



Prairie Island Nuclear Generating Plant  
1717 Wakonade Drive East  
Welch, MN 55089-9642

September 12, 2013

L-PI-13-088  
10 CFR 50.54(f)

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Prairie Island Nuclear Generating Plant Units 1 and 2  
Docket Nos. 50-282 and 50-306  
Renewed License Nos. DPR-42 and DPR-60

NSPM's Response to NRC Request for Information Pursuant to 10 CFR 50.54(f)  
Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force  
Review of Insights from the Fukushima Dai-ichi Accident – 1.5 Year Response for  
CEUS Sites

References:

1. NRC Letter, "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012, ADAMS Accession No. ML12056A046.
2. NRC Letter, "Endorsement of EPRI Final Draft Report 1025287, 'Seismic Evaluation Guidance,'" dated February 15, 2013, ADAMS Accession No. ML12319A074.
3. Electric Power Research Institute (EPRI) Report Number 1025287, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," dated November 2012, ADAMS Accession No. ML12333A170.
4. Nuclear Energy Institute (NEI) letter to NRC, "Proposed Path Forward for NTTTF Recommendation 2.1: Seismic Reevaluations," dated April 9, 2013, ADAMS Accession No. ML13101A379.
5. NRC Letter, "EPRI Final Draft Report XXXXXX, 'Seismic Evaluation Guidance: Augmented Approach for the Resolution of Near-Term Task Force Recommendation 2.1: Seismic,' as an Acceptable Alternative to the March 12, 2012, Information Request for Seismic Reevaluations," dated May 7, 2013, ADAMS Accession No. ML13106A331.

6. NSPM Letter to NRC, "PINGP's Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated April 29, 2013, ADAMS Accession No. ML13120A058.

On March 12, 2012, the NRC Staff issued Reference 1 to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 1 of Reference 1 contains specific Requested Actions, Requested Information, and Required Responses associated with Near-Term Task Force (NTTF) Recommendation 2.1, Seismic Evaluations. Enclosure 1 of Reference 1 requested each addressee in the Central and Eastern United States (CEUS) to submit a written response consistent with the requested seismic hazard evaluation information (items 1 through 7) by September 12, 2013. On February 15, 2013, NRC issued Reference 2, endorsing the Reference 3 industry guidance for responding to Reference 1. Section 4 of Reference 3 identifies the detailed information to be included in the seismic hazard evaluation submittals.

On April 9, 2013, NEI submitted Reference 4 to the NRC, requesting NRC agreement to delay submittal of some of the CEUS seismic hazard evaluation information so that an update to the EPRI (2004, 2006) ground motion attenuation model could be completed and used to develop that information. NEI proposed that descriptions of subsurface materials and properties and base case velocity profiles (items 3a and 3b in Section 4 of Reference 3) be submitted to NRC by September 12, 2013, with the remaining seismic hazard and screening information submitted to NRC by March 31, 2014. In Reference 5, the NRC agreed with this recommendation.

The enclosure to this letter contains the requested description of subsurface materials and properties, and base case velocity profiles for the Prairie Island Nuclear Generating Plant (PINGP). The information provided in the enclosure to this letter is considered an interim product of seismic hazard development efforts being performed for the industry by EPRI. The complete and final seismic hazard reports for PINGP will be provided to the NRC in the seismic hazard reevaluation submittals by March 31, 2014 in accordance with Reference 5.

This letter completes the commitment made in the Northern States Power Company, a Minnesota corporation (NSPM), d/b/a Xcel Energy, letter dated April 29, 2013 to submit the information identified in Items 3.a and 3.b for base case velocity profile and the description of subsurface materials and properties in Section 4 of Reference 3.

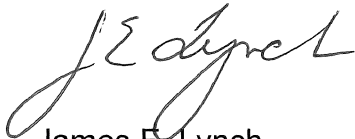
If there are any questions or if additional information is needed, please contact Ms. Jennie Wike, Licensing Engineer, at 612-330-5788.

Summary of Commitments

This letter proposes no new commitments and no revisions to existing commitments.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 09/12/2013



James E. Lynch  
Site Vice President, Prairie Island Nuclear Generating Plant  
Northern States Power Company - Minnesota

Enclosure

cc: Administrator, Region III, USNRC  
Director of Nuclear Reactor Regulation (NRR), USNRC  
Project Manager, PINGP, USNRC  
Resident Inspector, PINGP, USNRC

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**ENCLOSURE**

**Prairie Island Nuclear Generating Plant**

**Subsurface Materials and Properties,  
and Base Case Velocity Profiles**

**ENCLOSURE**  
**Prairie Island Nuclear Generating Plant**  
**Subsurface Materials and Properties, and Base Case Velocity Profiles**

**1.0 Introduction**

On March 12, 2012, the NRC Staff issued Reference 1 to all NRC power reactor licensees and holders of construction permits in active or deferred status. Enclosure 1 of Reference 1 contains specific Requested Actions, Requested Information, and Required Responses associated with Near-Term Task Force (NTTF) Recommendation 2.1, Seismic Evaluations. Enclosure 1 of Reference 1 requested each addressee in the Central and Eastern United States (CEUS) to submit a written response consistent with the requested seismic hazard evaluation information (items 1 through 7) by September 12, 2013. On February 15, 2013, NRC issued Reference 2, endorsing the Reference 3 industry guidance for responding to Reference 1. Section 4 of Reference 3 identifies the detailed information to be included in the seismic hazard evaluation submittals. In a letter dated April 29, 2013 (Reference 4), Northern States Power Company, a Minnesota corporation (NSPM), d/b/a Xcel Energy, committed to submit the information identified in Items 3.a and 3.b for base case velocity profile and the description of subsurface materials and properties in Section 4 of Reference 3.

This enclosure contains the descriptions of subsurface materials and properties, and base case velocity profiles for the Prairie Island Nuclear Generating Plant (PINGP). The information provided in the enclosure to this letter is considered an interim product of seismic hazard development efforts being performed for the industry by Electric Power Research Institute (EPRI). The complete and final seismic hazard reports for PINGP will be provided to the NRC in the seismic hazard reevaluation submittals by March 31, 2014.

**2.0 Subsurface Materials and Properties and Base Case Velocity Profiles**

The basic information used to create the site geologic profile at the PINGP is shown in Table 1. This profile was developed using information documented in Reference 5. The SSE Control Point is defined at the surface, and the profile was modeled up to the surface. For dynamic properties of soft rock layers, modulus and damping curves were represented with two (2) models. The first model used rock curves taken from Reference 6, and the second model assumed linear behavior. These dynamic property models were weighted equally. For dynamic properties of fill and compacted sand layers, modulus and damping curves were also represented with two (2) models. The first model used soil curves taken from Reference 6, the second model used soil curves

taken from Reference 7 and Reference 8. These dynamic property models were weighted equally. To model the profile, rock modulus and damping curves from Reference 6 were paired with soil modulus and damping curves from Reference 6, and linear rock modulus and damping curves were paired with soil modulus and damping curves from References 7 and 8.

The three (3) base case shear-wave velocity profiles used to model amplification at the PINGP site are shown in Figure 1. Profiles 1, 2, and 3 are weighted 0.4, 0.3, and 0.3, respectively. Thicknesses, depths, and shear-wave velocities ( $V_s$ ) corresponding to each profile are shown in Table 2.

Table 1 – Geotechnical Profile for PINGP

Depth Range <sup>a</sup> (feet)	Soil/Rock Description	Density (pcf)	Shear Wave Velocity (fps)	Compressional Wave Velocity (fps) <sup>c,d</sup>	Poisson's Ratio <sup>c,d</sup>
0	SSE control point (at surface)	---	---	---	---
0-50	Compacted Site Fill composed of fine to medium sand with gravel and occasional cobbles	125 <sup>b</sup>	2,150 <sup>b</sup>	4,750 <sup>b</sup>	0.37 <sup>b</sup>
50-180	Pleistocene Glacial outwash of dense to very dense sand with gravel	130	2,860	6,300	0.37
180-4100	Cambrian and Precambrian sandstone with minor shale horizons	150- 155	5,020	9,200	0.28
4100+	Precambrian granite basement rock	170 <sup>e</sup>	11200 <sup>e</sup>	18,000 <sup>e</sup>	0.18 <sup>e</sup>

NOTES: The bottom of the base mat of the combined Reactor, Turbine and Auxiliary Buildings varies from 5 feet to 30 feet below the surface elevation of the site.

<sup>a</sup> If thicknesses vary across site, indicate range in thickness

<sup>b</sup> Conservatively used from the 20 to 50 feet soil column previous to excavation and compaction. Actual values would be improved but are not reported in the USAR.

<sup>c</sup> Compressional-wave velocity and Poisson's ratio should be reported if those were the measurements taken at the site, and ranges in measurements should be reported. If shear-wave velocity measurements were taken, with ranges reported, the compressional-wave velocities and Poisson's ratio are not needed.

<sup>d</sup> If reliable shear- or compression-wave velocities are not available, please list whatever measurements are available (e.g. standard penetration blow-counts) that describe the quality of soil/rock from the surface to the deepest depth available.

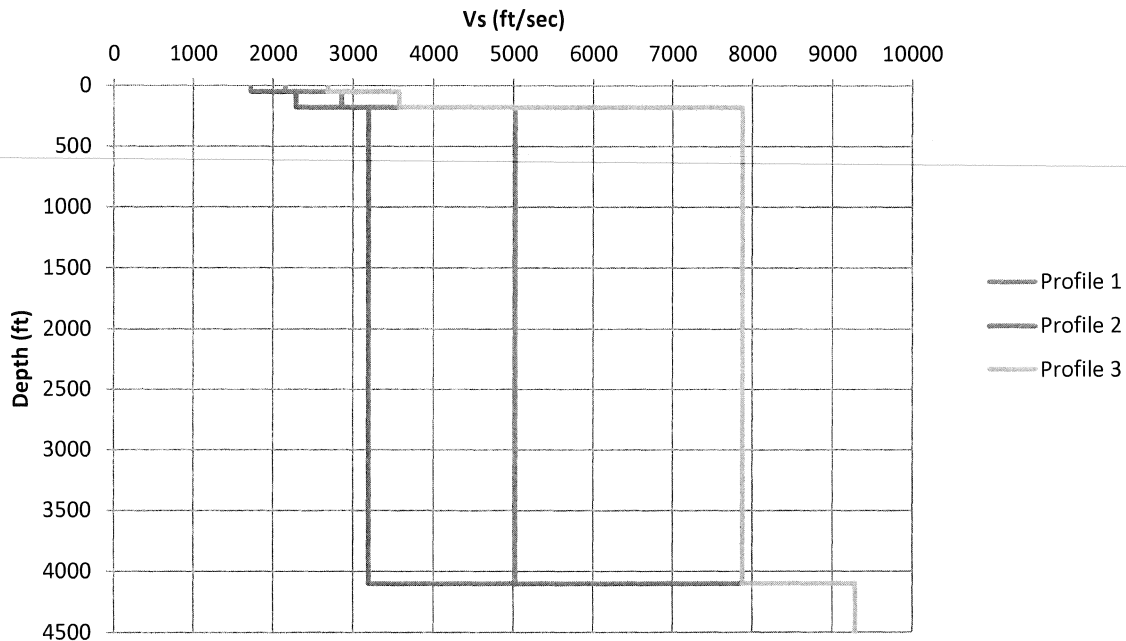
<sup>e</sup> Assumed values as stated in USAR appendix E, Plate 4.1 (Reference 5).

Table 2 - Layer Thicknesses, Depths, and  $V_s$  for 3 Profiles (PINGP)

Profile 1			Profile 2			Profile 3		
thickness(ft)	depth (ft)	$V_s$ (ft/s)	thickness(ft)	depth (ft)	$V_s$ (ft/s)	Thickness(ft)	depth (ft)	$V_s$ (ft/s)
	0	2150		0	1720		0	2687
5.0	5.0	2150	5.0	5.0	1720	5.0	5.0	2687
5.0	10.0	2150	5.0	10.0	1720	5.0	10.0	2687
5.0	15.0	2150	5.0	15.0	1720	5.0	15.0	2687
5.0	20.0	2150	5.0	20.0	1720	5.0	20.0	2687
5.0	25.0	2150	5.0	25.0	1720	5.0	25.0	2687
5.0	30.0	2150	5.0	30.0	1720	5.0	30.0	2687
5.0	35.0	2150	5.0	35.0	1720	5.0	35.0	2687
5.0	40.0	2150	5.0	40.0	1720	5.0	40.0	2687
5.0	45.0	2150	5.0	45.0	1720	5.0	45.0	2687
5.0	50.0	2150	5.0	50.0	1720	5.0	50.0	2687
5.0	55.0	2860	5.0	55.0	2288	5.0	55.0	3575
5.0	60.0	2860	5.0	60.0	2288	5.0	60.0	3575
5.0	65.0	2860	5.0	65.0	2288	5.0	65.0	3575
5.0	70.0	2860	5.0	70.0	2288	5.0	70.0	3575
5.0	75.0	2860	5.0	75.0	2288	5.0	75.0	3575
5.0	80.0	2860	5.0	80.0	2288	5.0	80.0	3575
5.0	85.0	2860	5.0	85.0	2288	5.0	85.0	3575
5.0	90.0	2860	5.0	90.0	2288	5.0	90.0	3575
5.0	95.0	2860	5.0	95.0	2288	5.0	95.0	3575
5.0	100.0	2860	5.0	100.0	2288	5.0	100.0	3575
5.0	105.0	2860	5.0	105.0	2288	5.0	105.0	3575
5.0	110.0	2860	5.0	110.0	2288	5.0	110.0	3575
5.0	115.0	2860	5.0	115.0	2288	5.0	115.0	3575
5.0	120.0	2860	5.0	120.0	2288	5.0	120.0	3575
5.0	125.0	2860	5.0	125.0	2288	5.0	125.0	3575
5.0	130.0	2860	5.0	130.0	2288	5.0	130.0	3575
5.0	135.0	2860	5.0	135.0	2288	5.0	135.0	3575
5.0	140.0	2860	5.0	140.0	2288	5.0	140.0	3575
5.0	145.0	2860	5.0	145.0	2288	5.0	145.0	3575
5.0	150.0	2860	5.0	150.0	2288	5.0	150.0	3575
5.0	155.0	2860	5.0	155.0	2288	5.0	155.0	3575
5.0	160.0	2860	5.0	160.0	2288	5.0	160.0	3575
5.0	165.0	2860	5.0	165.0	2288	5.0	165.0	3575
5.0	170.0	2860	5.0	170.0	2288	5.0	170.0	3575

Profile 1			Profile 2			Profile 3		
thickness(ft)	depth (ft)	V <sub>s</sub> (ft/s)	thickness(ft)	depth (ft)	V <sub>s</sub> (ft/s)	Thickness(ft)	depth (ft)	V <sub>s</sub> (ft/s)
5.0	175.0	2860	5.0	175.0	2288	5.0	175.0	3575
5.0	180.0	2860	5.0	180.0	2288	5.0	180.0	3575
10.0	190.0	5020	10.0	190.0	3197	10.0	190.0	7881
10.0	200.0	5020	10.0	200.0	3197	10.0	200.0	7881
10.0	210.0	5020	10.0	210.0	3197	10.0	210.0	7881
10.0	220.0	5020	10.0	220.0	3197	10.0	220.0	7881
10.0	230.0	5020	10.0	230.0	3197	10.0	230.0	7881
10.0	240.0	5020	10.0	240.0	3197	10.0	240.0	7881
10.0	250.0	5020	10.0	250.0	3197	10.0	250.0	7881
10.0	260.0	5020	10.0	260.0	3197	10.0	260.0	7881
10.0	270.0	5020	10.0	270.0	3197	10.0	270.0	7881
10.0	280.0	5020	10.0	280.0	3197	10.0	280.0	7881
10.0	290.0	5020	10.0	290.0	3197	10.0	290.0	7881
10.0	300.0	5020	10.0	300.0	3197	10.0	300.0	7881
10.0	310.0	5020	10.0	310.0	3197	10.0	310.0	7881
10.0	320.0	5020	10.0	320.0	3197	10.0	320.0	7881
10.0	330.0	5020	10.0	330.0	3197	10.0	330.0	7881
10.0	340.0	5020	10.0	340.0	3197	10.0	340.0	7881
10.0	350.0	5020	10.0	350.0	3197	10.0	350.0	7881
10.0	360.0	5020	10.0	360.0	3197	10.0	360.0	7881
10.0	370.0	5020	10.0	370.0	3197	10.0	370.0	7881
10.0	380.0	5020	10.0	380.0	3197	10.0	380.0	7881
10.0	390.0	5020	10.0	390.0	3197	10.0	390.0	7881
10.0	400.0	5020	10.0	400.0	3197	10.0	400.0	7881
10.0	410.0	5020	10.0	410.0	3197	10.0	410.0	7881
10.0	420.0	5020	10.0	420.0	3197	10.0	420.0	7881
10.0	430.0	5020	10.0	430.0	3197	10.0	430.0	7881
10.0	440.0	5020	10.0	440.0	3197	10.0	440.0	7881
10.0	450.0	5020	10.0	450.0	3197	10.0	450.0	7881
10.0	460.0	5020	10.0	460.0	3197	10.0	460.0	7881
10.0	470.0	5020	10.0	470.0	3197	10.0	470.0	7881
10.0	480.0	5020	10.0	480.0	3197	10.0	480.0	7881
10.0	490.0	5020	10.0	490.0	3197	10.0	490.0	7881
10.0	500.0	5020	10.0	500.0	3197	10.0	500.0	7881
154.9	654.9	5020	154.9	654.9	3197	154.9	654.9	7881
164.0	819.0	5020	164.0	819.0	3197	164.0	819.0	7881
164.0	983.0	5020	164.0	983.0	3197	164.0	983.0	7881
164.0	1147.0	5020	164.0	1147.0	3197	164.0	1147.0	7881
164.0	1311.1	5020	164.0	1311.1	3197	164.0	1311.1	7881

Profile 1			Profile 2			Profile 3		
thickness(ft)	depth (ft)	V <sub>s</sub> (ft/s)	thickness(ft)	depth (ft)	V <sub>s</sub> (ft/s)	Thickness(ft)	depth (ft)	V <sub>s</sub> (ft/s)
164.0	1475.1	5020	164.0	1475.1	3197	164.0	1475.1	7881
164.0	1639.2	5020	164.0	1639.2	3197	164.0	1639.2	7881
164.0	1803.2	5020	164.0	1803.2	3197	164.0	1803.2	7881
164.0	1967.2	5020	164.0	1967.2	3197	164.0	1967.2	7881
164.0	2131.3	5020	164.0	2131.3	3197	164.0	2131.3	7881
164.0	2295.3	5020	164.0	2295.3	3197	164.0	2295.3	7881
164.0	2459.4	5020	164.0	2459.4	3197	164.0	2459.4	7881
164.0	2623.4	5020	164.0	2623.4	3197	164.0	2623.4	7881
164.0	2787.5	5020	164.0	2787.5	3197	164.0	2787.5	7881
164.0	2951.5	5020	164.0	2951.5	3197	164.0	2951.5	7881
164.0	3115.5	5020	164.0	3115.5	3197	164.0	3115.5	7881
164.0	3279.6	5020	164.0	3279.6	3197	164.0	3279.6	7881
164.0	3443.6	5020	164.0	3443.6	3197	164.0	3443.6	7881
164.0	3607.7	5020	164.0	3607.7	3197	164.0	3607.7	7881
164.0	3771.7	5020	164.0	3771.7	3197	164.0	3771.7	7881
164.0	3935.7	5020	164.0	3935.7	3197	164.0	3935.7	7881
164.0	4099.8	5020	164.0	4099.8	3197	164.0	4099.8	7881
3280.8	7380.6	9285	3280.8	7380.6	9285	3280.8	7380.6	9285



**Figure 1 -  $V_s$  profiles for PINGP site**  
Shear-wave velocity ( $V_s$ )

### 3.0 References

1. NRC Letter, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012, ADAMS Accession No. ML12056A046.
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the Fukushima Dai-ichi Accident," dated April 29, 2013, ADAMS Accession No. ML13120A058.

5. Prairie Island Nuclear Generating Plant Updated Safety Analysis Report (USAR), Revision 32.
6. EPRI Report TR-102293, "Guidelines for Determining Design Basis Ground Motions," Vol. 1-5, dated November 1993.
7. Silva, W.J., N. A. Abrahamson, G.R. Toro, and C. Costantino. Report to Brookhaven National Laboratory, "Description and Validation of the Stochastic Ground Motion Model," dated November 15, 1996, ADAMS Accession No. ML042800294.
8. Walling, M.A., W.J., Silva and N.A. Abrahamson (2008). "Nonlinear Site Amplification Factors for Constraining the NGA Models," *Earthquake Spectra*, 24:1, 243-255.