

CURRICULUM VITAE
&
MEMORANDUM OF SCIENTIFIC ACTIVITY

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1. PERSONAL DATA

1956 Born in Thessaloniki/Greece on 23-9-1956.

Education:

1962-1968 44th Elementary School of Thessaloniki.

1968-1974 3rd High School of Thessaloniki.

1974-1979 School of Mechanical & Electrical Engineering, Faculty of Technology, Aristotle University of Thessaloniki. Diploma in Mechanical & Electrical Engineering (specialization in Electrical Engineering) on 14-11-79. GPA 8.2/10.

1998 Ph.D. in Electrical Engineering, School of Electrical & Computer Engineering, Aristotle University of Thessaloniki. Dissertation title: "*A simplified real and frequency independent modal transformation for overhead power transmission line transients calculations*". Supervisor Prof. P. Dokopoulos.

Employment:

1979-1984 Teaching and research assistant in the Power Systems Laboratory of the School of Electrical & Computer Engineering, Aristotle University of Thessaloniki.

1984-1985 Military obligations.

1985-present Instructor in the Power Systems Laboratory of the School of Electrical & Computer Engineering, Aristotle University of Thessaloniki, as Lecturer (1998-2006), Assistant Professor (2006 – 2010) and Associate Professor (2010-).

2. TEACHING

2.1. As research assistant:

2.1.1. Teaching assistant- Undergraduate courses

1979-1981:	EPS I and EPS II (yearly courses).	
1981-1983:	EPS I (yearly course).	
1983-1984:	[WS] EPS I	[SS] EPS II
1985-1990:	[WS] EPS II	[SS] EPS I
1990-1998:	[WS] EPS II	

1980-1984 Supervisor in student projects on home electrical installation design in the framework of the courses EPS I and EPS II.

2.1.2. Laboratory training

1983-1984	[WS] EPS I	[SS] EPS II
1985-1998:	[WS] EPS II	[SS] EPS I

2.2. As Lecturer:**2.2.1. Undergraduate courses**

1998-1999:		[SS] EPS and ELT (Chem, Eng - CE)
1999-2002:	[WS] ELT (CE)	[SS] EPS
2002-2003:	[WS] IET II ¹ , ELT (CE)	[SS] EPS
2003-2006:	[WS] IET II ¹ , ELT (CE)	[SS] IET I ¹

2.2.2. Laboratory training

2002-2006:	[WS] IET II
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2.2.3. Post graduate courses

2005-2006:	[MP64] Analysis of Power System Transients (with Prof. P. Dokopoulos)
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2.3. As Assistant Professor:**2.3.1. Undergraduate courses**

2006-2007:	[WS] STEPS ² , IET II, ELT (CE)	[SS] EPS I, IET I ³
2007-2008:	[WS] STEPS ⁴ , IET II ⁵ , ELT (CE)	[SS] EPS I ⁶ , IET I
2008-2009:	[WS] STEPS ⁴ , IET II, CMPS, ELT (CE) ⁷	[SS] EPS I ⁷ , IET I
2009-2010	[WS] STEPS ⁴ , IET II ⁷ , CMPS, ELT (CE) ⁷	[SS] EPS I, IET I ⁶

2.3.2. Postgraduate courses

2006-2009:	[MP1] Advanced topics in Power Systems (with Prof. A. Bakirtzis and Prof. D. Labridis). [MP34] Distributed generation (with Prof. A. Bakirtzis). [MP64] Analysis of Power System Transients.
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2.4. As Associate Professor:

2.4.1. Undergraduate courses

2010-2011:	[WS] STEPS ⁴ , IET II ⁸ , CMPS, ELT (CE) ⁷	[SS] EPS I, IET I ⁶
2011-2012:	[WS] STEPS ⁴ , IET II ⁸ , CMPS, ELT (CE) ⁷	[SS] EPS I, IET I ⁶
2012-2013:	[WS] STEPS ^{4,6} , IET II ^{7,8} , CMPS, ELT (CE) ⁷	[SS] EPS I, IET I ⁶
2013-2014:	[WS] STEPS ^{4,6} , IET II ^{7,8} , CMPS, ELT (CE) ⁷	[SS] EPS I, IET I ⁶

2.4.2. Postgraduate courses

2010-2012:	[MP1] Advanced topics in Power Systems (with Prof. A. Bakirtzis and Prof. D. Labridis). [MP34] Distributed generation (with Prof. A. Bakirtzis). [MP64] Analysis of Power System Transients.
2012-2014	[MP3] Advanced topics in electric energy generation, transmission, distribution and use (with Prof. A. Bakirtzis and Prof. D. Labridis) [MP4] Advanced topics in power system operation (with Prof. A. Bakirtzis and Prof. D. Labridis)

Abbreviations: WS: Winter Semester, SS: Spring Semester, EPS : Electric Power Systems, IET: Introduction to Electric Power Technology, STEPS: Special topics in Electric Power Systems, ELT: Electrotechnology (undergraduate course School of Chemical Engineering, AUTH), CMPS: Computational Methods in Power Systems.

European Credit Transfer System Units (ECTS): IET I 4, IET II 4, PSA I 5, STEPS 5, CMPS 4, ELT 4.

Together with: 1. Prof. P. Dokopoulos, 2. A. Dagoumas (assigned Lecturer), 3. G. Christoforidis (assigned Lecturer) 4. Prof. D. Labridis 5. D. Tsiamitros (assigned Lecturer), 6. G. Andreou, Lecturer 7. M. Alexiadis, Lecturer 8. P. Biskas, Lecturer.

Course contents: Available at : <http://ee.auth.gr/en/academics/undergraduate-studies/courses/>

2.5. Supervising Diploma Theses

During the above time I was supervisor in more than 110 Diploma Theses in the School of Electrical & Computer Engineering, AUTH.

2.6. Textbooks and tutorial notes

1. [*Electric Power Systems vol A*](#), Ziti Publications, Thessaloniki 2006, ISBN 960-456-020-4, pages 510 (with D. Labridis and P. Dokopoulos) – in Greek.
2. [*Introduction to Electric Power Technology I*](#), 60 pages, 2004 - in Greek.
3. [*Introduction to Electric Power Technology I – Induction motors*](#), 26 pages (with P. Dokopoulos), 2003 – in Greek.

4. [Introduction to Electric Power Technology II – Power electronics](#), 28 pages (with P. Dokopoulos), 2003 – in Greek.
5. [Introduction to Electric Power Technology II- Energy economics](#), 21 pages (with P. Dokopoulos), 2003 – in Greek.
6. [Electrotechnology – Classroom notes](#), 242 pages, 2005 – in Greek.
7. [Laboratory training IET II, Protection against electric shock in LV installations](#), 24 pages, 2007 – in Greek.

3. RESEARCH ACTIVITIES

3.1. Research interests.

- Model development for the simulation of electromagnetic transients in power systems.
- Simulation of steady state and transient performance of transmission and distribution grids.
- Investigations on the influence of the earth return path in overhead power transmission lines and underground cables
- Powerline communications in Low- and Medium Voltage power grids.
- Distributed energy resources with special emphasis in their dynamic performance.
- Environmental impacts of power systems with emphasis in the technologies to rationalize energy consumption.
- Load profiling and clustering with special emphasis in demand response, forecasting and dynamic pricing.
- Smart grids and intelligent use of energy.

3.2. Doctoral (PhD) Thesis supervision

3.2.1. Supervisor in Doctoral (PhD) Theses of ECE - AUTH:

- Panapakidis Ioannis: *Electricity Markets* (dissertation in progress since 2006).
- Kaloudas Christos: *Dynamic model of constant parameter transmission line with the finite difference time domain method* (concluded and examined in 2013).
- Papadopoulos Panagiotis: *Generalized dynamic models for smart electrical distribution networks* (concluded and examined in 2014).
- Chrysochos Andreas: *Frequency domain transient cable model* (dissertation in progress since 2010).
- Kryonidis Georgios: *Smart grid intelligent control and protection*. (dissertation in progress since 2013).
- Kontis Eleftherios: *Reduced order simulation models of extended smart grids* (dissertation in progress since 2014).

3.2.2. Participation in supervisory committees of Doctoral (PhD) Theses in ECE – AUTH

- Tsiamitros Dimitrios: *Influence of the multi-layer earth on the transient response of overhead power transmission lines and power cables* (2001-2005).
- Dagoumas Athanasios: *Influence of the Kyoto protocol application and of the distributed generation on the power systems planning* (2002-2006).
- Gouramanis Konstantinos: *Ampacity of low voltage power cables under non-sinusoidal currents* (2003-2007).
- Papadopoulos Theofilos: *Influence of earth on the propagation characteristics of transmission lines* (2003-2008).
- Marinopoulos Antonios: *Impact of penetration of distributed generation photovoltaic power systems on losses of power distribution systems* (2003-2009).
- Simoglou Christos: *Optimum offering strategies for electric power producers in Day-Ahead Energy Market* (2006-2011).

- Baslis Konstantinos: *Medium-term hydroplant operation scheduling in a competitive energy market* (2006-2010).
- Bouhouras Aggelos: *Power Distribution Network Reconfigurations for Loss Reduction and Reliability Improvement under Real Operating Conditions* (2006-2010).
- Milioudis Apostolos: *Use of communication devices for detecting high impedance faults and investigation of electromagnetic compatibility at power distribution networks* (2007-2012).
- Gavanoudis Spyros: *Fault ride-through capability improvement of converter interfaced wind turbine generators with supercapacitor energy storage systems* (2008-2014).
- Zaganas Vasilios : *Investigation of corona discharge in power transmission lines* (2008-2014).
- Kardakos Evangelos: *Energy markets analysis using simulations* (Dissertation in progress since 2011).
- Bakirtzis Emmanouil: *Short-Term power system operation scheduling under high renewable penetration*, (Dissertation in progress since 2012).
- Dourbois Grigorios: *European energy market integration under transmission system security constraints* (Dissertation in progress since 2013).

3.2.3. Participation in supervisory committees of Doctoral (PhD) Theses in other Universities

- Rallis Konstantinos: *Electromagnetic field analysis of underground conductors. Application in grounding configurations*, School of Mechanical Engineering, University of W. Macedonia (2008-2012).

3.2.4. Examination committee member for Doctoral (PhD) Theses in ECE-AUTH

- Satsios Konstantinos: *Inductive interference of electric power lines to nearby conductors – Application of FEM and artificial intelligent methods* (1999).
- Triantafyllidis Dimitrios: *Finite Element triangular fine mesh generator based on artificial intelligent methods* (2001)
- Biskas Pantelis: *Decentralized management of a power system* (2003).
- Christoforidis Georgios: *Contribution to the calculation of inductive interference of electric power lines to underground metallic conductors* (2004).
- Goundis Vasilios: *Optimal bidding strategies for electricity producers & market analysis via game theory* (2005).
- Ziogos Nikolaos: *Analysis of transmission rights auction in electric markets* (2006).
- Baxevanos Ioannis: *Power distribution systems automation: designing and simulation of an MV line fault localization and isolation as well as power restoration system for primary distribution networks, utilising distributed artificial intelligence* (2006).
- Andreou Georgios: *Study of the characteristics of power distribution networks for powerline communication* (2006).
- Zoumas Christoforos: *Application of genetic algorithms to the short-term hydrothermal coordination problem* (2007).
- Tellidou Athina: *Analysis of Market power exercise in electricity markets with intelligent agents* (2007).
- Asimakopoulos Konstantinos: *Multicarrier techniques in fading channels* (2007).

- Papaioannou Anna: *Propagation and access techniques in fading channel for broadband services* (2009).
- Yakinthos Charalambos: *Experimental results for increasing the dielectric strength in non-homogenous gaps: gap compaction in high voltage power lines* (2009)
- Lazaridis Lazaros: *Surface dielectric strength of insulating materials in a non-uniform electric field under impulse voltages: influence of humidity* (2010)
- Papaioannou Ioulia: *Influence of the penetration of Photovoltaic units in the power quality of distribution feeders* (2010)
- Tsovilis Thomas: *A statistical lightning attachment model: lightning incidence estimation and shielding design* (2010)
- Ilioudis Vasilios: *Sensorless control of synchronous motor* (2013)
- Chatziyiannis Dimitrios: *Energy Markets Integration* (2014)

3.2.5. Examination committee member for Doctoral (PhD) Theses in other universities

- Tsourakis Georgios: *Contribution of wind energy penetration in power system stability* – School of Electrical & Computer Engineering, National Technical University of Athens (NTUA) (2010).
- Rovolis Panagiotis: *Magnetic material modeling for optimal construction and operation of electric machines*, School of Electrical & Computer Engineering, National Technical University of Athens (NTUA) (2010).
- Koutroubezis Georgios: *Distributed generation penetration in distribution networks* - School of Electrical & Computer Engineering Democritus University of Thrace (DUTH) (2011).
- Apostolopoulos Christos: *Advanced fault detection algorithms in power transmission lines using synchronized or unsynchronized phasor measurements*, School of Electrical & Computer Engineering, National Technical University of Athens (NTUA) (2011).

3.3. Publications

3.3.1. Doctoral (PhD) Thesis

A simplified real and frequency independent modal transformation for overhead power transmission line transient calculations, Thessaloniki 1998 (in Greek) [[pdf](#)]

3.3.2. Publications in International peer-reviewed Journals

- J1. G. Papagiannis, P. Dokopoulos: '**A Simplified Frequency Independent Modal Transformation for Overhead Line Switching Transients**', *European Transactions on Electric Power Systems. (ETEP)*, vol. 5, no 5, 1995, pp. 307-314, [[link](#)], [[pdf](#)]
- J2. D.G. Triantafyllidis, G.K. Papagiannis, D.P. Labridis: '**Calculation of Overhead Transmission Line Impedances: A Finite Element Approach**', *IEEE Transactions on Power Delivery*, vol. PWRD-14, no. 1, 1999, pp. 287-293, [[link](#)], [[pdf](#)].
- J3. G.K. Papagiannis, D.G. Triantafyllidis, D.P. Labridis: '**A One-Step Finite Element Formulation For The Modeling Of Single And Double-Circuit Transmission Lines**', *IEEE Transactions on Power Systems*, vol. PWRS-15, no 1, 2000, pp. 33-38, [[link](#)], [[pdf](#)].
- J4. G.K. Papagiannis, D.A. Tsiamitros, D.P. Labridis, P.S. Dokopoulos: '**Direct Numerical Evaluation of the Earth Return Path Impedances of Underground Cables**', *IEE Proceedings on Generation, Transmission and Distribution*, vol. 152, no. 3, 2005, pp. 321-328, [[link](#)], [[pdf](#)].
- J5. D.A. Tsiamitros, G.K. Papagiannis, D.P. Labridis, P.S. Dokopoulos: '**Earth Return Path Impedances Of Underground Cables For The Two-Layer Earth Case**', *IEEE Transactions on Power Delivery*, vol. PWRD-20, no 3, 2005, pp. 2174-2181, [[link](#)], [[pdf](#)].
- J6. G.K. Papagiannis, D.A. Tsiamitros, D.P. Labridis, P.S. Dokopoulos, '**A Systematic Approach To The Evaluation Of The Influence Of Multi-Layered Earth On Overhead Power Transmission Lines**', *IEEE Transactions on Power Delivery*, vol. PWRD-20, no 4, 2005, pp. 2594-2601, [[link](#)], [[pdf](#)].
- J7. A.S. Dagoumas, G.K. Papagiannis, P.S. Dokopoulos: '**An economic assessment of the Kyoto Protocol application**', *Energy Policy*, vol. 34, no 1, 2006, pp. 26-39, [[link](#)], [[pdf](#)]
- J8. Tsiamitros, G.C. Christoforidis, G.K. Papagiannis, D.P. Labridis and P.S. Dokopoulos: '**Earth Conduction Effects in Systems of Overhead and Underground Conductors in Multi-Layered Soils**', *IEE Proceedings on*

- Generation, Transmission and Distribution*, vol. 153, no 3, 2006, pp. 291 – 299, [\[link\]](#), [\[pdf\]](#).
- J9. A.S. Dagoumas, E. Kalaitzakis, G.K. Papagiannis, P.S. Dokopoulos: '**A post-Kyoto analysis of the Greek electric sector**', *Energy Policy*, vol. 35, no 3, March 2007, pp. 1551-1563, [\[link\]](#), [\[pdf\]](#).
- J10. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos, '**Homogenous Earth Approximation of Two-Layer Earth Structures. An Equivalent Resistivity Approach**', *IEEE Transactions on Power Delivery*, vol. PWRD-22, no 1, 2007, pp. 658-666, [\[link\]](#), [\[pdf\]](#).
- J11. N. Protogeros, A. Economides, G.K. Papagiannis, C. Syleos, '**Developing a Near-optimal Lowest-consumption Tunnel Lighting System Using Software Agents through Power Line Communications**', *Journal of Computing and Information Technology*, vol CIT 15, no 2, 2007, pp. 185–191, [\[link\]](#), [\[pdf\]](#).
- J12. G.K. Papagiannis, A.S. Dagoumas, N. Lettas, P.S. Dokopoulos: '**Economic and environmental impacts from the implementation of an intelligent demand side management system at the European level**', *Energy Policy*, vol. 36, no 1, 2008, pp. 163-180, [\[link\]](#), [\[pdf\]](#).
- J13. A.S. Dagoumas, I.P. Panapakidis, G.K. Papagiannis, P.S. Dokopoulos, '**Post-Kyoto energy consumption strategies for the Greek interconnected electric system**' *Energy Policy*, vol. 36, no 6, 2008, pp. 1980-1999, [\[link\]](#), [\[pdf\]](#).
- J14. T.A. Papadopoulos, G.K. Papagiannis, P.S. Dokopoulos, '**Low Voltage Distribution Line Performance Evaluation for PLC Signal Transmission**', *IEEE Trans. on Power Delivery*, vol. PWRD-23, no 4, 2008, pp. 1903 - 1910, [\[link\]](#), [\[pdf\]](#).
- J15. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos: '**Earth Return Impedances of Conductor Arrangements in Multi-Layer Soils-Part I: Theoretical Model**', *IEEE Trans. on Power Delivery*, vol. PWRD-23, no 4, pp. 2392-2400, 2008, [\[link\]](#), [\[pdf\]](#).
- J16. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos: '**Earth Return Impedances of Conductor Arrangements in Multi-Layer Soils-Part II: Numerical Results**', *IEEE Trans. on Power Delivery*, vol. PWRD-23, no 4, pp. 2401-2408, 2008, , [\[link\]](#), [\[pdf\]](#).
- J17. T.A. Papadopoulos, G.K. Papagiannis, D.A. Labridis, '**Wave Propagation Characteristics of Overhead Conductors Above Imperfect Stratified Earth for a Wide Frequency Range**', *IEEE Trans. on Magnetics*, vol. 45, no 3, 2009, pp. 1064 – 1067, [\[link\]](#), [\[pdf\]](#).
- J18. T.A. Papadopoulos, D.A. Tsiamitros, G.K. Papagiannis, '**Impedances and Admittances of Underground Cables for the homogeneous Earth Case**', *IEEE Trans on Power Delivery*, vol. 25, no 2, 2010, pp. 961-969, [\[link\]](#), [\[pdf\]](#).
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- [as Associate Professor]
- J19. T.A. Papadopoulos, G.K. Papagiannis, D.P. Labridis, '**A generalized model for the calculation of the impedances and admittances of overhead power lines**

- above stratified earth**', Electric Power Systems Research, vol. 80, no 9, 2010, pp. 1160-1170, [[link](#)], [[pdf](#)].
- J20. T.A. Papadopoulos, D.A. Tsiamitros, G.K. Papagiannis, '**Earth return admittances and impedances of underground cables in non-homogeneous earth**', IET Generation, Transmission and Distribution, vol. 5, no 2, 2011, pp. 161 - 171, [[link](#)], [[pdf](#)].
- J21. T.A. Papadopoulos, A.I. Chrysochos, G.K. Papagiannis, '**Narrowband power line communication: Medium voltage cable modeling and laboratory experimental results**', Electric Power Systems Research, vol. 102, 2013, pp. 50-60, [[link](#)], [[pdf](#)].
- J22. T.A. Papadopoulos, A.I. Chrysochos, G.K. Papagiannis, '**Analytical Study of the Frequency-Dependent Earth Conduction Effects on Underground Power Cables**' IET Generation, Transmission & Distribution, vol. 7, no 3, 2013, pp. 276-287, [[link](#)], [[pdf](#)].
- J23. C.G. Kaloudas, T.A. Papadopoulos, K.V. Gouramanis, K. Stasinou, G.K. Papagiannis, '**Methodology for the selection of long-medium voltage power cable configurations**', IET Generation, Transmission and Distribution, vol. 7, no 5, 2013, pp. 526-536, [[link](#)], [[pdf](#)].
- J24. T.A. Papadopoulos, C.G. Kaloudas, A.I. Chrysochos, G.K. Papagiannis, '**Application of narrowband Power-Line communication in medium-voltage smart distribution grids**', IEEE Trans. on Power Delivery, vol. 28, no 2, 2013, pp. 981-988, [[link](#)], [[pdf](#)].
- J25. A.I. Chrysochos, T.A. Papadopoulos, G.K. Papagiannis, '**Robust calculation of frequency-dependent transmission line transformation matrices using the Levenberg-Marquardt method**', IEEE Trans. on Power Delivery, vol. PWRD-29, no 4, 2014, pp. 1621-1629, [[link](#)], [[pdf](#)].
- J26. P.N. Papadopoulos, T. A. Papadopoulos, P. Crolla, A. J. Roscoe, G. K. Papagiannis, G.M. Burt, '**Black-box dynamic equivalent model for microgrids using measurement data**', IET Generation, Transmission & Distribution, vol. 8, no 5, 2014, pp. 851-861, [[link](#)], [[pdf](#)].
- J27. I.P. Panapakidis, T.A. Papadopoulos, G.C. Christoforidis, G.K. Papagiannis, '**Pattern Recognition Algorithms for Electricity Load Curve Analysis of Buildings**', Energy and Buildings, vol. 73, 2014, pp. 137-145, [[link](#)], [[pdf](#)].
- J28. P.N. Papadopoulos, M. Kandyla, P. Kourtza, T.A. Papadopoulos, G.K. Papagiannis, '**Parametric Analysis of the steady state and dynamic performance of proton exchange membrane Fuel Cell models**', Renewable Energy, vol. 71, 2014, pp. 23-31, [[link](#)], [[pdf](#)].
- J29. P.N. Papadopoulos, T. A. Papadopoulos, P. Crolla, A. J. Roscoe, G. K. Papagiannis, G.M. Burt, '**Measurement-based analysis of the dynamic performance of microgrids using system identification techniques**', IET Generation, Transmission & Distribution, in print, [[link](#)], [[pdf](#)].

Journal Impact Factors

Journal	2013 Impact factor	5 year Impact factor	Paper count
Electric Power Systems Research	1.595	2.026	2
Energy and Buildings	2.465	3.076	1
Energy Policy	2.696	3.402	4
European Transactions on Electric Power Systems. (ETEP)	0.631	0.628	1
IEEE Transactions on Magnetics	1.2013	1.301	1
IEEE Transactions on Power Delivery	1.657	1.97	10
IEEE Transactions on Power Systems	3.53	4.368	1
IET Generation, Transmission & Distribution	1.307	1.725	7
Journal of Computing and Information Technology	-	-	1
Renewable Energy	3.361	3.842	1

Source: 2013 Journal Citation Reports Science Edition, ISI Web of Knowledge, Thomson Reuters

3.3.3. Publications in International Conferences

- C1. P. Dokopoulos, J. Gregoreades, D. Labridis, G. Papagiannis, A. Saramourtsis, D. Tampakis, J. Pinatsis, J. Kalogiannis, M. Pappas, P. Raftopoulos : **'Remote Control and Data Acquisition System for the Wind Energy Converters of the Greek Telecommunications Organisation'**, *Proc. 3rd European Symposium "Soft Energy at the Local Level"*, Chios Island, Greece, September 1991, [link], [pdf].
- C2. G. Papagiannis, P. Dokopoulos: **'A simplified Real Frequency Independent Modal Transformation'**, *Proceedings of the 21st E.M.T.P. European Users Group Meeting*, Crete Greece, June 1992, Pages 6, [link], [pdf].
- C3. G. Papagiannis, D. Tsiamitros, D. Labridis, P. Dokopoulos: **'Influence Of Earth Stratification on Overhead Power Transmission Line Impedances. A Finite Element Approach'**, *Proceedings of the MedPower 2002 Conference*, November 4-6, 2002, Athens, Greece, Pages 6, [link], [pdf].
- C4. B. Nilsson, P. Dokopoulos, G. Papagiannis, D. Tampakis, G. Bianconi, G. Fabozzi: **'A PLC-Based Electrical Energy Consumption Management System. Preliminary Field Test Results'**, *Proceedings of the 7th International Symposium on Powerline Communications*, vol. 1, pp. 10-15, Kyoto Japan, 26-28 March 2003, [link], [pdf].
- C5. G. K. Papagiannis, D. A. Tsiamitros, G. T. Andreou, D. P. Labridis, P. S. Dokopoulos: **'Earth Return Path Impedances Of Underground Cables For The Multi-Layer Case- A Finite Element Approach'** , *PowerTech Conference Proceedings, 2003 IEEE Bologna*, 23-26 June 2003, pages 7, vol.3, [link], [pdf].
- C6. G.T. Andreou, D.P. Labridis, G.K. Papagiannis: **'Modeling of low voltage distribution cables for powerline communications'**, *PowerTech Conference Proceedings, 2003 IEEE Bologna*, 23-26 June 2003, pages: 6, vol.2, [link], [pdf].
- C7. D.A. Tsiamitros, N. Lettas, G.K. Papagiannis, D. Tampakis: **'A PLC-Based Energy Consumption Management System. Field Tests and Simulation Results'**, *Proceedings of the 38th Universities Power Engineering Conference (UPEC)*, 1-3 September 2003, Thessaloniki, Greece, vol. 2. pp. 417-420, [link], [pdf].
- C8. G. Papagiannis, D. Tsiamitros, K. Gouramanis, G. Andreou, P. Dokopoulos: **'A PLC Based Energy Consumption Management System. Pilot Installation Field Tests and Simulation Results'**, *Proceedings of the 8th International Symposium on Powerline Communications*, Zaragoza, Spain, March 30-April 2, 2004, pages 6, [link], [pdf].
- C9. G. Papagiannis, K. Gouramanis, T. Papadopoulos, K. Papadopoulos, P. Dokopoulos : **'A PLC Based Energy Consumption Management System - Performance Analysis Of Overhead Lines And Underground Cables: Measurements And Simulation'**, *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, pages 7, [link], [pdf].
- C10. A. Dagoumas, N. Lettas, G. Papagiannis, P. Dokopoulos: **'Economic And Environmental Impacts From The Implementation Of An Energy Consumption Management System At The European Level'** , *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, Pages 9, [link], [pdf].

- C11. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos: **'Earth Return Path Impedances Of Underground Cables For The Two-Layer Earth Case'**, *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, Pages 8, [link], [pdf].
- C12. D.A. Tsiamitros, G.C. Christoforidis, G.K. Papagiannis, D.P. Labridis, P.S. Dokopoulos **' A Novel Method For The Calculation Of Self And Mutual Impedances Of Overhead Conductors And Pipelines Buried In Two-Layer Soils'**, *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, Pages 7, [link], [pdf].
- C13. N. Lettas, A. Dagoumas, G. Papagiannis, P. Dokopoulos, A. Zafirakis, S. Fachouridis, K. Manousaridis: **'Distributed Generation From Small Hydro Plants. A Case Study Of The Impacts On The Power Distribution Network'**, *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, Pages 7, [link], [pdf].
- C14. N. Lettas, A. Dagoumas, G. Papagiannis, P. Dokopoulos, A. Zafirakis, S. Fachouridis, K. Manousaridis: **'Maximizing distributed generation capacity of small hydro plants in a distribution network'**, *Proceedings of the Athens CIGRE Symposium, 'Power Systems with Dispersed Generation'*, 16-20 April, 2005, Athens, Greece, Pages 8, [link], [pdf].
- C15. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos: **'Equivalent Resistivity Approximation of Two-Layer Earth Structures For Earth Return Impedance Calculations'**, *PowerTech Conference Proceedings, 2005 IEEE St. Petersburg*, 26-30 June, 2005, Pages 7, [link], [pdf].
- C16. G.K. Papagiannis, T.A. Papadopoulos, C.D. Dovas, D.A. Tsiamitros, P.S. Dokopoulos: **'A PLC-Based Energy Consumption Management System. PowerLine Performance Analysis: Field Tests and Simulation Results'**, *PowerTech Conference Proceedings, 2005 IEEE St. Petersburg*, 26-30 June, 2005, Pages 7, [link], [pdf].
- C17. N. Lettas, A. Dagoumas, G. Papagiannis, P. Dokopoulos, A. Zafirakis, S. Fachouridis, K. Manousaridis: **'A Case Study of the Impacts of Small Hydro Power Plants on the Power Distribution Network with the Combination of On Load Tap Changers'**, *PowerTech Conference Proceedings, 2005 IEEE St. Petersburg*, 26-30 June, 2005, Pages 7, [link], [pdf].
- C18. A. Dagoumas, N. Lettas, K. Tomaras, G. Papagiannis, P. Dokopoulos, A. Zafirakis, S. Fachouridis, K. Manousaridis: **'Transient Analysis of Small Hydro Generators in a Network - Connected and islanded operational mode'**, *International Conference on Future Power Systems*, November 2005, Amsterdam, Pages 6, [link], [pdf].
- C19. A. Dagoumas, A. Marinopoulos, G. Papagiannis, P. Dokopoulos, **'Simulation of Small Hydro Generators in Islanding Operation in weak Distribution Networks'**, *XVII International Conference on Electrical Machines ICEM 2006*, September 2006, Chania, Greece, Pages 6, [link], [pdf].

- C20. T. A. Papadopoulos, C.G. Kaloudas, G.K. Papagiannis, '**A Multipath Channel Model for PLC Systems based on Nodal Method and Modal Analysis**' *IEEE - ISPLC Conference 2007*, Pisa, Italy, 26-28 March, 2007, pages 6, [[link](#)], [[pdf](#)].
- C21. T.A. Papadopoulos, B.D. Batalas, A. Radis, G.K. Papagiannis, '**Medium Voltage Network PLC Modeling and Signal Propagation Analysis**' *IEEE - ISPLC Conference 2007*, Pisa, Italy, 26-28 March, 2007, pages 6, [[link](#)], [[pdf](#)].
- C22. T.A. Papadopoulos, G.C. Argyropoulos, B.D. Sarantinos, G.K. Papagiannis, '**Analysis of Indoor PLC Networks: Laboratory Tests and Simulation Results**', *PowerTech 2007 IEEE Lausanne*, Lausanne, Switzerland, July 1-5, 2007, pages 7, [[link](#)], [[pdf](#)].
- C23. T.A. Papadopoulos, G.K. Papagiannis, '**Influence of Earth Permittivity on Overhead Transmission Line Earth-Return Impedances**', *PowerTech 2007 IEEE Lausanne*, Lausanne, Switzerland, July 1-5, 2007, pages 7, [[link](#)], [[pdf](#)].
- This paper received the [Basil Papadias award](#) as the best student paper among 200candidate papers.*
- C24. V.N. Katsanou, G.K. Papagiannis, '**Comparison of substation grounding system design methods using a FEM approach**', *Proceedings of the MedPower 2008 Conference*, Thessaloniki, Greece, November 2-5, 2008, Pages 7, [[link](#)], [[pdf](#)].
- C25. P.N. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, '**PEM Fuel Cell model in the Simulation of a Distributed Generation Network**', *Proceedings of the MedPower 2008 Conference*, Thessaloniki, Greece, November 2-5, 2008, Pages 6, [[link](#)], [[pdf](#)].
- C26. C.G. Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, '**Transient Performance of Overhead Transmission Lines above Stratified Earth of Varying Permittivity**', *Proceedings of the MedPower 2008 Conference*, Thessaloniki, Greece, November 2-5, 2008, Pages 6, [[link](#)], [[pdf](#)].
- C27. I.P. Panapakidis, G.K. Papagiannis, '**Evaluation of a supply side management and a demand side management policy implemented in the Greek electric sector**', *Proceedings of the MedPower 2008 Conference*, Thessaloniki, Greece, November 2-5, 2008, Pages 6, [[link](#)], [[pdf](#)].
- C28. T.A. Papadopoulos, D.A. Tsiamitros, G.K. Papagiannis, '**Analysis of the propagation characteristics of buried cables in imperfect earth**', *PowerTech 2009 IEEE Bucharest*, Bucharest, Romania, June 28 - July 2, 2009, Pages 8, [[link](#)], [[pdf](#)].
- C29. P.N. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, '**Dynamic Modelling of a grid-connected PEM Fuel Cell in a Distributed Generation Network**', *PowerTech 2009 IEEE Bucharest*, Bucharest, Romania, June 28 - July 2, 2009, Pages 8, [[link](#)], [[pdf](#)].
- C30. V.N. Katsanou, G.K. Papagiannis, '**Substation grounding system resistance calculations using a FEM approach**', *PowerTech 2009 IEEE Bucharest*, Bucharest, Romania, June 28 - July 2, 2009, Pages 6, [[link](#)], [[pdf](#)].

- C31. T.A. Papadopoulos, D.A. Tsiमितros, G.K. Papagiannis, '**Modal propagation characteristics of underground power cable systems**', *Proceedings of the 44th International Universities Power Engineering Conference (UPEC)*, Glasgow, Scotland, September 1-4, 2009, Pages 5, [[link](#)], [[pdf](#)].
- C32. D.A. Tsiमितros, T.A. Papadopoulos, G.K. Papagiannis, '**Modeling of gas insulated lines buried in single- and in two-layer earth**', *Proceedings of the 44th International Universities Power Engineering Conference (UPEC)*, Glasgow, Scotland, September 1-4, 2009, Pages 5, [[link](#)], [[pdf](#)].

[as Associate Professor]

- C33. Ch.G. Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, '**Spectrum Analysis of Transient Responses of Overhead Transmission Lines**', *UPEC Conference 2010, Cardiff, UK, 31 Aug. - 4 Sept., 2010*, pages 5, [[link](#)], [[pdf](#)].
- C34. T.A. Papadopoulos, A.I. Chrosochos, G.K. Papagiannis, '**Comparison of Earth Return Approaches on Modeling of Underground Cables**', *UPEC Conference 2010, Cardiff, UK, 31 Aug. - 4 Sept., 2010*, pages 5, [[link](#)], [[pdf](#)].
- C35. E.K. Gkogkou, C.V. Daniel, M.G. Gkeka, E. Efthymiou, Ch.G. Kaloudas, G.K. Papagiannis, '**Short-Circuit Current Calculation and Motor Starting Analysis in a Cement Industry in Cyprus**', *MedPower10 Conference, A. Napa, Cyprus, 7-14 November, 2010*, pages 5, [[link](#)], [[pdf](#)].
- C36. P.N. Papadopoulos, Ch.G. Kaloudas, T.A. Papadopoulos, G.D. Metaxas, G.K. Papagiannis, '**Magnetizing Inrush Current Effects on Large Transformer Arrangements**', *MedPower10 Conference, A. Napa, Cyprus, 7-14 November, 2010*, pages 7, [[link](#)], [[pdf](#)].
- C37. Ch.G. Kaloudas, P.N. Papadopoulos, T.A. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, '**Short-Circuit Analysis of an Isolated System Generator and Comparative Study of IEC, ANSI and Dynamic Simulation**', *MedPower10 Conference, A. Napa, Cyprus, 7-14 November, 2010*, pages 7, [[link](#)], [[pdf](#)].
- C38. M.Horner, G.C. Christoforidis, G.K. Papagiannis, T.A. Papadopoulos, '**USE:Efficiency: A First Level Audit Analysis of Selected University Buildings from 9 EU Countries**', *3rd International Scientific "Energy and Climate Change" Conference, Athens, Greece, October 7-8, 2010*, [[link](#)], [[pdf](#)].
- C39. T.A. Papadopoulos, E.A. Topriska, G.K. Papagiannis, G.C. Christoforidis, '**Electrical Energy Consumption Analysis in Tertiary Buildings**', *3rd International Conference on Renewable Energy Sources & Energy Efficiency, Nicosia, Cyprus, May 19-20, 2011*, pages 6, [[link](#)], [[pdf](#)].
- C40. G.C. Christoforidis, G.K. Papagiannis, T.A. Papadopoulos, S. McKay, '**Identifying Non-Technological barriers preventing the widespread of Wind Power in Europe - The GP-WIND Project**', *3rd International Conference on Renewable Energy Sources & Energy Efficiency, Nicosia, Cyprus, May 19-20, 2011*, pages 5, [[link](#)], [[pdf](#)].
- C41. T.A. Papadopoulos, Ch.G. Kaloudas, P.N. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, '**Static and Dynamic Calculation of Short-Circuit Currents in**

- Synchronous Generators**, *International Conference on Power Systems Transients 2011 – IPST’11*, Delft, The Nederland, June 14-17, 2011, pages 7, [[link](#)], [[pdf](#)].
- C42. K.V. Gouramanis, Ch.G. Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, K. Stasinou, **‘Sheath Voltage Calculations in Long Medium Voltage Power Cables’**, *2011 IEEE PES Trondheim PowerTech*, Trondheim, Norway, June 19-23, 2011, pages 6, [[link](#)], [[pdf](#)].
- C43. A.I. Chrysochos, T.A. Papadopoulos, G.K. Papagiannis, **‘Improved Time-Domain Modeling of Underground Cables’**, *46th International Universities Power Engineering Conference (UPEC)*, Soest, Germany, September 5-8, 2011, pages 6, [[link](#)], [[pdf](#)].
- C44. P.N. Papadopoulos, M.D. Chatzisdoris, T.A. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, **‘Integration of Smart Grid Technologies in a MicroGrid with PV and FC units’**, *46th International Universities Power Engineering Conference (UPEC)*, Soest, Germany, September 5-8, 2011, pages 6, [[link](#)], [[pdf](#)].
- C45. K.V. Gouramanis, Ch.G. Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, K. Stasinou, **‘Simulation of Switching and Lightning Transients in Parallel Single-Core Underground Cables’**, *46th International Universities Power Engineering Conference (UPEC)*, Soest, Germany, September 5-8, 2011, pages 6, [[link](#)], [[pdf](#)].
- C46. I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, **‘Load Profiling in the Deregulated Electricity Markets: A Review of the Applications’**, in *Proc. 9th International Conference on the European Energy Market (EEM12)*, 10-12 May 2012, Florence, Italy, pp. 8, [[link](#)], [[pdf](#)].
- C47. I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, **‘Electricity Customer Characterization Based on Different Representative Load Curves’**, in *Proc. 9th International Conference on the European Energy Market (EEM12)*, 10-12 May 2012, Florence, Italy, pp. 8, [[link](#)], [[pdf](#)].
- C48. G.C. Christoforidis, K.C. Chatzivasvas, T.A. Papadopoulos, G.K. Papagiannis, **‘Identifying non-Technological Barriers to Wind Power: Local Communities’**, *9th International Conference on the European Energy Market (EEM12)*, 10-12 May 2012, Florence, Italy, pp. 6, [[link](#)], [[pdf](#)].
- C49. I.P. Panapakidis, C.K. Simoglou, M.C. Alexiadis, G.K. Papagiannis, **‘Determination of the optimal electricity selling price of a retailer via load profiling’**, *47th International Universities Power Engineering Conference (UPEC)*, London Brunel, U.K., September 4 - 7, 2012, pages 6, [[link](#)], [[pdf](#)].
- C50. P.N. Papadopoulos, T.A. Papadopoulos, G.K. Papagiannis, **‘Dynamic modeling of a microgrid using smart grid technologies’**, *47th International Universities Power Engineering Conference (UPEC)*, London Brunel, U.K., September 4 - 7, 2012, pages 6, [[link](#)], [[pdf](#)].
- C51. A.I. Chrysochos, T.A. Papadopoulos, G.K. Papagiannis, **‘Field tests of a medium voltage single-core cable lying on the ground surface’**, *47th International Universities Power Engineering Conference (UPEC)*, London Brunel, U.K., September 4 - 7, 2012, pages 6, [[link](#)], [[pdf](#)].

- C52. A.I. Chrysochos, E.T. Makri, A.C. Dimou, T.A. Papadopoulos, G.K. Papagiannis, '**An Investigation of the Performance of Underground Cable Installations in Operational and Fault Conditions**', *MedPower 12 Conference*, Cagliari, Italy, October 1 - 3, 2012, [[link](#)], [[pdf](#)].
- C53. T.A. Papadopoulos, G.C. Christoforidis, K.C. Chatzisavvas, G.K. Papagiannis, '**Harmonic Level Measurements and Analysis at Higher Education Buildings**', *MedPower 12 Conference*, Cagliari, Italy, October 1 - 3, 2012, [[link](#)], [[pdf](#)].
- C54. I.P. Panapakidis, T.A. Papadopoulos, G.C. Christoforidis, G.K. Papagiannis, '**Analysis of the electricity demand patterns of a building in a university Campus**', *12th International Conference on Environment and Electrical Engineering, IEEEIC 2013*, Wroclaw, Poland, pp. 382-387, [[link](#)], [[pdf](#)].
- C55. I.P. Panapakidis, G.C. Christoforidis, G.K. Papagiannis, '**Modifications of the clustering validity indicators for the assessment of the load profiling procedure**', *Proceedings of the 4th International Conference on Power Engineering, Energy and Electrical Drives (POWERENG2013)*, 13-17 May 2013, Istanbul, Turkey, pages 6, [[link](#)], [[pdf](#)].
- C56. I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**Deriving the Optimal Number of Clusters in the Electricity Consumer Segmentation Procedure**', *Proceedings of 10th International Conference on European Energy Markets (EEM2013)*, 28-30 May 2013, Stockholm, Sweden, pages 8, [[link](#)], [[pdf](#)].
- C57. I.P. Panapakidis, A.S. Dagoumas, M.C. Alexiadis, G.K. Papagiannis, '**Improvements in the Clustering Validity Indexes of the Load Profiling Methodology**', *Proceedings of 10th International Conference on European Energy Markets (EEM2013)*, 28-30 May 2013, Stockholm, Sweden, pages 8, [[link](#)], [[pdf](#)].
- C58. A.S. Bouhouras, T.A. Papadopoulos, G.C. Christoforidis, G.K. Papagiannis, D.P. Labridis, '**Loss reduction via network reconfigurations in Distribution Networks with Photovoltaic Units Installed**', *Proceedings of 10th International Conference on European Energy Markets (EEM2013)*, 28-30 May 2013, Stockholm, Sweden, pages 8, [[link](#)], [[pdf](#)].
- C59. A.I. Chrysochos, Ch.G. Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, '**On the Use of the Finite Conductor Length Approach for the Calculation of Electromagnetic Transients in Overhead Transmission Lines**', *IEEE Grenoble PowerTech 2013*, Grenoble, France, June 16 - 20, 2013, pages 6, [[link](#)], [[pdf](#)].
- C60. I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**Three-stage clustering procedure for deriving the typical load curves of the electricity consumers**', *IEEE Grenoble PowerTech 2013*, Grenoble, France, June 16 - 20, 2013, pages 6, [[link](#)], [[pdf](#)].
- C61. I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**New adequacy measures for the evaluation of the load profiling process**', *IEEE Grenoble PowerTech 2013*, Grenoble, France, June 16 - 20, 2013, pages 6, [[link](#)], [[pdf](#)].
- C62. T.A. Papadopoulos, P.N. Papadopoulos, P. Crolla, A.J. Roscoe, G.K. Papagiannis, G.M. Burt, '**Dynamic Performance of a Low Voltage MicroGrid with Droop Controlled Distributed Generation**' *2013 IEEE Power & Energy Society General*

- Meeting*, Vancouver, British Columbia, Canada July 21-25, 2013, pages 6, [[link](#)], [[pdf](#)].
- C63. I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**Application of competitive learning clustering in the load time series segmentation**', *48th International Universities' Power Engineering Conference (UPEC 2013)*, 02-05 September 2013, Dublin, Ireland, pages 6, [[link](#)], [[pdf](#)].
- C64. A.I. Chrysochos, T.A. Papadopoulos, G.K. Papagiannis, '**Analysis of the Propagation Characteristics of Single-Core Cables from Experimental Results using Modal Decomposition**', *48 International Universities' Power Engineering Conference (UPEC 2013)*, 02-05 September 2013, Dublin, Ireland, pages 6, [[link](#)], [[pdf](#)].
- C65. P.N. Papadopoulos, T.A. Papadopoulos, P. Crolla, A. J. Roscoe, G.K. Papagiannis, G.M. Burt, '**Modelling of Distributed Energy Resources Using Laboratory-Experimental Results**', *48 International Universities' Power Engineering Conference (UPEC 2013)*, 02-05 September 2013, Dublin, Ireland, pages 6, [[link](#)], [[pdf](#)].
- C66. A.S. Bouhouras, T.A. Papadopoulos, G.C. Christoforidis, G.K. Papagiannis, D.P. Labridis, '**Systematic Sensitivity Analysis Regarding the Influence of Distributed Generation Units Allocation to the Optimal Reconfiguration for Loss Reduction**', *48 International Universities' Power Engineering Conference (UPEC 2013)*, 02-05 September 2013, Dublin, Ireland, pages 6, [[link](#)], [[pdf](#)].
- C67. G.C. Christoforidis, I.P. Panapakidis, T.A. Papadopoulos, G.K. Papagiannis, '**PV Power Clustering as a Means to Evaluate Energy Storage Options**', *2nd International Conference on Renewable Energy Research and Applications (ICRERA 2013)*, Madrid Spain, October 2013, pages 6, [[link](#)], [[pdf](#)].
- C68. G.C. Christoforidis, A.I. Chrysochos, G.K. Papagiannis, M. Hatzipanayi, G.E. Georghiou, '**Promoting PV energy through net metering optimization: The PV-NET project**', *2nd International Conference on Renewable Energy Research and Applications (ICRERA 2013)*, Madrid Spain, October 2013, pages 6, [[link](#)], [[pdf](#)].
- C69. G.C. Christoforidis, G.K. Papagiannis, M. Brain, T. Puksec, '**Establishing an assessment framework for energy sustainability in prisons: The E-SEAP project**' *14th International Conference on Environment and Electrical Engineering (EEEIC)*, 2014, 10-12 May 2014, pp.187-192, [[link](#)], [[pdf](#)].

From the above sixty nine (69) International Conference papers, fifteen (15) appear in Thompson Reuters (ISI) Web of Knowledge while forty three (43) in Scopus.

3.3.4. Publications in National Conferences.

Six (6) publications in national Conferences in Greek.

3.3.5. Other publications

Three (3) publications in local bulletins and newsletters (Technical Chamber of Greece - TEE, Association of professional Mechanical and electrical Engineers of N. Greece - SMHBE) in Greek.

3.4. Participation in research projects.

- 1990 Researcher in the project “*System control and data acquisition for OTE Wind energy converters in the islands of Kea, Syros, Paros*”, funded by VALOREN. Contractor ATC Ltd, Athens. Local coordinator Prof. P. Dokopoulos. The developed system and the corresponding operational data were presented in the 3rd European Symposium ‘*Soft Energy at the Local Level*’, Chios island, September 11- 14, 1991, and in the 4th National Conference on Alternative Energy Sources, Xanthi October 6-8, 1992.
- 1991 Participation in the design and delivery of a continuing education program for professional engineers entitled ‘*Modern electric installations - CAD*’. Coordinator Prof. P. Dokopoulos, Proj. Nr 2657, Funded by the European Social Fund – ESF, total budget 11.000.000 GRD. Concluded in 1991.
- 1992 Participation in the design and delivery of a continuing education program for professional engineers entitled ‘*Computer applications in the design of Modern electric installations*’. Coordinator Prof. P. Dokopoulos, Proj. Nr 2867, Funded by the European Social Fund – ESF, total budget 5.000.000 GRD. Concluded in 1992.
- 1993 Participation in the design and delivery of two continuing education programs for professional engineers entitled ‘*Alternative energy sources*’ and ‘*Telecom applications in Supervisory Control and Data Acquisition Systems*’. Coordinator Prof. P. Dokopoulos, Proj. Nr 8184, Funded by the European Social Fund – ESF, total budget 9.750.000 GRD. Concluded in 1993.
- 1994 Coordinator in the research project “*Data acquisition and production control in VIAMYL S.A.*”, funded by the RETEX programme, Contractor SYNTHESIS S.A., tot. budget 16.000.000 GRD. Concluded in 1994.
- 1995 Participation in the design and delivery of a continuing education program for professional engineers entitled ‘*Programmable Logic Controllers*’. Coordinator Prof. P. Dokopoulos, Proj. Nr 8936, funded by the European Social Fund – ESF, total budget 16.000.000 GRD. Concluded in 1995.
- 1997 Senior researcher in the research project “*Co-generation stability improvement for the N. Greece Chemical Industries (XBBE)*”, Coordinator Prof. P. Dokopoulos, Proj. Nr. 4758, Research Committee AUTH, tot. budget 4.500.000 GRD. Concluded in 1998
- 2002 Senior researcher in the European FP5 research project “*PowerMan Switch - An Innovative Energy Consumption Management System Based on a Punctual Electrical Control Device*”, NNE5-2001-00247, Local coordinator Prof. P. Dokopoulos, Proj. Nr. 20729, tot. budget 1.950.000 € (AUTH budget 410.000 €). Concluded in 2005.

- 2003 Participation in the project “*Restructuring the informatics studies in the School of Electrical & Computer Engineering of AUTH*”, EPEAEK II project. Coordinator Prof. P. Mitkas, concluded in 2006.
- 2004 Senior researcher in the research project “*Fault analysis and surge protection simulations for the PPC Lavrion co-generation power station*”, Contractor RODAX S.A., Proj. Nr. 80216, Research Comm. AUTH, coordinator Prof. P. Dokopoulos, tot. budget 35.000 €, concluded in 2005.
- 2005 Senior researcher in the research project “*Distributed generation*”, PENED GSRT Project Nr. 03ED947, Coordinator Prof. P. Dokopoulos, tot. budget 90.000 €. Concluded in 2007.
- 2005 Senior researcher in the research project “*Multimedia Services over the grid- MultiGrid*”, PENED GSRT Project Nr. 03ED754, Coordinator Prof. F.N. Pavlidou, tot. budget 200.000 €. Concluded in 2008.
- 2006 Senior researcher in the research project “*Auditing services for the cogeneration power plant of Aluminium of Greece S.A. in Ag. Nikolaos*”, Research Comm. AUTH, Proj. nr 81412, coordinator Prof. P. Dokopoulos, tot. budget 160.000 €. Concluded in 2006.
- 2007 Coordinator and assigned Grant holder of the European cooperation project ‘*South East Europe Continuing Education Network (SEECEN)*’, TEMPUS Project JEP-41154-2006. Proj. nr 82210, 7 partners, total budget 299773 €. Concluded in 2009.
- 2008 Coordinator of the research project ‘*Consulting services for the ALIVERI Thermal Power Plant 416.95 MW*’, Contractor RODAX S.A., Proj. nr. 83114, Research Committee AUTH, tot. budget 35.000 €. Concluded in 2009.
- 2008 Senior researcher in the research project ‘*Consulting services for the Ag. Nikolaos IPP Thermal Power Plant 430 MW*’, Contractor RODAX S.A., Proj. Nr. 83112, Research Committee AUTH, tot. budget 35.000 €. Concluded in 2009.
- 2009 Coordinator of the research project ‘*Power transformers inrush current calculations for ALUMINION OF GREECE S.A.*’, contractor Aluminium of Greece S.A., Proj. nr. 83344, Research Comm. AUTH, tot. budget 16.000 €. Concluded in 2009.
- 2009 Coordinator of the research project ‘*Transient stability analysis for CAPP Ag. Nikolaos*’, Contractor RODAX S.A., Proj. nr. 84676, Research Committee AUTH, tot. budget 18.000 €. Concluded in 2009.
- 2009 Local Coordinator of the European research project ‘*Universities and Students for Energy Efficiency*’, Intelligent Energy Europe, participation of 11 partners, Proj. nr. 83683, Research Committee AUTH, tot. budget 1.798.485 € (AUTH budget 129.001€). Concluded in 2012.
- 2009 Coordinator of the research project ‘*Investigation of the electrical & thermal performance of a cable connection of a wind farm to the distribution network*’, Contractor ROKAS IBERDROLA Renewables S.A.,

- Proj. nr. 84990, Research Committee AUTH, tot. budget 18.000 €. Concluded in 2010.
- 2010 Local Coordinator of the European research project '*Good practice in reconciling onshore and offshore wind with environmental objectives*', Intelligent Energy Europe, participation of 17 partners, Proj. nr. 84501, Research Committee AUTH, tot. budget 1.863.819 € (AUTH budget 68.646 €). Concluded in 2012.
- 2010 Coordinator of the research project '*Transient stability analysis of the combined cycle power plant HERON II*', Contractor HERON- GEK-TERNA S.A., Proj. nr. 85772, Research Committee AUTH, tot. budget 18.000 €. Concluded in 2010.
- 2010 Coordinator of the research project '*Short circuit & transient stability analysis for Combined Cycle Power Plant KORINTHOS POWER, Ag. Theodoroi*', Contractor RODAX S.A., Proj. nr. 85331, Research Committee AUTH, tot. budget 20.000 €. Concluded in 2010.
- 2011 Local Coordinator of the European research project '*E-SEAP European sustainable energy award for prisons*', Intelligent Energy Europe, participation of 8 partners, Proj. nr. 85805, Research Committee AUTH, tot. budget 1.361.074 € (AUTH budget 206.062 €). Concluded in 2014.
- 2011 Local Coordinator of the European research project '*E-BITS - Energy bits, Young people and media for a low energy footprint*', Intelligent Energy Europe, participation of 13 partners, Proj. nr. 85807, Research Committee AUTH, tot. budget 1.963.899 € (AUTH budget 116.590 €). Concluded in 2013.
- 2011 Local coordinator of the participation of the Power Systems Laboratory in the European research project '*DERRI – Distributed Energy Resources Research Infrastructures*'. The DERRI project is an FP7 project with 16 partners. External research organisations have been selected to use the DERRI partners research infrastructures for selected research projects. Power Systems Laboratory of AUTH participated in two (2) research projects, namely [MoDERN](#) and [more MoDERN](#). Concluded in 2013.
- 2012 Coordinator of the research project '*Reconfiguration of wind farm internal grids using underground cables, fault analysis and protection coordination*', Contractor ROKAS IBERDROLA Renewables S.A., Proj. nr. 88089, Research Committee AUTH, tot. budget 12.000 €. Concluded in 2012.
- 2012 Local Coordinator of the European research project '*Countdown to Low Carbon Homes*', ERA-Net Eracobuild programme, participation of 3 partners, Proj. nr. 87765, Research Committee AUTH, tot. budget 603.535 € (AUTH budget 99.130 €). Project in progress, to be concluded in December 2014.
- 2013 Local Coordinator of the European research project '*PV-Net – Promotion of PV energy through net metering optimization*', MED programme, co-funded by the European Regional Development Fund (ERDF), participation of 7 partners, Proj. nr. 88191, Research Committee AUTH,

tot. budget 1.279.526 € (AUTH budget 122.148 €). Project in progress, to be concluded in June 2015.

2013 Local Coordinator of the European research project '*INCREASE – Increasing the penetration of renewable energy sources in the distribution grid by developing control strategies and using ancillary services*', FP7 programme, participation of 13 partners, Proj. nr. 89123, Research Committee AUTH, tot. budget 4.391.419 € (AUTH budget 246.400 €). Project in progress, to be concluded in December 2016.

3.5. Other research and scientific activities

3.5.1. Reviewer for International journals

I have been serving as reviewer for the following international scientific journals:

- IEEE Transactions on Power Delivery,
- IEEE Transactions on Power Systems,
- IEEE Trans. On Smart Grids,
- IET Proceedings in Generation, Transmission and Distribution,
- IEEE Transactions on Electromagnetic Compatibility,
- IEEE Transactions on Communications
- Electric Power Systems Research (EPSR),
- International Journal of Electric Power and Energy Systems (IJEPES),
- International Trans. On Electrical Energy Systems,
- Energy Policy,
- Energy,
- COMPEL, International journal for computation and mathematics in electrical and electronic engineering,
- Renewable Energy,
- European Journal of Engineering Education,
- International Journal of Sustainable Energy
- International Journal of Power and Energy Systems

Also I have been serving as reviewer in many International Conferences (reviewing more than 400 papers).

3.5.2. Steering, Advisory Committees and Chairs in International Conferences

- Steering committee member of the International Universities Power Engineering Conference – UPEC, since 2009.

- International Advisory Committee member of the MedPower Conference since 2008.
- Local Organizing Committee vice Chairman MedPower 2008 Conference.
- International Advisory Committee member of the Powertech Eindhoven 2015 Conference.
- Chair in many sessions in the UPEC and MedPower Conferences.

3.5.3. Invited lecturer in universities and organizations

2009	Ss Cyril & Methodius University, Skopje, FYROM, School of Electrical Engineering and Information Technology (3 Lectures)
2009	Polytechnic University of Tirana, Tirana, AL, School of Electrical Engineering (2 lectures)
2009	University of Belgrade, Belgrade, RS School of Electrical Engineering (2 lectures)
2009	Tuzla University, Tuzla, BH School of Electrical Engineering (2 lectures)
2011	University of Tor-Vergata (Roma-2), Rome, IT Schools of Energy Engineering, (2 lectures)
2011	Polytechnic University of Valencia (UPV), Valencia, ES School of Electrical Engineering (1 lecture)
2011	Polytechnic University of Valencia (UPV), Valencia, ES School of Electrical Engineering (1 lecture) Instructor in a Special Summer School with 90 students from all over Europe on the topic of ' <i>Intelligent use of Energy in buildings</i> '.
2011	University of Cyprus, Nicosia, CY School of Electrical & Computer Engineering (1 lecture)
2011	Frederic University of Cyprus, Nicosia, CY School of Electrical Engineering (1 lecture)
2011	Polytechnic University of Bucharest, Bucharest, RO School of electric power engineering (1 lecture)
2011	Technical University of Cluj-Napoca, Cluj-Napoca RO School of Electrical Engineering, School of Automation and computer Science (1 lecture)
2011	Oradea University, Oradea, RO School of Electrical & Computer Engineering (1 lecture)

- 2011 Ss Cyril & Methodius University, Skopje, FYROM,
School of Electrical Engineering and Information Technology (1 lecture)
- 2011 Bitola University, Bitola, FYROM
School of Electrical Engineering (1 lecture)
- 2012 Institution of Engineering and Technology (IET) Cyprus Chapter (2
lectures)

4. OTHER PROFESSIONAL AND EDUCATIONAL ACTIVITIES

- 1979-1983 Contractor with "STIEBEL ELTRON HELLAS S.A.", EDP system planning and implementation.
- 1987-1989 Contractor with "NIXDORF COMPUTER S.A.", establishment of a Professional Training Center in Northern Greece and responsible for the design and delivery of in-graduate customer professional training programs.
- 1989-1995 Coordinator and instructor in more than 50 continuing education seminars for professional Engineers organized by the Power Systems Laboratory, AUTH and the Professional Training Center (KEK) of AUTH, the Association of Mechanical and Electrical Engineers of Northern Greece (S.M.H.B.E.), the Technical Chamber of Greece / Central Macedonia Branch, Institute of Professional Education (IEKEM/TEE) and the Greek Productivity Center (ELKEPA).
- 1991-1996 Contractor with 'ORBIS SOFTWARE Ltd' as project leader in customer oriented incorporate professional training seminars.
- 1993 Consultant in the project '*Automation systems for the new central fish-market in N. Michaniona*', funded by the Greek Ministry of Agriculture, total budget 1,6 billion GRD, contractor VOREIOELLADIKH ATE.
- 1993-1994 Participation in a EUROFORM / Central Macedonia Consortium work-team on the evaluation and proposal of standard thematic lists for the operational program '*Training structures*' for the industrial and construction sector.
- 1995 Contractor to the special Commissioning Committee of the new AGNO dairy milk factory.
- 1996, 1997 Evaluator of special investment proposals for industrial plants under Art. 23b N 2234/94 of the Greek Ministry of Development.
- 1996, 1997 Evaluator of investment proposals for the energy sector, M. 2.1, '*Competitiveness Programme*', of the Greek Ministry of Development. Under this Call 38 proposals were evaluated with total requested funding of 81 billion GDR.
- 2003, 2005 Evaluator of proposals for human resources training programs, M. 5.2, of the Greek Ministry of Labor. Under this Call 75 proposals were evaluated.
- 2003 Evaluator of investment proposals for the '*Information Society Programme*', M. 1.3, of the Greek Ministry of Finance. Under this Call 22 proposals were evaluated.
- 2006 Evaluator of investment proposals for the energy sector, "*Competitiveness Programme*", of the Greek Ministry of Development. Under this Call 8 proposals were evaluated for total requested funding of 4 million €.

5. ADMINISTRATIVE POSITIONS AND DELEGATIONS

- 1983 Elected representative of teaching and research assistants in the Assembly of the Department of Electric Energy of the School of Electrical Engineering of AUTH.
- 1987 - 1992 Elected representative of teaching and research assistants in the General Assembly of the School of Electrical Engineering of AUTH.
- 1989 - 1992 Elected representative of teaching and research assistants in the Administrative Council of the School of Electrical Engineering of AUTH.
- 1989 – 2010 Member of the Committee for undergraduate student matters of the School of Electrical Engineering of AUTH.
- 1997 - 2012 Member of the Procurement Committee of the School of Electrical Engineering of AUTH .
- 1999 – 2008 Member of the Curriculum Committee of the School of Electrical and Computer Engineering of AUTH. During the 3 final years of this period, active participation in the development of the revised Curriculum of the School.
- 1999 – 2007 Member of the Public Relations Committee of the School of Electrical and Computer Engineering of AUTH. As part of this activity, participation in many presentations of the School of Electrical and Computer Engineering of AUTH in High Schools and Colleges in the wider area of N. Greece, as well as in several workshops organized by the Employment and Career Office of AUTH.
- 2006 – 2010 Member of the Public Relations Committee of the Aristotle University of Thessaloniki.
- 2011 – 2012 Director of the Department of Electric Energy of the School of Electrical and Computer Engineering of AUTH.
- 2012 – today Deputy representative of the School of Electrical and Computer Engineering of AUTH in the Research Committee of the Aristotle University of Thessaloniki.
- 2013 – today Director of the Power Systems Laboratory of the School of Electrical and Computer Engineering of AUTH.

6. LANGUAGES

Greek (mother), English (excellent), German (good).

7. PROFESSIONAL BODIES AND ORGANIZATIONS

- Member of the Technical Chamber of Greece (TEE).
- Senior Member of the Institute of Electrical and Electronics Engineers (IEEE).
- Member of the Institution of Engineering and Technology (IET)
- Member of the Association of Mechanical & Electrical Engineers of N. Greece (SMHBE) and of the Greek Association of Professional Mechanical & Electrical Engineers (PSDMH).
- Member of the Council on Large Electric Systems (CIGRE)
- Member of the European EMTP Users Group.

8. FAMILY STATUS

Married, one child

9. DETAILED RECORD OF PUBLICATIONS

9.1. Doctoral (PhD) Thesis

A simplified real and frequency independent modal transformation for overhead power transmission line transient calculations, 1998.

The Thesis presents a formulation of an overhead transmission line model, suitable for time-domain transient computations. The model consists of a proper combination of Bergeron's method of characteristics and of a new simplified, real and frequency independent modal transformation. Several transmission line models in use are based on complex computational procedures. However, the development of such models was not followed by a similar increase in the accuracy of the model parameters, describing the physical system, or coming from the manufacturers. The Thesis focus on the development of a simplified model, which may be almost as accurate and provide a better understanding of the analytical procedure and a better insight into the basic phenomena.

Following a detailed analysis of the calculation methods of the parameters of overhead (OH) transmission lines (TL), the factors that influence the accuracy of these parameters' calculations are investigated. The sensitivity of specific subterms of these parameters and their influence in the transient responses of the OHTL is also investigated. Next the modal transformation theory and its application in the computation of transmission line surge responses is analyzed. Problems associated with frequency dependence of the transformation matrices and their implementation in practical computations is discussed.

The simplified real and frequency independent modal transformation results by ignoring products of residual terms, accounting for the asymmetries in the transmission line impedance and admittance matrices. Following this concept, the $Z'Y'$ matrix of any arbitrary OHTL results in a form, which is diagonalizable by a real and constant transformation matrix to a high degree of accuracy. The transformation matrices, the surge responses and the modal impedances and admittances are calculated using proper analytical formulas. The method may be extended to include double circuit lines, provided they have the same configuration irrespectively of the distance between them.

The proposed simplified transformation is applied in several OHTL geometries, for various earth resistivities and for a wide frequency range. Numerical tests regarding the quantitative analysis of the approximations, the calculation of surge responses, the degree of diagonalization by the transformation and the evaluation of the transmitted voltage error are carried out. The results were very satisfactory in all cases. Finally the simplified modal transformation is combined with Bergeron's method of characteristics, providing a novel transmission line model suitable for time-domain transient computations. The new model is used in the simulation of OHTL switching transients. Results are compared with those obtained by the J. Marti transmission line model and the corresponding time-domain model implemented in the EMTP showing excellent agreement. Therefore, the new model may be used in the simulation of overhead transmission line transients as it produces accurate results, while being simple, numerically reliable and efficient.

9.2. Publications in International peer-reviewed Journals

J1. G. Papagiannis, P. Dokopoulos : 'A Simplified Frequency Independent Modal Transformation for Overhead Line Switching Transients', *European Transactions on Electric Power Systems. (ETEP)*, vol. 5, No. 5, Sept.-Oct. 1995, pp. 307-314.

Modal transformation technique is a common tool for transmission line transient computations. A simplified modal decomposition of overhead transmission lines, suitable for time-domain switching (up to 10^5 Hz) transient computations, is proposed. By neglecting residual terms in the ZY matrix, transformation matrices are approximated as real and frequency independent. The resulting propagation constants remain unaffected from the line being transposed or not, although the existing asymmetries affect transformation matrices. The method can be extended for double circuit lines, provided they have the same configuration. Propagation characteristics, mode decoupling and travelling-wave transmission effects have been investigated. Results are compared with those obtained from other methods in use.

J2. D.G. Triantafyllidis, G.K. Papagiannis, D.P. Labridis: 'Calculation of Overhead Transmission Line Impedances: A Finite Element Approach', *IEEE Transactions on Power Delivery*, vol. PWRD-14, no. 1, 1999, pp. 287-293

In this paper, the finite element method (FEM) is used to calculate the frequency dependent series impedance matrix of an overhead transmission line. A novel approach is proposed, leading from FEM results to the direct computation of the symmetrical components impedance matrix of any single or double circuit transmission line. Results show excellent agreement with those obtained by classical computation methods. Test cases examined include impedance calculations in the presence of certain terrain irregularities in the line neighborhood, such as a line by a mountain side of variable slope, a line inside a canyon or a line near a water region

J3. G.K. Papagiannis, D.G. Triantafyllidis, D.P. Labridis: 'A One-Step Finite Element Formulation For The Modeling Of Single And Double-Circuit Transmission Lines', *IEEE Transactions on Power Systems*, vol. PWRS-15, no 1, 2000, pp. 33-38.

This paper is a continuation of the work presented in J2. The finite element method (FEM) formulation of J2 is used for the direct computation of overhead transmission line series and sequence impedances. The method is applied in single and double circuit line configurations of arbitrary geometry, giving results in perfect agreement with those available from classical calculation methods. The new method can easily handle cases of non-homogeneous and/or irregular terrain, where classical methods may fail. Results show differences of up to 20% in some of the TL parameters, due to the non-homogeneous earth. Corresponding differences are also recorded in the TL transient responses.

J4. G.K. Papagiannis, D.A. Tsiamitros, D.P. Labridis, P.S. Dokopoulos: 'Direct Numerical Evaluation of the Earth Return Path Impedances of Underground Cables', *IEE Proceedings on Generation, Transmission and Distribution*, vol. 152, no. 3, 2005, pp. 321-328.

The lossy earth return path influences significantly the impedances of underground power cables, especially in cases where transient simulation models are of interest. The use of approximations for the calculation of the earth correction terms proves to be inaccurate, especially at high frequencies or for low earth resistivities. A novel direct numerical integration scheme for the evaluation of the infinite integral terms is presented. The new method proves to be numerically stable and efficient in all cases examined. Results obtained by the novel integration scheme are compared with those obtained by other approaches, as well as by a finite-element method formulation for several single-core cable configurations and for cases of homogeneous and multilayered earth.

J5. D.A. Tsiamitros, G.K. Papagiannis, D.P. Labridis, P.S. Dokopoulos: '**Earth Return Path Impedances Of Underground Cables For The Two-Layer Earth Case**', *IEEE Transactions on Power Delivery*, vol. PWRD-20, no 3, 2005, pp. 2174-2181.

The influence of earth stratification on underground power cable impedances is investigated in this paper. A rigorous solution of the electromagnetic field for the case of underground conductors and a two-layer earth is presented. Analytic expressions for the self and mutual impedances of the cable are derived. The involved semi-infinite integrals are calculated by the novel, numerically stable, and efficient integration scheme of J4. Typical single-core cable arrangements are examined for a combination of layer depths and earth resistivities, based on actual measurements. The accuracy of the results over a wide frequency range is justified by a proper finite-element method formulation. The differences in cable impedances due to earth stratification are presented. Finally, a simple switching transient simulation is examined to evaluate the influence of the earth stratification on transient voltages and currents.

J6. G.K. Papagiannis, D.A. Tsiamitros, D.P. Labridis, P.S. Dokopoulos, '**A Systematic Approach To The Evaluation Of The Influence Of Multi-Layered Earth On Overhead Power Transmission Lines**', *IEEE Transactions on Power Delivery*, vol. PWRD-20, no 4, 2005, pp. 2594-2601.

The influence of earth stratification on overhead power transmission line impedances is investigated in this paper. A systematic comparison of existing approaches is done, while results are also obtained using a finite-element method formulation. The novel numerical integration technique of J4 is used for the calculation of the infinite integrals involved. Typical single- and double-circuit line configurations are examined for a combination of layer depths and earth resistivities over a wide frequency range. The influence of the layer depth is also investigated. Results show significant differences from those, corresponding to the case of homogeneous earth. Using the multilayered earth return impedances in transient simulations, the transient responses show that differences occur mainly in cases of asymmetrical faults, justifying the need for a detailed earth model implementation.

J7. A.S. Dagoumas, G.K. Papagiannis, P.S. Dokopoulos: '**An economic assessment of the Kyoto Protocol application**', *Energy Policy*, vol. 34, no 1, 2006, pp. 26-39.

Scope of this paper is to investigate scenarios concerning the economic implications of the Kyoto Protocol in its current version including the clean development mechanisms (CDMs), the Marrakesh Accords (Seventh session of the Conference of Parties, 29 October–9 November, Marrakesh, Morocco) and the Conference of Parties 9 in Milan (Ninth session of the Conference of Parties, 1–12 December, Milan). The general equilibrium model, GTAP-E was used for the investigation of the experiments which are focused on the cases of the USA participation and on the role of Russia as a major emission credits seller. A significant issue in the Kyoto Protocol negotiations is the introduction of sinks in the Marrakech Accords. This seems to weaken the initial targets by replacing CO₂ emissions reduction with forestation activities and reduces the cost of the Protocol compliance. It is also shown that the absence of the USA may reduce the costs for the other developed countries and may influence the total costs more than the CDMs. A new scenario is studied by introducing a guaranteed minimum of 60% in the emission credits sold by Russia. Results show that the profits of Russia are not significantly affected by the guaranteed minimum.

J8. Tsiमितros, G.C. Christoforidis, G.K. Papagiannis, D.P. Labridis and P.S. Dokopoulos: '**Earth Conduction Effects in Systems of Overhead and Underground Conductors in Multi-Layered Soils**', *IEE Proceedings on Generation, Transmission and Distribution*, vol. 153, no 3, 2006, pp. 291 – 299.

Electromagnetic interference calculations in the case of overhead lines and underground insulated conductors require the determination of the self and mutual impedances of all conductors in the arrangement. For the calculation of these impedances in nonhomogeneous soils, the use of the finite-element method is suggested. However, this is generally a complicated and time-consuming task. Analytic expressions for these impedances are derived by a solution of the electromagnetic field equations for the case of n-layer soil. The infinite integrals involved are evaluated using a numerically stable and efficient integration scheme. A typical transmission line/underground insulated pipeline arrangement is examined for various two-layer earth models and over a wide frequency range. The validity of the proposed methodology is justified by a proper finite-element method formulation. The inclusion of earth stratification leads to substantially different results for the calculated impedances. These differences affect significantly the levels of voltages and currents induced on the pipeline, even for power frequencies, justifying the need for a more detailed earth model representation.

J9. A.S. Dagoumas, E. Kalaitzakis, G.K. Papagiannis, P.S. Dokopoulos: '**A post-Kyoto analysis of the Greek electric sector**', *Energy Policy*, vol. 35, no 3, March 2007, pp. 1551-1563

The obligations resulting from the Kyoto Protocol (KP) are implemented by many participants, e.g. Greece, by a combination of two methods: (a) application of regional measures which restrict CO₂ emissions and (b) procurement of green certificates e.g. in a Climate Exchange Market (CEX). Therefore, the cost for compliance with the KP depends on the extent each method is used and also on the traded values in the CEX. The energy policy and planning to be considered are long-term items and now extension of the KP to a post-KP is discussed which reaches year 2020. In Greece, the electricity sector is with a weighted CO₂ contribution of 73%, the dominantly emission sector. The paper analyzes the cost and other merits of different scenarios for the

expansion of electrical power system in Greece. For different scenarios, the total cost of the electrical power system expansion is calculated as a function of the price of emission certificates. It has been shown that there is a price of 27.5€/tCO₂, above which specific mitigation measures may lead to cost optimum solutions. A sensitivity analysis is also presented concerning the variation of key parameters like the participation in the system expansion of new supercritical coal units, the price evolution of natural gas, the RES usage rate and the discount rates of the expansion investments. The presented results can be used for decisions on the cost optimal electrical power system expansion.

J10. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos, '**Homogenous Earth Approximation of Two-Layer Earth Structures. An Equivalent Resistivity Approach**', *IEEE Transactions on Power Delivery*, vol. PWRD-22, no 1, 2007, pp. 658-666

The homogenous earth representation of two-layer earth structures for earth return impedance calculations is investigated in this paper. This representation is based on equivalent resistivity, which takes properly into account the electromagnetic and the geometrical properties of the two earth layers. The equivalent resistivity can be used in the relatively simpler formulas for the earth return calculations for the case of homogenous earth. The new expression is implemented for six actual cases of two-layer earth structures involving combinations of overhead and underground conductors. Results show that the equivalent resistivity approach can lead to significant simplifications in most cases of switching transient simulations in the presence of two-layer earth structures

J11. N. Protogeris, A. Economides, G.K. Papagiannis, C. Syleos, '**Developing a Near-optimal Lowest-consumption Tunnel Lighting System Using Software Agents through Power Line Communications**', *Journal of Computing and Information Technology*, vol. CIT 15, no 2, 2007, pp. 185-191

This paper describes an innovative Energy Consumption Management System (ECMS) that is aimed at rationalizing the end use of the electrical energy in tunnel lighting. It is based on agent technologies and Power Line Communications to achieve lowest consumption lighting conditions at an optimal way. Depending on the type of application, the system would lead also to reduced installation and running costs, especially as far as lighting systems are concerned.

J12. G.K. Papagiannis, A.S. Dagoumas, N. Lettas, P.S. Dokopoulos: '**Economic and environmental impacts from the implementation of an intelligent demand side management system at the European level**', *Energy Policy*, vol. 36, no 1, 2008, pp. 163-180.

This paper presents the results of an analysis on the economic and environmental impacts of the application of an intelligent demand side management system, called the Energy Consumption Management System (ECMS), in the European countries. The ECMS can be applied for the control of individual, widely distributed electric loads, using the power distribution network as the command communication channel. The system can be applied in public lighting, in the tertiary and residential sectors, as well as in the industry. A top-down analysis investigates the possible penetration levels in each application area. The long-term impacts following the application of system are evaluated using the LEAP2006 platform. The WASP IV model is also used for the optimization of the power generation expansion and the corresponding calibration of LEAP2006. Several operational strategies combining variable market penetration of the ECMS and expected energy savings are examined. Results show that, under a logical market penetration, a reduction of 1-4% in primary

energy, of 1.5–5% in CO₂ emissions and a 2–8% saving in investment costs for power generation expansion is to be expected for the EU-15. The results also justify that innovative devices may be attractive to end users and also help in the implementation of global energy-saving policies.

J13. A.S. Dagoumas, I.P. Panapakidis, G.K. Papagiannis, P.S. Dokopoulos, '**Post-Kyoto energy consumption strategies for the Greek interconnected electric system**' *Energy Policy*, vol. 36, no 6, 2008, pp. 1980-1999.

The liberalization of the Greek electric market (Law 2773/99, updated with Laws 3175/2003 and 3426/2005 for incorporating Directive 2003/54 into the Greek legislation) is in its final structural transformation, which includes the fact that from 1.7.2007 each customer can select its electricity provider. This new status together with the procedure towards the formation of a post-Kyoto plan, raise the need of examining different energy saving strategies in the consumption side for evaluating their economic and environmental consequences. Such strategies may be useful for the decision makers or the electricity retail companies. This paper examines the influence of several post-Kyoto electricity consumption strategies in the Greek interconnected electric system for the period 2005–2025. The aim of the paper is to be used as a decision makers' tool for investigating the potential of electricity consumption policies. The results show that policies related either to seasonal peak demand control, or targeting at the total electric consumption lead to significant gains and emission reduction. Moreover the influence of factors, such as the weather conditions, the discount rate of the energy investments, the fuel prices evolution and the consumers' behavior linkage with oil prices are examined.

J14. T.A. Papadopoulos, G.K. Papagiannis, P.S. Dokopoulos, '**Low Voltage Distribution Line Performance Evaluation for PLC Signal Transmission**', *IEEE Trans. on Power Delivery*, vol. PWRD-23, no 4, 2008, pp. 1903 - 1910.

Power-line communications over the low-voltage networks is gaining the attention of researchers in both broadband and narrowband application areas. The transmission characteristics of the power-line carrier are very significant in signal propagation. This paper presents field test and simulation results concerning signal transmission on power lines in underground and aerial installations within the CENELEC EN 50065-1 B band. Field test results show the consistency to the transmission line theory and modal wave propagation. The well-known alternate transients program-electromagnetic transients program (ATP-EMTP) is used for the simulation of the transmission path. Simulation results, obtained for different operational cases and configurations, are compared to the actual measurements from field tests, showing satisfactory agreement. Finally, the proposed models are used in further investigations concerning the signal transmission.

J15. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos: '**Earth Return Impedances of Conductor Arrangements in Multi-Layer Soils-Part I: Theoretical Model**', *IEEE Trans. on Power Delivery*, vol. PWRD-23, no 4, pp. 2392-2400, 2008

The influence of earth stratification on the conductor impedances is investigated in this paper. A general solution of the electromagnetic-field equations for the case of overhead and underground transmission-line conductors of arbitrary topology and multilayer earth is presented. Generalized expressions for the self and mutual impedances of the conductors are derived. All existing approaches result from the generalized equations, when the corresponding approximations are applied. The suitable integration scheme presented in previous papers is used for the calculation of the complex integrals involved in the expressions.

J16. D.A. Tsiमितros, G.K. Papagiannis, P.S. Dokopoulos: '**Earth Return Impedances of Conductor Arrangements in Multi-Layer Soils-Part II: Numerical Results**', *IEEE Trans. on Power Delivery*, vol. PWRD-23, no 4, pp. 2401-2408, 2008

The influence of earth stratification on the conductor impedances is investigated in this paper. The generalized expressions for the self and mutual impedance of conductors in the multilayer earth case, which have been derived in J15, are implemented on typical overhead power transmission lines and underground single-core power cable arrangements for discrete and exponential variations of earth resistivity. The accuracy of the results over a wide frequency range is justified by a proper finite-element method formulation. The differences in the impedances due to earth stratification are presented. The influence of the earth stratification on the actual transient responses of the conductor arrangements is also investigated.

J17. T.A. Papadopoulos, G.K. Papagiannis, D.A. Labridis, '**Wave Propagation Characteristics of Overhead Conductors Above Imperfect Stratified Earth for a Wide Frequency Range**', *IEEE Trans. on Magnetics*, vol. 45, no 3, 2009, pp. 1064 – 1067

The influence of stratified earth on the wave propagation characteristics of overhead conductors is analyzed, using a generalized two-layer earth model of varying electromagnetic characteristics. A systematic comparison to simpler stratified earth models is presented, showing the differences in the propagation characteristics.

J18. T.A. Papadopoulos, D.A. Tsiमितros, G.K. Papagiannis, '**Impedances and Admittances of Underground Cables for the homogeneous Earth Case**', *IEEE Trans on Power Delivery*, vol. 25, no 2, 2010, pp. 961-969.

A general formulation for the calculation of the influence of the earth return path on the impedances and the admittances of underground multiconductor power cable arrangements is presented in this paper. The expressions for the self and mutual earth correction terms are derived by a rigorous solution of the electromagnetic-field equations. The involved semi-infinite integrals are calculated by using a suitable numerical integration technique. The propagation characteristics of a single insulated conductor and of a typical three-phase single-core cable arrangement are investigated and are compared to the corresponding ones obtained by other approaches. Finally, the cable parameters calculated by the proposed method are used in a simulation of a fast transient in a three-phase single-core cable.

J19 T.A. Papadopoulos, G.K. Papagiannis, D.P. Labridis, '**A generalized model for the calculation of the impedances and admittances of overhead power lines above stratified earth**', *Electric Power Systems Research*, vol. 80, no 9, 2010, pp. 1160-1170.

A general formulation of the methodology of J17 for the determination of the influence of imperfect earth on overhead transmission line impedances and admittances is presented in this paper. The resulting model can be used in the simulation of electromagnetic transients in cases of two-layer earth over a wide frequency range, covering most fast transient phenomena of power engineering interest. The propagation characteristics of an overhead transmission line over homogeneous and two-layer earth are investigated using the proposed model. A systematic comparison of the proposed model with other approaches is also presented and the differences due to earth stratification are reported. Finally, the transmission line parameters calculated by the proposed formulation are used in the simulation of fast transient surges in a transmission line excited by double exponential sources.

J20 T.A. Papadopoulos, D.A. Tsiamitros, G.K. Papagiannis, 'Earth return admittances and impedances of underground cables in non-homogeneous earth', IET Generation, Transmission and Distribution, vol. 5, no 2, 2011, pp. 161 – 171.

The influence of the stratified earth on the admittances and impedances of underground multiconductor arrangements is examined here. The electromagnetic characteristics of the stratified earth are included in a rigorous solution of the electromagnetic field equations, leading to new expressions for the self and mutual ground admittances and impedances of underground conductors. The new expressions are implemented for both a single insulated conductor and a typical three-phase single-core cable arrangement in various two-layer earth configurations. The derived propagation characteristics are compared with the corresponding ones obtained either by an approximate approach or for the homogeneous earth case. Finally, the modal propagation characteristics calculated by the proposed method are used in the simulation of steady-state high-frequency responses in the modal domain. The paper is a continuation of J18 for the case of a two-layer stratified earth.

J21 T.A. Papadopoulos, A.I. Chrysochos, G.K. Papagiannis, 'Narrowband power line communication: Medium voltage cable modeling and laboratory experimental results', Electric Power Systems Research, vol. 102, 2013, pp. 50-60.

Power line communication (PLC) is a key component in the communication infrastructure of the future smart grid with applications in both medium voltage (MV) and low voltage (LV) networks. PLC channel characteristics are very important for the signal propagation and further analysis of their performance is needed. Scope of this paper is to extend the methodology of C20 and the investigations of C21 for the case of a 3-phase MV single core cable topology and to examine the propagation characteristics of MV cables by implementing experimental and simulation tests for different cable configurations and operational cases. A PLC channel simulation model is presented using proper cable models and is validated by measurements showing a very good agreement in the results. Investigations concerning the signal propagation are conducted and results are discussed.

J22 T.A. Papadopoulos, A.I. Chrysochos, G.K. Papagiannis, 'Analytical Study of the Frequency-Dependent Earth Conduction Effects on Underground Power Cables' IET Generation, Transmission & Distribution, vol. 7, no 3, 2013, pp. 276-287.

In electromagnetic transient analysis, one major issue is the influence of the imperfect earth on the propagation characteristics of transmission line conductors. Extensive research has been published for overhead lines, whereas the corresponding literature for underground cables is significantly less. Recently, new expressions for the calculation of the ground impedance and admittance have been proposed for the homogeneous and the stratified earth case. However, most transient simulation programs still use approximate earth representations. Scope of this study is to compare the proposed formulation with the corresponding approximations, in order to introduce a frequency limit for the use of the approximate earth models, as well as criteria that dictate the use of a stratified earth model. The resulting propagation characteristics are used in transient calculations, in order to validate the effect of the differences by the various approaches and the need to include a more accurate model in the simulation of underground cable transients. The paper uses the methodology and part of the cases examined in J18, J20 and C34 to develop certain criteria and organize the investigations.

J23 C.G. Kaloudas, T.A. Papadopoulos, K.V. Gouramanis, K. Stasinou, G.K. Papagiannis, 'Methodology for the selection of long-medium voltage power cable

configurations', IET Generation, Transmission and Distribution, vol. 7, no 5, 2013, pp. 526-536.

Single conductor cables are widely used in several types of installations over the last years, including the interconnection of wind parks to the power grid. Owing to the complexity of cable installations each configuration must be treated individually, regarding the use of sheath cross-bonding, the influence of grounding resistances and the use of sheath voltage limiters. In this study, a systematic investigation of the performance of a long-medium-voltage cable configuration is presented. Sheath voltages and currents are calculated during steady-state and short-circuit conditions for varying sheath arrangements using the ATP/EMTP software. Results are validated by field measurements. The analysis is also extended to include the investigation of overvoltages in the installation, during slow and fast transients, according to the basic insulation level for the cable system. The paper is a continuation and extension of C45 and C45.

J24 T.A. Papadopoulos, C.G. Kaloudas, A.I. Chrysochos, G.K. Papagiannis, '**Application of narrowband Power-Line communication in medium-voltage smart distribution grids**', IEEE Trans. on Power Delivery, vol. 28, no 2, 2013, pp. 981-988.

Narrowband power-line communication (PLC) over distribution networks is gaining the attention of researchers, as a communication medium in future power grids. This paper investigates the application of narrowband PLC in smart distribution grids, starting from a historical overview on the accomplished technological progress and continuing with a comparison of the advantages and drawbacks of PLC technology to other smart-grid communication solutions. The analysis shows that narrowband PLC applications are best suitable for medium-voltage (MV) networks, due to the vast and complex geographical extent. The channel and topological characteristics of MV distribution networks are examined for different operational states and configurations, since they are important for the optimal design and implementation of the PLC infrastructure. The analysis is also extended to an existing overhead MV distribution network with distributed-generation units. The obtained results and the proposed methodology are useful and comprehensive tools for the efficient implementation of PLC technology in future smart grids. The paper uses the methodology of C20 and extends the analysis in cases of multipath topologies both for overhead and underground conductors.

J25 A.I. Chrysochos, T.A. Papadopoulos, G.K. Papagiannis, '**Robust calculation of frequency-dependent transmission line transformation matrices using the Levenberg-Marquardt method**', IEEE Trans. on Power Delivery, vol. PWRD-29, no 4, 2014, pp. 1621-1629.

This paper presents a new method for the calculation of smooth frequency-dependent transmission-line (TL) transformation matrices. The proposed method, based on the Levenberg-Marquardt algorithm, solves an equivalent real-valued approach of the generalized complex eigenproblem. The implemented formulation incorporates a robust convergence criterion and is applicable to all TL configurations, due to the included numerically well-defined computational scheme. Smooth modal transformation matrices are calculated for overhead and underground TL configurations under different representations of the imperfect earth. Results are compared and validated with the corresponding results obtained from the Newton-Raphson and the sequential quadratic programming methods, revealing the accuracy, efficiency, and robustness of the proposed formulation, even in cases where the other methods fail.

J26 P.N. Papadopoulos, T. A. Papadopoulos, P. Crolla, A. J. Roscoe, G. K. Papagiannis, G.M. Burt, '**Black-box dynamic equivalent model for microgrids using measurement data**', IET Generation, Transmission & Distribution, vol. 8, no 5, 2014, pp. 851-861.

A dynamic equivalent black-box model, based on Prony analysis is presented. The proposed model is suitable for dynamic studies of microgrids, considering changes in the active and reactive powers, bus voltages, currents and frequency. The developed model is evaluated using simulation results obtained from a medium-voltage microgrid and test measurements recorded in a low-voltage microgrid laboratory test facility. Results from the proposed model are in good agreement with the corresponding responses obtained from both simulations and laboratory tests. The examined microgrid configurations include rotating machines and inverter interfaced units implementing different control strategies, thus verifying the robustness of the proposed model. The paper is an extension of C50 and C62, generalizing the methodology presented in C65.

J27 I.P. Panapakidis, T.A. Papadopoulos, G.C. Christoforidis, G.K. Papagiannis, '**Pattern Recognition Algorithms for Electricity Load Curve Analysis of Buildings**', Energy and Buildings, vol. 73, 2014, pp. 137-145.

Buildings consume 40% of the total primary energy and 30% of the annual electricity, contributing significantly to greenhouse gas emissions. Naturally, therefore, building energy efficiency and notions like the nearly zero energy buildings are continuously gaining importance and popularity as means to reduce carbon emissions and the strong dependence on fossil fuels. A step towards this direction is the incorporation of smart grid technologies, mainly through the widespread of automatic meter reading and smart meters. This enables automatic collection of in depth information of the customer's behavior along with the building's performance and, thus, introduces new opportunities for energy saving and efficient management. However, the recorded amassing ream of data requires efficient processing and interpretation, so as to provide for meaningful information. In order to tackle this problem, this paper proposes a comprehensive methodology for the investigation of the electricity behavior of buildings, using clustering techniques. Utilizing a university campus as a case study, the proposed methodology is applied to the load curves of different buildings leading to the determination of an optimum clustering procedure. The methodology may be generalized for any type of building. The paper is an extension of C54 and C55 using further load measurements.

J28 P.N. Papadopoulos, M. Kandyla, P. Kourtza, T.A. Papadopoulos, G.K. Papagiannis, '**Parametric Analysis of the steady state and dynamic performance of proton exchange membrane Fuel Cell models**', Renewable Energy, vol. 71, 2014, pp. 23-31.

Proton exchange membrane fuel cells (PEMFCs) are devices that attract the interest for a variety of applications including portable devices, transportation and stationary power. Several models are available in the literature concerning PEMFCs with different modelling approaches. In this paper, two representative dynamic models are examined, one using an electrical equivalent and one based on semi-empirical equations. Moreover, an enhanced model based on semi - empirical equations and a simplified transfer function representation for the dynamic response is proposed. All models can be easily incorporated in power system simulation software. Scope of this paper is to present a parametric analysis method in order to determine the ability of each model to represent accurately the steady - state as well as the slow and fast dynamics of a PEMFC. The influence of each specific parameter is investigated and the

tuning procedure is described. Finally, simulation results are presented and the adaptability of all models is evaluated.

J29 P.N. Papadopoulos, T. A. Papadopoulos, P. Crolla, A. J. Roscoe, G. K. Papagiannis, G.M. Burt, '**Measurement-based analysis of the dynamic performance of microgrids using system identification techniques**', IET Generation, Transmission & Distribution, in print.

The dynamic performance of microgrids is of crucial importance, because of the increased complexity introduced by the combined effect of inverter interfaced and rotating distributed generation. This study presents a methodology for the investigation of the dynamic behavior of microgrids based on measurements using Prony analysis and state-space black-box modelling techniques. Both methods are compared and evaluated using real operating conditions data obtained by a laboratory microgrid system. The recorded responses and the calculated system eigenvalues are used to analyze the system dynamics and interactions among the distributed generation units. The proposed methodology can be applied to any realworld microgrid configuration, taking advantage of the future smart grid technologies and features

9.3. Publications in International Conferences

C1. P. Dokopoulos, J. Gregoreades, D. Labridis, G. Papagiannis, A. Saramourtsis, D. Tampakis, J. Pinatsis, J. Kalogiannis, M. Pappas, P. Raftopoulos : '**Remote Control and Data Aquisition System for the Wind Energy Converters of the Greek Telecommunications Organisation**', *Proc. 3rd European Symposium "Soft Energy at the Local Level"*, Chios Island, Greece, September 1991

This paper presents the remote control and data acquisition system of three wind turbine generators (WGs), sited in the islands Kea, Paros, Syros with rated power of 60, 110 and 110 kW respectively. Each WG is installed in the local telecommunication station of the Greek Telecommunications Organization (OTE). The described system can operate at any site, controls the WGs and also selects and processes functional data from them. A small part of the system is also installed in the local power control station of the Greek Public Power Corporation (PPC) and allows remote control operations on the WGs. Some results of the WGs operation until today are also presented.

C2. G. Papagiannis, P. Dokopoulos: '**A simplified Real Frequency Independent Modal Transformation**', *Proceedings of the 21st E.M.T.P. European Users Group Meeting*, Crete Greece, June 1992, Pages 6.

This paper is an initial investigation of the methodology presented in J1. An initial form of the simplified method for modal decomposition of transmission lines is presented. By neglecting second order terms in the ZV matrix, transformation matrices may be approximated as real and frequency independent. The resulting propagation constants are identical to that of fully transposed lines although the transposition is taken into account in transformation matrices. Analytical expressions for modal parameters may be derived. The method can be extended for double circuit lines, provided they have the same configuration Results obtained using the simplified method are compared with output from the conventional method implemented in EMTP.

C3. G. Papagiannis, D. Tsiamitros, D. Labridis, P. Dokopoulos: '**Influence Of Earth Stratification on Overhead Power Transmission Line Impedances. A Finite**

Element Approach, *Proceedings of the MedPower 2002 Conference*, November 4-6, 2002, Athens, Greece, Pages 6.

This paper is a continuation of J3 and an earlier version of J6. The influence of earth stratification on overhead power transmission line impedances is investigated in this paper. A comparison of existing approaches is done, while results are also obtained using a Finite Element Method formulation. Typical single and double circuit line configurations are examined for an extensive combination of layer depths and resistivities over a wide frequency range. Results show significant differences from corresponding for the case of homogenous earth. The influence of layer depth and of layer resistivities relation is also investigated.

C4. B. Nilsson, P. Dokopoulos, G. Papagiannis, D. Tampakis, G. Bianconi, G. Fabozzi: **'A PLC-Based Electrical Energy Consumption Management System. Preliminary Field Test Results'**, *Proceedings of the 7th International Symposium on Powerline Communications*, vol. 1, pp. 10-15, Kyoto Japan, 26-28 March 2003.

The paper presents the research project titled 'An Innovative Energy Consumption Management System (ECMS) based on a Punctual Electrical Control Device', which is funded by the European Commission DG XII, under the 'Energy, Environment and Sustainable Development' RTD Action. The project aims at the rational use of electric energy. ECMS is addressed to public and private users of electric energy and can be used to limit waste energy and to manage peak loads. The technical approach is the punctual control of each electrical power supply point through an intelligent switch called Power Management Switch (PMS). This narrow band PLC application uses frequency bands from 95 kHz to 148.5 kHz. The PMS devices can be remotely controlled by user terminal equipment through Internet or through a Virtual Private Network (VPN). The project includes the design and implementation of an ECMS in three pilot installations used for street lighting in Italy, Greece and Romania. By collecting consumption data the overall performance of the system will be evaluated. This paper also presents first results out of measurements concerning signal and data transmission characteristics obtained by field tests in Italy and in Greece and by experimental laboratory tests of transmission channels, with frequencies 100-145 kHz. Field and laboratory test were made in 5 wire 3 phase power cables.

C5. G. K. Papagiannis, D. A. Tsiamitros, G. T. Andreou, D. P. Labridis, P. S. Dokopoulos: **'Earth Return Path Impedances Of Underground Cables For The Multi-Layer Case- A Finite Element Approach'**, *PowerTech Conference Proceedings, 2003 IEEE Bologna*, 23-26 June 2003, pages 7, vol.3.

The lossy earth return path influences significantly the electrical parameters of underground power cables, especially in cases where transient simulation models are of interest. The use of approximations for the calculation of earth correction terms proves to be inaccurate at high frequencies or low earth resistivities. The infinite integral terms representing the earth influence are high oscillatory in cases of underground cables and therefore difficult to integrate numerically. The scope of this paper is to present and compare results, obtained by a novel numerically stable and efficient integration scheme to those obtained by a finite element method formulation for several single core cable configurations and for homogeneous and multi-layered earth. Significant differences between impedances are recorded, especially for high frequencies and low earth resistivities. This work is an earlier version of J4.

C6. G.T. Andreou, D.P. Labridis, G.K. Papagiannis: '**Modeling of low voltage distribution cables for powerline communications**', *PowerTech Conference Proceedings, 2003 IEEE Bologna*, 23-26 June 2003, pages: 6, vol.2.

Scope of this paper is to present results obtained by different procedures applied in the calculation of the electrical parameters for the simulation of low voltage distribution cables carrying high frequency communication signals. The examined procedures originate from methods used in transmission line modeling as well as in electromagnetic field analysis. Simple models of various cable types frequently installed in residential power distribution networks are used for the comparison of the procedures.

C7. D.A. Tsiamitros, N. Lettas, G.K. Papagiannis, D. Tampakis: '**A PLC-Based Energy Consumption Management System. Field Tests and Simulation Results**', *Proceedings of the 38th Universities Power Engineering Conference (UPEC)*, 1-3 September 2003, Thessaloniki, Greece, vol. 2. pp. 417-420.

In power line communications the signal transmission characteristics of the power line carrier are very significant. In this paper some preliminary field test results, concerning signal transmission characteristics on power cables in an existing street lighting installation are reported. The influence of electrical loads in signal transmission over power lines is also commented. Simulation results obtained by EMTP for the above installation are compared to the actual measurements, showing satisfactory agreement. The paper is a continuation of C4.

C8. G. Papagiannis, D. Tsiamitros, K. Gouramanis, G. Andreou, P. Dokopoulos: '**A PLC Based Energy Consumption Management System. Pilot Installation Field Tests and Simulation Results**', *Proceedings of the 8th International Symposium on Powerline Communications*, Zaragoza, Spain, March 30-April 2, 2004, pages 6.

In this paper, simulation results concerning signal voltage profiles along underground cables in a street lighting pilot installation are presented. Time domain transmission line models, implemented in the well-known Electromagnetic Transients Program were used for the simulation. The influence of parameters such as cable configuration and length, cable segmentation with different cross sections and ground resistivity is investigated. Results are compared to actual field measurements, showing good agreement. The paper extends the work presented in C4 and C7.

C9. G. Papagiannis, K. Gouramanis, T. Papadopoulos, K. Papadopoulos, P. Dokopoulos : '**A PLC Based Energy Consumption Management System - Performance Analysis Of Overhead Lines And Underground Cables: Measurements And Simulation**', *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, pages 7.

In this paper some preliminary field test results, concerning signal transmission characteristics on power lines in an existing street lighting installation are reported. The well-known EMTP is used for the simulation of the transmission path. Simulation results concerning the no-load and full load transmission characteristics and the implementation of carrier wave traps are compared to actual measurements from field tests, showing satisfactory agreement. The influence of line length and of other modeling parameters is also investigated. The paper is an extension of C8, following the conclusion of the Greek pilot installation. Field test results are compared to the simulation results with and without the use of special HF filters.

C10. A. Dagoumas, N. Lettas, G. Papagiannis, P. Dokopoulos: '**Economic And Environmental Impacts From The Implementation Of An Energy Consumption Management System At The European Level**', *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, Pages 9.

This paper presents the results of an analysis, concerning the economic and environmental impacts of the application of an Energy Consumption Management System (ECMS) in the European countries. LEAP2000 analysis platform is used to represent the energy system of each country including the flow of energy from the supply side to the demand side through conversion processes. This study investigates how an end-use technology can provide significant gains in terms of the environmental and the cost-effective side of this investment. The analysis starts from a business-as-usual scenario which is based on national communications and supposes the continuation of the current policies. Several strategies including the implementation of the ECMS are studied and show that under a logical penetration in the market a reduction of 10% in primitive energy, 15% in CO₂ emissions and a 30% saving in investment costs is to be expected. The market-penetration is influenced not only by low capital investment and the low price but also by the willingness of the governments to support the cost-effectiveness and the environmental gains of such technologies and to improve environmental ethics. This is an early version of J12.

C11. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos: '**Earth Return Path Impedances Of Underground Cables For The Two-Layer Earth Case**', *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, Pages 8.

The influence of earth stratification on underground power cable impedances is investigated in this paper. A solution of the electromagnetic field for the case of underground conductors and a two-layer earth is presented. Analytic expressions for the self and mutual impedances of the cable are derived. The involved semi-infinite integrals are calculated by a novel, numerically stable and efficient integration scheme. Typical single core cable arrangements are examined for a combination of layer depths and earth resistivities over a wide frequency range. The accuracy of the results is justified by a proper Finite Element Method formulation. The results for the two-layer earth case are also compared to the corresponding for the homogeneous earth case. Finally, the influence of layer depth and of layer resistivity is investigated. The paper is an early version of J5, applying the method presented in C5.

C12. D.A. Tsiamitros, G.C. Christoforidis, G.K. Papagiannis, D.P. Labridis, P.S. Dokopoulos '**A Novel Method For The Calculation Of Self And Mutual Impedances Of Overhead Conductors And Pipelines Buried In Two-Layer Soils**', *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, Pages 7.

The influence of earth stratification on the impedances of overhead conductors and underground pipelines is examined in this paper. New formulas for the self and mutual earth return impedances for the two-layer earth case are derived. The involved semi-infinite integrals are calculated by a novel, numerically stable and efficient integration scheme. A typical transmission line-underground pipeline arrangement is examined for six cases of two-layer earth models over a wide frequency range. The accuracy of the results is justified by a proper Finite Element Method formulation. The results for the two-layer earth case are compared to the corresponding for the homogeneous earth case, showing significant differences. The results obtained by the new expressions, when implemented for the calculation of the homogeneous earth impedances are also compared to other approaches. The paper is an early version of J8.

C13. N. Lettas, A. Dagoumas, G. Papagiannis, P. Dokopoulos, A. Zafirakis, S. Fachouridis, K. Manousaridis: '**Distributed Generation From Small Hydro Plants. A Case Study Of The Impacts On The Power Distribution Network**', *Proceedings of the MedPower 2004 Conference*, Lemesos, Cyprus, November 14-17, 2004, Pages 7.

Distributed Generation (DG) is gaining the research interest as it can offer an alternative way to cover the needs for more electric power in a deregulated electricity market under certain financial and environmental constraints. Several operational problems arise by the operation of DG in the distribution networks. Scope of this paper is to investigate several operational cases in a 20 kV distribution network including 8 small synchronous and asynchronous hydro generators. The voltage variation along the distribution network is examined under variable loading conditions, variable generation modes and by implementing voltage regulator and compensation capacitors. Results show that the DG can act as a voltage supporting mechanism in case of maximum loading conditions, while the voltage can be kept within limits in cases of low loading or when the generators are disconnected.

C14. N. Lettas, A. Dagoumas, G. Papagiannis, P. Dokopoulos, A. Zafirakis, S. Fachouridis, K. Manousaridis: '**Maximizing distributed generation capacity of small hydro plants in a distribution network**', *Proceedings of the Athens CIGRE Symposium, 'Power Systems with Dispersed Generation'*, 16-20 April, 2005, Athens, Greece, Pages 8.

Distributed generation (DG), provides electric power closer to the consumer, requires less transporting facilities, may reduce network losses and increase service quality. DG includes the application of small generators, typically up to 10 MW, which are not centrally planned and dispatched and which are usually connected to the distribution network. Scope of this paper is to find the maximum capacity that can accept each node and on several nodes simultaneously in a LV network containing DGs, under certain operational constraints. Synchronous generators are assumed to be connected at 8 certain network nodes. Two operational modes, the PV and the PC mode, are examined. The maximum capacity for each node is calculated first. Results show that the maximum capacity is achieved for PV operation and maximum loading when the voltage regulator is active. Next the generated power in all 8 nodes is maximized under certain operational constraints. Results show that the maximum power of all nodes is higher than the maximum power of the previous case. Thermal ratings mainly limit the DG expansion. Solutions depend greatly on the network topology. Individual planning studies can help the DNOs to decide properly on the optimal placement and on operational constraints regarding reactive power and power losses.

C15. D.A. Tsiamitros, G.K. Papagiannis, P.S. Dokopoulos: '**Equivalent Resistivity Approximation of Two-Layer Earth Structures For Earth Return Impedance Calculations**', *PowerTech Conference Proceedings, 2005 IEEE St. Petersburg*, 26-30 June, 2005, Pages 7.

The equivalence conditions between homogeneous and two-layer earth structures are investigated in this paper. The analysis is based on the comparison between the two-layer and the homogeneous earth return impedance relations. The aim is the derivation of a new simple formula to connect the homogeneous earth equivalent resistivity with the two-layer earth electromagnetic and geometric properties. Thus, the relatively simple expressions for the impedance calculation of the homogeneous earth case can be used for two-layer earth models. The new formula is implemented for six actual cases of two-layer earth models. The two-layer earth impedances are calculated for various configurations, including overhead transmission lines, underground cable

systems and a combination of overhead line and underground conductor. The calculated impedances are compared to the corresponding for the homogeneous earth, using the equivalent resistivity given by the new formula. The paper is an early version of J10.

C16. G.K. Papagiannis, T.A. Papadopoulos, C.D. Dovas, D.A. Tsiमितros, P.S. Dokopoulos: '**A PLC-Based Energy Consumption Management System. PowerLine Performance Analysis: Field Tests and Simulation Results**', *PowerTech Conference Proceedings, 2005 IEEE St. Petersburg, 26-30 June, 2005*, Pages 7.

This paper is the continuation of C9 and presents part of the research work done on the development of an integrated Energy Consumption Management System based on powerline communications. Field test results, concerning signal transmission characteristics on power lines in pilot installations are reported. The well-known EMTP is used for the simulation of the transmission path. Simulation results obtained for the no-load and for the full load cases and after the implementation of carrier wave traps, are compared to the actual measurements from field tests, showing satisfactory agreement. The influence of line length and of line terminations is also investigated for both underground cables and overhead distribution lines. The paper is an early version of J14.

C17. N. Lettas, A. Dagoumas, G. Papagiannis, P. Dokopoulos, A. Zafirakis, S. Fachouridis, K. Manousaridis: '**A Case Study of the Impacts of Small Hydro Power Plants on the Power Distribution Network with the Combination of On Load Tap Changers**', *PowerTech Conference Proceedings, 2005 IEEE St. Petersburg, 26-30 June, 2005*, Pages 7.

The deregulation of the electricity markets and the advances in the power generation technologies together with financial and environmental concerns have positioned distributed generation as a very promising power generation alternative. Scope of this paper is to investigate some problems related to voltage quality when DG is implemented in a weak distribution network. The case under study is a 20 kV distribution network containing 17 small synchronous and asynchronous hydro generators. The voltage variation along the distribution network is examined under variable loading conditions, variable generation modes and by implementing voltage regulator, on load tap changer and compensation capacitors. Results show that the DG can act as a voltage supporting mechanism, together with the other regulating devices, while it is essential to investigate the reactive power flow in the network.

C18. A. Dagoumas, N. Lettas, K. Tomaras, G. Papagiannis, P. Dokopoulos, A. Zafirakis, S. Fachouridis, K. Manousaridis: '**Transient Analysis of Small Hydro Generators in a Network - Connected and islanded operational mode**', *International Conference on Future Power Systems*, November 2005, Amsterdam, Pages 6.

Economic and environmental issues have shifted the power distribution network on a network containing small dispersed units. Distributed generators must be considered mainly in terms of the problems and constraints they raise, whereas they appear as an opportunity to improve the quality of supply and to defer network investments. The case under study is a 20 kV distribution network containing 17 small synchronous and asynchronous hydro generators. short circuit faults in different nodes, the islanding operation of different parts of the network and the switching on/off of the generators have been investigated taking into account the different types and different operational modes of the generators.

C19. A. Dagoumas, A. Marinopoulos, G. Papagiannis, P. Dokopoulos, '**Simulation of Small Hydro Generators in Islanding Operation in weak Distribution Networks**',

XVII *International Conference on Electrical Machines ICEM 2006*, September 2006, Chania, Greece, Pages 6.

Recent trends have led to a reform of the power distribution network towards the penetration of small dispersed units. Although distributed generators provide a number of strategic benefits, their application may pose important technical concerns. One of these concerns is the islanding operation of a network branch. Such operational cases are examined in a 20kV distribution network containing 8 small synchronous and asynchronous hydro generators. The transient behavior of the DG units following circuit breaker auto reclosure operations is examined in this paper for different network loading conditions and for different network configurations. The influence of the network reactive power compensation is also investigated.

C20. T. A. Papadopoulos, C.G. Kaloudas, G.K. Papagiannis, '**A Multipath Channel Model for PLC Systems based on Nodal Method and Modal Analysis**' *IEEE - ISPLC Conference 2007*, Pisa, Italy, 26-28 March, 2007, pages 6.

One main concern in PLC applications is related to multipath signal transmission and poses certain problems in the prediction of the signal characteristics. In this paper a simple model, suitable for the calculation of the signal voltage and current profiles in cases of multipath PLC channels is proposed. The model is based on the nodal admittance method and can be applied in multiconductor grids, which are decoupled using modal transformations. The model is based on the transverse electromagnetic (TEM) assumption. Several test cases are investigated, including different topologies of a power distribution circuit with the random addition of branches of varying lengths. Phase to phase and phase to ground signal injection cases are examined. The results are checked against the corresponding obtained by the well-known Electromagnetic Transients Program (ATP-EMTP), showing very good agreement.

C21. T.A. Papadopoulos, B.D. Batalas, A. Radis, G.K. Papagiannis, '**Medium Voltage Network PLC Modeling and Signal Propagation Analysis**' *IEEE - ISPLC Conference 2007*, Pisa, Italy, 26-28 March, 2007, pages 6.

PLC technology applications in Medium Voltage (MV) distribution networks are mainly related to the monitoring, control and metering applications. The CENELEC A band provides adequate transfer rate for such narrow band PLC applications. Scope of this paper is to present simulation results concerning NPL signaling on MV distribution networks. Cases of underground cables, overhead lines and distribution transformers are examined. All simulations have been done using the Electromagnetic Transients Program (ATP-EMTP). Results seem to be consistent with transmission line theory and modal wave propagation, showing standing wave signal voltage profiles along the lines. The case of an existing aerial MV distribution network is also examined for different frequencies and loading conditions, including open-ended lines, transformers, compensation capacitors and combinations of them.

C22. T.A. Papadopoulos, G.C. Argyropoulos, B.D. Sarantinos, G.K. Papagiannis, '**Analysis of Indoor PLC Networks: Laboratory Tests and Simulation Results**', *PowerTech 2007 IEEE Lausanne*, Lausanne, Switzerland, July 1-5, 2007, pages 7.

PLC technology applications in low voltage indoor power grids apart from Internet services are related also to monitoring and remote control applications. The CENELEC B band provides adequate transfer rate for such narrow band PLC applications. This paper presents an indoor network model, suitable for the analysis of narrow band PLC transmission. Laboratory tests and simulation results concerning signal transmission characteristics for the different model configurations are reported. The ATP-EMTP program is used for the simulation of the transmission path. Results

obtained by the simulation of different cases with variable electrical appliances connected are compared to the actual measurements from laboratory tests, showing satisfactory agreement. The impact of the appliances on the signal transmission is investigated and they are classified accordingly. Finally, the proposed equivalent models are used in a simulation of the signal transmission in a building.

C23. T.A. Papadopoulos, G.K. Papagiannis, '**Influence of Earth Permittivity on Overhead Transmission Line Earth-Return Impedances**', *PowerTech 2007 IEEE Lausanne*, Lausanne, Switzerland, July 1-5, 2007, pages 7

Earth displacement currents have a significant effect in the analysis of high frequency phenomena. In this paper, the influence of the earth permittivity on the overhead power transmission line impedances is investigated. Certain criteria are proposed for the classification of cases where displacement currents must be taken into account. A systematic comparison of the existing approaches for the homogenous earth models is done, while the accuracy of the results is justified using a proper finite-element method formulation. A typical 3phase, single circuit line configuration is examined, for a combination of earth permittivities and resistivities over a wide frequency range. The differences in the transmission line impedances and the propagation characteristics, due to the impact of displacement currents are presented. Finally a simple switching transient simulation is examined to evaluate the influence of different earth permittivities on the transient voltages and currents

This paper received the Basil Papadias award as the best student paper among 200 candidate papers.

C24. V.N. Katsanou, G.K. Papagiannis, '**Comparison of substation grounding system design methods using a FEM approach**', *Proceedings of the MedPower 2008 Conference*, Thessaloniki, Greece, November 2-5, 2008, Pages 7.

Grounding systems are very important for the safe construction of a substation or a simple building. This study investigates various methods concerning the calculation of a vertical rod grounding resistance. In addition, the use of a Finite Element Method (FEM) formulation in the analysis of grounding systems is presented. A 3D model is created in order to get an accurate field calculation. An investigation concerning the calculation of the apparent soil resistivity is also conducted. Test cases include both uniform and two layer earth structures. The results obtained by the FEM calculations are compared to those obtained by analytical methods, providing useful information about the most suitable methodology for the calculation of grounding resistance.

C25. P. N. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, '**PEM Fuel Cell model in the Simulation of a Distributed Generation Network**', *Proceedings of the MedPower 2008 Conference*, Thessaloniki, Greece, November 2-5, 2008, Pages 6

This paper presents a Proton Exchange Membrane (PEM) Fuel Cell model. Mass balance and semi-empirical equations are used in the modelling process. The model has been implemented in Matlab/Simulink and tested using various scenarios in order to study the transient behavior of a PEM fuel cell. The need for a Power Conditioning Unit (PCU) connecting the fuel cell to a Distributed Generation (DG) network has also been investigated.

C26. Ch. G. Kaloudas, T. A. Papadopoulos, G. K. Papagiannis, '**Transient Performance of Overhead Transmission Lines above Stratified Earth of Varying Permittivity**', *Proceedings of the MedPower 2008 Conference*, Thessaloniki, Greece, November 2-5, 2008, Pages 6.

Accurate modeling of earth conduction effects on transmission lines is an appealing topic, especially in the high frequency region for the simulation of fast transients. In this paper, the model presented in C23 is extended towards a general formulation for the determination of the influence of the stratified earth on the impedances of overhead lines. Special emphasis is given on the high frequency region, since the model parameters are strongly influenced by the influence of the displacement currents, depending on the permittivity of earth. A systematic analysis of different earth topologies is implemented and the results obtained by the proposed model are compared to the corresponding to simpler stratified and homogeneous earth models. Finally, the calculated parameters of the overhead transmission line are used in the simulation of several electromagnetic transients in order to investigate the influence of the proposed earth modeling on the transient responses.

C27. I. P. Panapakidis, G. K. Papagiannis, '**Evaluation of a supply side management and a demand side management policy implemented in the Greek electric sector**', *Proceedings of the MedPower 2008 Conference*, Thessaloniki, Greece, November 2-5, 2008, Pages 6.

A stable and reliable electricity market can be accomplished by the balance between electricity supply and demand. This can be done in two ways, either by supply side management or by demand side management. Energy planners have traditionally tried to avoid electricity shortages by increasing the supply of electricity. This approach, the supply side management, involves the identification of the energy requirements to eliminate an impending shortage. Demand side management is set of tools that the power utility can use in order to operate the power system in the least cost manner by altering the system load shape through peak clipping, valley filling, load shifting, strategic conservation, strategic load growth and flexible load shape. This paper examines the effects in terms of least cost electricity capacity expansion of various policies of the Greek interconnected system for the period 2010-2030.

C28. T. A. Papadopoulos, D. A. Tsiamitros, G. K. Papagiannis, '**Analysis of the propagation characteristics of buried cables in imperfect earth**', *PowerTech 2009 IEEE Bucharest*, Bucharest, Romania, June 28 – July 2, 2009, Pages 8.

The influence of the imperfect earth on the propagation characteristics of underground single bare conductors and single core insulated cables arrangements is investigated in this paper. The propagation characteristics are derived through the per-unit-length parameters of the conductors, using new expressions for the earth impedance and admittance correction terms. The influence of the earth electromagnetic and geometric configuration properties are thoroughly analyzed and the results are compared to the corresponding ones obtained by other approximate approaches. Finally, the buried conductor parameters calculated by the proposed method are used in a model, simulating typical fast transients. This is an extension of J18 included an extensive investigation of the influence of various parameters on the transmission characteristics of the underground conductors.

C29. P.N. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, '**Dynamic Modelling of a grid-connected PEM Fuel Cell in a Distributed Generation Network**', *PowerTech 2009 IEEE Bucharest*, Bucharest, Romania, June 28 – July 2, 2009, Pages 8.

This paper presents a dynamic Proton Exchange Membrane Fuel Cell Model (PEMFC) model based on mass balance and semi-empirical equations. The model presented in C26 is extended to a complete PEMFC System containing a Power Conditioning Unit (PCU) is also investigated and various scenarios are simulated to assess the behavior of a grid-connected FC in a Distributed Generation (DG) network.

C30. V.N. Katsanou, G.K. Papagiannis, '**Substation grounding system resistance calculations using a FEM approach**', *PowerTech 2009 IEEE Bucharest*, Bucharest, Romania, June 28 – July 2, 2009, Pages 6.

This is an extension of C25. The paper examines various methodologies for the calculation of different grounding systems, including single rods, rodbeds and grids. In addition, the use of a Finite Element Method (FEM) formulation in the analysis of grounding systems is presented. Both 2D and 3D models are created in order to get an accurate field calculation. Test cases include both uniform and two layer earth structures. The results obtained by the FEM calculations are compared to those obtained by analytical methods, providing useful information about the most suitable methodology for the calculation of the grounding resistance.

C31. T.A. Papadopoulos, D.A. Tsiamitros, G.K. Papagiannis, '**Modal propagation characteristics of underground power cable systems**', *Proceedings of the 44th International Universities Power Engineering Conference (UPEC)*, Glasgow, Scotland, September 1-4, 2009, Pages 5.

The systematic investigation of the wave propagation characteristics of underground multiconductor power cable arrangements with special emphasis on the influence of the imperfect earth is the objective of this work. The propagation characteristics are derived through proper modal transformations from the per-unit-length parameters of cable arrangements, using novel, accurate formulas for the series impedance and shunt admittance earth correction terms. Different single-core cable arrangements are examined. The differences in the results between the novel method and existing methodologies are presented, showing the need to include the shunt admittance earth correction terms in the analysis of fast transient phenomena.

C32. D. A. Tsiamitros, T.A. Papadopoulos, G.K. Papagiannis, '**Modeling of gas insulated lines buried in single- and in two-layer earth**', *Proceedings of the 44th International Universities Power Engineering Conference (UPEC)*, Glasgow, Scotland, September 1-4, 2009, Pages 5.

The accurate modeling of 3-phase Gas-Insulated Lines (GIL) buried directly into the earth is the objective of this paper. The frequency-dependent terms that correspond to the influence of the nonhomogeneous earth, of the SF₆/N₂ mixture insulator and of the skin effect are integrated in the per-unit length impedance and admittance matrices of the system. After a proper modal transformation, the modal propagation characteristics of the system are derived. Several parametric investigations are carried out for varying soil parameters and for different two-layer earth structures in order to evaluate the influence of each of these characteristics on the propagation properties of the GIL configuration.

C33 Ch.G Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, '**Spectrum Analysis of Transient Responses of Overhead Transmission Lines**', *UPEC Conference 2010, Cardiff, UK, 31 Aug. - 4 Sept., 2010*, pages 5.

Accurate modelling of transients in overhead transmission lines requires the use of proper time domain or frequency domain models. The derivation of an optimal frequency for the calculation of line parameters is very significant in time domain modelling. The methodology followed in this paper begins with the analysis of the spectrum of transient responses, in order to calculate the dominant transient response frequency. A thorough investigation on line length, terminations and the type of transient investigates certain empirical rules and clarifies the influence of these factors on transient responses. Results obtained in the time domain, using the proposed dominant frequency, are validated by the corresponding obtained from a frequency domain model. Using a similar procedure in multipath propagation topologies, the influence of the input surge impedance on the dominant transient frequency is investigated, leading to significant remarks.

C34 T.A. Papadopoulos, A.I. Chrosochos, G.K. Papagiannis, '**Comparison of Earth Return Approaches on Modeling of Underground Cables**', *UPEC Conference 2010, Cardiff, UK, 31 Aug. - 4 Sept., 2010*, pages 5.

This paper investigates the differences that occur in the propagation characteristics of underground cables, calculated using two individual earth return approaches. The first approach assumes that the influence of the imperfect earth is taken into account only on the cable impedances, using the well-known Pollaczek-Sunde earth return impedance formula, while in the second model new formulas for the earth return impedance as well as for the earth return admittance are used. From the comparison of the propagation characteristics of a single insulated cable obtained by the two approaches a critical frequency is proposed, showing a frequency limit for the use of the approximate formulation of Pollaczek-Sunde. Finally, the paper discusses the results of transient responses calculated in the frequency domain for different cases.

C35 E.K. Gkogkou, C.V. Daniel, M.G. Gkeka, E. Efthymiou, Ch.G. Kaloudas, G.K. Papagiannis, '**Short-Circuit Current Calculation and Motor Starting Analysis in a Cement Industry in Cyprus**', *MedPower10 Conference, A. Napa, Cyprus, 7-14 November, 2010*, pages 5.

The Vassiliko Cement Works factory is located on the island of Cyprus and is one of the main industrial units of the country. The plant is fed by the 132 kV high voltage (HV)

transmission network and power consumption is approximately 40 MW. It consists one of the major HV electric power customers on the island. Short-circuit current calculations and motor starting analysis are conducted for the electrical installation of the Vassiliko Cement Works. Short-circuit analysis has been performed according to IEC 60909 standard using NEPLAN software and taking into account the overall electrical equipment and installation configuration. The application of star-delta and soft-starting startup devices for the motors is examined so as a smooth startup is achieved and voltage variations within the whole installation is within the limits allowed.

C36 P.N. Papadopoulos, Ch.G. Kaloudas, T.A. Papadopoulos, G.D. Metaxas, G.K. Papagiannis, '**Magnetizing Inrush Current Effects on Large Transformer Arrangements**', *MedPower10 Conference, A. Napa, Cyprus, 7-14 November, 2010*, pages 7

In this paper the effect of the magnetizing inrush currents, occurring during the energization of transformers, is examined. A case study is presented for an industrial arrangement consisting of five large transformers and three generators. The transformers are modeled using the Hybrid/XFMR model implemented in the well-known transients program ATP-EMTP. This model can give an accurate representation of the core of the transformers. Various scenarios are simulated in order to investigate the occurrence of magnetizing inrush currents and the parameters affecting the peak value and the shape of the waveforms. Finally, various methods to reduce inrush currents are presented and evaluated.

C37 Ch.G. Kaloudas, P.N. Papadopoulos, T.A. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, '**Short-Circuit Analysis of an Isolated System Generator and Comparative Study of IEC, ANSI and Dynamic Simulation**', *MedPower10 Conference, A. Napa, Cyprus, 7-14 November, 2010*, pages 7.

The accurate evaluation of short-circuit currents is significant for the estimation of the maximum thermal and mechanical stress in electrical equipment and for the protection coordination of power systems. The IEC-60909 standard is widely used for the calculation of maximum and minimum short-circuit currents. The calculation according to the ANSI standard is also a reliable tool for the proper selection of circuit breakers. Symmetrical and asymmetrical fault currents in a typical topology of an isolated synchronous generator feeding local loads, fault current results are calculated using IEC-60909 and ANSI standards and are compared to the corresponding obtained by the dynamic simulation using ATP/EMTP. The influence of different network parameters as well as of some simplifying assumptions on generator modeling in both standards is systematically investigated and differences between the static and the dynamic analysis are examined.

C38 M.Horner, G.C. Christoforidis, G.K. Papagiannis, T.A. Papadopoulos, '**USE:Efficiency: A First Level Audit Analysis of Selected University Buildings from 9 EU Countries**', *3rd International Scientific "Energy and Climate Change" Conference, Athens, Greece, October 7-8, 2010*.

The paper presents results by the European project 'USE Efficiency'. 'USE Efficiency' is a project under the Intelligent Energy Europe II Program. It involves 13 partners from 10 EU countries. Its overall aim is to improve energy performance in University buildings and in this context establish training programmes for University students with a practical approach. Students are the main actors within the project. They will learn about energy efficiency in a close cooperation and interaction with professors and technical experts. The training programmes will be developed in relation to specific case studies focusing on improvement of University buildings at the 9

participating universities, with an active involvement of students in the analysis work. Prior to more detailed analyses at the universities (second level audit) a first level audit has been carried out aiming at an overview of state-of-the-art at the Universities.

C39 T.A. Papadopoulos, E.A. Topriska, G.K. Papagiannis, G.C. Christoforidis, '**Electrical Energy Consumption Analysis in Tertiary Buildings**', *3rd International Conference on Renewable Energy Sources & Energy Efficiency*, Nicosia, Cyprus, May 19-20, 2011, pages 6.

The European Energy Performance of Buildings Directive (EPBD) requires a certain Energy Performance Assessment (EPA) to be conducted for each building, to obtain an Energy Performance Certificate. For this purpose several software tools have been developed enabling the audit and assess of either residential, or tertiary buildings and the calculation of the energy needs and energy consumption in line with EPBD. In practice, however, significant differences between the calculated results and measurements are usually recorded, especially for the electrical consumption, since most of the EPA tools calculate only part of the electric energy consumption in a building. Scope of the paper is to present field measurements for the electrical consumption for different buildings in a University Campus in Greece. The recorded data are analyzed and compared for a specific building with the corresponding obtained by an EPA software. Differences between the two approaches are discussed, while interesting remarks are made concerning the electrical load profiles of University buildings and the rational use of lighting and air-conditioning systems during non-working hours. From the analysis of the results proper electric consumption control strategies of the electrical loads can be proposed, utilizing intelligent control systems.

C40 G.C. Christoforidis, G.K. Papagiannis, T.A. Papadopoulos, S. McKay, '**Identifying Non-Technological barriers preventing the widespread of Wind Power in Europe - The GP-WIND Project**', *3rd International Conference on Renewable Energy Sources & Energy Efficiency*, Nicosia, Cyprus, May 19-20, 2011, pages 5.

One of the goals of the European Union (EU) looking towards year 2020, is to increase the share of the energy production from Renewable Energy Sources (RES) up to 20%. The type of RES anticipated to contribute mainly towards this target is wind power. The total installed wind power in Europe is growing steadily during the last decade. However, in many cases the growth rate is considered insufficient, as in the case of Greece. There still exist important barriers that prevent the widespread of wind energy in Europe. Generally, these barriers fall into different categories, such as technical, economic, political, environmental, communities etc. In order to meet the EU 2020 targets, many of these barriers should be overcome. In this context, Good Practice Wind (GP-WIND) is a project funded by the Intelligent Energy Programme (IEE) that aims to identify the main barriers in relation to environment and communities and develop a Good Practice Guide and a 'How to' Toolkit, which will aid developers and various stakeholders in overcoming these barriers. The preliminary project activities include specialized workshops held in the eight (8) partner countries aiming to identify the main barriers in each country and possibly reveal good or bad practices. The scope of this paper is to present some preliminary results from the project that may be helpful to stakeholders, focusing mostly at the Greek situation and the main barriers identified. Moreover, the current situation concerning wind energy in Greece is analysed and discussed.

C41 T.A. Papadopoulos, Ch.G. Kaloudas, P.N. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, '**Static and Dynamic Calculation of Short-Circuit Currents in**

Synchronous Generators, *International Conference on Power Systems Transients 2011 – IPST’11*, Delft, The Nederland, June 14-17, 2011, pages 7.

The calculation of short-circuit currents is mostly based on the methodology of the international standards IEC-60909 and ANSI / IEEE C37.010.1979. This methodology, although it utilizes simple procedures and various assumptions, usually provides satisfactory results. However, dynamic tools such as the ATP/EMTP can be used for the accurate simulation of short-circuit currents. In this paper the influence of some simplifying assumptions on the synchronous generator modeling in both standards is investigated and differences between the static and the dynamic analysis are examined, highlighting cases where significant discrepancies may occur. The analysis includes single or multiple generators connected to isolated or grid connected topologies. The paper is a continuation of the work of C37.

C42 K.V. Gouramanis, Ch.G. Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, K. Stasinou, **‘Sheath Voltage Calculations in Long Medium Voltage Power Cables’**, *2011 IEEE PES Trondheim PowerTech*, Trondheim, Norway, June 19-23, 2011, pages 6.

This paper investigates the operation of single core underground medium voltage cables connected in parallel. The examination is based on an existing power cable arrangement connecting a 38 MW wind farm with the transmission grid. The cable arrangement consists of nine single core cables connected in parallel to form a triple 3-phase system. Several connection scenarios such as the earthing of the cable sheaths at one or both ends and the application of sheath cross-bondings are examined. Various simulation parameters are also investigated such as the grounding resistance of the cable sheaths and the number of the cable sheath transpositions. The respective voltages and currents induced on the cable sheaths are calculated under steady-state and short circuit conditions.

C43 A.I. Chrysochos, T.A. Papadopoulos, G.K. Papagiannis, **‘Improved Time-Domain Modeling of Underground Cables’**, *46th International Universities Power Engineering Conference (UPEC)*, Soest, Germany, September 5-8, 2011, pages 6.

The accurate modeling of transients in underground cables requires the use of proper time domain models, as no reliable and efficient frequency dependent model exists. Proper frequency selection is crucial for the calculation of underground parameters in time domain modeling, especially when studying transient phenomena. In this paper, the spectrum context of various transient responses in underground cables is analyzed in order to calculate the dominant frequency. A thorough investigation on the source type, cable length, cable terminations and representation of the imperfect earth is implemented so as to determine their influence on the dominant frequency. The validity of empirical rules for the determination of the dominant frequency is also investigated. Results obtained in the time domain, using the proposed frequency, are compared with those obtained from a recently developed frequency domain model, leading to significant remarks. The paper is an extension of C33 for the case of underground cables.

C44 P.N. Papadopoulos, M.D. Chatziseris, T.A. Papadopoulos, A.G. Marinopoulos, G.K. Papagiannis, **‘Integration of Smart Grid Technologies in a MicroGrid with PV and FC units’**, *46th International Universities Power Engineering Conference (UPEC)*, Soest, Germany, September 5-8, 2011, pages 6.

In this paper a model of a Distributed Generation network is presented, consisting of two electronically interfaced units. The scope is to implement and evaluate

various control methods and strategies in the concept of smart grid integration. Several scenarios of transient disturbances are simulated in order to analyze the influence of the controller on the power grid and the local loads. Transient responses are calculated and the overall behavior of the system is monitored to provide an in depth understanding of the influence of various disturbances in the system in order to design more efficient control strategies utilizing the benefits of a smart grid.

C45 K.V. Gouramanis, Ch.G. Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, K. Stasinou, '**Simulation of Switching and Lightning Transients in Parallel Single-Core Underground Cables**', *46th International Universities Power Engineering Conference (UPEC)*, Soest, Germany, September 5-8, 2011, pages 6.

Switching and lightning transients in single core cables lead to overvoltages along cable cores and also to induced overvoltages on sheaths. The stress on cable insulation is in these cases significant. Sheaths are usually grounded at cable terminals with small grounding resistances. Sheath grounding can be also applied at sheath cross bonding points along cables and most commonly using sheath voltage limiters, which are energized during transients. This paper focuses on the examination of the overvoltages that may appear in an existing installation of nine medium voltage, single core cables connecting a wind park with the transmission grid. The influence of sheath cross bonding and the use of proper ground resistances are investigated using the ATP/EMTP simulation software. The paper is an extension of C42.

C46 I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**Load Profiling in the Deregulated Electricity Markets: A Review of the Applications**', in *Proc. 9th International Conference on the European Energy Market (EEM12)*, 10-12 May 2012, Florence, Italy, pp. 8.

This paper provides a state of the art survey on the load profiling applications in the deregulated market. The survey is focused on topics like tariff design, load forecasting and various power distribution issues. The procedure of the formulation of the load profiles is analyzed, as well as the algorithms used for the aforementioned procedure. Furthermore, the paper presents the two general models that are used in load profiling, namely the area (or regional) and the category (or the consumer-group-related) model. The strength and weaknesses of each model are discussed. Finally, the authors contribute to the existing load profiling literature by introducing a clustering algorithm that is used in other clustering applications. The algorithm's performance is compared with a set of algorithms that have been proposed and the results are discussed.

C47 I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**Electricity Customer Characterization Based on Different Representative Load Curves**', in *Proc. 9th International Conference on the European Energy Market (EEM12)*, 10-12 May 2012, Florence, Italy, pp. 8.

Load profiling provides the necessary information about daily demand patterns for the short and medium-term actions of retailers and utilities. Consumer characterization is a two stage approach: In the first stage, the daily load curves of each consumer are classified in a certain number of clusters. Each cluster constitutes a load profile. In the second stage, one of these profiles is chosen as representative for the consumer and a new classification takes place between the load profiles of each customer, leading to the formulation of customer classes. This paper examines various approaches for the formulation of the consumer classes during the first stage. A specific profile is chosen and the second stage procedure takes place. A criterion based on cost

of purchased electricity is introduced in order to evaluate the results of the clustering of the second stage.

C48 G.C. Christoforidis, K.C. Chatzisavvas, T.A. Papadopoulos, G.K. Papagiannis, '**Identifying non-Technological Barriers to Wind Power: Local Communities**', *9th International Conference on the European Energy Market (EEM12)*, 10-12 May 2012, Florence, Italy, pp. 6.

Wind energy is anticipated to be the main Renewable Energy Source that will contribute towards meeting the European Union's 2020 targets. However, in many cases the growth rate is considered insufficient, as in Greece. There still exist important barriers that prevent the widespread of wind energy in Europe and arguably non-technological ones may be more difficult to overcome. In this context, GP-WIND is a project aiming to develop a Good Practice Guide and a 'How to' Toolkit, which will aid various stakeholders in overcoming barriers in relation to environment and communities. The scope of this paper is to present part of the thematic case studies dealing with communities. Moreover, a survey concerning local opposition to a proposed wind farm in Greece is discussed, along with the current situation concerning wind energy in the country. Results from the survey show that international good practice in terms of community engagement was not followed, resulting in considerable delays. The paper is an extension of C40.

C49 I.P. Panapakidis, C.K. Simoglou, M.C. Alexiadis, G.K. Papagiannis, '**Determination of the optimal electricity selling price of a retailer via load profiling**', *47th International Universities Power Engineering Conference (UPEC)*, London Brunel, U.K., September 4 - 7, 2012, pages 6.

Demand response is a concept that continually gathers the interest of various deregulated market entities. It offers a flexible resource to grid operators and reduces the need for investment in peak supply capacity, lowers the generation costs and limits the settlement risks. The consumers adjust their patterns of electricity usage in response to price signals. The retailers can design time variant tariffs schemes, like time-of-use rates, critical peak pricing and real time pricing. This paper deals with the formulation of real timing pricing options designed for an industrial consumer. We involve the load profiling tool in order to extract the typical daily load curves for each consumer and we examine the influence of choosing a different representative load curve in the profitability of a retailer. The paper uses the algorithms presented in C48.

C50 P.N. Papadopoulos, T.A. Papadopoulos, G.K. Papagiannis, '**Dynamic modeling of a microgrid using smart grid technologies**', *47th International Universities Power Engineering Conference (UPEC)*, London Brunel, U.K., September 4 - 7, 2012, pages 6.

In this paper a dynamic equivalent model of a microgrid based on Prony analysis is presented. The model parameters are considered to be derived from measurements using parameter estimation techniques. Fourier analysis is also used to study the frequencies involved in the transient response of the system. A microgrid with synchronous generators and inverter-interfaced units is studied and the effect of increased inverter penetration is also examined. Results for various transient disturbances such as changes in the synchronous generators torque, load changes and changes in the inverters setpoints are presented.

C51 A.I. Chrysochos, T.A. Papadopoulos, G.K. Papagiannis, '**Field tests of a medium voltage single-core cable lying on the ground surface**', *47th International Universities*

Power Engineering Conference (UPEC), London Brunel, U.K., September 4 - 7, 2012, pages 6.

The calculation of transients in power cables requires both the use of accurate simulation models and proper formulations for the representation of the imperfect earth. However, the scarcity of available field tests in the literature leads to questionable results in several simulation cases. In this paper a set of field measurements is presented, which has been conducted on a medium-voltage single-core cable lying on the ground surface. The cable is excited by various types of voltage sources, while several grounding and termination scenarios are implemented. The examined cable is further modified and modeled in order to simulate transient phenomena, using a recently developed frequency-domain universal model, including different earth formulations. The simulation results are compared with the corresponding field measurements, leading to significant remarks. An improvement in the calculation of the frequency dependent per-unit-length parameters is also proposed, which may lead to the more accurate modeling of cables lying on the ground surface

C52 A.I. Chrysochos, E.T. Makri, A.C. Dimou, T.A. Papadopoulos, G.K. Papagiannis, '**An Investigation of the Performance of Underground Cable Installations in Operational and Fault Conditions**', *MedPower 12 Conference*, Cagliari, Italy, October 1 - 3, 2012.

The widespread use of underground single core power cables has led to the necessity of investigation of the performance of cable installations in operational and fault conditions, especially due to the complexity of each case. In this paper the induced voltage and current distribution along cable sheaths is calculated for a medium voltage cable configuration using the ATP/EMTP simulation software, while the validity of all available simulation models is examined in the analysis. The implementation of several grounding, sheath cross-bonding and cable transposition techniques is thoroughly investigated in order to reduce sheath voltages below the permissible levels and also maintain low sheath currents and losses. The analysis also includes the influence of the number of joints and the cable length on the performance of the underground installations. The paper extends C42 investigating the performance and the accurate modeling of underground cables in steady state conditions.

C53 T.A. Papadopoulos, G.C. Christoforidis, K.C. Chatzisavvas, G.K. Papagiannis, '**Harmonic Level Measurements and Analysis at Higher Education Buildings**', *MedPower 12 Conference*, Cagliari, Italy, October 1 - 3, 2012.

Advances in power electronics have led to the use of non-linear devices in power systems. Such devices significantly distort the voltage and current waveforms, injecting current harmonics into the distribution network. This paper reports on measurements of the voltage and current harmonic levels for a total period of three weeks, conducted at the low voltage bus of two higher education institutions, feeding several types of loads. The findings are the voltage and current profiles of the most significant harmonic components. The recorded data are also statistically processed using box plots.

C54 I.P. Panapakidis, T.A. Papadopoulos, G.C. Christoforidis, G.K. Papagiannis, '**Analysis of the electricity demand patterns of a building in a university Campus**', *12th International Conference on Environment and Electrical Engineering, IEEEIC 2013*, Wroclaw, Poland, pp. 382-387.

The scope of this paper is to investigate the demand patterns of buildings of the Polytechnic School of the Aristotle University of Thessaloniki (AUTH) Campus in Greece. Electrical consumption data are obtained by the installed Supervisory Control and Data Acquisition (SCADA) system and the period of study is one year. Apart from offices, the building accommodates various laboratories for teaching and research purposes that incorporate a wide diversity of electrical equipment, such as electrical machinery, heating and cooling systems, small scale electronics, high voltage experimental laboratory devices, etc. The load profiling methodology is utilized for the purpose of extracting the representative daily load curves. The clustering of the load curves is done using the Kohonen Self-Organizing Maps (SOM) of various topologies. A detailed optimization of the SOM's parameters takes place for the purpose of the minimization of the clustering error. The paper is an early version of J27.

C55 I.P. Panapakidis, G.C. Christoforidis, G.K. Papagiannis, '**Modifications of the clustering validity indicators for the assessment of the load profiling procedure**', *Proceedings of the 4th International Conference on Power Engineering, Energy and Electrical Drives (POWERENG2013)*, 13-17 May 2013, Istanbul, Turkey, pages 6.

Load profiling aims at tracking exploitable information about the demand patterns of various consumer categories. The segmentation of the load curves corresponds to a clustering procedure, i.e. the grouping of load curves that are more similar to each other than those of another group. The interpretation of the clustering effectualness is done with a set of validity indicators or adequacy measures. The present study deals with the presentation and the examination of all clustering validity indicators that have been proposed in the load profiling literature. These indicators utilize the Euclidean distance as metric to address the similarity of the load curves that belong to the same cluster. The authors examine the behavior of the validity indicators by taking into account other metrics like the Manhattan and the Chebychev distances. This leads to a new definition of the adequacy measures that have been proposed in the literature.

C56 I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**Deriving the Optimal Number of Clusters in the Electricity Consumer Segmentation Procedure**', *Proceedings of 10th International Conference on European Energy Markets (EEM2013)*, 28-30 May 2013, Stockholm, Sweden, pages 8.

This paper examines a set of methods that determine the optimal number of clusters in the electricity consumer segmentation procedure. For the purpose of clustering the load curves of the consumers, we involve two algorithms of different concept and complexity, namely the Minimum Variance Method (MVM) hierarchical agglomerative algorithm and the Fuzzy C-Means (FCM). A parametric analysis takes place in order to optimize the FCM's parameters. Apart from the two clustering algorithms, we introduce in the load profiling studies two other methods that provide indications of the number of clusters within a data sample, namely the Max-Min and the Chain-map methods. For the sake of assessing the algorithm effectiveness, we utilize the ratio of Within Cluster sum of squares to Between Cluster variation (WCBCR) adequacy measure and the Bayesian Information Criterion (BIC). We also propose an improved version of the WCBCR

C57 I.P. Panapakidis, A.S. Dagoumas, M.C. Alexiadis, G.K. Papagiannis, '**Improvements in the Clustering Validity Indexes of the Load Profiling Methodology**', *Proceedings of 10th International Conference on European Energy Markets (EEM2013)*, 28-30 May 2013, Stockholm, Sweden, pages 8.

In the recent years the utilization of the load profiling tool for tracking the demand patterns is gathering momentum. There is variety of different clustering algorithms for the formation of daily load curve clusters. Their effectiveness is tested by a set of validity indexes or adequacy measures. This paper examines the behavior of all the adequacy measures that have been proposed in the related literature. We propose an alternative form of the measures that involves a weighting factor that refers to the variance of each element of the vector that represents the demand pattern. This fact increases the accuracy of the dissimilarity measures within and among the clusters. The data sample refers to the daily load curves of an existing high voltage industry within the Greek region and the period of study is the years 2003-2011. This vast amount of data is sufficient for assessing the load profiling methodology

C58 A.S. Bouhouras, T.A. Papadopoulos, G.C. Christoforidis, G.K. Papagiannis, D.P. Labridis, '**Loss reduction via network reconfigurations in Distribution Networks with Photovoltaic Units Installed**', *Proceedings of 10th International Conference on European Energy Markets (EEM2013)*, 28-30 May 2013, Stockholm, Sweden, pages 8.

The penetration of Renewable Energy Resources in Distribution Networks (DNs) is increasing rapidly, thus traditional issues regarding the DN operation should be faced through a different perspective that concerns dynamic behavior for both the distributed load consumption and power generation points of a network. Within this context, loss minimization in DNs by network reconfigurations should be examined subject to the variations regarding the load composition of the network due to the presence of Distributed Generation (DG) units. In this paper, the influence of Photovoltaic (PV) units installed in DNs to the optimal reconfiguration for loss reduction is investigated. The problem is stated, and a three level formulation is proposed in order to describe how the problem should be faced for an exhaustive and thorough analysis. Moreover, a simplified version of this proposed methodology is adopted in this work considering a two-stage sensitivity analysis: a spatial sensitivity analysis regarding the distribution of the PV units, and a quantitative sensitivity analysis concerning the penetration of the PV units in respect to the capacity of the network. The methodology is applied to three DNs by the published literature, and the results provide useful conclusions regarding the effect of the spatial distribution level along with the installed capacity of the PV units to the optimal reconfigured solution.

C59 A.I. Chrysochos, Ch.G. Kaloudas, T.A. Papadopoulos, G.K. Papagiannis, '**On the Use of the Finite Conductor Length Approach for the Calculation of Electromagnetic Transients in Overhead Transmission Lines**', *IEEE Grenoble PowerTech 2013*, Grenoble, France, June 16 - 20, 2013, pages 6.

Despite the progress that has been made in the representation of the imperfect earth, the majority of the most-known earth formulations assume that the Overhead Transmission Line (OHTL) is infinitely long. In this paper, earth-return correction terms for finite length OHTL are presented and compared to formulas of infinite line length. For this purpose, the corresponding per-unit-length parameters and propagation characteristics of a high-voltage OHTL of variable line length are compared. An empirical limit is also proposed, under which the finite conductor length approach should be taken into consideration. The analysis proceeds with the evaluation of the performance of the OHTL under steady-state and transient phenomena with divergences being observed for small line lengths, confirming the proposed length limit. The investigation reveals that the results from the finite conductor length approach can be on the safe side, therefore this approach should be taken into account. The paper extends the methodology of J17 for the case of finite length conductors.

C60 I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**Three-stage clustering procedure for deriving the typical load curves of the electricity consumers**', *IEEE Grenoble PowerTech 2013*, Grenoble, France, June 16 - 20, 2013, pages 6.

Load profiling based consumer characterization is a two-stage procedure: during the first stage the daily load curves of each consumer are grouped in a certain number of clusters. The average load curve is the normalized load profile of each cluster. For each consumer, a load profile is chosen and a new clustering takes place leading to the formation of consumer classes. This paper proposes one additional stage, the "pre-clustering" step in order to optimize the whole load profiling procedure. We employ the family of the hierarchical agglomerative algorithms in order to group the daily load curves into classes. The performance of the algorithms in formulating well separated and compact clusters is checked by an adequacy measure. The proposed analysis is suitable when there is an availability of large load data samples that are gathered through the smart metering infrastructure and stored at the utilities' databases.

C61 I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**New adequacy measures for the evaluation of the load profiling process**', *IEEE Grenoble PowerTech 2013*, Grenoble, France, June 16 - 20, 2013, pages 6.

The process of grouping load curves based on the similarity of their shapes is represented by unsupervised machine learning. Usually, in the load profiling problems, there is no available information about the number of desired clusters. The load data are grouped together and the objective is to minimize various indexes or adequacy measures that are related with the distances between the data within the same cluster. This paper presents all the adequacy measures that have been proposed in the load profiling related literature. Some of these measures show unstable behavior while the number of the output clusters increases. Hence, they are not suitable for defining the optimal number of clusters. Two new adequacy measures, used in other clustering problems are introduced, for easy detection of the appropriate number of clusters. Additionally, two demand pattern representation techniques are compared in terms of minimizing the clustering error.

C62 T.A. Papadopoulos, P.N. Papadopoulos, P. Crolla, A.J. Roscoe, G.K. Papagiannis, G.M. Burt, '**Dynamic Performance of a Low Voltage MicroGrid with Droop Controlled Distributed Generation**' *2013 IEEE Power & Energy Society General Meeting*, Vancouver, British Columbia, Canada July 21-25, 2013, pages 6.

Microgrids are small-scale highly controlled networks designed to supply electrical energy. From the operational point of view, microgrids are active distribution networks, facilitating the integration of distributed generation units. Major technical issues in this concept include system stability and protection coordination which are significantly influenced by the high penetration of inverter-interfaced distributed energy sources. These units often adopt the frequency-active power and voltage-reactive power droop control strategy to participate in the load sharing of an islanded microgrid. The scope of the paper is to investigate the dynamic performance of a low voltage laboratory-scale microgrid system, using experimental results and introduce the concept of Prony analysis for understanding the connected components. Several small disturbance test cases are conducted and the investigations focus on the influence of the droop controlled distributed generation sources.

C63 I.P. Panapakidis, M.C. Alexiadis, G.K. Papagiannis, '**Application of competitive learning clustering in the load time series segmentation**', *48th International*

Universities' Power Engineering Conference (UPEC 2013), 02-05 September 2013, Dublin, Ireland, pages 6.

Load time series segmentation can serve as the basis for the implementation of variety of applications that have the potential to modify the demand patterns. The scope of this study is three-fold. Firstly, a novel modeling technique of the metered load data of a high voltage industrial consumer is introduced. Instead of representing the daily load curve with a vector with T elements, where T is the time interval of the metering, it is proposed to represent the demand with six indicators that are related with the shape of the curve. Secondly, a new clustering algorithm is introduced in the load time series segmentation field of research. Lastly, a new clustering validity indicator is proposed that can provide an accurate evidence on the optimal number of clusters. The data under study are the active and reactive metered load of a full year.

C64 A.I. Chrysochos, T.A. Papadopoulos, G.K. Papagiannis, '**Analysis of the Propagation Characteristics of Single-Core Cables from Experimental Results using Modal Decomposition**', *48 International Universities' Power Engineering Conference (UPEC 2013)*, 02-05 September 2013, Dublin, Ireland, pages 6.

In this paper various field test transient responses from a medium-voltage single-core cable lying on the ground surface are presented. The results from six different excitation cases are compared, applying the modal decomposition theory with the use of a complex-frequency-dependent modal transformation matrix. The resulting modal voltages present unique modal travel time and attenuation, leading to significant remarks about the wave propagation along the cable in each examined case. The decoupled voltages are also compared to the corresponding obtained from the assumption of a real-constant transformation matrix. Results are in good agreement, validating the use of the simplified modal transformation matrix for the calculation of high-frequency transient phenomena in single-phase cables with short lengths. The calculated propagation modes are eventually related with the voltage differences and potentials of the examined cable, revealing their significance in the study of various engineering applications. The paper is a continuation of C51 and C52 in the investigation of the transmission characteristics of underground cables.

C65 P.N. Papadopoulos, T.A. Papadopoulos, P. Crolla, A. J. Roscoe, G.K. Papagiannis, G.M. Burt, '**Modelling of Distributed Energy Resources Using Laboratory-Experimental Results**', *48 International Universities' Power Engineering Conference (UPEC 2013)*, 02-05 September 2013, Dublin, Ireland, pages 6.

In this paper measurement results from a low voltage microgrid test facility are presented and analyzed using a black box modeling methodology based on Prony analysis. Several test cases are investigated with the microgrid operating in grid-connected and islanded mode, including step changes in loads and distributed generation units. The black-box modeling methodology is applied to the measurement results and can provide information considering the amplitude, the frequency and the damping of the oscillations appearing in the microgrid responses. Results show that the black-box model can represent with good accuracy the dynamic behavior of the microgrid. The paper is an extension of C50 and C62.

C66 A.S. Bouhouras, T.A. Papadopoulos, G.C. Christoforidis, G.K. Papagiannis, D.P. Labridis, '**Systematic Sensitivity Analysis Regarding the Influence of Distributed Generation Units Allocation to the Optimal Reconfiguration for Loss Reduction**', *48 International Universities' Power Engineering Conference (UPEC 2013)*, 02-05 September 2013, Dublin, Ireland, pages 6.

This paper investigates the influence of Distributed Generation (DG) units to the optimal reconfiguration of Distribution Networks (DNs) for loss reduction. The concept relies on load variations caused by the local generation, which results in different load composition in the network compared to the no DG case. A comprehensive investigation of all possible combinations regarding potential DG connection nodes has been implemented in a 16 and a 33 bus system. Results indicate that a limited number of branches, usually adjacent to the DGs, participate in the optimal solution, regardless of the load composition. Moreover, a quantified correlation of the DN nodes that mostly affect the problem solution is presented, based on the participation frequency of the corresponding loads. The paper extends the methodology of C58 including a more systematic investigation and analysis of the IEEE 33 and 69 bus systems.

C67 G.C. Christoforidis, I.P. Panapakidis, T.A. Papadopoulos, G.K. Papagiannis, '**PV Power Clustering as a Means to Evaluate Energy Storage Options**', *2nd International Conference on Renewable Energy Research and Applications (ICRERA 2013)*, Madrid Spain, October 2013, pages 6.

The rapid advancement of Renewable Energy Sources and especially Photovoltaics (PV) was aided by the generous Feed-in-Tariffs employed worldwide. However, such incentives are disappearing and the need of market revitalization is apparent. Providing energy storage in PV installations is considered as an attractive option from a technical point of view, since it may help reduce uncertainties and make such power source dispatchable. However, energy storage is not attractive to investors yet. In fact, several factors should be taken into consideration when performing a techno-economic analysis of an energy storage option in a PV installation. Such factors include, for example, the minimum allowable State Of Charge (SOC) and capital costs related to energy and power capacity. In this paper, we propose to incorporate clustering techniques when storage options are evaluated in a PV installation. With this approach, the basic input to calculations (i.e. the PV power output) is not simulated from archive meteorological data, but the actual power produced is taken into account for existing PVs. Historical data of power production from a PV station are grouped into clusters with representative power curves called centroids. In this way, evaluating storage options becomes less time consuming and simpler. This paper takes real data from a PV installation and formulates clusters using several techniques. After a comparison of the methods used, a discussion of how such clustering formulation may be used for optimization problems is presented. The clustering algorithms and performance criteria presented in papers C47, C48, C56, C57, C58 and C61 are applied here in cases of generation data time series.

C68 G.C. Christoforidis, A.I. Chrysochos, G.K. Papagiannis, M. Hatzipanayi, G.E. Georghiou, '**Promoting PV energy through net metering optimization: The PV-NET project**', *2nd International Conference on Renewable Energy Research and Applications (ICRERA 2013)*, Madrid Spain, October 2013, pages 6.

As the Feed-in-Tariff (FiT) scheme that was used widely in the past years start to fade away, new schemes and policies are needed to revitalize the Photovoltaic (PV) market, which in danger of stagnation. FiTs have rapidly reduced in most countries mainly due to the sharp decline in PV system costs and the fact that targets set in terms of Wp installed by 2020 have already been reached. One of the schemes proposed is net-metering. This scheme implies that an algebraic deduction is performed between the electrical energy produced by the PV system and the energy consumed. The net result if the energy produced is higher, is fed back to the grid preferably at a certain premium or retail prices. Although net-metering is not widely adopting currently, the combination of

PV systems cost decline and increase in electricity prices observed worldwide, will probably make such a scheme attractive to both investors and policy makers. In this context, PV-NET Metering is a project under Europe in the Mediterranean (MED) programme addressing the design of energy policies and strategies in the Mediterranean for cost-optimized utilization of Renewable Energy Sources (RES). It involves optimizing smart energy management schemes, in particular net metering, to provide an economically sustainable alternative to government FIT subsidies. This paper presents the initial steps taken in this project and presents an analysis concerning the Levelized Cost of Electricity (LCOE) in four regions - project partners and a grid parity calculation for Greece. Also, the methodology and technical specifications for the pilot installations foreseen are outlined.

C69 G.C. Christoforidis, G.K. Papagiannis, M. Brain, T. Puksec, '**Establishing an assessment framework for energy sustainability in prisons: The E-SEAP project**' *14th International Conference on Environment and Electrical Engineering (EEEIC)*, 2014, 10-12 May 2014, pp.187-192.

Prison sites are a special type of public buildings or facilities in general that are overlooked by policy makers. The prison size and constant energy use results in excessive energy consumptions, which implies that a focus on such sites is necessary. Most authorities rather focus on the security aspects of prison estates than their energy efficiency, and this is transferred naturally to all members of the prison community, i.e. staff and their families, prisoners and their families and wider community. In this context, the European Sustainable Energy Award for Prisons (E-seaP) is an Intelligent Energy Europe project that deals with the sustainable energy behavior of prison sites in 8 European regions. The main goal is to devise an assessment framework for energy sustainability in prisons using a holistic approach, which takes into consideration not only the building energy management but also the provision for education and training and the wider community impact. This paper presents the adopted assessment framework along with a comparison of energy consumption in 17 prison sites in Europe. The assessment procedure may be adapted for use also in other types of public buildings.

10. CITATIONS

(As of 20-8-2014)

Thompson Reuters (ISI) Web of Knowledge

195 with h-index 8 (including self-citations)
143 (not including self-citations)

Scopus

236 with h-index 10 (including self-citations)
158 with h-index 7 (not including self-citations)

Google Scholar

463 with h-index 12 (including self-citations)

Public google scholar profile at:
<http://scholar.google.com/citations?user=bitSbpYAAAAJ&hl=el>