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work introduces a framework, which models electricity demand by PEVs by extending a transport simulation called MATSim. The framework allows the evaluation of new charging policies and helps pinpoint possible bottlenecks in the electric grid.

2 - Technical and Economical Aspects of Integrating Plug-in Electric Vehicles in Large Scale Power Systems

Miguel Carrión, Electrical Engineering, University of Castilla - La Mancha, Avda Carlos III, s/n, Campus Fábrica de Armas, 45071, Toledo, Spain, miguel.carrión@uclm.es, *Luis Sanchez-rodriguez*

Plug in - Electric Vehicles (PEVs) are becoming an actual option to replace traditional combustion-engine cars. In this situation, it is a priority to analyze the impact of an extensive usage of electric vehicles in actual power systems. In this work, we study the technical and economical aspects of the integration of PEVs in the Iberian Peninsula power system (MIBEL). Three different approaches modelling the coordination between the system operator and PEVs users are considered. Finally, a realistic case study is solved and sensitivity studies are performed.

3 - Integrating Electric Vehicles into the Germany Electricity Grid — an Interdisciplinary Analysis

Patrick Jochem, Chair of Energy Economics (IIP), Karlsruhe Institute of Technology (KIT), Hertzstr. 16, 76187, Karlsruhe, Germany, jochem@kit.edu, *Thomas Kaschub*, *Alexandra-Gwyn Paetz*, *Wolf Fichtner*

This study analyses the integration of electric vehicles (EV) into the German power grid including different demand respond (DR) approaches from a technical, economical and user perspective. For this an overview of the future German electricity market with the focus on EV integration is given. It is shown that the shortage in the regional and local electricity grid is increased. DR can help to tackle this issue by controlled unidirectional or bidirectional (V2G) charging of EV. From the current perspective especially the first alternative seems to be attractive in all considered disciplines.

The paper analyses the achievement possibility frontier between research and teaching quality in higher education. It finds several important reasons why the associated feasible set is likely to be non-convex, making use of the standard performance analysis technique of Data Envelopment Analysis less valid. The paper therefore investigates the alternative Free Disposal Hull technique, and compares the results of deploying these techniques to the performance evaluation of UK Departments of Economics. See: <http://york.ac.uk/media/economics/documents/discussionpapers/2011/1125.pdf>

3 - Performance assessment of wind farms

Clara Vaz, School of Technology and Management, Polytechnic Institute of Bragança, Campus de Santa Apolónia, Apartado 134, 5301 - 857, Bragança, Portugal, clvaz@ipb.pt

This study develops a methodology to provide insights regarding the performance of wind farms from a European player in energy sector. Firstly, the DEA is used to measure the performance of wind farms in generating electricity from the resources available and non-discretionary variables such as wind (speed and availability). This analysis enables to identify the benchmarks whose best practices can be emulated by inefficient units and provides useful information for regulators in the sector. Secondly, bootstrap procedures are applied to obtain statistical inference on the efficiency estimates.

4 - Hospitals efficiency in Israel: 1999-2009

Zilla Sinuany-Stern, Industrial Engineering and Management, Ben Gurion University, Beer-Sheva, 84105, Beer-Sheva, Israel, zilla@bgu.ac.il, *Dov Chernichovsky*, *Lea Friedman*

Data Envelopment Analysis (DEA) is used to measure the efficiency of major general hospitals in Israel, during 1999-2009. The inputs are number of standard beds; the outputs are number of hospitalization days and number of discharges. In the second phase, we used regression analysis, to examine the effect of size, and type of ownership on hospitals efficiency. We found that independent hospitals are the most efficient and have decreasing returns to scale, followed by the governmental and public hospitals which have increasing returns to scale. Also Malmquist analysis was used over time.

■ TB-36

Tuesday, 10:30-12h00

CC-A43

DEA and Performance Measurement: Applications 4

Stream: DEA and Performance Measurement
Invited session

Chair: *Zilla Sinuany-Stern*, Industrial Engineering and Management, Ben Gurion University, Beer-Sheva, 84105, Beer-Sheva, Israel, zilla@bgu.ac.il

1 - Benchmarking the implementation path to efficiency: The case of small regional airports

Ekaterina Yazhemska, Business School, Hebrew University of Jerusalem, Mount Scopus, 91905, Jerusalem, Israel, katy1@mscc.huji.ac.il, *Nicole Adler*, *Tolga Ülkü*

Small and regional airports suffer from limited traffic, large fixed facilities and insufficient revenues to cover their costs. The question is how these airports should be structured, managed and financially supported in order to survive. Efficient operations contribute to decreasing the financial dependency of airports on subsidies. According to a DEA-based, bound adjusted measure, the efficiency levels of 89 European airports are determined. Due to heterogeneity across the sample, multiple ideal points are applied to identify implementation paths and to highlight managerial best practices.

2 - Analysing the Research and Teaching Quality Achievement Frontier

David Mayston, Economics and Related Studies, University of York, University of York, YO10 5DD, York, United Kingdom, dm3@york.ac.uk

■ TB-37

Tuesday, 10:30-12h00

CC-Act

OR in Health & Life Sciences 2

Stream: OR in Health & Life Sciences (contributed)
Contributed session

Chair: *Leanne Smith*, School of Mathematics, Cardiff University, Senghennydd Road, CF24 4AG, Cardiff, United Kingdom, SmithL13@cf.ac.uk

Chair: *Paul Harper*, School of Mathematics, Cardiff University, CF24 4AG, Cardiff, United Kingdom, harper@cardiff.ac.uk

1 - A Takt time based resource optimization technique to minimize patient wait time in hospitals

Jyoti R. Munavalli, Computer Science & Engineering, PESIT, India, Ph.D Research Scholar with Maastricht University, Netherlands, Ring Road,, BSK III stage, 580083, bangalore, karnataka, India, jyothimunavalli@gmail.com, *Frits van Merode*, *Srinivas A*

We propose a technique to address the resource optimization, patient flow balancing and wait time minimization in a hospital set-up. We present a mathematical model for resource optimization which is based on Takt time concept (average time a patient spends in a hospital for treatment) for each department in all the timeslots and considers the dependency constraints. The Linear programming solution provides the resource allocation pattern for each department during every time slot within the resource availability to balance the patient flow and achieve higher patient satisfaction levels.