

Comparison of Interconnection Standards

3/28/2003

	Utility 12/3/01 Filing	IEEE Rev 10	Texas	NARUC	FERC	Wisconsin Draft 5.95	California	Proposed Minnesota Standard
Electrical Code Compliance								
Installer must meet codes and permit requirements	Yes	--	Yes	--	Yes	Yes	Yes	Yes
Open Transition								
Mechanical Interlock	Yes	--	--	--	--	--	--	Yes
Describes Protective Elements Required	Yes	--	--	--	--	--	--	Yes
Quick Closed Transition Transfer Switch								
Mechanical Interlock	Yes	Some	Yes	--	--	Yes	Yes	Yes
Describes Protective Elements Required	Yes	--	Yes	--	--	Yes	Yes	Yes
Closed Transition Transfer Switch (Soft Loading)								
Describes Protective Elements Required	Yes	Some	Yes	--	--	Yes	Yes	Yes
Extended Parallel Operation								
Describes Protective Elements Required	Yes	Yes	Yes	--	Yes	Yes	Yes	Yes
Inverter Connection								
Describes Protective Elements Required	Yes	--	Yes	--	--	Yes	Yes	Yes
Describes Inverter Certification Requirements	Yes	--	Yes	--	--	--	Yes	Yes
Interconnection Issues and Requirements								
Visible Disconnect Requirement	Yes	Allowed	Yes	--	--	Yes	Yes	Yes
Grounding Requirements	Yes	Yes	--	--	--	Yes	Yes	Yes
Maximum Single Phase Generation Size			50kW			--	20kVA	40kW
Operating Limits								
Voltage	Yes	Yes	Yes	--	--	Yes	Yes	Yes
Establishes Maximum Voltage Dip Magnatude Level		4-5%	3%					4%
Frequency	Yes	Yes	Yes	--	--	Yes	Yes	Yes
Harmonics	Yes	Yes	Yes	--	--	Yes	Yes	Yes
Interference	Yes	--	Yes	--	--		Yes	Yes
Islanding	Yes	Yes	--	--	--		Yes	Yes
Power Factor requirements				--	--	>90-98%	>90%	>90-100%
Feeder Penetration Percentage Issues								
Deals with Issues involved with Spot Networks	--	Yes	Yes	--	--		Yes	--
Generation Metering, Monitoring and Control								
Describes Metering Requirements	Yes	--	--	--	--	Yes	Yes	Yes
Describes Monitoring Requirements	>1MW	>250kW	>2MW	--	--	Yes	>250kW	>250-1000kW
Protective Relaying								
Describes relaying standards	Yes	Yes	Yes	--	--	--	Yes	Yes
Provides protective one-lines	Yes	--	--	--	--	Yes	--	Yes
Testing Requirements								
Describes required tests for installations	Yes	Yes	--	--	--		Yes	Yes
Allows Pre-Certified or Type Tested equipment	Yes	Yes	Yes	--	--	Yes	Yes	Yes
Defines "Pre-Certified"	--	--	Yes			Yes	Yes	Yes
Requires commisioning tests	Yes	Yes	--	--	Yes	Yes	Yes	Yes
Discusses Periodic maintenance Testing	Yes	Yes	--	--	--	Yes	Yes	Yes
Interconnection Review Process								
Provides Review Process Flow Chart	Yes	--	Yes	Yes	--	Yes	Yes	Yes
Provides standard process	Yes	--	Yes	Some	--	Yes	Yes	Yes
Provides standard costs for engineering studies	--	--	No	No	No	No	Yes	No
Provides Standard Application	Yes	--	Yes	Yes	Yes	Yes	Yes	Yes
Dispute Resolution Procedures								
Provides Interconnection Agreement	Yes	--	Yes	Yes	Yes	Yes	Yes	Yes
Insurance Requirements (Seet Table 3)	Yes	--	Yes	Yes	Yes	--	--	Yes

COMPARISION OF INTERCONNECTION APPLICATION FEES

5/15/2003

	<20kW	20-40kW	40-200kW	200-250kW	250-500kW	500kW-1000kW	1000-10,000kW
Utility 12/3/01 PUC Filing	Cost 1	Cost 2					
IEEE REV 10	NOT ADDRESSED						
Texas	\$0 (See Note 1)					Actual Costs	
NARUC	NOT ADDRESSED						
FERC	NOT ADDRESSED						
Wisconsin	\$0	\$250	\$500				
California	\$800 (See note 2)						
Proposed Minnesota Standard							
Open Transfer Systems	\$0					\$100	
Quick Closed Transfer Systems	\$0	\$100			\$250	\$500	
Extended Parallel Systems Using Pre-Certified Systems	\$0	\$250	\$1,000			\$1,500	
Extended Parallel Systems	\$100	\$500	\$1,500			\$1,500	

Note 1 - charges may be applied to customer if generation is greater then 15% of feeder load level or the generation could contribute > 25% of the maximum potential short circuit current on a single radial feeder.

Note 2 No charges for Solar systems up to 1MW, also special credit of interconnection costs of \$5,000 per state law.

COMPARISON OF UTILITY RESPONSE TIME

3/28/2003

	<20kW	20-40kW	40-200kW	200-500kW	500kW-1000kW	1000-2000kW	2000-10,000kW
Utility 12/3/01 PUC Filing	Not Addressed						
IEEE REV 10	Not Addressed						
Texas	4-6 weeks total process time, unless substatial upgrades to Area EPS are required.						
NARUC (Application Review)	20 Days						
(Supplemental Review)	xx Weeks						
FERC (Application Screening)	25 days (10 + 15)						
(Supplemental Review)	5 days if no modifications required or Place Project in a Queuing Priority if Mods are required						
Wisconsin (Application Review)	10 Days						
(Eng. Review)	10 Days	15 Days		20 Days		40 Days	
California	10 days	20 days					
Proposed Minnesota Standard							
(Application Review)	15 Days (Note 1)						
(Final Review)	15 Days (Note 1)						

Numbers shown are Business Days from receipt of completed application

Many standards provide longer times for secondary Network connections

Note 1 - Additional time may be required on more complex interconnections. Area EPS will notify applicant if additional time is required

COMPARISION OF INSURANCE REQUIREMENTS

3/28/2003

	<20kW	20-40kW	40-200kW	200-250kW	250-500kW	500kW-1000kW	1000-10,000kW
Utility 12/3/01 PUC Filing	\$1,000,000						
IEEE REV 10	Insurance Not Addressed						
Texas	\$1,000,000 plus \$20,000,000 (See note 1)						
NARUC	Insurance Not Addressed						
FERC	Insurance Not Addressed						
Wisconsin	\$300,000	\$1,000,000					\$2,000,000
California (Note 2)	\$500,000	\$1,000,000					\$2,000,000
Proposed Minnesota Standard	\$300,000	\$1,000,000					\$2,000,000

Note 1 Insurance required per ERCOT standard interconnection agreement, no talk of insurance in DG rules.
 ERCOT interconnection agreement requires \$1 million for each of the following; Employers Liability and worker's compensation; Commercial General Liability; Comprehensive Automobile Liability. It is also required to carry \$20 million of Excess Public liability (over and above the \$1 million Employers Liability, Commercial and Automobile Liability Insurance).

COMPARISION OF INTERCONNECTION STUDY FEES

3/28/2003

	<20kW	20-40kW	40-200kW	200-250kW	250-500kW	500kW-1000kW	1000-10,000kW
Utility 12/3/01 PUC Filing	Actual Costs						
IEEE REV 10	N/A						
Texas (Application Fee)	\$0 (See Note 1)					Actual Costs	
NARUC	Actual Costs						
FERC	Actual Costs						
Wisconsin	\$0	Max of \$1000		Actual Costs			
California	\$600 (See note 2)						
Proposed Minnesota Standard	Actual Costs						

**Note 1 - charges may be applied to customer if generation is greater then 15% of feeder load level or the generation could contribute > 25% of the maximum potential shourt circuit current on a single radial feeder.
 Also study interconnection fees may be applied if interconnecting with a networked system and generation is > 20 kW.
 It appears that each Utility files its study fees as part of the DG rate filing.**

Note 2 No charges for Solar systems up to 1MW, also special credit of interconnection costs of \$5,000 per state law.