- New Fairmont Switching Station:
  - 5-bay breaker-and-a-half design
  - Two 28.8MVar Capacitor banks
  - New Control House
  - Grading
- Existing Original:
  - 5-bay breaker-and-a-half design
  - One additional position connected to the bus
  - Two 28.8MVar Capacitor banks
  - New Control House
- Existing Option 1 (4 Bay)
  - 4-bay breaker-and-a-half design (with and without replacing existing breakers)
  - Two 28.8MVar Capacitor banks
  - New Control House
- Existing Option 2 (5 Bay)
  - 5-bay breaker-and-a-half design (with and without replacing existing breakers)
  - Two 28.8MVar Capacitor banks
  - New Control House

WMECO views the strong system benefits as full justification for the costs to be incurred for the breaker-and-a-half bus configuration. The impacts associated with the re-building of the Fairmont Switching Station can be mitigated and provide no reason for the loss of such strong system benefits. As a result, series "8"[37] entails a loss of reliability benefits which makes these options impractical.

3.4 COMPARISON OF THE FOUR FINALIST TRANSMISSION ALTERNATIVES ON THE BASIS OF COSTS, IMPACTS AND RELIABILITY: VARIATION 6a OR 6b ON THE NORTHERN AND THE SOUTHERN ROUTE

On the basis of the analysis in Section 3.3, the short list of finalist options, all Option A variations, are as follows:

[37] Option 8c has been dropped due to the cost and impracticality of the additional line from the Ludlow Substation to the Fairmont Switching Station. See: Section 3.3.7, above. In addition, option 8b includes a new 115-kV line from the Stony Brook generating station to the Ludlow Substation, in addition to a new 115-kV connection from the Stony Brook generating station to the Fairmont Switching Station. The extra cost of the first new line to the Ludlow Substation is an additional reason to drop further consideration of option 8b.

- Option 6a, Northern Route (or 6a N)
- Option 6a, Southern Route (or 6a S)
- Option 6b, Northern Route (or 6b N)
- Option 6b, Southern Route (or 6b S)

The finalist options will be compared on the basis of costs, impacts and reliability in the following sections.

3.4.1 Stony Brook 115-kV Connection to Fairmont: Option 6a Versus Option 6b Compared on the Basis of Costs, Impacts and Reliability

For each option, the "b" designation referred to the connection of the Stony Brook Generating Station at 115 kV via two new overhead circuits, 4.8 miles in length following an existing 1.4-mile transmission line right-of-way emanating in a northward direction from the generating station miles and then traveling on a new right-of-way for 3.4 miles in a northwest direction to a new point of interconnection with the #1113 and #1134 circuits near to National Grid's Five Corners Substation in Granby, Massachusetts. Existing 115-kV circuits #1113 and #1134 would also be re-built for 4.9 miles from the connection point to the Fairmont Switching Station in Chicopee.

At the October, 2006 meeting of the SNETR Project Board, National Grid and NUSCO recognized the following pros and cons regarding the connection of the Stony Brook Generating units directly into the Greater Springfield 115-kV system:

"Pros:

- *Substantial system benefits at a cost only slightly above the alternative*
- *Connecting Stony Brook provides additional operational flexibility by means of Stony Brook quick-start units into the 115-kV system.*
- *Connecting Stony Brook enables Springfield to withstand the (extreme contingency) loss of the Ludlow 345/115-kV Substation.*
- *Connecting Stony Brook provides additional dynamic reactive support for the 115-kV system.*
- *Connecting Stony Brook reduces the number of capacitors that are required when compared to the same option without Stony Brook.*
- *Connecting Stony Brook would provide better coverage for 115-kV circuit outages west of Ludlow Substation.*

Cons

- *Singles out the contribution of a generator.*
- *Requires acquiring new ROW to build the 115-kV lines, or partial undergrounding in streets.*
- *Cost is slightly higher (~$6M)*"

(SNETR Board, October, 2006)

In its PAC December 15, 2006 presentation, ISO-NE noted that the Stony Brook interconnection was under consideration and noted the improvement of area (non-spinning) reserves with the quick-start units and the reduction/minimization of the severity of the extreme contingencies with Stony Brook connected via a separate right-of-way.[38]

Throughout the detailed engineering and siting analyses conducted by NUSCO during 2007,[39] the Stony Brook connection was a part of the preferred option being actively studied. NUSCO project engineers, Burns & McDonnell, prepared a formal "Route Selection Study for the Stony Brook to Five Corners Project" in September, 2007 where the following table appeared:

Table 3-5: Overhead versus Underground Line-Route Comparison (Stony Brook to Five Corners)

Criteria	Overhead Route (A3)	Underground Route
Length (miles)	4. 8 total	4.8 total (3.2 UG/1.6 OH)
New ROW (length in miles)	3.4	0
New ROW (acres)	42	0
Expanded ROW (length in miles)	0	0
Expanded ROW (acres)	0	0
Wetland impacts (acres)	5.7	0.4 (20' x length)
Estimated Cost	$34.8M	$61.5M

In order to continue the formal environmental and engineering analysis, formal surveying permission was required from 67 abutting or nearby property owners who would be required to grant easements for the new right-of-way. However, permission was obtained from only 21 of the 43 owners who were contacted. Difficulty obtaining the 3.4 miles of new right-of-way without instituting eminent domain proceedings was apparent based on the early reaction and opposition to the preliminary surveying effort.

[38] See: ISO-NE, "Southern New England Transmission Reinforcement" presentation to the PAC, December 15, 2006, slide 59.

[39] See: NEEWS Final Report, Proposed Plan Application, Steady State Analysis, presented to the NEPOOL Transmission Task Force November 28, 2007 (TTF Final Report), page 12, Item 5. See: Section 2.2.6, above.

3.4.1.1 Cost Differentials

Additional efforts were made to refine the cost of the Stony Brook interconnection options. More detailed engineering cost estimates were developed which compared the costs of the Stony Brook interconnection to the alternative modifications required at the Ludlow Substation. Those alternative modifications included replacing the two existing autotransformers at the Ludlow Substation and rebuilding overhead 115-kV lines #1481, #1426, #1552 from the Ludlow to the East Springfield Substations.

The final cost comparisons were developed by the engineering team. The cost differential remained as originally estimated at approximately $6 million. The components of that cost differential are as follows:

Table 3-6: Cost Comparison for Alternate A – With Stony Book Lines – Overhead

Build New Stony Brook to Five Corners 115-kV Lines	$29,400,000
Rebuild Five Corners to Fairmont 115-kV (1113/1134 circuits)	$22,000,000
Stony Brook Substation Upgrade	$3,500,000
Ludlow Substation Replace One Auto Transformer	$24,100,000
Construction (only) Subtotal	$79,000,000

Table 3-7: Cost Comparison for Alternate B – Without Stony Brook

Replace 2 Autotransformers at Ludlow	$39,700,000
Rebuild Lines 1481, 1426, 1552 from Ludlow to East Springfield Substation	$33,200,000
Construction (only) Subtotal	$72,900,000

The above cost table assumes (i) that the GSRP 345-kV line would be built on the Northern Route and (ii) that most 115-kV overhead line work associated with GSRP in the corridor from the Ludlow Substation to the East Springfield Substation would be required only if the decision was made to exclude the Stony Brook interconnection. The latter assumption is most favorable to the Stony Brook interconnection since use of the Northern Route will require significant re-building and re-conductoring of the overhead 115-kV lines which presently occupy the Northern Route ROW. It is possible that some associated 115-kV overhead line work would still be required if the Stony Brook interconnection was made. Not assigning overhead 115-kV line-upgrade costs in the corridor from the Ludlow Substation to the East Springfield Substation to the Stony Brook interconnection is a very conservative assumption which favors the interconnection. Notwithstanding the conservative assumption in favor of the interconnection, a cost disadvantage exists for including the Stony Brook interconnection and is equal to approximately $6 million of raw construction costs. In addition, significant environmental impacts and high risk of delays would be encountered with the interconnection.[40] See: Section 3.4.1.2, below.

However, an additional analysis was conducted to see if the cost differential between the decision to include or to exclude the Stony Brook interconnection would vary if the Southern Route was chosen for the 345-kV transmission line. In general, connecting Stony Brook at 115 kV to Fairmont would cause greater flows on the 115-kV system from Fairmont south and result in more re-building and re-conductoring in the Fairmont to Agawam corridor. Conversely, excluding the Fairmont interconnection at 115 kV for Stony Brook and modifying the Ludlow Substation (and others) as an alternative would, in general, cause greater flows on the 115-kV overheard circuits between the Ludlow Substation and the

[40] If impacts and/or delays caused NUSCO to put all or part of the new lines from Stony Brook to Five Corners underground, or if the EFSB ordered the line to be put underground, the cost differential would dramatically increase from approximately $6 million up to as high as $60 million in favor of not including the Stony Brook interconnection.

Shawinigan Switching Station, between the Ludlow Substation and East Springfield Substation, and between the Ludlow and Orchard Substations and then between the Orchard and East Springfield Substations. Those greater flows would result in the need for more re-building and re-conductoring. Compare: Exhibit 3.1, *Options Analysis*, Appendix A, Table A-4, Option 6a to Option 6b (both assume use of the Southern Route).

For the Southern Route analysis, the associated 115-kV overhead line work added costs to either decision regarding Stony Brook. The net effect for project configurations which included the underground cable components in downtown Springfield was that a smaller cost disadvantage resulted from including the Stony Brook connection. When the cable components were removed from the overall project and a comparison was run for the Southern Route between including and excluding the Stony Brook interconnection, a cost advantage resulted from adding the Stony Brook interconnection. See: Table 3-11, Section 3.4.2, below. However, even with a cost advantage from including the Stony Brook interconnection when the Southern Route was used and no new cables were installed, significant environmental impacts and high risk of delays would be encountered with the connection. See: Section 3.4.2, below.

3.4.1.2 System Benefits and Environmental Impacts

Recognition that the Stony Brook tie would significantly increase the cost of each option caused WMECO to re-assess the system benefits and environmental impacts of constructing the tie. This reassessment was undertaken in December, 2007 and January, 2008. The following conclusions were reached:

System Benefits:

The construction and re-building of 115-kV overhead transmission lines for the Stony Brook interconnection would:

- Provide additional operational flexibility by means of connecting the Stony Brook quick-start units into the greater Springfield area's 115-kV system.
- Enable the Springfield 115-kV system to withstand the loss of the Ludlow 345-kV Substation (an extreme contingency).
- Provide additional dynamic reactive support to the Springfield 115-kV system.
- Reduce the number of substation capacitor banks connected to the Springfield 115-kV system.

- Provide improved reliability following single or multiple 115-kV circuit outages west of Ludlow Substation.

In contrast, the Ludlow Substation modifications alternate would:

- Provide a solution which, when combined with the other components of the GSRP, would result in an integrated GSRP with the same electric reliability as the alternative GSRP design which includes the 115-kV Stony Brook lines.
- Not single out the contribution of any given generator nor require construction on virgin right-of-way (ROW).

Siting and Environmental Impact:

The construction and re-building of the 115-kV overhead transmission lines would span 9.5 miles of ROW including 3.4 miles of virgin ROW. This transmission line option would be the more environmentally damaging alternative and would require new ROW resulting in a higher risk of opposition during siting, permitting, and land acquisition. The new line would impact areas of potential threatened and endangered species and wetlands, and it would require upwards of 30 acres of tree removal.

The virgin ROW would require approximately 1.7 million square feet or approximately 40 acres of easements traversing through residential and forested land. The easements would be difficult to acquire as evidenced by the number of field survey refusals. The land acquisition team approached many of the property owners to acquire survey access. Approximately 21 of the 43 total property owners that were contacted denied access to conduct field surveys. Approximately 67 properties would require easement acquisition. The risk of condemnation would be high along the new ROW and therefore, the siting risk would be heightened. A consolidated proceeding for condemnation and siting approval would be likely to be delayed by the opposition of owners whose properties were being condemned. Construction of all parts of the GSRP solution would be delayed by such opposition. If condemnation proceedings followed the siting approval, the full solution would not be constructed and energized until the second proceeding concluded.

The proposed Ludlow Substation modifications will be completed within WMECO property lines. Thus, there will be minimal to no additional environmental impacts associated with the additional substation modifications.

3.4.1.3 Stony Brook Interconnection: Conclusion

In January, 2008, NUSCO concluded that the system benefits were no longer justified in light of the significantly higher impacts and risks of the interconnection. More specifically, the risk to scheduling was too significant to be ignored and the GSRP was deemed to be too important to be delayed by the difficulties expected in effecting the Stony Brook interconnection. This conclusion eliminates the following options: 3b, 6b, 7b and 8b for all affected routes, whether using the Northern or the Southern Route for the 345-kV line.

It should be stressed that alternatives to the Stony Brook interconnection, and the interconnection itself, when assessed for the Southern Route, involved re-building or building along different parts of the overhead 115-kV path from the Ludlow Substation to the Agawam Substation. As indicated above, those cost differentials were taken into account in the final decision making for Stony Brook in the two cases designated as options "a" and "b".

3.4.2 Northern Route Versus Southern Route: Select North Principally on Basis of Costs and Impacts

Two feasible 345-kV line routes remain between the Ludlow and the Agawam Substations (where the 345/115-kV connection would be made and where a new 345-kV line from the North Bloomfield Substation would connect): option 6a North and 6a South. Both take advantage of existing rights-of-way with 115-kv overhead circuits. Each was assessed, and compared with the other, on five (5) Key Criteria developed for the NEEWS Project by NUSCO and National Grid based on siting requirements in Massachusetts, Rhode Island and Connecticut.

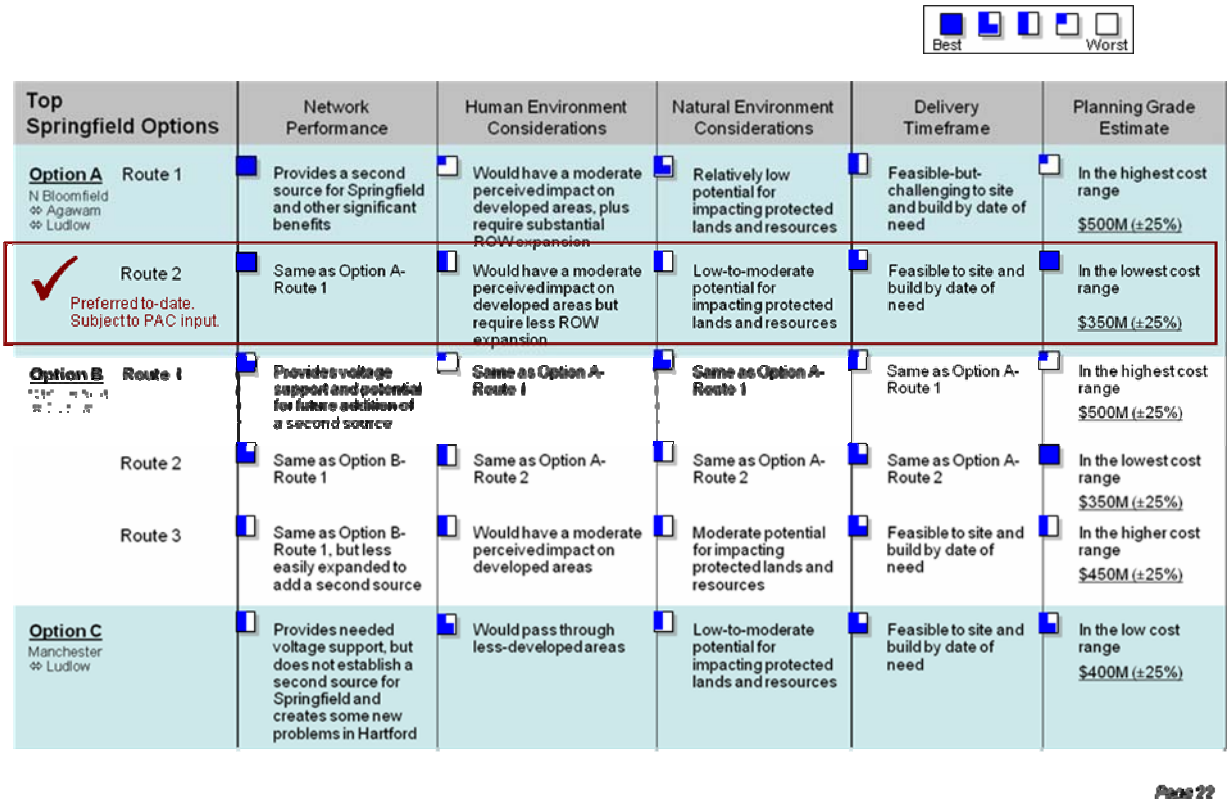
Those criteria were described by NUSCO and National Grid at the December 15, 2006 PAC presentation (slide 13) as follows:

- "Network Performance & Long-term Flexibility - The potential impact to the long-term reliability, flexibility, and expandability of the network must be considered so that, over their lifetime, the new facilities (i) will be able to solve currently identified problems, (ii) will be able to meet future interconnection and demand needs and (iii) will improve the competitive power markets, including access to renewable energy.
- Human Environment Considerations - The potential impact on customers and local community interests must be taken into account by considering the impact of the new facilities on the communities they will serve and the communities where they will be sited.

- Natural Environment Considerations - The potential impact on the surrounding natural environment must be considered, as well as the ability of the option to meet environmental laws and regulations.
- Delivery Timeframe - The likelihood of permitting and building the new facilities in time to meet identified needs must be considered.
- Cost Considerations - As stewards of our customers' and shareholders' investment in the new facilities, we must consider costs in the evaluation process, including giving consideration to the full lifetime costs and the anticipated longevity of the electrical solution."

At the December 15, 2006 PAC presentation, NUSCO had originally selected the Southern Route based on the following Summary Comparison of the "Top Springfield Reliability Options" (slide 22):

Slide #22: Summary Comparison: "Top Springfield Reliability Options"



As noted by the (✓) mark, the choice of the Southern Route was based on engineering and planning information known at the time and was largely explained by the initial engineering assessment that approximately thirteen (13) miles of 115-kV circuits along the corridor between the Ludlow Substation

and the Agawam Substation would require relocation and undergrounding of existing 115-kV facilities on nearby public roads if the Northern Route was used. The SNETR Project Board had been presented a summary of this analysis in October, 2006 as follows:

Slide #16: Comparison of Options – Scope

Scope

Springfield Options	345-KV Lines (c-miles) New OH+UG	345-KV Lines (c-miles) Modified	345-kV Substations New	345-kV Substations Modified	115-kV Lines[1] (c-miles) New OH+UG	115-kV Lines[1] (c-miles) Modified OH+UG	115-kV Substations New	115-kV Substations Modified	Equipment A – Autotransformer P – Phaseshifter
345-kV North Route	32+0	11	2	1	0+13	0	0	0	
345-kV South Route	41+1	4	2	1	0+5	0	0	0	

[1] Approximately in 115-kV segments affected by clearances for 345-kV option

Environmental Characteristics

Municipals Count

7

8

Springfield Options	ROW Acquisition New (Acres)	ROW Acquisition Expanded (Acres)	Residences Number w/i 500'	Residences Clusters w/i 500'	Public Facilities Number w/i 500'	ROW Upgrade Miles of New[1] 345 ROW	Government Protected Lands Parks	Government Protected Lands Acres Traversed	Natural Resources Wetland Acres	Natural Resources R/T/E Acres
345-kV North Route	0	48	593	38	6	32	6	49	76	179
345-kV South Route	0	28	632	43	3	30	13	101	201	527

[1] Adjacent new 345-kV ROW, exclusive of existing 115-kV ROW that would be upgraded to 345-kV

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These summary characteristics had been developed by NUSCO in September, 2006, when the following tables were prepared:

Table 3-8: Springfield Option A – South

Segment	Length (Miles)	Cross Sections	Right-of-Way Acquired (Acres)	115-kV Underground (Miles)	345-kV Underground (Miles)	Reconfig-uration Distance (Miles)	Number of Line Crossings	Number of River Crossings
1	14.40	5	28.08	0	0	0	0	0
1A	3.57	4	5.57	4.60	0	3.57	0	0
27A	11.75	12	0	0	1.45	0	0	1
41	11.04	1	0	0	0	0	4	0

Table 3-9: Springfield Option A – North and B – North

Segment	Length (Miles)	Cross Sections	Right-of-Way Acquired (Acres)	115-kV Underground (Miles)	345-kV Underground (Miles)	Reconfig-uration Distance (Miles)	Number of Line Crossings	Number of River Crossings
1	14.40	5	28.08	0	0	0	0	0
1A	3.57	4	5.57	4.80	0	3.57	0	0
27	20.62	23	19.03	9.46	0	16.63	0	1

Throughout 2007, more detailed engineering, planning, routing and environmental analyses were conducted. In considering the use of the either route, the threshold issue was the confirmation by transmission planners that the use of each route would solve all contingencies and have comparable network performance and reliability. When network performance was confirmed for each route, of most importance next was a detailed engineering and siting assessment of the line separations, structure options and electrical characteristics along the Northern Route. That assessment led to the conclusion that the new 345-kV circuits could share structures with re-built 115-kV overhead circuits on the Northern Route. No 115-kV circuit undergrounding would be required.

Cost estimates and environmental impact assessments dropped for the Northern Route in comparison to the equivalent estimates and assessments when the new 345-kV lines and the re-conductored or re-built 115-kV overhead lines were sited on the mostly separate rights-of-way associated with using the Southern Route for the 345-kV line.

After the 2007 work, analyses do show that the Northern Route can accommodate the 345-kV line and is superior because of:

- The likelihood or probability of timely siting;
- The shorter distance for the new 345-kV lines, 34.9 miles for the Northern Route versus 40.5 miles for the Southern Route;
- The dramatic drop in the total miles of impacted overhead corridors, a total for the Northern of 41.9 miles versus a total of 64.5 miles for the Southern Route (the sum of the 345-kV corridor length of 40.5 miles plus the 24.0 miles on the Northern Route where the existing corridor would be impacted by overhead 115-kV line up-grade work);
- Anticipated lower cost;
- Fewer environmental impacts;

- Fewer property abutters;
- Lower acreage clearing;
- Similar system benefits to meet load demand; and
- Proximity to the Fairmont Switching Station where nine 115-kV lines interconnect, allowing future system expansion options such as adding a 345/115-kV autotransformer at Fairmont for injection of power into the Greater Springfield area 115-kV system.

The following subsections of this Section 3.4 present a summary of the route selection and engineering studies which show this superiority of the Northern Route to the Southern Route based on the principal criteria, costs and impacts.

3.4.2.1 The 345-kV Overhead Line Route-Selection Process

To facilitate the assessment and scoring of the transmission line route alternatives, NUSCO developed Project-specific evaluation criteria that address environmental, human and social, land-use, and engineering/technical factors that are relevant to making a choice between the Northern Route and the Southern Route for the GSRP. Table 3-10 lists these evaluation criteria, the data metric for each criterion, and the source for the applicable data for the 345-kV overhead line. For the potentially viable Project route alternatives, NUSCO applied numeric data metrics that were as objective as possible to obtain a numerical score (or ranking) for each alignment based on the evaluation criteria. The data were translated to a common scale for summing purposes and the totals were then summarized and sorted, resulting in a raw, unweighted score for each potential line-route option. Based on the evaluation criteria, the best scoring potential options represented routes with potentially fewer impacts, less challenging circumstances, and/or other more favorable conditions and were, accordingly, preferable routes.

Table 3-10: Project Evaluation Criteria and Associated Data Metrics – Overhead 345-kV Lines

Evaluation Criteria	Data Metric	Available Data Source
Total route length	Feet	GIS analysis
Length NOT paralleling existing linear facilities	Feet	Visual review using aerial photography in GIS
Length by land use (Commercial/Industrial)	Feet	MassGIS land use
Length by land use (Undeveloped Land)	Feet	MassGIS land use
Length by land use (Residential)	Feet	MassGIS land use
Length by land use (Park/School/Open Space)	Feet	MassGIS Protected and Recreational Open Space Parcel data
Length through private easement	Feet	Parcel data
Length through stream or wetland	Feet	DEP wetlands and streams
Length through environmental sensitive area	Feet	NHESP priority habitats of protected species
Railroad crossings	Number	Visual review using aerial photography in GIS
Stream crossings	Number	Visual review using aerial photography in GIS
Cultural resources predictive modeling analysis	Qualitative score (1 to 3)	UMass Report
Residences w/in ROW	Number	Visual review using aerial photography in GIS
Residences w/in 100 feet of edge of ROW	Number	Visual review using aerial photography in GIS
Residences w/in 101 to 300 feet of edge of ROW	Number	Visual review using aerial photography in GIS
Businesses w/in ROW	Number	Visual review using aerial photography in GIS
Businesses w/in 100 feet of edge of ROW or centerline	Number	Visual review using aerial photography in GIS
Businesses w/in 101 to 300 feet of edge of ROW	Number	Visual review using aerial photography in GIS
Public Facilities w/in 300 feet of edge of ROW	Number	MassGIS infrastructure Visual review using aerial photography in GIS
Public Facilities w/in 301 to 1,200 feet of edge of ROW	Number	MassGIS infrastructure Visual review using aerial photography in GIS
Visibility	Rating	Visual review using aerial photography in GIS

For the 345-kV overhead lines, each of two alternate Agawam to Ludlow line routes on existing ROW, together with the North Bloomfield to Agawam line, would establish the required North Bloomfield-Agawam-Ludlow 345-kV connection. Although the majority of these two routes differ geographically, each route between North Bloomfield Substation and the Connecticut state border and from the border to Agawam Substation would follow the same existing overhead transmission line ROW. The alternate

routes for the new 345-kV Agawam to Ludlow transmission line, referred to herein as the Preferred Route or Northern Route and the Noticed-Alternative Route or Southern Route, each of which includes a common route segment from the North Bloomfield to the Agawam Substation, are described as follows:

The Preferred Route would extend from North Bloomfield Substation to Agawam Substation following existing ROW, and then would continue north from Agawam Substation, still on existing ROW to Ludlow Substation.

The Noticed-Alternative Route would extend from North Bloomfield Substation to the Agawam Substation and then south from the Agawam Substation to the South Agawam Junction. For a portion of this segment in Agawam, approximately 1.1 miles of the ROW is too narrow and would have to be widened by approximately 65 feet to share the ROW with the new North Bloomfield to Agawam 345-kV line. The line then turns east at South Agawam Junction, following existing ROW generally paralleling the Connecticut/Massachusetts border, before turning north (at Hampden Junction) to reach the Ludlow Substation.

Comparing the Northern and Southern Routes between Agawam and Ludlow, NUSCO considered that the ROW along the Northern Route would be affected in any case by the required re-construction of the existing 115-kV lines between Agawam, Piper, Chicopee, Shawinigan, and Ludlow. There are currently two 115-kV circuits from Agawam to Piper to Chicopee, two from Chicopee to the Exit 6 Junction near Shawinigan, two from East Springfield Junction to Fairmont, three from the Exit 6 Junction near Shawinigan to East Springfield Substation, and three from Shawinigan to Orchard Junction to Ludlow. These circuits are supported by various types of single- and double-circuit line structures (i.e., two circuits share common supporting structures). These 115-kV circuits will all have larger conductors to yield higher circuit capacity. The new 345-kV line can be constructed on these ROW as part of the same overall construction effort, and it can share structures with one of the 115-kV circuits in each segment of the Northern Route.

The Northern and Southern Routes are illustrated below in Figure 3-8 and Figure 3-9, respectively. The following Table 3-11 compares the Northern and Southern Routes, illustrating miles of affected ROW in both Massachusetts and Connecticut.

Figure 3-8: Preferred Northern Route

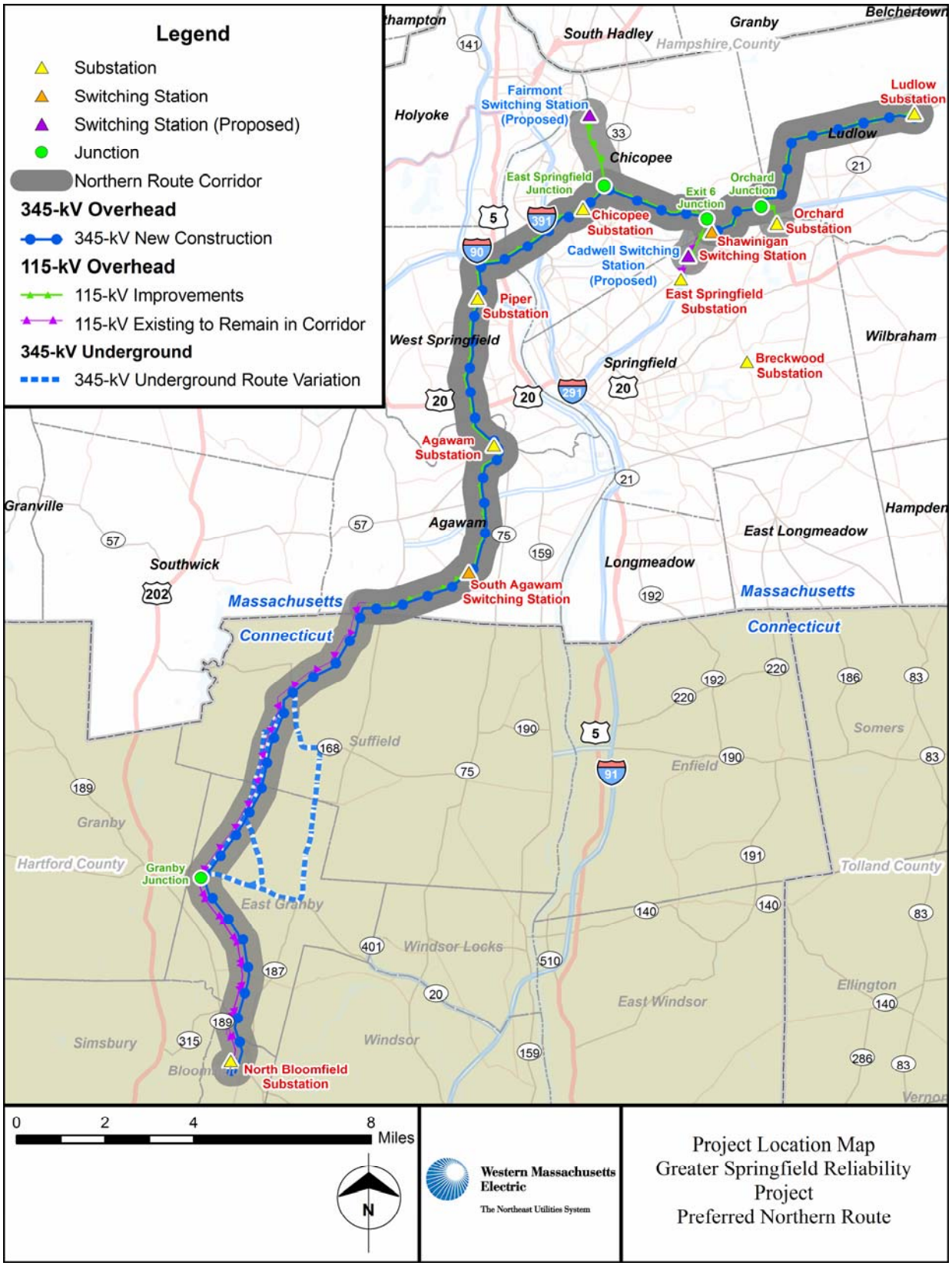

Figure 3-9: Noticed-Alternative Southern Route

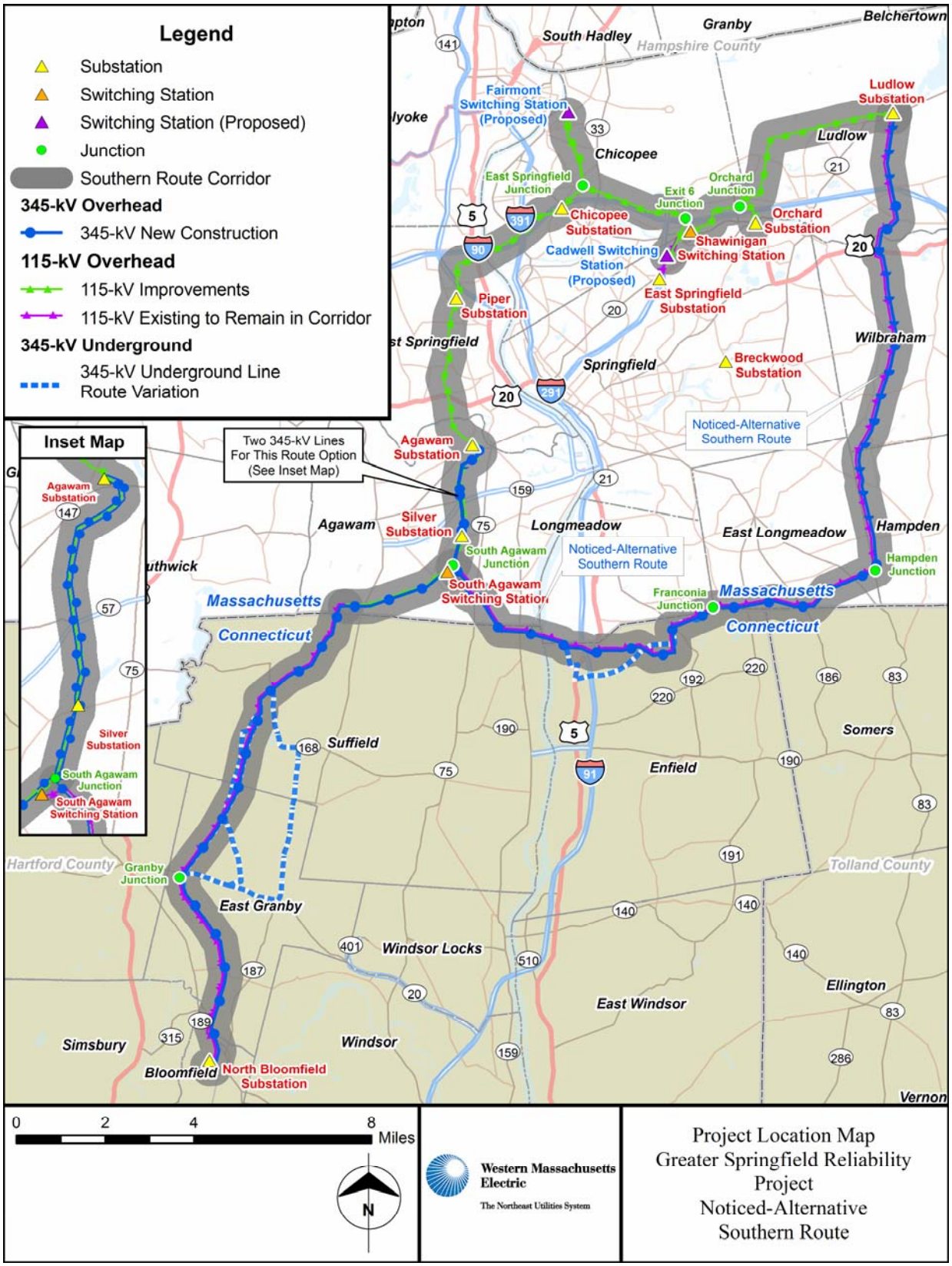

Table 3-11: Northern vs. Southern Route Comparison

ROW Segment	Affected ROW if Both New 345-kV & Reconstructed 115-kV lines located on Northern Route (miles/location by state)	Affected ROW if 115-kV lines on Northern Route & New 345-kV line on Southern Route (miles/location by state)
N. Bloomfield/ Agawam	18 miles (6 miles in MA and 12 miles in CT)	18 miles (6 miles in MA and 12 miles in CT)
Agawam/Piper-Chicopee/Ludlow	17 (MA)	17 (MA)
S. Agawam/ Hampden/Ludlow	N/A	22 (5 miles in CT and 17 miles in MA)
115-kV Spurs	4 (MA)	4 (MA)
Total Affected ROW[41]	39 (12 miles in CT and 27 miles in MA)	61 (17 miles in CT and 44 miles in MA)

Accordingly, if the Southern Route were selected for the 345-kV line between Agawam and Ludlow, a total of 64.5 miles of existing overhead transmission line ROW would have to be disturbed for activities such as vegetation clearing, building new or widening existing access roads for use during construction, excavation for structure foundations, and other construction tasks. On the other hand, use of the Northern Route would involve only 39 miles of transmission line ROW disturbance, avoiding the disturbance of approximately 22 linear miles of ROW. The consolidation of the 345-kV and 115-kV line construction along the Northern Route also would require fewer construction support and staging areas and substation facilities.

The selected preferred and noticed-alternatives line routes were further compared as presented in Table 3-12. "Check marks" (✓) in each table identify the route which is superior for each of the evaluation criteria employed by NUSCO.

[41] The circuit miles of new 345-kV line construction for the Northern Route is 34.8 miles and for the Southern Route is 43.6 miles (inclusive of 3.2 miles in the North Bloomfield to Agawam segment (above) and another 3.2 miles in the segment which goes from Agawam to South Agawam Junction). *Note: for the Southern Route, two sets of structures for 345-kV lines are required in the segment from South Agawam Junction to Agawam Substation in order to make the connection at the Agawam Substation and then to return to the Southern Route segment which goes from South Agawam Junction to Hampden Junction to Ludlow Substation.*

Table 3-12: Comparative Summary of Northern and Southern 345-kV Overhead Line Routes Including 115-kV Line Improvements

Evaluation Criteria	Northern Route w/115-kV Improvements (Preferred Route)		Southern Route w/ 115-kV Improvements (Noticed-Alternative)	
Construction Schedule	36 months		36 months[42]	
Total Costs	$714 Million[43]	✓	$766 Million	
Easement & Potential Home Impacts	Fewer homes adjacent (one corridor)	✓	More homes adjacent (two corridors)	
Route Length	39.4 miles	✓	61.8 miles	
Tree Removal	Less tree clearing (one corridor)	✓	More tree clearing (two corridors)	
Streams/wetlands crossed	Approximately 6.8 miles	✓	Approximately 13.4 miles	
Threatened & Endangered Species Habitat crossed	Approximately 7.8 miles	✓	Approximately 20.5 miles	
Additional ROW width	Approximately 11.1 acres	✓	Approximately 15.6 acres	
Potential Cultural Resources	Less disturbance (one corridor)	✓	More disturbance (two corridors)	

Structure sharing by the new 345-kV circuit and a 115-kV circuit on the same right-of-way results in clear advantages for the Northern Route over the Southern Route on each of the five (5) Key Criteria used by NUSCO in making its final choice.

3.4.2.2 Current Cost Comparisons for the Final 345-kV Overhead Line Route Options 6a North (with and without the Cables) and 6a South (with and without the Cables)

NUSCO, with the assistance of Burns & McDonnell, has completed cost comparisons for the final solution options, including the preferred Springfield Solution which is identified, consistent with the Options Analysis, as Option A, 6a North (without cables) or in the following table, simply as 6n North. The results of those analyses are present below in Section 3.5 in Table 3-13.

For those options in the table which include "cables", the final configuration of the cables was determined by NUSCO at an interim stage of the ISO-NE Review Process. It must be distinguished from the more

[42] See: Section 5.1 for a footnoted discussion of performance advantages during construction if the decision were made to construct the 345-kV lines on the Southern Route prior to constructing the 115-kV improvements along the Northern Route. To gain that construction period performance advantage, however, the total construction duration would be longer than indicated here and costs would increase as well.

[43] Current cost comparisons are given in the following Section 3.4.2.2 are total cost including owner directs and indirects.

expansive and expensive SCP. The revised cables project includes one replacement underground 115-kV cable circuit from the East Springfield Substation to the Breckwood Substation and a second replacement underground cable circuit from the West Springfield Substation to the Breckwood Substation. In order to solve contingency overloads, while also reducing costs and maximizing the value of the remaining "through-path" to the West Springfield Substation, no new underground 115-kV cable circuit from the East Springfield Substation to the Clinton Substation was included. In effect, the replacement underground 115-kV cable circuit from the West Springfield Substation to the Breckwood Substation was the more cost-effective and valuable alternative.

As shown in Table 3-13, the following results apply with respect to the Northern Route versus the Southern Route comparison:

- Each 6a option using the Northern Route is less expensive than its counterpart option using the Southern Route;
- For the Springfield Solution (without cables), the 6a option using the Northern Route is less expensive than the 6a option using the Southern Route by over $52 million; and
- If different options with respect to Stony Brook are compared on the Northern and the Southern Routes for the solutions without cables, the Northern Route is still superior to the Southern Route (for 6a option (without cables) on the Northern, i.e., the Springfield Solution, versus 6b option (without cables) on the Southern, the difference is about $20 million)

3.4.2.3 Conclusion on Northern versus Southern

In all relevant cases studied, the Northern Route is the less costly alternative to the Southern Route (Section 3.7.2).

With respect to the other Key Evaluation Criteria, the Northern Route is superior to the Southern Route by a significant margin. The dramatically lower number of miles of impacted right-of-way (Table 3-11) translates into significantly lower impacts on the human and the natural resource environment. In no category reviewed in Table 3-12, above, is the Southern Route superior to the Northern Route.

Although difficult to quantify, cost risk, schedule risk and licensing risk are considerably lower on the Northern Route as a result of its lower impacts. Risk of all character arises inevitably from the need to mitigate more impacts, to apply for more permits and to satisfy the concerns of more affected members of the community.

With respect to reliability and ability to meet the electric need, no measurable difference exists between the routes. On balance, the Northern Route is far superior to the Southern Route, just as Option A was found to be far superior to Options B and C in terms of system performance (Section 2.2.2 and Section 2.2.3[44]).

3.5 FINAL COST COMPARISONS FOR OPTIONS 6A NORTH (WITH AND WITHOUT CABLES), 6A SOUTH (WITH AND WITHOUT CABLES), 6B SOUTH (WITH AND WITHOUT CABLES) AND 7A SOUTH

Table 3-13 below contains cost estimates for seven 345-kV route/Stony Brook connection pairs which NUSCO considered as a feasible "short list" of alternative configurations for purposes of cost estimating in this Petition. As explained in Section 2.2.10, above (with further detail in Section 4), when WMECO decided to eliminate the SCP and all other cable upgrades in the City of Springfield, only the alternatives which include "no cables" were in the actual final "short list". However, the interim cable configuration (as of February, 2008) described in Section 3.4.2, above, was included in the table for comparison in order to show the significant total cost reduction associated with the elimination of all of the cable work in the City of Springfield.

Table 3-13 shows all of the results set forth in the Northern Route versus Southern Route comparison in Section 3.4.2 (which are repeated here), and in addition the following results:

- Each 6a option using the Northern Route is less expensive than its counterpart option using the Southern Route;
- For the Springfield Solution (without cables), the 6a option using the Northern Route is less expensive than the 6a option using the Southern Route by over $52 million; and
- If different options with respect to Stony Brook are compared on the Northern and the Southern Routes for the solutions without cables, the Northern Route is still superior to the Southern Route (for 6a option (without cables) on the North, i.e., the Springfield Solution, versus 6b option (without cables) on the South, the difference is about $20 million)
- Removing the cables[45] from option 6a North reduces costs by $148 million;

[44] See also Section 7.2.4 of Exhibit 3.1, for the assessment of the operations personnel from ISO-NE and CONVEX as reported in the Options Analysis.

[45] The "cables" being removed at this stage are those in the interim configuration of the cables project described above in Section 3.2.5.2, i.e., two upgraded cable circuits, one from the East Springfield Substation to the Breckwood Substation and the other from the Breckwood Substation to the West Springfield Substation. These "cables" are not comparable to the three-cable SCP in scope or in cost.