

## Upper Peninsula Generation Integration Screening Study

September 2016

ATC voluntarily performed a high level, steady-state screening of transmission facilities in Michigan's Upper Peninsula. This was done to assist generation developers with the preliminary identification of potential locations where existing transmission facilities may be able to accommodate the addition of new and/or additional generation capacity. All potential locations were screened for single contingency steady-state limitations. Locations that could not accommodate generation for a single contingency were removed from the Tables that were produced through this effort. ATC has not performed any analysis to identify the scope or cost of work to eliminate the limit(s) that were identified for any of the contingencies that were noted. ATC may choose to perform similar screening studies of other portions of its footprint in the future, as system conditions and circumstances warrant.

Additional steady state, multiple contingency analysis was performed for locations that appeared to be capable of hosting 100 MW or more of generation under steady state, single contingency conditions. The multiple contingency analysis resulted in reduced generation capacity from the single contingency screen being indicated for some locations. Other locations could not accommodate any new generation under multiple contingency conditions and, as such, were removed from the Tables. ATC has not performed any analysis to identify the scope or cost of work to eliminate the limit(s) that were identified for any of the contingencies that were noted.

ATC's screening did not include any stability analysis. Previous studies in the UP have identified sensitivity to stability issues. Since different types of generating units may have substantially different stability performance characteristics, a stability analysis would not be generally applicable. Furthermore, this study did not consider the number or size of units necessary to be a replacement for Presque Isle Power Plant. Finally, the study analyzed only one potential generation site at a time and, as such, the results are not necessarily additive.

The Tables that follow below identify the location, screening results and the U.P. sub-zone where existing transmission facility is located. The attached map is divided into six sub zones for ease in finding the locations identified in the Tables. Tables 1 illustrates the results of the multiple contingency analysis. Table 2 provides the results of the single contingency analysis sorted by sub-zone.

Additional disclaimers: This was a high level screening study using a single steady-state model and a particular set of assumptions, as described herein. The study results listed in the Tables below may not be indicative of the results that would be produced via the MISO Tariff Attachment X Generation Interconnection process. System stability, both angular and voltage, were not considered in this screening study. ATC makes no representations, either expressed or implied, that the scope of the interconnection facilities or transmission upgrades required to connect generation at these sites would be minimal, or even feasible. Single contingency screening results do not reflect any possible reductions required for multiple contingencies. The analysis considered 69kV, 138kV and 345kV nodes in the power flow model, but did not consider actual bus configuration or the existence of buses for constructability at the locations that were studied. Corresponding interconnection facilities and transmission upgrades

will be determined by the MISO Tariff Attachment X process. This non-binding, voluntary study is presented for informational purposes only and ATC makes no guarantee or warranty that the information presented herein is accurate or complete.

**Additional Steady- State Analysis Base Assumptions**

Presque Isle Generating Plant Output: 0 MW

Interconnection with the City of Marquette: 0 MW interchange

Mackinac HVDC flow modeled as: 20 MW North to South

White Pine Generating Plant Output: 0 MW

Empire Mine Load: 0 MW

**Preliminary Results with Multiple Contingency Screen**

**Table 1**

| <b>Location</b> | <b>Voltage</b> | <b>Potential Generation Amount (MW)</b> | <b>Sub Zone</b> | <b>Contingency Screen</b> |
|-----------------|----------------|---|-----------------|---------------------------|
| Atlantic        | 69kV           | 77                                      | 1               | Multiple                  |
| M-38            | 138kV          | 75                                      | 1               | Multiple                  |
| Presque Isle    | 138kV          | 274                                     | 3               | Multiple                  |
| National        | 138kV          | 260                                     | 3               | Multiple                  |
| Empire          | 138kV          | 240                                     | 3               | Multiple                  |
| Freeman         | 138kV          | 149                                     | 3               | Multiple                  |
| Big Bay         | 138kV          | 136                                     | 3               | Multiple                  |
| Tilden          | 138kV          | 124                                     | 3               | Multiple                  |
| Barnum          | 138kV          | 107                                     | 3               | Multiple                  |
| North Lake      | 138kV          | 107                                     | 3               | Multiple                  |
| Perch Lake      | 138kV          | 103                                     | 3               | Multiple                  |

**Preliminary Results Using Single Contingency Screen**

**Table 2**

| <b>Location</b>    | <b>Voltage</b> | <b>Potential Generation Amount (MW)</b> | <b>Sub Zone</b> | <b>Contingency Screen</b> |
|--------------------|----------------|---|-----------------|---------------------------|
| M-38               | 69kV           | 68                                      | 1               | Single                    |
| Elevation St.      | 69kV           | 61                                      | 1               | Single                    |
| Winona             | 69kV           | 60                                      | 1               | Single                    |
| Atlantic           | 138kV          | 59                                      | 1               | Single                    |
| Winona             | 138kV          | 58                                      | 1               | Single                    |
| Boston             | 69kV           | 56                                      | 1               | Single                    |
| Osceola            | 69kV           | 56                                      | 1               | Single                    |
| Mass               | 69kV           | 50                                      | 1               | Single                    |
| Henry St.          | 69kV           | 48                                      | 1               | Single                    |
| MTU                | 69kV           | 48                                      | 1               | Single                    |
| Lake Mine          | 69kV           | 39                                      | 1               | Single                    |
| Toivola            | 69kV           | 39                                      | 1               | Single                    |
| Ontonagon          | 69kV           | 37                                      | 1               | Single                    |
| Ontonagan          | 138kV          | 34                                      | 1               | Single                    |
| Portage            | 69kV           | 33                                      | 1               | Single                    |
| White Pine Mine    | 69kV           | 33                                      | 1               | Single                    |
| Rockland           | 69kV           | 32                                      | 1               | Single                    |
| White Pine Village | 69kV           | 32                                      | 1               | Single                    |
| Baraga             | 69kV           | 31                                      | 1               | Single                    |
| L'Anse             | 69kV           | 30                                      | 1               | Single                    |
| UPSCO              | 69kV           | 27                                      | 1               | Single                    |
| Victoria           | 69kV           | 26                                      | 1               | Single                    |
| Keweenaw           | 69kV           | 21                                      | 1               | Single                    |
| Twin Lakes         | 138kV          | 77                                      | 2               | Single                    |
| Aspen              | 69kV           | 70                                      | 2               | Single                    |
| Iron Grove         | 69kV           | 55                                      | 2               | Single                    |
| Lakota Rd.         | 138kV          | 47                                      | 2               | Single                    |
| Strawberry Hill    | 69kV           | 41                                      | 2               | Single                    |
| Crystal Falls      | 69kV           | 40                                      | 2               | Single                    |
| Peavy Falls        | 69kV           | 35                                      | 2               | Single                    |
| Lincoln            | 69kV           | 32                                      | 2               | Single                    |
| Florence           | 69kV           | 30                                      | 2               | Single                    |
| Lakehead           | 69kV           | 25                                      | 2               | Single                    |
| Pine               | 69kV           | 22                                      | 2               | Single                    |
| Conover            | 69kV           | 20                                      | 2               | Single                    |
| Lakota Rd.         | 69kV           | 20                                      | 2               | Single                    |
| Michigamme         | 69kV           | 16                                      | 2               | Single                    |

**Preliminary Results Using Single Contingency Screen**

**Table 2 (Continued)**

| <b>Location</b>      | <b>Voltage</b> | <b>Potential Generation Amount (MW)</b> | <b>Sub Zone</b> | <b>Contingency Screen</b> |
|----------------------|----------------|---|-----------------|---------------------------|
| Bruce Crossing       | 69kV           | 15                                      | 2               | Single                    |
| Land O Lakes         | 69kV           | 15                                      | 2               | Single                    |
| Watersmeet           | 69kV           | 13                                      | 2               | Single                    |
| Forsyth              | 69kV           | 93                                      | 3               | Single                    |
| North Lake           | 69kV           | 60                                      | 3               | Single                    |
| Barnum               | 69kV           | 52                                      | 3               | Single                    |
| Alger Delta          | 69kV           | 46                                      | 3               | Single                    |
| Chatham              | 69kV           | 46                                      | 3               | Single                    |
| Munising             | 69kV           | 46                                      | 3               | Single                    |
| Forest Lake          | 69kV           | 45                                      | 3               | Single                    |
| AD Hiawatha          | 69kV           | 44                                      | 3               | Single                    |
| Mineral Proc.        | 69kV           | 43                                      | 3               | Single                    |
| Munising             | 138kV          | 40                                      | 3               | Single                    |
| Gwinn                | 69kV           | 39                                      | 3               | Single                    |
| Timber Products      | 69kV           | 29                                      | 3               | Single                    |
| Greenstone           | 69kV           | 25                                      | 3               | Single                    |
| Sawyer               | 69kV           | 21                                      | 3               | Single                    |
| MTF                  | 69kV           | 13                                      | 3               | Single                    |
| Perch Lake           | 69kV           | 13                                      | 3               | Single                    |
| Randville            | 69kV           | 73                                      | 4               | Single                    |
| Watson               | 69kV           | 51                                      | 4               | Single                    |
| Mountain             | 69kV           | 48                                      | 4               | Single                    |
| Harris               | 69kV           | 36                                      | 4               | Single                    |
| Sagola               | 69kV           | 34                                      | 4               | Single                    |
| Old Mead Rd.         | 69kV           | 86                                      | 5               | Single                    |
| Lakehead Rapid River | 69kV           | 56                                      | 5               | Single                    |
| North Bluff          | 69kV           | 53                                      | 5               | Single                    |
| Masonville           | 69kV           | 52                                      | 5               | Single                    |
| West Side            | 69kV           | 51                                      | 5               | Single                    |
| Bay View             | 69kV           | 50                                      | 5               | Single                    |
| Cornell              | 69kV           | 48                                      | 5               | Single                    |
| Escanaba             | 69kV           | 45                                      | 5               | Single                    |
| Gladstone            | 69kV           | 45                                      | 5               | Single                    |
| Blaney Park          | 69kV           | 84                                      | 6               | Single                    |
| Engadine             | 69kV           | 84                                      | 6               | Single                    |
| Valley               | 69kV           | 83                                      | 6               | Single                    |
| Gould City           | 69kV           | 82                                      | 6               | Single                    |
| Curtis               | 69kV           | 81                                      | 6               | Single                    |
| Manistique           | 69kV           | 73                                      | 6               | Single                    |

**Preliminary Results Using Single Contingency Screen**

**Table 2 (Continued)**

| <b>Location</b>   | <b>Voltage</b> | <b>Potential Generation Amount (MW)</b> | <b>Sub Zone</b> | <b>Contingency Screen</b> |
|-------------------|----------------|---|-----------------|---------------------------|
| Glen Jenks        | 69kV           | 59                                      | 6               | Single                    |
| 3 Mile            | 69kV           | 54                                      | 6               | Single                    |
| 9 Mile            | 69kV           | 54                                      | 6               | Single                    |
| Newberry          | 69kV           | 49                                      | 6               | Single                    |
| Sault             | 69kV           | 49                                      | 6               | Single                    |
| Louisiana Pacific | 69kV           | 48                                      | 6               | Single                    |
| NBHSPL 69         | 69kV           | 48                                      | 6               | Single                    |
| Newberry Village  | 69kV           | 48                                      | 6               | Single                    |
| Roberts           | 69kV           | 47                                      | 6               | Single                    |
| Portage St        | 69kV           | 46                                      | 6               | Single                    |
| Tone              | 69kV           | 42                                      | 6               | Single                    |
| Kincheloe         | 69kV           | 41                                      | 6               | Single                    |
| Rudyard           | 69kV           | 41                                      | 6               | Single                    |
| Eckerman          | 69kV           | 39                                      | 6               | Single                    |
| Hulbert           | 69kV           | 39                                      | 6               | Single                    |
| MI Limestone      | 69kV           | 37                                      | 6               | Single                    |
| Raco              | 69kV           | 37                                      | 6               | Single                    |
| Rexton            | 69kV           | 36                                      | 6               | Single                    |
| Rockview          | 69kV           | 36                                      | 6               | Single                    |
| Brimley           | 69kV           | 35                                      | 6               | Single                    |
| Trout Lake        | 69kV           | 34                                      | 6               | Single                    |
| Pine Grove        | 69kV           | 33                                      | 6               | Single                    |
| Detour            | 69kV           | 32                                      | 6               | Single                    |
| Goetzville        | 69kV           | 32                                      | 6               | Single                    |
| Magazine          | 69kV           | 32                                      | 6               | Single                    |
| Pickford          | 69kV           | 32                                      | 6               | Single                    |
| Seney             | 69kV           | 31                                      | 6               | Single                    |
| Talentino         | 69kV           | 31                                      | 6               | Single                    |
| Dafter            | 69kV           | 27                                      | 6               | Single                    |
| St. Ignace        | 69kV           | 26                                      | 6               | Single                    |
| MLQ               | 69kV           | 25                                      | 6               | Single                    |

