Costs and Savings are in 2005 Dollars

**Table 3: Decision Matrix**

| | | Base Case + two fixes | S<br>Byron - N Madison | S<br>Paddock - Rockdale | SW<br>Salem - N Madison | SW<br>plus Salem - Maquoketa 161 kV fix (Iowa) | SW<br>plus Hazleton - Salem 345 kV fix (Iowa) |
|---|---|---|---|---|---|---|---|
| **Mileage** | | | | | | | |
| 345 kV (or EHV DC) Miles | | 49 | 143 | 84 | 202 | 202 | 278 |
| 138 kV or 161 kV Miles | | 75 | 114 | 60 | 140 | 165 | 216 |
| **Economic Factors** | | | | | | | |
| Estimated Cost ($M) | | $21.40 | $137.30 | $64.00 | $260.10 | $267.48 | $410.10 |
| Annualized ($M/yr) | | $1.93 | $12.36 | $5.76 | $23.41 | $24.07 | $36.91 |
| Market Savings ($M/yr) | | $10.57 | $15.53 | $10.78 | $6.52 | $15.53 | $14.00 |
| Net Savings ($M/yr) | | $8.64 | $3.17 | $5.02 | ($16.88) | ($8.54) | ($22.91) |
| **Sensitivities:** | | | | | | | |
| 3x Market Savings | | 31.7 | 46.6 | 32.3 | 19.6 | 46.6 | 42.0 |
| 3x Net Savings | | 29.8 | 34.2 | 26.6 | (3.8) | 22.5 | 5.1 |
| **Other Factors** | | | | | | | |
| Transfer Capability (MW) | 16% | 3648 | 4787 | 4756 | 4766 | 4766 | 4835 |
| LMP Comparability (w/ UP) | 10% | 8.0 | 9.0 | 9.0 | 5.0 | 9.0 | 10.0 |
| Reliability (LOLE) | 5% | 4.0 | 10.0 | 10.0 | 10.0 | | |
| Reliability (EUE) | 5% | 0.0 | 10.0 | 0.0 | 9.0 | | |
| Strategic Benefits | 24% | 1.7 | 7.2 | 1.7 | 8.8 | | |
| System Performance | 5% | 9.0 | 9.0 | 10.0 | 10.0 | | |
| Operating Flexibility | 5% | 1.0 | 8.0 | 4.0 | 7.0 | | |
| Societal Impacts | 15% | 10.0 | 5.0 | 9.0 | 7.0 | | |
| Environmental Impacts | 15% | 10.0 | 4.0 | 9.0 | 3.0 | | |
| **NET SCORE** | **100%** | **5.4** | **7.3** | **5.2** | **7.5** | | |

*(February 2, 2005)*

# AMERICAN TRANSMISSION COMPANY ACCESS INITIATIVE - DECISION MATRIX

## Economic Comparison

| Scenario | Measure | Weighting % | Economic Component | Base Case + two fixes | Byron N. Madison (Illinois) | Salem N. Madison (Iowa) |
|---|---|---|---|---|---|---|
| **Base Case** | $Millions per year | 70% | Annual Capital Carrying Charge ($M) | 1.9 | 12.4 | 23.4 |
| | | | Market Savings - 2012 ($M) | 10.0 | 14.6 | 6.2 |
| | | | Loss Cost Savings - 2012 ($M) | -0.5 | 4.0 | 4.1 |
| | | | **Annual Net Savings ($M)** | **8.0** | **2.3** | **-17.3** |
| | | | | 2 | 10 | 6 |
| High Wind | $Millions per year | 10% | Annual Capital Carrying Charge ($M) | 2.7 | 12.9 | 20.1 |
| | | | Market Savings - 2012 ($M) | 17.1 | 27.0 | 27.4 |
| | | | Loss Cost Savings - 2012 ($M) | 0.2 | 3.7 | 5.0 |
| | | | **Annual Net Savings ($M)** | **14.4** | **14.1** | **7.3** |
| | | | | 10 | 10 | 5 |
| High Internal Generation | $Millions per year | 10% | Annual Capital Carrying Charge ($M) | 2.7 | 12.9 | 20.1 |
| | | | Market Savings - 2012 ($M) | 9.7 | 21.3 | 17.5 |
| | | | Loss Cost Savings - 2012 ($M) | -0.3 | 1.2 | 2.0 |
| | | | **Annual Net Savings ($M)** | **7.0** | **8.4** | **-2.6** |
| | | | | 8 | 10 | 0 |
| Low Internal Generation | $Millions per year | 10% | Annual Capital Carrying Charge ($M) | 2.7 | 12.9 | 20.1 |
| | | | Market Savings - 2012 ($M) | 25.0 | 65.7 | 61.7 |
| | | | Loss Cost Savings - 2012 ($M) | -0.3 | 2.3 | 2.9 |
| | | | **Annual Net Savings ($M)** | **22.3** | **52.8** | **41.6** |
| | | | | 4 | 10 | 8 |
| | | 100% | **Economic Score** | **3.6** | **10** | **5.5** |

## Comparison of Other Factors

| Category | Measure | Weighting % | *out of state terminal*<br>*in-state terminal*<br>*connects to* | Access Alternatives<br>Base Case + two fixes | Byron N. Madison (Illinois) | Salem N. Madison (Iowa) |
|---|---|---|---|---|---|---|
| **Transfer capability** | | | | *rank of alternatives on a 1 to 10 scale, with 10 the highest (best)* | | |
| TTC, with two fixes for each alternative | **MW** | | | **3648** | **4787** | **4766** |
| base case | MW | 10.0% | | 4 | 10 | 10 |
| high wind scenario | MW | 2.0% | | 2 | 6 | 10 |
| high internal generation scenario | MW | 2.0% | | 2 | 10 | 10 |
| low internal generation scenario | MW | 2.0% | | 3 | 9 | 10 |
| **LMP comparability (Chris H.)** | | | | | | |
| | With UPPCO | 10.0% | | 8 | 9 | 5 |
| | Without UPPCO | 0.0% | | 0 | 0 | 0 |
| **Reliability measurements** | | | | | | |
| LOLE | probability, days/year | 5.0% | | 4 | 10 | 10 |
| EUE | MWh/yr | 5.0% | | 0 | 10 | 9 |
| **Strategic benefits** | | | | | | |
| provides transmission infrastructure | subjective, +/- | 4.0% | | 1 | 7 | 10 |
| access to out-of-state renewable resources | subjective, +/- | 4.0% | | 3 | 6 | 10 |
| benefits to neighboring systems | subjective, +/- | 4.0% | | 3 | 8 | 5 |
| geographic diversity | subjective, +/- | 4.0% | | 1 | 5 | 9 |
| enhances value of other TYA projects | subjective, +/- | 4.0% | | 1 | 8 | 10 |
| economic development potential | subjective, +/- | 4.0% | | 1 | 9 | 9 |
| **System performance** | | | | | | |
| voltage security | MW | 5.0% | | 9 | 9 | 10 |
| **Operating flexibility** | list anticipated benefits | 5.0% | | 1 | 8 | 7 |
| **Societal impacts** | | 15.0% | | 10 | 5 | 7 |
| corridor sharing potential | % of route | | | | | |
| new right-of-way required | miles | | | | | |
| public/private lands traversed | % of route | | | | | |
| **Environmental impacts** | | 15.0% | | 10 | 4 | 3 |
| river crossings | | | | | | |
| wetlands | | | | | | |
| endangered species | | | | | | |
| State natural areas | | | | | | |
| State parks | | | | | | |
| Federal lands (national forests and parks) | | | | | | |
| tribal lands | | | | | | |
| special water areas | | | | | | |
| | | 100.0% | **Other Factors Score** | **5.44** | **7.32** | **7.52** |

**Summary of Weighting**

| | |
|---|---|
| **Transfer capability enhancement** | 16% |
| **Reliability/system perf. enhancement** | 20% |
| **Strategic benefits** | 24% |
| **Comparability** | 10% |
| **Societal impacts** | 15% |
| **Environmental impacts** | 15% |
| | 100% |

## Comparison of Economic and Other Factors

| | Access Alternatives<br>Base Case + two fixes | Byron N. Madison (Illinois) | Salem N. Madison (Iowa) |
|---|---|---|---|
| **Other Factors Score** | **5.44** | **7.32** | **7.52** |
| **Economic Score** | **3.60** | **10.00** | **5.50** |
| **Overall Score** | **9.04** | **17.32** | **13.02** |

*the higher the score, the better*

| Category | |
|---|---|
| **Economics** | |
| Annual Capital Carrying Charge ($M) | The estimated, levelized annual revenue requirements associated with the Capital Costs of the projects. |
| Market Savings - 2012 ($M) | Equals Production Costs plus Purchased Power Costs minus the revenue from sales. This value includes the loss savings and is in 2003 dollars. |
| Loss Cost Savings - 2012 ($M) | Equals the money saved due to reducing losses on the system. This is the 2012 savings in 2003 dollars.<br>The values for the Base case are taken from Jamal Khudai's Loss presentation. These include accurate measurement of the 60% and 80% load cases.<br>The values for the High Wind, High Internal Generation and Low Internal generation cases were equated from the respective base cases, and the values for the 50% and 70% load values are a .5 and .7 multiple from the base case loss numbers respectively. 50% and 70% were used as an approximation instead of 60% and 80% due to the lack of the 60% and 80% cases at the time of the study. |
| **Annual Net Savings ($M)** | Equals the opposite of the Annual Capital Carrying Charge minus the Market Savings. A positive result indicates a net savings. This value is also in $2003. |
| **Transfer capability** | |
| base case, with two fixes | Formula used for ranking of MUST results: (project MW xfr-3000)/1610 * 10 and then round, for example, Byron (4787-3000)/1610 * 10 ~= 10 |
| high wind scenario, committed internal generation | |
| high internal generation scenario | |
| low internal generation scenario | |
| **Reliability measurements** | |
| LOLE | All of the upgrades met the .1day/year requirement for the LOLE study. Meeting the requirement was set at a value of "4" and the lowest value of .0003 was given a value of 10. The middle values were then subjectively determined. Note: The values for those blocks shaded in yellow were not available at the time this verification was developed. |
| EUE | To rank the EUE results, the data from the EUE studies for each case was compared to the base case. The change in EUE was then normalized by shifting each value up by 11,124. This left the data ranging from 0 to 742,479. Each value was then divided by 74,247.9 to leave values between 0 and 10. The floor of each value was then Taken to produce an integer ranking between 0 and 10. Please See the table to the right for the calculations. |
| **System Performance** | |
| voltage security | Formula used for ranking of VSAT results: (project MW xfr)/(highest project MW xfr) * 10 then subtract 1 point for voltage collapse; for example, byron had the highest so they get a 10 but have to deduct a point for voltage collapse. |
| **LMP comparability** | To rank the LMP comparability, the maximum and minimum LMP values were compared for each upgrade. Because the LMP value for UPPCO was the highest for each case, a second comparison without UPPCO was created to avoid skewing the data. These differences between max and min values were then interpolated with the lowest difference receiving a 10 and the other results being similary scaled. These calculations are in the graphs to the right. |

| | | | Base Case | Byron | Salem |
|---|---|---|---|---|---|
| **Strategic benefits** | | | | | |
| provides transmission infrastructure | subjective, +/- | 2% | 1 | 7 | 10 |
| to better accommodate new generation and/or | | | Provides no new 345 kV infrastructure | Provides additional 345 kV infrastructure | Provides additional 345 kV infrastructure |
| load, and facilitate lower voltage expansion | | | | Project area parallels existing 345 kV (~25 miles) | Project area remote from existing 345 kV |
| | | | | | Lower voltage expansion planned in project area |
| access to out-of-state renewable resources | subjective, +/- | 2% | 3 | 6 | 10 |
| namely, prospective wind generation in Iowa | | | Provides moderate improvement | Provides significant improvement | Provides significant improvement |
| and Minnesota | | | | | Best alternative for this purpose |
| provides system benefits to neighboring | subjective, +/- | 1% | 3 | 8 | 5 |
| transmission owners | | | addresses one limitation on Alliant-West system | moderate improvement in Byron stability response | addresses limitations on Alliant-West system |
| | | | | addresses limitations on Alliant-West system | |
| improves geographic diversity of 345 kV grid | subjective, +/- | 2% | 1 | 5 | 9 |
| | | | No new 345 kV | moderate; up to 25 miles from existing 345 kV | excellent; up to 75 miles from existing 345 kV |
| | | | | 25 miles from nearest parallel 345 kV | ~100 miles from nearest parallel 345 kV |
| enhances value of other TYA projects | subjective, +/- | 2% | 1 | 8 | 10 |
| | | | nothing identified | enhances Wempletown-Paddock, Madison | enhances Wempletown-Paddock, Madison |
| | | | | 345 kV loop, Rockdale-Lannon | 345 kV loop, Rockdale-Lannon, Spring Green- |
| | | | | | W.Middleton conversion |
| improves economic development potential | subjective, +/- | 1% | 1 | 9 | 9 |
| in the project area | | | nothing identified | provides 345 kV infrastructure in area where | provides 345 kV infrastructure in area where |
| | | | | lower voltage system is adequate but not robust | lower voltage system is adequate but not robust |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Operating flexibility** | subjective | | 1 | 8 | 7 |
| | | | no identifiable change | facilitates outage scheduling flexibility for Wempletown-Paddock circuits | facilitates outage scheduling flexibility for Wempletown-Paddock circuits |
| | | | | facilitates outage scheduling flexibility for circuits from Byron | |

| | | | | |
|---|---|---|---|---|
| **Societal impacts** | | 10 | 5 | 7 |
| corridor sharing potential | % of route | n/a | 60% | 100% |
| new right-of-way required | miles | 0 | 38 | 0 |
| public/private lands traversed | % of route | n/a | TBD | TBD |

| | | |
|---|---|---|
| This provides numerical justification for the Societal Impacts rating. This weights the corridor sharing at 33% of the final value, and the new right-of-way at 66% of the final value. | 0.196595745 | 0.33 |
| | 0.28 | - |
| | 5.21 | 6.70 |