

# Interconnection Standards

1254(a)(15) EPACT

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# Section 1254(a)(15)

- Each electric utility shall make available, upon request, interconnection service to any electric consumer that the electric utility serves.

Service to an electric consumer under which an on-site generating facility on the consumer's premises shall be connected to the local distribution facilities.....



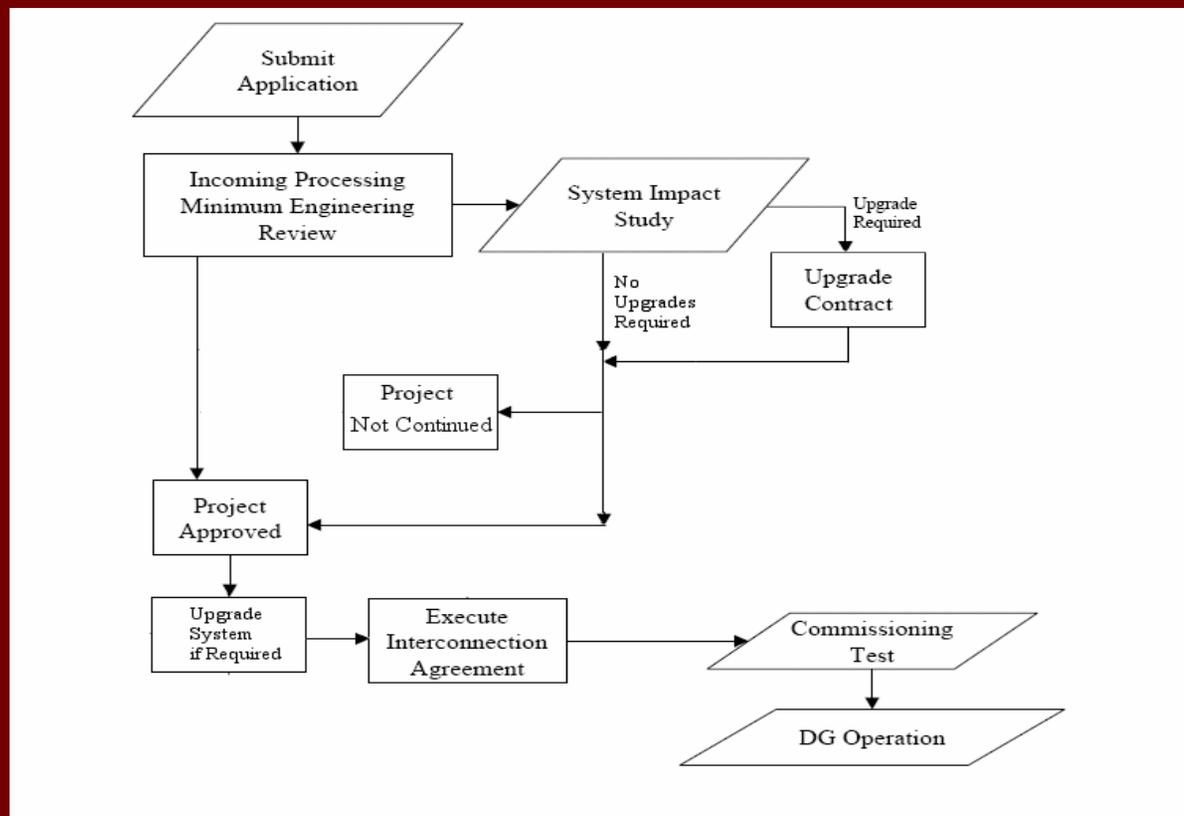
# Interconnection

- Interconnection Policy In Place Since 1989
  - Procedures are documented in Montana-Dakota's "Guidelines for Interconnection Requirements & Parallel Operation of Customer Owned Generation"
  - Guidelines provided upon request



# Interconnection

- Process is similar to that in NARUC PURPA Manual



# Interconnection

- IEEE Standard 1547

- The EPACT Standard endorses IEEE Standard 1547 for Interconnecting Distributed Resources with Electric Power Systems (IEEE 1547).
- Collaborative effort to implement general guidelines for interconnection of generators with an aggregate capacity of 10 MW or less.



# Interconnection

- IEEE Standard 1547

- Originally written & affirmed in 2003 with subsequent revisions & more expected.
- Provides no specifications of hardware or other equipment for a safe & reliable interconnection
- Does not specify exactly how an interconnection is to be made
- Standard 1001-1988 preceded IEEE 1547 & provided more detail for a specific grid. Did not work well as a uniform guide for all grids.



# Interconnection

- Montana-Dakota's Guidelines

- Revised as necessary for consistency with IEEE 1547 Standards as developed
- Relied heavily on information contained in Standard 1001-1988 with adjustments to reflect safe operation on Montana-Dakota's system
- Each interconnection request is studied based on information provided through application process via standard forms.



# Interconnection

- Montana-Dakota's Guidelines

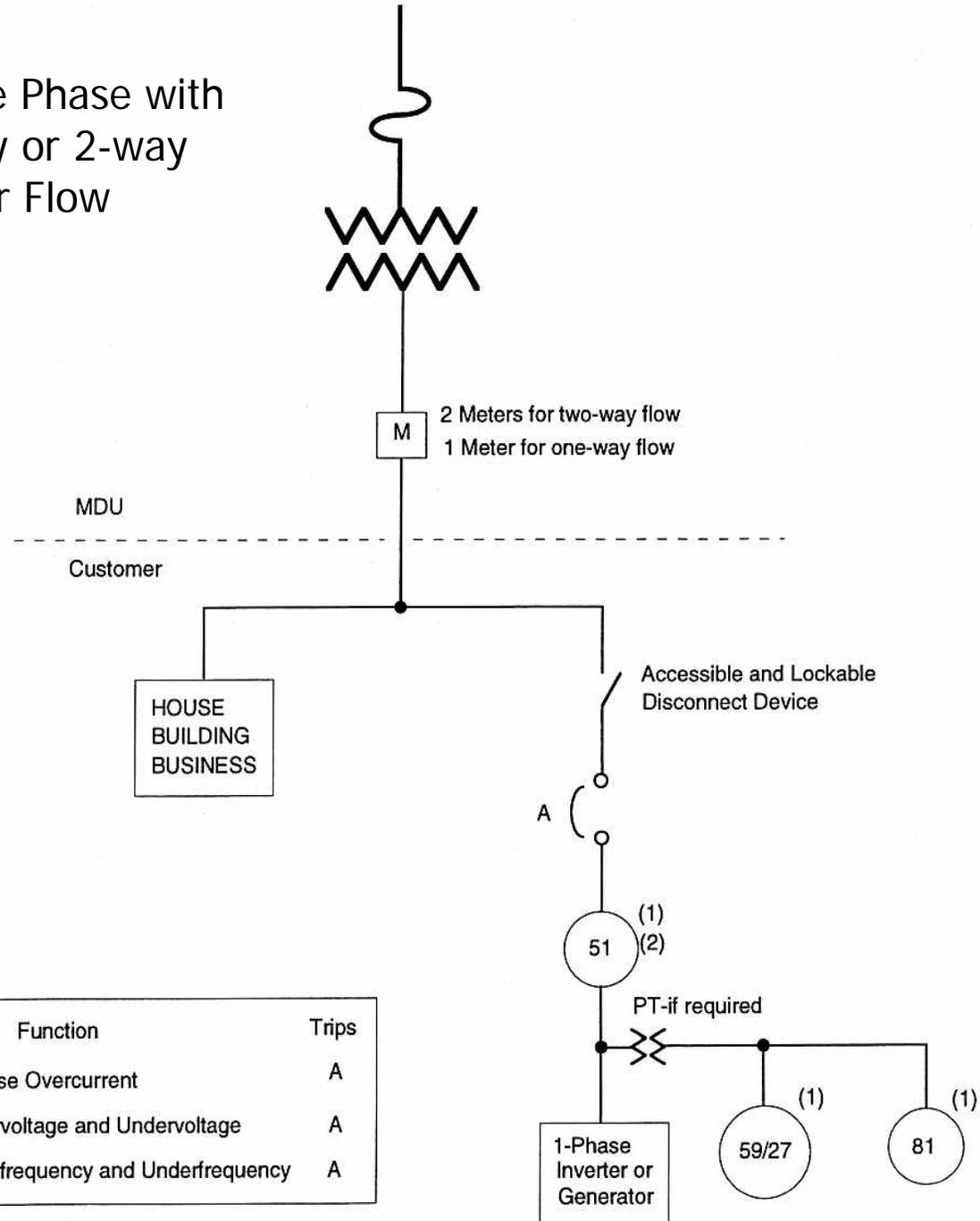
- Study will take into consideration

- Safety for Montana-Dakota personnel,
- Protection of the power system integrity,
- Protection of other customers' equipment & property and
- Protection of interconnecting customer's equipment & property

- Presently 19 different interconnection designs. Following are a couple of more common interconnections.



# Single Phase with 1-way or 2-way Power Flow

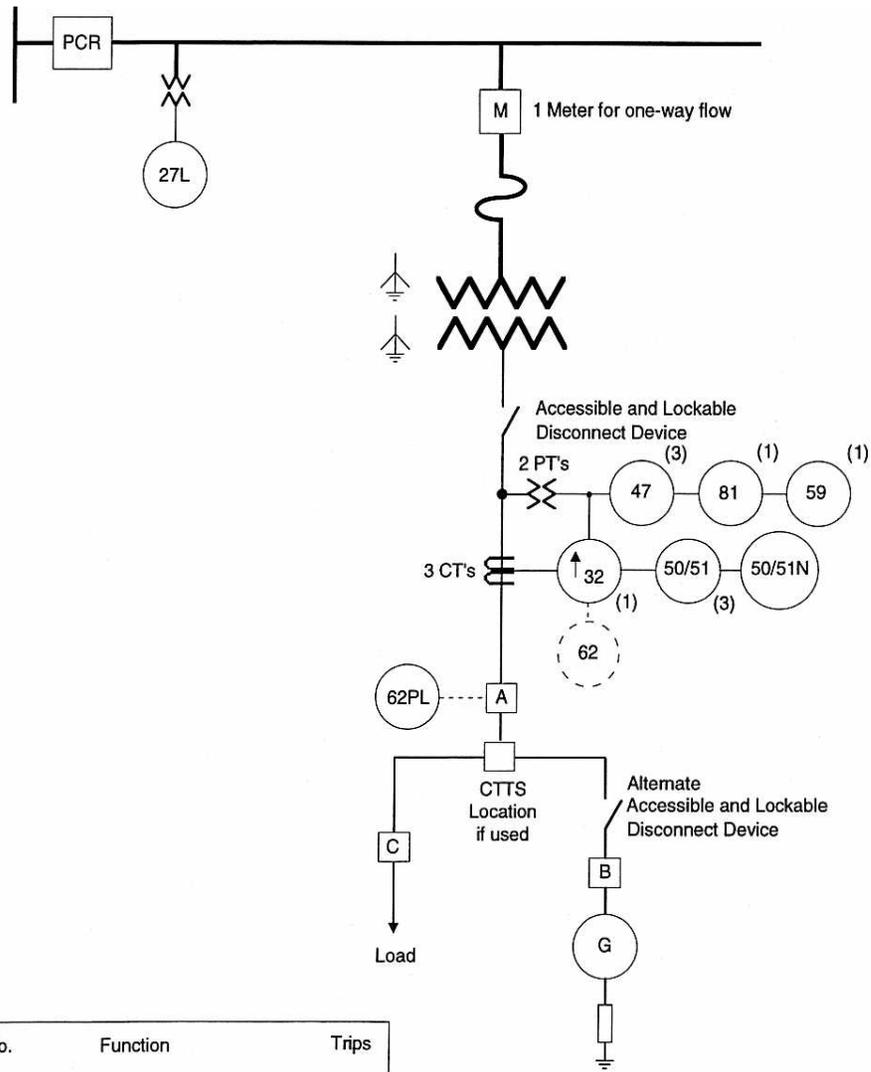


Device No.	Function	Trips
51	Phase Overcurrent	A
59/27	Oversvoltage and Undersvoltage	A
81	Overfrequency and Underfrequency	A

(1) (2) (3) Indicates Number of Phases Monitored



# Medium Generator – Limited Parallel Operation; 1-Way Flow



Device No.	Function	Trips
50/51	Phase Overcurrent	A
50/51N	Ground Overcurrent	A
47	Undervoltage/Negative Sequence	A
59	Overvoltage	A
32	Power (Trip for Power Toward MDU)	A
62	Optional Time Delay relay for 32	A
81	Overfrequency and Underfrequency	A
62PL	Parallel Limit Timer	A
27L	Undervoltage	
CTTS	Closed Transition Transfer Switch (Soft Transfer Required)	

(1) (2) (3) Indicates Number of Phases Monitored

Typical Distribution Interconnection with One-Way Power Flow  
Limited Parallel Operation

	<b>MEDIUM GENERATOR BELOW 5000 KVA FIGURE 3</b>		
	DATE: 12/8/89	<b>MONTANA-DAKOTA UTILITIES CO.</b>	



# Interconnection

- Generators  $< 100$  kW usually connected @ very little cost to interconnecting customer
- Generators  $> 100$  kW may have some expense associated with changes to Company's system.
  - Estimated cost provided upon completion of study
  - All interconnections (including Montana-Dakota's) follow same study guidelines.



# Interconnection

- Transmission interconnections must be applied for through the Midwest Independent System Operator (MISO)
- MISO procedures are in accordance with the FERC Rules for Small Generator Interconnects (20 MW or less) or Rules for Large Generator Interconnects > 20 MW



# Summary

- Montana-Dakota's Interconnection Guidelines are documented and consistently applied to all interconnection requests
- Interconnection Guidelines are specific to Montana-Dakota's system
- An Interconnection Standard should NOT be adopted

