
Elevation Temp	Float	Temporary elevation value of object's location
Create Date	Date	Object created date
Update Time	Time	Object updated time
Data Source Type	String	One of 'Drawing','Hearing','Field Survey',and'GPS Measurement'
Data Source Details	String	Detailed information of data source
Note	String	Free text information, remarks

C.2 Gas Transmission

(1) Gas Pipeline

Attribute Name	Attribute Type	Description
Company	String	Owner company's name
From Station ID	String	Valve Station ID from which the pipeline comes
From Station Name	String	Valve Station name from which the pipeline comes
To Station ID	String	Valve Station ID to which the pipeline goes
To Station Name	String	Valve Station ID to which the pipeline goes
Outside Diameter [inch]	Integer	Outside diameter value
Length [km]	Float	Length of the pipeline
Pipe Material	String	Material of the pipe
Corrosion Allowance [mm]	Float	Allowance of pipe corrosion
Design Pressure [psig]	Float	Design pressure
MAOP [psig]	Float	Maximum allowable operating pressure
OP Normal [psig]	Float	Normal operating pressure
Normal Flow Rate [mmscfd]	Float	Normal flow rate
CP System	String	The pipeline has cathodic protection system, or not. (Yes or No)
Flow Direction	String	Flow direction of the pipeline

(2) Gas Valve Station

Attribute Name	Attribute Type	Description
Valve Station GTCL ID	String	Valve Station ID managed by GTCL
Serial Number	String	Serial number of Valve Station
Company	String	Owner company of Valve Station
Divname	String	Division name Valve Station belongs to
Distname	String	District name Valve Station belongs to
Valve Station Location	String	Location of Valve Station
Incoming From	String	The place of Valve Station is connected from.
Outgoing To	String	The place of Valve Station is connected to.
Installed Year	Integer	Installed year of Valve Station
Contractor	String	Contractor of building Valve Station
Manufacturer	String	Manufacturer of building Valve Station
Flow Rate	Float	Normal flow rate
MAOP [PSIG]	Float	Maximum allowable operating pressure
OP Normal [PSIG]	Float	Normal operating pressure
OP Minimum [PSIG]	Float	Minimum operating pressure
SCADA ID Flow Meter	String	SCADA ID of flow meter in the Valve Station
SCADA ID Pressure Gauge	String	SCADA ID of pressure gauge in the Valve Station
Utility	String	Related Utility

(3) Gas Field

Attribute Name	Attribute Type	Description
Divname	String	Division name Valve Station belongs to
Distname	String	District name Valve Station belongs to
Gas Production [MMSCFD]	Float	Gas production amount of Gas Field
Condensate Production [MMSCFD]	Float	Condensate production amount of Gas Field
Well Head Pressure [PSIG]	Float	Well head pressure of Gas Field
MAOP [PSIG]	Float	Maximum allowable operating pressure
OP Normal [PSIG]	Float	Normal operating pressure
OP Minimum [PSIG]	Float	Minimum operating pressure
Supply Pressure	Float	Supply pressure of Gas Field
Processing Facility	String	Processing facility of Gas Field

C.3 Gas Detailed Pipeline

(1) Gas Detailed Pipeline

Attribute Name	Attribute Type	Description
Segment Number	String	Number of Pipeline segment
ASME B31.8 Design Class	String	Design class of Pipeline
Wall Thickness [MM]	Float	Wall thickness of Pipeline
Cover Depth [M]	Float	Cover depth of Pipeline

(2) Angle Point of Gas Pipeline

Attribute Name	Attribute Type	Description
Chainage [KM]	Float	Kilometer part of Angle Point Chainage
Chainage [M]	Float	Meter part of Angle Point Chainage
Angle Degree	Float	Degree part of angle
Angle Minute	Float	Minute part of angle
Angle Second	Float	Second part of angle
Angle Direction	String	Direction of angle (RT: Right Turn, LT: Left Turn)
North	Float	North part of coordinate
East	Float	East part of coordinate

(3) Gas Crossing Point

Attribute Name	Attribute Type	Description
Type	String	Crossing Point type (Road, River HDD, Railway, Power Cable, Pipeline)
Type Description	String	Detailed information of type
Crossing Description	String	Detailed information of Crossing Point
Chainage [KM]	Integer	Kilometer part of Angle Point Chainage
Chainage [M]	Float	Meter part of Angle Point Chainage

(4) Soil Resistivity

Attribute Name	Attribute Type	Description
Resistivity 1M [OHM-M]	Float	Resistivity of 1 meter depth
Resistivity 2M [OHM-M]	Float	Resistivity of 2 meter depth
Resistivity 3M [OHM-M]	Float	Resistivity of 3 meter depth
Chainage [KM]	Integer	Kilometer part of Angle Point Chainage
Chainage [M]	Float	Meter part of Angle Point Chainage

(5) Cathodic Protection (CP) of Gas Pipeline

Attribute Name	Attribute Type	Description
Type	String	Type of CP (Station, Ground Cell, Test Station)
Chainage [KM]	Integer	Kilometer part of Angle Point Chainage
Chainage [M]	Float	Meter part of Angle Point Chainage

C.4 Gas Distribution

(1) Gas Pipe

Attribute Name	Attribute Type	Description
Fid P Pipe	Integer	ID of Pipe (Number)
Pipe Uid	String	ID of Pipe (Code like 'C70' or 'D436')
Zone Code	String	Zone Code of Pipe (Code like 'Z03')
Pipe Type	String	Type of Pipe (like '4 Bar' or '10 Bar')
Coating Ty	String	Coating type of Pipe (like 'Tape')
Nominal Di	Float	Nominal diameter
Outside Di	Float	Outside diameter
Operating	Float	Operating pressure
Manufactur	String	Manufacturer
Installati	Date	Installation date
Material C	String	Material Code (like 'MS')
Wall Thick	Float	Wall Thickness
Ground Dep	Float	Ground Depth
Length Mea	Float	Measured pipe length
Length Sou	String	Information source of pipe length (like 'GIS')
Pipe Name	String	Name of Pipe
Present St	String	Present Status
Enabled	Integer	Enabled of pipe (like '1')
Remarks	String	Remarks
Segment	String	Description of pipe segment
Valve Id	String	ID of connected valve
U Date	Date	Data updated date
Shape Leng	Float	Geometry length

(2) Gas Riser

Attribute Name	Attribute Type	Description
New Uid	Integer	ID of Riser (Number)
Riser Uid	String	ID of Riser (Code like '160131HRA07')
Zone Code	String	Zone Code of Pipe (Code like 'Z03')
Service UI	String	ID of service
Customer U	String	ID of customer
Customer I	String	Telephone number of customer
Riser Name	String	Name of customer
Riser Type	String	Type (like 'Domestic', 'Commercial', or 'CNG Pump')
Model Name	String	Model name of Riser
Manufactur	String	Manufacturer
Manufact I	Date	Manufactured date
Installati	Date	Installation date
Join Type	String	Join type of Riser
Material C	String	Material Code
Operating	Float	Operating pressure
Diameter I	Float	Incoming connection's diameter
Diameter O	Float	Outgoing connection's diameter
Present St	String	Present Status
Remarks	String	Remarks
Enabled	Integer	Enabled of Riser (like '0')
Address	String	Customer Address
Appliance1	String	Appliance (Code like 'S-4' or 'D-5', etc.)
Appliance2	String	same as above
Appliance3	String	same as above
Appliance4	String	same as above
Appliance5	String	same as above
Photo1	String	Attached Photo's file path
Photo2	String	same as above
Photo3	String	same as above

(3) Gas Control (Valve)

Attribute Name	Attribute Type	Description
Valve Uid	String	ID of Valve (Code like '150426HHA01')
Zone Code	String	Zone Code of Pipe (Code like 'Z03')
Pipe Uid I	String	Incoming pipe's ID
Pipe Uid O	String	Outgoing pipe's ID
Valve Name	String	Name of valve
Valve Type	String	Type of valve (like 'Ball')
Diameter I	Float	Incoming connection's diameter
Diameter O	Float	Outgoing connection's diameter
Serial Num	String	Serial number
Model Name	String	Model name
Manufactur	String	Manufacturer
Manufact 1	Date	Manufactured date
Installati	Date	Installation date
Join Type	String	Join type (like 'Hot-Tapping' or 'Flange')
Material C	String	Material Code (like 'MS')
Operating	String	Operating Status (like 'Manual' or 'Manual-Line')
Ground Dep	Float	Gound Depth
Valve Size	Float	Valve size (like '2', '3', or '4')
Present St	String	Present Status (Code like 'F')
Remarks	String	Remarks
Photo1	String	Attached Photo's file path
Photo2	String	same as above
Photo3	String	same as above
U Date	Date	Data updated date

(4) Gas Pipe Casing

Attribute Name	Attribute Type	Description
Type	String	Type of casing
Sheet	String	Drawing sheet number

(5) Consumer information (Gas Meter)

Attribute Name	Attribute Type	Description
Customer ID	String	Customer's code
Customer Name	String	Name of customer
Customer Type	String	Customer's type (like 'Domestic')
Postal Code	String	Postal code of customer
Customer Address	String	Customer's Address
Name Of Building	String	Building's name customer lives in.
Contact Tel	String	Customer's telephone number
Email	String	Customer's E-Mail
Installed Date	Date	Installation date
Meter Serial Number	String	Serial number
Status	String	Operation Status (like 'Operating')
Connected Pipe Diameter	Float	Diameter value of connected pipe

C.5 Gas Internals

(0) Internals Common Physical Fields

Attribute Name	Attribute Type	Description
Valve Station GTCL ID	String	Valve Station ID managed by GTCL
Serial Number	String	Serial number of Valve Station
Valve Station Location	String	Location of Valve Station
Incomming From	String	The place of Valve Station is connected from.
Outgoing To	String	The place of Valve Station is connected to.
Installed Year	Integer	Installed year of Valve Station
Contractor	String	Contractor of building Valve Station
Manufacturer	String	Manufacturer of building Valve Station

(1) Gas Pipes

Attribute Name	Attribute Type	Description
Diameter	Float	Pipe Diameter
Operating Pressure [psig]	Float	Operating pressure

(2) Valves

Attribute Name	Attribute Type	Description
Valve Type	String	Type of valve (like 'Ball Valve')
Status	String	Open or Close
Connected Pipe Diameter	Float	Diameter value of connected pipe
Operating Pressure [psig]	Float	Operating pressure
Design Flow [mmscfd]	Float	Flow rate

(3) Meters

Attribute Name	Attribute Type	Description
Connected Pipe Diameter	Float	Diameter value of connected pipe
Type	String	Type (like 'Orifice', etc.)

(4) Manifolds

Attribute Name	Attribute Type	Description
Connected Pipe Diameter	Float	Diameter value of connected pipe
Type	String	Type of Manifold
Design Pressure [psig]	Float	Design pressure
Operating Pressure [psig]	Float	Operating pressure
Design Temperature [deg C]	Float	Design temperature
Operating Temperature [deg C]	Float	Operating temperature
Material	String	Material description
Diameter [mm]	Float	Diameter value
Length [mm]	Float	Length value
Wall Thickness [mm]	Float	Wall thickness value
Demister Spec	String	Demister specification

(5) Instruments

Attribute Name	Attribute Type	Description
Connected Pipe Diameter	Float	Diameter value of connected pipe
Function	String	One of 'Indicator', 'Transmitter', 'Controller', or 'Recorder'

(6) Filters

Attribute Name	Attribute Type	Description
Connected Pipe Diameter	Float	Diameter value of connected pipe
Type	String	Type of filter ('Horizontal' or 'Vertical')
Design Pressure [psig]	Float	Design pressure
Operating Pressure [psig]	Float	Operating pressure
Design Temperature [deg C]	Float	Design temperature
Operating Temperature [deg C]	Float	Operating temperature
Material	String	Material description
Inlet [inch]	Float	Inlet size
Outlet [inch]	Float	Outlet size
Diameter [mm]	Float	Diameter value
Length [mm]	Float	Length value
Wall Thickness [mm]	Float	Wall thickness value
Demister Spec	String	Demister specification

(7) K.O. drum

Attribute Name	Attribute Type	Description
Connected Pipe Diameter	Float	Diameter value of connected pipe
Type	String	Type of drum
Design Pressure [psig]	Float	Design pressure
Operating Pressure [psig]	Float	Operating pressure
Design Temperature [deg C]	Float	Design temperature
Operating Temperature [deg C]	Float	Operating temperature
Material	String	Material description
Diameter [mm]	Float	Diameter value
Length [mm]	Float	Length value
Wall Thickness [mm]	Float	Wall thickness value
Demister Spec	String	Demister specification

(8) Heat exchanger

Attribute Name	Attribute Type	Description
Connected Pipe Diameter	Float	Diameter value of connected pipe
Type	String	Type of heat exchanger
Design Pressure [psig]	Float	Design pressure
Operating Pressure [psig]	Float	Operating pressure
Design Temperature [deg C]	Float	Design temperature
Operating Temperature [deg C]	Float	Operating temperature
Material	String	Material description
Diameter [mm]	Float	Diameter value
Length [mm]	Float	Length value
Wall Thickness [mm]	Float	Wall thickness value
Demister Spec	String	Demister specification

C.6 Power Transmission

(1) Power Stations

Attribute Name	Attribute Type	Description
PSMP Name	String	Name called in PSMP
Scheduled Retirement Year	Integer	Scheduled retirement year of Power Station
Scheduled Retirement Month	String	Scheduled retirement month of Power Station
PGCB Grid Division	String	Grid division managed by PGCB
Grid Connection	String	Grid connection of Power Station
Grid Connection [KV]	Float	Grid connection Voltage
Output [MW]	Float	Power output
Annual Generation [MWh/YEAR]	Float	Power annual generation of Power Station
Gas Consumption [MMSCF/YEAR]	Float	Gas consumption amount of Power Station
MMCFD 2017	Float	Gas consumption amount at 2017
MMCFD 2025	Float	Gas consumption amount at 2025
MMCFD 2035	Float	Gas consumption amount at 2035
Cod	String	EX (Existing) or Commissioning Year
Retirement	Integer	Retirement year
MW 2016	Float	Power output at 2016
MW 2025	Float	Power output at 2025
MW 2035	Float	Power output at 2035
MW 2041	Float	Power output at 2041
Gas Supply Company Name	String	Company name (like 'Bakhrabad')
Gas Supply Company Code	String	Company code (like 'C-9')
Account Name By Gas Company	String	Power Station name managed by gas company
Capacity [MMSCF]	Float	Gas capacity
Supply [MMSCF]	Float	Supplied gas capacity
Pressure1 [PSIG]	Float	Gas pressure value 1
Flow1 [MMSCFD]	Float	Gas flow rate value 1
Pressure2 [PSIG]	Float	Gas pressure value 2
Flow2 [MMSCFD]	Float	Gas flow rate value 2

(2) Substations

Attribute Name	Attribute Type	Description
Substation PGCB ID	String	ID managed by PGCB
Serial Number	String	Serial number of Substation
Company	String	Owner company of Substation
Substation Location	String	Location of Substation
Incomming From	String	The place of Substation is connected from
Outgoing To	String	The place of Substation is connected to
Substation Primary Voltage Level	String	One of '11KV', '33KV', '132KV', etc.
Substation Secondary Voltage Level	String	One of '11KV', '33KV', '132KV', etc.
Substation Type	String	GIS or AIS
Type of Insulation	String	Insulation description
Bus Scheme	String	One of 'Single Bus', 'Bubble Bus', etc.
Construction Year	String	Year of construction
Installed Year	Integer	Year of instllation
Contractor	String	Contractor name
Facility Category	String	Category (like '400/230', '132/33', etc.)
Pgcb Grid Division	String	Division name managed by PGCB
Nos of Transformer	Float	Value (One of 0, 1, 2, 3, 4)
Capacity of Transformer	String	Capacity (like '3x15/20, 1x25/41')
Total Capacity [MVA]	String	Total capacity

(3) Transmission Lines

Attribute Name	Attribute Type	Description
Oper Name	String	Operation company's name (PGCB)
Line Name	String	Power line's name
Line Type	String	One of 'Aerial' or 'Burial'
Core No	Integer	Total core number
Core Use	Integer	Used core number
Core Ready	Integer	Non-used core number
Length [km]	Float	Line length
Transmission Line Name	String	Power line's name (Same meaning as Line Name)
Transmission Line ID	String	Line ID (like 'TL-174')
Voltage Level [KV]	Float	Voltage value
PGCB Grid Division	String	Division name managed by PGCB
Route Length [KM]	Float	Route length (Same meaning as Length)
Circuit Length [KM]	Float	Route length multiplied by number of circuit
Number of Circuit	String	'Single', 'Double', or 'Four'
Conductor Name	String	Name of conductor
Conductor Size [MM2]	String	Size of conductor (like '2x795 MCM')
Capacity [MW]	Float	Capacity value
Construction Year	String	Year of construction

C.6 Power Internals

(0) Internals Common Physical Fields

Attribute Name	Attribute Type	Description
Substation PGCB ID	string	ID managed by PGCB
Serial Number	string	Serial number of Substation
Station Location	string	Location of Substation
Incomming From	string	The place of Substation is connected from
Outgoing To	string	The place of Substation is connected to
Substation Primary Voltage Level	code voltage	One of '11KV', '33KV', '132KV', etc.
Substation Secondary Voltage Level	code voltage	One of '11KV', '33KV', '132KV', etc.
Substation Type	code substation_type	GIS or AIS
Bus Scheme	code bus_scheme	One of 'Single Bus', 'Bubble Bus', etc.
Installed Year	integer	Year of instllation
Contractor	string	Contractor name

(1) Power Lines/Cables

<No Specific Attributes>

(2) Disconnect switches

Attribute Name	Attribute Type	Description
SLD Code	String	A kind of code
Voltage	String	One of '11KV', '33KV', '132KV', etc.
Ampere Rating [A]	Float	Ampere rating value
Status	String	'Close' or 'Open'

(3) Circuit breakers

Attribute Name	Attribute Type	Description
SLD Code	String	A kind of code
Type	String	One of 'Bulk Oil', 'Minimum Oil', etc.
Voltage	String	One of '11KV', '33KV', '132KV', etc.
Ampere Rating [A]	Float	Ampere rating value
Breaking Capacity [kA]	Float	Breaking capacity value
Ampere Frame [A]	Float	Ampere frame value
Status	String	'Close' or 'Open'

(4) Earth

Attribute Name	Attribute Type	Description
SLD Code	String	A kind of code
Voltage	String	One of '11KV', '33KV', '132KV', etc.
Earthing Cable Size [mm2]	Float	Cable size
Earthing Type	String	One of 'A', 'B', or 'C'
Earth Resistance [ohm]	Float	Resistance value

(5) Generators

Attribute Name	Attribute Type	Description
SLD Code	String	A kind of code
Type	String	'ST' or 'GT'
Voltage	String	One of '11KV', '33KV', '132KV', etc.
Ampere [A]	Float	Ampere value
Rated Output [MW]	Float	Output value
Fuel	String	Fuel description

(6) Transformers

Attribute Name	Attribute Type	Description
SLD Code	String	A kind of code
Primary Voltage	String	One of '11KV', '33KV', '132KV', etc.
Capacity [MVA]	Float	Capacity value
Vector Group	String	Vector group description
Impedance	Float	Impedance value

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Appendix-D Power Data

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

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APPENDICES

Appendix-E Presentation Materials

Appendix E-1 Inception Report

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

Inception Report

April 2017

Nippon Koei Co., Ltd.
Chiyoda U-Tech Co., LTD.

Contents

1. Background of the Project
 - Change of Primary Energy Supply
 - Change of Operation Mode
 - Issues of Existing Gas Infrastructure
 - Gas and Power Collaboration
 - Modernized Organization
2. Requirement for Gas and Power Sector
3. Project Milestone
4. Object model and work flow
5. Items of data collection
6. Program of Study Tour to Japan and USA
7. Way forward and requests
8. Schedule of this Project
9. Study Members
10. Human Resource Development Guideline in the next phase

1. Background of the Project

Current Situation and Challenges (1)

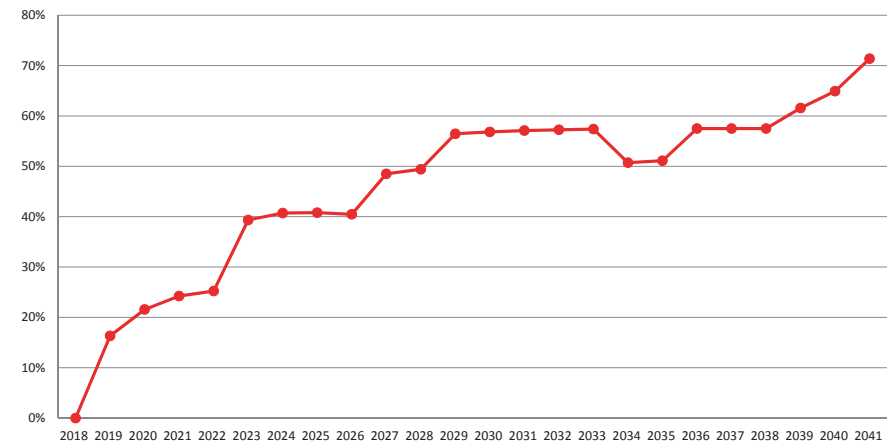
Turning point of Primary Energy Supply:

- Increasing Gas Demand and Decline of Domestic Gas Production
- Introduction of LNG, Planning and Construction of New Infrastructure, and Reinforcement of Existing Infrastructure.

Current Situation and Challenges (1)

Dependence on Import gas (LNG) will increase.

Forecast of Gas Import (LNG) over Demand



Current Situation and Challenges (2)

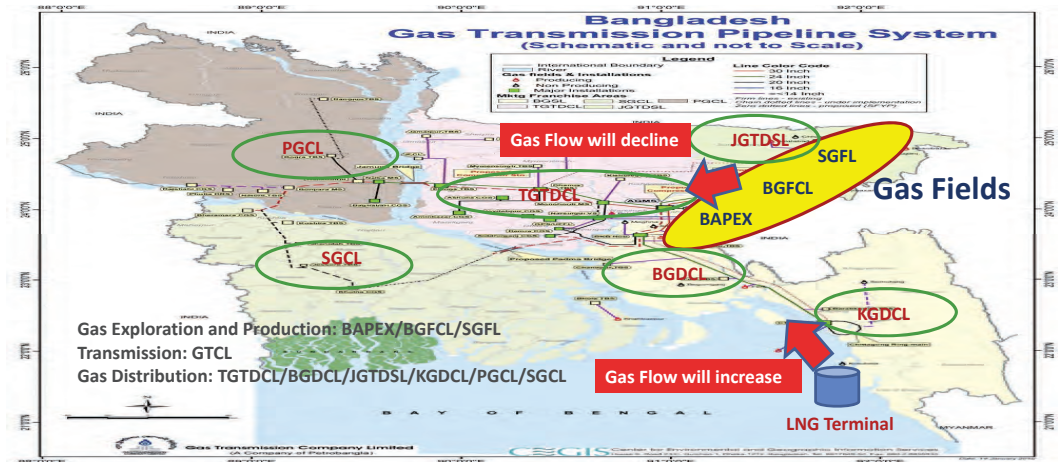
Change of Operation Mode:

- Gas Supply Mode to shift from “Gas Allocation” to “Gas Demand” based operation, assuming that enough gas is supplied via. LNG
 - Introduction of advanced process control system is required
- Mixed Supply of Domestic and LNG gas
 - New billing system is required to cater for a difference in pricing and heating value.
- Delivery of LNG gas from Matarbari to Dhaka (400 km) takes 10hrs. Meanwhile, LNG gas is not flexible enough to meet demand fluctuation in Dhaka (load center).
 - LNG to be used as a primary gas source and domestic gas to be a secondary gas source

Current Situation and Challenges (2)

Change of Operation Mode:

- Each company operates independently under gas allocation system.
 - Integrated Operation System to be introduced



Current Situation and Challenges (3)

Issues of Existing Gas Infrastructure

- Gas infrastructure has been constructed to deliver gas primarily from North East Gas Fields
 - New infrastructure to be constructed to receive LNG gas and to ease the gas shortage especially in the western part of the country.
- Suffering from Gas Leakage and System Losses, i.e., losing money.
 - Rehabilitation of aged gas infrastructure, and Update of Process Flow Diagrams and Route Map
 - Introduction of Systematic Maintenance System
- No Common Design Standard, Material Classification/Specification
 - Integrity of the gas infrastructure need to be secured.

Current Situation and Challenges (4)

Gas and Power Collaboration

- **Power Station** plays important role as a foundation customer for gas pipeline development/extension.
- **Gas Infrastructure** affects the selection of construction site for Power Station.
- For example, Strategic deployment of Power Stations in discussion:
 - Case1: Distributed Power Stations around Dhaka, Large scale pipeline from Matarbari to Dhaka, reinforcement of local pipeline system around Dhaka
 - Case 2: Centralized Power Station near LNG Terminal in Matarbari, High Voltage Transmission line from the power station to Dhaka, with reinforcement of power grid around Dhaka
- Need efficient collaboration between Gas and Power Sectors for infrastructure development

Current Situation and Challenges(5)

Modernizing Organization incl. Human Resource management

- Clearing system is primitive. Current Gas System has been managed by the use of sales/purchase invoices among the companies declared by each gas company.
- System Integration and centralized operation/monitoring system to be introduced, and account settlement should be based on actual measurement.
- Quality human resource is limited. No internationally recognized organization to support and qualify Engineers in Bangladesh
- Engineer Qualification system to be discussed.

Requirements for Gas Sector

Two requirements to be achieved by the use of “Soft Infrastructure”, as follows:

1. Introducing Modernized Gas Operation System

Advanced Process Control
Preventive Maintenance
Operation Safety
Asset Management

2. Capacity Building for Planning

Identify Issues and Project
Survey and collect data to support the potential project
Optimize the plan and carry out Basic Engineering
Construction/Operation
Review Performance of the past Projects

Requirements for Power Sector

Through the PSMP 2016, following problems and issues are identified:

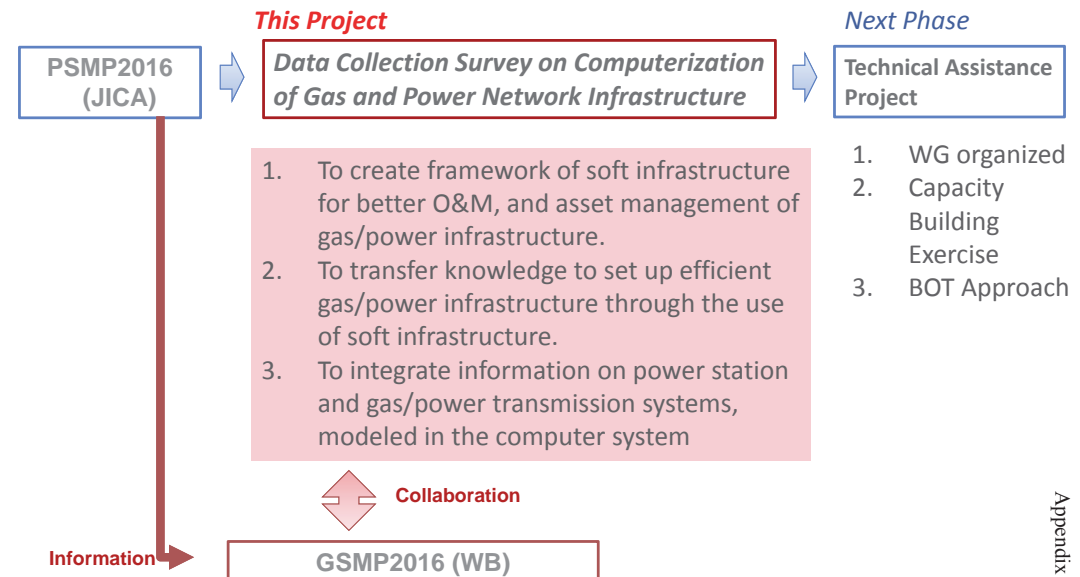
1. Upgrading of Transmission Line, Considering:

- Old, Low Efficiency Small Scale Power Plant (less than 100 MW) to be retired
- **Large scale power plant to be constructed at the strategic location in collaboration with Gas Sector**
- To be ready for International Power Interconnection
- Modern Frequency Monitoring/Control System to be introduced

2. O&M of Power Plant, Require:

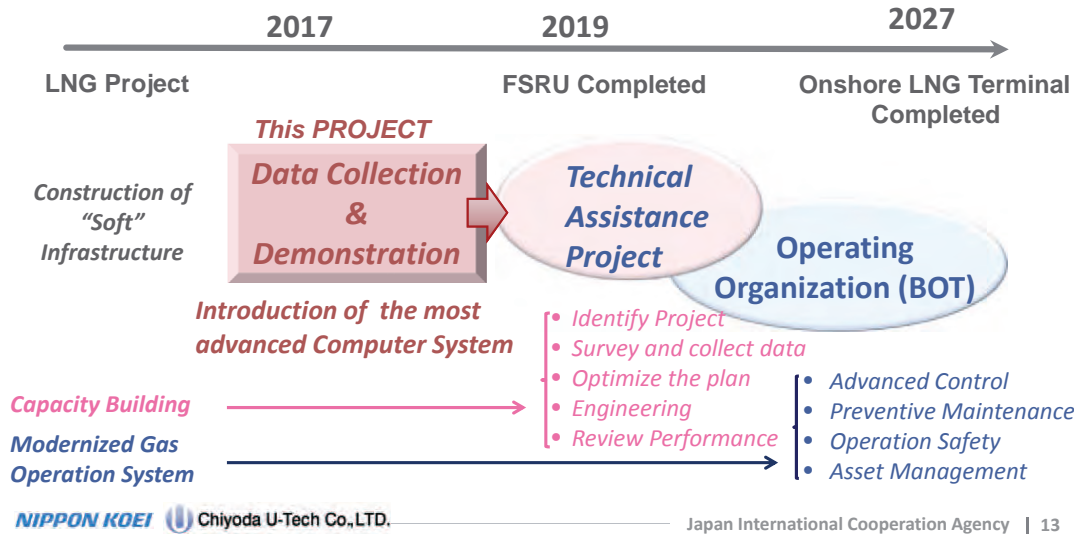
Capacity Building for Power Plant Maintenance
Preparation of Safety Standard for Power Plant

Outline of the Project



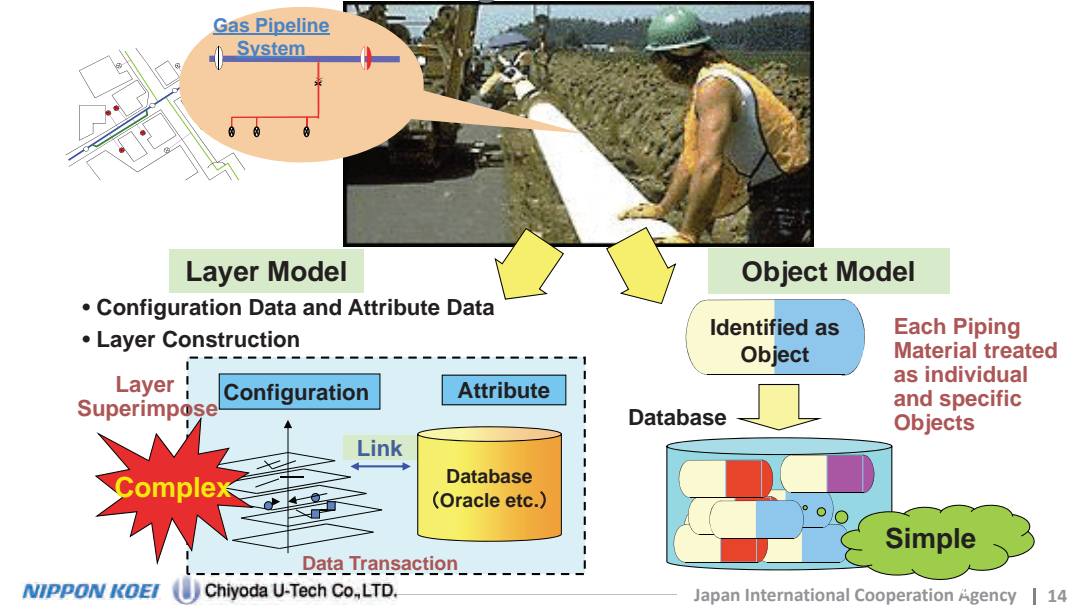
Project Milestone

Construction of "Soft Infrastructure" and capacity building via., TA and BOT is very important to achieve efficient use of gas and modernize the gas operation and management system.

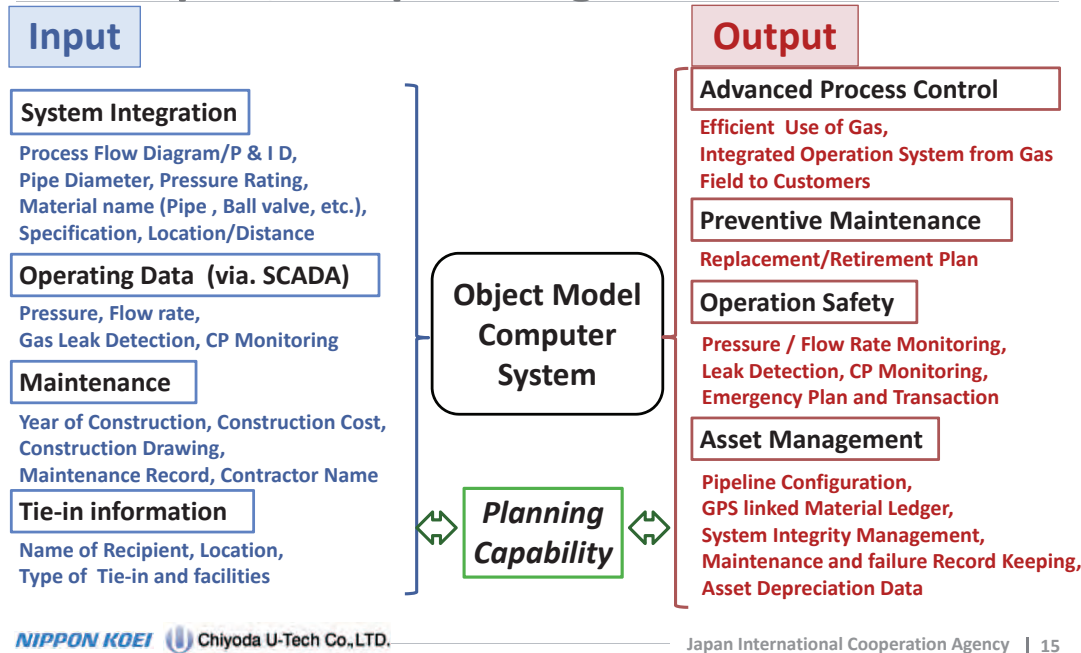


Use of Object Model

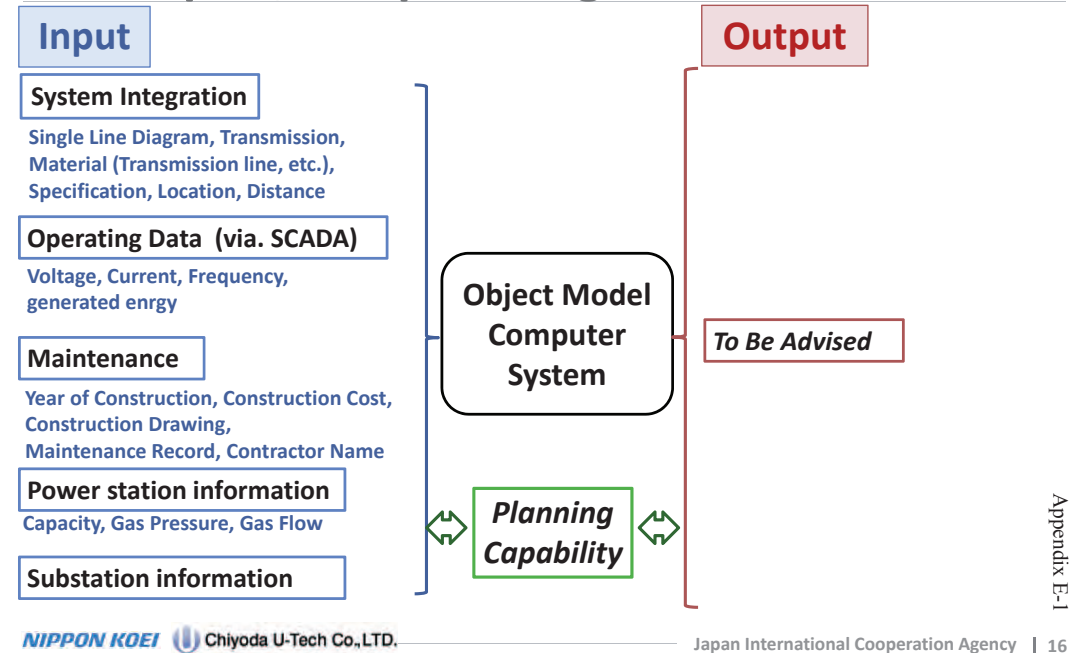
Advanced Network Management & Solution



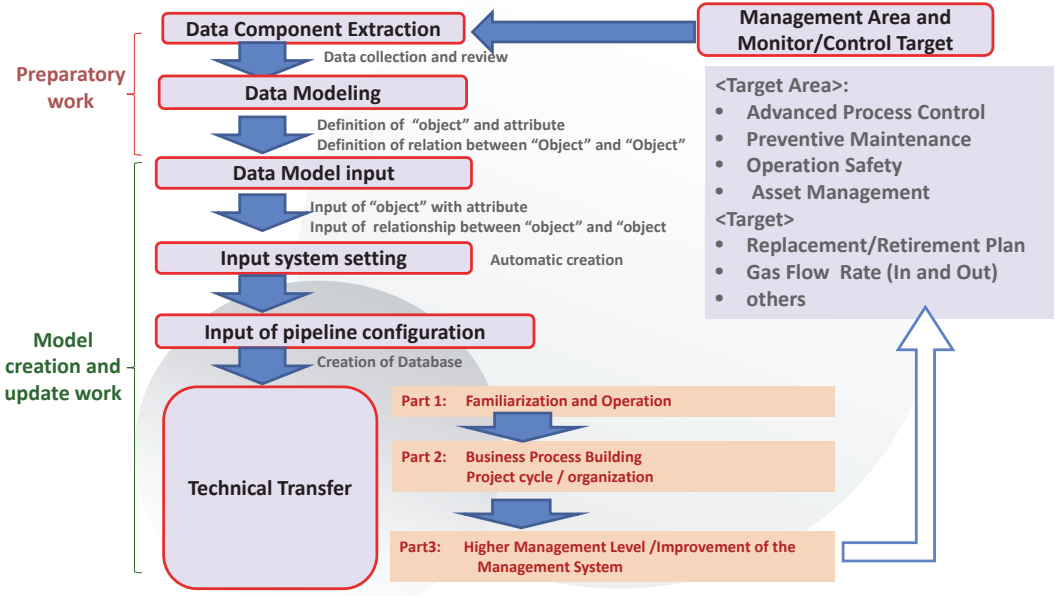
Data Input / Output Image: Gas Sector



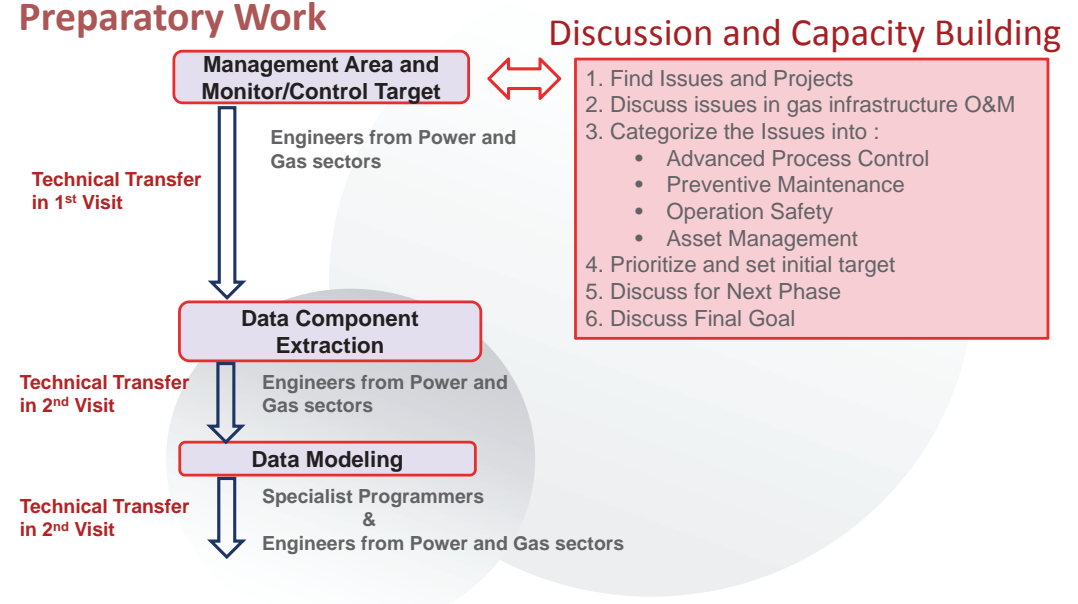
Data Input / Output Image: Power Sector



Work Flow & Management Lv. Upgrading

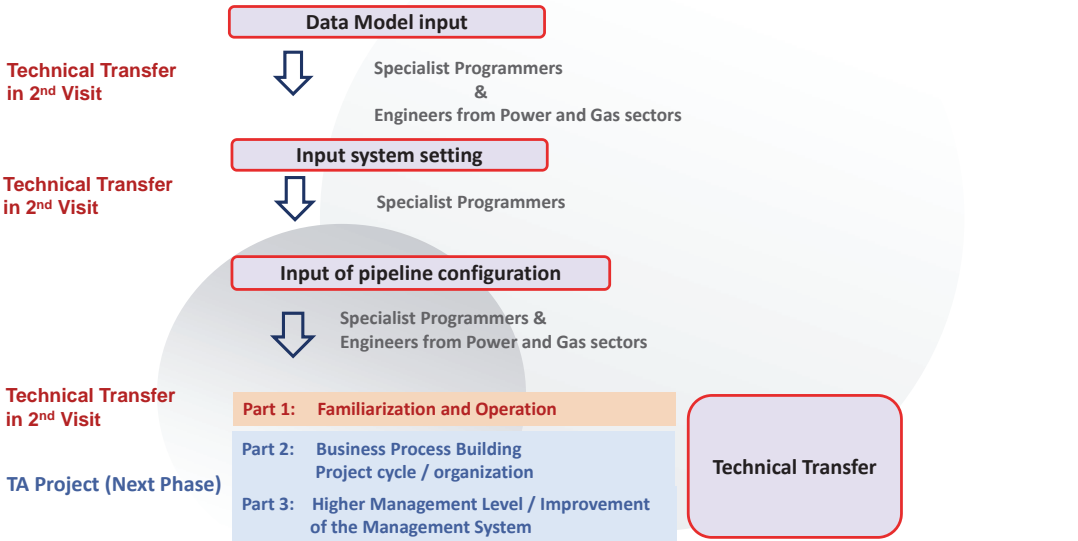


Work Flow and Team/Capacity Building

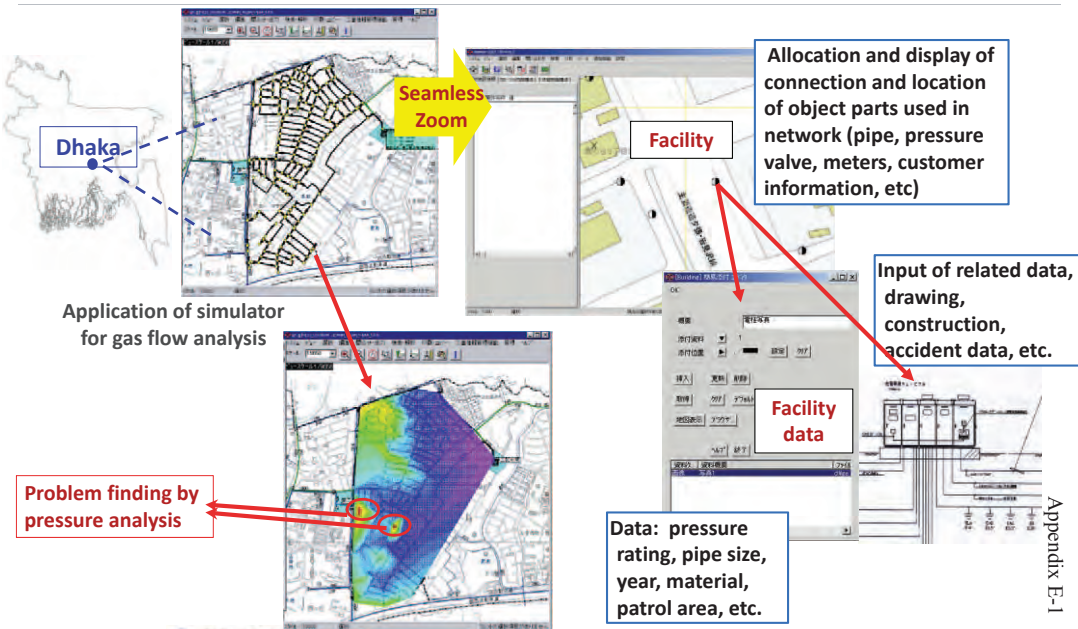


Work Flow and Team/Capacity Building

Model creation and update work



Example of Object Model (1)



Example of Object Model (2) (power)



Electricity LV lines

Substation single line diagram

Service wire status and photo/drawing

Field name	Value
Id	938806
Known As	
Voltage	LV
Status	In service
Length	16.77 m
Centreline	✓

“closed”: Power is supplied to relevant feeder
“opened” Power is cut in relevant feeder

LV Switch connection status

Field name	Value
Known As	LV Switch 2
Voltage	LV
Switch State	closed
Annotation	✓
Substation Internals	26891 0066
Primary Connection	✓
Secondary Connec...	✓

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Pilot Area for Demonstration



Gas and Power Network in Bangladesh

- GTCL Pipeline System
- A part of major TGTDCCL Pipe Lines
- Major Gas Users including Power Stations
- Major Power Grid and Substations

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Data Collection (Gas Sector)



Gas Production/Transmission / Distribution

Energy Division MPEMR: Petrobangla, BAPEX, BGFL, SGFL,GTCL, TGTDCCL, BGDCL, JGTDSL, PGCL, KGDCL

- Gas/Condensate Component and Production, Operating Pressure
- Process Flow Diagram and P&ID,
- Transmission/distribution pipe route drawings, and ROW information
- As-build construction drawings
- Piping Material Specification/Standard Construction Drawings
- Construction/Operation Year and Construction Cost
- Information on tie-in point
(location, size, pressure rating, flow meters, etc.)
- Information on Process Control, Maintenance, Emergency Transaction,
- Information on CP (Cathodic Protection) System
- Future expansion and rehabilitation plan
(short term: up to 2025, mid term: up to 2035, long term: up to 2041)

Data Collection (Power Sector) -1



Power Stations

Power Division MPEMR: BPDB, PGCB

- Existing Power Station
Location information,
capacity (MW), actual output record(MW), generated energy (GWh)
- Construction Data
Operation start year, expansion year
- Operation and maintenance status,
Fuel type and consumption
Inspection and Maintenance record
Power outage (regular and accidental) information
- Future plans
short term: up to 2025, mid term: up to 2035, long term: up to 2041

Data Collection (Power Sector) -2



Power Transmission Lines and Substations

Power Division MPEMR: BPDB, PGCB

- Transmission line network route (GIS or CAD),
Single line diagram, voltage, size of wire, number of circuit
- Construction year
- Substation
location data, construction year, operation and maintenance information
- Future expansion plan
short term: up to 2025, mid term: up to 2035, long term: up to 2041

Study Tour to Japan and USA



Visit to Japan and USA is organized in two phases, 1st Visit, and 2nd Visit.

● 1st visit: Introduction and Basic Course

- ✓ Visit Process Engineering Company and discuss basics of process engineering.
- ✓ Visit Gas and Water companies in Japan where Object Model is used
- ✓ Visit Gas and Power company in US where cross-sector application is practiced.
- ✓ Visit LNG production and export terminal in US to learn pricing dynamism of LNG and impact to the world Market.

● 2nd visit: Advanced Course

- ✓ Based on the data collected in Bangladeshi, Exercise Data Review and Processing to suit to create Data Model.
- ✓ Exercise Data Model input to the system to create Input System Setting and create gas and power infrastructure configuration in the computer.
- ✓ Exercise practical use of the computer system.
- ✓ Introduction of NSS and RADAR application

Visit Schedule (Japan and USA)



Item	1 st visit to Japan and USA	2 nd visit to Japan and USA
Period	Jun-Jul 2017, 2 weeks	Aug-Sep 2017, 2 weeks
Course	Introduction and Basic Course Capacity Building Exercise	Advanced Course Capacity Building Exercise
Participant	10 Participants -MPEMR : 2 High Level Officials from each division -GTCL, PGCB: 1 High Level Official and 1-2 Engineers (with BSc. or higher) from planning section in each organization	5 Participants -MPEMR : 1 High Level Official from each division -GTCL, PGCB: Same Engineers from 1 st visit

Please kindly appoint candidate participant.

Visit Program: GNSS Application



Use of GNSS to identify exact location of:
Pipe Route
pipeline components

Visit Program: Use of Subsurface RADAR



Underground Pipe can be detected and identified by the use of :
Subsurface RADAR



Product of AIREC Engineering Corporation

Detect Exact Location of Network Infrastructure:
(Gas, Water, Power Cable and Fiber Optics Lines)

7. Way forward and requests



#	Item	Description	Schedule
1	Signing of the minutes		Wrap Up Meeting
2	Appointment of officer in charge for this Study from Energy Div.	-Secretary/Additional Secretary: To chair the meetings -OIC: Daily communication and coordination	By 20 Apr 2017
3	Assignment of C/P Engineers from gas/power companies	- Engineers from Petrobangra, GTCL, BPCB, PGCB, and gas distribution companies for data collection	By End of April 2017
4	Selection of participants for visit to Japan, and USA	- 10 Participants for 1 st trip, 5 Participants for 2 nd trip (same engineers in 1 st trip)	By End of April 2017
5	Consideration of next technical assistance project for soft infrastructure		By June 2017

8. Schedule of this project (Provisional)



Item	Apr. 2017	May 2017	Jun. 2017	Jul. 2017	Aug. 2017	Sep. 2017	Oct. 2017	
Field assignment of JICA Study Members	■	■		■	■	■		
Selection of local consultant	■							
Soft infrastructure software set up		■						
Data collection and input		■						
Visit to Japan and USA			1st		2nd			
Preparation of soft infrastructure demonstration				■				
Seminar		Interim				Final		
Comments for Reports				Draft final		Final		

9. Study Members



Name	Position	Company
Masaaki Ebina	Team Leader/ Gas Infrastructure Management (Pipeline Plan)	Nippon Koei
Yuka Nakagawa	Deputy Team Leader/ Power Infrastructure Computer System	Nippon Koei
Komachiya	Gas Infrastructure Computer System	Geoplan
Kunio Hatanaka	Energy Economy and Policy	TEPCO
Toshiyuki Kobayashi	Power Generation Plan	TEPCO HD
Keisuke Ueda	Transmission Line Plan	TEPCO PG
Takashi Sato	Gas Infrastructure Management (Process Design)	Chiyoda U-tech
Takehiro Hirobe	Piping Design Standard	Chiyoda U-tech
Akiko Urago	Environmental & Social Consideration-1	Raven
Kentarō Yamamoto	Gas Supply Plan / Environmental & Social Consideration-2	Nippon Koei

Based on UK-SPEC (Standard for Professional Engineering Competence)
assisted by IMechE/IPEJ (in discussion)

Development of Competence A to E

A: Use a combination of general and specialist engineering knowledge and understanding to optimize the application of existing and emerging technology

B: Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems

C: Provide technical and commercial leadership.

D: Demonstrate effective interpersonal skills.

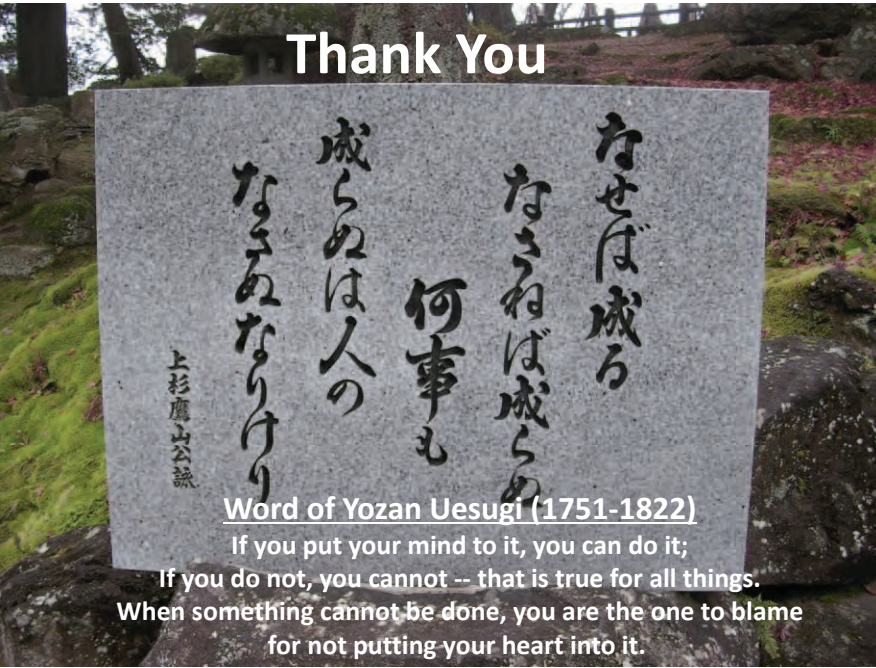
E: Demonstrate a personal commitment to professional standards, recognizing obligations to society, the profession and the environment.

“Banhattan” = Manhattan of Bangladesh

JICA Team is looking forward to working together with Bangladesh



Thank You



成らぬは人の
なまぬなりけり
何事も
なまぬば成らぬ
なせば成る

Word of Yozan Uesugi (1751-1822)

If you put your mind to it, you can do it;

If you do not, you cannot -- that is true for all things.

When something cannot be done, you are the one to blame
for not putting your heart into it.

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

Final Report

APPENDICES

Appendix-E Presentation Materials

Appendix E-2 Interim Seminar

Interim Seminar

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

August 2017

Nippon Koei Co., Ltd.
Chiyoda U-Tech Co., LTD.

Contents

1. **Background of Project**
 - 1.1 Future Energy Projection
 - 1.2 Challenges in Gas and Power sectors
2. **“Smallworld” as System Integration Tool**
3. **Progress of the Study**
 - 3.1 What we have done
 - 3.2 Smallworld in Bangladesh
 - 3.3 Study Tour Overview
4. **Way Forward**
 - 4.1 Road Map
 - 4.2 Sustainable Entity
 - 4.3 Next Step

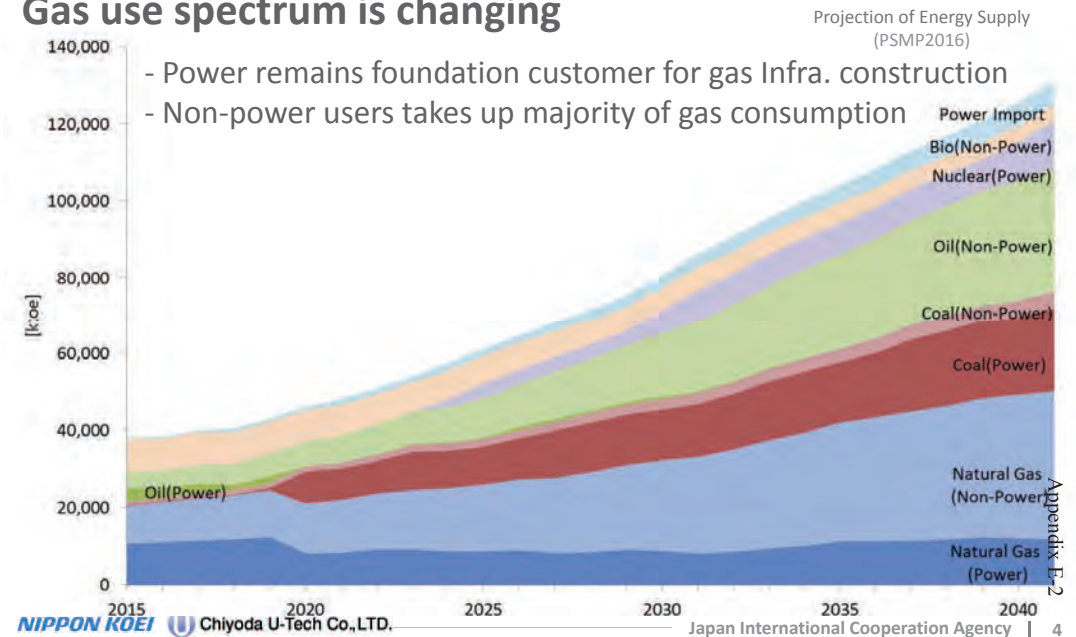
Data Collection Survey on Computerization of Gas and Power Network Infrastructure

1. Background of the Project

- 1.1 Future Energy Projection
- 1.2 Challenges in Gas and Power sectors
 - 1.2.1 Challenges in Gas and Power sectors
 - 1.2.2 Reliable Gas Network Infrastructure
 - 1.2.3 Gas and Power Collaboration

1.1 Future Energy Projection in Bangladesh (1)

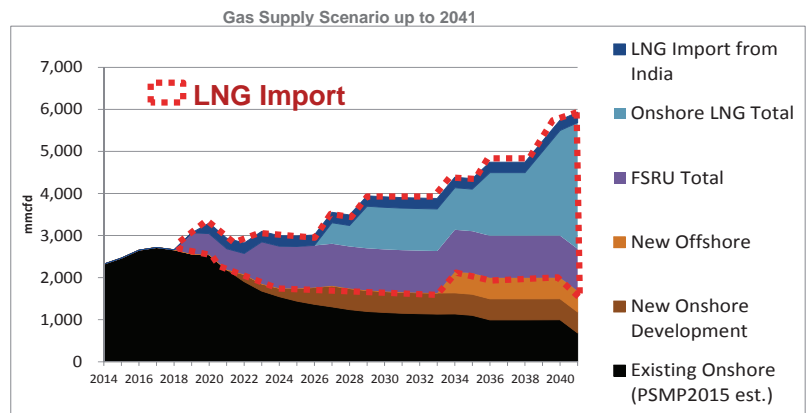
Gas use spectrum is changing



1.1 Future Energy Projection in Bangladesh(2)

• LNG import: 70% of Gas supply in 2041

- ✓ Requirement for Import LNG : 4,000 mmcf/d (2041)
- ✓ Supply Plan: FSRU 500mmcf/d x 2 + Land Terminal 3,000 mmcf/d x 1



1. Background of the Project

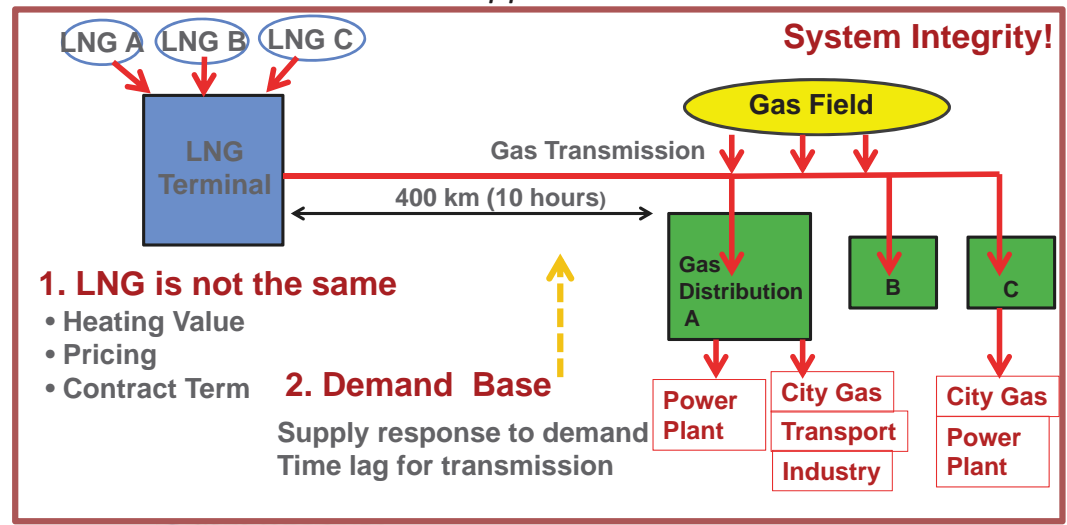
1.2.1 Challenges in Gas & Power Sector (1)

- (1) Integrated Operation System and Information Sharing**
 - Operation Mode will change;
 - ✓ Gas Allocation to **Demand basis**
 - ✓ Different pricing (domestic gas and LNG)
 - ✓ LNG for base load supply/ Domestic Gas for peak load supply
- (2) Reliable gas network infrastructure**
 - ✓ Unified Design Standard
 - ✓ Asset Management and Maintenance System
 - ✓ Gas Leak/System Losses and Accident to ZERO
- (3) Gas and Power Collaboration**
 - ✓ Investment Cost and Schedule Optimization for gas and Power Infrastructure including Power Station

1. Background of the Project

1.2.1 Challenges in Gas & Power Sector (2)

No Integration ! No advanced control !
 → What would happen to Power Plant?



1.2.1 Challenges in Gas & Power Sector (3)

What is “Integrated System” ?

- Schematically Connected; Traceable from gas field to each customer
- Geographical Routing and Connections (Traceability)

What is gas demand based Operation?

- Demand Profile of each customer
- Assuming Total Gas Demand Profile
- Supply gas from LNG Terminal and/or Domestic Gas Fields to meet the demand

Why Advanced Control is required?

- Delivery of LNG Gas to Dhaka takes 10 hrs
- Domestic Gas reach in short time period while Gas Pack is working
- Time Lag between Power Supply Plan and physical gas supply
- Mix of Several LNGs + Domestic Gas; Require Flow Control and Heating Value Monitoring to Identify exact supply amount and consumption by sources



1.2.2 Reliable gas network infrastructure (1)

- (1) Design Standard
- Standard to be unified

Pipeline	Material	General Section		Road Crossing		Corrosion Allowance	Soil Cover Depth
		Class/Zone	Safety Factor	Class/Zone	Safety factor	mm	m
Bakhrabad-Siddhrirgonji	API 5L X70	3	0.5	4	0.4	0	1.2
Dhonua-Elenga (D-N)	API 5L X60	2	0.6	Casing Pipe		1.5	1

- (2) Asset Management
- Standard/System to be upgraded

- Minimized Material Redundancy and optimization of Spare Parts Management
- Drawings/Document Updating and Tracking System
- Cathodic Protection to Distribution System; concern of degradation



1.2.2 Reliable gas network infrastructure (2)

- (3) Operation and Maintenance

O&M for 100 years!

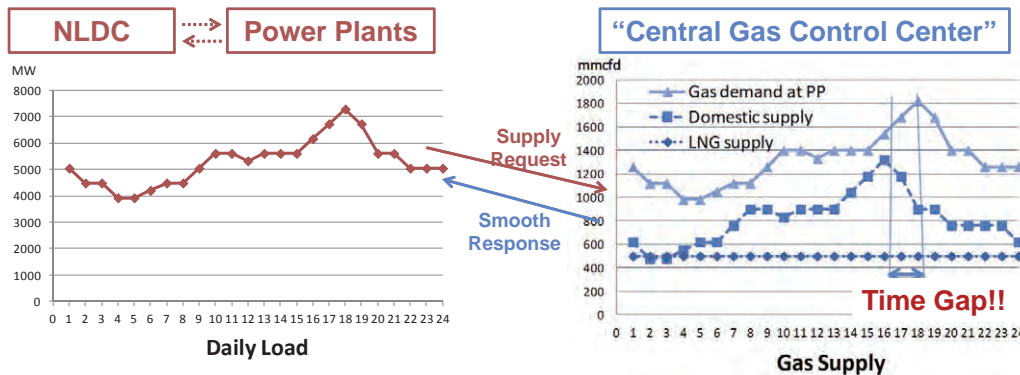
Typical O&M Organization

	Operation	Maintenance
System	SCADA	Asset Management System
Transaction	Real Time Solution	Mid-Long Term Solution
Management	Process Control	Enterprise Asset Management (EAM)
		Enterprise Resource Planning (ERP)
Emergency	Emergency Shut Down (ESD)	Outage Control and Recovery (offline analysis)



1.2.3 Gas and Power Collaboration

- (1) Energy transmission: Gas Pipeline or Power line
- Investment and schedule optimization
- (2) Time lag: Gas Requirement by Power vs. gas delivery



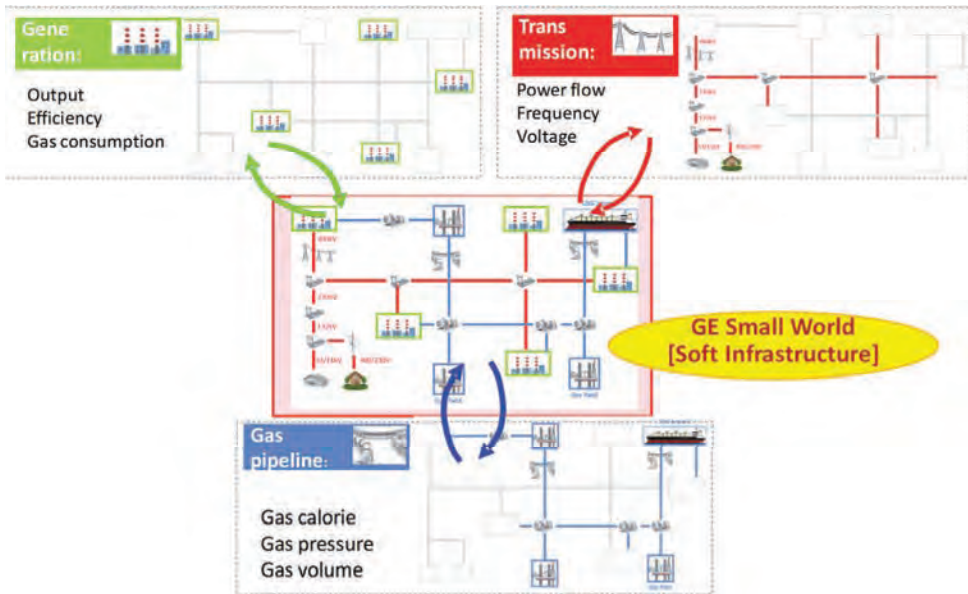
Data Collection Survey on Computerization of Gas and Power Network Infrastructure



2. "Small World" as System Integration Tool

- 2.1 System Integration Tool
- 2.2 Smallworld and GIS
- 2.3 Smallworld with SCADA, etc.

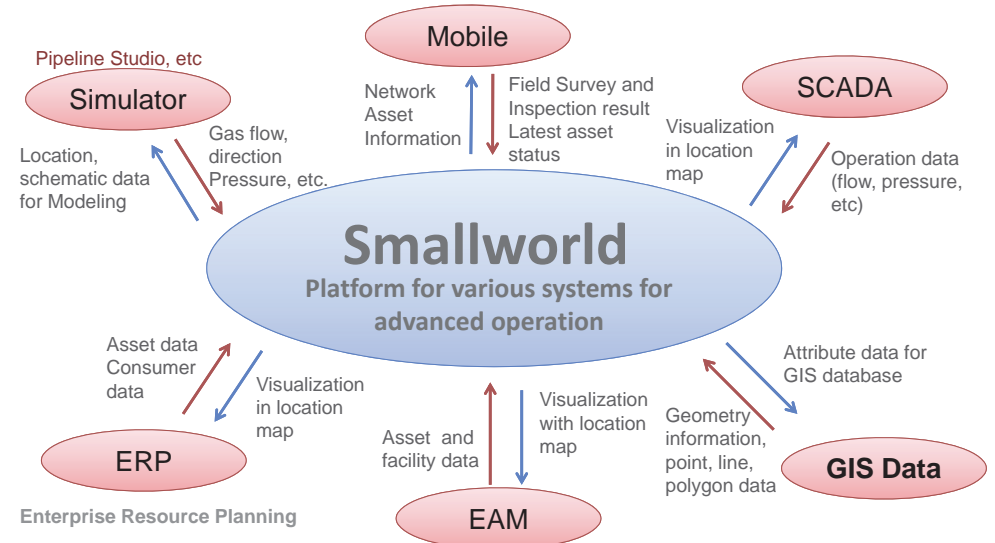
2.1 System Integration Tool (1)



2.1 System Integration Tool (2)



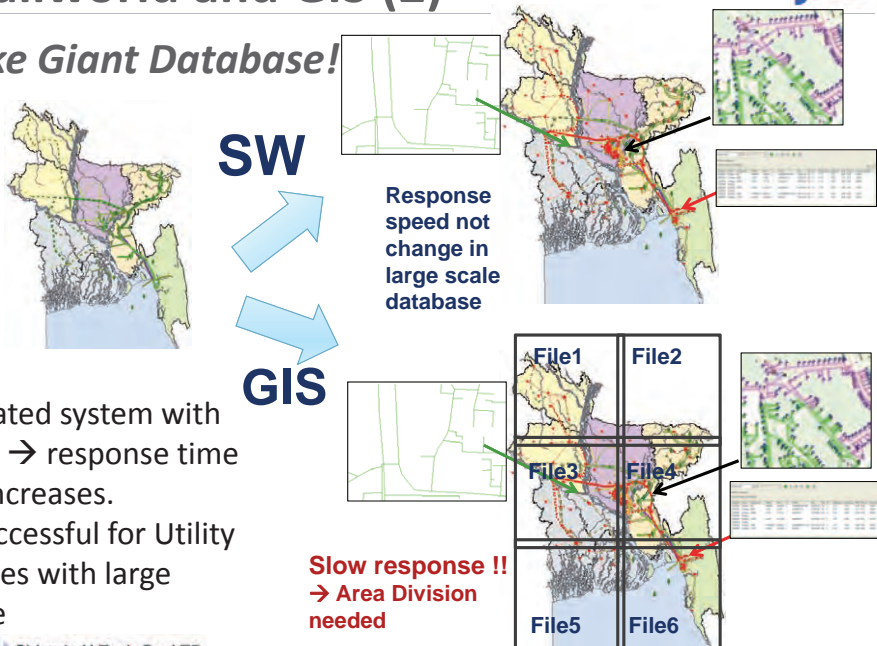
The platform collaboration with various systems for advanced and operation.



2.3 Smallworld and GIS (2)



SW is like Giant Database!

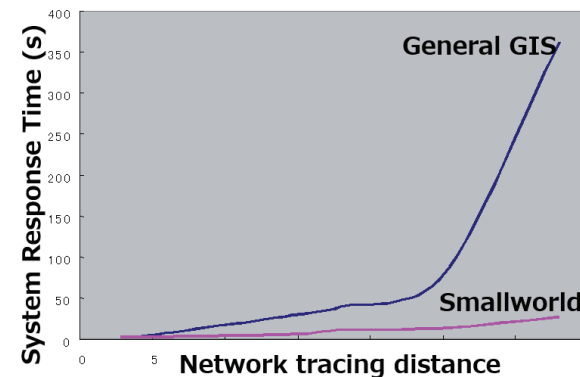


- Complicated system with big data → response time largely increases.
- SW is successful for Utility companies with large database

2.3 Smallworld and GIS (3)



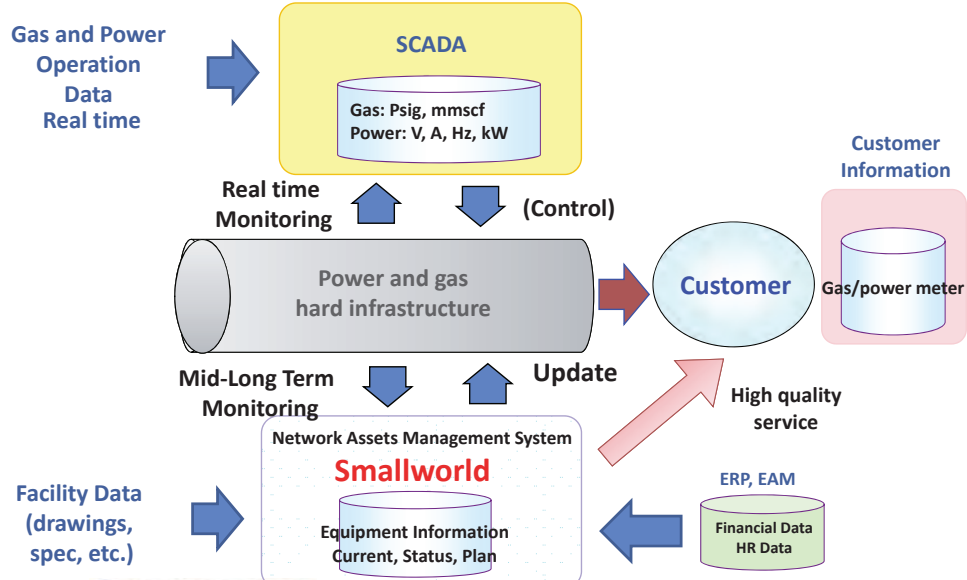
Large scale utility applies Smallworld



- Switch from GIS to SW
- >1300 utility companies applies SW (900 is electricity companies)
 - ✓ EdF/GdF manages >4mil consumers
 - ✓ Xcel Energy: 576,000 km power line
 - ✓ Florida power: 1.6 mil power poles
 - ✓ Hydro Quebec: 108,000km

2.4 Smallworld with SCADA, etc.(1)

Network Asset Management with SCADA and other systems



2.4 Smallworld with SCADA, etc.(2)

Remote Control system

Tank Levels

Trend Information

Facility Status

Data from SCADA

Gas flow: XX scfd
Gas pressure: XX psig
Construction year: xxxx

Mid-Long Term Monitoring
Emergency Plan
Gas and Power Outage Control
Historical Data Analysis
Leak Detection and CP Condition
Other Abnormal Trend Detection

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

3. Progress of the Study

3.1 What we have done

3.2 Smallworld in Bangladesh

3.3 Study Tour Overview

3. Progress of the study

3.1 What we have done

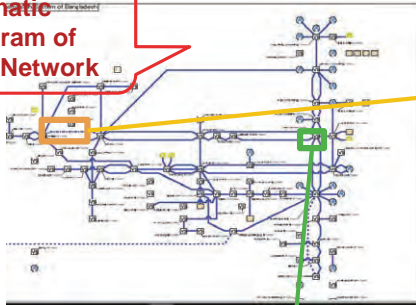
Activities performed:

Period	Activity
Apr 2017	Kick-off with MoPEMP and Courtesy Call to H.E. State Minister
May-July 2017	Data/Drawing collection
May-July 2017	Soft infrastructure demonstration modeling
8-17 July 2017	Study Tour to Japan
Aug 2017	Interim Seminar

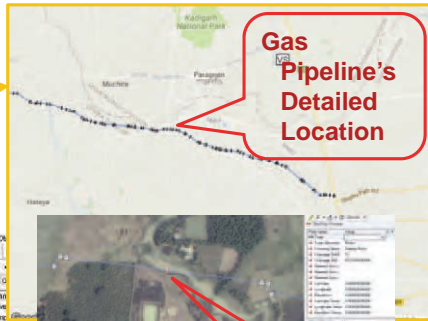
3.2 Smallworld in Bangladesh (1)



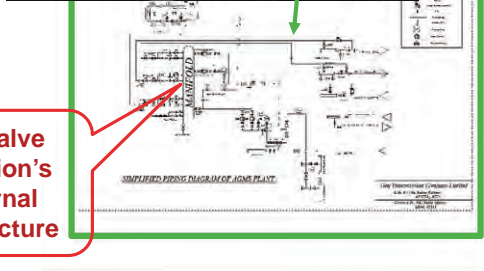
Schematic Diagram of Gas Network



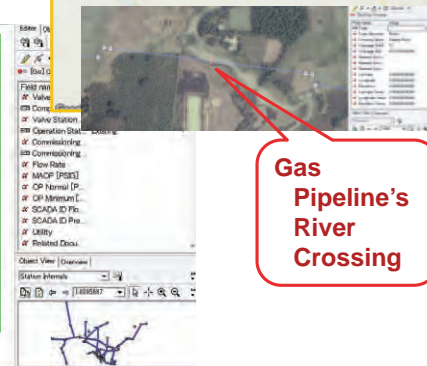
Gas Pipeline's Detailed Location



Gas valve Station's Internal Structure



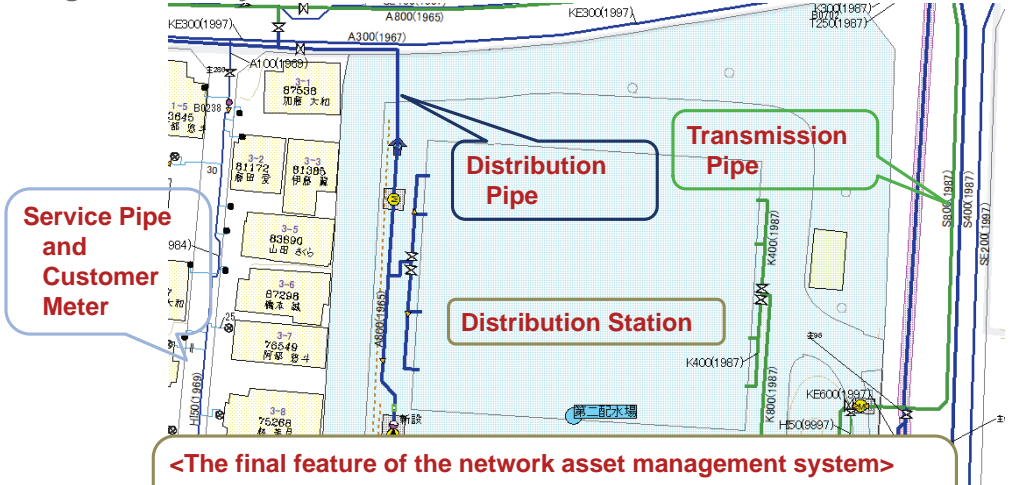
Gas Pipeline's River Crossing



3.2 Smallworld in Bangladesh (2)



Target in near future



Service Pipe and Customer Meter

Distribution Pipe

Transmission Pipe

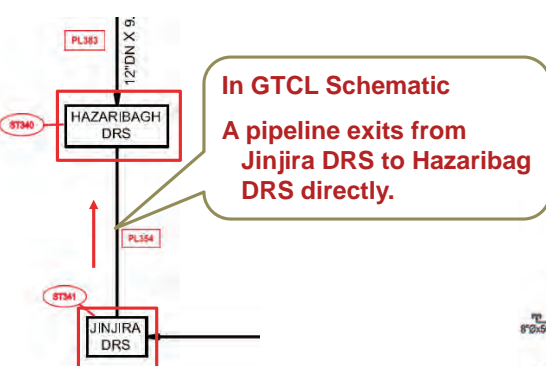
Distribution Station

<The final feature of the network asset management system>
Transmission, distribution and service facilities are connected each other on single asset management database system.

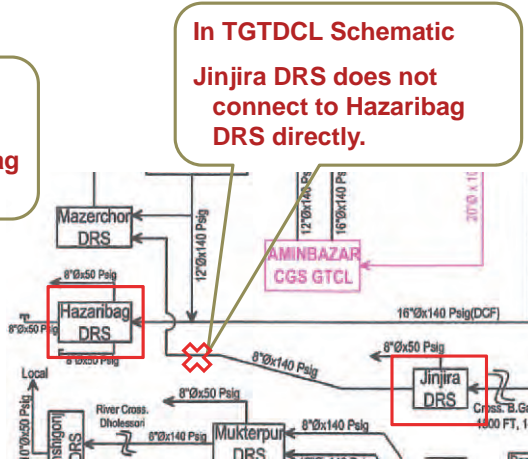
3.2 Smallworld in Bangladesh (3)



Need to be solved: Company demarcations



In GTCL Schematic
A pipeline exits from Jinjira DRS to Hazaribagh DRS directly.



In TGTDCS Schematic
Jinjira DRS does not connect to Hazaribagh DRS directly.

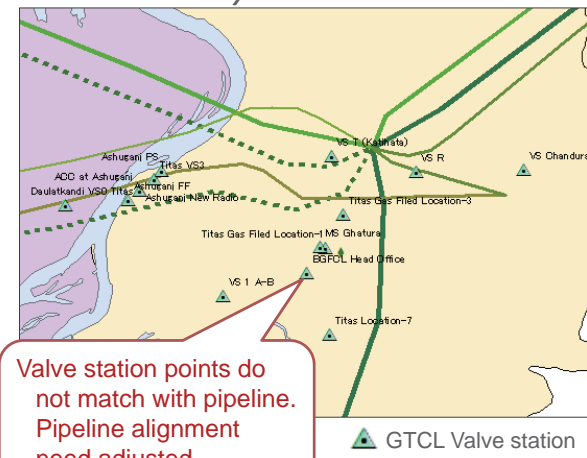
Jinjira DRS and Hazaribagh DRS in GTCL Schematic

Jinjira DRS and Hazaribagh DRS in TGTDCS Schematic

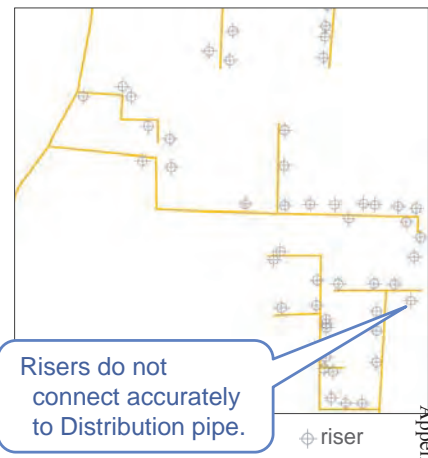
3.3 Preparation of SW Demonstration



Need to be solved: Accuracy. Clarification/modification of existing data necessary



Valve station points do not match with pipeline. Pipeline alignment need adjusted.



Risers do not connect accurately to Distribution pipe.

Transmission Pipeline

Distribution Pipeline

Appendix E-2

3.2 Smallworld in Bangladesh (4)



Inconsistency problem between schematic drawings
And the lack of accuracy on connection



Proper connection of valves, pipes, meters, etc in system

After these problems are resolved:

- Minimized down time. Quick recovery with positioning in visual map and spare parts with asset database
- Announcement of gas outage to customers quickly and accurately
- Minimizing time and resource of inspection and survey work
- Optimization of integrated future gas/power network plan

3.3 Study Tour Overview (1)



Study Tour in Japan was conducted to visit advanced system operation example and gas and power with LNG facility

Day	Date	Contents	Objective
10-Jul	Mon	<ol style="list-style-type: none"> Orientation at Nippon Koei) Central control center of TEPCO Chiyoda and Chiyoda U-tech 	<ol style="list-style-type: none"> To share objective of study tour in Japan To study power supply control system example To know Process Flow of LNG plant, LNG receiving terminal, and Floating gas-power ship
11-Jul	Tue	LNG Futtsu Terminal and Gas Power	To learn facility of LNG receiving terminal (LNG handling, BOG, etc.) for 5000 MW gas power station incl. MACC Gas transmission system to be dedicated line for power

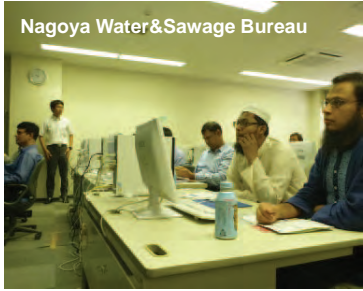
10-11 July (NK, TEPCO, Futtu, Chiyoda)



3.3 Study Tour Overview (2)



Day	Date	Contents	Objective
12-Jul	Wed	<ol style="list-style-type: none"> Nagoya City Waterworks and Sewage Bureau Toho Gas Control Center 	<ol style="list-style-type: none"> To learn drawing management and standardization in utility companies To learn gas distribution system, pressure control, and customer information
13-Jul	Thu	Toho Gas Chita LNG Terminal	To learn LNG handling, power and city gas each dedicated line
14-Jul	Fri	Basic Operation of Object Model Soft Infrastructure	To understand basic function and operation method of Soft Infrastructure
15-Jul	Sat	Exercise and discussion about Soft Infrastructure	To understand role of soft infrastructure to assess future system requirement in Bangladesh
16-Jul	Sun	Tokyo Gas Science Center	To understand recent pipe material, gas customer service, etc.



Gas Sector

GTCL Engineers

Power Sector

BPDB Engineer

PGCB Engineers

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

4. Way Forward

4.1 Road Map

4.2 Sustainable Entity

4.3 Next Step

4. Way Forward

4.1 Road Map

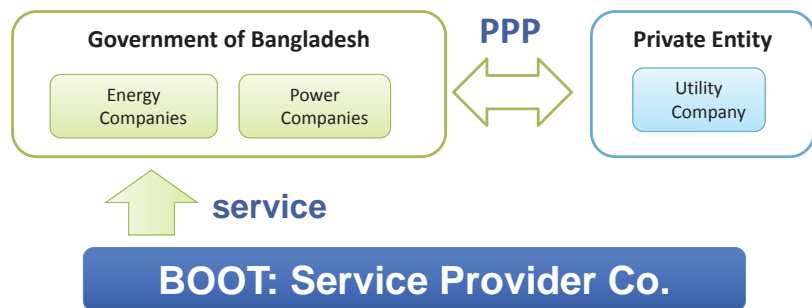
Stage	Data Collection Survey	Technical Cooperation Project	Operating Organization (BOOT)
Soft component			
Smallworld	★	★	★
Design Standard		★	
Digitizing Pilot Project		★	
Digitizing All Area			★
BOOT Framework		★	
Reliable Infrastructure			
Asset Management			★
Advanced Control			★
Preventive Maintenance			★

• **Cost Example of Japan**

A gas company with 2.5 million accounts supplying 400 mmscfd gas (city gas only), 300 concurrent system users, initial \$3.0 million, annual cost \$0.8 mil/year

4.2 Sustainable Entity

Public and Private Partnership after BOOT Approach



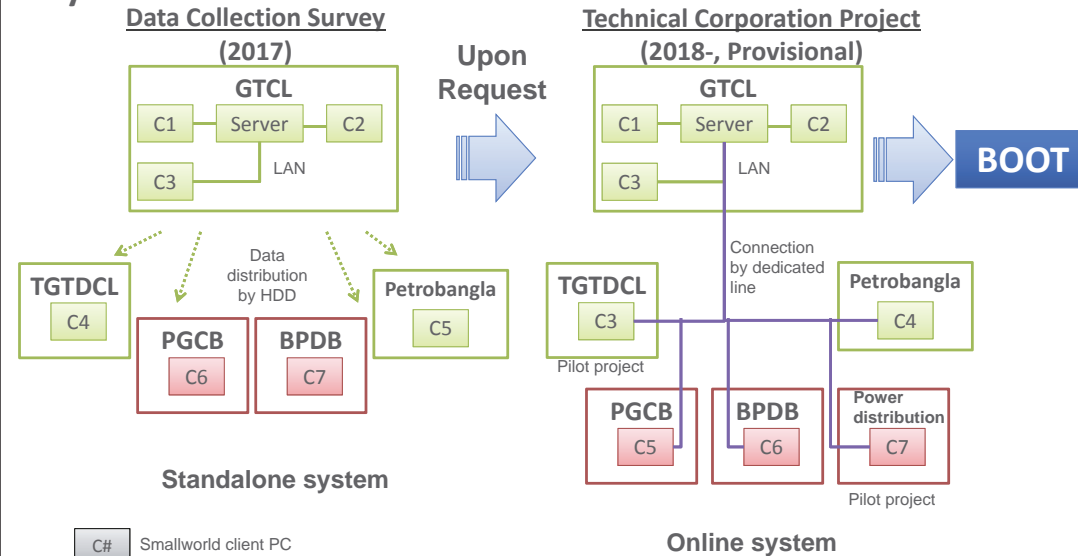
- **System Integration: Gas and Power**
- **System operation**, maintenance and Update Soft Infrastructure
 - Monitor and report Mid-Long Term Trend/Detect Issues
 - Emergency Plan (Power and Gas Outage)
 - Planning and Basic Engineering for Expansion or Renewal Project

For discussion



4.3 Next Step (1)

System Installation in Offices



4.3 Next Step (2): 2nd Study Tour

Intensive course for high-class officers



Day	Activity in Japan	Day	Activity in USA
Day 1	Move from Dhaka to Singapore	Day 9	GE Training course-1 :Gas pipeline management
Day 2	Move from Singapore to Tokyo	Day 10	GE Training course-2 : Power managee incl. SCADA and smart grid
Day 3	Lecture: Soft infrastructure	Day 11	Gas and power utility company with Soft infrastructure -1 (Xcel Energy)
Day 4	Site visit: RADER cable and pipe detection (Sinza, Saitama)	Day 12	(move from Denver to Charlotte)
Day 5	Site visit: Piping material (Sekisui) Site visit: Cable material	Day 13	Gas and power utility company with Soft infrastructure -2 (Duke Energy)
Day 6	Lecture: Data input of Bangladesh gas/power asset	Day 14	(move from Charlotte to Houston)
Day 7-8	Move from Tokyo to Denver, USA	Day 15-16	Visit to Free Port (LNG exporting facility)
		Day 17	From Houston to Istanbul
		Day 18	From Istanbul to Dhaka

4.3 Next Step (3): Schedule



Time	Item	Requested
Early August 2017	Finalization of participant for 2 nd Japan and USA visit	Nomination, GO, visa procedure
Aug-Oct 2017	Data/Drawing collection	Facilitation with relevant organization
Sep-Nov 2017	Preparation for Demonstration and policy recommendation	Discussion for policy
Oct 2017	2nd Japan and US Visit	
Early November 2017	Draft Final Report	Comment on DFR
Late November 2017	Equipment hand-over	
December 2017	Final Seminar / Final Report	

Thank You!!



Data Collection Survey on Computerization of Gas and Power Network Infrastructure

Final Report

APPENDICES

Appendix-E Presentation Materials

Appendix E-3 Final Seminar

Final Seminar

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

4 December 2017

Nippon Koei Co., Ltd.
Chiyoda U-Tech Co., LTD.

Final Seminar: Agenda

Time	Item
8:50-9:20	Registration
9:20-9:40	Opening Remarks
9:40-10:25	Issue, Challenges, and Recommendations
10:25-10:55	Demonstration of Soft Infrastructure of Bangladesh
10:55-11:10	Tea Break
11:10-11:25	Design Standard and Result of Data Collection
11:25-11:40	Proposed Submarine Pipeline and Environment Scoping
11:40-11:55	Schedule and Way Forward
11:55-12:15	Discussion
12:15-12:30	Closing Remarks

Contents

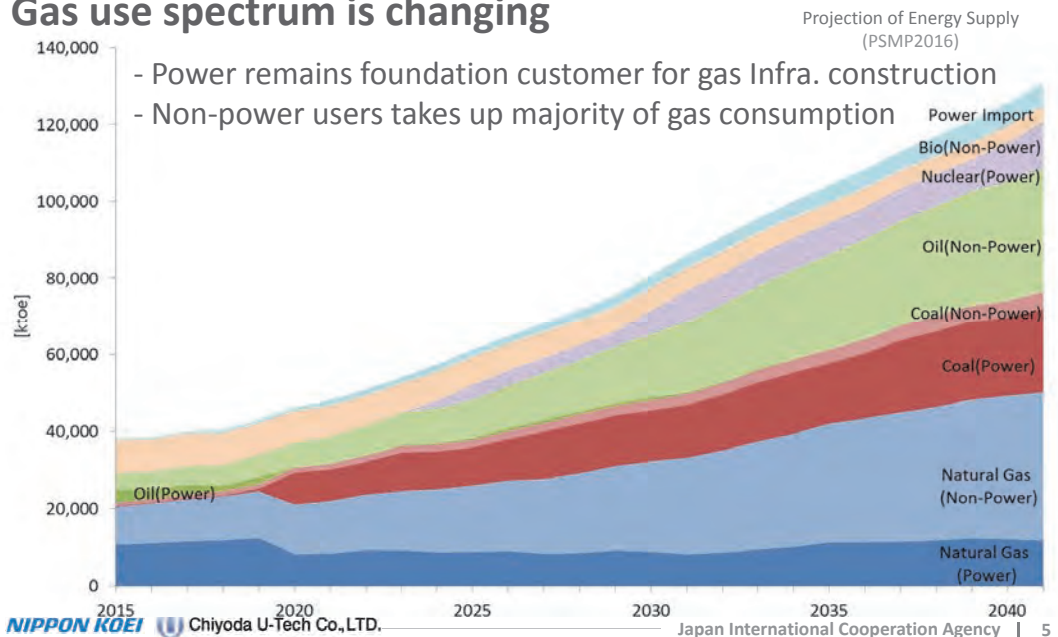
1. Introduction
2. Issues, Challenges
3. Recommendations on Gas Infrastructure Configuration
 - 3.1 Infrastructure Configuration
 - 3.2 Infrastructure Development Scenario
 - 3.3 Onshore Pipeline vs. Offshore Pipeline
 - 3.4 Collaboration with ERP Team
4. Demonstration of Soft Infrastructure of Bangladesh
5. Result of Data Collection
6. Design Standard
7. Environment Scoping of Proposed Offshore Pipeline
8. Schedule and Way Forward

Data Collection Survey on Computerization of Gas and Power Network Infrastructure

1. Introduction

1.1 Future Energy Projection in Bangladesh (1)

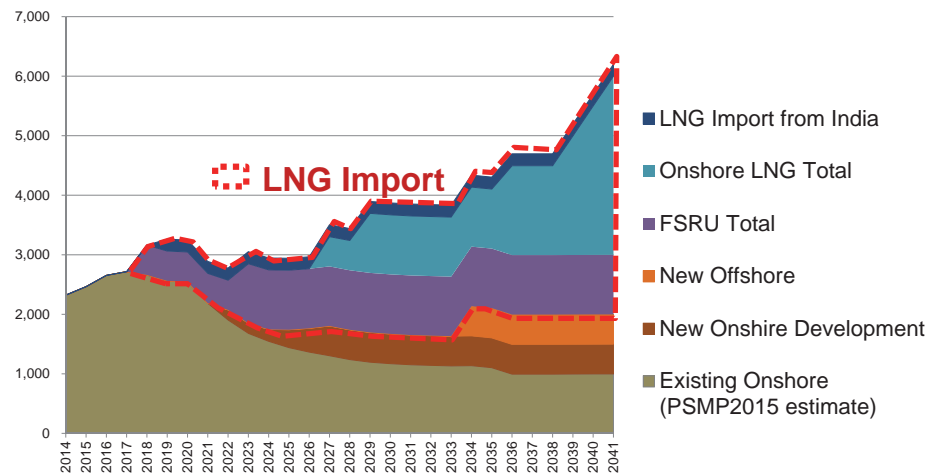
Gas use spectrum is changing



1.2 Gas Supply Scenario in Bangladesh

✓ Requirement for Import LNG : 4,000 – 5,000 mmcf/d (2041)

Note: DFR of GSMP by World Bank in 2017 suggest higher gas requirement



1.3 LNG Project List

LNG Import FSRU/FSU/Terminal projects are in line (5000 mmscf/d).
(as of Nov 2017)

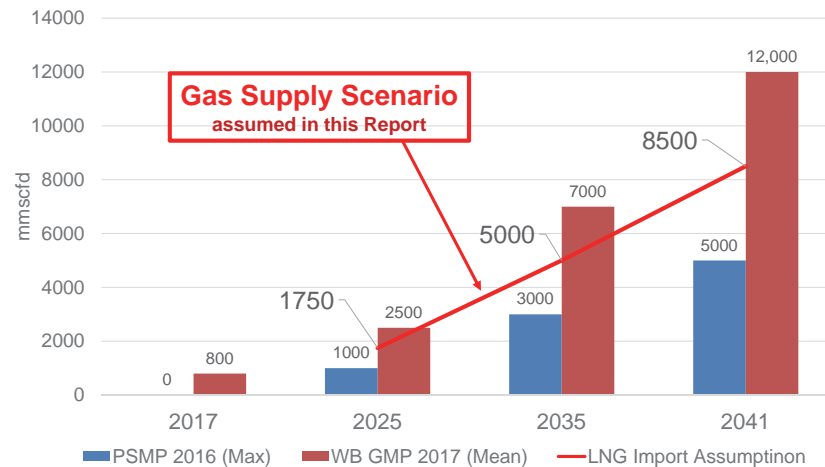
	Type	Terminal Operator	Location	Flow Rate (mmscf/d)	Commissioning Schedule	Project Type	Status
1	FSRU	Excelerate Energy	Moheskhal	500	Apr-18	BOOT	Contract Signed
2	FSRU	Summit Corp.	Moheskhal	500	Oct-18	BOOT	Contract Signed
3	Land Terminal	China Huanqiu Contracting & Engineering (HQC)	Moheskhal	1,000	Dec-21		MoU Signed
4	FSU	Hongkong Shanghai Manjala Power Ltd. (HSMPL)	Moheskhal	500	26 months after Agreement		Term Sheet Signed
5	Land Terminal	Petronet	Kutubdia	1,000	Under confirmation		Head of Understanding Signed
6	FSU	Relience	Kutubdia	500	Dec-19		MoU signed
7	Land Terminal	Sembcorp	Moheskhal	1,000	Dec-22		MoU signed

Total: 5,000 mmscf/d

Source: RPGCL and Petrobangla

1.4 Gas Demand Forecast

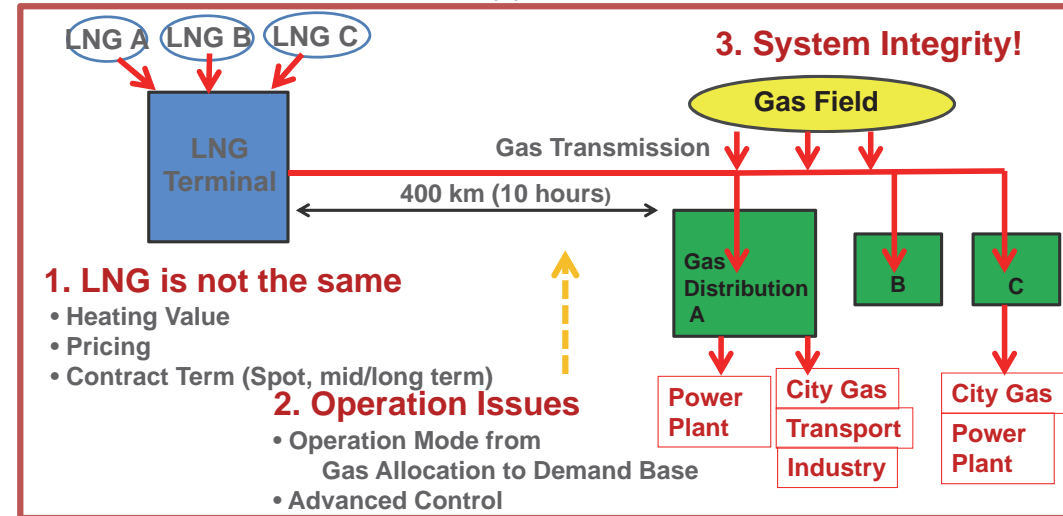
A large difference in Gas Demand Forecast
PSMP2016 vs. GSMP2017



2. Issues and Challenges

2.1 Challenges in Gas & Power Sector

No Integration ! No advanced control !
→ What would happen to Power Plant?



2.2 LNG Import system & Operational Issues

Issues:

- Numbers of LNG Suppliers
Heating value,
Supply volume,
Contract terms (long term and short term)
Pricing
- Domestic Gas Mixture
- Use Common Infrastructure



Solution : Appropriate Management System to be in place

Avoid operational and financial risk !

- System Integration/Advanced Control required
- Introduce “Capacity Right” which is allocated to each gas suppliers as a supply capacity limit
- Set up “Quality Bank” an entity to regulate gas flow rate and compensate price/quality differentials among the suppliers against gas quality standard to settle the account

2.3 Operation issues

Change of Operation Mode

- Current Gas Allocation System does not meet with the requirement of Power and Industry.
 - ✓ Need to know Demand Profile of each customer
 - ✓ Need to send the gas to meet Demand Profile
- Need to change to Demand Based Supply
- Demand vs. Supply Time Lag will take place
 - ✓ Delivery of LNG Gas to Dhaka takes 10 hrs

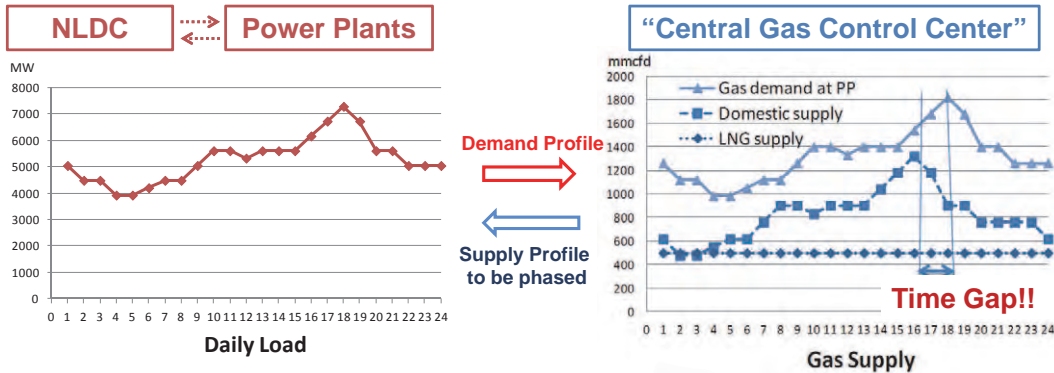
2.4 Gas and Power Collaboration

Time lag: Gas Requirement by Power vs. gas delivery

Gas delivery time is slow but power requirement is instant.

Gas demand profile by power plant and gas supply profile need to be phased

→ Advanced Gas Supply Control System is Required



2.5 System Integrity Issues

- Inconsistency in Design Philosophy/Standard of pipeline
 - No integrity is guaranteed
 - Material specification need to be in common
- Inappropriate Material Specifications
 - Electric Resistance Weld (ERW) Pipe is no more use for critical services i.e., gas pipeline
- No updated Pipeline Drawings nor Distribution Piping Drawings
- Inappropriate use of Design Pressure
 - Losing gas transportation capacity significantly

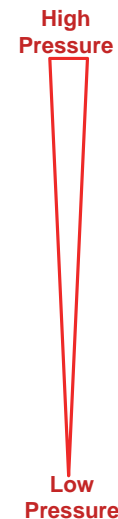
Data Collection Survey on Computerization of Gas and Power Network Infrastructure

3. Recommendations

3.1 Infrastructure Configuration

3.1.1 Current Gas Supply System in Bangladesh

Fish Bone Pressure System



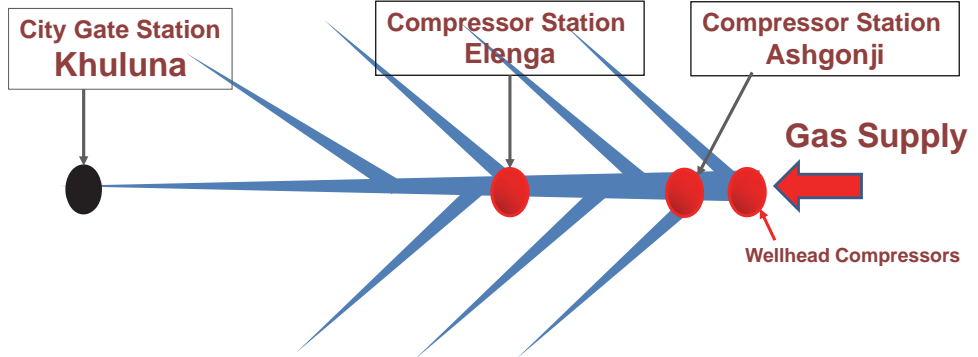
Valve Station	psig	kg/cm ² g	Gas Pressure
Design Pressure	1135	79.8	MAOP (Design Pressure)
Kailashtila A2/3	1133	79.7	MAOP
Target Operating Pressure	1000	70.3	
Ghatura M & R	970	68.2	Minimum Operating Pressure
BB M&R	950	66.8	Minimum Operating Pressure
Monohohordi	740	52.0	Minimum Operating Pressure
Narsingdi	650	45.7	Minimum Operating Pressure
Dhonua	600	42.2	Minimum Operating Pressure
Elenga	550	38.7	Minimum Operating Pressure
Demra/Siddhirgonj/Chittagoj CGS	400	28.1	Minimum Operating Pressure
Joydepur	350	24.6	Minimum Operating Pressure
Ashiulia	218	15.3	Minimum Operating Pressure

3.1.2 Gas Supply System in Bangladesh Fish Bone System (current)



1. Fish Bone System –Initial Development Stage

- Higher Pressure to maintain overall pressure balance
- Supply Capacity is limited and/or compressor station required
- Works under Gas Allocation System, not for demand base supply
- Vulnerable to incidents (no back up)



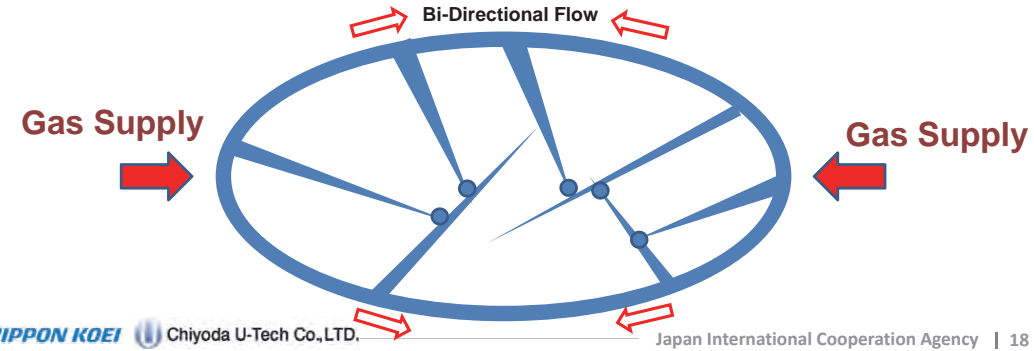
International Donners have supported Fish Bone Infrastructure.

3.1.3 Gas Supply System Development Loop System (Proposed for Future)



2. Loop System –Advanced Supply Stage

- Optimized gas pressure (lower loop gas pressure)
- Larger Supply Capacity
- Demand Base Supply
- Stable Supply (bidirectional) and easy back up network development
- Simple gas flow control, i.e., pressure
- No Compressor Stations in the Loop Configuration



Data Collection Survey on Computerization of Gas and Power Network Infrastructure

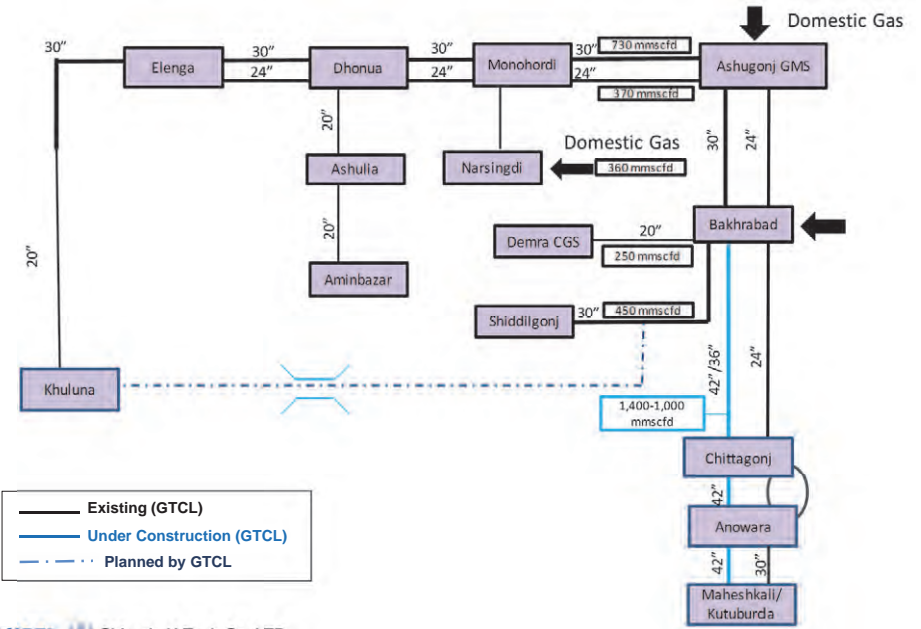


3. Recommendations

3.2 Infrastructure Development Scenario

3.2.1 Pipeline Status in 2018

For present Potential incremental demand: 800-1000mmscfd



— Existing (GTCL)
 — Under Construction (GTCL)
 - - - Planned by GTCL

3.2.2 Pipeline (PL) Status in 2018



Gas Import Requirement:

Present Gas Latent Demand is reported to be 800 -1000 mmscfd (need to be imported)

Gas Import Plan :

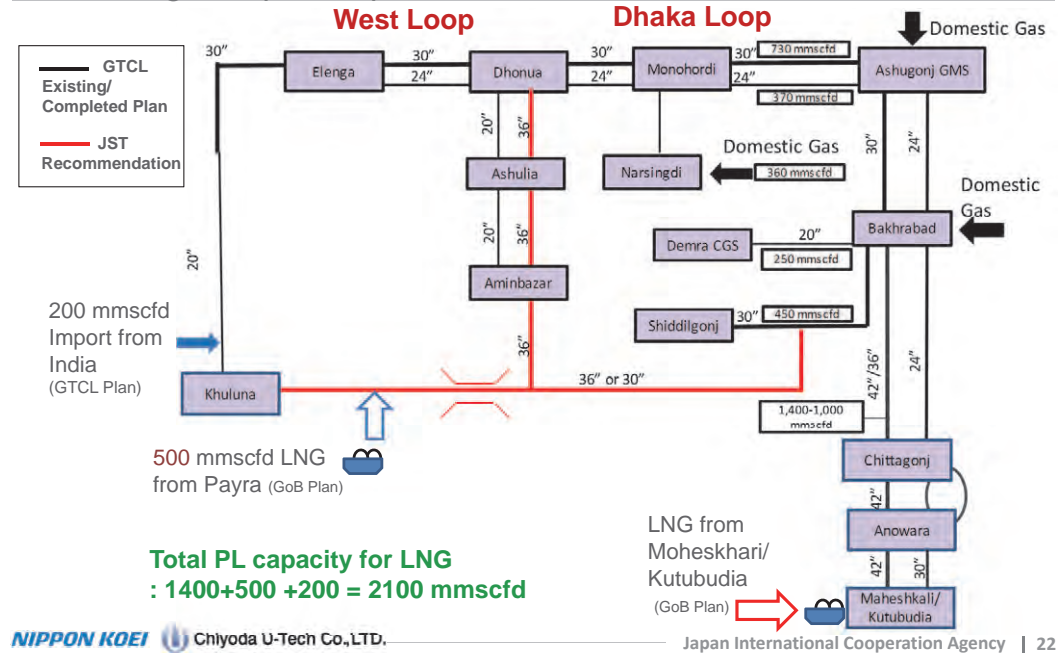
Commencement of Gas Supply from two FSRU at Moheshkali
Total Supply capacity will be 1000 mmscfd

Infrastructure Construction

- (1) Completed (GTCL)
 - 30" PL from Moheshkari to Anowa,
 - Capacity: 500 mmscfd to Chittagon
- (2) Under construction (GTCL)
 - 42" PL from Mohaeshkari to Faujdarhat: 1400 mmscfd
 - 36" PL from Faujdarhat to Bakhrabad : 1000 mmscfd
 - Capacity: 1000 mmscfd to Bakhrabad

3.2.3 Pipeline Development Scenario 2025

For gas import requirement: 1,750 mmscfd



3.2.4 Pipeline Development Scenario 2025



Gas Import:

1750 mmscfd is assumed

Gas Supply Plan :

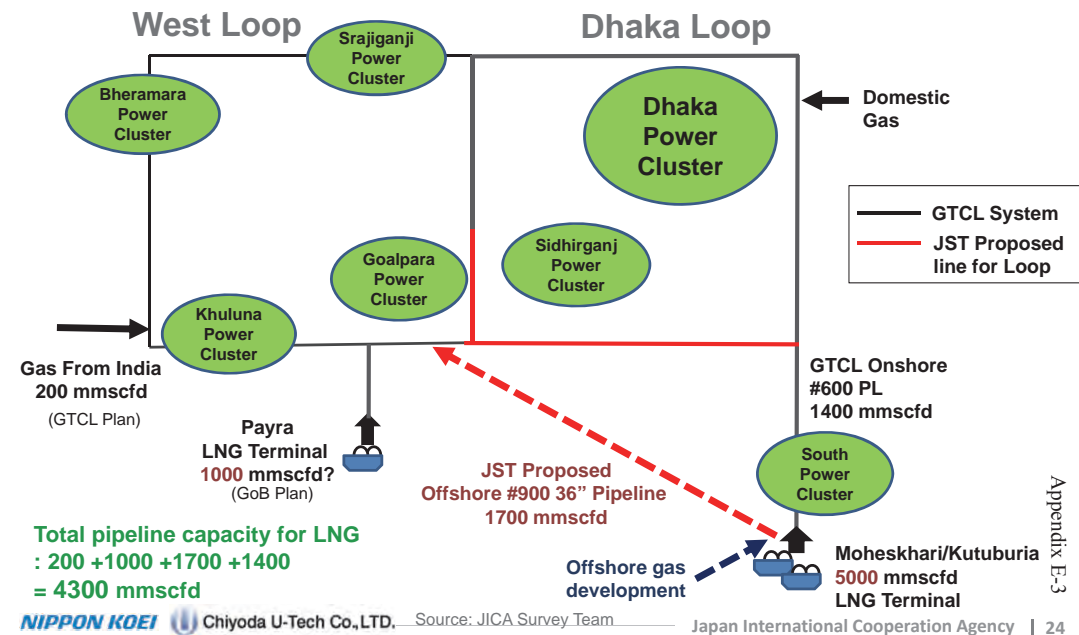
Gas Supply from FSRUs and Land based LNG Terminal at Payra, Mohaeshkali/Kutubdia

Infrastructure Construction recommended by JST:

- (1) Dhaka Pipeline Loop Construction
Optimized Pressure (lower operating Pressure)
- (2) West pipeline Loop Completed
- (3) 5,000 mmscfd LNG Gas evacuation plan from Moheshkali/Kutubdia to be prepared
- (4) Need to increase gas supply pipeline capacity:
Rise MAOP (Maximize the use of Pressure Rating) if possible

3.2.5 Pipeline Development Scenario 2035

Gas Import Requirement 5,000mmscfd



Gas Import:

5000 mmscfd is assumed

Gas Supply Plan:

Land based LNG Terminal at Mohaeshkali/Kutuburia Expanded Payra LNG Terminal?

Infrastructure Construction:

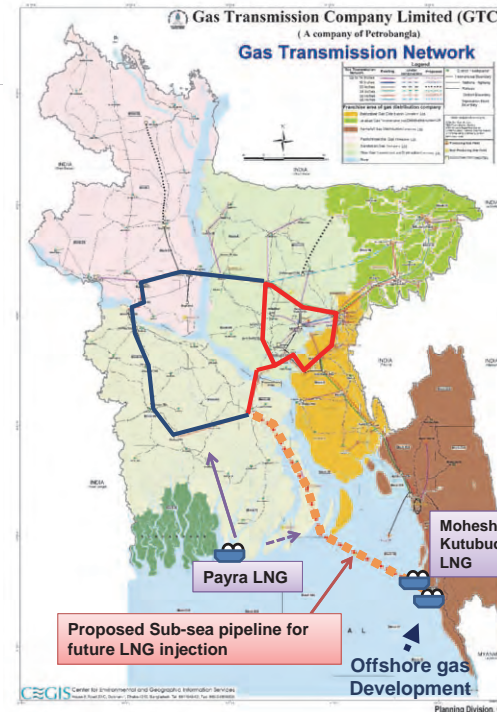
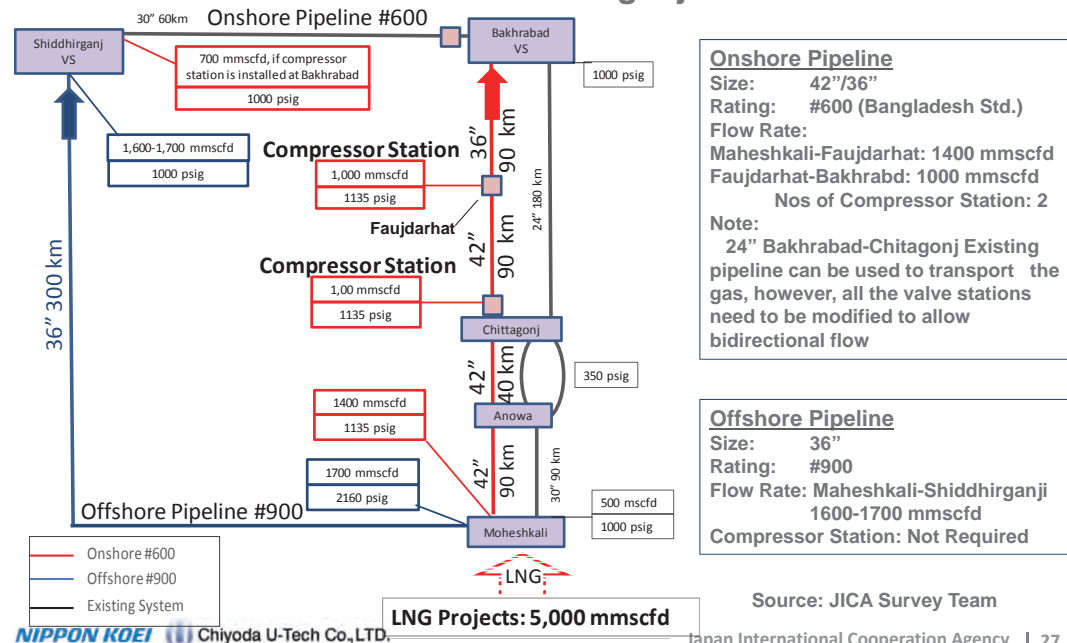
- (1) 36" Offshore #900 Class Pipeline to West Padoma (JST Recommendation)
- (2) Expansion of Payra LNG Terminal (GoB provision)
- (3) New Pipeline System to support Offshore Gas Development to be prepared (GoB provision)

3. Recommendations

3.3 Onshore Pipeline vs Offshore Pipeline

3.3.1 Onshore Pipeline vs. Offshore Pipeline

From Matabari/Moheshkari to Shiddhirganj

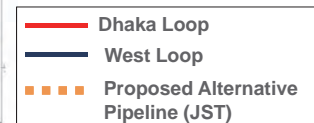


3.3.2 Offshore Pipeline

Proposed Offshore Pipeline & Dhaka/West Loop

Proposed Alternative pipeline

- 36", #900
- approx. 300 km
- 1700 mmscfd
- Estimated Cost USD 860mil
- Cost @2014 base



3. Recommendations

3.4 Collaboration with ERP Team

3.4.1 ICT and ERP

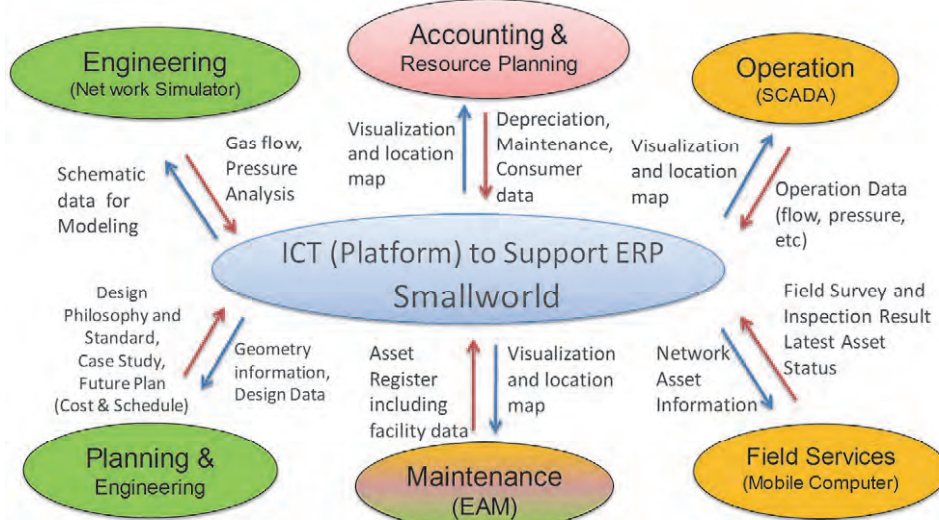
1. ERP is a Concept, not System
2. Word “ERP” is used by Accounting Side using SAP, initially introduced by Manufacturing Industry
3. Concept of ERP differ from Industry to Industry
4. Target Parameter is different
 Oil and Gas Industry: Safety/Reliability/Cost/Profit
 Manufacturing industry: Quality/Cost/Profit
5. Oil and Gas Industry is Asset based Industry
 Maintain the facility 50-100 years
5. ERP has been developed since end 1970s, for 40 years. It is continued effort Over the years
6. “Smallworld” is key System for Asset Management

Note:

ICT: Information and Communication Technology
 ERP: Enterprise Resource Planning

3.4.2 Typical ERP Organization

ICT (Platform) to support ERP



Enterprise Asset Management (EAM)

Source: JICA Survey Team

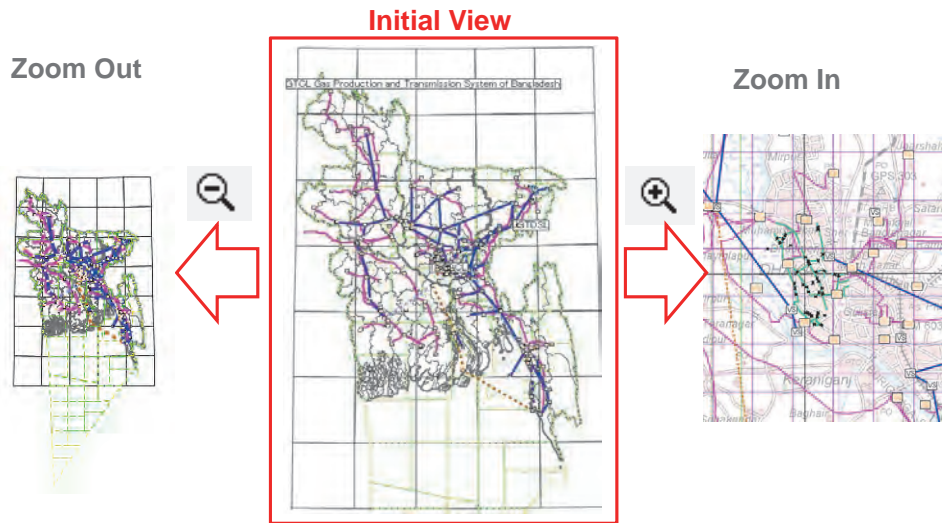
Data Collection Survey on Computerization of Gas and Power Network Infrastructure

4. Demonstration Soft Infrastructure in Bangladesh (in separate presentation)

Initial View of the Demo System



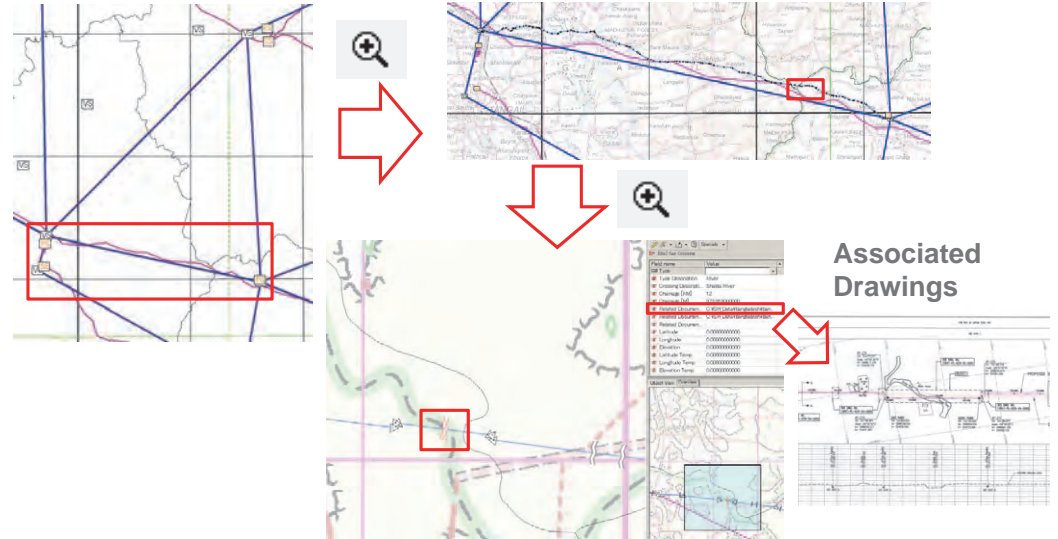
Blue Lines are Gas Pipelines, **Pink Lines** are Power Transmission Lines.
Zoom In/Out is smoothly managed with zoom icon.



Geographic World



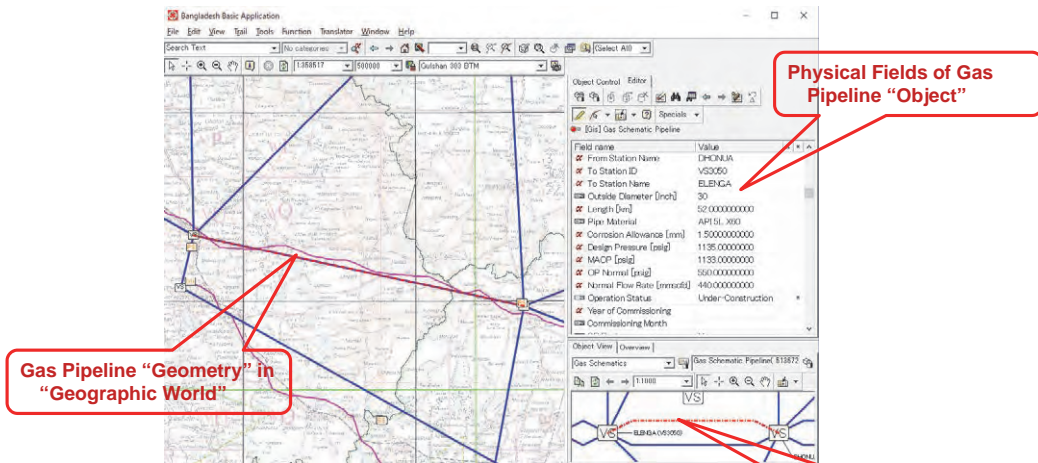
In a small scale map, only main pipeline geometries are shown.
As we zoom in to a larger-scale map, detailed pipeline geometries are shown.



A Real World Object (RWO)



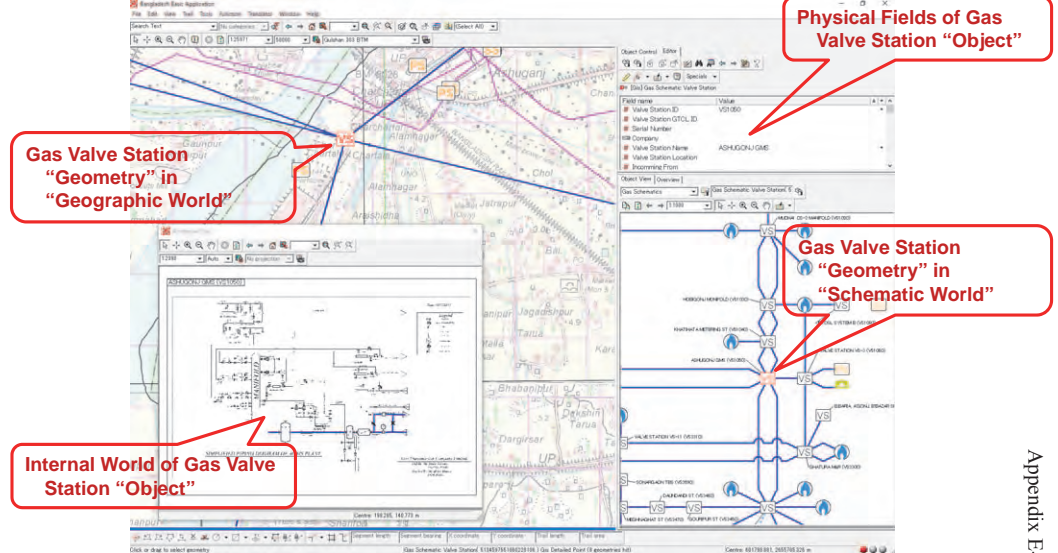
A "thing" in the real world is related one-to-one to an "Object" in Smallworld.



Object Examples (1)



Gas Valve Station



Object Examples (2)



Power Sub Station and Transmission Line

“Physical Fields” of Transmission Line “Object”

Transmission Line “Geometry” in “Geographic World”

“Physical Fields” of Sub Station “Object”

“Internal World” of Sub Station “Object”

Sub Station “Geometry” in “Geographic World”

Change to “Schematic World”



1. Select a Valve Station.

“Schematic World” is a logical map simplifying connections.

2. See “Physical Fields” of the Valve Station.

3. Select “Schematic World”.

4. Change map view to “Schematic World”

Change to “Internal World”



1. Select a Sub Station.

“Internal World” is detailed map showing facility inside.

2. See “Physical Fields” of the Sub Station.

3. Select “Internal World”.

4. Change map view to “Internal World”

“Objects” in “Internal World”



Each Station type object can have own facility/equipment object in building internal’s “World”.

Sub Station “Geometry” in “Geographic World”

“Internal World” of Sub Station “Object”

“Physical Fields” of Circuit Breaker

Various Asset Component “Objects” can be placed in the “Internal World”

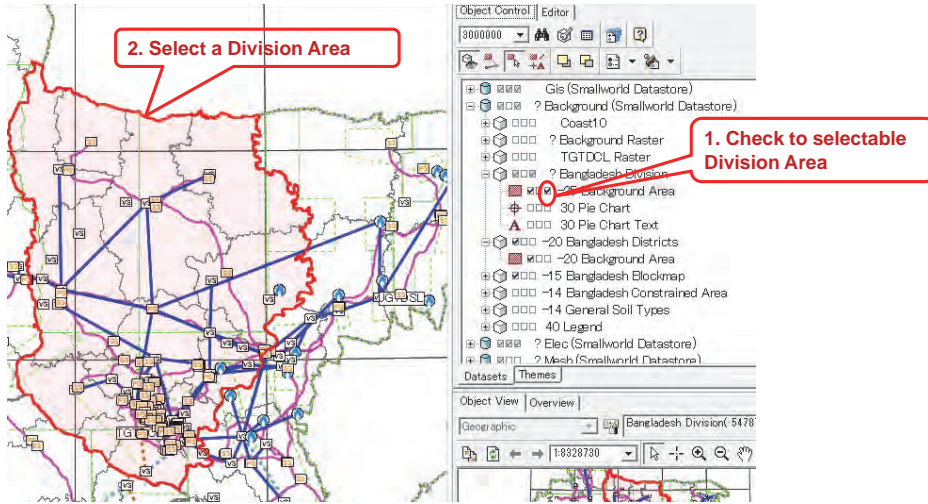
Circuit Breaker “Geometry” in the “Internal World”

Spatial Query (1)



Spatial Query can select objects existing in a certain area, region, division, etc.

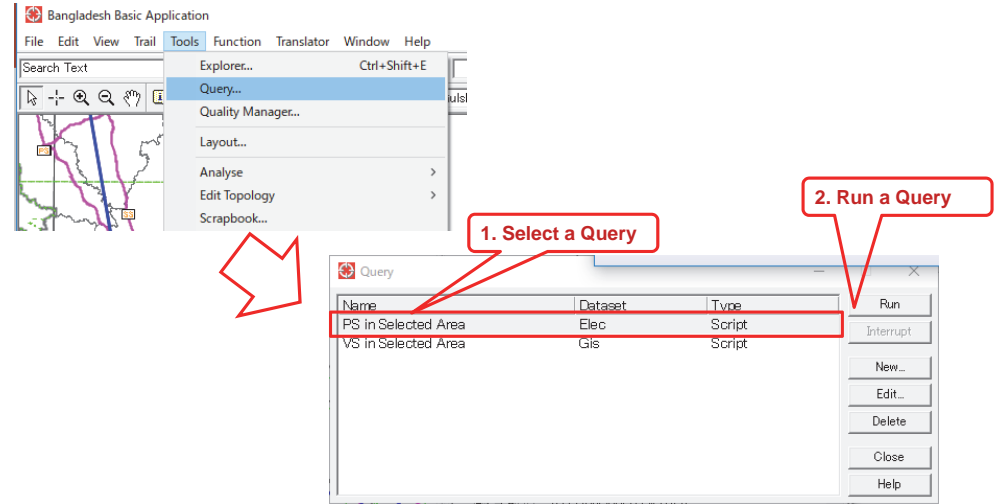
1. Select a Division Area



Spatial Query (2)



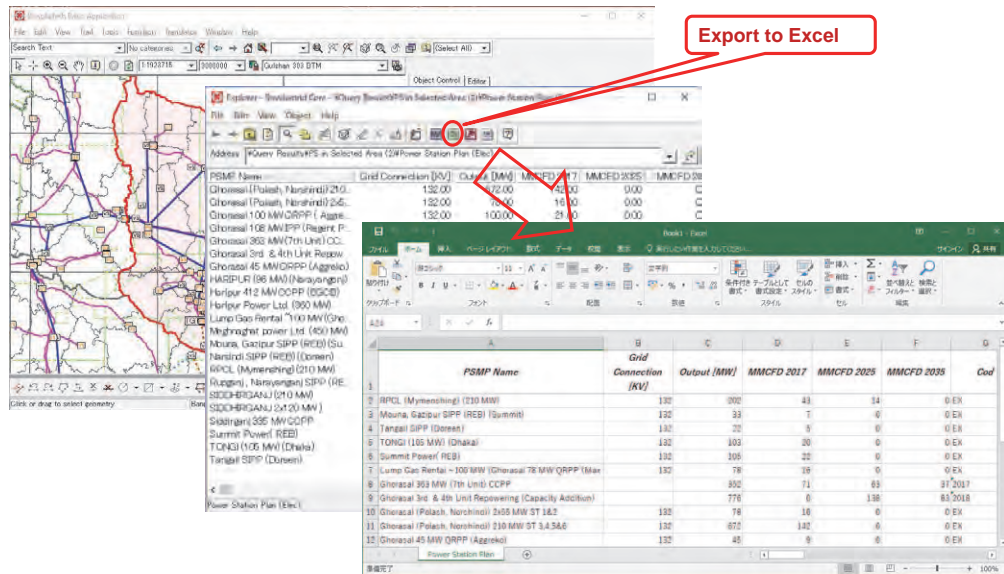
2. Run a Spatial Query



Spatial Query (3)



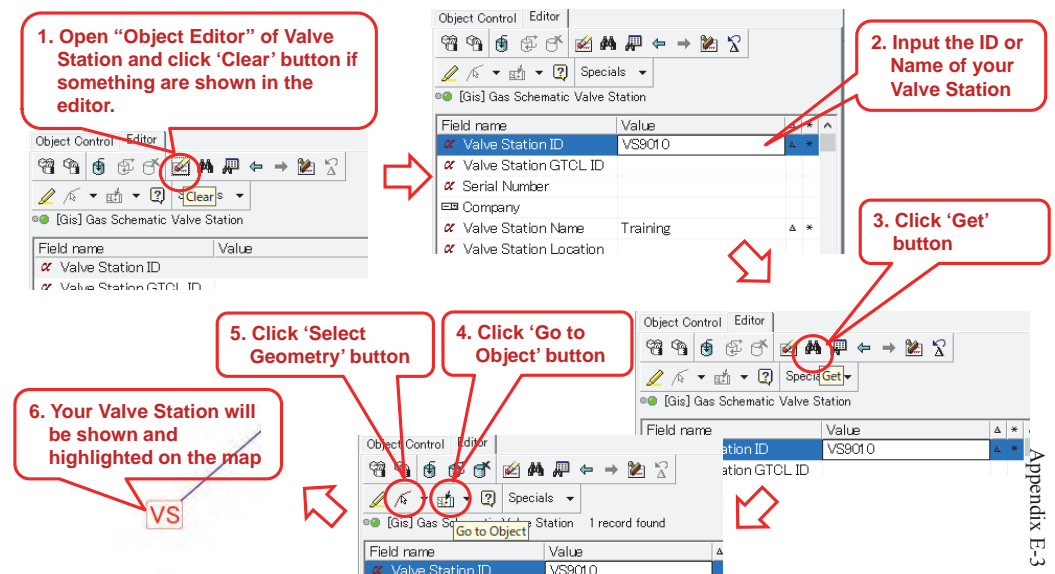
3. See the Result of Spatial Query



Finding Objects in a map by ID or name



If you miss your new Valve Station location, it can be searched through "Get" bottom.



Network Trace (1)



“Network trace” is a function that chases facilities connected each other. It is used to find optimum path at various network condition.

1. Choose Manifold ('Auto' is also ok.)
2. Click 'Shortest path'
3. Click 'Start node'
4. Point Start Object a Gas Field
5. Start node information is shown
6. Click 'End node'
7. Point End Object a Gas Meter
8. End node information is shown

Network Trace (2)



Run network trace, and the result is shown on the map.

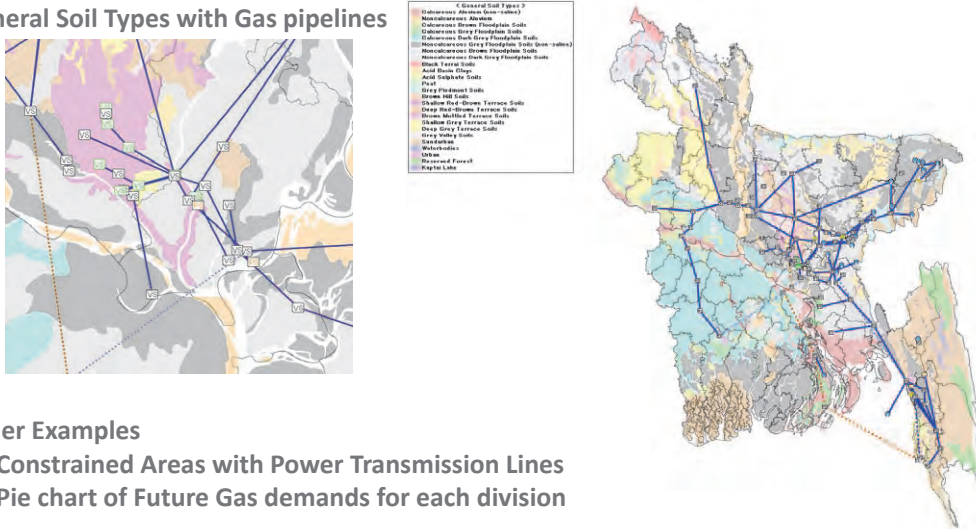
9. Run Trace
10. Show Traced Area
11. A route from the gas field to the meter is shown as a light blue line

Thematic Mapping



Switch to various thematic maps easily, and overlaid with various facilities. Utilization of various thematic maps enables efficient infrastructure network planning.

General Soil Types with Gas pipelines



Other Examples

- Constrained Areas with Power Transmission Lines
- Pie chart of Future Gas demands for each division

SOB Background Maps Status



Current status of SOB background maps on the demo system

Scale	1:250,000	1:50,000	1:25,000	1:5,000
Usage	Whole Map Summary	Mid-Range Map Big River and Broad Road	Detailed Map Land Mark Normal Road	Most Detailed All Road Each Buildings
Example			N/A	
Done / Total	26 / 27	68 / 267	0 / 988	8 / 124
Next Step	Import all area	Import facility existing area	Import urban area mainly	Import all Dhaka area

5. Result of Data Collection

5.1 Issues of Document Management

Limited drawings and documents appropriate for digitization

- Numbers of Missing Drawings needs to be identified or newly created
 - Documents were dispersed when organization is changed/merged/separated
 - Rely on the memory of persons. When he retires, it will be lost.
- **Process Flow Diagram with authorization necessary**
- **Centralized Drawing Data management System is necessary**
 - Electronic filing /document management system is recommended: (reference serial number, date, document type, department, responsible staff, ongoing/incoming, project name, etc.)
- **Effort for preparation of documents with pipe locator and GPS is necessary**

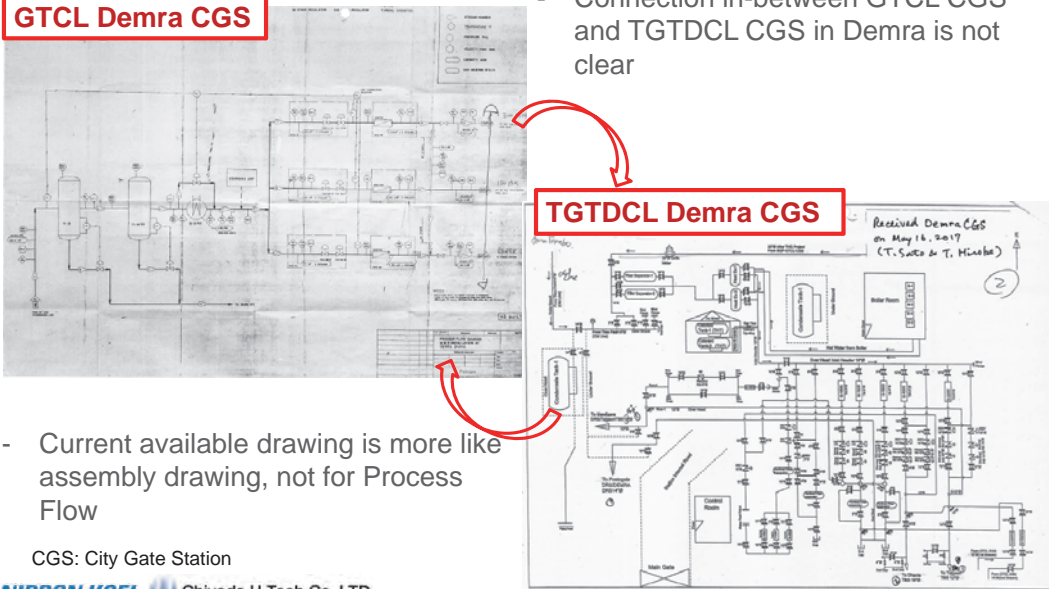


5.2 Difficulty in Tracking Gas Flow

GTCL Demra CGS

- Connection in-between GTCL CGS and TGTDCL CGS in Demra is not clear

TGTDCL Demra CGS



- Current available drawing is more like assembly drawing, not for Process Flow

CGS: City Gate Station

6. Design Standard

6.1 Inconsistency in Design Philosophy/Standard of pipeline



(1) Design Standard

- Unified Design Standard is necessary

Pipeline	Material	General Section		Road Crossing		Corrosion Allowance	Soil Cover Depth
		Class /Zone	Safety Factor	Class /Zone	Safety factor	mm	m
Bakhrabad-Siddhirgonji	API 5L X70	3	0.5	4	0.4	0	1.2
Dhonua-Elenga (D-N)	API 5L X60	2	0.6	Casing Pipe		1.5	1

(2) Spare Parts Management

- Unified Material Specification is required

- Need to Minimize Material Redundancy and optimize numbers of Spare Parts



6.2 Review of MAOP



(MAOP: Maximum Allowable Operating Pressure)

Bangladesh transmission pipeline applies lower MAOP.
1440 psig MAOP system should be applied from now on!

Typical MAOP vs. Bangladesh

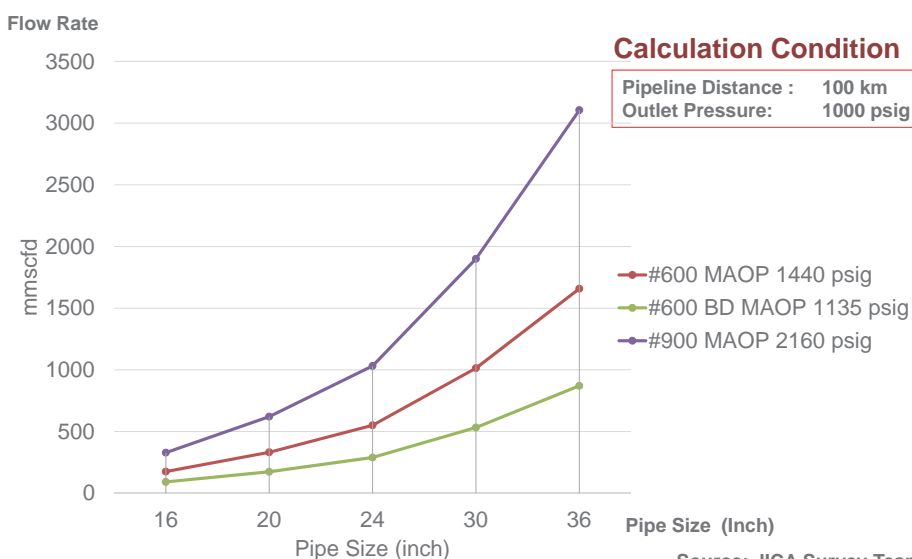
ASME Class	MAOP	Comment
400 #	960 psig	Not Normally Used now
600 #	1440 psig	Popular
	1135 psig	Bangladesh practice
	1000 psig	Bangladesh practice
	960 psig	Bangladesh practice
900#	2160 psig	Offshore/Long Distance Pipeline

Source: JICA Survey Team

6.3 Flow Capacity Comparison



MAOP: #600 Bangladesh/ #600 Standard/ #900 Standard



Source: JICA Survey Team

6.4 Danger of the Use of ERW Pipe



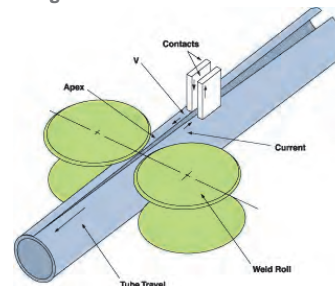
PEPCON plant in Henderson, Nevada, USA

May 4, 1988. Fire and massive explosions

16" Natural Gas Pipeline Rupture

- 40' Ruptured Section
- Electric Resistance Weld (ERW) showed stitching and lack of fusion

Manufacturing Process of Electric Resistance Weld (ERW)



6.5 Danger of the Use of ERW Pipe

Identified Location in Bangladesh

- Bibiyana Gas Field to to Aushkadi DRS (6”x 5 km at 1000 psig, Completed in 2012)
- Sreemongal TBS to Bhairabgonj Bazar DRS (6”x 2.5 km at 500 psig, Completed in 2016)
- Debpur to Kumargaon (8”x 10 km at 1000 psig, Completed in 2014)
- Patibag DRS to Jalalpur Valve Station (6” x 18 km at 500 psig, Completed in 2016), etc.

Careful Monitoring and Replacement Plan to be prepared

DRS: District Regulating Station, TBS: Town Bordering Station

7. Environment Scoping for Offshore Pipeline

7.1 Environmental and Social Consideration (ESC)

All Development/Renovation Project

Regulation, Policy & Plan

Bangladesh National/ Local

- Environment Conservation Act, 1995
- Environment Conservation Rules, 1997 etc.

International Donner (e.g. JICA)

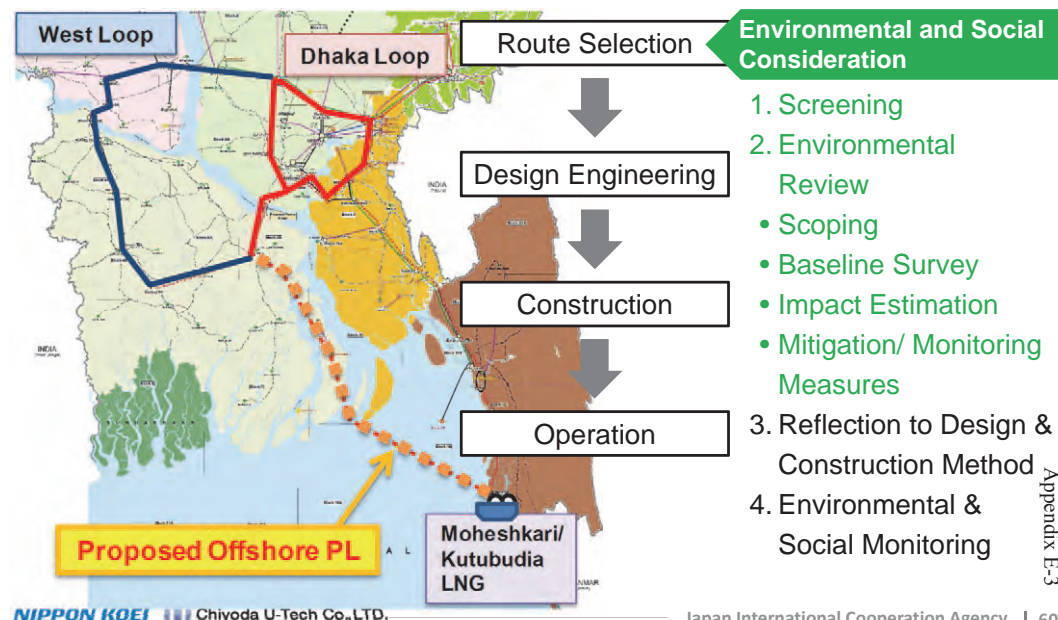
- JICA Guidelines for Environmental and Social Considerations, 2010 etc.

Environmental and Social Consideration

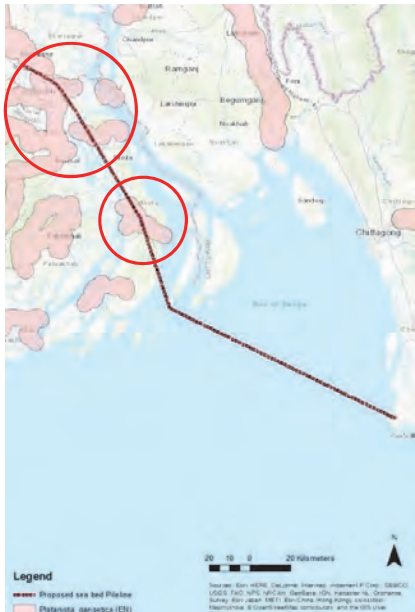
- ✓ Environmental Standards
- ✓ Protected Area, Environmental Zoning
- ✓ Existing Residential Area, Urban Area
- ✓ Communication with Stake Holders etc.

↓
Project Implementation

7.2 ESC Process on Project Stage



7.3-a Habitats of Wild Lives (Biota & Ecosystem)



http://www.panda.org/wh_at_we_do/endangered_species/cetaceans/about/river_dolphins/ganges_river_dolphin/

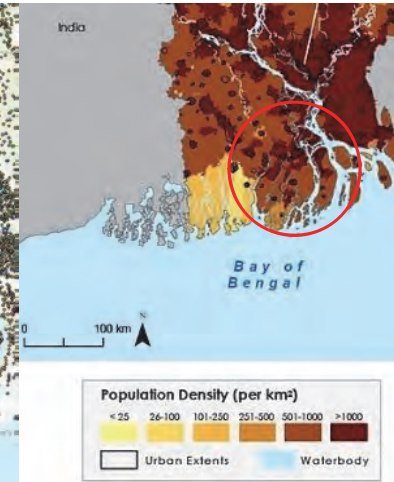
LEAST CONCERN	NEAR THREATENED	VULNERABLE	<ENDANGERED>	CRITICALLY ENDANGERED	EXTINCT IN THE WILD	EXTINCT
LC	NT	VU	EN	CR	EW	EX

Ganges River Dolphin (*Platanista gangetica*)
Endangered Category in IUCN Red List

Proposed Route of Sub-sea PL has a high possibility to give **Ecological Impacts**.

Consideration/ Impact Minimizing Measures are Necessary.

7.3-b Involuntary Resettlement



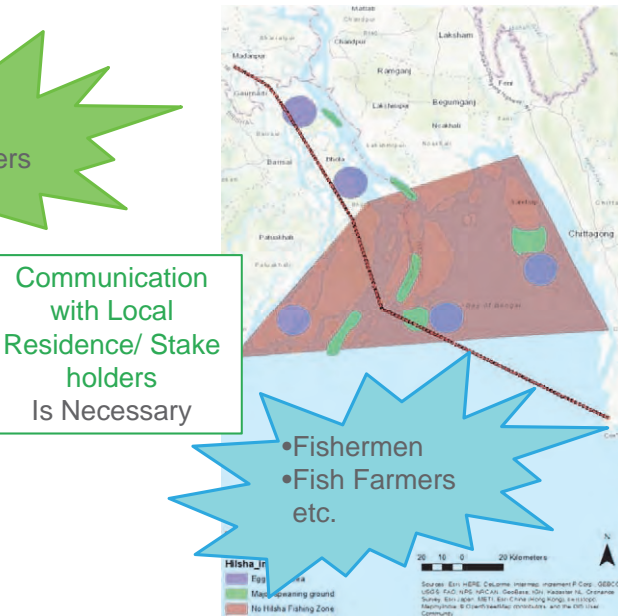
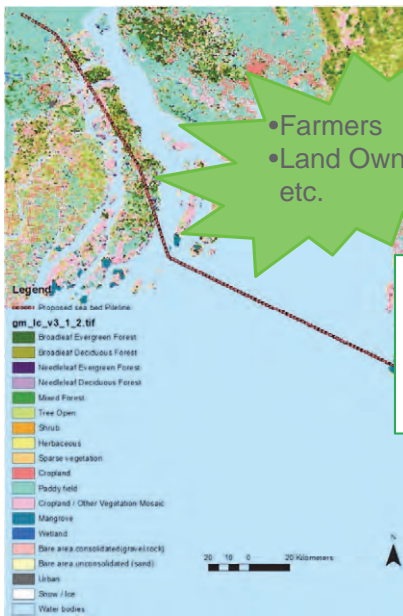
On Shore part of Sub-sea PL might crosses high population density areas.

High Possibility of Involuntary Resettlement

Avoidance/ Minimizing the Resettlement is Important.

Host countries MUST make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels.

7.3-c Land Use and Local Economics



Communication with Local Residence/ Stake holders Is Necessary

7.4 Suggestion from Draft Scoping



Measures to Minimize Environmental & Social Impacts based on the Scientific/Sociological

Survey on Route Selection

- ✓ Interview survey & Site survey to identify the habitat of important species
- ✓ Site survey & Satellite Image examination to identify the housing and facilities on the considerable ROW

Items need to be considered in Design Engineering

- ✓ Minimizing the Acoustic Impact on Underwater Wildlife, and the Destruction of Coastal Vegetation
- ✓ Early Discussion with Local Residence/Fisherman, and Reflecting the Results to the Design Engineering
- ✓ Simulation of the Worst Case and Estimation of the Impact

8. Schedule and Way Forward

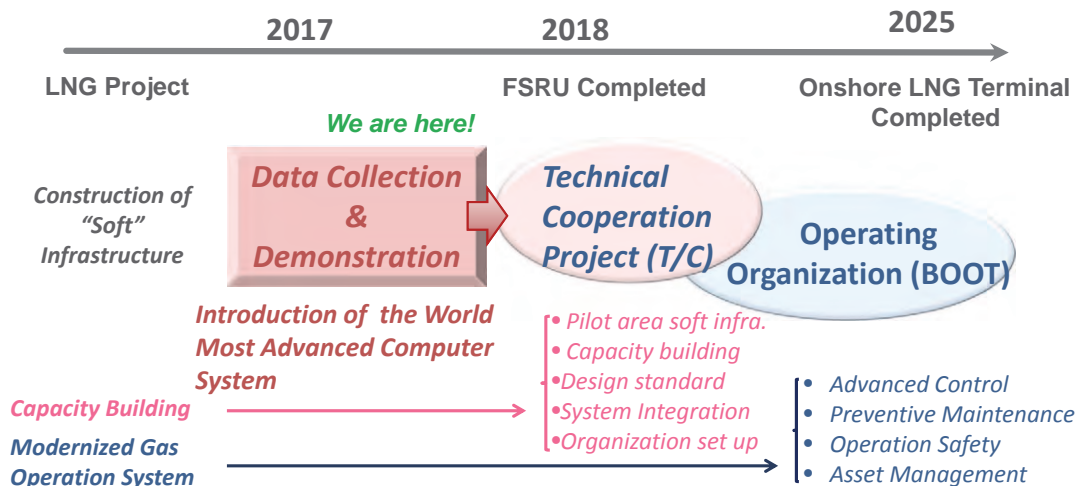
8.1 What we have done

Activities performed:

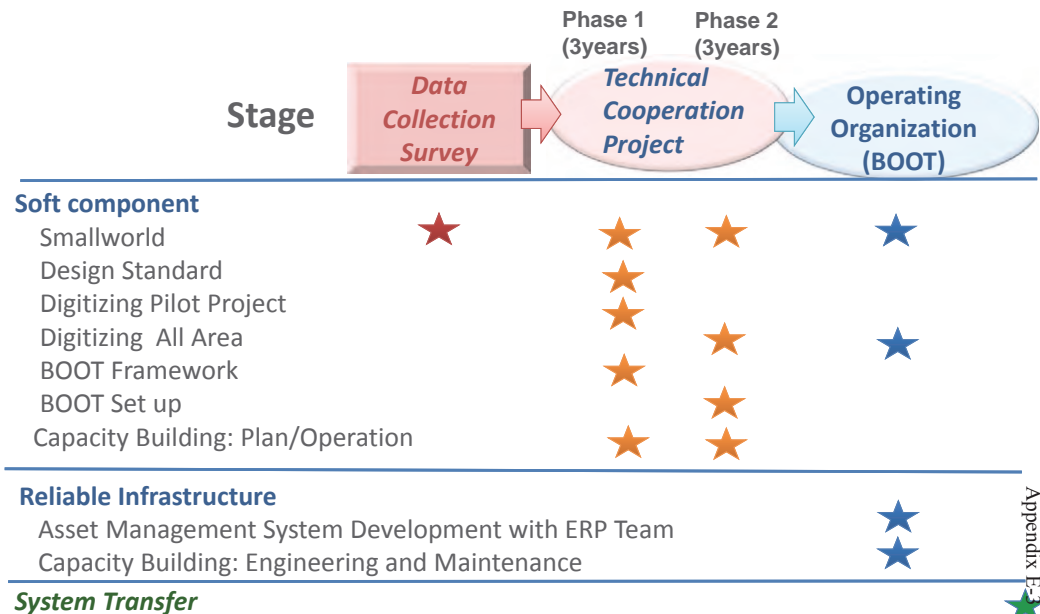
Period	Activity
Apr 2017	Kick-off with MoPEMP and Courtesy Call to H.E. State Minister
May-Oct 2017	Data/Drawing collection
May-Oct 2017	Soft infrastructure demonstration modeling
8-17 July 2017	1 st Study Tour to Japan
Aug 2017	Interim Seminar
Oct-Nov 2017	2 nd Study Tour in Japan and USA

8.2 Project Milestone

Construction of “Soft Infrastructure” and capacity building via., T/C and BOOT is proposed important to achieve efficient use of gas and modernize the gas operation and management system.



8.3 Road Map

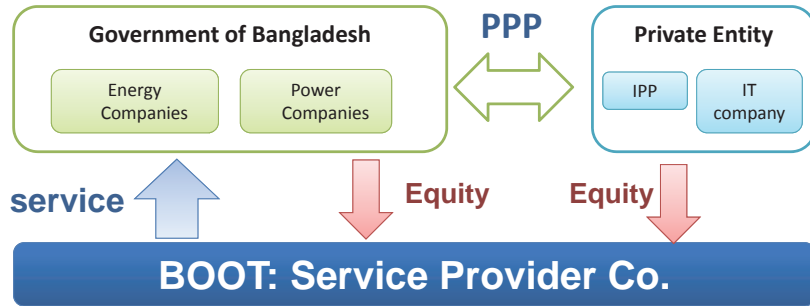


8.4 Sustainable Entity

For discussion



Public and Private Partnership after BOOT Approach



- **System Integration: Gas and Power**
- **System operation,**
 - Building and updating “Soft” Infrastructure (data model)
 - Monitoring of Mid-Long Term Trend Analysis, and detect Issues
 - Preparation of Emergency Plan (Power and Gas Outage)
 - Planning and Basic Engineering of Expansion/Upgrading Project

8.5 Provisional Technical Cooperation Project



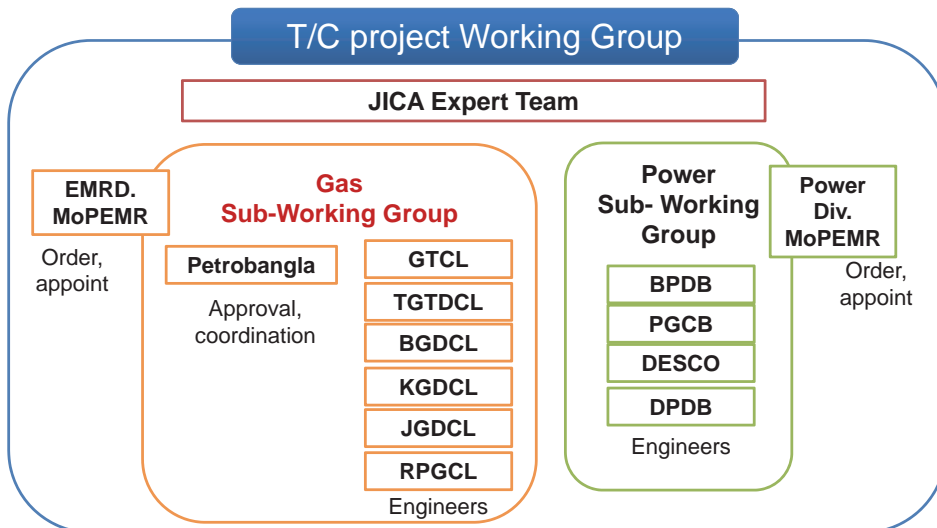
Proposed purpose and output of the Technical Cooperation Project

Item	Description
Overall Goal	Modernize the Gas and Power Operation System in a technically and financially sustainable manner so that Gas and Power Infrastructure is reliable to contribute to the economic growth of Bangladesh.
T/C Purpose	Develop human resources and implementing organization, and establish integrated and advanced gas and power asset management system.
Outputs	<ol style="list-style-type: none"> 1. Soft Infrastructure covering selected pilot area in Bangladesh to be constructed. Initial target pilot area will be GTCL Pipeline System, and TGTDC, BGDCL, KGDCL, JGTDC, RPDCL, PBCB, BPDB, DESCO, DPDC Franchise Areas 2. Capacity building on planning, design, maintenance, and operation safety is conducted and standard is prepared to achieve advanced control, asset management and operation safety in gas sector 3. Integrated operation system of gas and power sectors 4. Institutional structure for provisional organization of gas and power asset management to be founded

8.6 Proposed Working Group structure



Working group formation and appointment of full-time engineers from respective organization is necessary to implement T/C activity.



8.7 Next Step : Provisional Schedule



Schedule toward next Technical Cooperation project

Time	Item	Requested
Late Nov 2017	Draft Final Report	Comment on DFR
Nov to early Dec 2017	Equipment hand-over	-Singing hand-over certificate -Keeping equipment for next T/C
Jan 2018	Submission of Final Report	
Jan-Mar 2018	Preparation and coordination of T/C	
Apr-Aug 2018	Detailed Planning for T/C	
Sep 2018 -	Commencement of T/C*	

*Subject to R/D(Record of Discussion)

ধন্যবাদ
Thank you
ありがとうございました

***“Human will go away,
Database remains for ever!!”***

By Mr. Moniruzzaman, BPDB

