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Base on burn material power pool, too positiveb19> Power pool, saving power poolOperation optimization of residential distributed energy system

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Abstract:on PV cells, burn material powerPools,residential energy systems for storage batteries for research objects,according to mixed integer linear programmingRationale theory constructbuild its run optimization mathematical model,While satisfying the residential power and thermal requirements, the,determines the running policy with the least annual running cost.In the test the departmentInternal energy source of the same time,consider policy factors such as the cost stream and the feed-in price of electricity and gas prices.In divide analysis system "powerThe force and thermal composition of the same time,also discusses the best use of photovoltaic cell power generation and battery optimal charging and discharging strategy.

Keywords: fuel cellPV cell;battery;Residential Distributed energy system;Run excellent

Middle Chart Category number:TK01+9document marker:Aarticle number:1671-52 (2014)04-0379-06

doi:10.13941/j.cnki.21-1469/tk.2014.04.001

Introduction

inIn*centurytoto,energy consumption and what it raises'sTheEnvironment issue has become the most important of allthe"the" "".inTerminal energy consumption structure,,Architectureenergy consumption is importantGroupinpart,while residential building energyconsumption about buildingenergy consumption30%[1].as the standard of living is mentionedhigh,people'srequirements for size and comfort between living null are also moreThe morehigh,make residentialcansource consumption becomes a rigid needask,renders yearly growthtrendtrend.to promote residential construction sectionto,external wall insulation,efficientLighting,such asindividual energy-saving technology to develop fastand is abouttoUsherin bottlenecks statesin recent years,as a new energy-saving rationaleRead withSquareMethod,Residential distributed energy systems are widely closedNote[2]~[5].

Residential distributed energy system is in compliance with domestic and foreign distributionstyleEnergy DevelopmentFlow,from system levelpromote residential energy savinghaveeffect.based on local resource characteristics and user-specific needsfind,LiveHome distributed energy supply system can be usedavariety of techniquesoperation,as housewithMini-cogenerationtechnology,distributed photovoltaic generation technologies, etc..Pressdo not follow the power generation methodwith,Home MiniCogenerationTechnologyandcan be divided into Stirlingmachine,internal combustionmachine and fuel powerPool3Largeclass[6].homewithminitypeCHP system changed completely accordingtoLaiCity Large grid,Central heating,traditional air conditioning refrigerationEnergysupplymodelstyle,nobutwithonpower,and Summer systemCold,,winterheating,achieve self-sufficiency in residential energy fromfeet,moreremaining PowerQuantity alsoto incorporate electricityNetwork.In addition,as a clean Power generationsquare,inrecent years,distributionPV power system in residential areaalsoIswidely expectedwith[7].

however,each of these distributed energy technologies haveits limitationsSex.For example,PV System affected by

weather conditionsring,cannot connectcontinuePower generation;Energy-saving dive for household micro-cogeneration technologyForce Limited, etc..Multi-technology coupling applications are a good way to ensure that all kindsofcan be technically excellentpotentialComplementary effective solutionone.based on the aboveread,with wisdomcanhome,0 Carbonhome,0 Energy-saving concept of homeout,DayThisand other developed countries have proposed integrated use of photovoltaic powerpool,fuel powerPooland battery-dwelling distributed energy supply systemUnified[8].set PVpool,fuelResidential distributed supply for battery and batteryDepartmentEC,to achieve energy in time and space 、 Resourcesinteraction withMutualFill,therefore,optimization of system run scenarios to shutdownto.Current,countryinside and outsideon residential distributed energy system Operation optimizationinvestigate,mainto focus on the home mini cogeneration systemReset and run excellent with,For multi-energy complementary housing distributed energyResearch onsource systemopRow optimization study relativelyless[9],[10].

This article is based on photovoltaicPool,Fuel PowerPool,Battery'sLive residentialenergy systems for research onlike,based on mixed integernumber of linear gaugestroketheory to build its operation optimization mathematical modeltype,on fullfeet Residence PowerForceand thermodynamic requirements for samewhen,Thedetermines the year running costminimum shippinglinepolicy.whenthe model considers the same as the source of the system,,comprehensive

Draft Dayperiod:2013-11-12.

Fund Projects:The capacity building of some local institutions of Shanghai Municipal Science and TechnologyCommission 131 (+60501000);Shanghai University's Distinguished teachingGrant(orientalpeople)Post Plan ItemsMesh.

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consider electricity prices and natural gascost stream and top for priceNetworkPrice, etc. policy duetoelement.in the analysis of system power and thermal composition of theat the same time,also discusses the lightvolt battery power generation best Use formandbattery best charge/dischargeforAll components of the system.

1. based on fuel powerpool,solar cell,battery homeSubCloth energy system

Figure1for couplingPVpool,Fuel PowerPoolThe concept of a residential distributed energy system for the home of the,"store Power" diagram[8].

Figure2using PV cells,fuel cell,Storage battery Residential Distributed energy system flowchart

Fig.2 flow Chart of fuel cell/pv/battery basedResidential energy system

2. Run an optimized math model

from Livethe physical model of a residential distributed energy system can beSee,Department

Unified Energy flow is more complexMiscellaneous,toachieve the desired economy,Save Energy,Subtractroweffect,system optimization Run to shutdownto.Itis necessary to consider the comprehensive

power and thermal requirements for dwellingsAsk,Technologies for distributed energy-capable devices

features,seasonal and time wave of solar energyMove,Electricity Price anddaysgas prices and other related reasonselement,make reasonable system runs

Figure1concept map for residential distributed energy Systems

Fig.1 Fuel cell/pv/battery based Residential energysystem

InGrade Correspondence,Temperature counterpart,Cascade Benefitswith"" "" []fuel cell homeMicro-cogeneration technology to achieve energyFitrationale,comprehensive,efficient energy savingwith.Household distributed photovoltaic power generation systemis the mostpromisingof renewable energy utilization,inSendelectrical procedurein,implement"0 energy consumption",0 Pollution.Home Small storagePowerpool can store daylight PVbattery excess powercanor usethe to cheap late-night power chargePower,for power usagepeak timesection,bothsectionsave powerfee, isdsmwith.

inthe SystemMedium,"Home fuel cell with natural gas"burnmaterial,through the Desulfurizer,modifierExtracting hydrogen,with oxygen in the airinreactor Chemical reverseshould generate electricityto,Recycle heat.If the residual heat cannot be completedfull user needsseek,start burningmaterialInternal integration of the battery systema supplemental burneror standby water heater, etc.makeup burnappliance Hotcan.PV cells have a direct supply of electricity generated byhousehold power,,to batteryCharge and sell to powernet3exit.fuel cell power generationcan only be directly forpower,do not give batterychargeelectricity and internet salesPower.If the power generation of fuel cells and photovoltaic cells is

Policy.This article is based on a mathematical programming rationaleread,built on fuel cell,solar powerpool,Theoperation optimization mathematical model of the distributed energy system of the battery housetype.The mathematical model is mainly composed of the inputquantity,target letternumber,Constraints and output groupsare.input includespre-energy system knotconstruct,User-time power and thermal load data,electricity price and natural gas pricegrid,Government subsidy policy and fuel cell,performance parameters for system components such as photovoltaic cellsnumber.throughmodulo toparse,to finally get the following outputamount: ① satisfies target functionnumber

and the system year running fee for constraintswith;②mini-thermoelectricityproduction

optimize run by systemCase;③optimized operation of PV cells,④optimized run of batterycase.also,through vs. Rules system moremore,The also draws a comprehensive assessment of the systems such as energy efficiency and environment, which meanssubscript.

2.1 Destination Function

Theoptimal means for energy management decisions by end-users in view of economic efficiencysuperscript,This mathematical model minimizes the annual operating cost of the entire residential energy system as a target letternumber.is simpleupsee,maintenance costs for distributed energy-capable devices ignore noMeter,withassumes the power generation or heat recovery efficiency of each device is setvalue.

Notenough to meet user needsFind,can be discharged by battery or straightthen

Min{cTotal=cPur+cRun+cGas-CSal

(1)buy power from the grid.Thisis,thepower load includes both forphoto

in-style:CTOTALtotal annual operating feewith;CGRIDbuy from power gridPower

straight for bright and power equipmentPower RequiredFind,also includes summerEmpty

cost;CFC

Run for fuel cell cogeneration systemthis;Load Adjustment;Thermal Loadincludes winter heating loads and hot waterneed

CSUBurn to fillthis;CGRIDfor system yearCollectBenefits,System Year CollectionBenefits

Ask.The specific flow of the system such asdiagram2is shownin.

Including subsidies for the spontaneous use of photovoltaic cells and the sale of electricity to the grid Receivedby electricityBenefits.

hourly discharge of batteriesQuantity;ELoaDto perwhen

power grid Purchasethis:

Power NegativeLotus;HLoaDfor hourly thermal negativeLotus;HSUto hourlyFill

Grid

Burn Heat;HFcwaste heat recovery for fuel cellsQuantity.

CPur=ΣσDM(EM,H,SElF+EM,H,STB)PM,H,ELEC（2）

(2)Fuel Cell ListMeta

in-style:DMdays for each monthnumber;EGRid

To buy electricity from the grid

style(8),style(9)the IS for fuel cell unit power generation andmoreHot

Connect using the PowerQuantity;EGRid

To purchase electricity from the power grid for battery charging

amount of recycledBundle,Departmentthe power and heat generated by the can not exceed

ElectricalPowerQuantity;PM,H,ELECPowerGridPowerPrice.

The operating cost of the micro cogeneration system is the fuel cell

its ratingQuantity.

to ensure energy supplyStableSex,Reliability,intrue setsystem optimization Run targetPrerequisites for FunctionsNext,the must also be from the followingseveralaspects set the constraint baritem.

(1)energy supply and demand levelScale

Livethe supply and demand balance of residential energy system mainly includes systemPowerhourly supply and demand level of force and thermal powervalue.Residential Power requirements can beby buying from the gridpower,can also be made from photovoltaic cells and fuel powerPoolpower generation given fullfull.ifown generation is larger than real time powerneedseek,can be stored in a storagebattery or sold to the gridpower.Homehotforce load through recovery burnmaterial battery heat and burn devicecomeSatisfiesthe.system power balance and thermal balance as(6),Type

(7)shown.

in-style:ESTBfor storageBattery storage at a point in time;εtobattery storage Systemnumberλ toMinimum battery storage Systemnumber;ESTBMaximum battery power storageQuantity.

style(11)is the constraint bar for the battery balancepieces.It indicates thatthetotal for a certain time periodisstored as the last-period end-saving electricity amount tothis time periodThesum of the electricity is deducted from this period of timeFulldischarge of electric demand for foot residencesamount.(12)show one daystartStorage of battery at first timecharge for 0 points of the dayandthe firsttime of the daythecharge amount and deduct the same timesectionThe discharge amount of is.(13)Specify the initial momentofthesimulation(ayearfirst day 0o'clock)battery storageis 0.(14)

the sets the allowable storage capacity of the battery fanSurround.

integernumber;InM,HandOutM,Hto0~1wholevariable, onbehalf of batterytheisfilledwith,, and.

2.2 Optimization Method

solving decision problems with mathematical programming is mainly divided into twoStep:First,make the actual decisionPolicy IssuesTranslate,Presentation as Mathmostoptimized form,UseMathematical modeling methods to establish decision issues'ssystem run Optimization mathematical modeltype;then,Select,Leveraging OptimizationsSquareMethod and tool Solvertype.This article selects Professional Operations Research soft,LINGOConstruct the above mathematical modeltype,and select the built-inalgorithm intoline

Key,The changes also have a direct impact on the system's optimalRun sideCase.due to power demand and thermal requirements with the quarterlysection,periodchange,thistextsimplifies the year to winterseason,Summer,Spring and AutumnQuarter3period.2month and7The month is determined as winter andSummer's monthis,4monthandtheaverage of the one month is determined to be the representative month of Spring and autumnpart.

such asFigure3show,everyday6:00~10:and17:00~23:

is peak powerparagraph,:~TimesDay6:yearis Power troughperiod.from the overall andstatement,residential power load with seasonal changescomparisonsmall,fromin summer air-conditioning loadisgreater than large,Summer Power loadissignificantly higher thanitshe two seasons.livehomeonhotload varies with seasons non-often

Ming Show, Summer season,Thermal load of residential usersunder/b18> is 0, only in

3. Case Analysis

3.1 Research Object

for validationvalid for the above optimization modelSex,This article selectsOne2-layer residential building for research tolike.Residential Building securityinstall#m2'sPV CellsBoard,Rated power generationQuantity1kWfuel cell,capacityQuantityto6kWhBattery and reloadto.Home Poweronpower grid,fuel cell,PV cells and batteries to fullfeet,Thermal Requirements by Fuelbattery system generated heat supplyshould,does notfootpartially through a supplemental combustion device to fullfull.when PV cell power generation is superover user requirements,canto store excess power in batteryorsell to powernet.

3.2 model input parameter setting

(1)Energy NegativeLotus

the hourly power load and thermal load of the dwelling are shown in Fig.3.

2.0 Large,largebodysetinin6:00~10:and17:00~23:twotimeparagraph:winter heat load obviousIncreaseLarge,6:00~11:and 16:~:These two timesparagraph,hot load up to peakvalue.

(2)Device Performance Parametersnumber

Another important input bar for the optimization modelpieces,Hometo thetechnical performance of the components of the source system is to determinethesystem thermalandpower output key parametersnumber.based on the current cityfield availabilityThe survey,Summarize the technical parameters of the system components intothetable1.

Frompart will beGet0.42$/kwhsubsidies,ExtraDepartmentSub-Internet only performs desulfurization benchmark powerprice(0.48$/kwH).

3.3 Optimizing Run Policy Analysis

Theultimate goal of the optimization model built in this article is to establish satisfactionOptimal transport of residential energy systems with predetermined objective functions and constraints

Row Policy.This article will address the abovehome,to winterexample,fromElectricForce balance and thermal balance two angle Analysis system optimization operation policy.

(1)power supply and demand flatScale

such asFigure4Show,from fuel powerpool,PV cells and batteriesThe system composed of the can meet the residentialpower requirements,%%;PowerNetacts as a complement when the price of the electricity is low at night.fuel cells take aa"late early stop"Run policy,that is, evening power peakperiodto temporarystart move, theis partially loaded in the morning aftertheline,until the clearmorningpeak load run at a larger workloadto9:stopstop.Daypower demand completely by PV cellfor,its remainderalsouseon the internet and battery chargerPower.where,spontaneous fromwith,remaining powerInternet accessand%battery charge(to,50.7%,35.2%and14.1%.This can besee,more than half of PV power generation is for home makewith,Meet Mecountry"forPrivate use"main,remaining powernetThedistributed PV Development campaign.Storage battery is mainly in the late night power consumptionpower,Its main charge is photovoltaic hairPower,charge is smaller than thegrid nightexample.

4. Conclusion

This article takes fuel powerPool,PV Cells and batteriesLiveHomeEnergy system for research tolike,linear based on mixed integersPlanningTherationaletheory constructs its operational optimization mathematical modeltype,Whensatisfied to livehomePowerForceand thermal requirements with the sametime,thedetermines the residential energy system yearrunsto this smallest running policyslightly.uses the case of a dwelling to be divided intoanalysis,tocertify that the model is valid,.uses this modeltype,not only to analyze the power and Jelipine of residential energy systems,,and canexploreburnbattery running policyslightly,PV Cell Internet access policyand storageThe best of all components of the system, such as charging and discharging policiesfor the grouprunsidecase.The analyzes user negativeloadby changing the relevant input parametersnumber,cansource price,government policy etc outside influence to systemrunSideShadow of casering.Although this article takes residential energy systems for research tolike,

Figure4power supply and demand balance for winter homes

Fig.4 electricity balance of residential building(winter)

Comprehensivedescribed,based on fuel powerPool,PV cells and battery residential energy systems can fully achieve the family energy independence of the new energy supply and demand rationaleRead.where,PV cells and fuel cells are used to meet daytime and night basic power requirementsseek,andthepowerpoolis used to adjust day and night load levelbalance.

(2)Thermal supply and demand levelScale

relative to power supply and demand balancesay,LiveHomeEnergy system Relative comparison of heat supply and demand balance simplesingle,itsmaintothe thermal source is only the residual heat of the fuel cell cogeneration system and the supplemental Burning Heat two partSub.such asdiagram5show,The nighttime thermal requirements are mainly covered by the residual heat of the fuel cell.foot,the daytime thermal requirements must go throughKaiwithSupplemental combustion Device Referencefor;This alsomatchesThepower generation of the aforementioned fuel cellspecialsex.fuel cell waste heat is the main source of residential heat demand.

But the proposed analytical method for other types of building energy systems

The EC also has some guidancerighteousness.

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