



7X Energy Frio County Transmission Project – ERCOT Independent Review

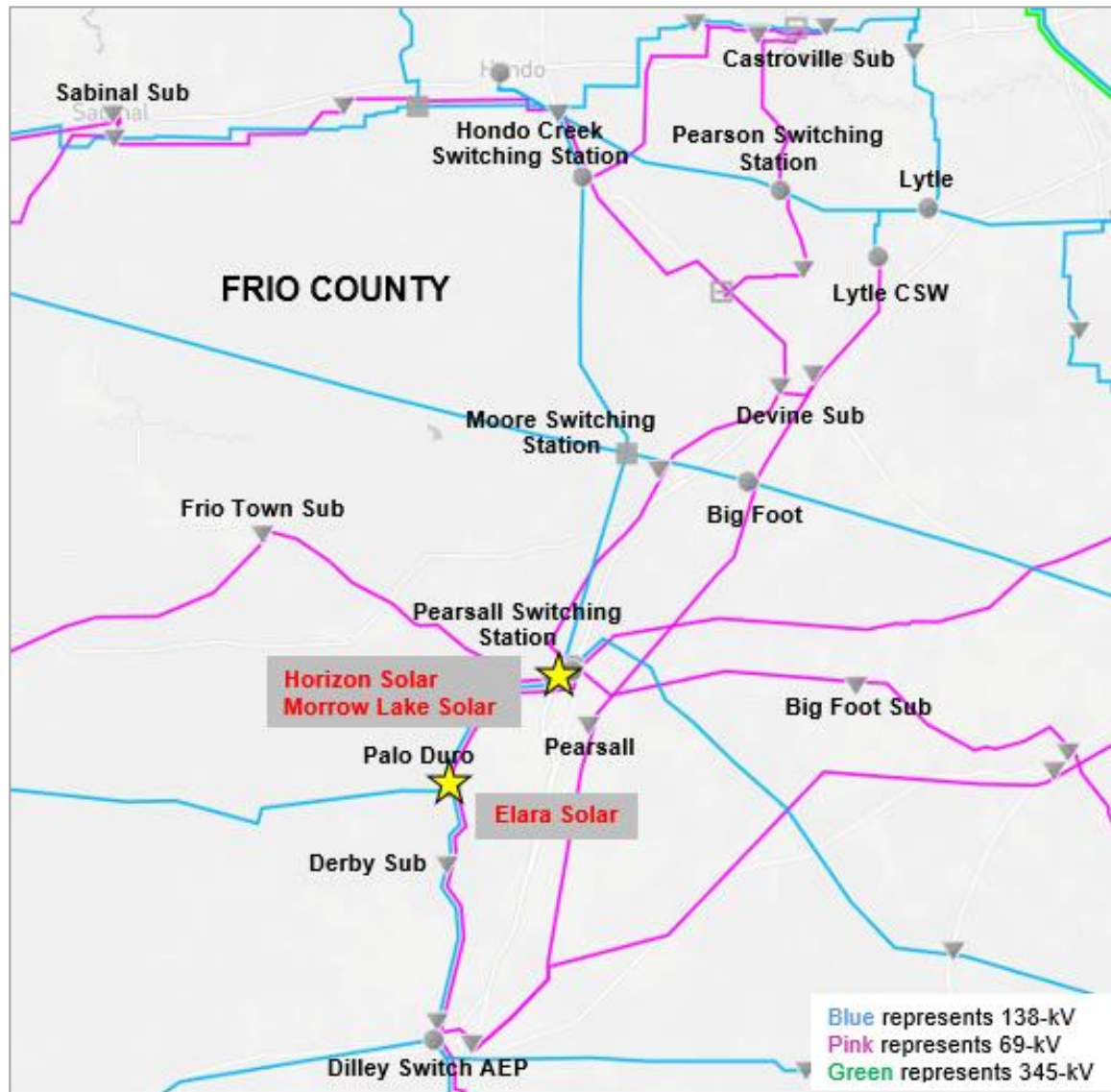
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Regional Planning Group
May 19, 2020

Introduction

- 7X Energy submitted the Frio County Transmission Project to the Regional Planning Group (RPG) in November, 2019 as an economic-driven project to address the local transmission congestion in Frio County associated with the addition of new solar generation facilities in the area
- This is a Tier 2 project estimated to cost \$23 million (generic cost estimates) and expected to be in service by Summer 2021
- ERCOT presented the scope at the January 2020 RPG meeting
http://www.ercot.com/content/wcm/key_documents_lists/189694/7X_Frio_County_Project_Study_Scope_01_21_2020_RPG.PDF
- ERCOT presented a study update at the February 2020 RPG meeting
http://www.ercot.com/content/wcm/key_documents_lists/189700/7X_Frio_County_Project_Study_Update_02_18_2020_RPG.PDF

Study Area



Updates Since February RPG Meeting

- Planned generators in the ERCOT system that met Planning Guide Section 6.9(1) conditions for inclusion in the base cases (according to the 2020 March Generation Interconnection Status report) were added to the respective study base cases.
- Confirmed LNG loads and associated transmission upgrades in the Corpus Christi North Shore project were added to the 2024 economic study base case

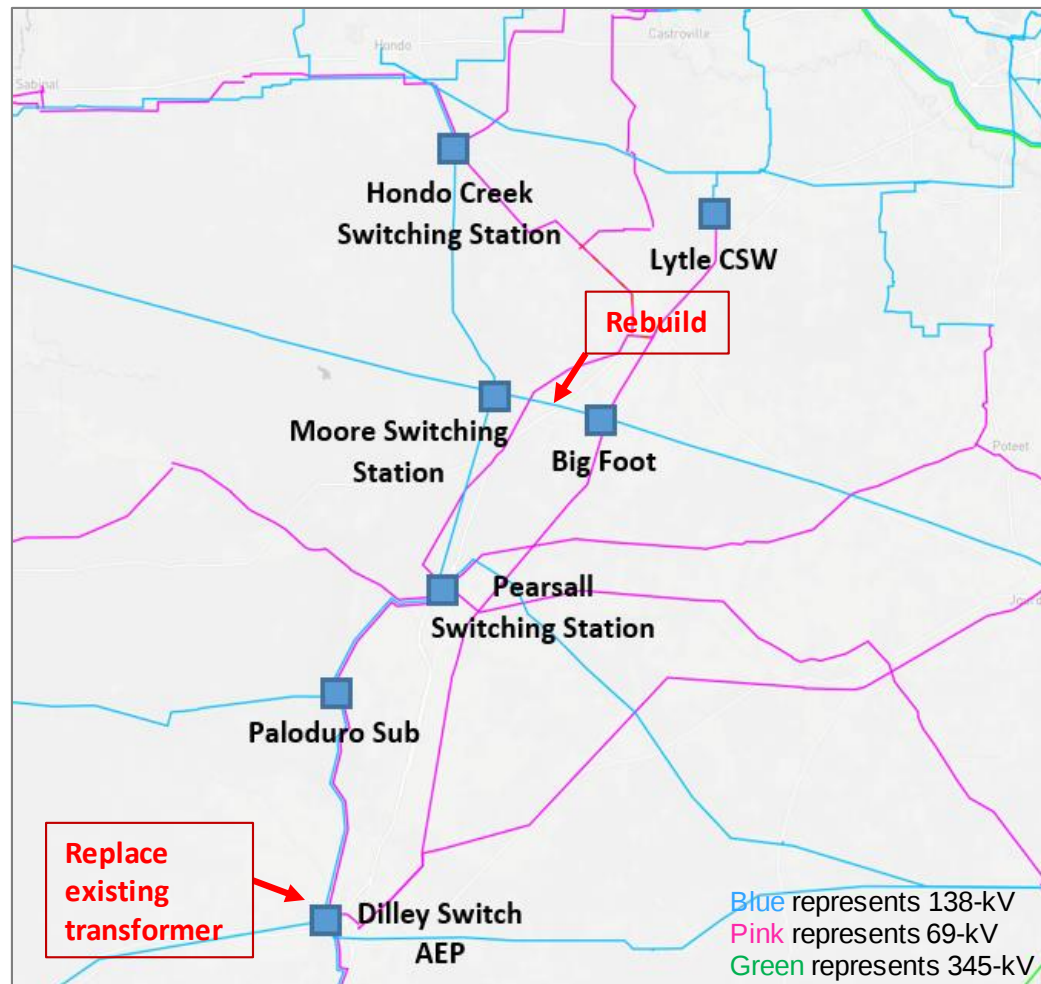
Base Case Production Cost Simulation Results

- The table shows the congested elements in the base cases due to the addition of solar generators in Frio County
- Congestion rent is color coded with Red indicating high congestion, Orange indicating medium congestion, and Yellow indicating low congestion

Monitored Line	2021	2024
Moore – Big Foot 138-kV line	Red	Red
Pearsall 138/69-kV transformer	Orange	Orange
Dilley Switch 138/69-kV transformer	Orange	Orange
Moore – Hondo Creek 138-kV line	Yellow	Yellow
Big Foot 138/69-kV transformer	Yellow	Yellow

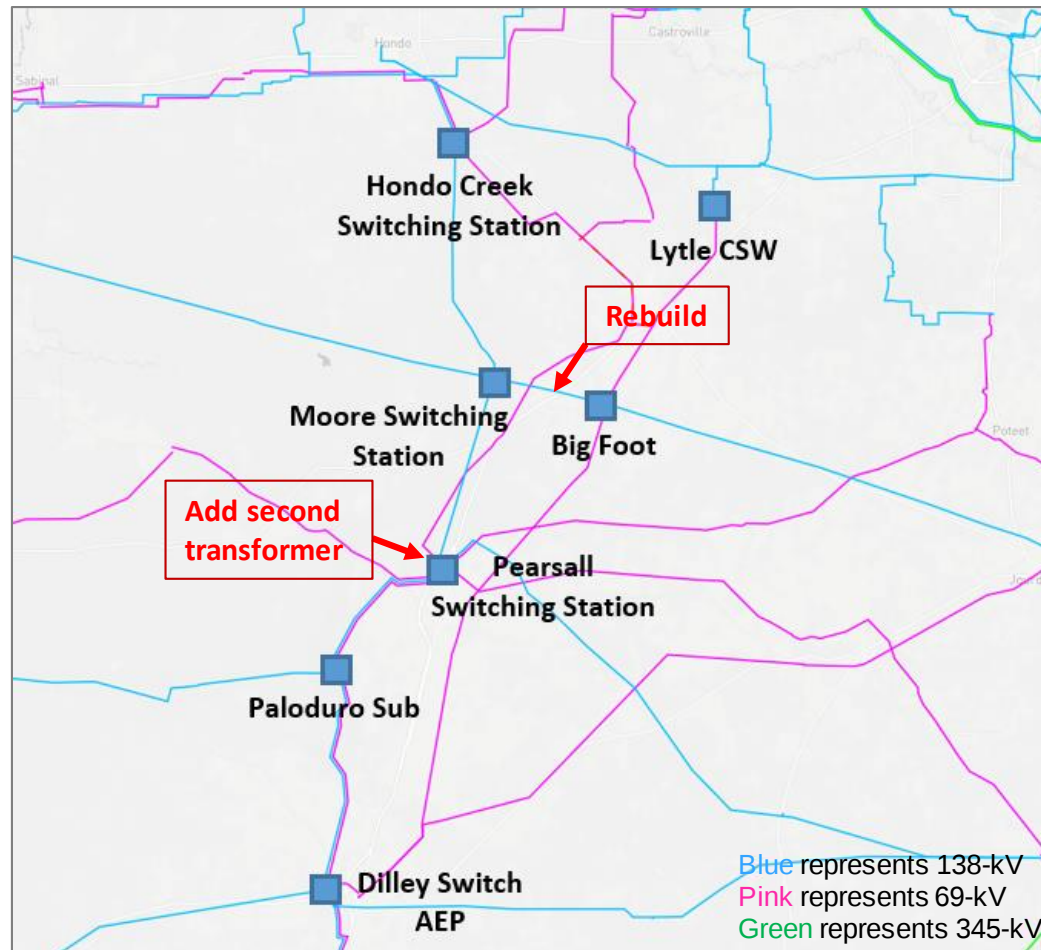
Transmission Upgrade Options

- **Option 1** – Rebuild Moore – Big Foot 138-kV line and replace AEP-owned 138/69-kV transformer at Dilley Substation



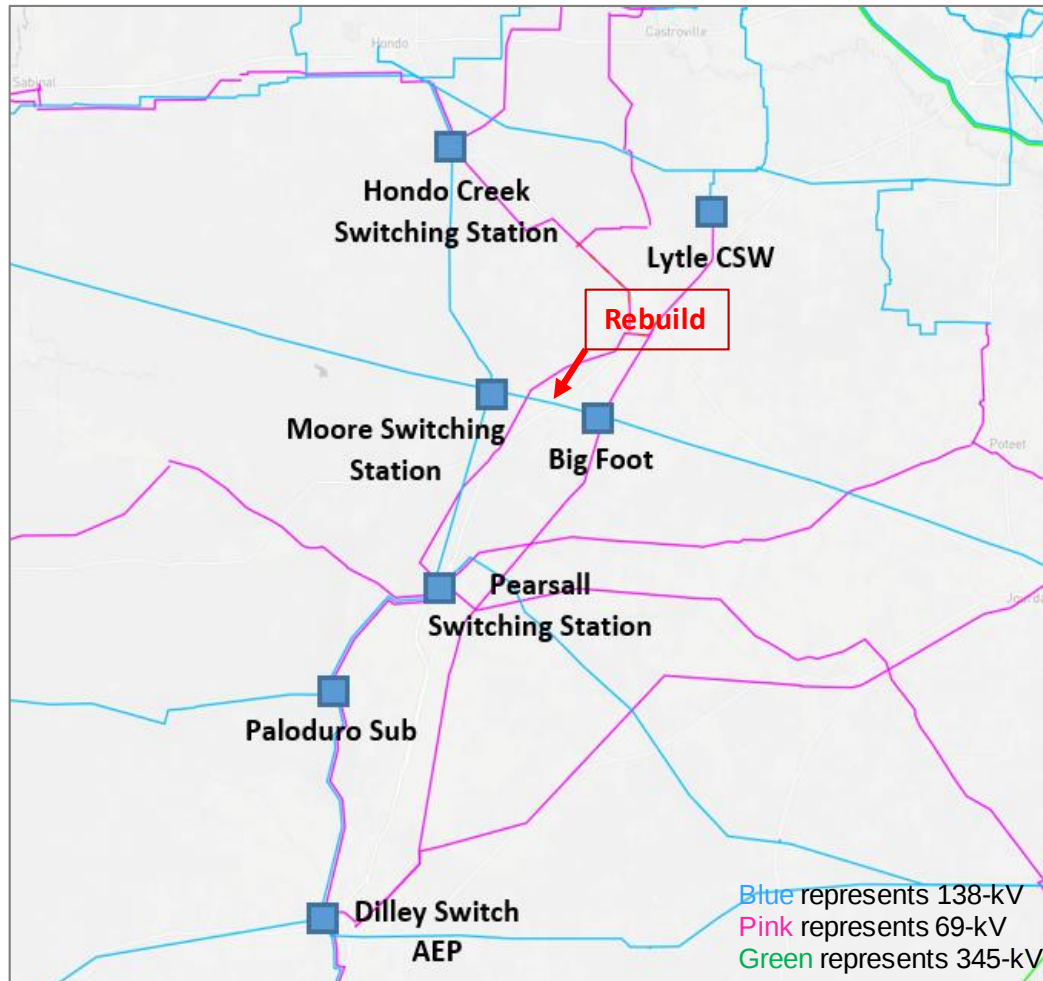
Transmission Upgrade Options

- **Option 2** – Rebuild Moore – Big Foot 138-kV line and add a second 138/69-kV transformer at Pearsall Substation



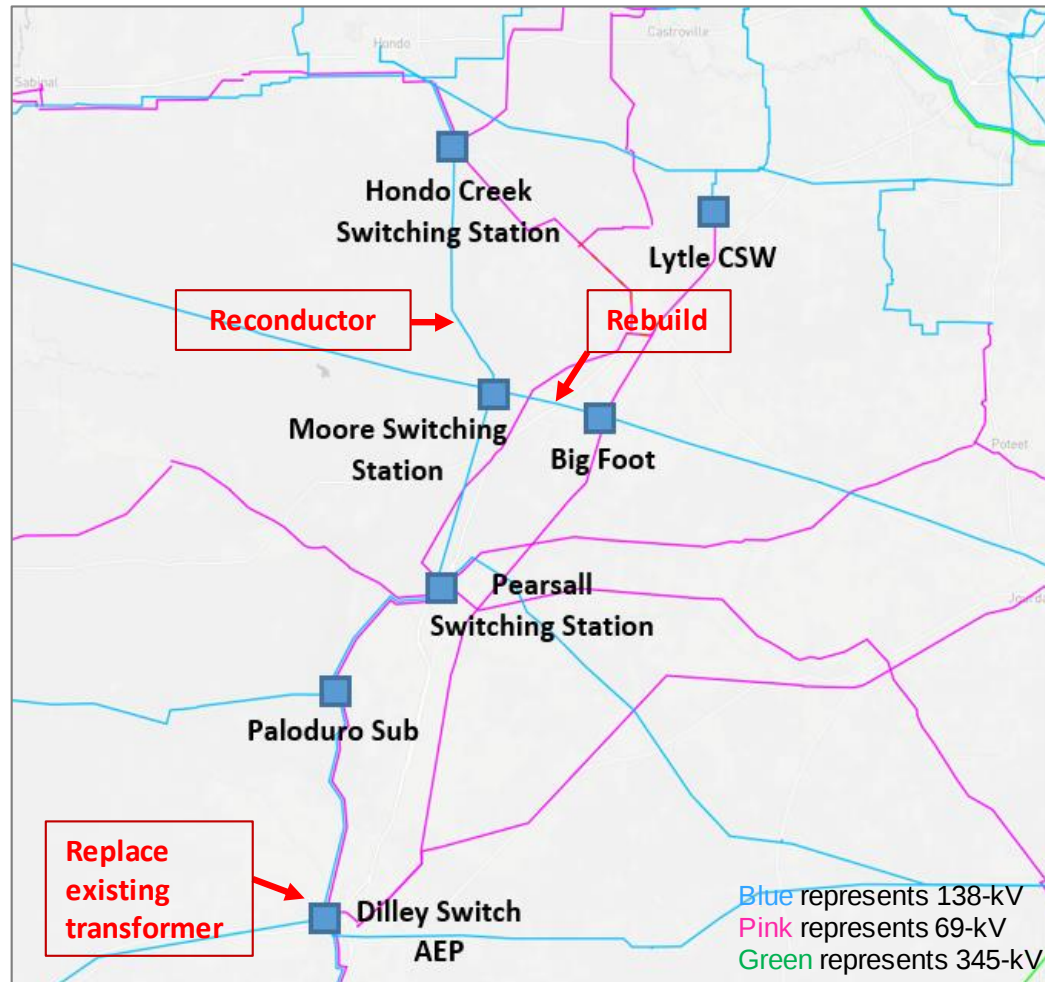
Transmission Upgrade Options

- Option 3 – Rebuild Moore – Big Foot 138-kV line



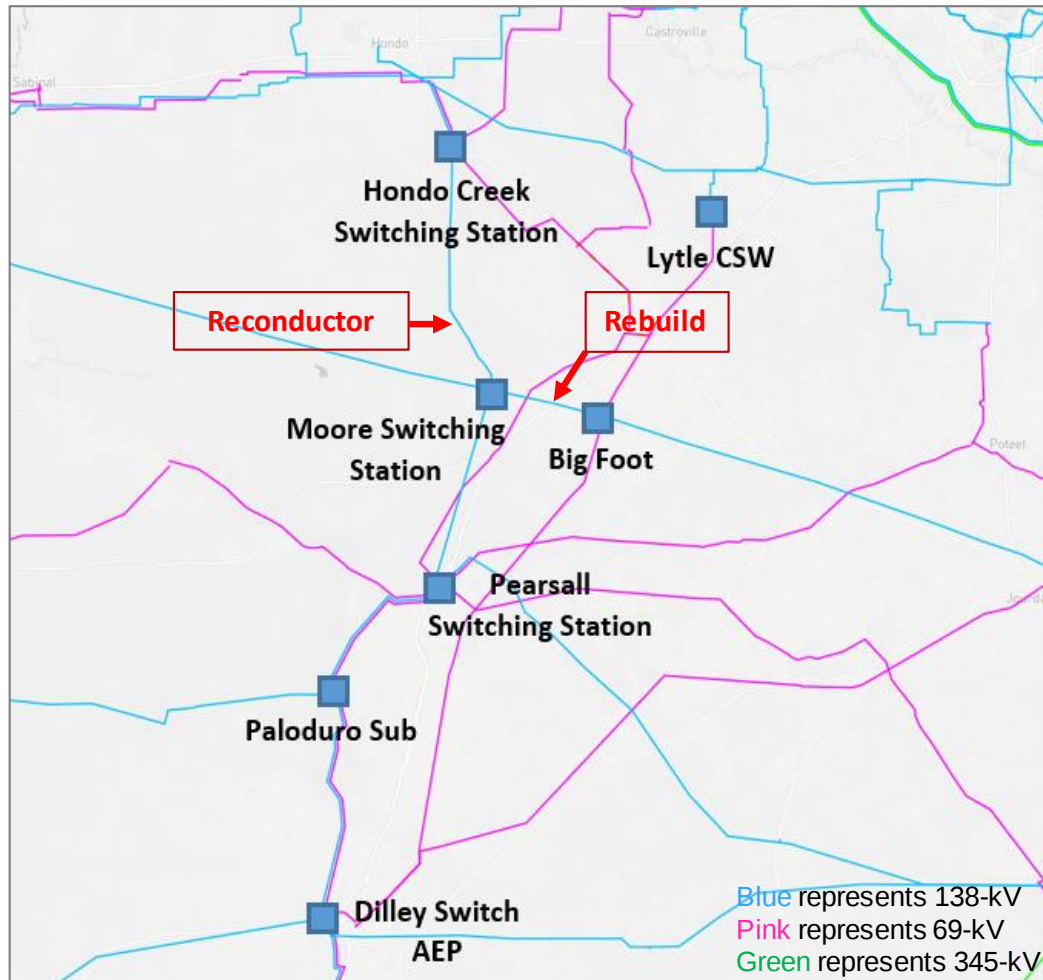
Transmission Upgrade Options

- **Option 4** – Rebuild Moore – Big Foot 138-kV line, reconductor Moore – Hondo Creek 138-kV line, and replace AEP-owned 138/69-kV transformer at Dilley Substation



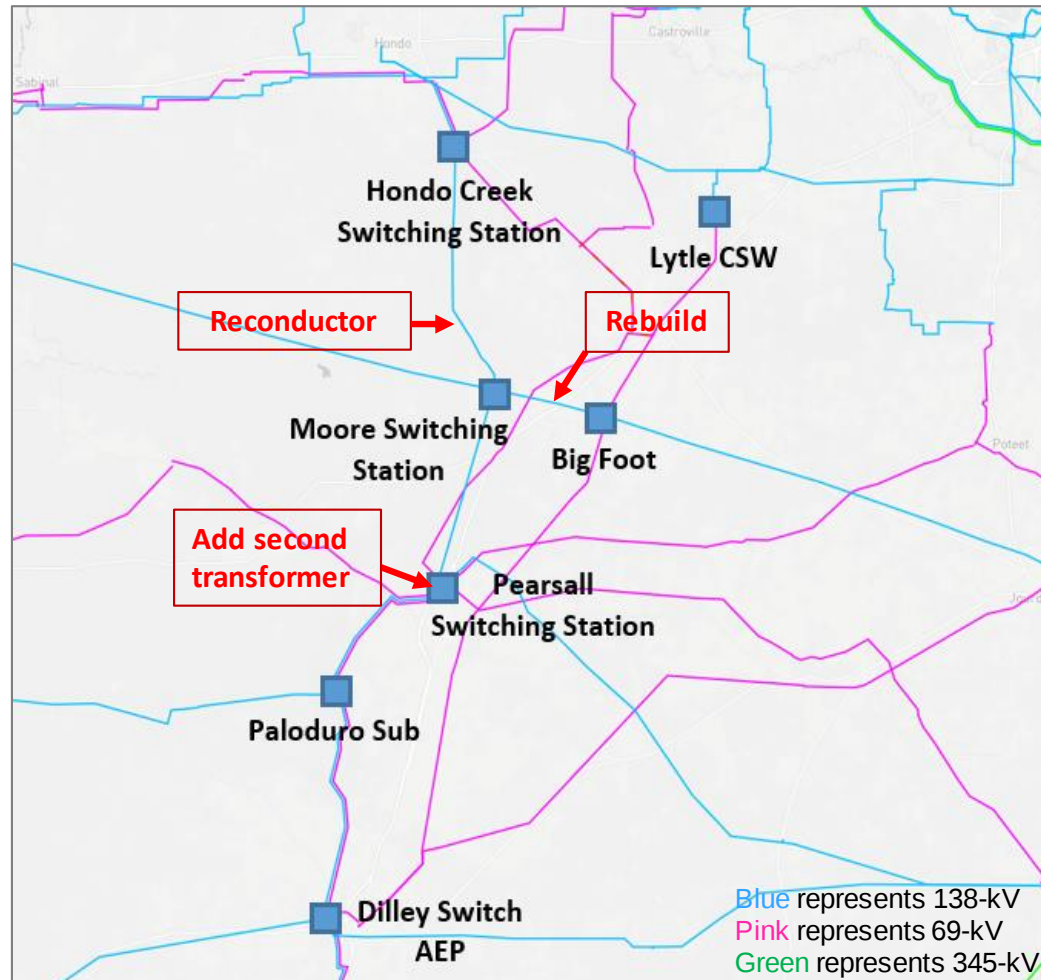
Transmission Upgrade Options

- **Option 5** – Rebuild Moore – Big Foot 138-kV line and reconductor Moore – Hondo Creek 138-kV line



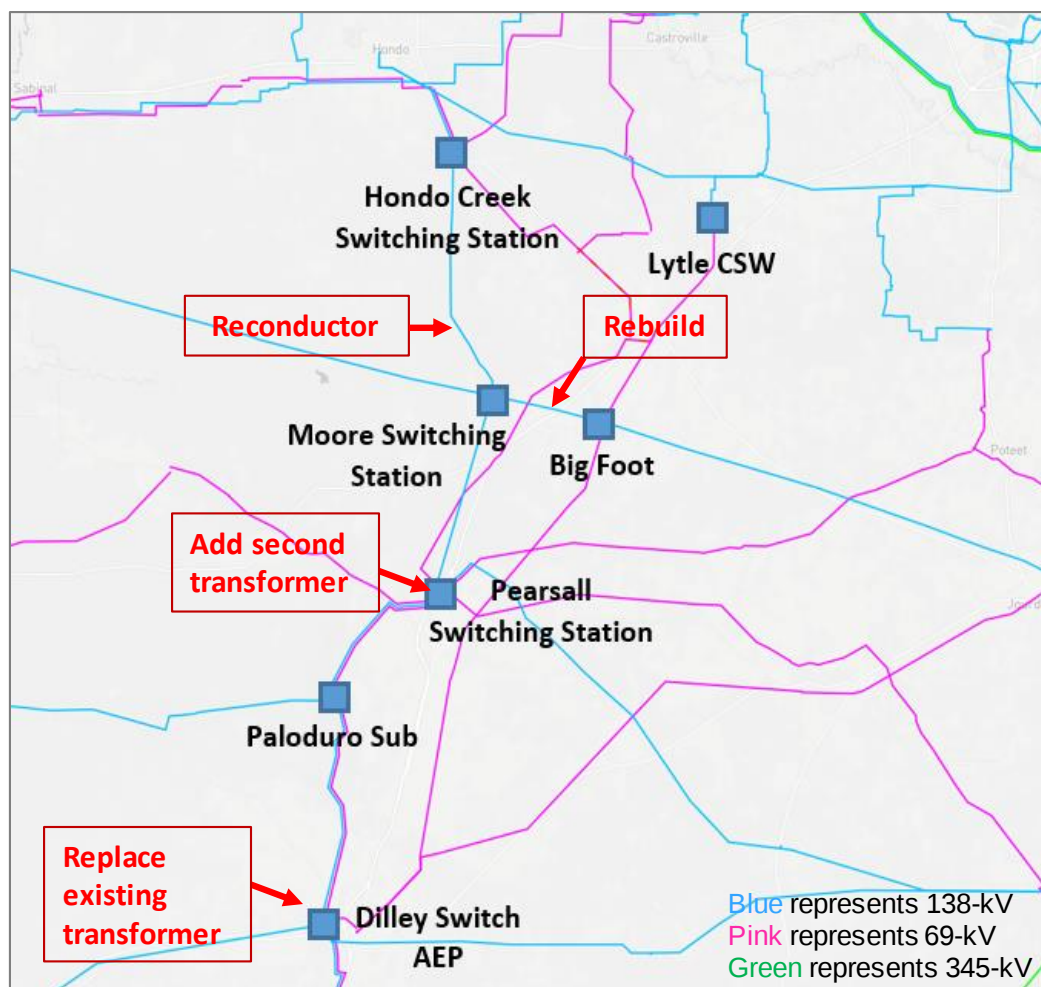
Transmission Upgrade Options

- **Option 6** – Rebuild Moore – Big Foot 138-kV line, reconductor Moore – Hondo Creek 138-kV line, and add a second 138/69-kV transformer at Pearsall Substation



Transmission Upgrade Options

- **Option 7** – Rebuild Moore – Big Foot 138-kV line, reconductor Moore – Hondo Creek 138-kV line, replace AEP-owned 138/69-kV transformer at Dilley Substation, and add a second 138/69-kV transformer at Pearsall Substation



Economic Criteria

- The analysis used the ERCOT economic planning criteria outlined in Section 3.11.2 (5) of the current Nodal Protocols consistent with the 2019 RTP study

<http://www.ercot.com/mktrules/nprotocols/current>

- ERCOT used 14% as the first-year revenue requirement

http://www.ercot.com/content/wcm/key_documents_lists/138702/FinancialAssumptions_EconomicCriteria.pdf

Transmission Upgrade Option Evaluations

Option	Capital Cost ⁽¹⁾ (\$M)		Annual Production Cost Savings (\$M)		Annual Benefit to Capital Cost Ratio ⁽²⁾ (%)	
	2021	2024	2021	2024	2021	2024
Option 1	11.94	12.86	1.57	2.09	13.1%	16.3%
Option 2	14.20	15.29	1.89	2.76	13.3%	18.1%
Option 3	8.46	9.11	1.08	1.25	12.8%	13.7%
Option 4	15.91	17.14	2.03	2.15	12.8%	12.5%
Option 5	12.43	13.38	3.36	2.06	27.0%	15.4%
Option 6	18.17	19.57	2.92	2.01	16.1%	10.3%
Option 7	21.65	23.32	2.52	1.73	11.6%	7.4%

(1). Capital cost estimates provided by AEP and STEC were escalated to 2021 and 2024 dollars using an annual inflation rate of 2.5%

(2). Annual benefit to cost ratios for 2021 and 2024 were calculated using escalated cost estimates in 2021 and 2024 dollars, respectively

Preferred Option

- Among all the transmission upgrade options that were studied, Option 5 displayed the best production cost savings and met the ERCOT economic criteria in both study years
- Additionally, Option 5 had one of the lower capital cost estimates of the options studied
- Upgrading the Moore-Big Foot and Moore-Hondo Creek 138-kV lines would also help local generation in Frio County electrically closer to the major load centers in the South Central weather zone compared to other options evaluated
- Option 5 will help modernize both Moore-Big Foot and Moore-Hondo Creek 138-kV lines (constructed in 1953 and 1974, respectively)
- Based on these results, ERCOT selected Option 5 as the preferred option

Sensitivity Analysis

- A sensitivity analysis was performed on the selected transmission upgrade option (Option 5) to assess its performance under low and high monthly natural gas price assumptions

Low Monthly Natural Gas Price Forecast for Years 2021 and 2024

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	2.68	2.49	2.39	2.44	2.48	2.53	2.43	2.41	2.41	2.51	2.51	2.69
2024	2.71	2.52	2.41	2.46	2.50	2.56	2.46	2.43	2.44	2.54	2.54	2.72

High Monthly Natural Gas Price Forecast for Years 2021 and 2024

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2021	3.19	2.97	2.84	2.90	2.95	3.01	2.89	2.87	2.87	2.99	2.99	3.20
2024	4.00	3.72	3.56	3.64	3.70	3.78	3.63	3.59	3.60	3.75	3.75	4.01

Source: 2020 RTP Economic Assumptions presented at February 2020 RPG meeting

http://www.ercot.com/content/wcm/key_documents_lists/189700/2020RTP_EconomicAssumptions_02182020.pdf

Sensitivity Analysis - Results

- Natural gas price sensitivity indicated that the economic benefits realized by the preferred transmission upgrade option (Option 5) were partially driven by the ability of the upgrades to get more output from the local natural gas units in the area

Low Natural Gas Price Sensitivity				High Natural Gas Price Sensitivity			
2021 Savings (\$M)	2024 Savings (\$M)	2021 C/B ratio ⁽¹⁾	2024 C/B ratio ⁽¹⁾	2021 Savings (\$M)	2024 Savings (\$M)	2021 C/B ratio ⁽¹⁾	2024 C/B ratio ⁽¹⁾
1.42	2.10	11.4%	15.7%	1.18	0.64	9.5%	4.8%

(1). Annual benefit to cost ratios for 2021 and 2024 were calculated using escalated cost estimates in 2021 and 2024 dollars, respectively.

Sensitivity Analysis - Results

- Results indicated that the economic benefits realized by Option 5 were partially driven by the ability of the upgrades to relieve congestion experienced by natural gas generation in the area
- With higher natural gas prices, the natural gas generation in the area was less economic relative to the overall ERCOT generation when compared to the base price scenario, thereby lowering the overall production cost savings provided by Option 5
- With lower natural gas prices, the natural gas generation in the area was generating more hours compared to the base price scenario
- However, the overall system-wide cost to serve the load was also lower, thus the cost to redispatch the generation due to congestion was lower. This accounted for the lower production cost savings realized by Option 5 in 2021, though the savings were slightly higher in 2024

ERCOT Recommendation

- Based on the ERCOT Independent Review, ERCOT recommends Option 5 as the preferred option. Option 5 consists of the following upgrades:
 - Rebuild the Moore – Big Foot 138-kV line such that the summer emergency rating is at least 485 MVA
 - Reconductor the Moore – Hondo Creek 138-kV line such that the summer emergency rating is at least 382 MVA
- Estimated Capital Cost: \$12.13 Million

Deliverables

- **Timeline**
 - Final EIR Report to be posted in the MIS in May 2020



Stakeholder Comments Also Welcomed to Sun Wook Kang:
skang@ercot.com

Appendix A – Cost Estimates

Transmission Upgrade Option	Cost Provided by TSPs (M\$)
Option 1 Rebuild Moore-Big Foot 138-kV line Replace the existing 138/69-kV transformer at AEP-owned Dilley SW substation	11.65
Option 2 Rebuild Moore-Big Foot 138-kV line Add a second 138/69-kV transformer at Pearsall substation	13.85
Option 3 Rebuild Moore-Big Foot 138-kV line	8.25
Option 4 Reconductor Moore-Hondo Creek 138-kV line Replace the existing 138/69-kV transformer at AEP-owned Dilley SW substation	15.53
Option 5 Rebuild Moore-Big Foot 138-kV line Reconductor Moore-Hondo Creek 138-kV line	12.13
Option 6 Rebuild Moore-Big Foot 138-kV line Reconductor Moore-Hondo Creek 138-kV line Add a second 138/69-kV transformer at Pearsall substation	17.73
Option 7 Rebuild Moore-Big Foot 138-kV line Reconductor Moore-Hondo Creek 138-kV line Replace the existing 138/69-kV transformer at AEP-owned Dilley SW substation Add a second 138/69-kV transformer at Pearsall substation	21.13