
How Ameren Plans and Executes Large Transmission Projects

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Ameren Transmission

Presentation Outline

- Ameren Overview
- Scoping and Initial Estimate
- Schedule and Budget Development
- Risk Identification
- Risk Mitigation
- Execution
- Issue Resolution

Ameren Overview

8,600
employees

6 million
population served in
Missouri and Illinois

2.4 million
electric customers

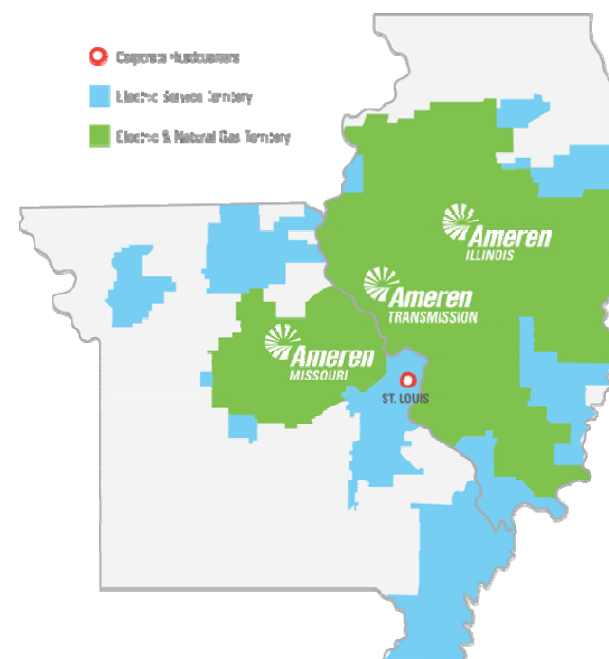
900,000 +
natural gas customers

64,000
square mile service territory

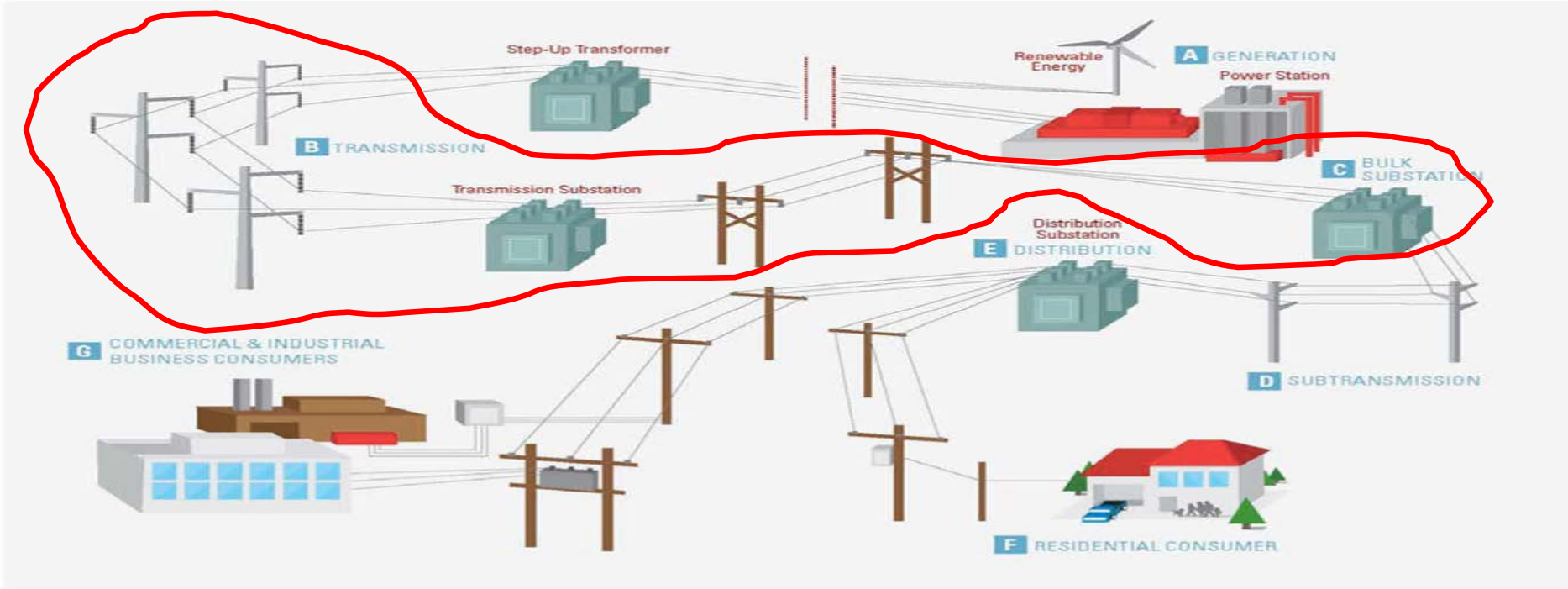
10,300 MW
electric generation

7,900
circuit miles of electric
transmission lines

\$11 billion*
2018-2022 planned
capital expenditures



What is Transmission?



Transmission Lines



Transmission Substations





Scoping and Initial Estimate



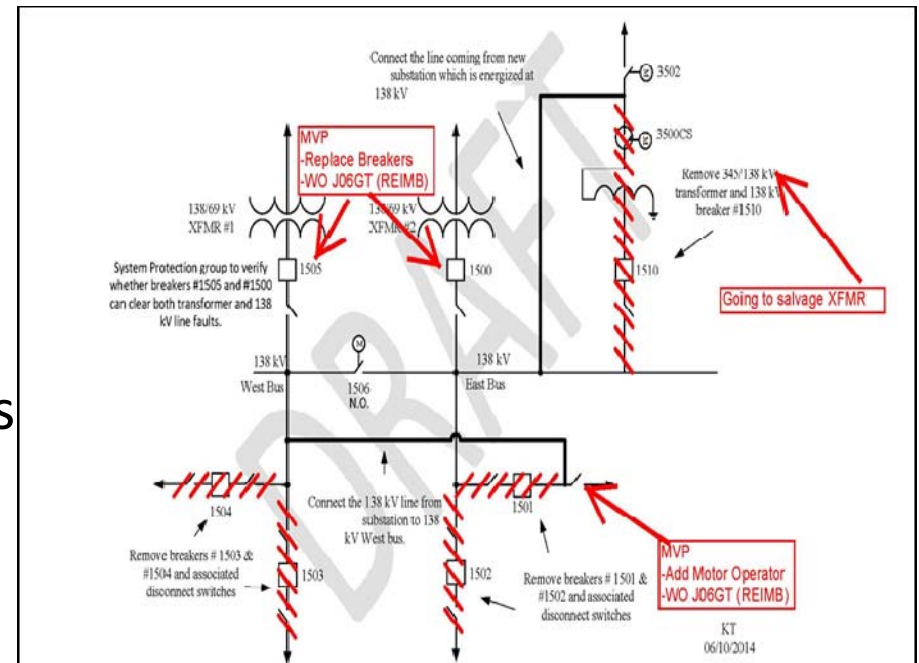
Project Types

- Compliance Driven
- Aging Infrastructure
- Condition Based
- Increase Reliability



Scope Development

- Identify major scope elements
- Collaborative process
- Requires input from key stakeholders



Scope Takeoff

Description	Qty.	UOM
Battery, 125 V, 300- 320 AmpHr, w/Rack, Indoor	1	EA
Battery Charger, 125 V, 40 A	1	EA
Cable Tray, Indoor/Outdoor, Any Size	75	FT
Circuit Breaker, Dead Tank, 138 kV, 1200/2000/3000 A, 40 kA, SF6	3	EA
Circuit Breaker, Accessories, 138kV, 161kV, 230kV, CT-3000/5 C800, 40-63 kA, Thermal Factor=2	12	SET
Circuit Breaker, Accessories, 138kV, 161kV, Tank Heaters	3	EA
Circuit Breaker, Accessories, 138kV, 161kV, 230kV, Local Remote Switch	3	EA
Circuit Breaker, Accessories, 138kV, 230kV, Remove gas from 40kA breaker shipment	3	EA
Conductor, Stranded, Al, 1590 AAC/SAC, 1 Phase	2200	FT
Conductor, Tube, Al, 5", Schedule 40, 1 Phase	1040	FT

Estimate Development

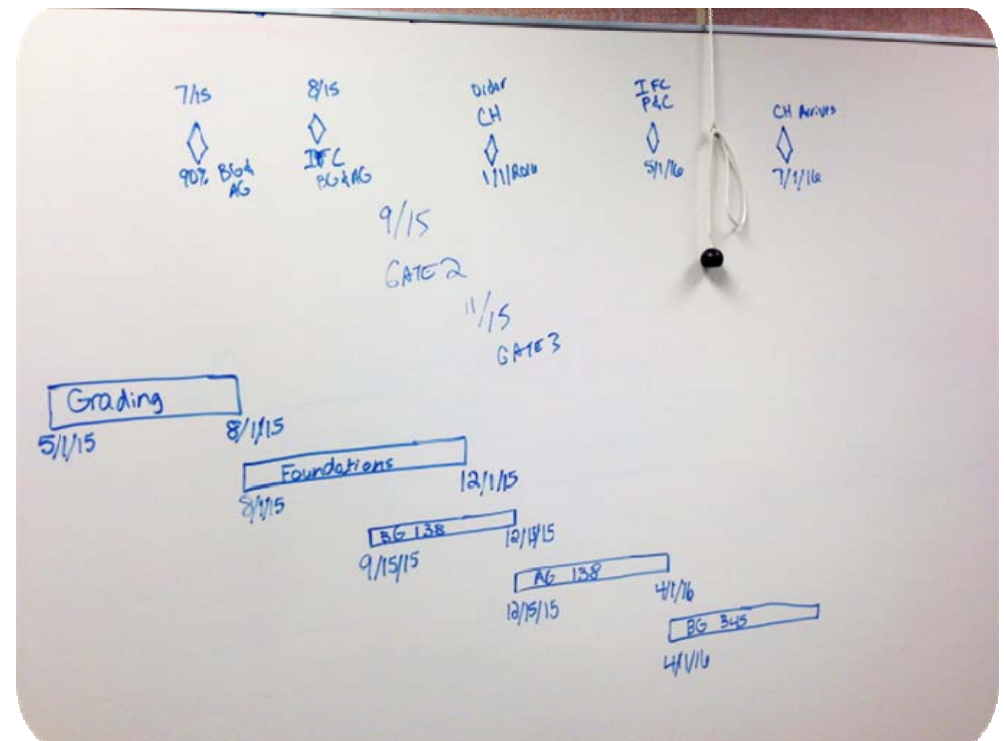
Estimate Attributes			
Station Area (sf)	116,332	Interrupting Ka	40kA
Soil Condition	Average	Avg. Dist. from Control Bldg. (ft)	180
Labor And Material Summary			
Labor Types	Hours	Unit Cost	Amount
Engineering	1,400		\$ 96,166
Civil Engineer	300	\$ 69	\$ 20,607
Station Design Engineer	800	\$ 69	\$ 54,952
System Protection Engineer	300	\$ 69	\$ 20,607
Drafting	1,800		\$ 91,782
Electrical Drafting	1,200	\$ 51	\$ 61,188
Physical Drafting	600	\$ 51	\$ 30,594
Oversight	2,000		\$ 156,760
Construction Supervisor	600	\$ 79	\$ 47,634
Project Manager	1,000	\$ 81	\$ 80,650
Project Scheduling and Controls	400	\$ 71	\$ 28,476
Construction	8,760		\$ 1,138,785
Construction Labor	7,095	\$ 130	\$ 922,335
Relay Test	1,665	\$ 130	\$ 216,450
Support	160		\$ 13,205
Environmental Support	160	\$ 83	\$ 13,205
Labor Total	14,120		\$ 1,496,698

Schedule and Budget Development



Whiteboard Schedules

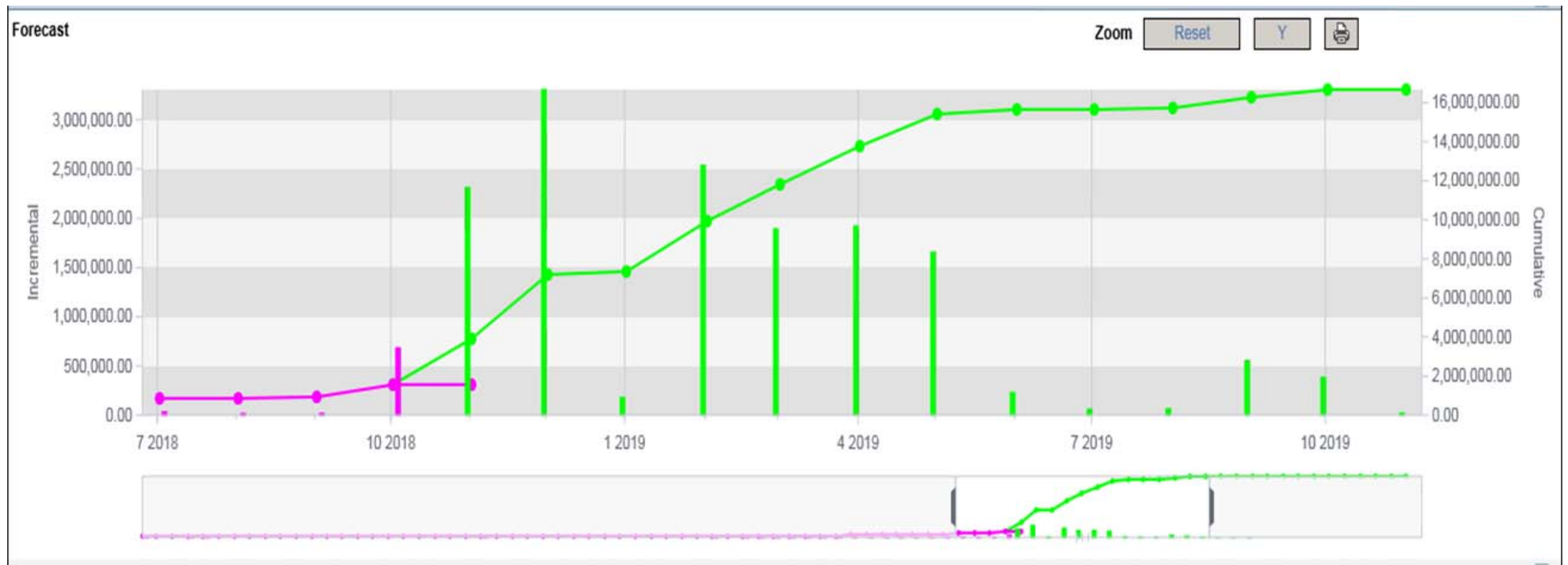
- ❑ Develop the initial Level 1 schedule
- ❑ Have all key project stakeholders attend to provide input
- ❑ Define all key project deliverables and due dates
- ❑ Obtain “buyoff” from key stakeholders
- ❑ Establish a framework for how key deliverables and dates are changed



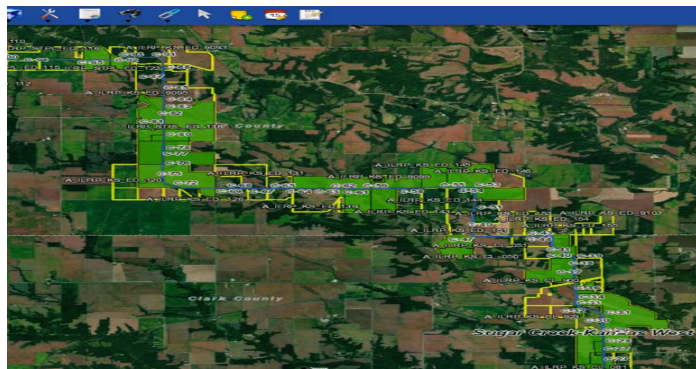
Initial Schedule

Activity ID	Activity Name	Start	Finish	Remaining Duration	Total Float	2013												2014											
						Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec					
Right of Way Width Calcs		26-Jun-14 A	26-Jun-14 A	0																									
TBD1.AC-RE-0870	PE Incorporate Comments & Issue Final Right of Way Width Calcs	26-Jun-14 A	26-Jun-14 A	0																									
TBD1.AC-RE-0860	Ameren/URS Review Right of Way Width Calcs	26-Jun-14 A	26-Jun-14 A	0																									
TBD1.AC-RE-0859	PE IFR for Ameren/URS Review	26-Jun-14 A	26-Jun-14 A	0																									
TBD1.AC-RE-0850	PE Prepare Right of Way Width Calcs	26-Jun-14 A	26-Jun-14 A	0																									
TBD1.AC-RE-0855	PE IHR Right of Way Width Calcs	26-Jun-14 A	26-Jun-14 A	0																									
Drawings		18-Aug-14	29-Aug-14	10	461																								
Easement Requirement Drawings		18-Aug-14	29-Aug-14	10	461																								
TBD1.AC-RE-0890	SAM Inc. - Prepare and Issue Final Easement Requirement Drawings	18-Aug-14	29-Aug-14	10	461																								
Survey Package		20-Jun-14 A	24-Nov-15	60	136																								
TBD1.AC-SUR-1070	Ameren Approved Route	26-Jun-14 A	26-Jun-14 A	0																									
TBD1.AC-SUR-1170	PE Prepare Preliminary Structure Staking Information	02-Sep-15	04-Sep-15	3	193																								
TBD1.AC-SUR-1175	Preliminary Structure Staking Complete	02-Sep-15	04-Sep-15	0	193																								
TBD1.AC-SUR-1180	PE Prepare Construction Staking Information	20-Oct-15	02-Nov-15	10	136																								
TBD1.AC-SUR-1200	Construction Structure Staking Complete	24-Nov-15	24-Nov-15	0	136																								
Engineering Design		19-Jan-15	23-Feb-15		810																								
Estimating Package		19-Jan-15	02-Mar-15	31	188																								
Calculations & Design Criteria		19-Jan-15	02-Mar-15	31	188																								
Line Construction Design Criteria		19-Jan-15	02-Mar-15	31	188																								
TBD1.AC-EN-1220	PE Prepare Line Construction Design Criteria	19-Jan-15*	30-Jan-15	10	0																								
TBD1.AC-EN-1221	PE IHR Line Construction Design Criteria	26-Jan-15	30-Jan-15	5	4																								
TBD1.AC-EN-1225	PE Issue for Ameren/URS Review - Line Construction Design Criteria	02-Feb-15	02-Feb-15	1	4																								
TBD1.AC-EN-1230	Ameren/URS Review Line Construction Design Criteria	03-Feb-15	16-Feb-15	10	188																								
TBD1.AC-EN-1240	PE Incorporate Comments & Issue Final Line Construction Design Crit	17-Feb-15	02-Mar-15	10	188																								
Shield Wire Selection Study		26-Jan-15	30-Jan-15	5	72																								
TBD1.AC-EN-1700	Ameren Prepare & Issue Shield Wire Selection Study	26-Jan-15	30-Jan-15	5	72																								
Conductor Selection/Validation		26-Jan-15	30-Jan-15	5	72																								
TBD1.AC-EN-1730	Ameren Prepare & Issue Conductor Selection/Validation Study	26-Jan-15	30-Jan-15	5	72																								
Clearing Package		03-Feb-15	02-Nov-15	195	154																								
Drawings		03-Feb-15	02-Nov-15	195	154																								
Clearing Drawings		03-Feb-15	02-Nov-15	195	154																								
TBD1.AC-EN-2170	PE Prepare & Issue 80% Package for Estimating - Clearing Drawings	03-Feb-15	06-Jul-15	110	154																								
TBD1.AC-EN-2200	PE Update & IHR 90% Package for IFB - Clearing Drawings	07-Jul-15	04-Sep-15	44	154																								
TBD1.AC-EN-2210	PE Issue 90% Package for Ameren/URS Review - Clearing Drawings	07-Sep-15	07-Sep-15	1	154																								
TBD1.AC-EN-2220	Ameren / URS 90% Package Review for IFB - Clearing Drawings	08-Sep-15	21-Sep-15	10	154																								
TBD1.AC-EN-2240	PE Update and Issue Clearing IFC Package	22-Sep-15	02-Nov-15	30	154																								
Foundation Package		07-Jul-15	04-Dec-17	630	0																								
Final Construction Staking Complete for Order Location		07-Jul-15	07-Jul-15	0	460																								

Budget Development




Risk



Risk Register Development

- Permits
- Property/Easements
- Material availability
- Outages
- Aging Infrastructure
- Estimate Variation
- Safety
- Quality

Count of Risk by Status



Original Contingency	Current Contingency Ask (Not including Short Term Hold)	Contingency Held In Short Term Hold	Total Contingency Spent to Date	Total Contingency Surrendered to Date	Overall Project Status
\$0.00	\$684,716.87	\$0.00	\$0.00	\$0.00	2.51

Item Name	Risk	Risk Status	Potential Impact (Cause and Effect)	Risk Response Strategy	Risk Triggers	Trigger Response Strategies	Contingency Ask	Risk Categories	Owner	Risk Start Date	Risk End Date	Risk Score					Trend
												Rate	Current	Techn. P & E	Schedule	Safety	
12465 - Engineering/Design - Higher than expected costs as a result of lack of design scope definition.	Draft	Issues that occur as a result of detailed design analysis might result in costs that were not identified during the estimating process (for example - remediation of unstable soils)	Early and definitive completion of design drawings.	Engineering reports previously unidentified issues with design that were not included in the initial estimate or specifications	Discuss options with the team that will minimize impact to the project	\$70,000.00	Transmission Categories -> Construction	Eddings, Greg	9/2/18	12/31/18	1	0	0	1	0	1	↑
12463 - Disputes with customer over scope of work, maintenance of site, payment or other issues	Draft	Facilities to be built for are for interconnect with PPI, with land to be purchased by PPI and sold to Ameren, with adjacent PPI equipment. Any change in design, scope or cost on the part of PPI or Ameren could lead to dispute on cost.	Review and procure signoff from PPI on detailed scope cost when available Establish communications early with PPI to facilitate discussion on any price impacts	Determine point person at PPI with authority to sign off on changes Ensure Customer payments are received on time per the Construction Agreement	If customer fails to pay on time, request security for further work per Article 4.2 of the contract	\$50,000.00	Transmission Categories -> Construction	Manull, Bailey	9/2/18	12/31/18	1	2	1	0	1	→	

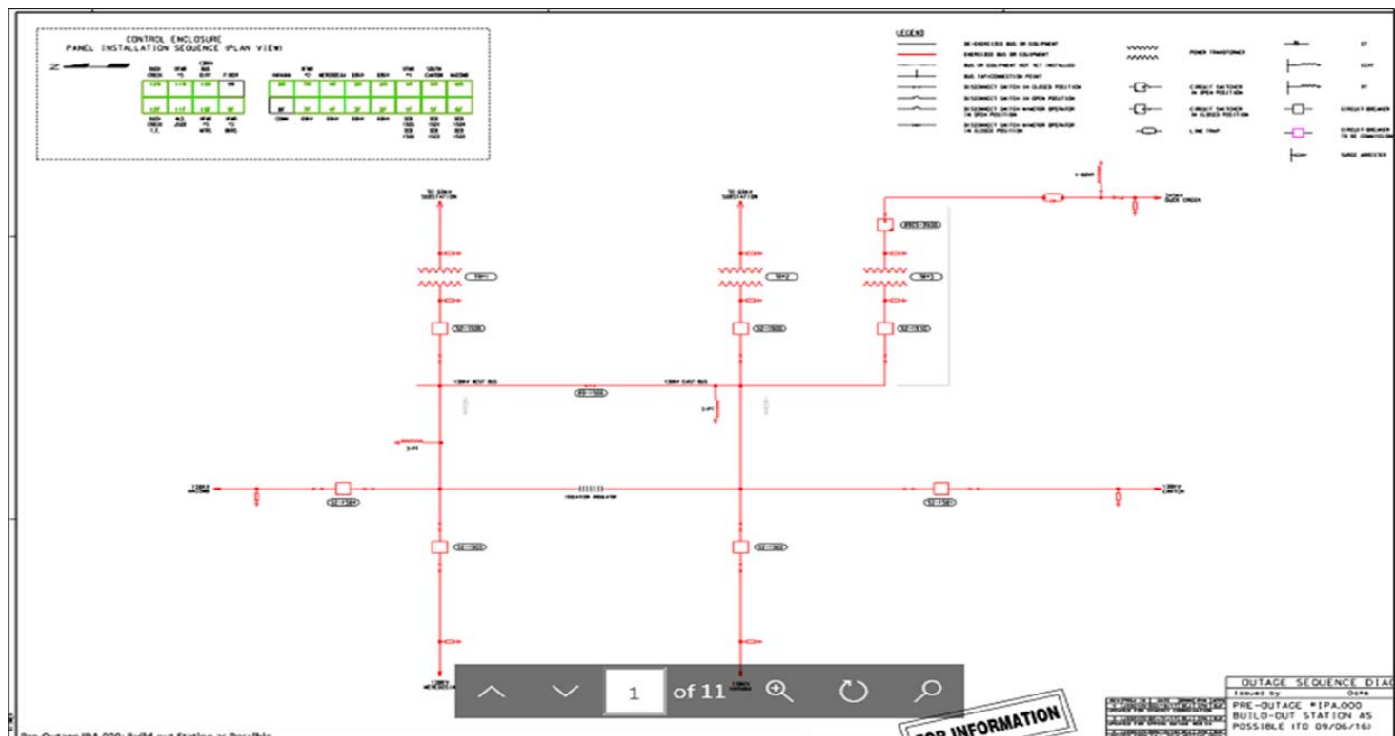
Risk Mitigation Strategies

- ❑ Stakeholder Engagement
- ❑ Early Material Order/Delivery
- ❑ Design / Constructability Reviews
- ❑ Vendor Surveillance

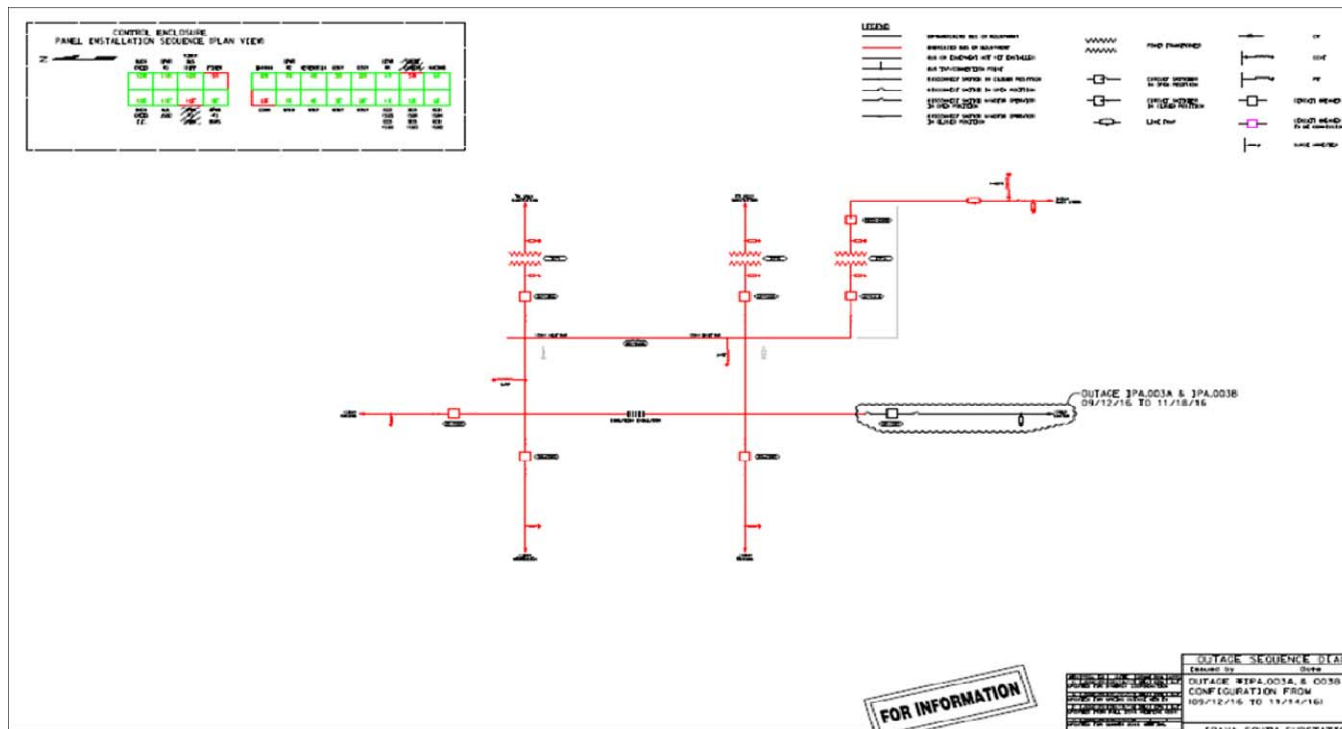


ACCESS ROADS												
Access Road Number	Priority	Access Road Name	Access adequate or planned for construction?	Relating Access Adequate for DRB Pkg?	Access Road Name	Location Area, Dist. of, or Section	Is road Obstructed?	Is there a Reviewer?	Challenge Using Section 408	Exchange District Name	Are there any impediments?	Is the Road Paved?
Access Road		IMP-001-001-01										
C-1		IMP-001-001-01	ADEQUATE	Y	IMP-1-01	Y	Y	Y	N/A	N/A	N/A	Y
C-2		IMP-001-001-01	ADEQUATE	Y	IMP-1-02	Y	Y	Y	N/A	N/A	N/A	N/A
C-3		IMP-001-001-01	ADEQUATE	Y	IMP-1-03	Y	Y	Y	N/A	N/A	N/A	N/A
C-4		IMP-001-001-01	ADEQUATE	Y	IMP-1-04	Y	Y	Y	N/A	N/A	N/A	N/A
C-5		IMP-001-001-01	ADEQUATE	Y	IMP-1-05	Y	Y	Y	N/A	N/A	N/A	N/A
C-6		IMP-001-001-01	ADEQUATE	Y	IMP-1-06	Y	Y	Y	N/A	N/A	N/A	N/A
C-7		IMP-001-001-01	ADEQUATE	Y	IMP-1-07	Y	Y	Y	N/A	N/A	N/A	N/A
C-8		IMP-001-001-01	ADEQUATE	Y	IMP-1-08	Y	Y	Y	N/A	N/A	N/A	N/A
C-9		IMP-001-001-01	ADEQUATE	Y	IMP-1-09	Y	Y	Y	N/A	N/A	N/A	N/A
C-10		IMP-001-001-01	ADEQUATE	Y	IMP-1-10	Y	Y	Y	N/A	N/A	N/A	N/A
C-11	IMP	IMP-001-001-01	Y	Y	IMP-1-11	Y	Y	Y	N	N/A	N/A	Y
C-12	IMP	IMP-001-001-01	Y	Y	IMP-1-12	Y	Y	Y	N	N/A	N/A	Y
C-13	IMP	IMP-001-001-01	Y	Y	IMP-1-13	Y	Y	Y	N	N/A	N/A	Y
C-14	IMP	IMP-001-001-01	Y	Y	IMP-1-14	Y	Y	Y	N	IMP-1-14	Y	N/A
C-15	IMP	IMP-001-001-01	Y	Y	IMP-1-15	Y	Y	Y	Y	IMP-1-15	Y	N/A
C-16	IMP	IMP-001-001-01	Y	Y	IMP-1-16	Y	Y	Y	Y	IMP-1-16	Y	N/A

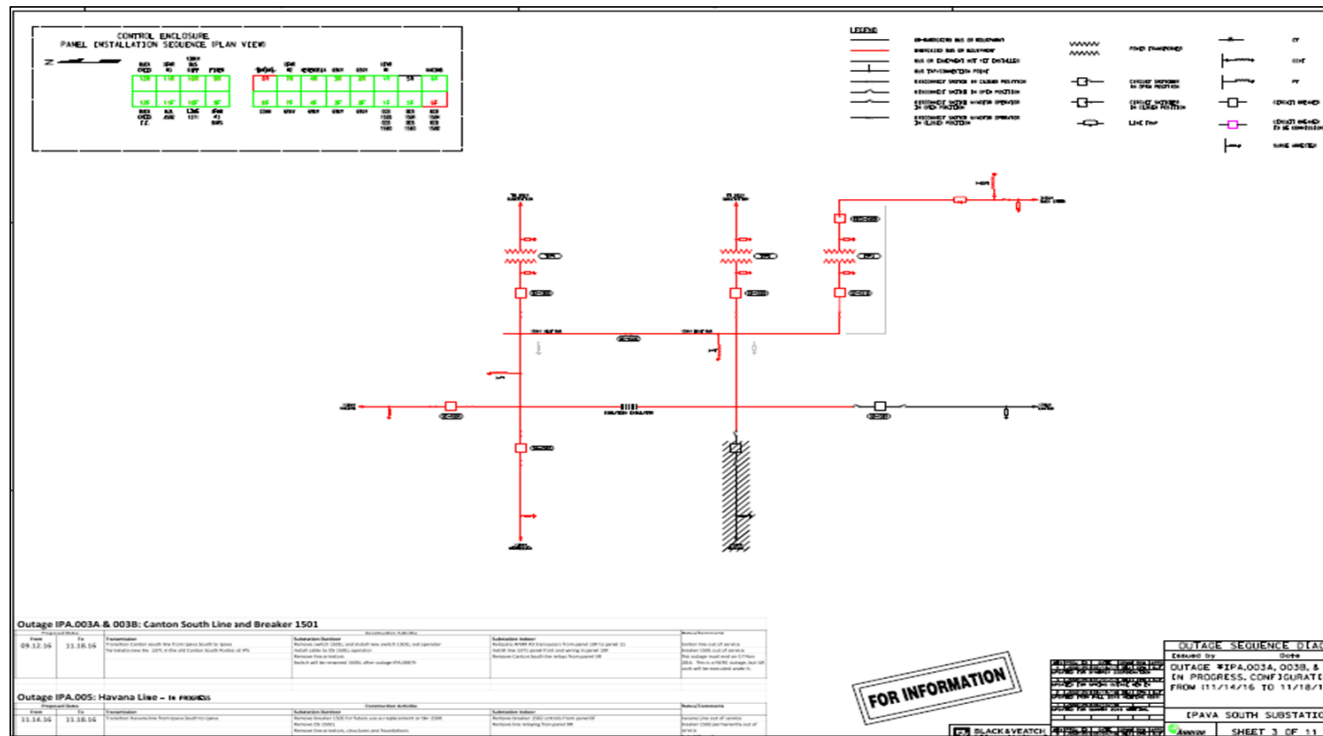
Risk Mitigation Strategies Outage Management



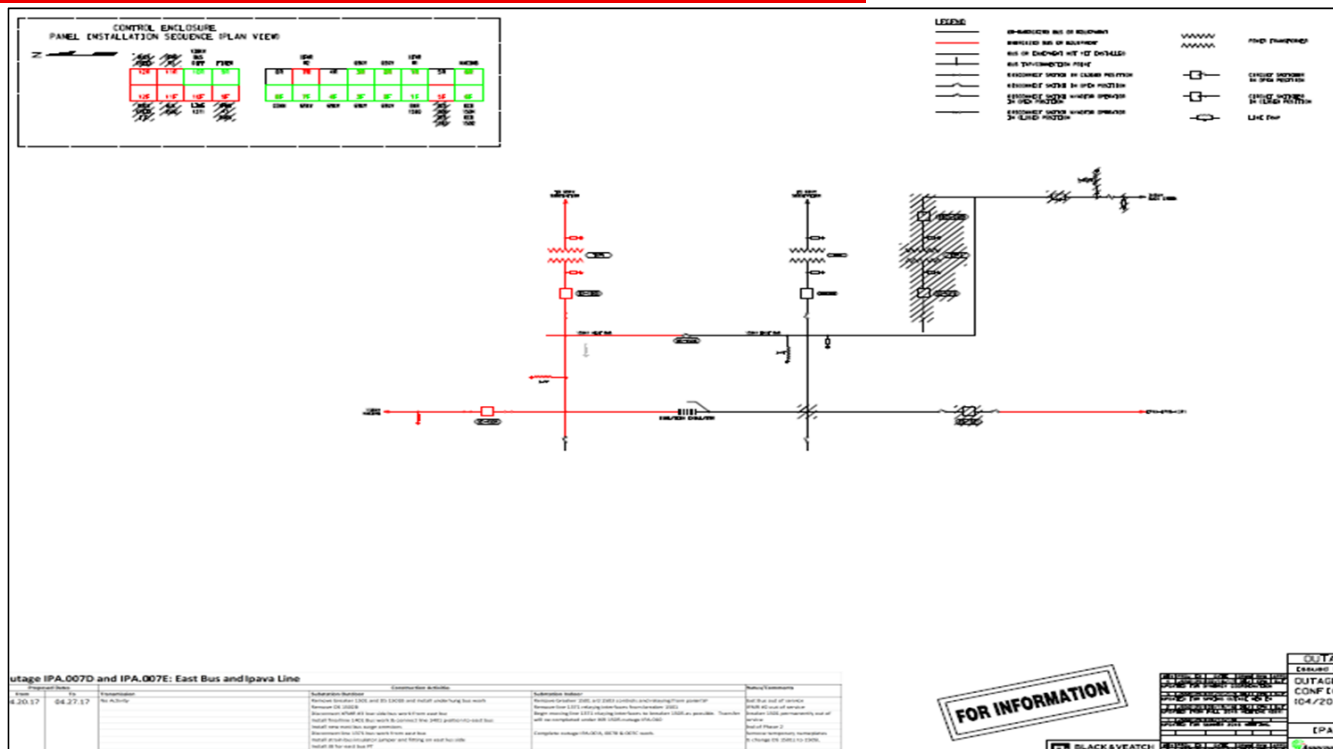
Risk Mitigation Strategies Outage Management (Cont.)



Risk Mitigation Strategies Outage Management (Cont.)



Risk Mitigation Strategies Outage Management (Cont.)



Contracting Strategies

- Time and Expense
- Fixed Units
- Fixed Price

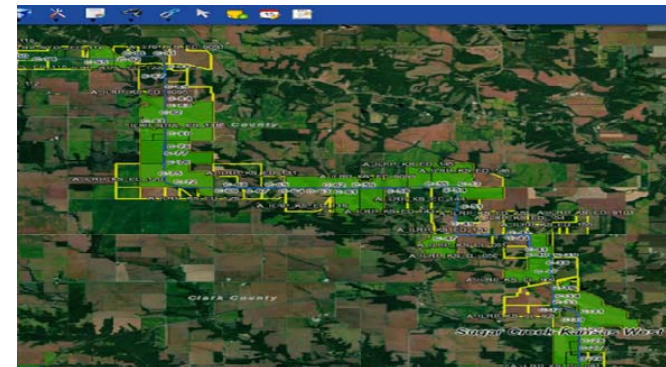


Project Execution



Pre-Construction Planning

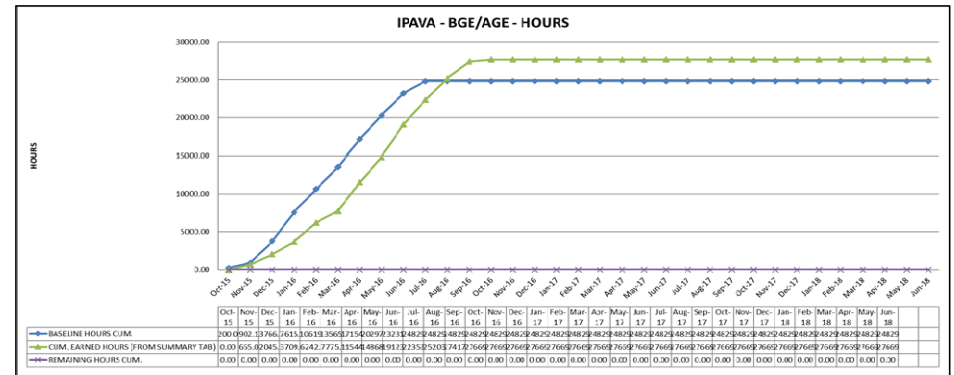
- Detailed Schedule Development
- Baseline Establishment
- Material Receipt and Inventory
- Quality / Safety Plans
- Pre-Construction Walkdowns



Performance Tracking

- Progress Reporting
- Earned Value Management
- Progress Payments
- Requests for Information
- Change Management
- Vendor Evaluations

Activity ID	Description	Start Date	End Date	Planned Hours	% Complete	Status
JI000-DC24-1080	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 241	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1081	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 242	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1082	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 243	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1083	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 244	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1084	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 245	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1085	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 246	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1086	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 247	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1087	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 248	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1088	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 249	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1089	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 250	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1090	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 251	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1091	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 252	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1092	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 253	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1093	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 254	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1094	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 255	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1095	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 256	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1096	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 257	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1097	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 258	10-Sep-16	30-Sep-16	4,000	100%	Completed
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JI000-DC24-1099	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 260	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1100	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 261	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1101	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 262	10-Sep-16	30-Sep-16	4,000	100%	Completed
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JI000-DC24-1111	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 272	10-Sep-16	30-Sep-16	4,000	100%	Completed
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JI000-DC24-1113	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 274	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1114	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 275	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1115	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 276	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1116	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 277	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1117	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 278	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1118	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 279	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1119	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 280	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1120	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 281	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1121	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 282	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1122	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 283	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1123	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 284	10-Sep-16	30-Sep-16	4,000	100%	Completed
JI000-DC24-1124	Early Paving & Laydown Site Work LP Deep ADDTD Pcs. 285	10-Sep-16	30-Sep-16	4,000	100%	Completed



Issue Resolution





Issue Resolution Examples



Questions

