European Journal of Academic Essays 3(1): 1-6, 2016
ISSN (online): 2183-1904
ISSN (print): 2183-3818
www.euroessays.org

Operation of an Hub Energy System With Regard To Response Load

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Abstract: This paper The power industry worldwide has undergone many changes and different countries with different motives into And. Pulse laid privatization of renewal of restructuring the electricity market formation, program management consumption by power companies came into force. So in such circumstances the authorities responsible for the market is that it created such incentives in consumers into demand response programs that would encourage power consumption as a subset of the known consumption.

Keywords: hub Energy System - multi-carrier distribution system optimized --operate-pollution response times

1. Introduction

THE increasing utilization of gas-_red and other distributedgeneration (co- and trigeneration) is expectedto have signi_cant in_uence on both the technicaland economical operation of power delivery systems. Theconversions between the different energy carriers establisha coupling of the corresponding power _ows, which resultalso in economic interactions. For example, a micro turbine
can be used to produce both electricity and heat from
natural gas, and such a device will then affect natural gasand electricity power _ows as well as the heat supply ofthe load.With different energy carriers available and the possibilityof demand-side conversion between them, the customergets _exible in supply. An electric load for instancecan be supplied directly from the electric grid but alsofrom a device that converts natural gas into electricity [1].Thisexibilityraisesnewquestionsconcerningoptimalsyst em operation.illustrates the situation for a customer connectedto a number of power delivery networks via a socalledenergy hub, which represents an interface betweennetworks and loads A similar concept focusing onsomewhat different aspects was developed by EPRI The different energy carriers provided at the input of theenergy hub can be consumed directly from the networksor indirectly by converting the power into other forms. Itis up to the customer to decide a) how much of which energy

carriers to consume from the networks and b) how to convert the input powers in order to meet the load demand. The related optimization problem is well-known Economic Dispatch (ED) problem Theenergy carriers offered at the input can be seen as generatorswith different cost structures[1]. However, there aresome signi_cant differences which have to be consideredin the formulation of this problem:

2. Systems applications hub energy:

A concept hub energy systems with smart grid Microgrid and can also be used in the modeling and optimization of energy through the use of microgrid several hub energy systems linked Used in the modeling and the design Simulation and simultaneous use of electricity and gas network using the hub energy system

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2.1. Model of operation of the elements the hub energy system:

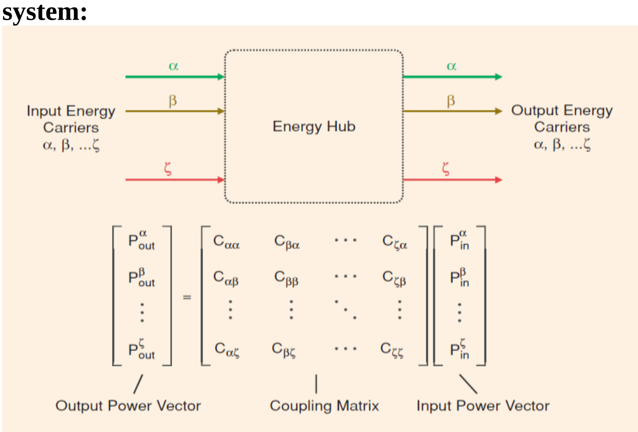

Figure 1: Modeling the transformation of power through an energy hub.

Reliability and availability of energy supply is an importantdesign criterion; therefore, models have also been developedfor this kind of investigation. Failureandrepairratescan bedefined forallcomponents in the system. Considering anenergy hub, failure and repair rates of the coupling elementscan be stated in matrices similar to theconversion matrix. The influence of theenergy hub, i.e., an increase or decreaseof availability between input and outputof the hub, can be analyzed with thisapproach. Furthermore, the model can beused in the optimization process.Various optimization problems canbeidentifiedwhenconsideringintegratedmulticarrier systems. The basic questionof combined optimal power flowis how much of which energy carriersthe hubs should consume and how theyshould be converted in order to meetthe loads at their outputs [2]. This is anoperational problem. In the planningphase, the optimal structure of the hubmay be of interest, which can be foundby determining the optimal couplingmatrix that describes the conversions within the hub. Converterscan then be selected to establish this optimal coupling,and missing technologies can be identified. Theseand other optimization problems have been formulatedand analyzed using various criteria such as energy costs,system emissions, and transmissionsecuritymeasures.Multiobjectiveoptimization can be performed by combiningdifferent criteria in composite objective functions[2]

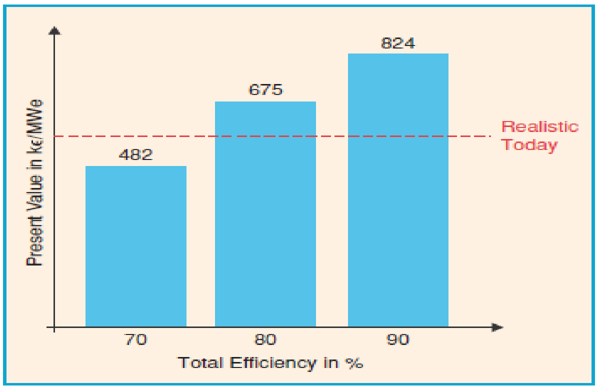

Figure 2: Result of investment analysis

The present valueof the device (per MW electrical output) increases with itstotal efficiency, since more energy cost are saved in eachperiod if the efficiency is higher. Today's investment cost forCHP units of comparable size are in the range of €500,000per MW electrical output (rated). The conclusion that canbe drawn from this plot is that an investment is reasonable ifa total efficiency of more than 75% can be achieved.

3. Evaluation of Investment

When talking about completely new systems on the greenfield, the question of cost plays one of the most importantroles. Energy prices and savings in energy cost can be estimated,although assumptions are often critical. The evaluationof investment costs is more difficult. How much willnew technologies such as fuel cells costs in 30–50 years?

Toavoid speculations based on doubtful assumptions, thequestion is put differently[3]. The justifiable investment costsare determined by comparing the performances of the conventionaland the proposed/assumed system. For example,energy cost and CO_2 taxes can be compared for a conventionalsystem and an optimized greenfield structure. Fromthe annual savings due to higher energy efficiency and lessemissions of new technologies, a present value can bedetermined that represents the break-even investment costof the new technology. With this method, results stilldepend on critical assumptions as inflation, compounding,and risk. However, using this tool for sensitivity analysisyields deeper insight into economics; it enablesidentificationofthesignificantparameters.shows an example where the sensitivitybetween total energy efficiency ofa cogeneration-equipped energyhub and its justifiable investmentcost was determined. In this particularcase, results show that evenstate-of-the-art technology couldkeep up with the requirements, i.e.,installing such cogenerationdevices would be reasonable froman economic point of view (undercertain assumptions).

4. A First Application

The energy hub idea was picked upby a municipal utility in Switzerland,the Regionalwerke AG Baden,
which plans to build an energy hubcontaining wood chip gasificationand methanation and a cogeneration plant. The idea is togenerate synthetic natural gas(SNG) and heat from woodchips, a resourcewhich is available in the company's supplyregion. The produced SNG can then either be directlyinjected in the utility's natural gas system, or convertedinto electricity via a cogeneration unit and fed into the electric distribution network. Waste heat, which accrues inboth cases, can be absorbed by the local district heatingnetwork. The whole system can be seen as an energy hubprocessing different energy carriers—wood chips, electricity,heat, and SNG[3]. In addition to these energy carriers, thegasification process requires nitrogen and steam, whichhave to be provided at the hub input. gives anoverview of the hub layout. The new thing here is not thetechnology used (converters), but the integrated planningand operation, which is believed to enable better overallsystemperformance.Thedevelopedmulticarrier analysis tools can be appliedto this energy hub to answer some fundamental questions.

1. How should the converters berated, i.e., how much electricity, SNG, and heat shouldthe hub be able to produce?
2.How should the energy hub be operated, how much electricity/SNG/heat should begenerateddepending on the actual load situation?
3.Which and how much of which energy carrier should the energy hub be able to store—wood chips,SNG, heat, electricity?

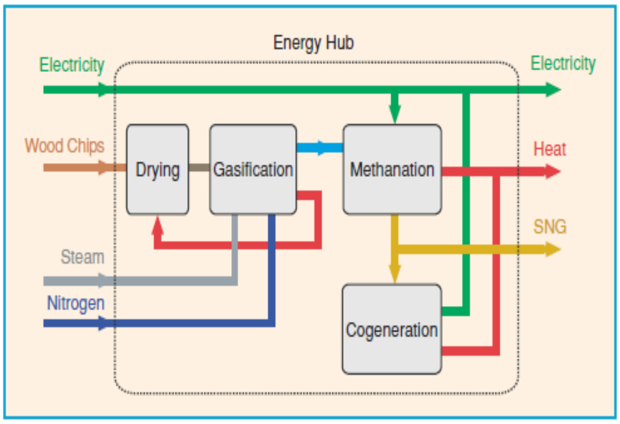

Figure 3: Sketch of the energy hub to be realized by Regionalwerke AG Baden,Switzerland.

How does the energy hub influence theoverall system performance in terms of reliability/availability, energy efficiency, and power quality?The project is still in the planning phase. A first version ofthe hub, which only contains wood gasification and cogenerationunits, should be realized by 2009. The full version, which then includes the methanation part thus enablinginfeed of SNG into the natural gas network should start runningin 2011[3].

5. Use loud management:

consumption generally refers to programs whose impact on consumption patterns of customer electricity consumption Bashd. of which are power companies to time power consumption, the field for the benefit of consumers and even provide their own.

5.1. loud Response:

Response time is one of the the new developments in the field of DSM, which means the participation of consumers in improve energy consumption patterns of. The overall objective of loud response programs to achieve two important features are network reliability and reduce prices.According to the definition provided the DOE in February of 2006, demand response, change in electrical energy consumption by consumers of normal consumption patterns, in response to changes in electricity prices or in response to stimulus spending set to reduce power consumption (at hours when electricity prices above market or system reliability dongerThe importance of loud responseToday's anticipated load curves of the growing consumption of electrical energy that supply a lot of disposable investment needs. In these circumstances, could help to solve this dilemma Barman meet the The importance of demand response, when it becomes clear that knowing the frequency Applied fiscal profits for consumers and even the network itself provides, inter alia, reducing the amount of blackouts, reduce production costssmooth undercarriage load curve, helping to stabilize market prices and .

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6. Modeling hub energy

The model and the objective functions and constraints brought about the need to solve equations hub energy system. we. In this chapter the results of the simulation and change initiatives are taken to optimize the energy system.

6.1.Implementation and simulation:

hub energy of a model system was investigated. This model taking into account the response time in the scenario without storage the elementsinvestigated the optimization objective function, and the results are plotted graph The model of each element of the hub energy system, several different types of efficiency considered using optimization software Gams elements, with the best efficiency and lowest cost to be placed in orbit[4].

In energy prices in the calculation and determination of the amount of gas and electricity is very effective input, the model in energy prices is evaluated accordingtothe followingdiagram

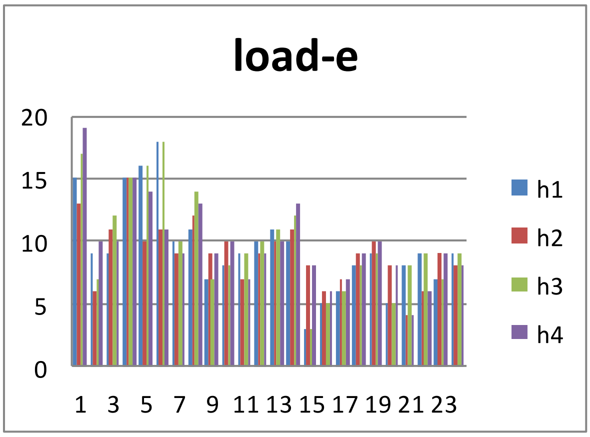

Figure 4: The demand for electricity and heat at different times of the day

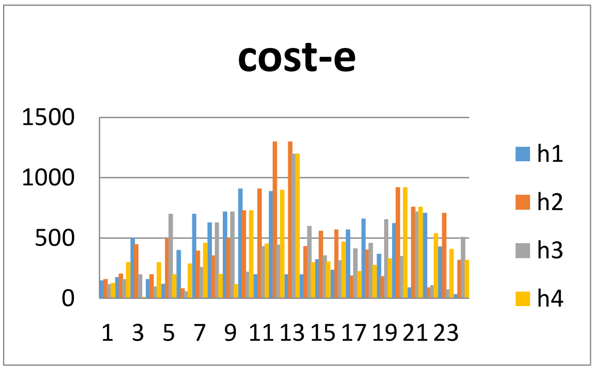

Figure 5: The cost of gas input to the hub system in the model

As specified in the chart above is due to the change in output load in the different hours of the day, with the rising cost of energy and use less instead of the alternative uses carrier.v electricity and gas as well as the input by the optimization software is calculated for the following graph[5].

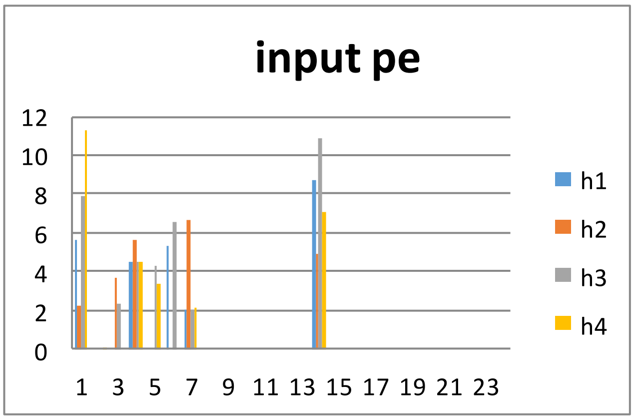

Figure 6: The amount of electrical energy input to the hub energy in the model

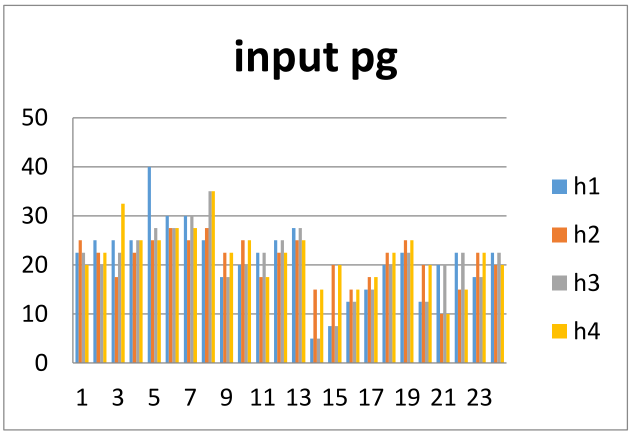

Figure 7: Gas energy input to the system in the modeling

Assuming constant demand response to changes In energy prices and taking into account sensitivity of times the price Me = .02 after sending data optimization software Gams the results of the simulation to determine the the cost of electrical energy input to the system integrated energy is as below[5].

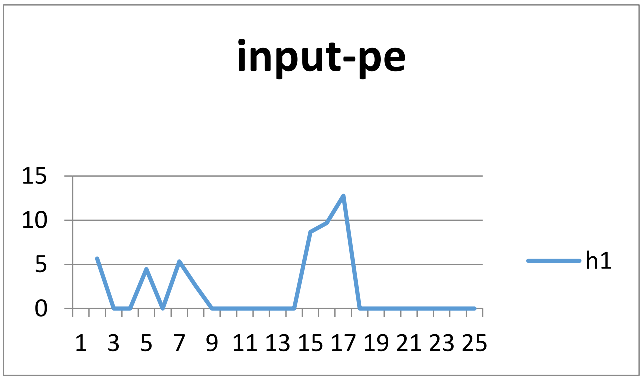

Figure 8: The amount of electrical energy input to hub system

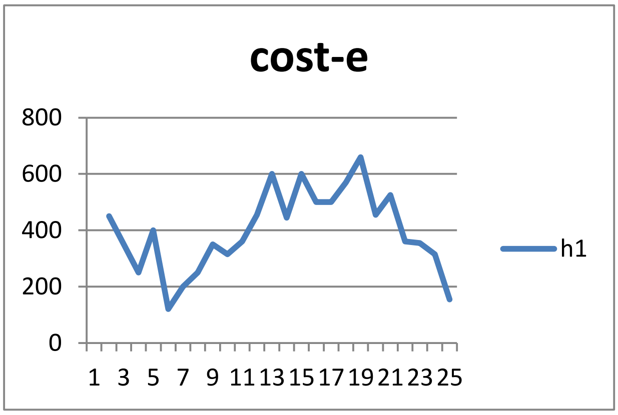

Figure 9: New cost power hub energy input to the system in the first scenario study

6.2.The third model is the first scenario by considering Me = .06:

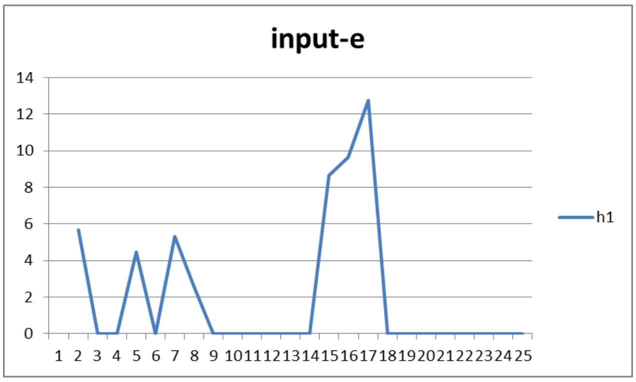

Figure 10: The amount of electrical energy input to the system in the first scenario study

Figure 11: New cost power hub energy input to the system in the first scenario study

However, the study price charts in different hours of the day to the conclusion Provided that the the price increase in the output amount is reduced How to shift the burden to the sensitivity of the load (Me) at different times and in different types of cost are And the increase is part of the objective function.

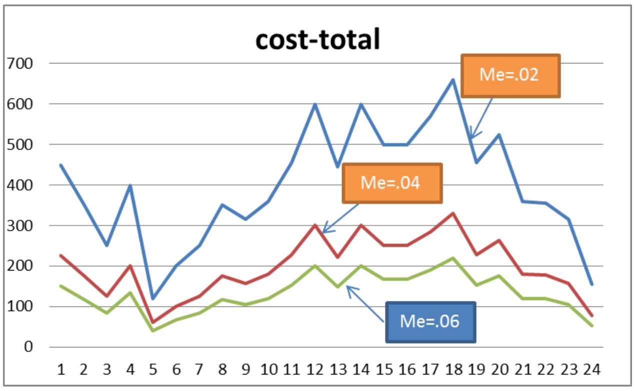

Figure 12: The cost of energy inputs due to the sensitivity of the integrated energy system in time to review the first scenario

6.3. Second scenario:

With the increase in the price of the energy system and taking into account the sensitivity of the load (.06 = Me) After sending data optimization software Gams results of the simulation to determine the amount of electrical energy input to the system integrated energy costs is as follows

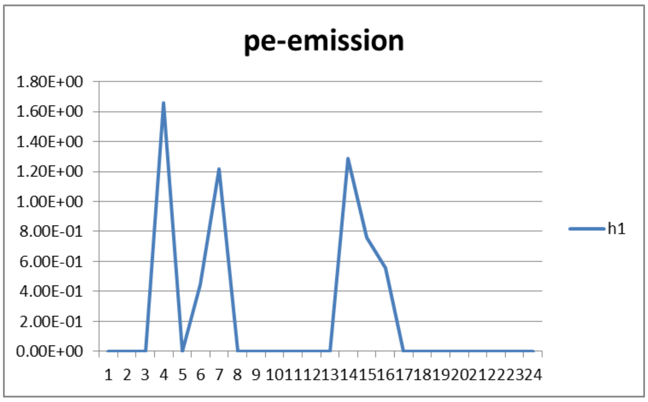

Figure 13: New cost power hub energy input to the system in the first scenario study

The amount of electrical energy input to the system in the Second scenario study

6.4.And also the inlet gas to the chart below:

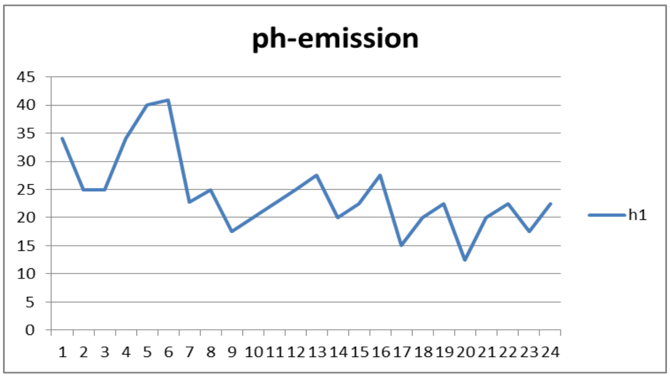

Figure 14: Gas energy input to the system in the Second scenario study

Now, check the amount of electricity and gas inlet with making sensitive time (Me = .06) and the electricity and gas air pollution, come to the following conclusions[5].

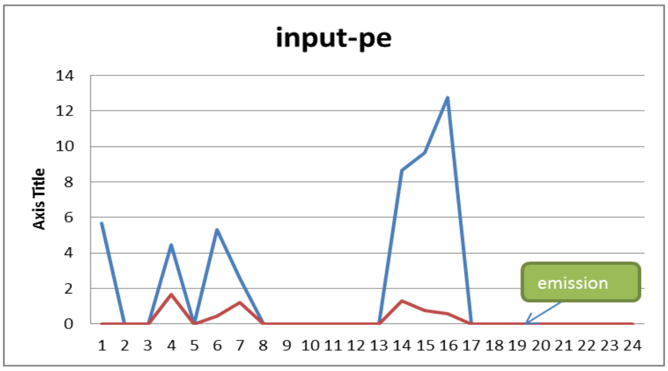

Figure 15: The amount of electrical energy input to the system in the Second scenario stud

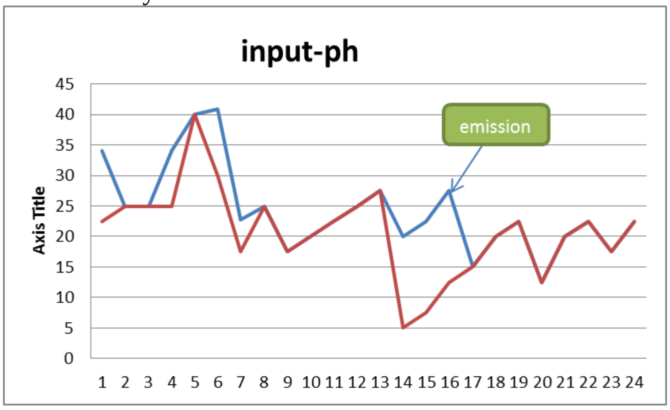

Figure 16: Gas energy input to the system in the Second scenario study

The amount of gas in the total energy input to the system in the Second scenario studyGas prices are calculated after the application is as followsThe cost of gas energy inputs due to the sensitivity of the integrated energy system in time to Second scenario study

7. Conclusion

. The search for and apply innovations and changes in the model exists within hub energy system can be concluded that this model is that we can development a new model. In this model we can see that taking into account the electricity and heat, reduced costs the operation also discussed in context and according to the model a sensitivity analysis, responsive loads on the objective function, as well as the effects of pollution on the performance of the operation system have been taken.

References

[1] B. Bakken and A.T. Holen. 2004,Energy service systems,Integrated planning case studies.pp:1605-1611

[2] G. Reed, J. Greaf, T. Matsumoto, Y. Yonehata, M. Takeda, T. Aritsuka,Y. Hamasaki, F. Ojima, A. Sidell, R. Chervus, and K. Nebecker, July 2000"Applicationofa5mva,4.16kvdstatcomsystemforvoltageflickercompensation at seattle iron and metals, pp: 1605 – 1611.

[3] K. Frauenhofer, H. Glavitsch, and R. Bacher eds.1993Optimization in Planning and Operation of

ElectricPower Systems. Physica Springer,. ISBN 3-7908-0718-4.

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[4] O. Flanigan.1972 Constrained derivates in natural gas pipeline system optimization. Journal of Petroleum Technology, pp: 549.556

[5] S. An, Q. Li, and T.W. Gedra.2003 Natural gas and electricityoptimal power _ow. In Proc. of IEEE PESTransmissionand.DistributionConference,Dallas, USA.

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