

December 6, 2004

Mr. Charles Brooks
Staff Assistant
Industry and Government Relations
Institute of Nuclear Power Operations
700 Galleria Parkway, NW
Atlanta, GA 30339-5957

SUBJECT: REQUEST FOR REVIEW OF DRAFT REPORT ENTITLED, "EVALUATION OF
LOSS OF OFFSITE POWER EVENTS AT NUCLEAR POWER PLANTS:
1986 – 2003"

Dear Mr. Brooks:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft report entitled, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1986 – 2003," documenting loss of offsite power (LOOP) frequency estimates and time-dependent nonrecovery probability curves. We would appreciate receiving your comments by 45 days from the receipt of this letter.

The Nuclear Regulatory Commission (NRC) performed this study to:

- Update the LOOP frequency and nonrecovery probabilities using the latest LOOP event information, and
- Calculate station blackout risk (in terms of core damage frequency) with updated Standardized Plant Analysis Risk (SPAR) models for a spectrum of plants.

The attached report addresses the first item. We will address the second item in a follow-on study to be completed in early 2005.

The LOOP frequencies and nonrecovery probabilities addressed in the attached report are key inputs for the station blackout (SBO) risk evaluation, along with updated emergency diesel generator performance parameters, and plant-specific SBO coping features incorporated in the SPAR models.

This report constitutes an update of two reports that the U.S. Nuclear Regulatory Commission (NRC) previously published to document analyses of LOOP events at U.S. commercial NPPs. Specifically, NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," covered events that occurred in 1968 – 1985, while NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 – 1996," covered those that occurred in 1980 – 1996. This update was necessary, in part, because of a change in electrical power grid regulations beginning around 1997 and the associated concern about what impact deregulation might have on LOOP frequencies and/or durations and, therefore, on nuclear plant safety.

The attached report is patterned after NUREG/CR-5496, but covers data for 1986 – 2003. The researchers selected 1986 as the starting point in order to begin where NUREG-1032 ended. Although historical records identify LOOP events in a straightforward manner, corresponding information concerning the durations of such events has not always been clear. Moreover, for some LOOP events, the durations were estimated based on other information and/or engineering judgments based on plant operating experience.

The analyses documented in this report resulted in different frequency estimates for critical and shutdown operations under five categories of LOOPS (plant-centered, switchyard-centered, grid-related, severe weather-related, and extreme-weather related). For power operation, grid-related LOOPS contribute 50 percent to the total frequency of 0.033 per reactor critical year, while switchyard-centered LOOPS contribute 26 percent. The remaining three categories of LOOPS have frequency contributions ranging from 7 to 9 percent. By contrast, for shutdown operation, switchyard-centered LOOPS contribute 54 percent to the total frequency of 0.19 per reactor shutdown year, while plant-centered LOOPS contribute 27 percent.

Overall, LOOP frequencies during power operation have decreased significantly over the 36-year period from 1968 through 2003. However, during shutdown operation, the LOOP frequency has remained essentially constant over the 24-year period from 1980 through 2003, although the severe-weather-related LOOP frequency varied significantly depending upon coastal or non-coastal location. By contrast, during power operation, only the grid-related LOOP frequency varied significantly by geographical location. This difference is almost solely the result of one highly unusual LOOP event on the August 14, 2003, during which a grid blackout affected nine NPPs.

The analyses documented in this report also indicated that, on average, LOOP events lasted longer in 1996 – 2003 than in 1986 – 1996. In particular, the LOOP duration data for 1986 – 1996 exhibited a statistically significant increasing trend over time. By contrast, no statistically significant trend exists for 1997 – 2003.

The updated frequency and duration information from this study will support future assessments of the current risk (core damage frequency) associated with LOOP and SBO accident scenarios, as well as the evaluation of existing regulations regarding electrical power for the safe operation of NPPs.

We would appreciate specific comments regarding the method to use for the estimation of plant-specific LOOP frequencies and the estimation of the potential bus restoration times.

C. Brooks

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

C. Brooks

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

Distribution w/o attachment:

OERAB RF	RBarrett, NRR	GShukla, NRR	MHoncharik, NRR
DRAA RF	BSheron, NRR	DHolland, NRR	TAlexion, NRR
JCraig/CPaperiello, RES	RBorchard, NRR	BBenney, NRR	BPham, NRR
JLamb, NRR	JDyer, NRR	JJolicoeur, OEDO	JCalvo, NRR

Identical Letters:

Mr. Charles Brooks
Staff Assistant
Industry and Government Relations
Institute of Nuclear Power Operations
700 Galleria Parkway, NW
Atlanta, Georgia 30339-5957

Mr. Marvin Fertel
Nuclear Energy Institute
1776 I Street, N.W.
Suite 400
Washington, D. C. 20006-3708

Mr. David Lochbaum
Union of Concerned Scientists
1707 H. Street, N.W.
Suite 600
Washington, D. C. 20006-3919

Mr. John Gaertner, Senior Technical Leader
Risk Management
Electric Power Research Institute
P.O. Box 217097
Charlotte, NC 28221

Mr. Gordon Bischoff, Project Manager
Westinghouse Combined Owners Group
Mail Stop 5-16
P. O. Box 355
Pittsburgh, PA 15230-0355

Mr. James Mallay
B&W Owners Group Services
Framatome Technologies, Inc.
P.O. Box 10935
Lynchburg, VA 24506-0935

Mr. Jack Gray, Chairman
BWR Owners Group
Entergy Nuclear
440 Hamilton Avenue
P.O. Box 5029
White Plains, NY 10601

Mr. Frank J. Rahn, Manager
Risk-Based Priorization
3412 Hillview Avenue
Palo Alto, CA 93404-1395

OAR in ADAMS? (Y or N) Y
Publicly Available? (Y or N) Y

ADAMS Accession No.: ML043380290
Enclosure Accession No.: ML043380322
Date of Release to Public: 12/20/2004

Template No. RES-006
Sensitive? N

DOCUMENT NAME: G:\EXTERNAL LOOP REPORT REVIEW LETTER-1.WPD

***See previous concurrence**

To receive a copy of this document, indicate in the box "C" = Copy w/o encl "E" = Copy w/encl "N" = No copy

OFFICE	*OERAB	E	*OERAB	N	*OERAB	E	*RES Tech Editor	N	*DRAA	E
NAME	DRasmuson		CLui		NChokshi		PGarrity		CAder	
DATE	12/03/04		12/06/04		12/06/04		12/08/04		12/06/04	

OFFICIAL RECORD COPY

RES File Code: 2C-3

Mr. Marvin Fertel
Nuclear Energy Institute
1776 I Street, N.W.
Suite 400
Washington, D.C. 20006-3708

SUBJECT: REQUEST FOR REVIEW OF DRAFT REPORT ENTITLED, "EVALUATION OF
LOSS OF OFFSITE POWER EVENTS AT NUCLEAR POWER PLANTS:
1986 – 2003"

Dear Mr. Fertel:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft report entitled, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1986 – 2003," documenting loss of offsite power (LOOP) frequency estimates and time-dependent nonrecovery probability curves. We would appreciate receiving your comments by 45 days from the receipt of this letter.

The Nuclear Regulatory Commission (NRC) performed this study to:

- Update the LOOP frequency and nonrecovery probabilities using the latest LOOP event information, and
- Calculate station blackout risk (in terms of core damage frequency) with updated Standardized Plant Analysis Risk (SPAR) models for a spectrum of plants.

The attached report addresses the first item. We will address the second item in a follow-on study to be completed in early 2005.

The LOOP frequencies and nonrecovery probabilities addressed in the attached report are key inputs for the station blackout (SBO) risk evaluation, along with updated emergency diesel generator performance parameters, and plant-specific SBO coping features incorporated in the SPAR models.

This report constitutes an update of two reports that the U.S. Nuclear Regulatory Commission (NRC) previously published to document analyses of LOOP events at U.S. commercial NPPs. Specifically, NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," covered events that occurred in 1968 – 1985, while NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 – 1996," covered those that occurred in 1980 – 1996. This update was necessary, in part, because of a change in electrical power grid regulations beginning around 1997 and the associated concern about what impact deregulation might have on LOOP frequencies and/or durations and, therefore, on nuclear plant safety.

The attached report is patterned after NUREG/CR-5496, but covers data for 1986 – 2003. The researchers selected 1986 as the starting point in order to begin where NUREG-1032 ended. Although historical records identify LOOP events in a straightforward manner, corresponding information concerning the durations of such events has not always been clear. Moreover, for some LOOP events, the durations were estimated based on other information and/or engineering judgments based on plant operating experience.

The analyses documented in this report resulted in different frequency estimates for critical and shutdown operations under five categories of LOOPS (plant-centered, switchyard-centered, grid-related, severe weather-related, and extreme-weather related). For power operation, grid-related LOOPS contribute 50 percent to the total frequency of 0.033 per reactor critical year, while switchyard-centered LOOPS contribute 26 percent. The remaining three categories of LOOPS have frequency contributions ranging from 7 to 9 percent. By contrast, for shutdown operation, switchyard-centered LOOPS contribute 54 percent to the total frequency of 0.19 per reactor shutdown year, while plant-centered LOOPS contribute 27 percent.

Overall, LOOP frequencies during power operation have decreased significantly over the 36-year period from 1968 through 2003. However, during shutdown operation, the LOOP frequency has remained essentially constant over the 24-year period from 1980 through 2003, although the severe-weather-related LOOP frequency varied significantly depending upon coastal or non-coastal location. By contrast, during power operation, only the grid-related LOOP frequency varied significantly by geographical location. This difference is almost solely the result of one highly unusual LOOP event on the August 14, 2003, during which a grid blackout affected nine NPPs.

We would appreciate specific comments regarding the method to use for the estimation of plant-specific LOOP frequencies and the estimation of the potential bus restoration times.

M. Fertel

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

Mr. David Lochbaum
Union of Concerned Scientists
1707 H Street, N.W.
Suite 600
Washington, D.C. 20006-3919

SUBJECT: REQUEST FOR REVIEW OF DRAFT REPORT ENTITLED, "EVALUATION OF
LOSS OF OFFSITE POWER EVENTS AT NUCLEAR POWER PLANTS:
1986 – 2003"

Dear Mr. Lochbaum:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft report entitled, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1986 – 2003," documenting loss of offsite power (LOOP) frequency estimates and time-dependent nonrecovery probability curves. We would appreciate receiving your comments by 45 days from the receipt of this letter.

The Nuclear Regulatory Commission (NRC) performed this study to:

- Update the LOOP frequency and nonrecovery probabilities using the latest LOOP event information, and
- Calculate station blackout risk (in terms of core damage frequency) with updated Standardized Plant Analysis Risk (SPAR) models for a spectrum of plants.

The attached report addresses the first item. We will address the second item in a follow-on study to be completed in early 2005.

The LOOP frequencies and nonrecovery probabilities addressed in the attached report are key inputs for the station blackout (SBO) risk evaluation, along with updated emergency diesel generator performance parameters, and plant-specific SBO coping features incorporated in the SPAR models.

This report constitutes an update of two reports that the U.S. Nuclear Regulatory Commission (NRC) previously published to document analyses of LOOP events at U.S. commercial NPPs. Specifically, NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," covered events that occurred in 1968 – 1985, while NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 – 1996," covered those that occurred in 1980 – 1996. This update was necessary, in part, because of a change in electrical power grid regulations beginning around 1997 and the associated concern about what impact deregulation might have on LOOP frequencies and/or durations and, therefore, on nuclear plant safety.

The attached report is patterned after NUREG/CR-5496, but covers data for 1986 – 2003. The researchers selected 1986 as the starting point in order to begin where NUREG-1032 ended. Although historical records identify LOOP events in a straightforward manner, corresponding information concerning the durations of such events has not always been clear. Moreover, for some LOOP events, the durations were estimated based on other information and/or engineering judgments based on plant operating experience.

The analyses documented in this report resulted in different frequency estimates for critical and shutdown operations under five categories of LOOPS (plant-centered, switchyard-centered, grid-related, severe weather-related, and extreme-weather related). For power operation, grid-related LOOPS contribute 50 percent to the total frequency of 0.033 per reactor critical year, while switchyard-centered LOOPS contribute 26 percent. The remaining three categories of LOOPS have frequency contributions ranging from 7 to 9 percent. By contrast, for shutdown operation, switchyard-centered LOOPS contribute 54 percent to the total frequency of 0.19 per reactor shutdown year, while plant-centered LOOPS contribute 27 percent.

Overall, LOOP frequencies during power operation have decreased significantly over the 36-year period from 1968 through 2003. However, during shutdown operation, the LOOP frequency has remained essentially constant over the 24-year period from 1980 through 2003, although the severe-weather-related LOOP frequency varied significantly depending upon coastal or non-coastal location. By contrast, during power operation, only the grid-related LOOP frequency varied significantly by geographical location. This difference is almost solely the result of one highly unusual LOOP event on the August 14, 2003, during which a grid blackout affected nine NPPs.

We would appreciate specific comments regarding the method to use for the estimation of plant-specific LOOP frequencies and the estimation of the potential bus restoration times.

D. Lochbaum

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

Mr. John Gaertner, Senior Technical Leader
Risk Management
Electric Power Research Institute
P.O. Box 217097
Charlotte, NC 28221

SUBJECT: REQUEST FOR REVIEW OF DRAFT REPORT ENTITLED, "EVALUATION OF
LOSS OF OFFSITE POWER EVENTS AT NUCLEAR POWER PLANTS:
1986 – 2003"

Dear Mr. Gaertner:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft report entitled, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1986 – 2003," documenting loss of offsite power (LOOP) frequency estimates and time-dependent nonrecovery probability curves. We would appreciate receiving your comments by 45 days from the receipt of this letter.

The Nuclear Regulatory Commission (NRC) performed this study to:

- Update the LOOP frequency and nonrecovery probabilities using the latest LOOP event information, and
- Calculate station blackout risk (in terms of core damage frequency) with updated Standardized Plant Analysis Risk (SPAR) models for a spectrum of plants.

The attached report addresses the first item. We will address the second item in a follow-on study to be completed in early 2005.

The LOOP frequencies and nonrecovery probabilities addressed in the attached report are key inputs for the station blackout (SBO) risk evaluation, along with updated emergency diesel generator performance parameters, and plant-specific SBO coping features incorporated in the SPAR models.

This report constitutes an update of two reports that the U.S. Nuclear Regulatory Commission (NRC) previously published to document analyses of LOOP events at U.S. commercial NPPs. Specifically, NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," covered events that occurred in 1968 – 1985, while NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 – 1996," covered those that occurred in 1980 – 1996. This update was necessary, in part, because of a change in electrical power grid regulations beginning around 1997 and the associated concern about what impact deregulation might have on LOOP frequencies and/or durations and, therefore, on nuclear plant safety.

The attached report is patterned after NUREG/CR-5496, but covers data for 1986 – 2003. The researchers selected 1986 as the starting point in order to begin where NUREG-1032 ended. Although historical records identify LOOP events in a straightforward manner, corresponding information concerning the durations of such events has not always been clear. Moreover, for some LOOP events, the durations were estimated based on other information and/or engineering judgments based on plant operating experience.

The analyses documented in this report resulted in different frequency estimates for critical and shutdown operations under five categories of LOOPS (plant-centered, switchyard-centered, grid-related, severe weather-related, and extreme-weather related). For power operation, grid-related LOOPS contribute 50 percent to the total frequency of 0.033 per reactor critical year, while switchyard-centered LOOPS contribute 26 percent. The remaining three categories of LOOPS have frequency contributions ranging from 7 to 9 percent. By contrast, for shutdown operation, switchyard-centered LOOPS contribute 54 percent to the total frequency of 0.19 per reactor shutdown year, while plant-centered LOOPS contribute 27 percent.

Overall, LOOP frequencies during power operation have decreased significantly over the 36-year period from 1968 through 2003. However, during shutdown operation, the LOOP frequency has remained essentially constant over the 24-year period from 1980 through 2003, although the severe-weather-related LOOP frequency varied significantly depending upon coastal or non-coastal location. By contrast, during power operation, only the grid-related LOOP frequency varied significantly by geographical location. This difference is almost solely the result of one highly unusual LOOP event on the August 14, 2003, during which a grid blackout affected nine NPPs.

We would appreciate specific comments regarding the method to use for the estimation of plant-specific LOOP frequencies and the estimation of the potential bus restoration times.

J. Gaertner

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

Mr. Gordon Bischoff, Project Manager
Westinghouse Combined Owners Group
Mail Stop 5-16
P.O. Box 355
Pittsburgh, PA 15230-0355

SUBJECT: REQUEST FOR REVIEW OF DRAFT REPORT ENTITLED, "EVALUATION OF
LOSS OF OFFSITE POWER EVENTS AT NUCLEAR POWER PLANTS:
1986 – 2003"

Dear Mr. Bischoff:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft report entitled, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1986 – 2003," documenting loss of offsite power (LOOP) frequency estimates and time-dependent nonrecovery probability curves. We would appreciate receiving your comments by 45 days from the receipt of this letter.

The Nuclear Regulatory Commission (NRC) performed this study to:

- Update the LOOP frequency and nonrecovery probabilities using the latest LOOP event information, and
- Calculate station blackout risk (in terms of core damage frequency) with updated Standardized Plant Analysis Risk (SPAR) models for a spectrum of plants.

The attached report addresses the first item. We will address the second item in a follow-on study to be completed in early 2005.

The LOOP frequencies and nonrecovery probabilities addressed in the attached report are key inputs for the station blackout (SBO) risk evaluation, along with updated emergency diesel generator performance parameters, and plant-specific SBO coping features incorporated in the SPAR models.

This report constitutes an update of two reports that the U.S. Nuclear Regulatory Commission (NRC) previously published to document analyses of LOOP events at U.S. commercial NPPs. Specifically, NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," covered events that occurred in 1968 – 1985, while NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 – 1996," covered those that occurred in 1980 – 1996. This update was necessary, in part, because of a change in electrical power grid regulations beginning around 1997 and the associated concern about what impact deregulation might have on LOOP frequencies and/or durations and, therefore, on nuclear plant safety.

The attached report is patterned after NUREG/CR-5496, but covers data for 1986 – 2003. The researchers selected 1986 as the starting point in order to begin where NUREG-1032 ended. Although historical records identify LOOP events in a straightforward manner, corresponding information concerning the durations of such events has not always been clear. Moreover, for some LOOP events, the durations were estimated based on other information and/or engineering judgments based on plant operating experience.

The analyses documented in this report resulted in different frequency estimates for critical and shutdown operations under five categories of LOOPS (plant-centered, switchyard-centered, grid-related, severe weather-related, and extreme-weather related). For power operation, grid-related LOOPS contribute 50 percent to the total frequency of 0.033 per reactor critical year, while switchyard-centered LOOPS contribute 26 percent. The remaining three categories of LOOPS have frequency contributions ranging from 7 to 9 percent. By contrast, for shutdown operation, switchyard-centered LOOPS contribute 54 percent to the total frequency of 0.19 per reactor shutdown year, while plant-centered LOOPS contribute 27 percent.

Overall, LOOP frequencies during power operation have decreased significantly over the 36-year period from 1968 through 2003. However, during shutdown operation, the LOOP frequency has remained essentially constant over the 24-year period from 1980 through 2003, although the severe-weather-related LOOP frequency varied significantly depending upon coastal or non-coastal location. By contrast, during power operation, only the grid-related LOOP frequency varied significantly by geographical location. This difference is almost solely the result of one highly unusual LOOP event on the August 14, 2003, during which a grid blackout affected nine NPPs.

We would appreciate specific comments regarding the method to use for the estimation of plant-specific LOOP frequencies and the estimation of the potential bus restoration times.

G. Bischoff

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

Mr. James Malley
B&W Owners Group Services
Framatome Technologies, Inc.
P.O. Box 10935
Lynchburg, VA 24506-0935

SUBJECT: REQUEST FOR REVIEW OF DRAFT REPORT ENTITLED, "EVALUATION OF
LOSS OF OFFSITE POWER EVENTS AT NUCLEAR POWER PLANTS:
1986 – 2003"

Dear Mr. Malley:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft report entitled, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1986 – 2003," documenting loss of offsite power (LOOP) frequency estimates and time-dependent nonrecovery probability curves. We would appreciate receiving your comments by 45 days from the receipt of this letter.

The Nuclear Regulatory Commission (NRC) performed this study to:

- Update the LOOP frequency and nonrecovery probabilities using the latest LOOP event information, and
- Calculate station blackout risk (in terms of core damage frequency) with updated Standardized Plant Analysis Risk (SPAR) models for a spectrum of plants.

The attached report addresses the first item. We will address the second item in a follow-on study to be completed in early 2005.

The LOOP frequencies and nonrecovery probabilities addressed in the attached report are key inputs for the station blackout (SBO) risk evaluation, along with updated emergency diesel generator performance parameters, and plant-specific SBO coping features incorporated in the SPAR models.

This report constitutes an update of two reports that the U.S. Nuclear Regulatory Commission (NRC) previously published to document analyses of LOOP events at U.S. commercial NPPs. Specifically, NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," covered events that occurred in 1968 – 1985, while NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 – 1996," covered those that occurred in 1980 – 1996. This update was necessary, in part, because of a change in electrical power grid regulations beginning around 1997 and the associated concern about what impact deregulation might have on LOOP frequencies and/or durations and, therefore, on nuclear plant safety.

The attached report is patterned after NUREG/CR-5496, but covers data for 1986 – 2003. The researchers selected 1986 as the starting point in order to begin where NUREG-1032 ended. Although historical records identify LOOP events in a straightforward manner, corresponding information concerning the durations of such events has not always been clear. Moreover, for some LOOP events, the durations were estimated based on other information and/or engineering judgments based on plant operating experience.

The analyses documented in this report resulted in different frequency estimates for critical and shutdown operations under five categories of LOOPS (plant-centered, switchyard-centered, grid-related, severe weather-related, and extreme-weather related). For power operation, grid-related LOOPS contribute 50 percent to the total frequency of 0.033 per reactor critical year, while switchyard-centered LOOPS contribute 26 percent. The remaining three categories of LOOPS have frequency contributions ranging from 7 to 9 percent. By contrast, for shutdown operation, switchyard-centered LOOPS contribute 54 percent to the total frequency of 0.19 per reactor shutdown year, while plant-centered LOOPS contribute 27 percent.

Overall, LOOP frequencies during power operation have decreased significantly over the 36-year period from 1968 through 2003. However, during shutdown operation, the LOOP frequency has remained essentially constant over the 24-year period from 1980 through 2003, although the severe-weather-related LOOP frequency varied significantly depending upon coastal or non-coastal location. By contrast, during power operation, only the grid-related LOOP frequency varied significantly by geographical location. This difference is almost solely the result of one highly unusual LOOP event on the August 14, 2003, during which a grid blackout affected nine NPPs.

We would appreciate specific comments regarding the method to use for the estimation of plant-specific LOOP frequencies and the estimation of the potential bus restoration times.

J. Malley

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

Mr. Jack Gray, Chairman
BWR Owners Group
Entergy Nuclear
440 Hamilton Avenue
P.O. Box 5029
White Plains, NY 10601

SUBJECT: REQUEST FOR REVIEW OF DRAFT REPORT ENTITLED, "EVALUATION OF
LOSS OF OFFSITE POWER EVENTS AT NUCLEAR POWER PLANTS:
1986 – 2003"

Dear Mr. Gray:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft report entitled, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1986 – 2003," documenting loss of offsite power (LOOP) frequency estimates and time-dependent nonrecovery probability curves. We would appreciate receiving your comments by 45 days from the receipt of this letter.

The Nuclear Regulatory Commission (NRC) performed this study to:

- Update the LOOP frequency and nonrecovery probabilities using the latest LOOP event information, and
- Calculate station blackout risk (in terms of core damage frequency) with updated Standardized Plant Analysis Risk (SPAR) models for a spectrum of plants.

The attached report addresses the first item. We will address the second item in a follow-on study to be completed in early 2005.

The LOOP frequencies and nonrecovery probabilities addressed in the attached report are key inputs for the station blackout (SBO) risk evaluation, along with updated emergency diesel generator performance parameters, and plant-specific SBO coping features incorporated in the SPAR models.

This report constitutes an update of two reports that the U.S. Nuclear Regulatory Commission (NRC) previously published to document analyses of LOOP events at U.S. commercial NPPs. Specifically, NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," covered events that occurred in 1968 – 1985, while NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 – 1996," covered those that occurred in 1980 – 1996. This update was necessary, in part, because of a change in electrical power grid regulations beginning around 1997 and the associated concern about what impact deregulation might have on LOOP frequencies and/or durations and, therefore, on nuclear plant safety.

The attached report is patterned after NUREG/CR-5496, but covers data for 1986 – 2003. The researchers selected 1986 as the starting point in order to begin where NUREG-1032 ended. Although historical records identify LOOP events in a straightforward manner, corresponding information concerning the durations of such events has not always been clear. Moreover, for some LOOP events, the durations were estimated based on other information and/or engineering judgments based on plant operating experience.

The analyses documented in this report resulted in different frequency estimates for critical and shutdown operations under five categories of LOOPS (plant-centered, switchyard-centered, grid-related, severe weather-related, and extreme-weather related). For power operation, grid-related LOOPS contribute 50 percent to the total frequency of 0.033 per reactor critical year, while switchyard-centered LOOPS contribute 26 percent. The remaining three categories of LOOPS have frequency contributions ranging from 7 to 9 percent. By contrast, for shutdown operation, switchyard-centered LOOPS contribute 54 percent to the total frequency of 0.19 per reactor shutdown year, while plant-centered LOOPS contribute 27 percent.

Overall, LOOP frequencies during power operation have decreased significantly over the 36-year period from 1968 through 2003. However, during shutdown operation, the LOOP frequency has remained essentially constant over the 24-year period from 1980 through 2003, although the severe-weather-related LOOP frequency varied significantly depending upon coastal or non-coastal location. By contrast, during power operation, only the grid-related LOOP frequency varied significantly by geographical location. This difference is almost solely the result of one highly unusual LOOP event on the August 14, 2003, during which a grid blackout affected nine NPPs.

We would appreciate specific comments regarding the method to use for the estimation of plant-specific LOOP frequencies and the estimation of the potential bus restoration times.

J. Gray

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

Mr. Frank J. Rahn, Manager
Risk-Based Priorization
3412 Hillview Avenue
Palo Alto, CA 93404-1395

SUBJECT: REQUEST FOR REVIEW OF DRAFT REPORT ENTITLED, "EVALUATION OF
LOSS OF OFFSITE POWER EVENTS AT NUCLEAR POWER PLANTS:
1986 – 2003"

Dear Mr. Rahn:

In accordance with our peer review process, we are offering you the opportunity to review and comment on the enclosed draft report entitled, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1986 – 2003," documenting loss of offsite power (LOOP) frequency estimates and time-dependent nonrecovery probability curves. We would appreciate receiving your comments by 45 days from the receipt of this letter.

The Nuclear Regulatory Commission (NRC) performed this study to:

- Update the LOOP frequency and nonrecovery probabilities using the latest LOOP event information, and
- Calculate station blackout risk (in terms of core damage frequency) with updated Standardized Plant Analysis Risk (SPAR) models for a spectrum of plants.

The attached report addresses the first item. We will address the second item in a follow-on study to be completed in early 2005.

The LOOP frequencies and nonrecovery probabilities addressed in the attached report are key inputs for the station blackout (SBO) risk evaluation, along with updated emergency diesel generator performance parameters, and plant-specific SBO coping features incorporated in the SPAR models.

This report constitutes an update of two reports that the U.S. Nuclear Regulatory Commission (NRC) previously published to document analyses of LOOP events at U.S. commercial NPPs. Specifically, NUREG-1032, "Evaluation of Station Blackout Accidents at Nuclear Power Plants," covered events that occurred in 1968 – 1985, while NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 – 1996," covered those that occurred in 1980 – 1996. This update was necessary, in part, because of a change in electrical power grid regulations beginning around 1997 and the associated concern about what impact deregulation might have on LOOP frequencies and/or durations and, therefore, on nuclear plant safety.

The attached report is patterned after NUREG/CR-5496, but covers data for 1986 – 2003. The researchers selected 1986 as the starting point in order to begin where NUREG-1032 ended. Although historical records identify LOOP events in a straightforward manner, corresponding information concerning the durations of such events has not always been clear. Moreover, for some LOOP events, the durations were estimated based on other information and/or engineering judgments based on plant operating experience.

The analyses documented in this report resulted in different frequency estimates for critical and shutdown operations under five categories of LOOPS (plant-centered, switchyard-centered, grid-related, severe weather-related, and extreme-weather related). For power operation, grid-related LOOPS contribute 50 percent to the total frequency of 0.033 per reactor critical year, while switchyard-centered LOOPS contribute 26 percent. The remaining three categories of LOOPS have frequency contributions ranging from 7 to 9 percent. By contrast, for shutdown operation, switchyard-centered LOOPS contribute 54 percent to the total frequency of 0.19 per reactor shutdown year, while plant-centered LOOPS contribute 27 percent.

Overall, LOOP frequencies during power operation have decreased significantly over the 36-year period from 1968 through 2003. However, during shutdown operation, the LOOP frequency has remained essentially constant over the 24-year period from 1980 through 2003, although the severe-weather-related LOOP frequency varied significantly depending upon coastal or non-coastal location. By contrast, during power operation, only the grid-related LOOP frequency varied significantly by geographical location. This difference is almost solely the result of one highly unusual LOOP event on the August 14, 2003, during which a grid blackout affected nine NPPs.

We would appreciate specific comments regarding the method to use for the estimation of plant-specific LOOP frequencies and the estimation of the potential bus restoration times.

F. Rahn

- 3 -

If you have any questions regarding this report, please contact Dr. Dale Rasmuson (301-415-7571, DMR@nrc.gov).

Sincerely yours,

/RA/

Charles E. Ader, Director
Division of Risk Analysis and Applications
Office of Nuclear Regulatory Research

Attachment: As stated

