



Rayburn Electric Cooperative Load Integration STUDY UPDATE

RPG

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System Development

Background

- Integrate RCEC system's remaining load into ERCOT
- Analyze the transmission proposals submitted by Lone Star Transmission LLC
- Perform steady state and economic analysis
- Evaluate alternative options
- Scope and Assumptions:
 - <http://www.ercot.com/calendar/2016/9/20/77741-RPG>

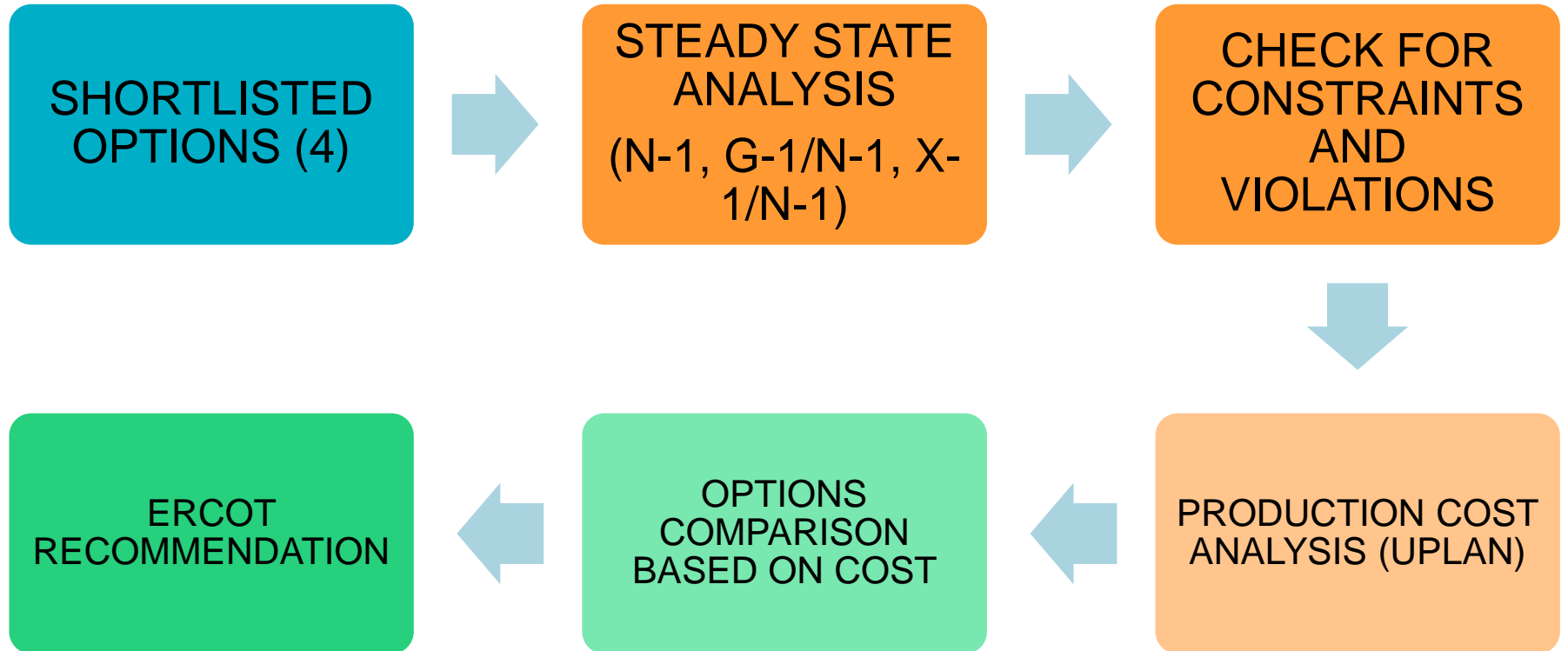
Expected RCEC System Transfer

- 190 MW of load
- 138 kV system
- Approximately 15 buses
- No generation

Data and Assumptions

- Interconnection timeline of Rayburn into ERCOT is expected to be year 2020
- Weather zones of study are North, North Central and East
- 16RTP_2021_SUM_NNC steady state case prepared by ERCOT was used (East load at max - 3400 MW)
- There were no Planning Guide 6.9 generation in the vicinity of integration in East
- Rayburn integration data from Lone Star with business as usual load scenario (190 MW)
- ERCOT RTP P1 through P7 contingencies and RCEC contingency data set

Approach



Options Evaluation

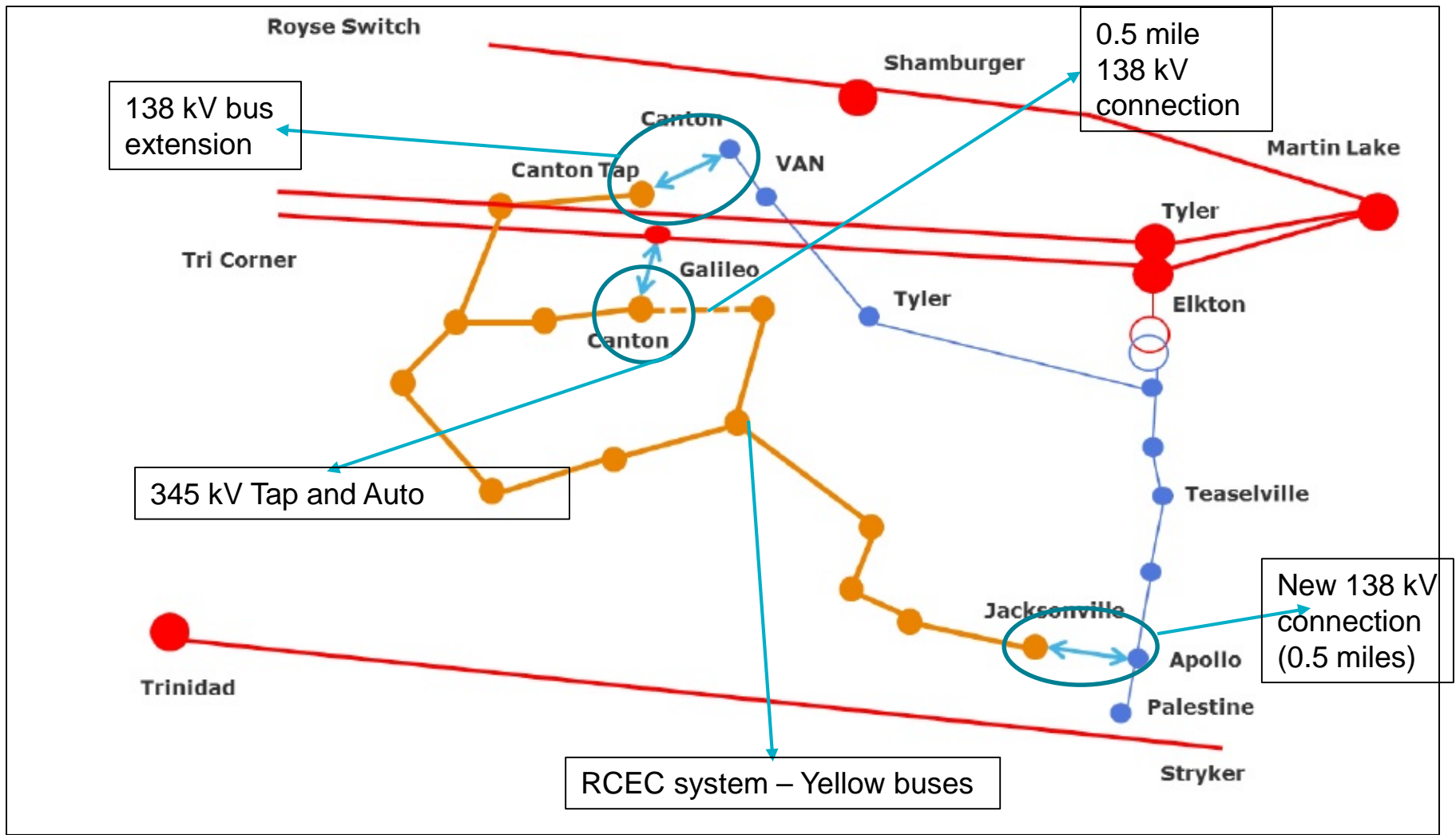
- ERCOT evaluated 12 options using the following criteria:
 - NERC/ERCOT Reliability criteria
 - 345 kV connectivity feasibility
 - Capital cost consideration
 - Ease of building new substation or expanding existing ones
- Based on the evaluation, the following 4 shortlisted options (please refer to Appendix for details) were selected for detailed analysis



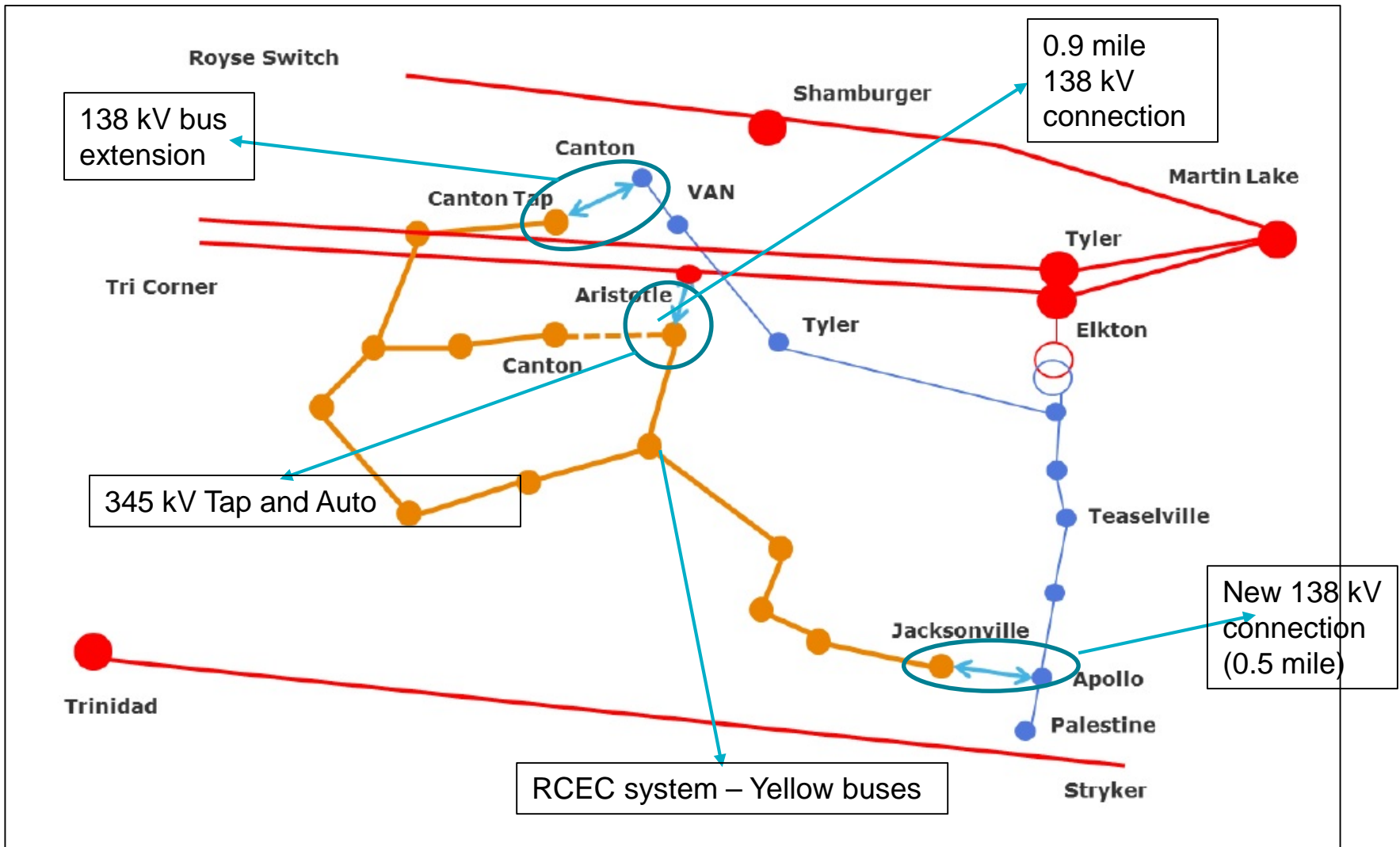
Short listed options

All options have a single common 345 kV tap on the line from Tyler Grande – Tricorner (2nd Martin Lake circuit)

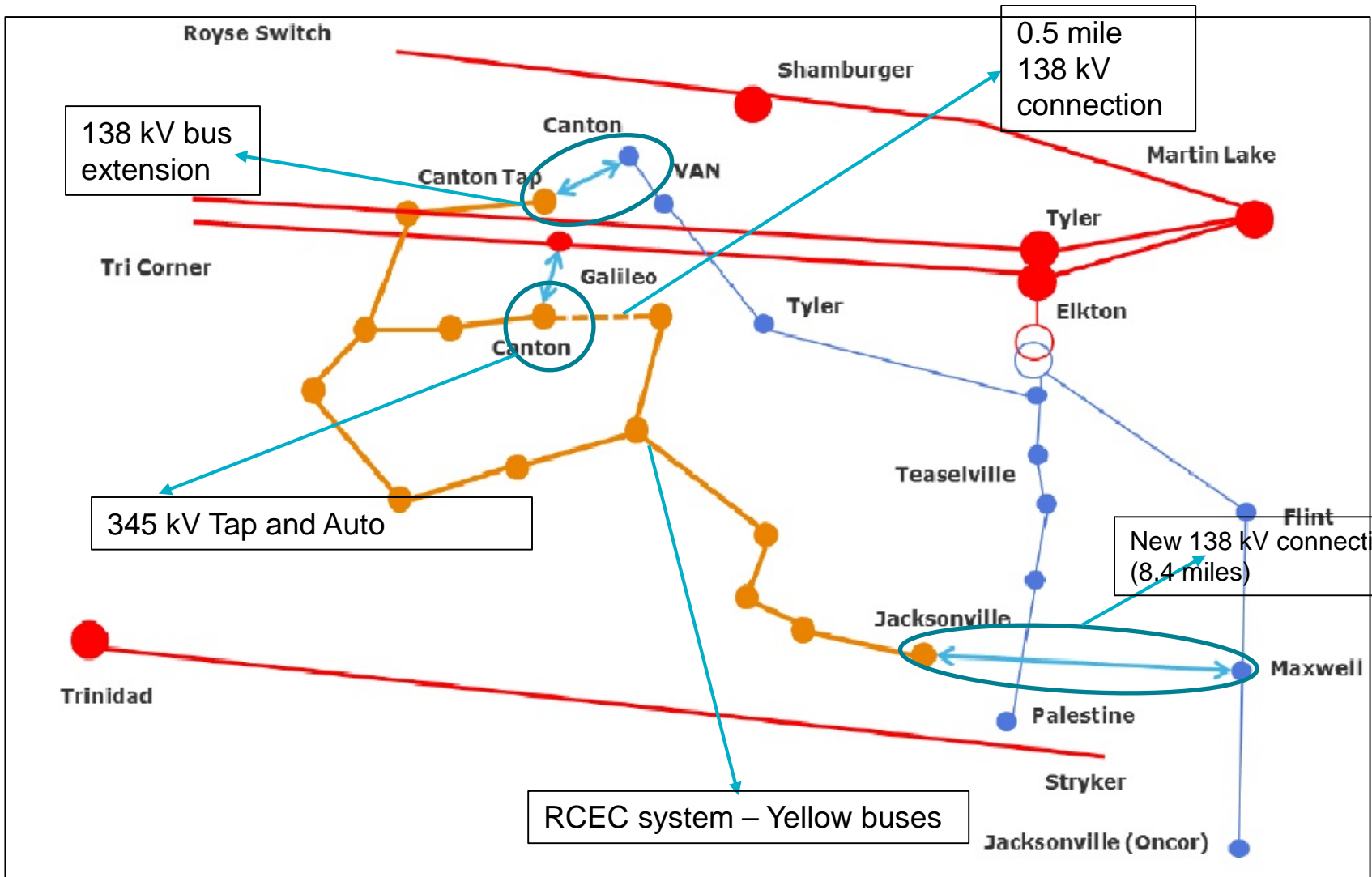
Option 1 – Capital cost:~ \$39 Million



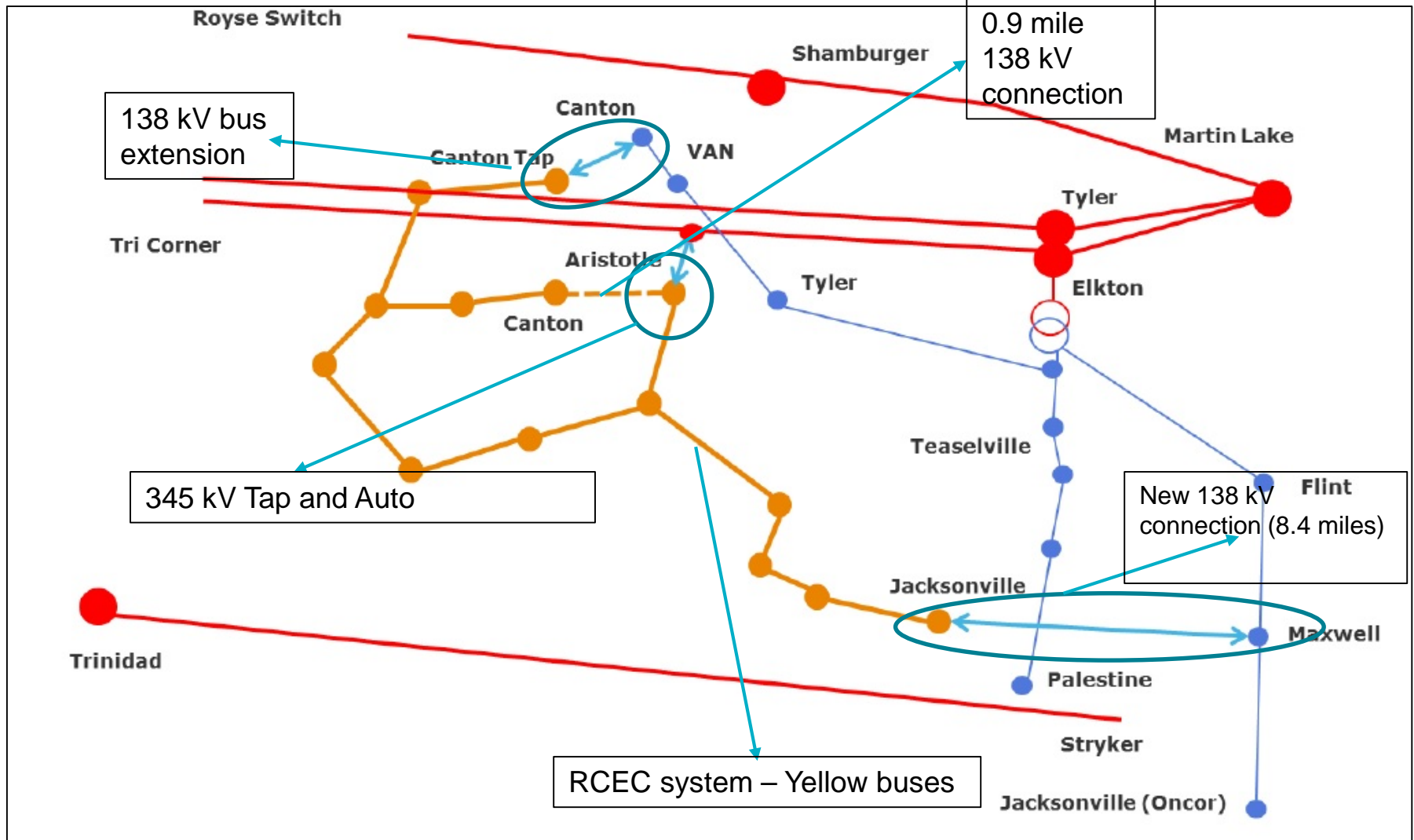
Option 2 – Capital cost: ~\$38 Million



Option 3 - Capital cost: ~\$48 Million



Option 4 - Capital cost: ~\$47 Million



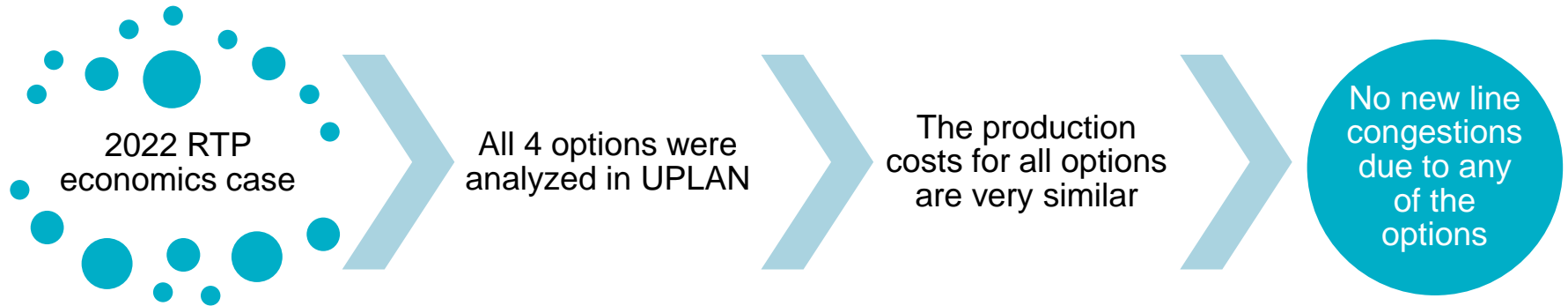
Results – Steady state analysis

- Four Rayburn options were selected for final review
 - No post contingency criteria violations in the vicinity of the Rayburn system under NERC P1, P2, and P7 contingencies
 - G-1/N-1 Analysis (NERC P3):
 - Martin Lake unit#3
 - Freestone Energy Center
 - Big Brown Unit #1
 - No new post contingency criteria violations

Results – Steady state analysis contd...

- X-1/N-1 analysis (NERC P6):
 - All East zone auto transformers (total of 18) were studied for all 4 shortlisted options
 - No new criteria violations in all cases
- All the four Options results satisfied the NERC/ERCOT steady state reliability requirements

Results – Economic Analysis



ERCOT recommendation

- All options satisfy the reliability criteria
- Production costs values for all 4 options were very close and comparable
- Based on the evaluation, ERCOT recommends Option 2 as the least cost alternative for integrating the RCEC system into ERCOT

DESCRIPTION:

Extend Bus Work & add 138kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap
New 345kV Substation (6 breaker ring bus) on one circuit of Martin Lake – Tricorner line app. 83 miles from Martin Lake (Aristotle_345 Sub)

New 138kV Switching Station on the 138kV Teaselville - Palestine line app. 30 miles from Palestine (Apollo_138)

345/138kV, 650 MVA auto at Aristotle

New 0.9 mile single circuit 138kV line from Aristotle to Ben Wheeler

Expand Ben Wheeler sub to accommodate Aristotle_345 Sub & Canton Sub connection

Extend the 138kV Coffee - Jacksonville single circuit line into the new Apollo_138kV switching station (0.5 miles)



Questions?



Appendix (Details on the Four options)

Option 1 and 2

Option 1:

Extend Bus Work & add 138kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap

New 345kV Substation (6 breaker ring bus) on one circuit of Martin Lake – Tricorner line app. 83 miles from Martin Lake (Galileo_345 Sub)

New 138kV Switching Station on the 138kV Teaselville - Palestine line app. 30 miles from Palestine (Apollo_138)

345/138kV, 650 MVA auto at Galileo

New 0.5 mile single circuit 138kV line from Galileo to Canton Sub

Expand Canton sub to accommodate the connections from Galileo_345 Sub

Extend the 138kV Coffee - Jacksonville single circuit line into the new Apollo_138kV switching station (0.5 miles)

Option 2:

Extend Bus Work & add 138kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap

New 345kV Substation (6 breaker ring bus) on one circuit of Martin Lake – Tricorner line app. 83 miles from Martin Lake (Aristotle_345 Sub)

New 138kV Switching Station on the 138kV Teaselville - Palestine line app. 30 miles from Palestine (Apollo_138)

345/138kV, 650 MVA auto at Aristotle

New 0.9 mile single circuit 138kV line from Aristotle to Ben Wheeler

Expand Ben Wheeler sub to accommodate Aristotle_345 Sub & Canton Sub connection

Extend the 138kV Coffee - Jacksonville single circuit line into the new Apollo_138kV switching station (0.5 miles)

Options 3 and 4

- Option 3:

Extend Bus Work & add 138kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap

New 345kV Substation (6 breaker ring bus) on one circuit of Martin Lake – Tricorner line app. 83 miles from Martin Lake (Galileo_345 Sub)

New 138kV Switching Station on the 138kV Jacksonville - Flint line app. 5 miles from Jacksonville (Maxwell_138)

345/138kV, 650 MVA auto at Galileo

New 0.5 mile single circuit 138kV line from Galileo to Canton Sub

Expand Canton sub to accommodate the connections from Galileo_345 Sub

Extend the 138kV Coffee - Jacksonville single circuit line into the new Maxwell_138kV switching station (8.4 miles)

Option 4:

Extend Bus Work & add 138kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap

New 345kV Substation (6 breaker ring bus) on one circuit of Martin Lake – Tricorner line app. 83 miles from Martin Lake (Aristotle_345 Sub)

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