

2017 AEIT International Annual Conference

**Cagliari, Italy
20-22 September 2017**



**IEEE Catalog Number: CFP1717W-POD
ISBN: 978-1-5386-1058-9**

**Copyright © 2017, Associazione Italiana di Elettrotecnica, Elettronica,
Automazione, Informatica e Telecomunicazioni (AEIT)
All Rights Reserved**

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP1717W-POD
ISBN (Print-On-Demand):	978-1-5386-1058-9
ISBN (Online):	978-8-8872-3737-5

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

2017 AEIT International Annual Conference (AEIT)

Cagliari (Italy), September 20-22, 2017

TABLE OF CONTENTS

Methods, Components and Technologies for Transmission and Distribution

Co-simulation Aspects for Energy Systems with High Penetration of Distributed Energy Resources 1

M. Cvetkovic, K. Pan, C.D. López, R. Bhandia, P. Palensky - Delft University of Technology,
The Netherlands

Generation of Artificial Distribution Networks for the Evaluation of Advanced Control Solutions 7

G. Viganò, M. Rossi, D. Moneta - RSE - Ricerca sul Sistema Energetico, Italy

Stochastic Evaluation of Distribution Network Hosting Capacity: Evaluation of the Benefits introduced by Smart Grid Technology 13

M. Rossi, G. Viganò, D. Moneta, D. Clerici - RSE - Ricerca sul Sistema Energetico, Italy

Interoperability of Phasor Measurement Units under Voltage Unbalance Conditions 19

P. Castello, C. Muscas, P.A. Pegoraro - University of Cagliari, Italy, G. Guida, G.M. Giannuzzi,
P. Pau - Terna, Italy

Voltage Management Strategies for Low Voltage Networks supplied through Phase- Decoupled On-Load-Tap-Changer transformers 25

A. Bettanin, M. Coppo, A. Savio, R. Turri - University of Padova, Italy

Detection of Cross-Country Faults in Medium Voltage Distribution Ring Lines 31

A. Codino, F.M. Gatta, A. Geri, S. Lauria, M. Maccioni - Sapienza University of Rome, Italy, R.
Calone - e-distribuzione, Italy

Fault Location in Unearthed 60 kV Subtransmission Network based on the Travelling Wave Method 37

R. Benato, S. Dambone Sessa, G. Rinzo - University of Padova, Italy, M. Poli, C. Quaciari -
Terna, Italy

Terna's Approach for on-line Monitoring System - *Intelligent Management of Assets in a Large Scale Infrastructures* 43

M. Rebolini, A. Valant, F.M. Pepe - Terna Rete Italia, Italy

Italian National Resilience Plan 2017 - *For a more Reliable Grid* 49

F. Ciasca, A. Sallati, N. Tolu - Terna Rete Elettrica Nazionale, Italy

Italy's National Energy Strategy - *For a more Competitive and Sustainable Energy* 54

L. Michi, E.M. Carlini, S. Ratti - Terna Rete Elettrica Nazionale, Italy

European Resource Adequacy: Success and Challenges - *The Traditional Market*

***Design of 1980s not fit for Today's Markets* 60**

L. Michi, E.M. Carlini, S. Biondi, P. Capurso, M. Santoro - Terna Rete Elettrica Nazionale, Italy

Temporary Overvoltage Mitigation in Symmetrical Monopole VSC-MMC HVDC links 66

F. Palone, M. Marzinotto, L. Buono - Terna Rete Italia, Italy

Overall Availability Assessment of HVDC VSC XLPE Cable Symmetrical Monopolar Configuration 72

R. Benato, A. Chiarelli, S. Dambone Sessa, D. Napolitano - University of Padova, Italy

HVDC Technology Overview and new European Network Codes Requirements 78

S. Barsali, P. Pelacchi, D. Poli - University of Pisa, Italy, F. Bassi, G. Bruno, R. Gnudi - Terna Rete Italia, Italy

Passive Cancellation Loops: Case Study, Model Simulation and Field Test on a real HV Overhead Line in Italy - *Electromagnetic Computation and Optimization* 84

M. Rebolini, M. Forteleoni - Terna Rete Italia, Italy, D. Capra - CESI, Italy

The 2.0 Cost Benefit Analysis and its Application to the National Development Plan 2017 - *Methodology for Evaluating Electricity Grid Projects' Benefits: Current Status and Further Improvements* 90

E.M. Carlini, C. Gadaleta - Terna Rete Elettrica Nazionale, Italy

Highly Efficient Overhead Line Innovative Conductors with Reduced Joule Power Losses 96

R. Benato, R. Caldon, M. Coppo, S. Dambone Sessa - University of Padova, Italy, D. Mimo, D. Peroni, M. Previatello - De Angeli Prodotti, Italy

Energy Union is about Reinventing System Operation - *Europe's Energy Future Looking towards Energy Efficiency, Renewable Energies and Consumer*

***Empowerment* 102**

E.M. Carlini, S. Ibbi, C. Pascucci - Terna Rete Elettrica Nazionale, Italy, S. Moroni - Terna Rete Italia, Italy

Analysis of Real Kilometric Three-Core Armoured Cables by means of an Integral Multiconductor three-dimensional Model 108

R. Benato, S. Dambone Sessa - University of Padova, Italy

A 4 GW AC Submarine Turkish Power Grid Reinforcement under the Dardanelles Strait 114

R. Benato - University of Padova, Italy, I. Balanuye, F. Köksal, N. Ozan, E. Özdemirci - Türkiye Elektrik İletim A.Ş., Turkey

MV Underground Cables: Effects of Soil Thermal Resistivity on Anomalous Working Temperatures 120

L. Calcara, S. Sangiovanni, M. Pompili - Sapienza University of Roma, Italy

Power Conversion System Model and Control for Energy Stationary Storage 125

M. Andriollo, R. Benato, S. Dambone Sessa, F. Nucci, F. Siviero - University of Padova, Italy, F. Palone, M. Rebolini - Terna, Italy

Measurement-Based Lithium-Manganese Oxide Battery Model 131

R. Benato, S. Dambone Sessa, F. Bevilacqua - University of Padova, Italy, F. Palone - Terna, Italy

Innovative Optical Systems and Sensors for on line Monitoring of High Voltage Overhead Lines and Power Components 137
L. De Maria, E. Golinelli, U. Perini - RSE, Italy

Application of Multiterminal HVDC Interconnections in European Transmission Grid 143
M. Brenna, D. Zaninelli - Politecnico di Milano, Italy

Smart Grids and Smart Cities

Smart City Vizzate Project: Development and Field Test of an Architecture for the Local Dispatching of Distribution Networks 149
D. Falabretti, M. Delfanti - Politecnico di Milano, Italy, L.A. Dao, L. Ferrarini, L. Piroddi - Politecnico di Milano, Italy

Experimental Assessment of ESS Integration in a Microgrid Supplied by Photovoltaic 155
C. Sanna, M. Gawronska - Sardegna Ricerche, Italy, A. Salimbeni, M. Porru, A. Damiano - Università di Cagliari, Italy

A simple Strategy to Optimally Design and Manage a Photovoltaic Plant Integrated with a Storage System for different Applications 161
S. Bracco, M. Brignone, F. Delfino, P. Girdinio, P. Laiolo, R. Procopio - University of Genoa, Italy

The Energy Router Project: Enabling Control for Prosumers 167
S. Bruno, G. Giannoccaro, M. La Scala, G. Lopopolo - Polytechnic University of Bari, Italy

A Voltage Optimization Tool for Smart Distribution Grids with Distributed Energy Resources 173
G.M. Casolino, A.R. Di Fazio, A. Losi, M. Russo - Università degli Studi di Cassino e del Lazio Meridionale, Italy, M. De Santis - Università degli Studi "Niccolò Cusano", Italy

Assessment of Typical Residential Customers Load Profiles by Using Clustering Techniques 179
N. Natale, F. Pilo, G. Pisano, M. Troncia - University of Cagliari, Italy, F. Bignucolo, M. Coppo, N. Pesavento, R. Turri - University of Padova, Italy

Scenario Tree Generation for the Optimization Model of a Parking Lot for Electric Vehicles 185
A. Borghetti, F. Napolitano - University of Bologna, Italy, S. Rahmani-Dabbagh - Sharif University of Technology, Iran, F. Tossani - University of Bologna, Italy

House to Grid (H2G) Ancillary Services supplied by Next Generation AC/DC Household Systems 191
F. Bignucolo, R. Caldon, N. Pesavento, A. Savio - University of Padova, Italy

Network Assessment in Static and Dynamic Conditions of Microgrid Optimal Operation Plan 197
B. Aluisio, M. Bronzini, M. Dellapigna, M. Dicorato, G. Forte, M. Trovato - Politecnico di Bari, Italy

Mobility and Electrical Transports

Automatic Train Operation Systems: a Survey on Algorithm and Performance Index 203
P. Caramia - Università degli Studi di Napoli Parthenope, Italy, G. Lauro - Ansaldo STS, Italy, M. Pagano, P. Natale - Università degli Studi di Napoli "Federico II", Italy

Prediction of Useful Life for Signal Connectors in Railway Applications 209

M. Brenna, F. Foiadelli, M. Longo - Politecnico di Milano, Italy, L. Bonadeo - ITT Cannon Veam Italia, Italy

New Approaches to Simulate AC Electrified Railway Systems 215

A. Capasso, R. Lamedica, A. Ruvio - Sapienza University of Rome, Italy, M. Ceraolo, G. Lutzemberger - University of Pisa, Italy

A Methodologic Approach to Define a new Layout of 3 kV DC Railway Substation 221

C. Spalvieri, L. Pantalone - Rete Ferroviaria Italiana, Italy, R. Lamedica, A. Ruvio, M. Maccioni, E. Bombelli - Sapienza University of Rome, Italy

Results of Early Tests on 3kVDC Electric Traction Substation Empowered by Innovative Booster 226

F. Caracciolo, E. Fedeli - Rete Ferroviaria Italiana, Italy

A Method to Size the Stack and the Battery of a Fuel Cell Vehicle Reducing the Fuel Consumption 231

G. Graber, V. Galdi, V. Calderaro, A. Piccolo - University of Salerno, Italy

Energy Efficiency Improvements in Port Areas: towards an Integrated Energy Management 237

B. Aluisio, M. Dicorato, G. Forte, R. Sbrizzai, M. Trovato - Politecnico di Bari, Italy, M. Mega - Port Authority of Bari, Italy

Distributed Systems and Technologies for Smart Cities: Issues and Emerging Solutions

Preliminary Performance Monitoring Plan for Energy Retrofit: a Cognitive Building - The "Mandolesi Pavillon" at the University of Cagliari 243

G. Desogus, E. Quaquero, A. Sanna, G. Gatto - University of Cagliari, Italy, G. Di Giuda - Politecnico di Milano, Italy, L.C. Tagliabue, S. Rinaldi, A.L.C. Ciribini - University of Brescia, Italy, V. Villa - Politecnico di Torino, Italy

Community Involvement in Urban Maintenance Prioritization 249

F. Re Cecconi, N. Moretti, M.C. Dejacco, S. Maltese - Politecnico di Milano, Italy, L.C. Tagliabue - University of Brescia, Italy

On the Use of LPWAN for EVehicle to Grid Communication 255

P. Ferrari, A. Flammini, S. Rinaldi, M. Rizzi, E. Sisinni - University of Brescia, Italy

Capturing Citizens' Emerging Needs - Using Social Networks in Smart Cities 261

V. Seidita, A. Chella, M. Carta - Università degli Studi di Palermo, Italy

Power Electronics

Design-oriented Analysis of ECOT-controlled DCM/CCM Boundary Boost PFC Pre-regulators 267

C. Adragna - STMicroelectronics, Italy

Comparison between Harmonic Reduction Procedures for 5-level Inverters 273

C. Buccella, M.G. Cimatori - University of L'Aquila, Italy, C. Cecati - Harbin Institute of Technology, P.R. China and DigiPower, Italy, E. Babaei - University of Tabriz, Iran

A Novel Modified Central Switch DC-DC Converter for Solar energized SRM driven Irrigation Pump 279

A.K. Mishra, B. Singh - Indian Institute of Technology Delhi, India, A. Chandra, K. Al-Haddad - Ecole de Technologie Superieure, Canada

Synchronous Rectification with Low Voltage MOSFETs in LLC Converters 285

S. Di Mauro, S. Musumeci, A. Raciti - University of Catania, Italy, F. Fusillo, F. Scrimizzi, R. Scollo - STMicroelectronics, Italy

Super Junction MOSFET in Power Factor Correction Converters 291

S. Musumeci, F. Portoghese, A. Raciti - University of Catania, Italy, A. Gaito, D. Murabito, R. Scollo - STMicroelectronics, Italy

Computational Electromagnetics and Optimization

Magnetic Field Generated by a 22 kW-85 kHz Wireless Power Transfer System for an EV 297

T. Campi, S. Cruciani, M. Feliziani - University of L'Aquila, Italy, F. Maradei - Sapienza University of Rome, Italy

High Efficiency and Lightweight Wireless Charging System for Drone Batteries 303

T. Campi, S. Cruciani, M. Feliziani - University of L'Aquila, Italy, F. Maradei - Sapienza University of Rome, Italy

Magnetic Materials Characterization by Tabu Search Optimization 309

S. Carcangiu, M. Caboni, A. Fanni, A. Montisci - University of Cagliari, Italy, E. Cardelli, A. Faba - University of Perugia, Italy

Optimal Design of a Permanent Magnet Spring 315

A. Musolino, M. Raugi, R. Rizzo, M. Tucci - University di Pisa, Italy, E. Díez Jiménez - Universidad de Alcalá, Spain

Finite Element – Boundary Condition Iteration: a Set of Hybrid Methods for the Computation of Electromagnetic Fields in Open Boundaries 319

G. Aiello, S. Alfonzetti, S.A. Rizzo, N. Salerno – Università di Catania, Italy

Optimization of the Magnetic Shield of a Levitation Melting Device 325

S. Alfonzetti, C. Buttò, S.A. Rizzo, N. Salerno - University of Catania, Italy

Smart Systems

Machine Learning for Energy Efficiency - Automatic Detection of Electric Loads from Power Consumption 331

C. Tomazzoli - Parco Scientifico e Tecnologico di Verona, Italy, S. Scannapieco - Real T, Italy

A Community Payment Scheme for Consciousness Energy Usage 337

S. Bistarelli - University of Perugia, Italy, P. Giuliadori - University of Camerino, Italy, D. Mugnai - University of Perugia, Italy

Energy Control in All-Electric Ship: State of the Art and IoT Perspectives 343

M. Chiandone, G. Sulligoi - University of Trieste, Italy

Crypto-Trading: Blockchain-oriented Energy Market 347

K. Mannaro, A. Pinna, M. Marchesi - University of Cagliari, Italy

Cyber Security

Tor Traffic Analysis and Identification 352

F. Mercaldo, F. Martinelli - Institute for Informatics and Telematics - National Research Council of Italy (CNR), Pisa, Italy

Post-quantum Cryptography based on Codes: State of the Art and Open Challenges 358

M. Baldi, P. Santini, G. Cancellieri - Università Politecnica delle Marche, Italy

Detecting Attacks to Internal Vehicle Networks through Hamming Distance 364

D. Stabili, M. Marchetti, M. Colajanni - University of Modena and Reggio Emilia, Italy

Twitter Analysis for Real-Time Malware Discovery 370

F. Concone, A. De Paola, G. Lo Re, M. Morana - Università degli Studi di Palermo, Italy

Security in Cyber-Physical Production Systems - A Roadmap to Improving IT-Security in the Production System Lifecycle 376

E. Weippl, P. Kieseberg - SBA Research, Austria

Emerging Technologies

COLLEGA Semantic Middleware for Collaborative Assistance in Mobile Social Networks 382

D. Hasse - Federal University of Santa Catarina - UFSC, Brazil, C.R. De Rolt - State University of Santa Catarina - UDESC, Brazil

Visibility Trials of Unmanned Aerial Vehicles (Drones) by commercial X-Band Radar in Sub-urban Environment 388

G. Galati, G. Pavan, F. De Palo - "Tor Vergata" University, Italy, D. Latini - GEO-K, Italy, F. Carbone, F. Del Frate - "Tor Vergata" University, Italy, F. Pietrobono - Free Lance Mechanical Engineer, Italy

Optimal Demand-Response Operation of Heating and Energy Storage in Smart Buildings 394

G. Bianchini, M. Casini, D. Pepe, A. Vicino, G.G. Zanvettor - Università di Siena, Italy

Outdoor Characterisation of High Concentration Photovoltaic Modules 400

M. Gawronska, C. Sanna - Sardegna Ricerche, Italy, R. Rizzo - Università di Napoli Federico II, Italy, M. Boi, A. Damiano - Università degli Studi di Cagliari, Italy

Internet of Things

Evaluation Methodologies for the NB-IOT System: Issues and ongoing Efforts 406

S. Foni, T. Pecorella, R. Fantacci - University of Florence, Italy, C. Carlini, P. Obino - Telecom Italia, Italy, M.G. Di Benedetto - Sapienza Università di Roma, Italy

NB-IoT and LoRA Connectivity Analysis for M2M/IoT Smart Grids Applications 412

S. Persia, C. Carciofi, M. Faccioli - Fondazione Ugo Bordoni, Italy

An Ambient Intelligence System for Assisted Living 418

A. De Paola, P. Ferraro, S. Gaglio, G. Lo Re, M. Morana, M. Ortolani, D. Peri - University of Palermo, Italy

A LoRa Enabled Building Automation Architecture Based on MQTT 424

S. Spinsante, G. Ciattaglia, A. Del Campo, D. Perla, D. Pigni, G. Cancellieri, E. Gambi - Università Politecnica delle Marche, Italy

NB-IoT System Deployment for Smart Metering: Evaluation of Coverage and Capacity Performances 429

M. Pennacchioni, M.G. Di Benedetto - Sapienza University of Rome, Italy, T. Pecorella - University of Florence, Italy, C. Carlini, P. Obino - Telecom Italia, Italy

TLC Mobile

Performance Evaluation of LTE in unlicensed Bands for indoor Deployment of Ultra-Broadband Mobile Networks 435

C. Rasconà, M.G. Di Benedetto - Sapienza University of Rome, Italy, T. Pecorella - University of Florence, Italy, C. Carlini, P. Obino - Telecom Italia, Italy

Next Generation Architecture for Real Time Multimedia Applications 440

M. Scarlato, C. Perra - University of Cagliari, Italy

Power Consumption in Mobile HetNets 446

C. Carciofi, P. Grazioso, F. Matera - Fondazione Ugo Bordoni, Italy

Ultra-Broadband Mobile Networks from LTE-Advanced to 5G: Evaluation of Massive MIMO and Multi-Carrier Aggregation Effectiveness 452

M. Neri, M.G. Di Benedetto - Sapienza University of Rome, Italy, T. Pecorella - University of Florence, Italy, C. Carlini, A. Castellani, P. Obino, P. Sciaratta - Telecom Italia, Italy

Sustainability

Tecno-Economic and Environmental Assessment of a Full Electric Smart City Eco-District 458

M. Garau, E. Ghiani, G. Celli, F. Pilo - University of Cagliari, Italy

Conscious Involvement of the Territory of National Electricity Transmission System Grid Development - Comparison of different Approaches Evolved over Time 464

A. Motawi - Terna, Italy

Transparency in Transactive Energy at Distribution Level 470

M.L. Di Silvestre, L. Dusonchet, S. Favuzza, M.G. Ippolito, S. Mangione, F. Massaro, L. Mineo, E. Riva Sanseverino, E. Telaretti, G. Zizzo - University of Palermo, Italy

Economic Assessments on the Use of Wired and Wireless Recharging Systems in Italian and European Market 475

M. Longo, D. Zaninelli - Politecnico di Milano, Italy, G. Cipriani, V. Di Dio, R. Miceli - University of Palermo, Italy

Selective Electromagnetic Monitoring of Specific Sources (MUOS) in Sicily 480

S. Caldara, A. Sansone Santamaria - Sicilian Environmental Protection Agency (Arpa Sicilia), Italy

Service Continuity and Safety

Analysys of Complex Hospital Electrical Systems 485

P.A. Scarpino, F. Grasso - University of Florence, Italy

Resilient Power in Hospitals: the S. Giovanni Addolorata General Hospital Case Study 489
A. Prudenzi, A. Fioravanti - University of L'Aquila, Italy, V. Caracciolo - Azienda Ospedaliera S. Giovanni, Italy

Lightning Protection of Medical Structures 495
G.L. Amicucci - National Institute for Insurance against Accidents at Work (INAIL), Italy, F. Fiamingo - University of Rome Campus Bio Medico, Italy

Validation of a Medical Power Supply Prototype in Compliance with International Standards and Its Application into Italian Operating Rooms 501
E. Zennaro, C. Barrese, F. Fiamingo - Campus Bio-Medico University Hospital of Rome, Italy

Electrical Machines and Drives

Torque Vectoring System for Improving Manoeuvrability of Light Electric Vehicles 507
M. De Santis, S. Agnelli, O. Giannini - Università degli Studi Niccolò Cusano, Italy

Feedback Linearization Control of Wind Turbine Equipped with Doubly Fed Induction Generator 513
G. Cipriani, M. Corpora, V. Di Dio, F. Di Piazza, A. Sferlazza - University of Palermo, Italy

Rotor Torsional Resonance Detection in Induction Drives by MCSA Focused on Rotor Slot Harmonics 519
C. Bruzzese, E. Santini - Sapienza Università di Roma, Italy

Steering Algorithm for Nonholonomic Mechanical Systems using Adaptive Sliding Mode Control 525
W. Abbasi - Capital University of Science and Technology, Pakistan and The University of Lahore, Pakistan, F. ur Rehman, I. Shah - Capital University of Science and Technology, Pakistan

Electrical, Mechanical and Thermal Design By Multi-Physics Simulations of a Permanent Magnet Linear Actuator for Ship Rudder Direct Drive 530
C. Bruzzese, M. Rafiei, S. Teodori, E. Santini - Sapienza Università di Roma, Italy, T. Mazzuca, G. Lipardi - Italian Navy, Italy

Enhanced Loss Model Algorithm for Interior Permanent Magnet Synchronous Machines 536
M. Caruso, A.O. Di Tommaso, R. Miceli, C. Nevoloso, C. Spataro, F. Viola - Università di Palermo, Italy