MANITOBA HYDRO INTERNATIONAL &

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GPU SOLUTIONS FOR PSCAD

PROJECT REVIEW

- Sending data to/from GPU is often a bottleneck for performance
- Want to minimize data transfers during solve
- Send matrix for entire system to GPU in compressed storage format
- Use optimized and flexible sparse algorithms to factor system matrix on the GPU; keep the result there
- Send dense vector **b** to the device, solve $A\mathbf{x} = \mathbf{b}$, return dense vector **x**
- Benchmarks for *Province* data set with current code: 2.5 ms per time step with NVIDIA Quadro RTX, 0.5 ms per time step with NVIDIA V100

PROJECT UPDATE

- Writing interface between existing QRFactor code and PSCAD software
- Using object-oriented approach in C
- Project consists of source and header files with mixed host and device code
- Use __host__, __device__, or __global__ decorators to specify where the functions can be called from
- Use separate compilation with nvcc and CUDA linker to create executable
- Possible performance hit with separate compilation unless libraries are linked properly