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NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

ERSWG Meeting
Eastern Interconnection Frequency Response Assessment:

Changing Resource Mix Study

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March 8, 2017, Atlanta, GA

RELIABILITY | ACCOUNTABILITY




Study Purpose

Purpose:

- Understand the interconnection-wide reliability implications of the changing resource mix on frequency response
- Incorporate policy issues such as Clean Power Plan implementation with sensitivities such as changing resource mix, control strategies, and other assumptions
- Use the ERSTF Measure 4 metrics to assess frequency response performance

Phased Approach

- **Phase I** – 2016/17
  - Focus on improving plant modeling and data quality
  - Base case development
  - Scenario analysis using various futures
- **Phase II** – 2017/18
  - Evaluate sensitivities using the ERSTF's Frequency Performance measures
  - Integrate complex load model
- **Phase III** – 2018/19
  - Evaluate other interconnections
  - Storage and distributed generation impacts

Frequency Response Study Phase I

- **Cases**
  - Business-As-Usual (BAU) Frequency Responsive Case
  - CPP Base Case: BAU Case with 8500 MW of NTR additions
  - High Nuclear Retirements Case: CPP Base Case with 10,000 MW of Additional NTRs
- **Deadband Modeling**
  - Deadband = 0.00
  - Deadband = +/- 0.017 Hz
- **New Technology Resources (NTRs) Dispatch**
  - Dispatch Pgen = PMAX
  - Dispatch Pgen = 75% PMAX

Build Cases for Frequency Response Scenarios

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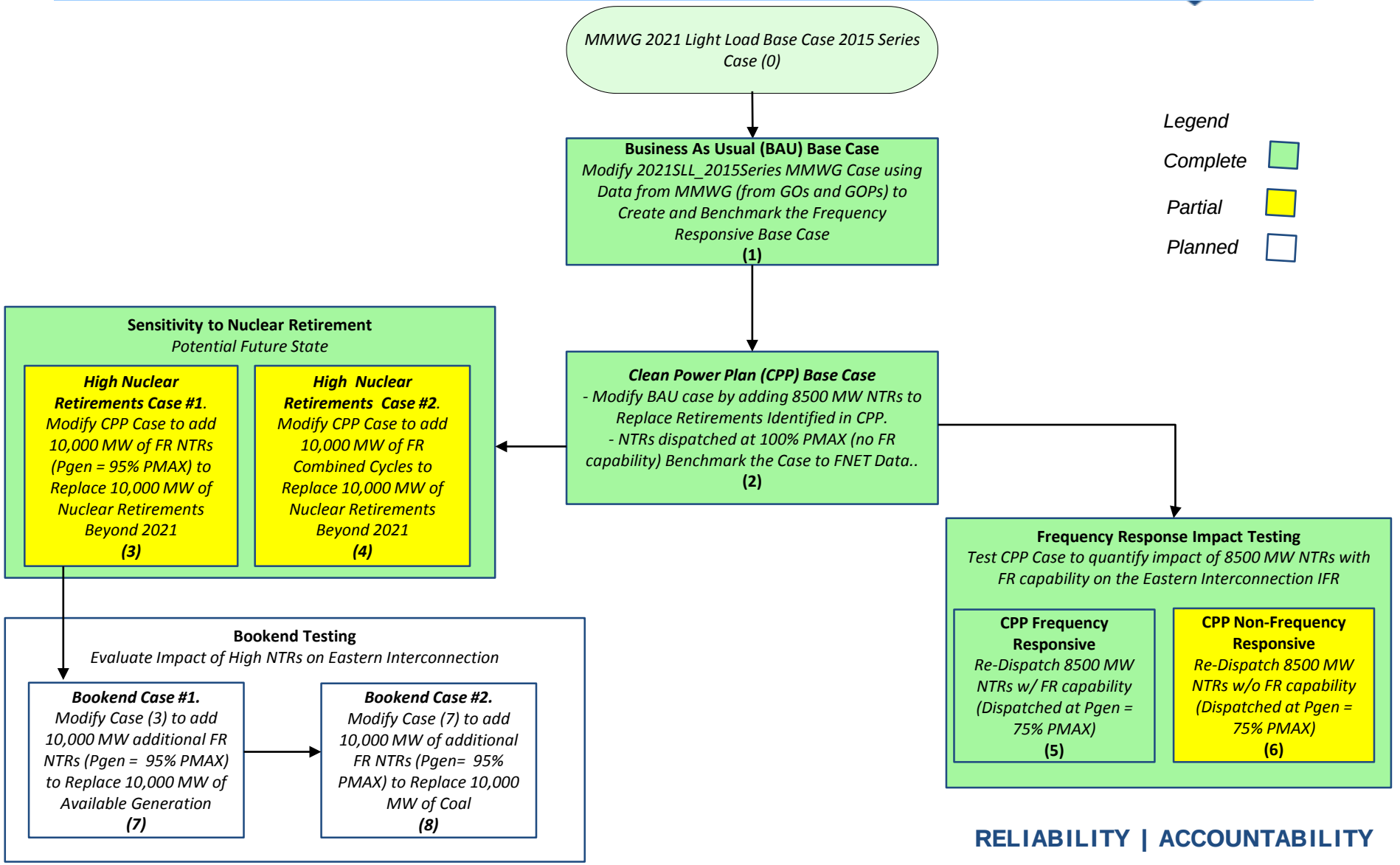
Frequency Responsive Case Development



Analysis Events

- ***Analysis and Benchmarking Events***
  - EI 2015-04-07 Washington, D.C., (1981 MW) (Calvert Cliffs 1 & 2 tripped at 1779 MW net)
  - May 25, 2014 at 07:01 Trip Millstone 2 (870 MW) and Millstone 3 (1,233 MW)
  - Add Loss of Limerick (1100 MW) Generation to Evaluate More Severe Contingency.

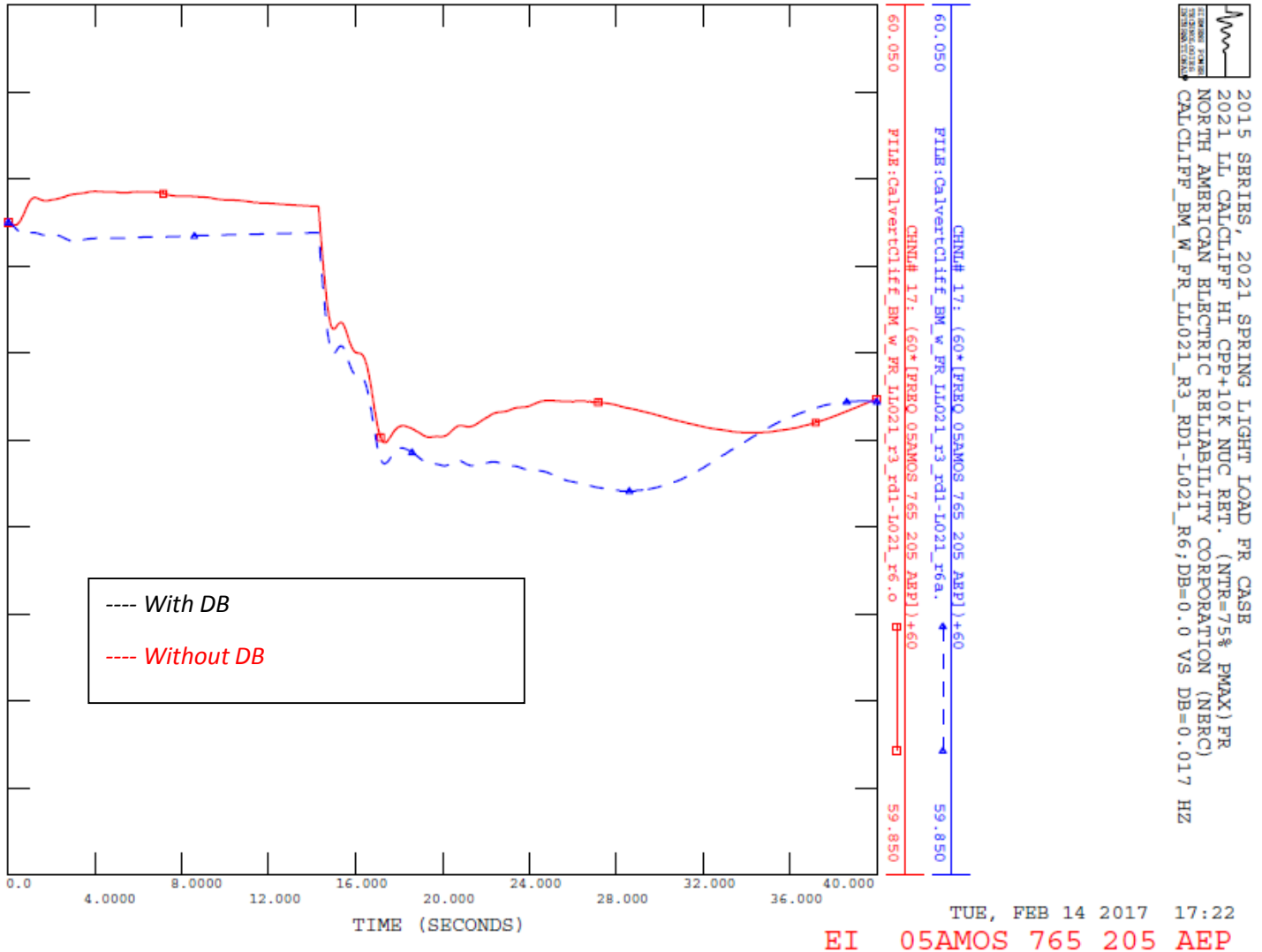
No Disturbance FR CPP Case + 10,000 MW NTRs (100% PMAX) DB = +/- 0.017

♀ PTI INTERACTIVE PLOTTING PROGRAM--PSSPLT SUN, FEB 12 2017 20:47
2015 SERIES, 2021 SPRING LIGHT LOAD FR CASE
2021 LL BASE_CASE DB+-0.017 CPP+10K N.R. (NTR=100% PMAX)FR; Deadband = +/- 0.017 Hz

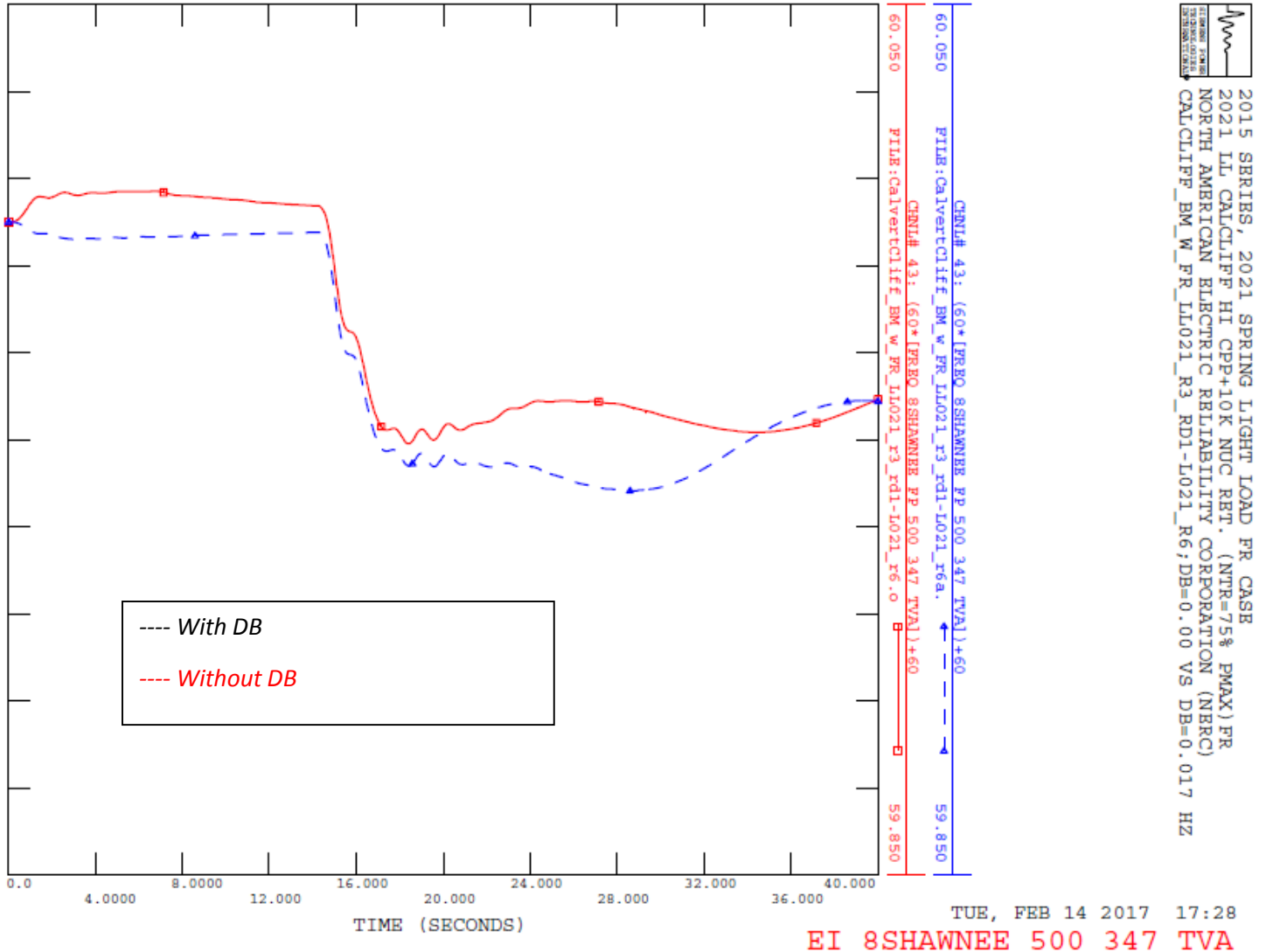
LIST OF 50 CHANNELS WITH MAXIMUM DEVIATION FROM INITIAL TIME= -0.0083
FROM TIME 0.0000 TO TIME 60.0000

CHANEL	IDENTIFIER	INITIAL VALUE	DEVIATION	TIME (SECONDS)
21	FREQ 08EBEND 345 212 DEO&K	0.000	0.5933E-06	34.2235
22	FREQ 09BATH 345 209 DAY	0.000	0.5695E-06	34.1944
40	FREQ 7W GARRARDEK 345 320 EKPC	0.000	0.5039E-06	34.2235
18	FREQ 06CLIFTY 345 206 OVEC	0.000	0.4719E-06	34.3193
20	FREQ 08BEDFRD 345 208 DEI	0.000	0.4460E-06	34.4360
23	FREQ 10ABB345 345 210 SIGE	0.000	0.4456E-06	34.4568
27	FREQ 18CAMPBL 345 218 METC	0.000	0.4393E-06	34.8025
25	FREQ 16GUION 345 216 IPL	0.000	0.4336E-06	34.4360
19	FREQ 07WORTHN 345 207 HE	0.000	0.4326E-06	34.4651
39	FREQ 7REID 345 314 BREC	0.000	0.4307E-06	34.4568
36	FREQ 7SMITH 345 364 OMUA	0.000	0.4271E-06	34.4360
45	FREQ LEVEE 500 401 FPL	0.000	0.4190E-06	35.8773
17	FREQ 05AMOS 765 205 AEP	0.000	0.4071E-06	34.4360
46	FREQ LK TARPON 500 402 DEF	0.000	0.4051E-06	35.8648
11	FREQ SALBRY 345 105 NB	0.000	0.3900E-06	36.4980
12	FREQ 101S-WOODBIN 345 106 NS	0.000	0.3860E-06	36.6229
141	FREQ ELM ROAD 345 295 WEC	0.000	0.3829E-06	34.9025
69	FREQ ERG T11 345 295 WEC	0.000	0.3826E-06	-0.0083
26	FREQ 17HIPLE 345 217 NIPS	0.000	0.3824E-06	34.7151
29	FREQ WILTON ; 765 222 CE	0.000	0.3787E-06	34.7151
147	FREQ RACINE1 345 295 WEC	0.000	0.3781E-06	34.8984
127	FREQ RACINE2 345 295 WEC	0.000	0.3777E-06	34.9067
137	FREQ ARCADN3 345 295 WEC	0.000	0.3750E-06	34.9067
138	FREQ ARCADN1 345 295 WEC	0.000	0.3747E-06	34.9275
143	FREQ BAIN 2 345 295 WEC	0.000	0.3743E-06	34.8275

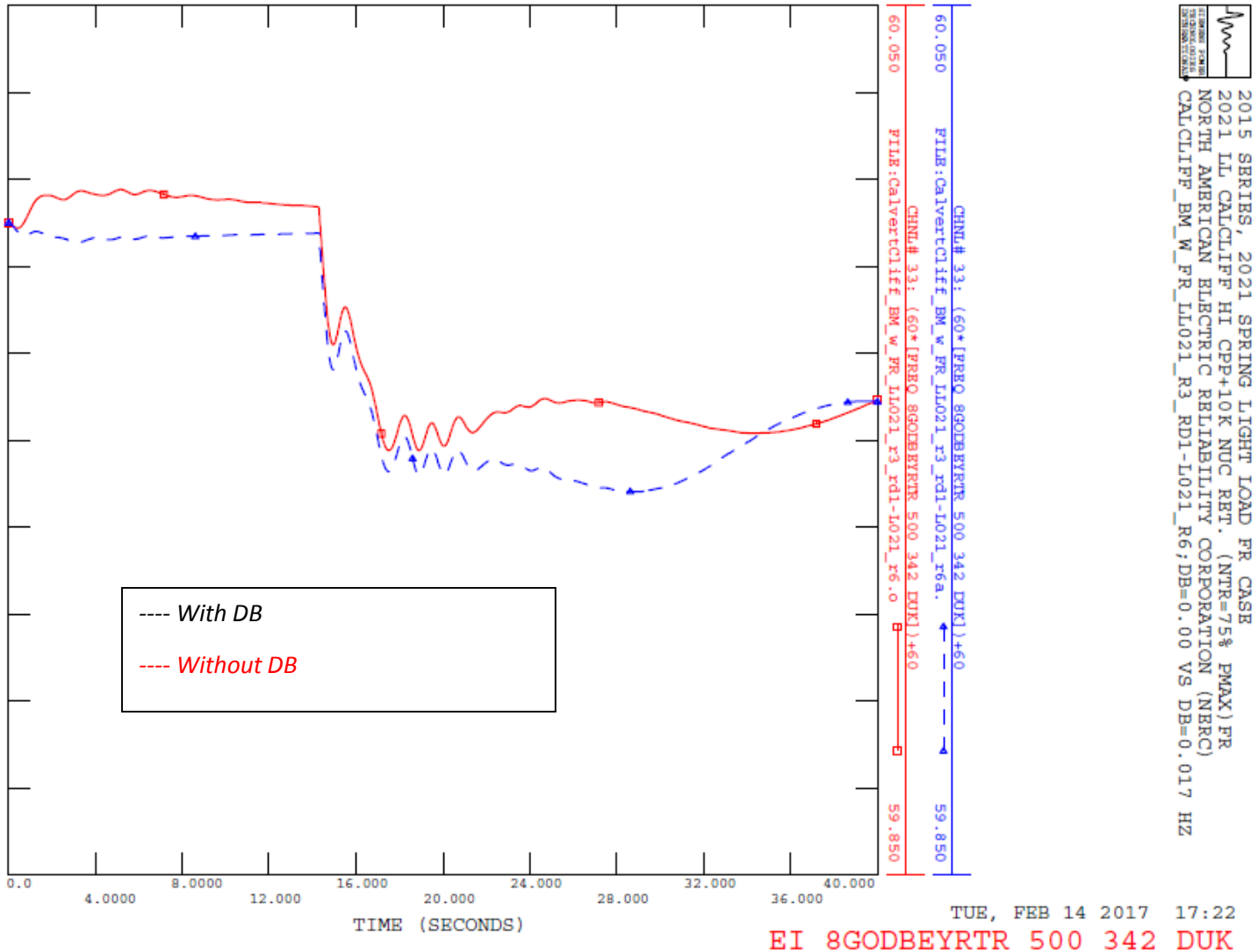
Cal. Cliff (AEP) CPP Case + 10,000 MW NTRs (75% PMAX) DB=0.00 vs DB=0.017 HZ



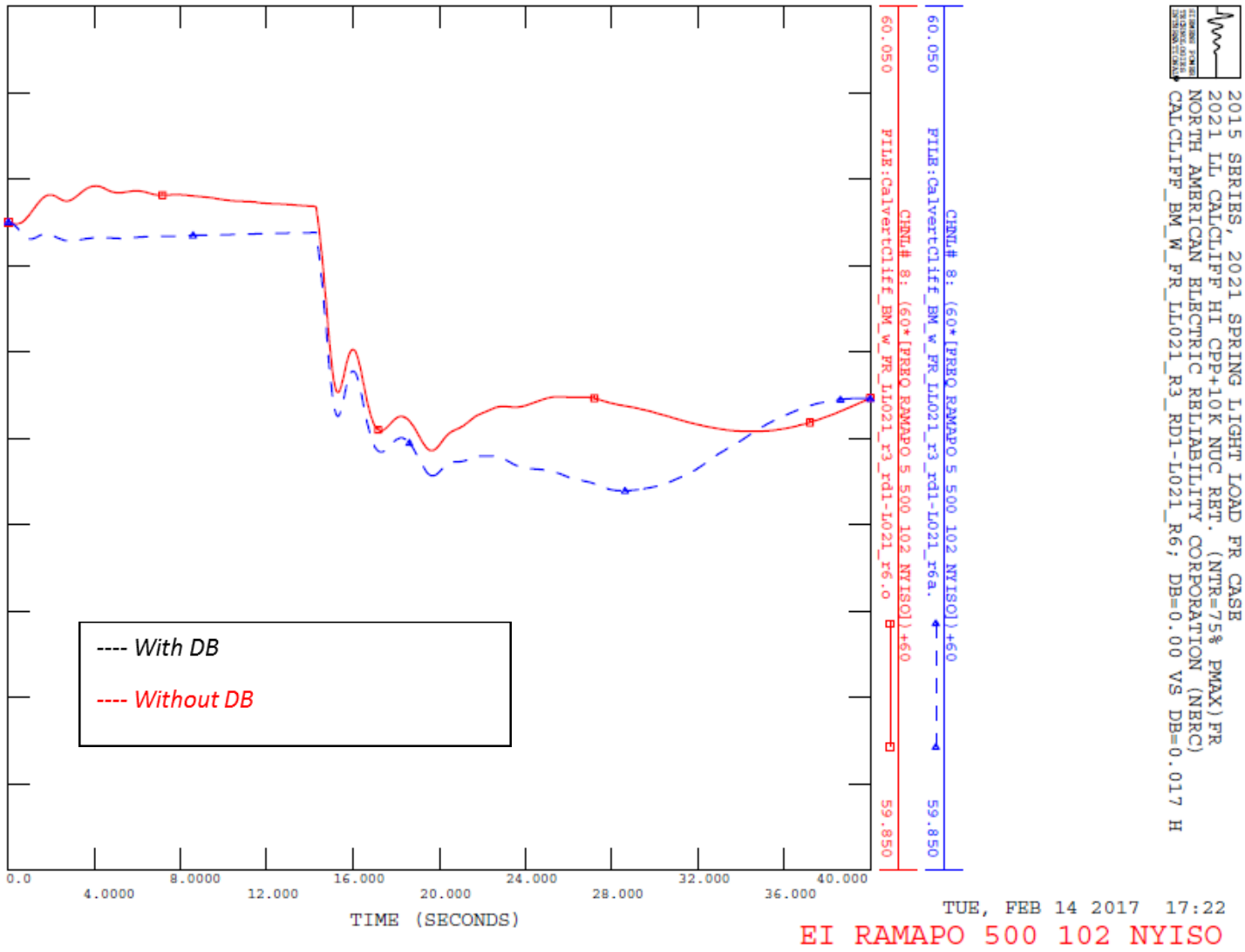
Cal. Cliff (TVA) CPP Case + 10,000 MW NTRs (75% PMAX) DB=0.00 vs DB=0.017 HZ



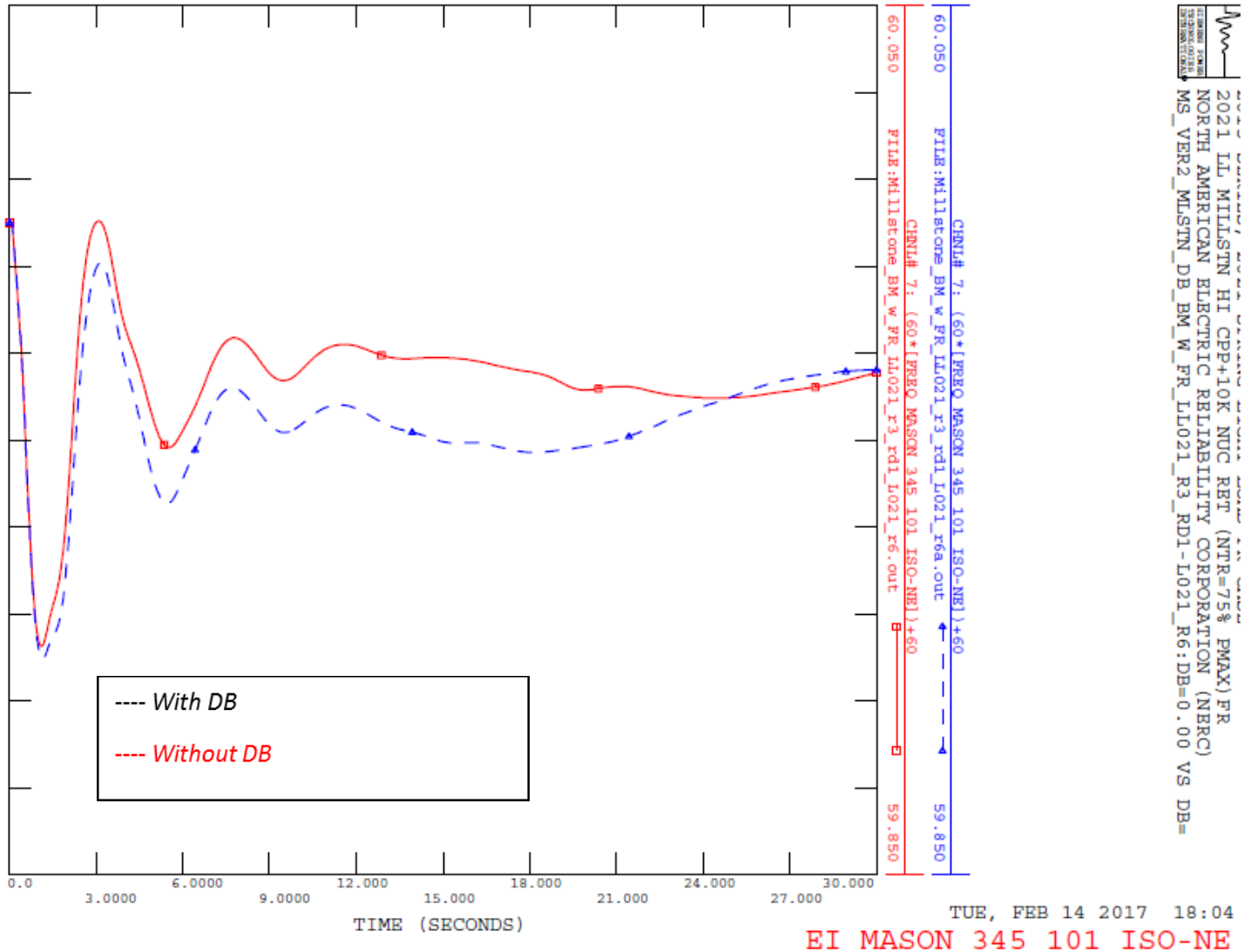
Cal. Cliff (DUK) CPP Case + 10,000 MW NTRs (75% PMAX) DB=0.00 vs DB=0.017 HZ



Cal. Cliff (AEP) CPP Case + 10,000 MW NTRs (75% PMAX) DB=0.00 vs DB=0.017 HZ



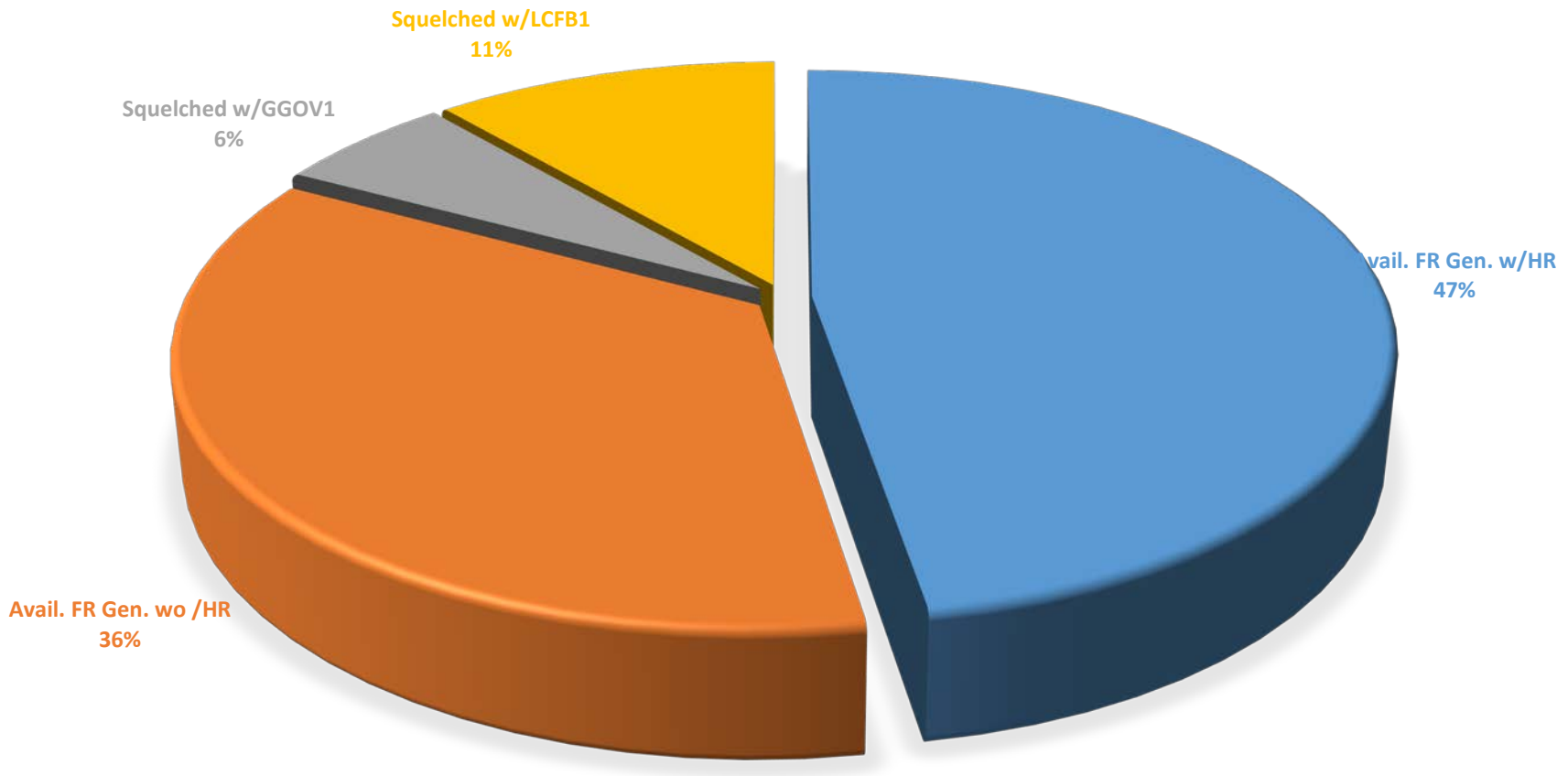
Millstone (ISO-NE) CPP Case + 10,000 MW NTRs (75% PMAX) DB=0.00 vs DB=0.017 HZ



Base Case Online Generation Summary

Base Case Online Generation Summary		
Avail. FR Gen. w/HR	63,283	47.0%
Avail. FR Gen. wo /HR	49,542	36.8%
Squelched w/GGOV1	7,634	5.7%
Squelched w/LCFB1	14,252	10.6%
Total Online Generation	**134,711**	**100.0%**

Base Case Online Generation Summary



Questions and Answers