

1.

1997 35.8GW  
10 2010 62.2GW 가  
,  
가  
,  
,  
, GAS  
가 .

2.

R. McFee  
1980  
가  
가  
2006  
Brookhaven (BNL),  
Gratz , (ETL)  
가  
Nb, NbTi,  
“ (zero)” Nb3Sn  
, , ,

가 )

1987 , 1990 1

가 former, cryostat, , Termination .

가 2.1

1 ?

가 AC

DC , (WD, Warm Dielectric), (CD, Cold Dielectric)

765kV 345kV 154kV 22.9kV 가

2

cryostat

20% 가 가 (

1 |

|        |                              |                              | OF          | CV   |
|--------|------------------------------|------------------------------|-------------|------|
| Former | Flexible Pipe or Spiral Tape | Flexible Pipe or Spiral Tape | Spiral Tape |      |
|        |                              | NbTi, Nb <sub>3</sub> Sn     |             |      |
|        | Tape                         | Tape                         |             |      |
|        | 77K (-196 )                  | 4.2K (-269 )                 | 90          | 90   |
|        |                              |                              | OF          | ( )  |
|        |                              |                              | OF          | XLPE |
|        |                              |                              | PT          |      |

1 | ( , )



2 |



3 |

(single phase & three phase)



eddy current loss  
(High-Tc Temperature, HTS) shield  
cryostat eddy  
current 가

3

HTS shield  
shield 가 cryostat  
eddy current  
cryostat 3  
cryostat

2.2

compact

AC Loss  
가

1 Former,  
( ),

. Former

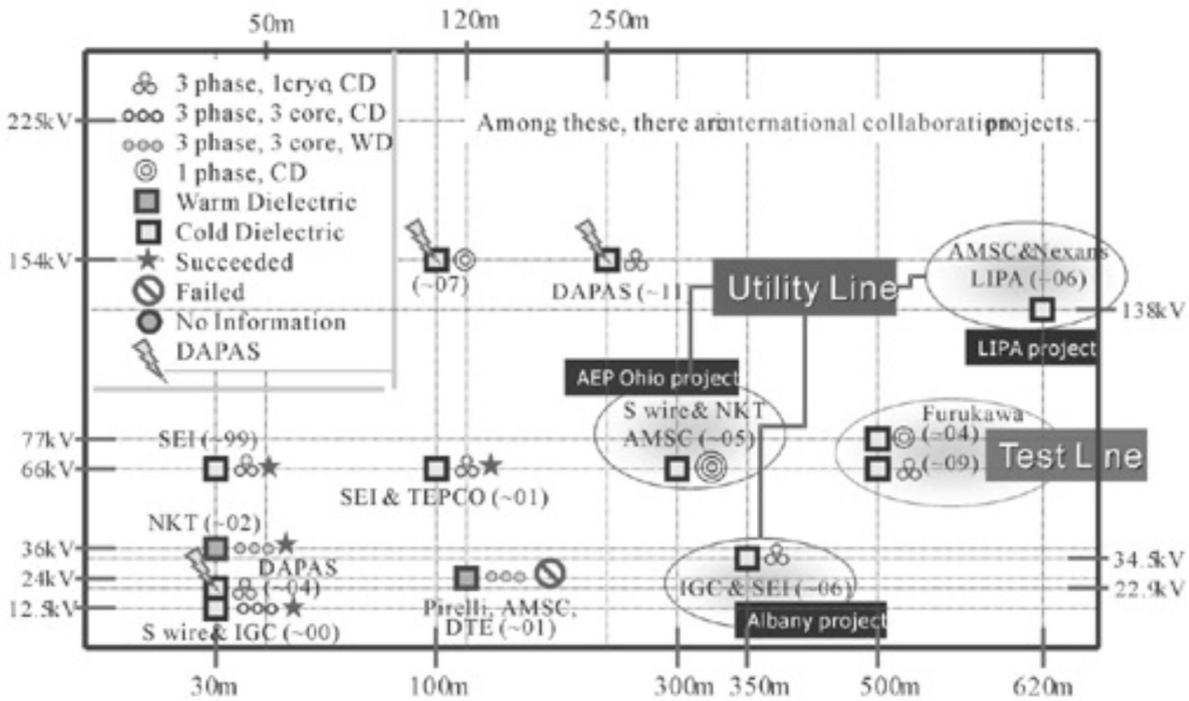
taping pitch

## 2.3

Ag shieth/Bi-2223 가 , cryostat  
 transposition AC Loss MLI Super-insulation  
 2 , 가  
 Coated conductor , 가  
 가 cryostat  
 PE, XLPE , cryocooler,  
 Kraft Paper, PP , transfer line,  
 Laminated paper

가가

4



3. LIPA Long Island  
620m 2006  
가 (HTS wire)  
AMSC (American Superconductor) 가  
Nexans 가  
5  
4 , 6 Top view  
가  
138kV  
3.1.  
3 가  
DOE SPI 3.1.2. AEP Ohio project  
(Superconductivity Partnership with  
Industries) AEP Ohio project 1 3  
LIPA project, AEP Ohio project, . 2005 300m  
Albany project . 3 Ohio  
2 , ULTERA 가  
. ULTERA  
3.1.1. LIPA (Long Island Power Authority) project Southwire 30m  
NKT  
2 | DOE SPI 3

| Install  | Long Island Power Authority | Bixby Substation, Ohio | Albany, New York |
|----------|-----------------------------|------------------------|------------------|
| Period   | 2002 - 2006                 | 2003 - 2005            | 2003 - 2006      |
| Nation   | France&USA                  | Denmark&USA            | Japan&USA        |
| Length   | 620m                        | 300m                   | 350m             |
| Volt/Cur | 138kV/2.5kA                 | 13.2kV/2.5kA           | 34.5kV/2.5kA     |
| FUND     | Gov.                        | 15M\$                  | 4.33M\$          |
|          | Ind.                        | 15M\$                  | 4.32M\$          |
|          | Total                       | 30M\$                  | 8.65M\$          |

5 | LIPA project  
(Cold Dielectric)



7 | AEP Ohio project Triax Cable Design



6 | LIPA



DOE  
13M\$ , 가  
가  
350m  
, 30m 2  
(Coated Conductors)  
8 350m

9 Hudson

Top view

7 3 former

800A

5m

34.5kV

Fabrication

CRIEPI

Sumitomo

13.2kV

3kA

3 phases-in-1 cryostat

2006 Cold Dielectric

5

3.1.3. Albany project

8 | Albany project 350m

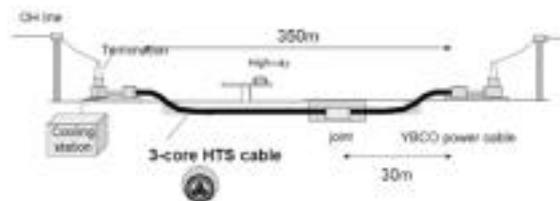
Albany project 2

가

IGC - SuperPower

100m

(SEI)



9 | Hudson 350m



3.2 Super-ACE

100m

Albany project  
Super-ACE project  
500m

CRIEPI

Super-ACE

AC loss

2009

1W/m

2004

sample cable

500m system

77kV

Polypropylene paper

1 wire

500m

가

가

5kA

3kA 1W/m

1kA 1W/m

1kA

Laminated

Bi-2223

10

2004 4

11

CRIEPI

50km,

10km

11 (c)

가 12

2003 11

2004 1

가

가

13 CRIEPI

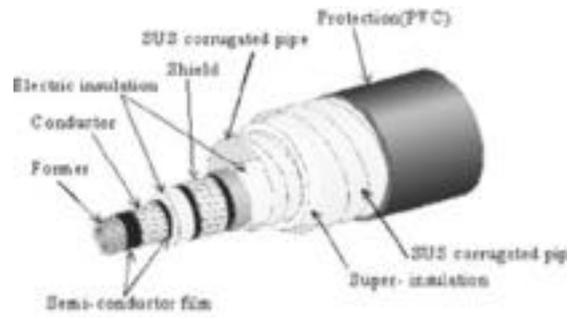
500m

10

1kA

500m

77kV,



11

CRIEPI

500m



12 | CRIEPI 2003 11  
500 m



13 | Furukawa CRIEPI



13 | Furukawa CRIEPI



3.3.

30

, IEE CAS

InnoPower

, InnoPower

InnoPower Bi-2223 wire

InnoST

2004 6 30m

35kV , 2kA

Cold

Dielectric

Warm Dielectric

8 GM

3.4

2001 21C

LS ( ),

, 16

14 | 30m

( , , )



15

30m



22.9kV, 50MVA

30m

22.9kV, 50MVA, 3 30m

cold Dielectric

1 cryostat

3

2005 7

가 22.9kV

154kV

CAST( )

DAPAS Program

DOE가

SPI

NEDO가

Super - ACE

가

863

가

SPI

Nexans ,

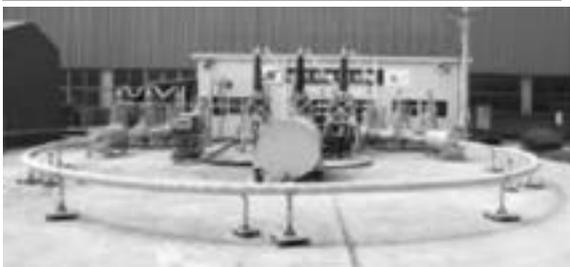
NKT ,

4.

16

(LS

)



가

가