

PROGRAMME

June 4 – 6, 2013 · Frankfurt am Main · Germany

3rd International Conference on Energy Process Engineering Transition to Renewable Energy Systems

www.ICEPE2013.com



ORGANISED BY



PROCESSNET
EINE INITIATIVE VON DECHEMA UND VDI-GVC

IN COOPERATION WITH



EFCE 60 YEARS 1953-2013
European Federation of Chemical Engineers
Europäische Ressort für Chemie-Ingenieurwesen
Fédération Européenne de Génie Chimique



• • • • **VIK**
Energie für die Industrie

VGB
POWER TECH

LECTURE PROGRAMME

Tuesday, June 4, 2013

9:00 Registration & Welcome Coffee

Max Buchner lecture hall

Chair D. Stolten, Juelich Research Center/D

DETERMINING DRIVING FORCES FOR A TRANSITION TO RENEWABLE ENERGY SYSTEMS

10:15 Opening
D. Stolten, Juelich Research Center/D

10:25 Welcome address: BMBF
G. Schütte, Federal Ministry of Education and Research, Bonn/D

10:40 Coffee Break

11:25 Transition to renewables as a challenge for industry – the German Energiewende from an industry perspective
C. Rolle, The Voice of German Industry, Berlin /D

11:40 Industry perspectives of wind power
H. Stiesdal, Siemens Wind Power A/S, Brande/DK

11:55 Challenges of electric drives prepared for the transportation sector
C. H. Mohrdieck, Daimler AG, Kirchheim/D

12:10 Motivation of an industrial gases & engineering company to energy transition
A. Opfermann, Linde AG, Pullach/D

12:25 Renewables as a market opportunity for an independent power producer
B. Bartels, BeBa Energie GmbH/D

12:40 Lunch and Poster Exhibition

LECTURE PROGRAMME

Tuesday, June 4, 2013

Max Buchner lecture hall

Chair V. Scherer, Ruhr University Bochum/D

TECHNICAL SOLUTIONS AND COHERENT STRATEGIES FOR A TRANSITION TO RENEWABLE ENERGY SYSTEMS

13:40 Transition to a fully sustainable global energy system
C. Petersdorff, ECOFYS Germany, Cologne/D

14:05 An innovation strategy for DESERTEC with incremental steps
U. Hueck, DESERTEC Foundation, Hamburg/D

14:30 The impact of renewable energy development on energy and CO₂ emissions in China
Z. Xiliang, Institute of Energy Environment and Economy, Tsinghua University, Peking/RC

14:55 The Scottish Government's electricity generation policy statement
C. Imrie, The Scottish Government, Midlothian/GB

15:20 Exploring the functional organization of a fully renewable pan-European electricity system
M. Greiner, Aarhus School of Engineering ASE/DK

15:45 Coffee Break

16:15 Hydrogen as an enabler for renewable energies
D. Stolten, Juelich Research Center/D

16:40 The decreasing market value of variable renewables: integration options and deadlocks
L. Hirth, Vattenfall GmbH, Berlin/D

17:05 Status of fuel cell electric vehicle development and deployment: Hyundai's fuel cell electric vehicle development as a best practice example
T. W. Lim, Hyundai Motor Company/ROK

17:30 Japan's energy policy after the 3.11 natural and nuclear disasters – from the viewpoint of the R&D of renewable energy and its current state
H. Uchida, Department of Nuclear Engineering, School of Engineering/J

17:55 Pre-investigation of hydrogen technologies at large scales for electric grid load balancing
F. Gutierrez-Martin, Universidad Politécnica de Madrid/E

21

18:20 Get Together & Poster Exhibition

19:30 End of the Conference Day

LECTURE PROGRAMME

Wednesday, June 5, 2013

Max Buchner lecture hall

9:00	Energy savings potentials and technologies in the industrial sector: Europe as an example W. Eichhammer, Fraunhofer Institute for Systems and Innovation Research ISI, Karlsruhe/D
9:30	The transition to renewable energy systems from an economical perspective M. Grundmann, ARGE Netz GmbH & Co.KG, Brekum/D
10:00	Introduction to the transmission networks G. Andersson, ETH Zurich/CH
10:30	Pumped storage hydropower A. Harby, SINTEF, Trondheim/N
11:00 Coffee Break and Change Rooms	

	<i>Max Buchner lecture hall</i>	<i>Carl Duisberg lecture hall</i>
	ADVANCED BATTERIES	BIO MASS – GLOBAL ASPECTS & RESOURCES
11:30	Advanced batteries for electric vehicles and energy storage systems <i>S. Mo Oh, Seoul National University/ROK</i>	Biomass – aspects of global resources and political opportunities <i>G. Melin, Swedish Bioenergy Association (Svebio), Stockholm/S</i>
12:00	Novel electrolytes for lithium-ion batteries M. Ahrens, T.J.S. Schubert, IOLITEC Ionic Liquids Technologies GmbH, Heilbronn/D	Alternative biomass for the substitution of fossil resources and wood in industrial and energetic applications P. Quicker, M. Schulten, H. Gerhards, RWTH Aachen University/D
12:20	Long term operation of rechargeable high temperature solid oxide batteries A. Leonide, W. Drenckhahn, H. Greiner, S. Kosse, Siemens AG, Erlangen/D	Use case analysis for CO₂-based renewable fuels A. Tremel, M. Walz, M. Baldauf, Siemens AG, Erlangen/D
12:40	Fluid dynamic aspects of large liquid metal batteries T. Weier, N. Weber, F. Stefani, V. Galindo, M. Seilmayer, Helmholtz-Zentrum Dresden-Rossendorf/D	Hazard analysis of a biomethane plant O. Dixit, N. Mollekopf, TU Dresden/D
13:00	Lunch and Poster Exhibition	

LECTURE PROGRAMME

Wednesday, June 5, 2013

Max Buchner lecture hall

Energy savings potentials and technologies in the industrial sector: Europe as an example W. Eichhammer, Fraunhofer Institute for Systems and Innovation Research ISI, Karlsruhe/D	9:00
The transition to renewable energy systems from an economical perspective M. Grundmann, ARGE Netz GmbH & Co.KG, Brekum/D	9:30
Introduction to the transmission networks G. Andersson, ETH Zurich/CH	10:00
Pumped storage hydropower A. Harby, SINTEF, Trondheim/N	10:30
11:00 Coffee Break and Change Rooms	

	<i>Franz Patat lecture hall</i>	<i>Paul-Duden lecture hall</i>
	CHEMICAL STORAGE OF RENEWABLE ELECTRICITY	SUSTAINABLE BUILDINGS
11:30	Chemical storage of renewable electricity via hydrogen – principles and hydrocarbon fuels as an example G. Schaub, KIT – Karlsruhe Institute of Technology/D	China road map for building energy conservation Y. Da, Tsinghua University, Peking/RC
12:00	Producing ammonia from renewable sources of electricity S. Schulte Beerbühl, KIT – Karlsruhe Institute of Technology/D; B. Kolbe, C. Roosen, ThyssenKrupp Uhde GmbH, Dortmund/D; F. Schultmann, KIT – Karlsruhe Institute of Technology/D	Net Zero: nature and sustainability targets for built environment performance C. J. Kibert, University of Florida, Gainesville/USA
12:20	Energy storage based on electro- chemical conversion of ammonia J. Fuhrmann, Weierstrass Institute for Applied Analysis and Stochastics, Berlin/D; U. Krewer, TU Braunschweig/D	
12:40	Technology and costs of flexible biogas-based electricity supply M. Trommler, H.F. Jacobi, E. Mauky, DBFZ, Leipzig/D	
13:00	Lunch and Poster Exhibition	

LECTURE PROGRAMME

Wednesday, June 5, 2013

Max Buchner lecture hall

14:00	Natural gas pipeline systems G. Linke, E.ON Ruhrgas AG/D
14:30	Introduction to a future hydrogen infrastructure J. Ogden, University of California Davis/USA

Max Buchner lecture hall

Carl Duisberg lecture hall

POWER PRODUCTION BY PHOTOVOLTAICS		ELECTROCHEMICAL GAS PRODUCTION
15:00	Towards photovoltaic technology on the terawatt scale: status and challenges <i>B. Rech, Helmholtz-Zentrum Berlin/D</i>	Status on technologies for hydrogen production by water electrolysis <i>J. Mergel, Juelich Research Center/D</i>
15:30	Nanoengineering electrodes for high performance dye-sensitized solar cells L. Chang Ming, G.-H. Guai, T. Chen, Nanyang Technological University, Singapore/SGP	Rapid response electrolysis for grid balancing J. Newton, P. Doran, S. Bourne, ITM-Power GmbH, Schmitten/D
15:50	Using a flywheel associated to PV plant in order to increase the integration of PV into island electrical grid C. Abbezzot, University of Corsica – CEA, Ajaccio/F; Q. T. Tran, M. Perrin, CEA-INES, Le Bourget-du-lac/F; P. Poggi, University of Corsica, Ajaccio/F; P. Serre-Combe, CEA-INES, Le Bourget-du-lac/F; M. Muselli, University of Corsica, Ajaccio/F	High pressure hydrogen production by means of water electrolysis R. Hanke-Rauschenbach, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg/D; B. Bensmann, Otto-von-Guericke University, Magdeburg/D; I.K. Pena-Arias, K. Sundmacher, Max Planck Institute for Dynamics of Complex Technical Systems, Magdeburg/D
16:10	Achievements and challenges in thin film silicon module production: an exemplary cooperation between company and research institution R. Schlatmann, S. Neubert, S. Kirner, S. Ring, M. Zelt, Helmholtz-Zentrum Berlin/D; T. Frijnts, H. Zollondz, A. Heidelberg, Masdar PV GmbH, Ichtershausen/D; B. Rau, O. Gabriel, B. Stannowski, Helmholtz-Zentrum Berlin/D	
16:30	Coffee Break	

LECTURE PROGRAMME

Wednesday, June 5, 2013

Max Buchner lecture hall

Natural gas pipeline systems G. Linke, E.ON Ruhrgas AG/D	14:00
Introduction to a future hydrogen infrastructure J. Ogden, University of California Davis/USA	14:30

Franz Patat lecture hall

Paul-Duden lecture hall

POWER TO GAS	EMERGING & DEVELOPING COUNTRIES	
Power to gas <i>D. Stolten, Juelich Research Center/D</i>	Renewable energy future for the developing world <i>D. Holm, ISES Africa, Hartbeespoort/ZA</i>	15:00
The natural gas grid as backbone of a stable RES-based energy system – storage and transportation potential T. Kolb, KIT - Karlsruhe Institute of Technology/D; F. Graf, DVGW e.V.; Karlsruhe/D	Large scale wind energy to electricity & hydrogen, cropping, managing and utilization in Patagonia, Argentina J. Bolcich, Asociacion Argentina del Hidrogeno, Bariloche/RA	15:30
Methanation of CO ₂ – storage of renewable energy in a gas distribution system J. Grünig, T. Schaaf, A. von Garnier, A. Orth, Outotec GmbH, Oberursel/D	Temperature influence on crude palm oil hydrotreating over nimo-/Al ₂ O ₃ catalysts M. Guzman, A. Guzman, L. Garzon, Instituto Colombiano del Petróleo, Piedecuesta/CO; V. Kafarov, Universidad Industrial de Santander, Bucaramanga/CO	15:50
Use of renewable energy in the form of methane via electrolytic hydrogen generation K. Hashimoto, Tohoku Institute of Technology, Sendai/J; N. Kumagai, K. Izumiya, H. Takano, Daiki Ataka Engineering, Kashiwa/J; Z. Kato, Tohoku Institute of Technology, Sendai/J		16:10
Coffee Break		16:30

LECTURE PROGRAMME

Wednesday, June 5, 2013

Max Buchner lecture hall		Carl Duisberg lecture hall	
SOLAR THERMAL POWER PRODUCTION		GEOTHERMAL POWER	
17:00	Solar thermal power production	Geothermal power	
<i>Chair</i>	<i>R. Pitz-Paal, DLR, Cologne/D</i>	<i>C. Bromley, GNS Science, Taupo/NZ</i>	
17:30	Concentrated solar power plants: design methodology H.L. Zhang, Catholic University of Leuven/B; J. Baeyens, University of Warwick, Coventry/GB; J. Degrève, Catholic University of Leuven, Leuven/B; G. Cacères, University Adolfo Ibanez, Santiago/RC	87 Hybrid geothermal-solar power systems: modeling and optimization A. Tizzanini, Politecnico di Milano, Pisa/I; M. Paci, A. De Marzo, ENEL Ingegneria ed Innovazione, Pisa/I; A. Mitsos, RWTH Aachen University/D	94
17:50	Solar boiler concept for concentrating solar power plants U. Hueck, DESERTEC Foundation, Hamburg/D	93 Production of clean geothermal steam for direct use as process heat L. Lind, E.K. Mroczek, <u>C.J. Bromley</u> , GNS Science, Taupo/NZ	98
18:10			
18:30	End of the Conference Day		
19:00	Reception at the Frankfurt Marriott Hotel		
19:30	Conference Dinner at the Frankfurt Marriott Hotel Hamburger Allee 2, 60486 Frankfurt am Main, Phone: +49 (0)69 79550		
20:00	Poster Award		

LECTURE PROGRAMME

Wednesday, June 5, 2013

Franz Patat lecture hall		Paul-Duden lecture hall	
GEOLOGICAL GAS STORAGE		BIOMASS FOR POWER PRODUCTION	
	Geological storage for the transition from natural to hydrogen gas <i>J. Wackerl, Juelich Research Center/D</i>		17:00 Flexible power generation from biomass – an opportunity for a renewable sources-based energy system? <i>D. Thrän, UFZ, Leipzig/D</i>
	 HP-gas-storage in geological formations – standard practice, performance and recent developments F. Crotogino, R. Schneider, KBB Underground Technologies GmbH, Hannover/D	104	 New frontiers in anaerobic digestion as sustainable energy technology B. Ruggeri, Politecnico di Torino, Torino/I
	 ACAES technology applying sand as storage medium M. Hämerle, K. Schwaiger, M. Haider, R. Eisl, TU Vienna/A	105	 Efficient and ultra-clean use of biogas in the fuel cell – the DFC experience M. Farooque, T. Leo, T. Rauseo, FuelCell Energy, Inc., Danbury/USA
	 Underground storage of hydrogen: lateral gas spreading, natural methanation and the effect of leopard skin M. Panfilov, M. Rasoulzadeh, I. Panfilova, Université de Lorraine/F; L. Ganzer, V. Reitenbach, TU Clausthal/D	111	 GREEN-FC – Decentralized energy supply using modular facilities for utilizing biogenic energy sources in fuel cells T. Birth, W. Heineken, L. He, Fraunhofer Institut IFF, Magdeburg/D
	End of the Conference Day		
	Reception at the Frankfurt Marriott Hotel		
	Conference Dinner at the Frankfurt Marriott Hotel Hamburger Allee 2, 60486 Frankfurt am Main, Phone: +49 (0)69 79550		
	Poster Award		

LECTURE PROGRAMME

Thursday, June 6, 2013

Max Buchner lecture hall

9:00	Introduction to transmission grid components A. Schnettler, RWTH Aachen/D
9:30	Energy storage technologies – characteristics, comparison and synergies 125 A. Hauer, ZAE Bayern – Technology for Energy Systems and Renewable Energy, Garching/D
10:00	The transition to renewable energy systems – on the way to a comprehensive transition concept U. Schneidewind, Wuppertal Institute for Climate, Environment and Energy/D
10:30 Coffee Break and Change Rooms	

Max Buchner lecture hall

Carl Duisberg lecture hall

MARITIME POWER PRODUCTION		THE FUTURE ROLE OF FOSSIL POWER PLANTS – DESIGN AND IMPLEMENTATION
11:00	Catalyzing growth: an overview of the United Kingdom's burgeoning marine energy industry <i>D. Krohn, RenewableUK/GB</i>	The future role of fossil power plants – design and implementation <i>E. Christensen, VGB Power Tech/D</i>
11:30	Wave energy generation difficulties solved by Eco Wave Power 126 <i>D. Leb, Eco Wave Power inc., Tel Aviv/IL</i>	Influence of the fluctuating increasing renewable energies onto the operation of thermal power plants 133 <i>E. Hassel, S. Meinke, J. Nocke, University of Rostock/D</i>
11:50	Optimization of tidal turbine fields and runoff powerstations 128 <i>P. Pelz, TU Darmstadt/D</i>	Future Role of Fossil Power Plants <i>J. Meitz, RWE Power AG/D</i>
12:10		Techno-economic assessment of solar-assisted post-combustion capture of carbon dioxide 138 <i>J. McGregor, N. Dave, J. Hinkley, P. Feron, T. Do, T. Ritchie, CSIRO Energy Technology, Mayfield West/AUS</i>

12:30 **Lunch and Poster Exhibition**

LECTURE PROGRAMME

Thursday, June 6, 2013

Max Buchner lecture hall

Introduction to transmission grid components A. Schnettler, RWTH Aachen/D	9:00
Energy storage technologies – characteristics, comparison and synergies A. Hauer, ZAE Bayern – Technology for Energy Systems and Renewable Energy, Garching/D	9:30
The transition to renewable energy systems – on the way to a comprehensive transition concept U. Schneidewind, Wuppertal Institute for Climate, Environment and Energy/D	10:00
10:30 Coffee Break and Change Rooms	

Franz Patat lecture hall

Paul-Duden lecture hall

SMART GRID	SUSTAINABLE BUILDINGS / EUROPE	
Smart grid: facilitating cost-effective evolution to a low-carbon future <i>G. Strbac, Imperial College, London/GB</i>	Nearly zero, net zero and plus energy buildings – theory, terminology, tools and examples <i>K. Voss, University of Wuppertal/D</i>	11:00
Networking energy in a new market 139 <i>P. van der Sluis, Alliander N.V./NL</i>	Fuel cell technology for efficient energy conversion in a future energy supply system 144 <i>A. Heinzel, J. Roes, University of Duisburg-Essen/D</i>	11:30
Decentralized generation and storage of power and heat 140 <i>J. Wuennen, WS WärmeProzesstechnik GmbH, Renningen/D</i>	Operation concepts for smart grid integrated heat pumps and CHP-systems in a supply structure with high share of RES 152 <i>C. Wittwer, S. Mueller, R. Hollinger, Fraunhofer ISE, Freiburg/D</i>	11:50
	Fuel cell µ-CHP systems for sustainable buildings 153 <i>K. Föger, Ceramic Fuel Cells, Aachen/D</i>	12:10

12:30 **Lunch and Poster Exhibition**

LECTURE PROGRAMME

Thursday, June 6, 2013

Max Buchner lecture hall	
13:30	Onshore wind power P. W. Cheng, University of Stuttgart/D
14:00	Offshore wind power D. Infield, University of Strathclyde, Glasgow/GB
14:30	Hydropower Å. Killingtveit, Norwegian University of Science and Technology, Trondheim/N
15:00	Coffee Break
Max Buchner lecture hall	
Carl Duisberg lecture hall	
15:30	E-MOBILITY Transition from petro-mobility to electro-mobility <i>Chair</i> D. L. Greene, Oak Ridge National Laboratory, Knoxville/USA
16:00	Transport electrification: a key element for energy system transformation and climate stabilization D. McCollum, V. Krey, P. Kolp, Y. Nagai, K. Riahi, International Institute for Applied Systems Analysis (IIASA), Laxenburg/A
16:20	Integration of quick charging stations for e-mobility in power grids of weak infrastructure and high impact of renewable energies N. Becker, Ruhr-University of Bochum/D, C. Sourkounis, Power Systems Technology/D; A. Broy, Power Mechatronic/D
16:40	Grid integration of electric vehicles on the energy supply system J. Linssen, W. Hennings et al, Juelich Research Center/D
17:00	Change Rooms
Max Buchner lecture hall	
17:05	Conclusion of the Conference V. Scherer, Ruhr Univ. Bochum, Germany
17:20	Closing Remarks D. Stolten, Juelich Research Center, Germany
17:30	End of 3 rd ICEPE 2013

LECTURE PROGRAMME

Thursday, June 6, 2013

Max Buchner lecture hall	
13:30	Onshore wind power P. W. Cheng, University of Stuttgart/D
14:00	Offshore wind power D. Infield, University of Strathclyde, Glasgow/GB
14:30	Hydropower Å. Killingtveit, Norwegian University of Science and Technology, Trondheim/N
15:00	Coffee Break
Franz Patat lecture hall	
Paul-Duden lecture hall	
CHEMICAL GAS PRODUCTION	
15:30	Near SURFACE GAS STORAGE Near-surface bulk storage of hydrogen Presentation: V. Tietze, Juelich Research Center/D <i>Chair</i> B. Scheppat, University of Applied Sciences Wiesbaden Rüsselsheim/D
16:00	Mitigating intermittency – electric energy storage with hydrogen in the GWh range J. Wilhelm, Rosetti Marino SpA, Ravenna/I
16:20	Layout of a H ₂ energy storage system for an industrial real estate location K.H. Klug, Westphalian University of Applied Sciences Gelsenkirchen/D
16:40	Amine boranes as hydrogen carriers: routes towards dehydrogenation and development of hydrogen storage materials B. Jagirdar, Indian Institute of Science, Bangalore/IND
Change Rooms	
Max Buchner lecture hall	
17:05	Conclusion of the Conference V. Scherer, Ruhr Univ. Bochum, Germany
17:20	Closing Remarks D. Stolten, Juelich Research Center, Germany
17:30	End of 3 rd ICEPE 2013

POSTER PROGRAMME

P 1	Monitoring of rankine cycles with zeotropic mixtures as working fluid P. Schlagermann, H. Mergner, T. Kölbel, EnBW Energie Baden-Württemberg AG, Karlsruhe/D	177
P 2	Utilization of renewably generated power in the chemical process industry J. Riese, M. Grünewald, Ruhr-University Bochum/D	178
P 4	Ultrasonic assisted biodiesel production D.H. Hövener, C.J. Schabot, S. Marx, North-West University, Potchefstroom/ZA	183
P 5	Cu-Zn-Al mixed oxides catalysts for H₂ production via steam reforming of methanol reaction D. Hammoud, C. Gennéquin, E. Abi-Aad, Université du Littoral Côte d'Opale, Dunkerque/F	184
P 7	Kinetic study for the catalytic conversion of Biomass-derived HMF into liquid fuels K. Vuyyuru, P. Strasser, TU Berlin/D	185
P 8	Ethanol gel production from water hyacinth and cacti C.J. Schabot, S. Marx, P.W. Smit, D.C. Uys, North-West University, Potchefstroom/ZA	186
P 9	Characterization of zeolite NaX loaded with Na and testing as catalysts for transesterification of Jatropha seed oil S. Manadee, N. Osakoo, O. Sophiphun, S. Prayoonpokarach, J. Wittayakun, Suranaree University of Technology, Nakhon Ratchasima/THA	187
P 10	A rapid one-step microwave-assisted hydrolysis of sweet sorghum bagasse in dilute acid or base B. Ndaba, I. Chiyanzu, S. Marx, North-West University, Potchefstroom/ZA	193
P 11	Effects of <i>Saccharomyces cerevisiae</i> and <i>Zymomonas mobilis</i> on the co-fermentation of hydrolyzate from sweet sorghum bagasse pretreatment B. Ndaba, I. Chiyanzu, S. Marx, North-West University, Potchefstroom/ZA	194
P 13	Processing of alternative fuels – State of the art and innovations L. Di Matteo, DI MATTEO Group, Beckum/D	195
P 14	Chemical looping: flexible technology for the transition from fossil to renewable energy production G. Veser, University of Pittsburgh/USA	196
P 15	Continuous pyrolysis of bio-oil obtained from Cogongrass by control temperature in the novel pyrolysis reactor conducted at temperatures 400 K. Promdee, Chulalongkorn University, Bangkok/THA	197
P 16	Biogas upgrading based on the CO₂ absorption by amino acid salts B. Klein, B. Heidel, G. Scheffknecht, University of Stuttgart/D	198

POSTER PROGRAMME

P 17	Photovoltaic power generation forecasting S. Hamid Oudjana, Laghouat University, Ghardaia/DZ	199
P 18	Study and control of a flywheel energy storage system associated to a wind power conversion system A. Belfedhal, S. Kouadria, Laboratory of electrical engineering and plasma/University of ibn Khaldoun Tiaret, Tiaret/DZ; E.M Berkouk, Laboratory of control process, Algiers/DZ; Y. Meslem, Laboratory of electrical engineering and plasma/University of ibn Khaldoun Tiaret, Tiaret/DZ	200
P 19	Water intake structure of small hydro power plant with high priority task for the environmental friendly and energy-efficient use H. Dzafo, Mechanical Engineering Faculty Sarajevo, Sarajevo/BIH	201
P 20	Thermodynamic material data as a tool for the development of advanced lithium-ion batteries M. Prill, T. Markus, Research Center Juelich/D	202
P 21	SOLIDHEAT-Materials, reactors and process integration for thermochemical energy storage J. Widhalm, T. Fellner, A. Werner, M. Haider, F. Winter, TU Vienna/A	203
P 22	Potential applications for high temperature thermal energy storage (HTTES) H.L. Zhang, Katholieke Universiteit Leuven, Leuven/B; J. Baeyens, University of Warwick, Coventry/UK; J. Degrève, Katholieke Universiteit Leuven/B; F. Pitié, University of Warwick, Coventry/UK	209
P 23	Plant and operational safety of hydro power plants K. Hirtenlehner, ZT Hirtenlehner, Steyr/A	210
P 25	Effect of cerium on nickel-bimetallic zirconia supported mixed alloy catalysts for methanation T. Kim, K. Song, A. G. Bhavani, POSTECH, Pohang city/ROK ; D.Jun Koh, RIST, Pohang city/ROK, J. S. Chung, POSTECH, Pohang city/ROK	211
P 26	Hydrogen production from water splitting by the photocatalysis of Pt and Ru doped bismuth oxide catalyst under visible light irradiation J.J. Wu, S.H. Hsieh, G.J. Lee, Feng Chia University, Taichung/TW; S.H. Davies, S.J. Masten, Michigan State University/USA, E. Lansing/TW	212
P 27	The future of biomass pyrolysis in the production of value-added chemicals A. Brems, Katholieke Universiteit Leuven, Heverlee/B; J. Baeyens, University of Warwick, Coventry/UK; J. Degrève, R. Dewil, Katholieke Universiteit Leuven, Heverlee/B	213
P 28	Continuous catalytic process for biodiesel production using macroalgal oil in supercritical conditions A. Santana, S. Santos, University of Campinas, Campinas/BR; M. A. Larrayoz, University Politecnica Catalunya, Barcelona/E; R. Maciel, University of Campinas, Campinas/BR	214

POSTER PROGRAMME

P 29	Characterization of zeolite NaX loaded with Na and testing as catalysts for transesterification of Jatropha seed oil <u>S. Manadee</u> , N. Osakoo, O. Sophiphun, S. Prayoonpokarach, J. Wittayakun, Suranaree University of Technology, Nakhon Ratchasima/T; N. Supamathanon, Rajamangala University of Technology Isan, Nakhon Ratchasima/T	218
P 30	Decentralized use of residual and waste materials as a base of an integrated local energy supply – A vision <u>H. Schneider</u> , J. Born, Flensburg University of Applied Sciences/D	219
P 31	Physical modelling of fuel cells: at the electrochemistry / chemical engineering interface <u>A. Kulikovsky</u> , Research Centre Juelich/D	220
P 32	Advances in biomass utilization for heat and power generation <u>S. MacLean</u> , J. Leicher, E. Tali, A. Giese, Gaswärme-Institut e. V., Essen/D	221
P 33	Development of renewable Pt/Li-metal-oxide/Pt hydrogen storage materials splitting water and absorbing hydrogen at room temperature <u>K. Morita</u> , Nagoya Industrial Science Research Institute, Nagoya/J; B. Tsuchiya, Meijo University, Nagoya/J; S. Nagata, Tohoku University, Sendai/J	222
P 34	Simulation and exergy analysis of multicomponent distillation system <u>A.N. Anozie</u> , Obafemi Awolowo University, Ile-Ife/WAN; K.A. Adesina, S.V. Omosuli, Rufus Giwa Polytechnic, Owo/WAN	223
P 35	Design and optimization of CO₂-N₂ expander cycle for LNG offshore process. <u>M. Hasan</u> , M. Khan, <u>M. Lee</u> , Yeungnam University, Kyongsan si Kyongbuk/ROK; S. Lee, Korea Gas Corporation, Incheon/ROK	238
P 36	Real-time optimization and modelling for water and energy efficient irrigation management in Australian cotton and maize industry <u>K.L. Khatri</u> , MUCET, Khairpure Sindh/PK; K.J. Harrijin, MUET, Jamshro/PK; M.D. Memon, MUCET, Khairpure/PK; I.A. Rajpar, SAUT, Tandojam/PK; R.J. Smith, USQ, Toowoomba/AUS	239
P 37	Energy conservation and optimization in condensate splitter plant refinery <u>E. M. Al-Mutairi</u> , King Fahd University of Petroleum & Minerals, Dhahran/SA	240

POSTER PROGRAMME

LAST MINUTE POSTER

LMP 1	Membrane processes for H₂ recovery in fossil fuelled power plants and related systems <u>M. Grätz</u> , S. Shishatskiy, T. Brinkmann, Helmholtz-Zentrum Geesthacht/D	243
LMP 2	Hydrogen photoproduction by N₂-fixing cyanobacteria: an approach for sustainability <u>S.N. Kosourov</u> , H. Leino, G. Murukesan, University of Turku/FIN; A.A. Tsygankov, Institute of Basic Biological Problems RAS, Pushchino/RUS; Y. Allahverdiyeva, E.-M. Aro, University of Turku/FIN	245
LMP 3	Operating challenges for metal air batteries <u>D. Schröder</u> , U. Krewer, TU Braunschweig/D	246
LMP 4	High-performance SO₂ absorbers: fixation and separation of CO₂ as microcrystalline solid <u>J. Müller</u> , S. Makran, R. Jonker, S. Doedt, <u>H. Buettner</u> , University of Applied Sciences Münster, Steinfurt/D	247
LMP 5	Optimal mix of renewable power generation in the mena region as basis for an efficient electricity supply to europe <u>A. Alhamwi</u> , T. Vogt, D. Kleinhans, S. Weitemeyer, NEXT ENERGY EWE-Forschungszentrum für Energietechnologie, Oldenburg/D	250
LMP 6	Energy-efficient refurbishment – energy saving potential <u>F. Scharf</u> , Juelich Research Center/D	251
LMP 7	Roadmaps for the deployment of hydrogen and fuel cell technologies in Germany <u>M. Robinius</u> , T. Grube, D. Stolten, Juelich Research Center/D	252
LMP 8	Preparation and characterization of carbon nanotube supported H₄SiW₁₂O₄₀ and Pt-H₄SiW₁₂O₄₀ catalysts for electrooxidation of cyclohexane <u>M.S. Saleh</u> , A. Aouissi, A.M. Al-Mayouf, A.A.Al-Suhybani, King Saud University, Riyadh/SA	