The Future of Michigan's Power Supply – a UP Focus

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Problem Statement

- **Serve load reliably and economically**
- **Upper Peninsula is a load pocket**
- **Three primary variables**
  - **Load**
  - **Generating resources**
  - **Import capability**

Load Forecasting Challenges

- **Economy**
- **Energy efficiency**
- **Retail choice**
- **New end-use technologies**
- **UP load increments or decrements often relatively large**

Generation Status

- **Currently abundant capacity in the MISO region**
- **UP located generation is not adequate to serve UP load (without imports)**
- **UP generators are relatively old, small, & inefficient**
- **Key issues**
  - **Changing environmental rules**
  - **Retirements**
  - **Fuel availability**
  - **Reliability and cost of renewables**

Transmission

- **Transmission within and into the UP faces unique problems**
- **Troll land effects and MISO west to east flows**
- **New transmission issues**
  - **Siting**
  - **Who builds, who pays, who benefits**
  - **Changes in transmission topography**
  - **Planning considerations for the outage of a big line.**

Reliability – A Fragile Balance

- **Planning standard for firm load is one outage event in 10 years**
- **A big system with robust transmission is better at self-healing**
- **UP is a load pocket with transmission constraints – a very small sub-system**
- **This affects reliability and economics**

Economics (Econ 101)

- **Goal is to provide electricity at prices that enable UP commerce to flourish**
- **UP electric infrastructure – improving robustness, but still needs work**
- **THIS WILL COST MONEY**
- **Very important to optimize decisions re: electric system investments**
  - **Fixed vs. variable cost**
  - **Generation vs. transmission**
  - **Long-term vs. short-term**

Things to Think About

- **We have some serious challenges**
- **Optimize long- and short-term perspectives**
- **Portfolio of solutions can reduce risk**
- **Transmission construction mitigates power supply cost but is not a hedge**
- **Cul-de-sac status impedes transparent pricing**
- **Generation investment is direct assigned**
- **Transmission investment is socialized**

Charlie's Thoughts on System Planning

- **Generation close to load is good**
- **Economy of scale is powerful**
- **Robust transmission can cover many ills**
- **All things being equal – local investment is preferable to distant investment**
- **There will always be unintended consequences**
- **Everything is interdependent**