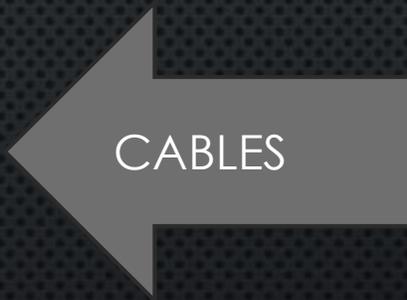


ETI HIGH VOLTAGE PRODUCTS

ETI
GROUP



CABLES



FPSO

WHAT IS A HV SWIVEL ?

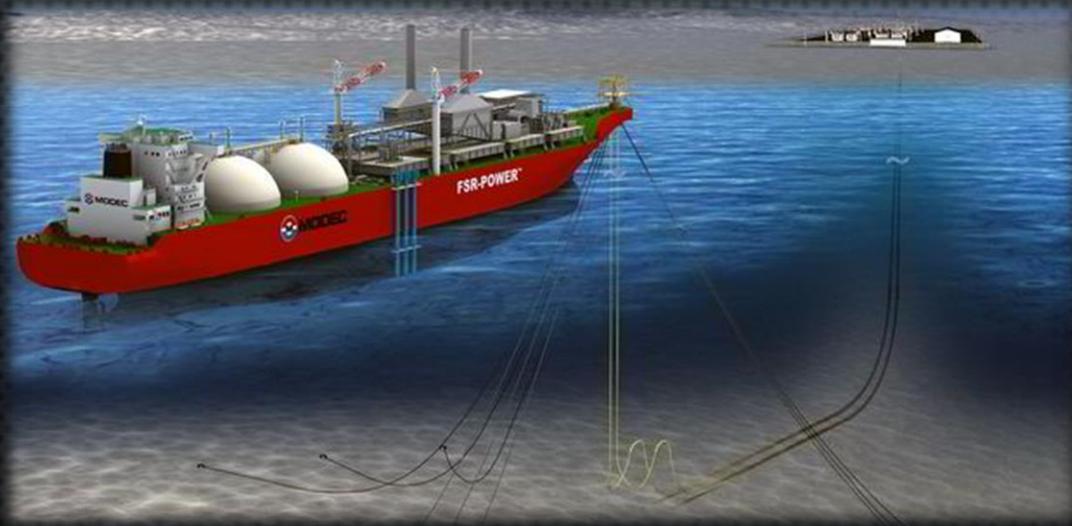
- HV SWIVEL ALLOWS A TRANSFER OF VOLTAGE AND CURRENT FROM A FIXED PART TO A ROTATING PART, WITHOUT ANY TRANSFORMATION.



WHAT CAN WE DO WITH AN HV SWIVEL ?

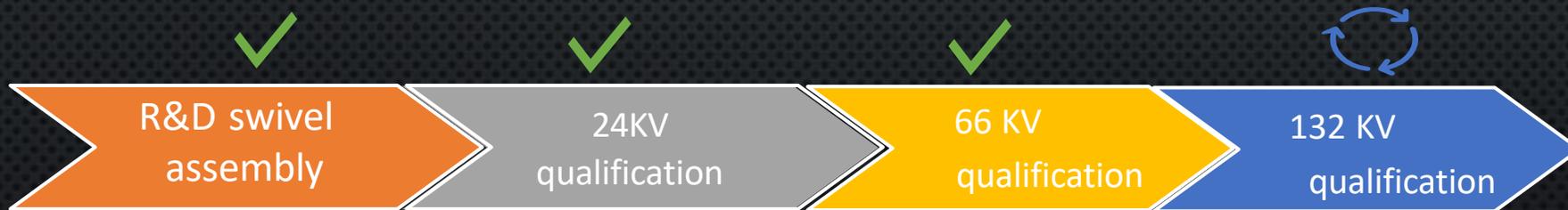
APPLICATIONS :

- FPSO ELECTRIFICATION
- FLNG ELECTRIFICATION
- FOWT WITH WEATHERVANE SYSTEMS
- FLOATING ENERGY HUBS



HOW TO IMPROVE HV SWIVEL TECHNOLOGY ?

- ETI HAS PATENTED A NOVEL HV SWIVEL CONTACT TECHNOLOGY BASED ON ROLLING CONSTRAINED CONTACTS.
 - NO WEAR = NO CONTAMINATION
 - INCREASED SWIVEL RELIABILITY
 - LOW TO NO MAINTENANCE
 - CONTACTS DISTRIBUTED ON FULL TRACK CIRCUMFERENCE: HOT SPOT ISSUE SOLVED



HOW TO TRANSFER POWER TO THE SWIVEL ?

- TYPICAL CONCERN ABOUT HV CABLES :
 - BENDING RADIUS.
 - HEAT RESISTANCE.
 - FIRE RESISTANCE.
 - INSULATION AGING
 - STIFFNESS
 - ELECTROMAGNETIC
 - IECex V CONNECTOR >11kV DOES NOT EXIST

- ELECTRICAL INTERFACES ARE A REAL CHALLENGES



Up to Ø55mm core for 132kV cable

HOW TO TRANSFER POWER TO THE SWIVEL ?

- ETI HAS DEVELOPED AND PATENTED THE COMPACT POWER LINE
 - UP TO 145KV - 1000AMPS, 50/60Hz.
 - IEC COMPLIANT.
 - ROBUST AS A PIPING LINE.
 - ENABLE THE INTEGRATION OF SEVERAL SWIVELS FOR BETTER OPERATIONAL PERFORMANCE



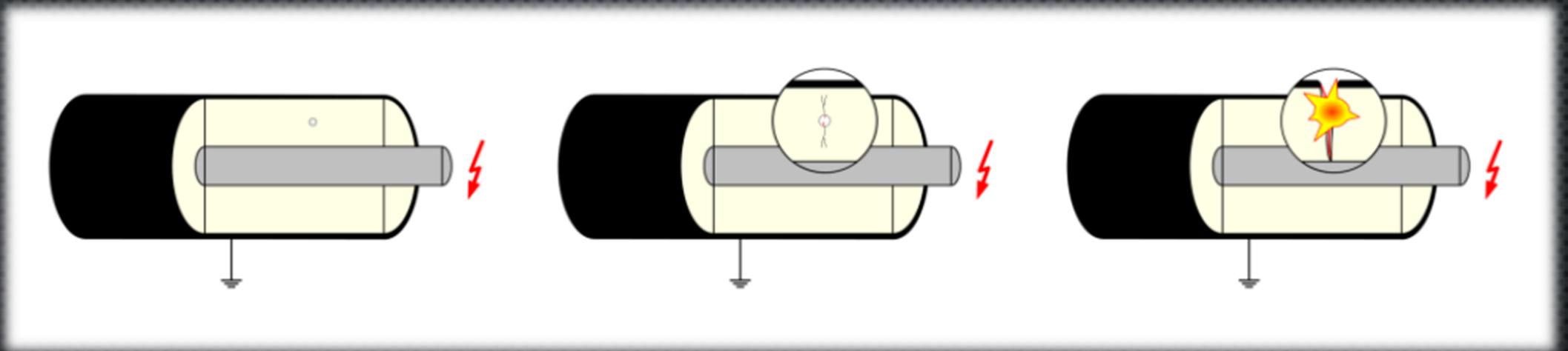
HOW TO TEST A HV SWIVEL ?

- STANDARD TEST
 - INSULATION RESISTANCE MEASUREMENT
 - DIELECTRIC TESTING
 - SHORT CIRCUIT
 -
- PARTIAL DISCHARGE

HOW TO TEST A HV SWIVEL ?

- PARTIAL DISCHARGE

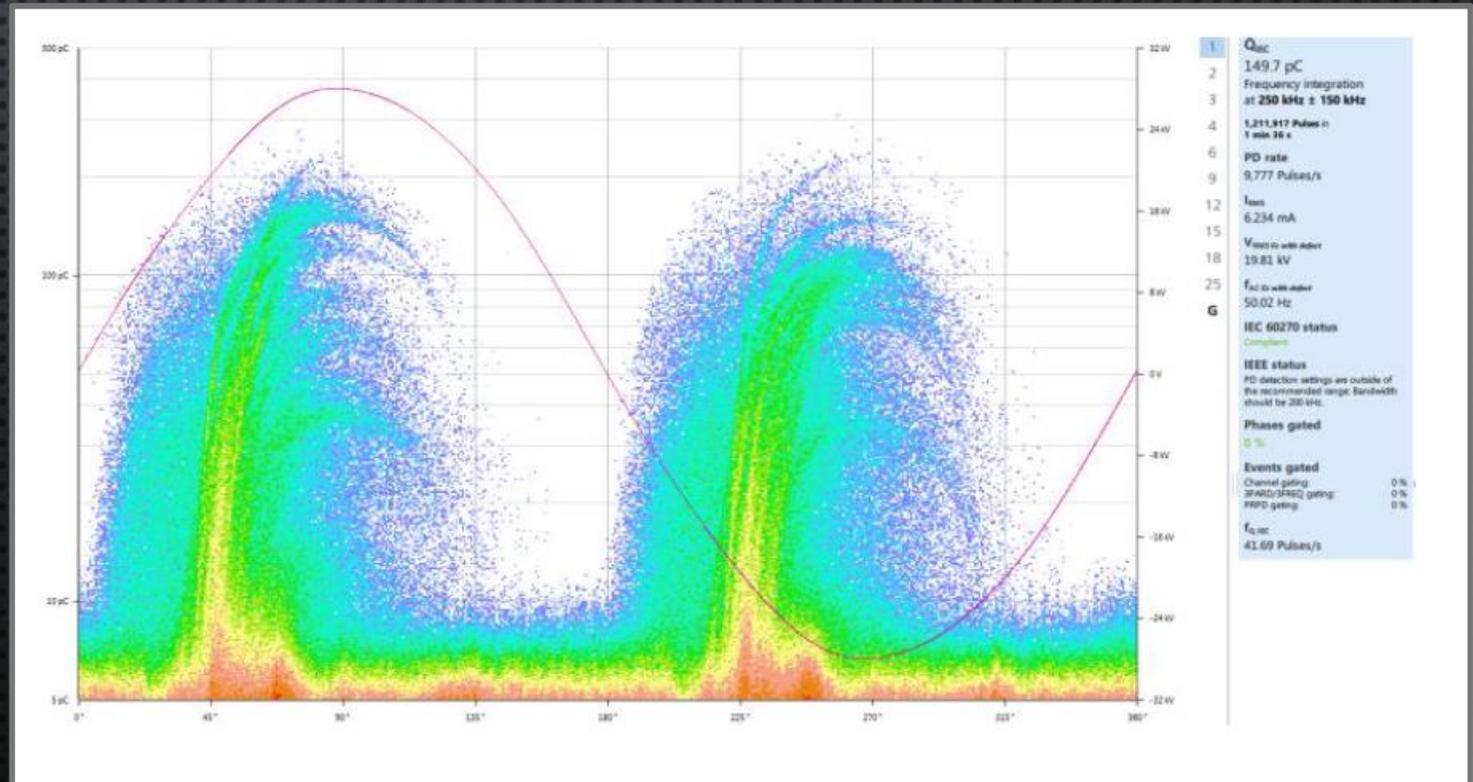
A PARTIAL DISCHARGE IS A LOCALIZED DIELECTRIC BREAKDOWN OF A SMALL PORTION OF A SOLID OR FLUID ELECTRICAL INSULATION SYSTEM UNDER HIGH VOLTAGE STRESS.



HOW TO TEST A HV SWIVEL ?

PARTIAL DISCHARGE TEST

- WHAT DO YOU MEASURE WITH A PARTIAL DISCHARGE TEST?
- WHEN TO ANALYZE PARTIAL DISCHARGES ?
 - DEVELOPMENT TESTS
 - FACTORY ACCEPTANCE TESTS
 - ON-SITE MEASUREMENTS



HOW TO TEST A HV SWIVEL ?

- BREAK DOWN THE EQUIPMENT INTO SUB-ASSEMBLIES AND TEST THEM INDIVIDUALLY TO DETERMINE THE LIMITS OF EACH PART OF THE PRODUCT



HOW TO QUALIFIED A HV SWIVEL ?

- WAY AHEAD OF THE ACTUAL STANDARDS
- LACK OF REFERENCE FRAME FOR VALIDATION



- DISCUSSED WITH ALL STAKEHOLDERS
- WORK AND PARTICIPATE TO DEVELOP A NEW STANDARD

THE ETI HV SWIVEL OUTSTANDING RESULT

- 30°C MAX TEMPERATURE RAISE UNDER 800A



THE ETI HV SWIVEL OUTSTANDING RESULTS

PARTIAL DISCHARGE TEST

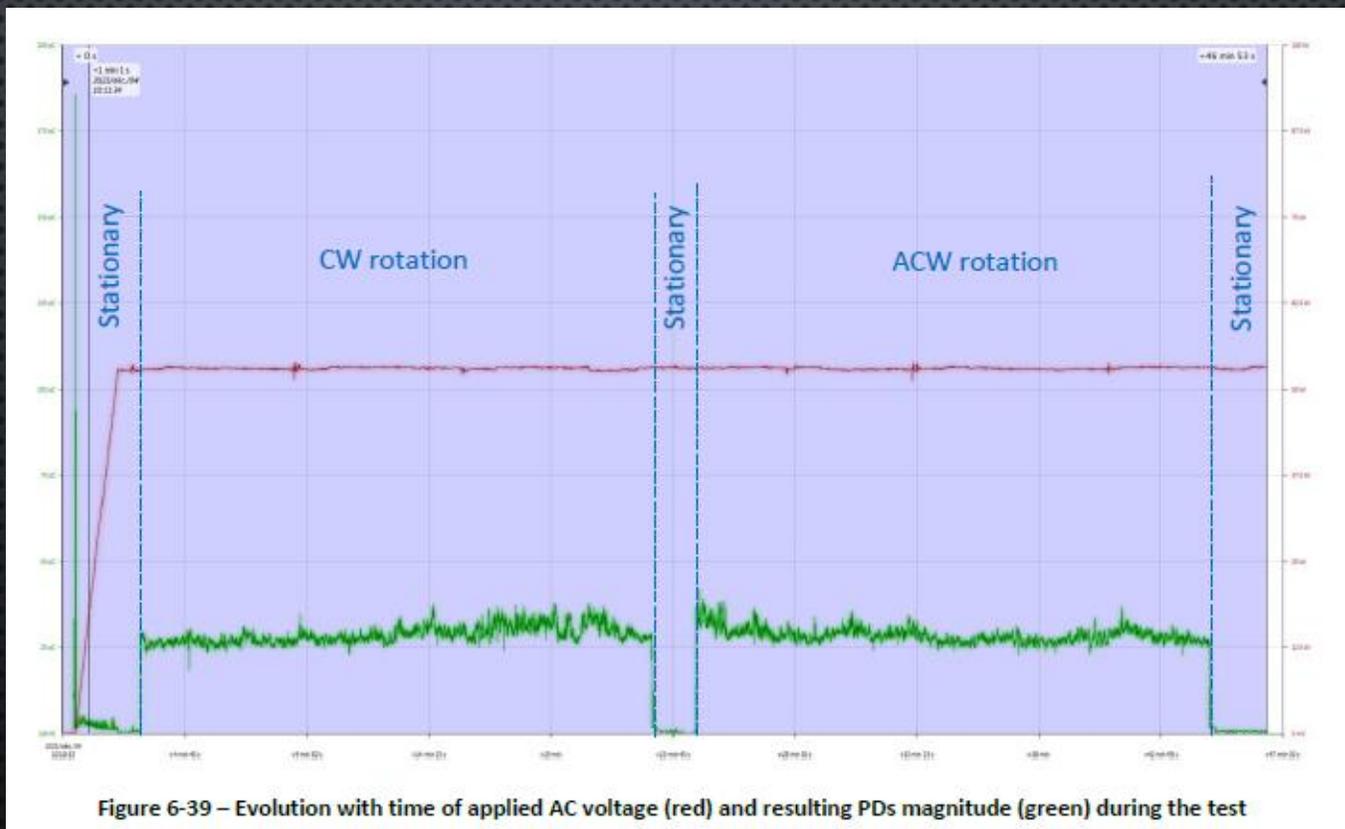


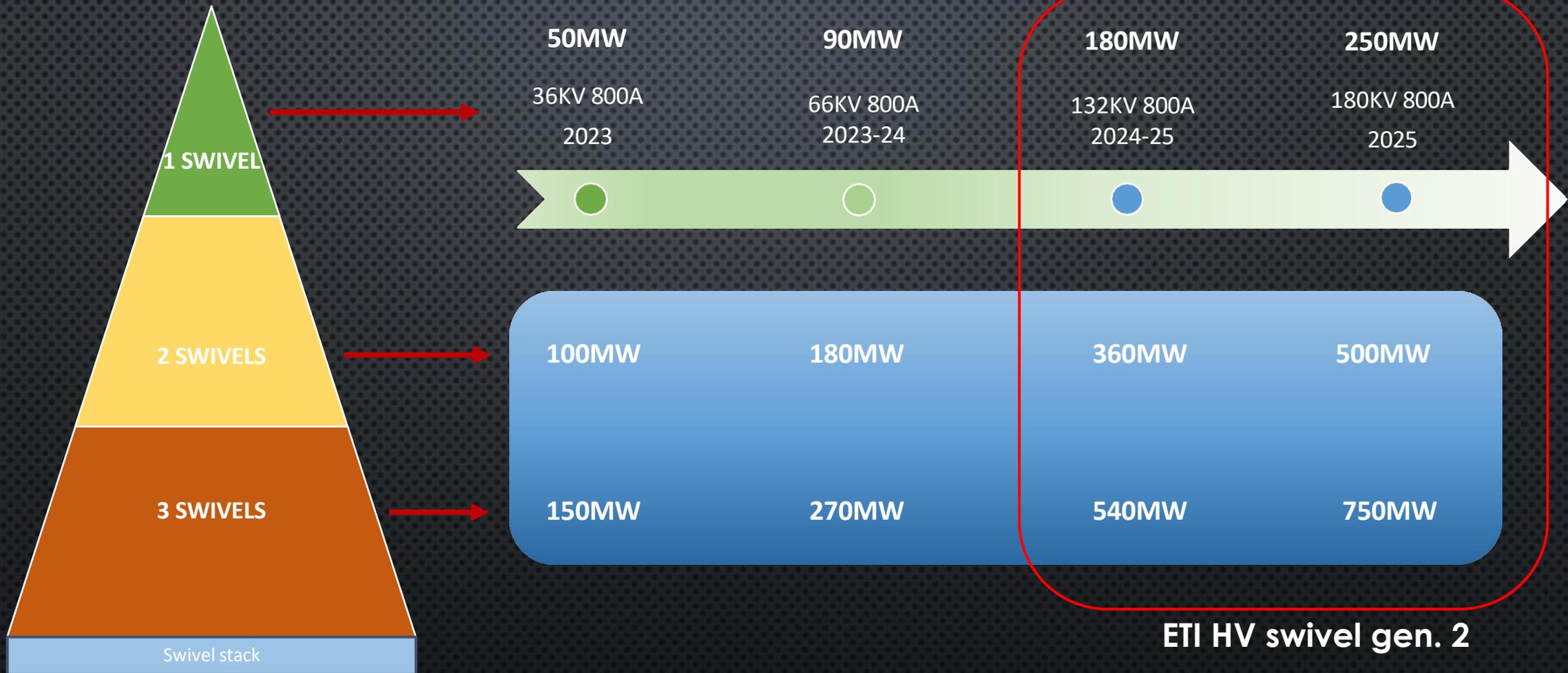
Figure 6-39 – Evolution with time of applied AC voltage (red) and resulting PDs magnitude (green) during the test

THE ETI HV SWIVEL DATASHEET

- CHARACTERISTICS :

Service Voltage	up to 66kV - 50/60 Hz
Conductors per enclosure	3 Phasis + PE
Assigned Current	up to 800 A per Phase
I_{sc} Withstanding	25kA/1s
Insulation medium	environmentally friendly insulation (EFI)
Stackable	Up to 3
Torque	2kN.m
External diameter	1,8m
Inner diameter (free bore)	0,6 m; higher upon request
Height	1m

ETI HV SWIVEL POWER COMBINATIONS



TECHNOLOGIES READINESS LEVEL



ETI HV SWIVEL & CPL



We are targeting TRL 9 in the coming years