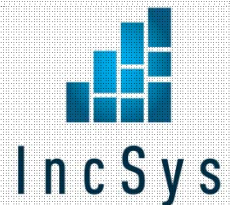


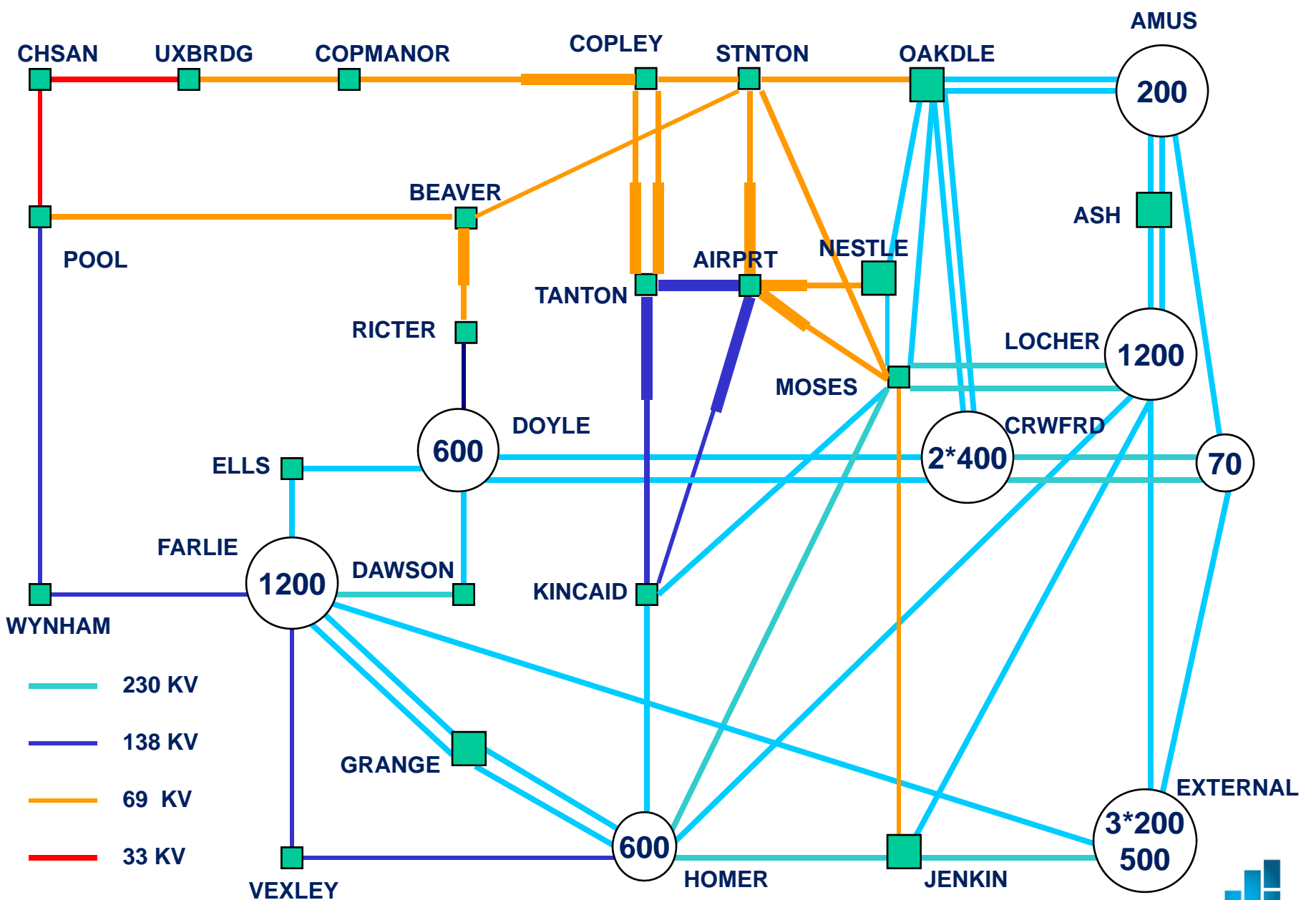
NERC Training Voltage Control Scenario

EMS User Group Meeting
September 21, 2010
Chicago, IL

Presented By

Robin Podmore
IncSys, Issaquah, WA





IncSys

Scenario:

Severe Weather permanently damages Oakdale to
Crawford 1 & 2 230 kV lines

Baker to Amus 230 kV line is overloaded

Baker to Amus line trips

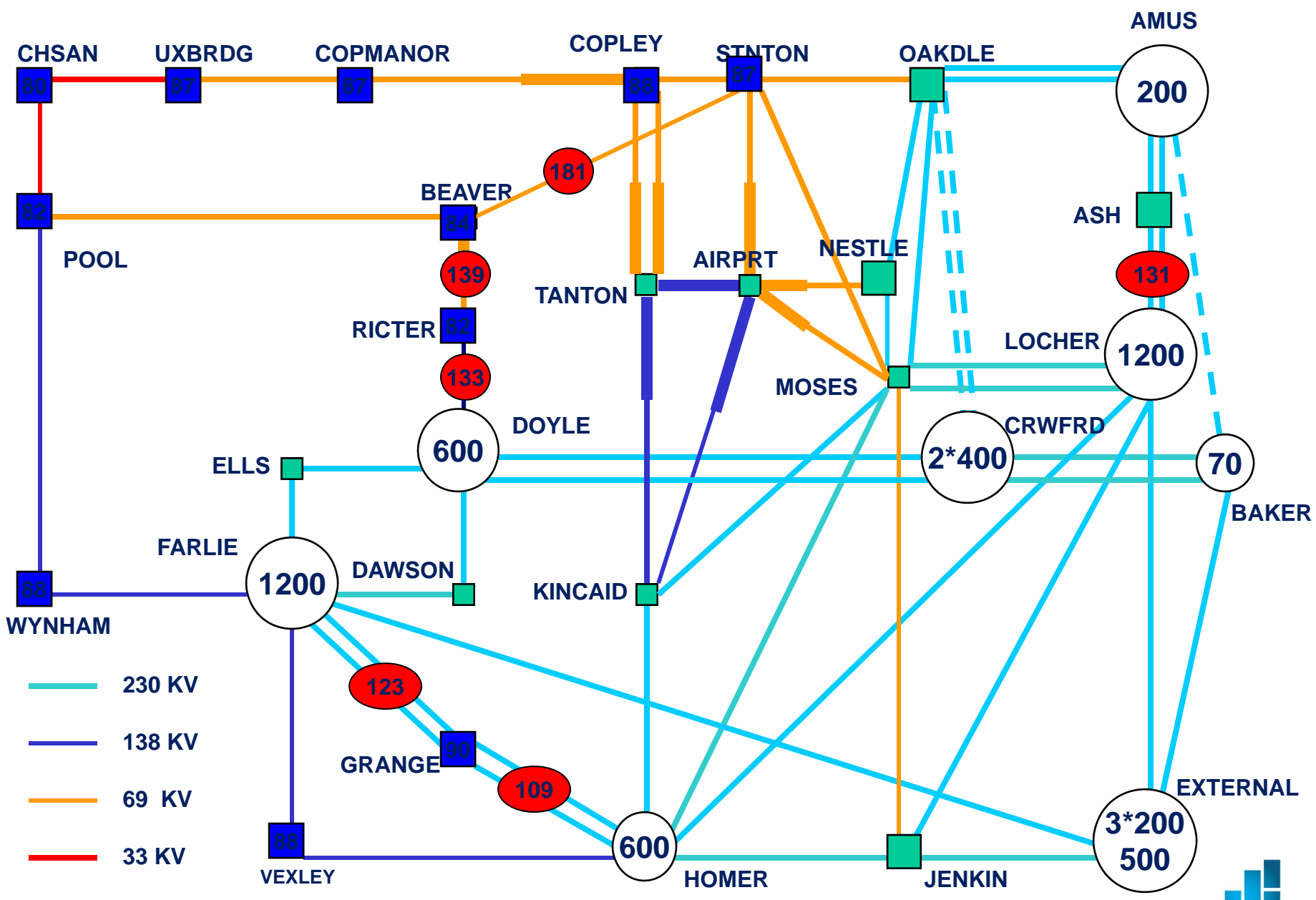
Assignment

All NERC Operating Standards and Procedures are applicable

Restore system to prevent voltage collapse and cascading outages

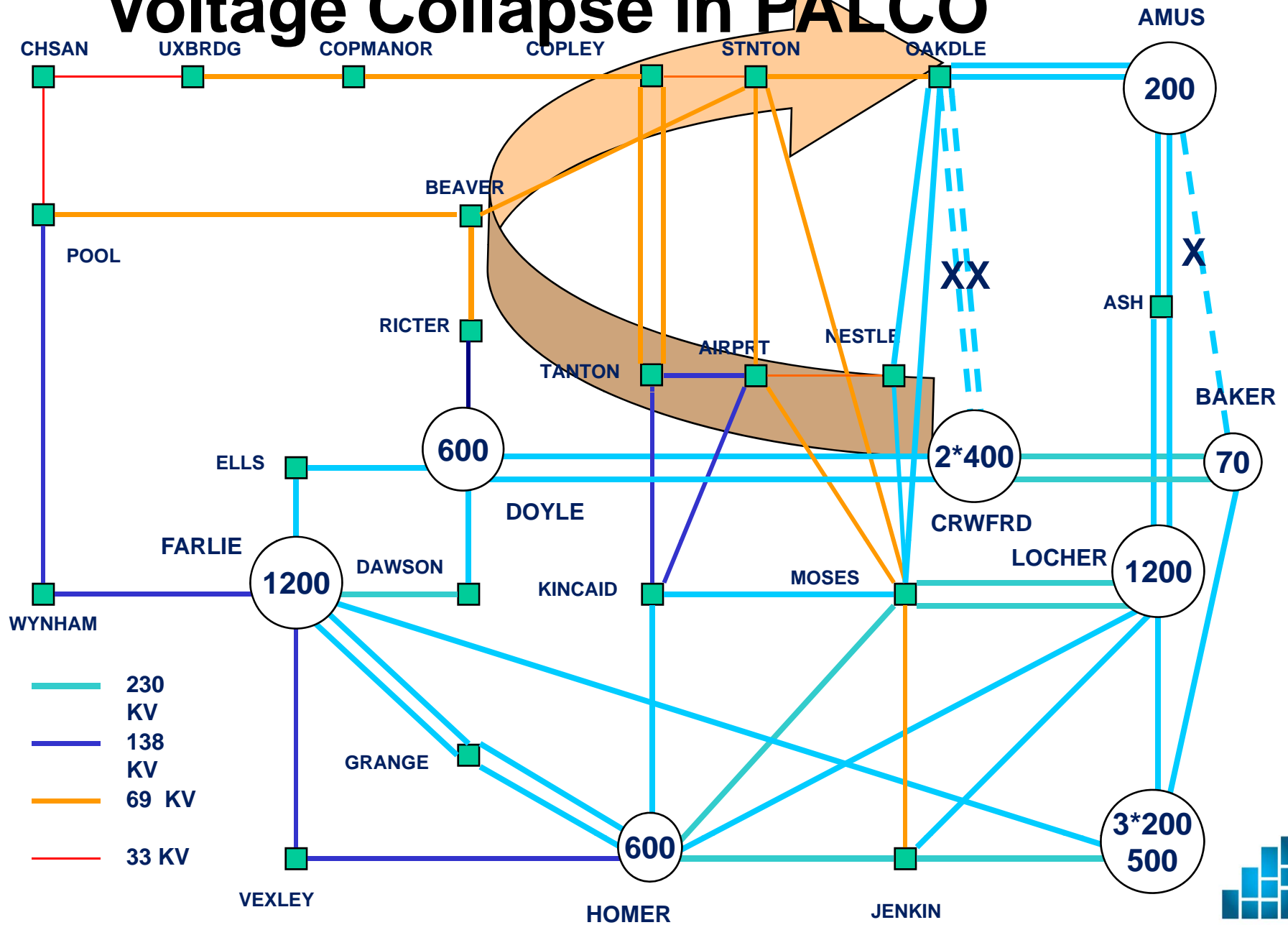
Return bus voltages to normal

Return line loadings to within STE limits ASAP



IncSys

Voltage Collapse in PALCO



Cues

Lines are heavily overloaded

Extreme low voltages at Rictar and Cheshan

Critical Q for Rictar < 20 MVAR

Tap regulation at Rictar causes voltage collapse

Status of capacitor banks

MW outputs of units

MVAR reserves of units

Generator Controls

Generator MVAR Controls										Generator MW Controls							
Resource count:		12		Station:						Resource count:		12		Station:			
Generator	AVR Mode	Actual MVAR	Max MVAR	Actual KV	Sched KV					Generator	Mode	Elec MW	OpMax MW				
EXTRNL 1	AUTO	154.3	231.8	230.0	230.0					EXTRNL 1	LFC-...	29.1	200.0				
EXTRNL 2	AUTO	84.2	231.8	230.0	230.0					EXTRNL 2	LFC-...	29.1	200.0				
EXTRNL 3	AUTO	100.4	231.8	230.0	230.0					EXTRNL 3	LFC-...	29.1	200.0				
EXTRNL 4	AUTO	144.8	183.5	235.0	235.0					EXTRNL 4	LFC-...	266.0	500.0				
BAKER	AUTO	0.0	0.0	0.0	24.0					BAKER	OFF	0.0	73.0				
CRWFRD 1	AUTO	86.6	151.0	24.0	24.0					CRWFRD 1	AGC-...	397.3	400.0				
CRWFRD 2	AUTO	86.4	151.1	24.0	24.0					CRWFRD 2	AGC-...	397.1	400.0				
LOCHER	AUTO	250.2	508.3	24.0	24.0					LOCHER	AGC-...	875.0	1200.0				
AMUS	AUTO	132.7	132.7	23.3	24.0					AMUS	LFC-...	187.7	200.0				
HOMER	AUTO	277.0	282.3	24.0	24.0					HOMER	LFC-...	447.3	600.0				
DOYLE	AUTO	235.2	235.2	23.7	24.0					DOYLE	AGC-...	572.9	600.0				
FARLIE	AUTO	405.9	426.7	24.0	24.0					FARLIE	LFC-...	1120.0	1200.0				

Shunt Capacitors

Capacitors					
Resource count: 9		Station:			
Company	Station	Nominal KV	Nominal MVAR	Capacitor	MVAR
PAL	BEAVER	69.0	50.0	BEAVER1	35.9
PAL	BEAVER	69.0	50.0	BEAVER2	0.0
PAL	COPMANOR	69.0	21.0	COPLEY1	0.0
PAL	COPMANOR	69.0	10.0	COPLEY2	0.0
PAL	RICTER	138.0	50.0	RICTER1	32.1
PAL	RICTER	138.0	50.0	RICTER2	32.1
PAL	VEXLEY	138.0	50.0	VEXLEY SVC C1	0.0
PAL	VEXLEY	138.0	50.0	VEXLEY SVC C2	0.0
PAL	VEXLEY	138.0	50.0	VEXLEY1	46.7

Debrief

What were the important cues?

What patterns were recognized?

What are the recommended actions?

What were your greatest concerns?

How would you explain your action to
a Rookie?

Explain the important mental models