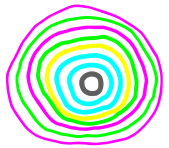
VOITH

FRT, FIKS, RfG
How to ride through the fault?

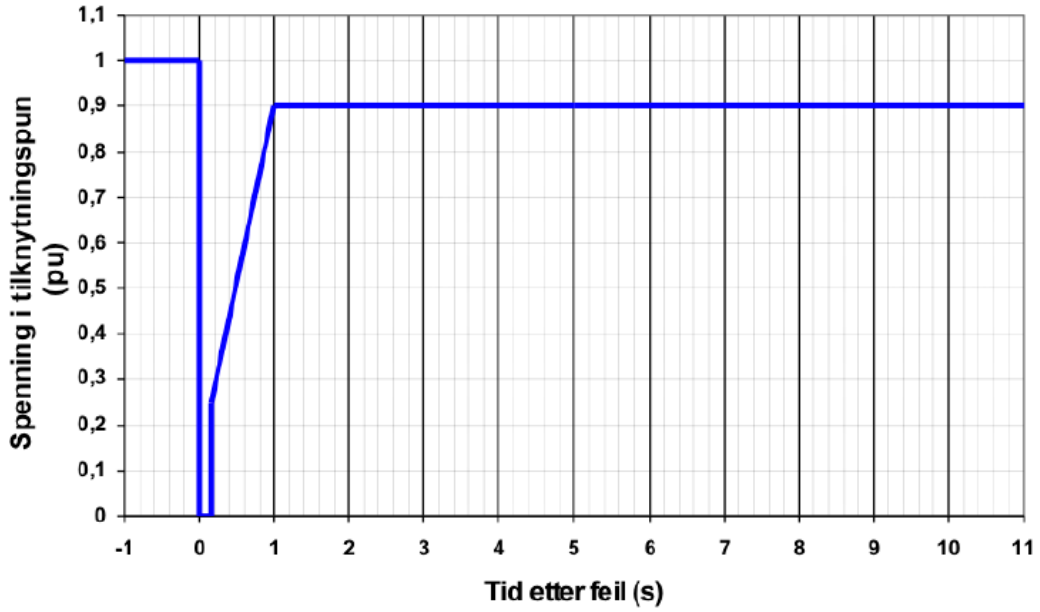
Oslo, 2017-11-16



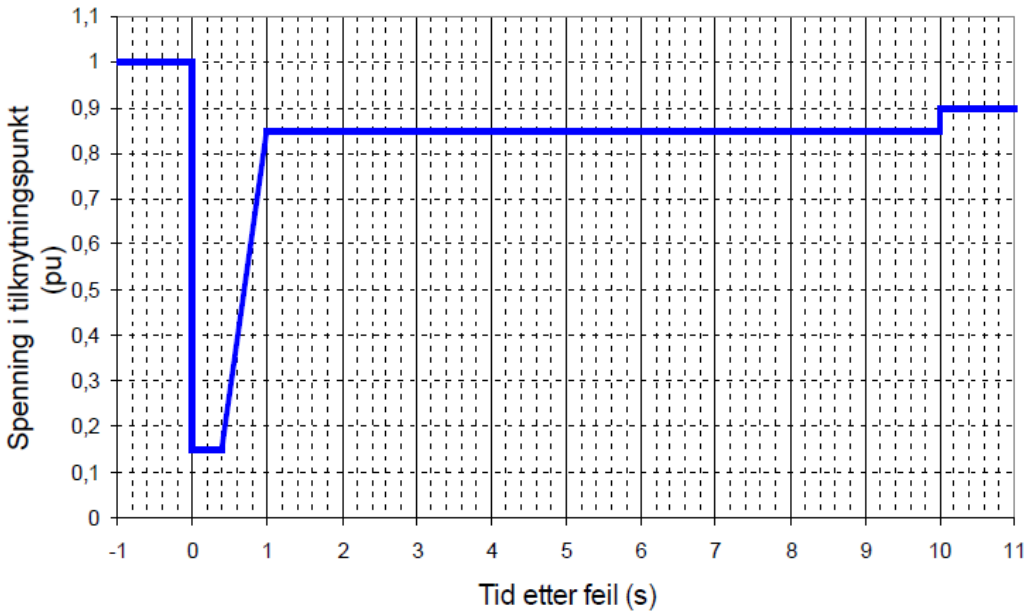
Welcome
to the Next
150 Years

Fault-Ride-Through, what does the FIKS say?

Produksjonsanlegg skal operere og levere effekt innenfor følgende spenningsforløp i tilknytningspunktet:



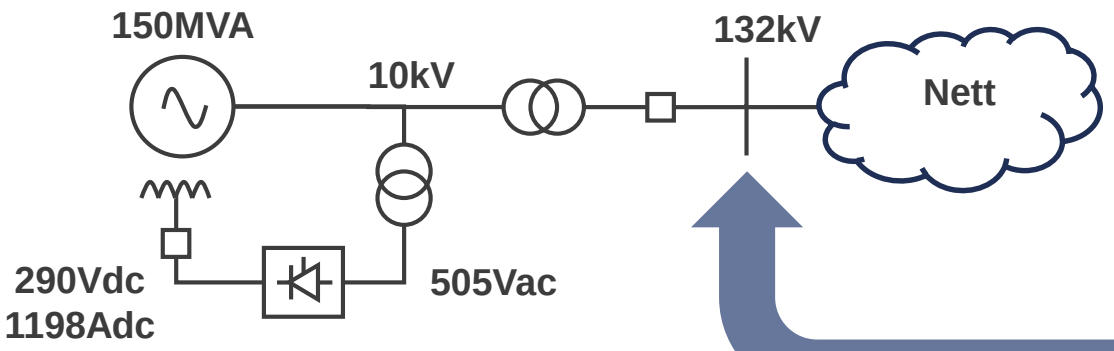
DRIFTSSPENNING ≥ 220 KV

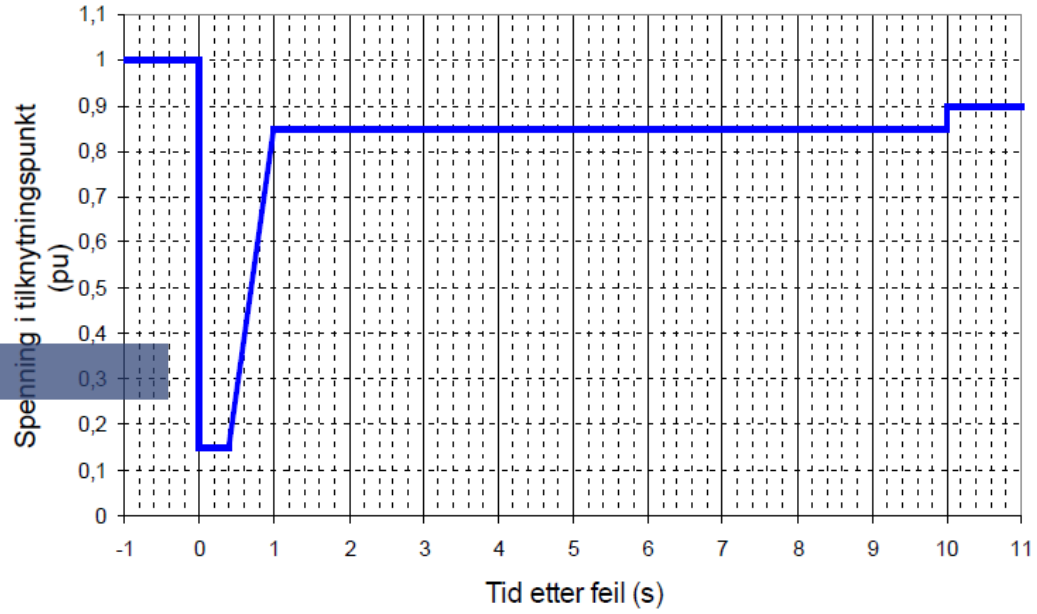


DRIFTSSPENNING < 220 KV

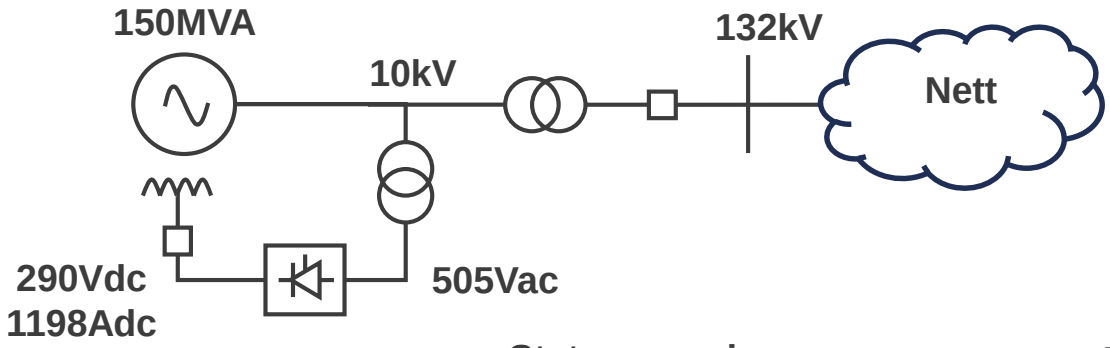
Fault-Ride-Through, what does the FIKS say?

Produksjonsanlegg skal operere og levere
effekt innenfor følgende spenningsforløp i tilknytningspunktet:



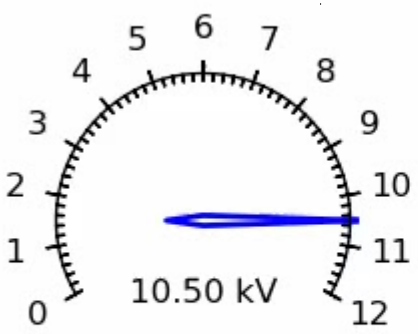


DRIFTSSPENNING < 220 KV

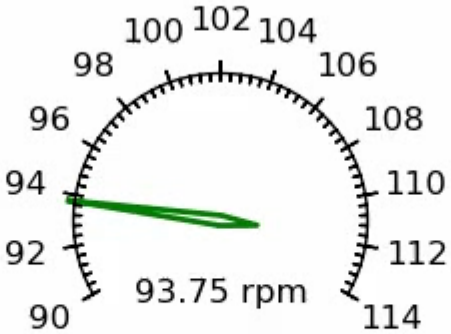


VOITH

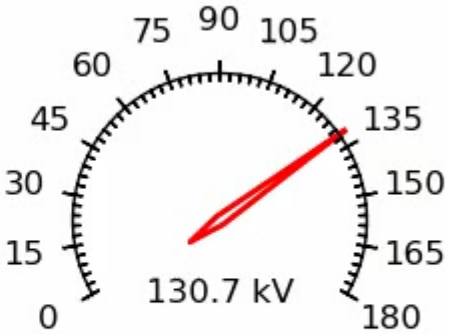
Statorspenning
[kV]



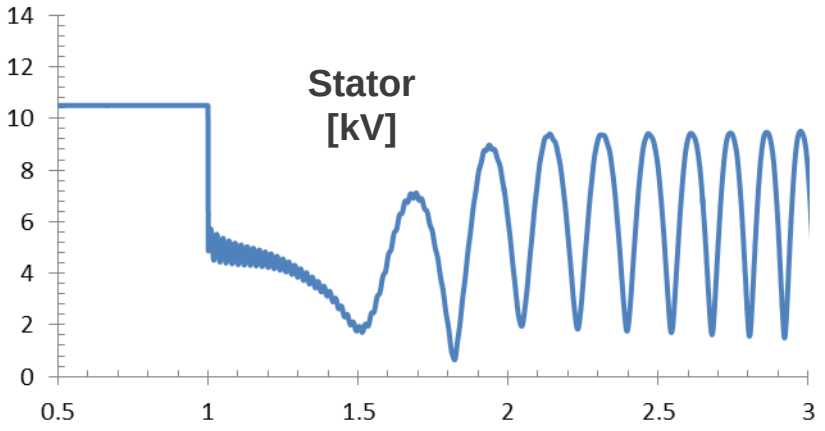
Aggregat rpm
[min^{-1}]

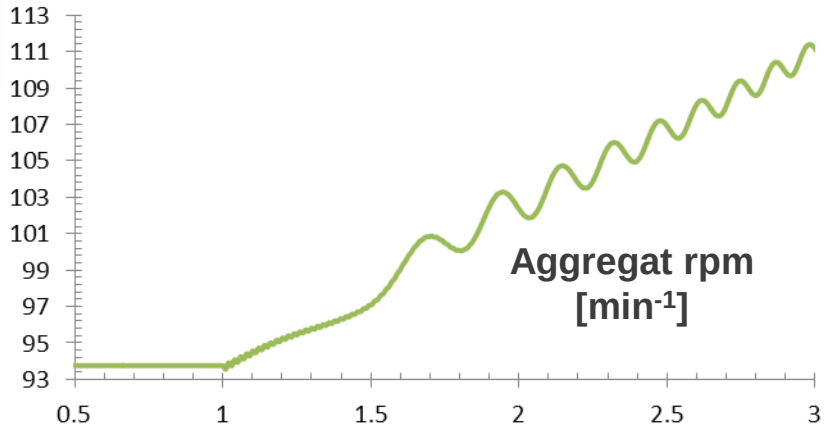


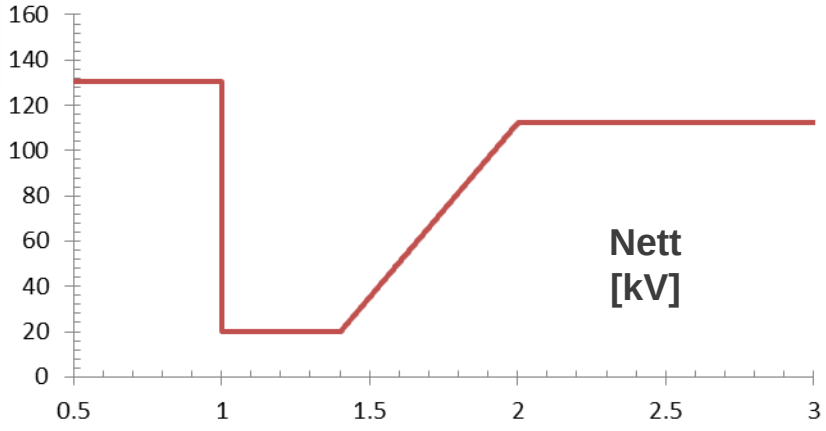
Nettspenning
[kV]



Clock: 0.946 s





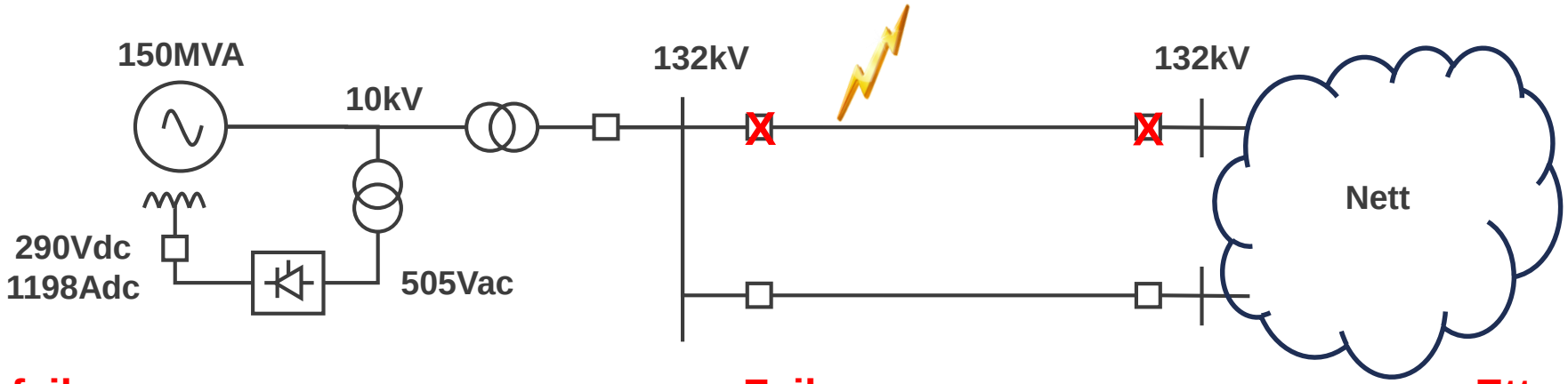


Fault-Ride-Through, what does the RfG say?

‘fault-ride-through’: the capability of electrical devices to be able to remain connected to the network and operate through periods of low voltage at the connection point caused by secured faults

Fault-Ride-Through, what does the RfG say?

Remain connected secured faults



Før feil

Kortslutningsyttelse

kV MW MVAr

Feil

type

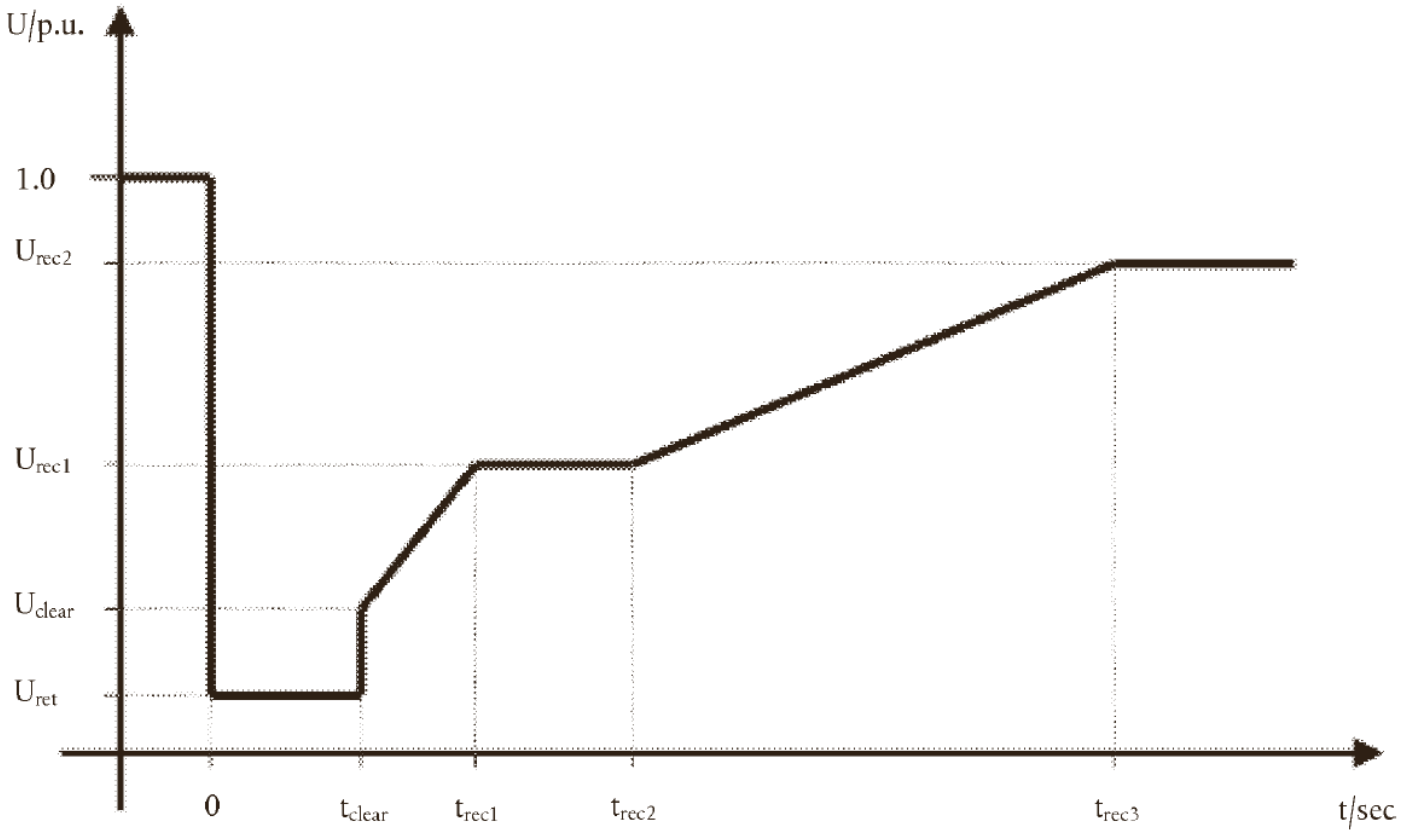
restspenning (avstand)

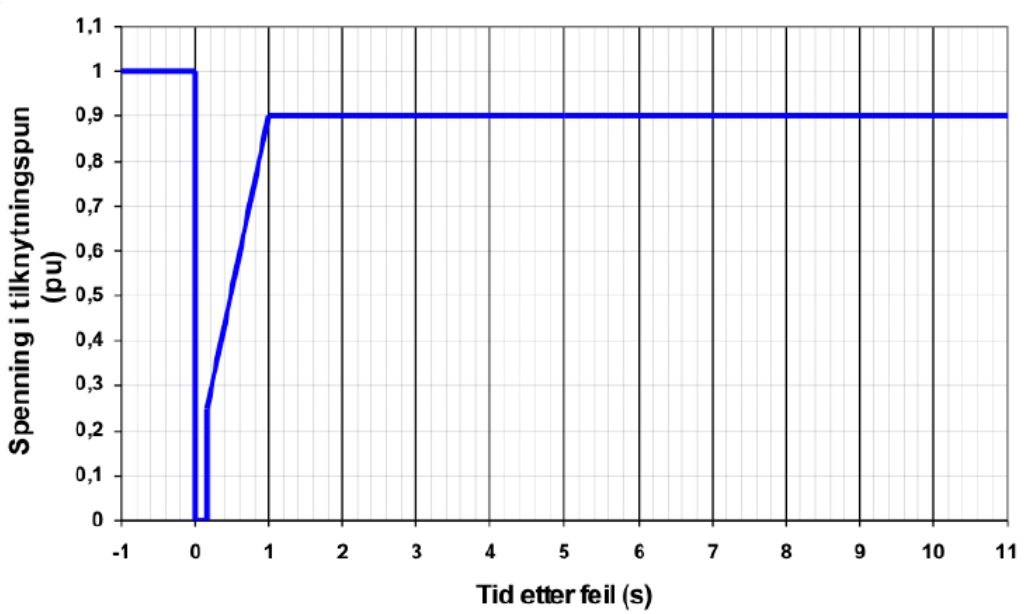
tid

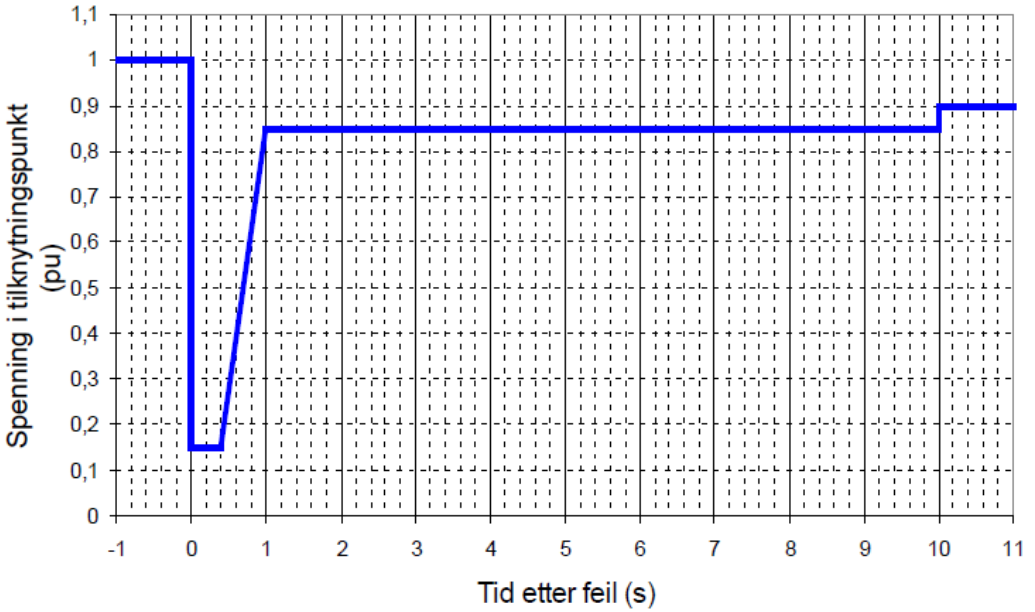
Etter feil

Kortslutningsytelse

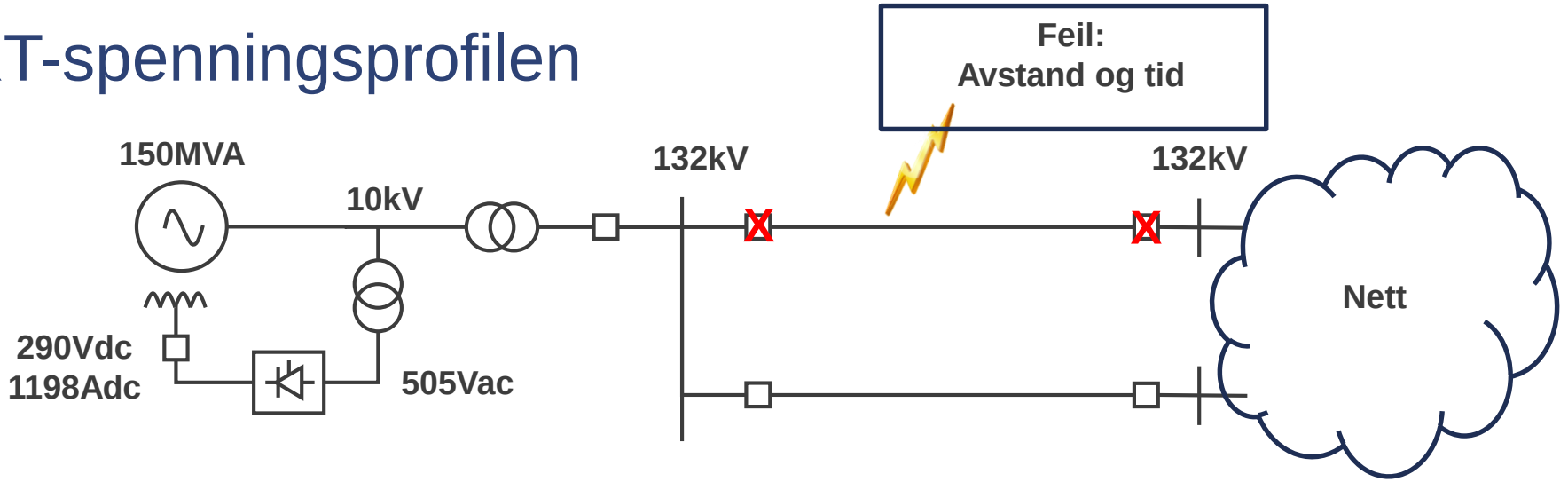
RfG FRT-spenningsprofilen

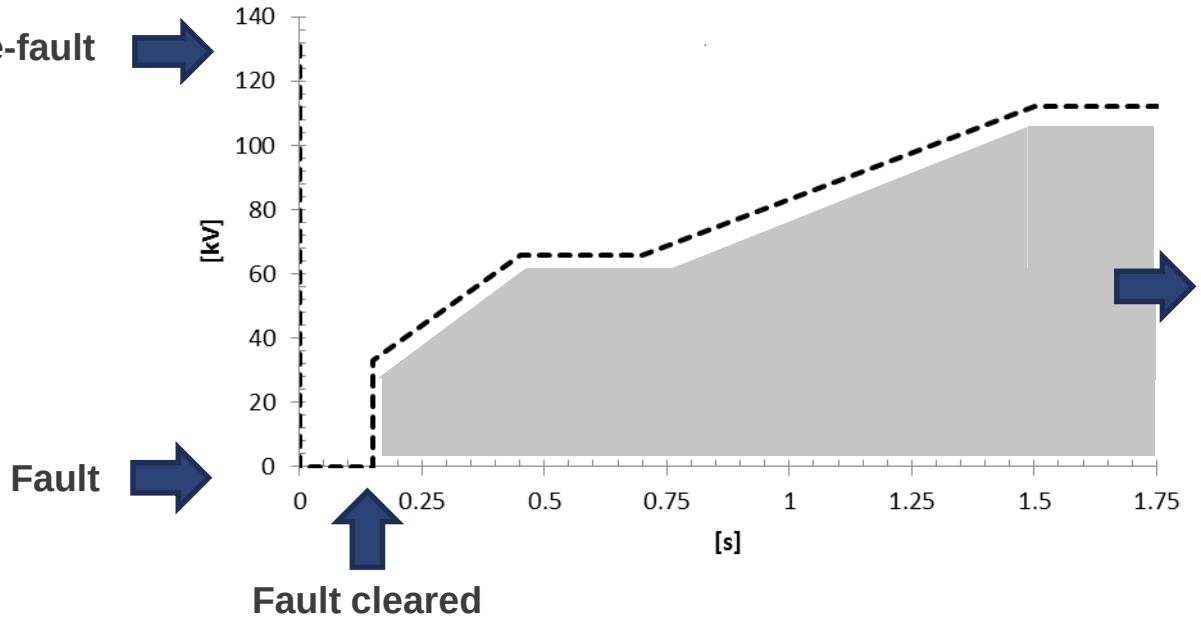






RfG FRT-spenningsprofilen



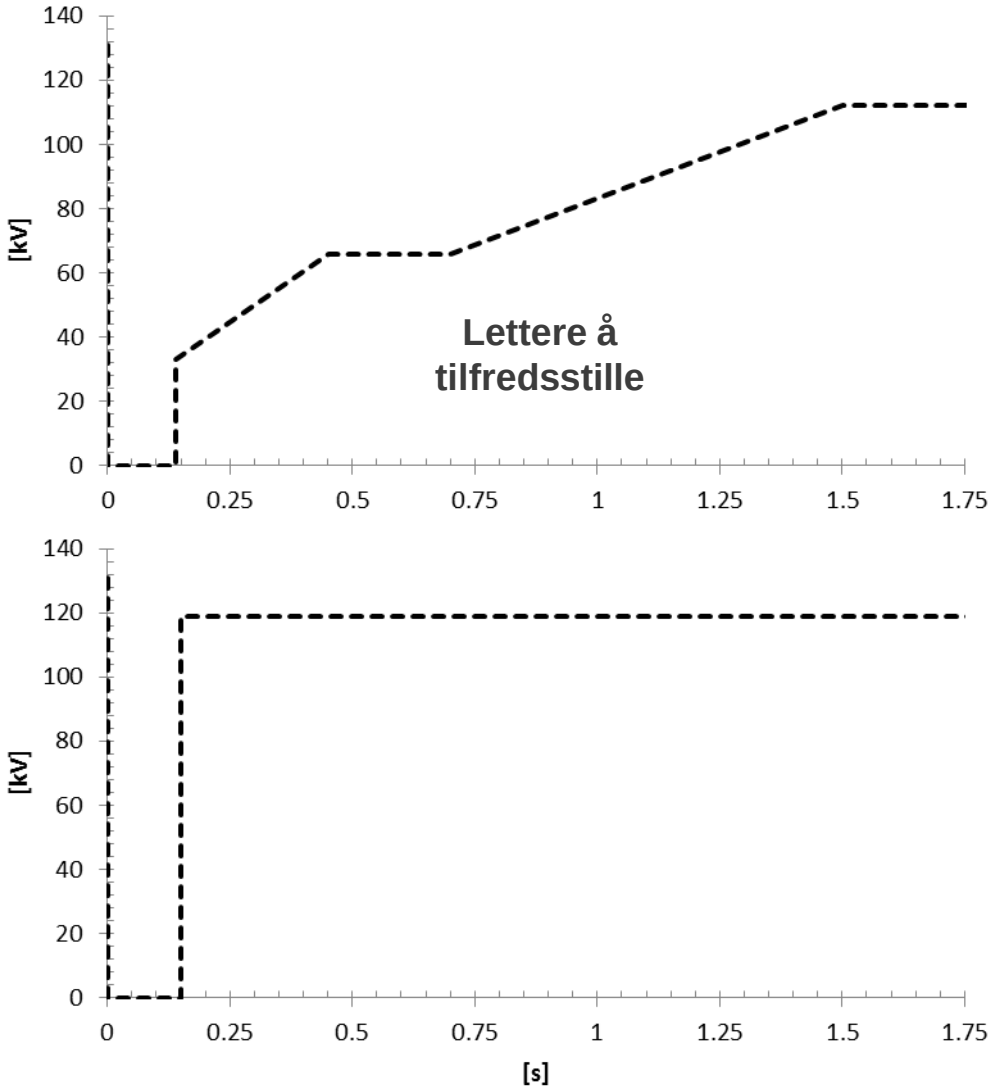


Laveste spenning på tilkoblingspunktet som generatoren klarer å opprettholde.

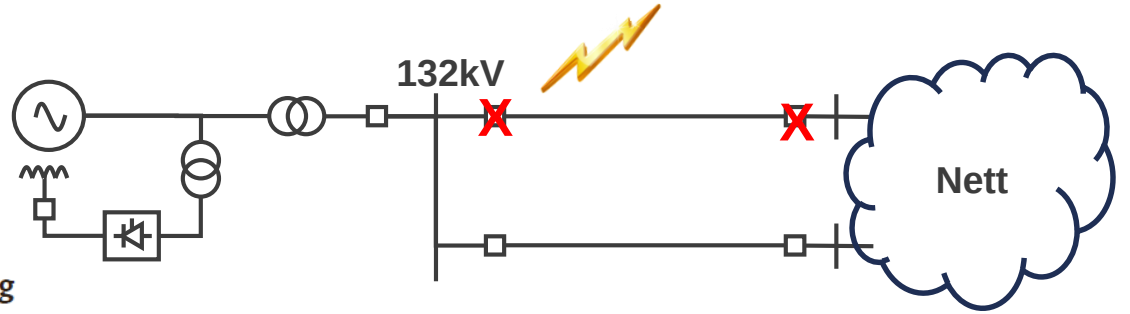
EU 2016/631 FRT-spenningsprofilen

Parameters for Figure 3 for fault-ride-through capability of synchronous power-generating modules

Voltage parameters (pu)		Time parameters (seconds)	
U_{ret}:	0	t_{clear}:	0,14-0,15
U_{clear}:	0,25	t_{rec1}:	t_{clear}-0,45
U_{rec1}:	0,5-0,7	t_{rec2}:	t_{rec1}-0,7
U_{rec2}:	0,85-0,9	t_{rec3}:	t_{rec2}-1,5

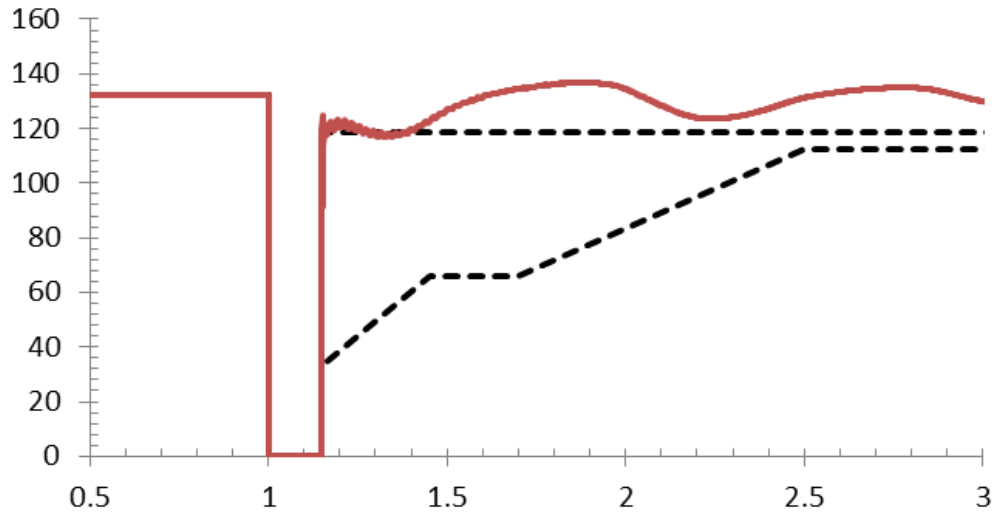


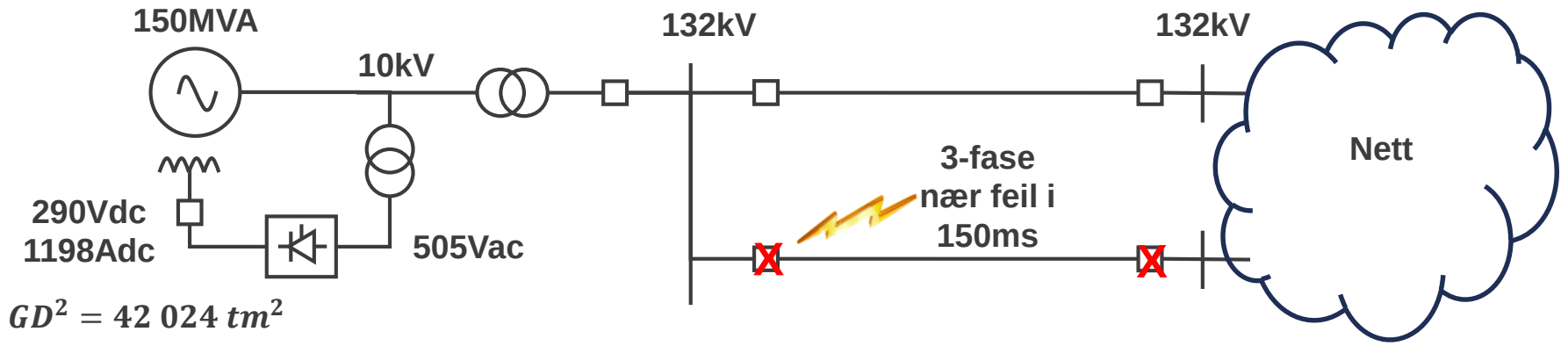
EU 2016/631 FRT-spenningsprofilen



Parameters for Figure 3 for fault-ride-through capability of synchronous power-generating modules

Voltage parameters (pu)		Time parameters (seconds)	
U_{ret}:	0	t_{clear}:	0,14-0,15
U_{clear}:	0,25	t_{rec1}:	t_{clear}-0,45
U_{rec1}:	0,5-0,7	t_{rec2}:	t_{rec1}-0,7
U_{rec2}:	0,85-0,9	t_{rec3}:	t_{rec2}-1,5



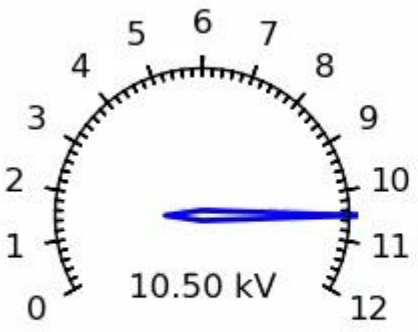


Nett kortslutningsytelse	
Før feil	Lav
Etter feil	Veldig lav

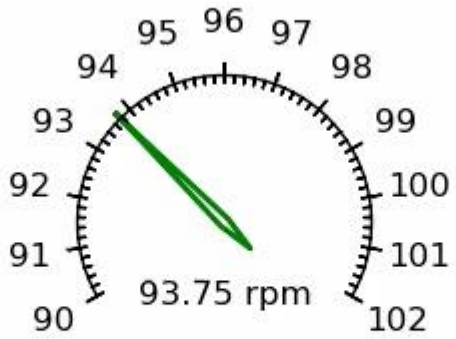
$GD^2 = 42\,024\ tm^2$

$H = 3,375s$

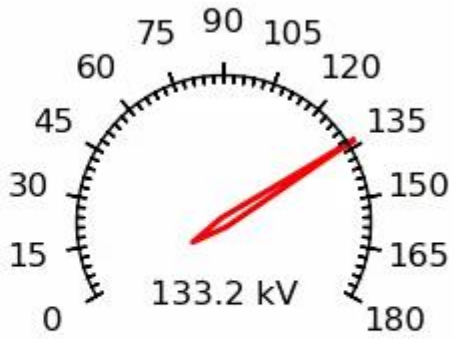
Statorspenning [kV]



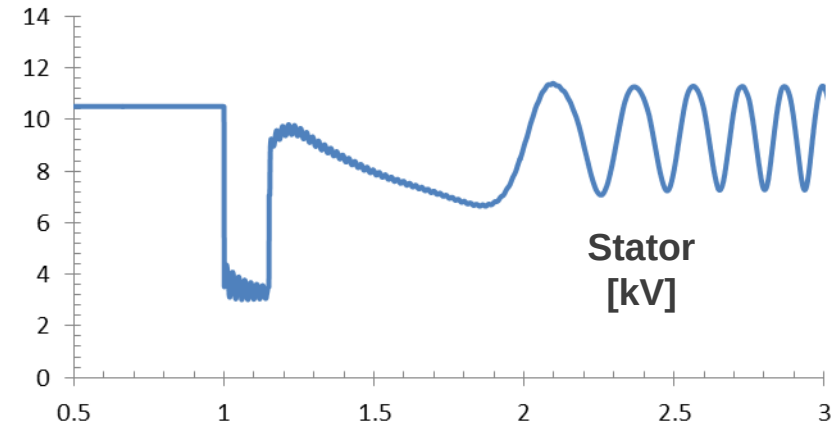
Aggregat rpm [min-1]

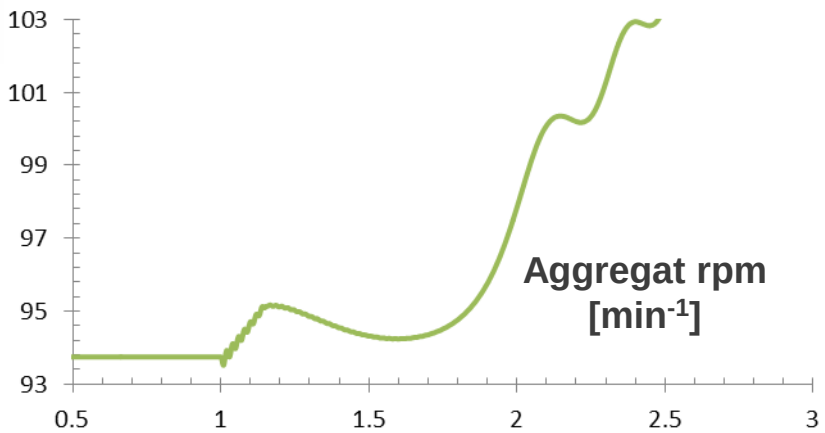


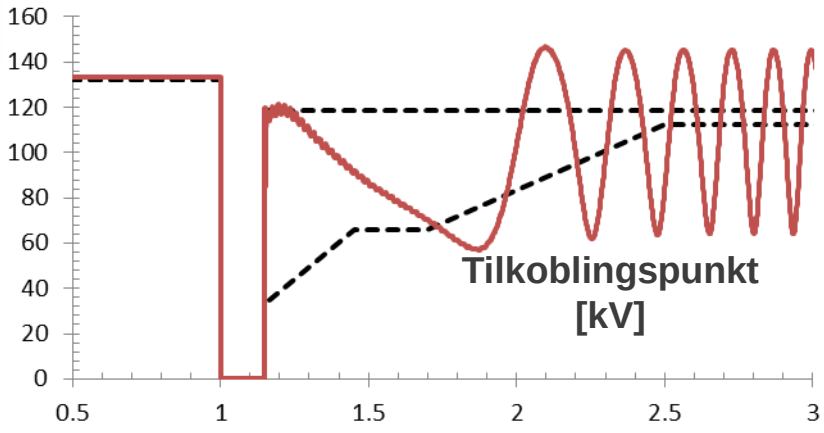
Tilkoblingspunkt [kV]



Clock: 0.946 s

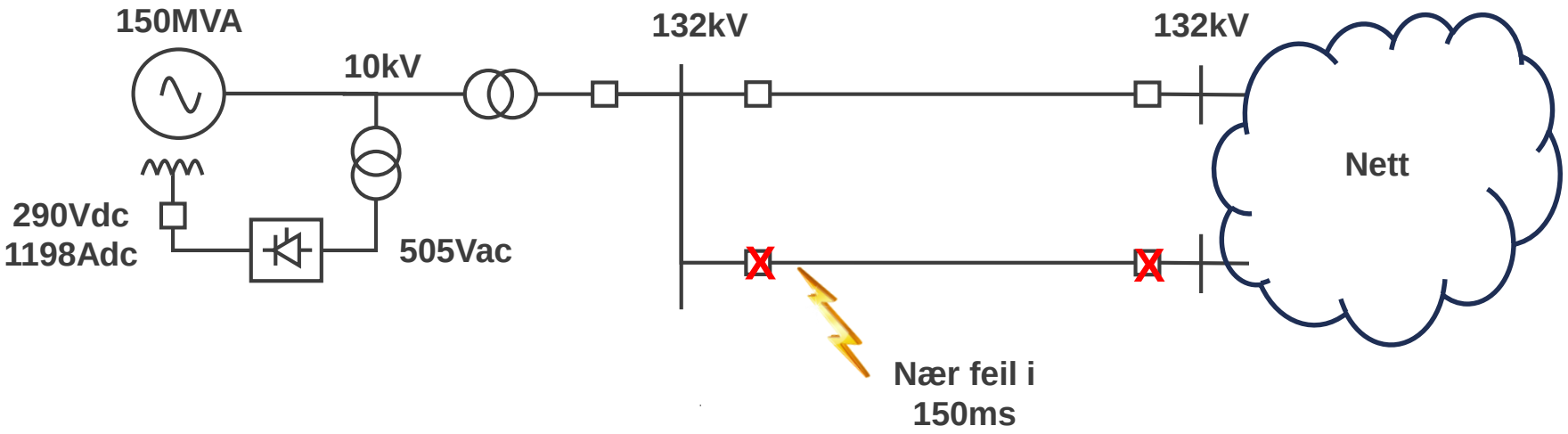


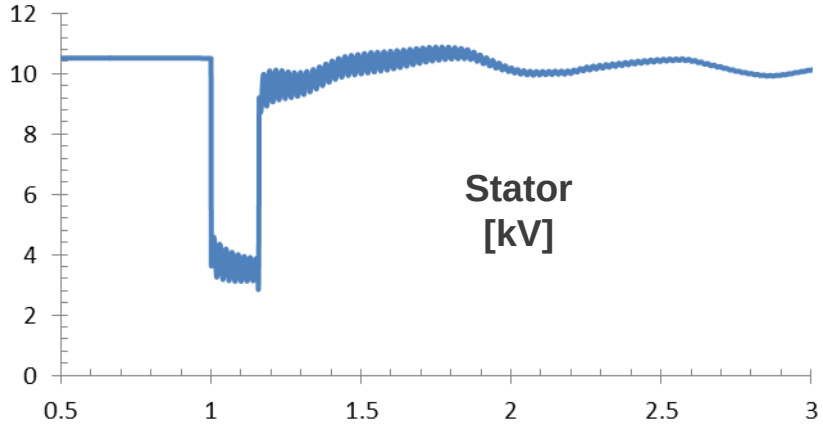


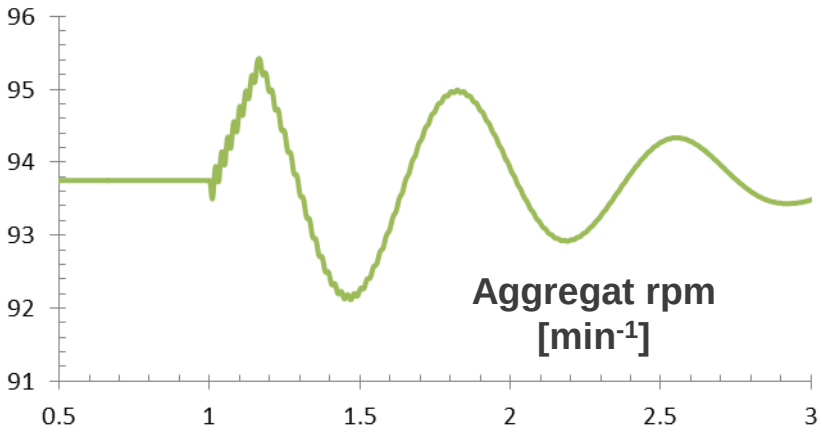


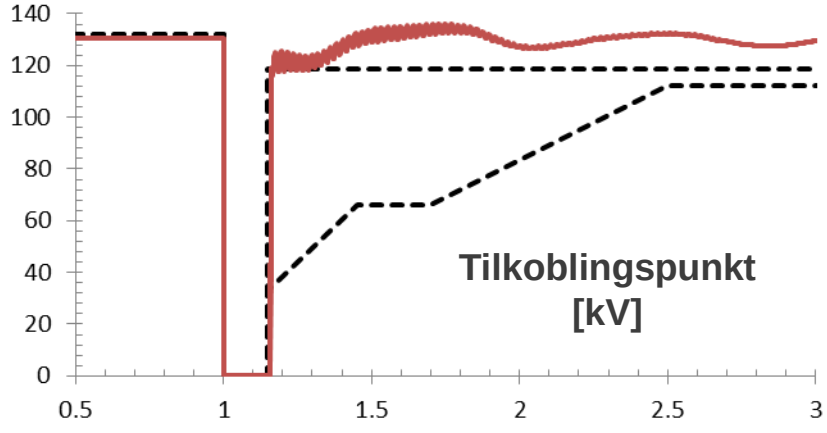
Nett kortslutningsytelse	
Før feil	Middels
Etter feil	Lav

Er det mulig å tilfredsstille FRT i RfG?









FIKS, krav om dynamiske egenskaper

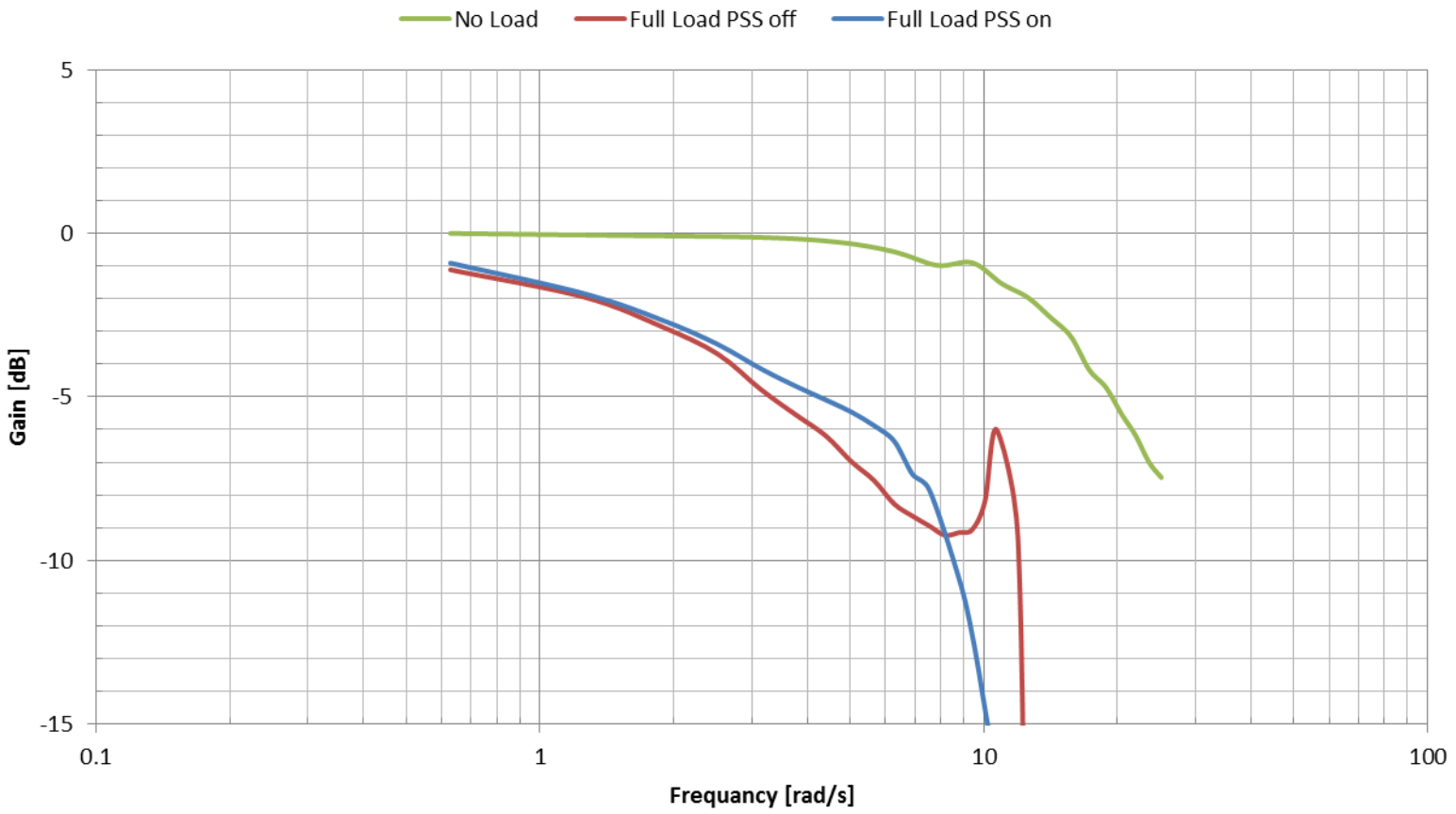
- Takspenningsfaktor 2, dvs. utlegging slik at to ganger nominell feltspenning kan påtrykkes i 10 sekunder. Innebærer også dimensjonering for takstrømsfaktor 2 i feltstrømmen. Dette
- Tyristorbroen skal være fullstyrt.

Teknologi avhengig (statisk magnetisering)

- Båndbredden for regulatoren bør minst være 20-30 rad/s
- PSS2A i IEEE 421.5, 1992 og nyere, er normgivende.

FIKS, krav om dynamiske egenskaper

- Båndbredden for regulatoren bør minst være 20-30 rad/s



55MVA aggregat med statisk magnetisering (ikke i Norge).

Frekvensrespons fra statorspenning settpunkt til statorspenning.

Aggregat i:

- tomgang
- full last med PSS av
- full last med PSS på

RfG, generelle punkt

- Art. 43 Compliance simulation
  - Kraftprodusenten må vise via en simulering at aggregatet oppfyller kravene i RfG
- Art. 45.6 Tripping to household
  - Aggregatet må tåle et lastavslag og kunne bli liggende i tomgang
- Art. 45.7 Reactive power capability test
  - Aggregatet må kjøres minst en time med maks over- og undemagnetisert generator ved 0%, 50% og 100% aktiv last. Dvs. 6 timers test!
    Hva med nettspenningen her ved svake nett?

Contact:
Daniel Mota
Area Sales manager
Tel. +47 928 17 473
daniel.mota@voith.com

VOITH

Inspiring Technology
for Generations

Inspiring Technology
for Generations