Connection of Distributed Generation to Enel's Network in the Transition Period from Passive Networks to Smartgrids.

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The evolution of regulatory scenario

**up to 31/12/2008**

- Res. 89/07 (LV Connections)
- Res 281/05 (HV/MV Connections)

**since 1/01/2009**

- AEEG Res. 99/08 and 179/08 (Code for Active Connections)
  - MV/LV connection fees are calculated on flat costs basis
  - Big penalties to SOs for connection delays
  - Producers with HV or MV connection can build network plants for their connection

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DK 5600
ENEL MV connection rules (passive users)

DK 5740
ENEL MV connection rules (active users)

DK 5940
ENEL LV connection rules (active users)

Guide for the connections to Enel’s network

DK 5400
ENEL HV connection rules

DK 5310
Procedural modalities for connections

CEI 0-16 Standard: Reference technical rules for the connection of active and passive consumers to the HV and MV electrical networks of distribution Company
The evolution of distributed generation

Year 2008

Low Voltage Network
Connections (n.): ~20.000
Avg. Power (kW/Installation): ~7,5
Total Connected Power (MW): ~150

Medium Voltage Network
Connections (n.): ~420
Avg. Power (MW/Installation): ~1
Total Connected Power (MW): ~420

High Voltage Distribution Network
Connections (n.): 23
Avg. Power (MW/Installation): ~34
Total Connected Power (MW): ~780

1.350 MW of DG/RES CONNECTIONS in 2008
(only Enel’s network)

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DG connections on Enel’s LV network

2009: provisional data

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DG connections on Enel's MV network

2006 | 2007 | 2008 | 2009

July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | August | September | October | November | December | January | February | March | April | May | June | July | 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| January | February | March | April | May | June |

2009: provisional data

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LV connections planned

Connections to Distribution network
Updated on: April 30th, 2009

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The evolution of distributed generation

MV connections planned

Connections to Distribution network
Updated on: April 30th, 2009

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Impact on Distribution network

Distributed Generation
= Distribution Service

Dispersed Generation
= Transmission Service

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Technical Issues

Reverse Flow

- new voltage regulation strategy on MV network
- network automation
- unintentional islanding
- network and generators stability
- energy remuneration

Approx. 14% among HV/MV Substations owned by Enel Distribuzione behave as active
Technical Issues
Network planning

Planning studies:

• DG should be considered on planning new network improvements (98th percentile of Measured power)

• Load forecast must not be affected by the DG (98th percentile of Load power)

Hourly power peaks on MV busbars of a primary substation with relevant reverse flow (about 15 MW of DG rated power is connected to the MV network).
DG collector

A new planning option

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Conclusion

• The increase of DG in the Italian distribution networks has relevant impact on network planning and operation.

• The trend imposes a deep thought on network planning and operational criteria.

• Solutions for the current network in order to meet the highest technical standards in terms of quality of energy supply are already developed, while others are still in progress.