

## **Appendix I**

# **Transient Stability Switching Sequences**

Switching Sequence 1 - Three-phase fault on Pala 69 kV bus cleared after 6 cycles (no system elements removed post clearing).

```
*
* 3-phase 6 cycle fault at Pala 69 kV
*
* CC cards for post-transient only
*
CC  DRP 0
*
* Apply bus fault at Pala 69 kV
*
FB  60.0  "PALA    "  69.0
*
* Clear bus fault at Pala 69 kV
*
CFB 66.0  "PALA    "  69.0
*
```

Switching Sequence 2 - Three-phase fault on Pala 69 kV bus cleared after 6 cycles by opening Pala - Lilac 69 kV TL6932.

```
*
* 3-phase 6 cycle fault at Pala 69 kV
* followed by loss of Pala - Lilac 69 kV TL6932
*
* CC cards for post-transient only
*
CC  DRP 0
*
* Apply bus fault at Pala 69 kV
*
FB  60.0  "PALA    "  69.0
*
* Clear bus fault at Pala 69 kV
*
CFB 66.0  "PALA    "  69.0
*
* Trip Pala - Lilac 69 kV TL6932
*
DL  66.0  "PALA    "  69.0  "LILAC  "  69.0  "1  "
*
```

Switching Sequence 3 - Three-phase fault on Pala 69 kV bus cleared after 6 cycles by opening Avocado - Monserate - Pala 69 kV TL698.

```
*
* 3-phase 6 cycle fault at Pala 69 kV
* followed by loss of Avocado - Monserate - Pala 69 kV TL698
*
* CC cards for post-transient only
*
CC  DRP 0
*
* Apply bus fault at Pala 69 kV
*
FB  60.0  "PALA      "  69.0
*
* Clear bus fault at Pala 69 kV
*
CFB 66.0  "PALA      "  69.0
*
* Trip Avocado - Monserate - Pala 69 kV TL698
*
DL  66.0  "AVOCADO "  69.0  "MNSRATTP"  69.0  "1 "
DL  66.0  "MNSRATTP" 69.0  "MONSRATE"  69.0  "1 "
DL  66.0  "MNSRATTP" 69.0  "PALA      "  69.0  "1 "
*
```

Switching Sequence 4 - Three-phase fault on San Onofre 230 kV bus cleared after 6 cycles by tripping San Onofre units 2 and 3.

```
*
* 3 phase 6 cycle fault at San Onofre 230 kV
* followed by loss of SONGS units #2 and #3
*
* CC cards for post-transient only
*
CC DRP 2150
*
* Apply bus fault at S.ONOFRE 230 kV
*
FB 60.0 "S.ONOFRE" 230.
*
* Clear bus fault at S.ONOFRE 230 kV
*
CFB 66.0 "S.ONOFRE" 230.
*
* Trip SONGS units #2 and #3
*
TG 66.0 "S.ONOFR2 " 22. "***"
TG 66.0 "S.ONOFR3 " 22. "***"
*
```

Switching Sequence 5 - Three-phase fault on Palomar Energy 230 kV bus cleared after 6 cycles by tripping Palomar Energy units 1, 2, and 3.

```
*
* 3-phase 6 cycle fault at Palomar 230 kV
* followed by loss of PEN units 1, 2 and 3
*
* CC cards for post-transient only
*
CC  DRP 520
*
* Apply bus fault at Palomar 230 kV
*
FB  60.0  "PEN      " 230.
*
* Clear bus fault at Palomar 230kV
*
CFB 66.0  "PEN      " 230.
*
* Trip PEN units 1, 2 and 3
*
TG  66.0  "PEN_CT1 " 18. "***"
TG  66.0  "PEN_CT2 " 18. "***"
TG  66.0  "PEN_ST  " 18. "***"
*
```

Switching Sequence 6 without SPS - Three-phase fault on Imperial Valley/Windfarm 500 kV bus cleared after 4 cycles by opening Imperial Valley/Windfarm-Miguel 500 kV transmission line. (without SPS)

```
*
* 3-phase 4 cycle fault at Imperial Valley 500 kV/Windfarm 500 kV
* followed by loss of Imperial Valley/Windfarm - Miguel 500 kV TL50001;
*
* CC cards for post-transient only
*
CC  DRP 0
*
* Apply bus fault at Imperial Valley 500 kV/Windfarm 500 kV
*
FB  60.0  "WNUFARMS" 500.
*
* Flash SWPL capacitors
*
FC  60.0  "HASSYAMP" 500. "N.GILA " 500. "1 " 2
*FC  60.0  "N.GILA " 500. "IMPRLVLY" 500. "1 " 2
*FC  60.0  "IMPRLVLY" 500. "WNUFARMS" 500. "1 " 1
*
* Clear bus fault at Imperial Valley 500 kV/Windfarm 500 kV
*
CFB 64.0  "WNUFARMS" 500.
*
* Trip Imperial Valley/Windfarm - Miguel TL50001
*
DL  64.0  "WNUFARMS" 500. "MIGUEL " 500. "1 "
*
* Reinsert remaining SWPL capacitors
*
RC  64.0  "HASSYAMP" 500. "N.GILA " 500. "1 " 2
*RC  64.0  "N.GILA " 500. "IMPRLVLY" 500. "1 " 2
*RC  64.0  "IMPRLVLY" 500. "WNUFARMS" 500. "1 " 1
*
```

Switching Sequence 6 with SPS 6.1 - Three-phase fault on Imperial Valley/Windfarm 500 kV bus cleared after 4 cycles by opening Imperial Valley/Windfarm-Miguel 500 kV transmission line. (with SPS 6.1)

```

*
* 3-phase 4 cycle fault at Imperial Valley 500 kV/Windfarm 500 kV
* followed by loss of Imperial Valley/Windfarm - Miguel 500 kV TL50001;
* followed by automatic SPS 6.1 to open IV Generation
*
* CC cards for post-transient only
*
CC  DRP 952
*
* Apply bus fault at Imperial Valley 500 kV/Windfarm 500 kV
*
FB  60.0  "WNUFARMS" 500.
*
* Flash SWPL capacitors
*
FC  60.0  "HASSYAMP" 500. "N.GILA " 500. "1 " 2
*FC  60.0  "N.GILA " 500. "IMPRLVLY" 500. "1 " 2
*FC  60.0  "IMPRLVLY" 500. "WNUFARMS" 500. "1 " 1
*
* Clear bus fault at Imperial Valley 500 kV/Windfarm 500 kV
*
CFB 64.0  "WNUFARMS" 500.
*
* Trip Imperial Valley/Windfarm - Miguel TL50001
*
DL  64.0  "WNUFARMS" 500. "MIGUEL " 500. "1 "
*
* Reinsert remaining SWPL capacitors
*
RC  64.0  "HASSYAMP" 500. "N.GILA " 500. "1 " 2
*RC  64.0  "N.GILA " 500. "IMPRLVLY" 500. "1 " 2
*RC  64.0  "IMPRLVLY" 500. "WNUFARMS" 500. "1 " 1
*
* SDG&E SPS TMC1505 6.1 SPS B
* (assume redundant scheme in CFE operates in 2 sec)
* Trip IV Generation
*
TG  64.0  "INTBCT " 16.  "****"
TG  64.0  "INTBST " 18.  "****"
TG  64.0  "IV GEN1 " 21.  "****"
TG  64.0  "IV GEN2 " 18.  "****"
TG  64.0  "IV GEN3 " 18.  "****"
*
* Add in LRP1 unit if connected for export to U.S.
*

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Switching Sequence 6 with SPS 6.2 - Three-phase fault on Imperial Valley/Windfarm 500 kV bus cleared after 4 cycles by opening Imperial Valley/Windfarm-Miguel 500 kV transmission line. (with SPS 6.2)

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*
* 3-phase 4 cycle fault at Imperial Valley 500 kV/Windfarm 500 kV
* followed by loss of Imperial Valley/Windfarm - Miguel 500 kV TL50001;
* followed by automatic SPS 6.1 to open IV Generation
* followed by automatic SPS 6.2 to open ML - TJI 230 kV TL23040 Heavy Summer
* followed by automatic SPS 6.2 to open IV-ROA 230 kV Light Winter
*
* CC cards for post-transient only
*
CC  DRP 952
*
* Apply bus fault at Imperial Valley 500 kV/Windfarm 500 kV
*
FB  60.0  "WNUFARMS" 500.
*
* Flash SWPL capacitors
FC  60.0  "HASSYAMP" 500. "N.GILA " 500. "1 " 2
*FC  60.0  "N.GILA " 500. "IMPRLVLY" 500. "1 " 2
*FC  60.0  "IMPRLVLY" 500. "WNUFARMS" 500. "1 " 1
*
* Clear bus fault at Imperial Valley 500 kV/Windfarm 500 kV
CFB 64.0  "WNUFARMS" 500.
*
* Trip Imperial Valley/Windfarm - Miguel TL50001
DL  64.0  "WNUFARMS" 500. "MIGUEL " 500. "1 "
*
* Reinsert remaining SWPL capacitors
RC  64.0  "HASSYAMP" 500. "N.GILA " 500. "1 " 2
*RC  64.0  "N.GILA " 500. "IMPRLVLY" 500. "1 " 2
*RC  64.0  "IMPRLVLY" 500. "WNUFARMS" 500. "1 " 1
*
* SDG&E SPS TMC1505 6.1 SPS B
* (assume redundant scheme in CFE operates in 2 sec)
* Trip IV Generation
TG  64.0  "INTBCT " 16.  "****"
TG  64.0  "INTBST " 18.  "****"
TG  64.0  "IV GEN1 " 21.  "****"
TG  64.0  "IV GEN2 " 18.  "****"
TG  64.0  "IV GEN3 " 18.  "****"
*
* SDG&E SPS TMC1505 6.2
* (assumes ROA-HRD or ROA-RUM over 388 MVA operates in 2 sec)
* Trip ML - TJI 230 kV TL23040 Heavy Summer
* Trip IV-ROA 230 kV Light Winter
*
DL  184.  "MIGUEL " 230. "TJI-230 " 230. "1"
DL  184.  "IMPRLVLY" 230. "ROA-230 " 230. "1"
*

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