



Danish Energy
Agency

Heat Planning Tongchuan

John Tang
Senior Advisor

唐约翰
高级顾问



Outline of Feasibility Study

- Data and Investments collected together with Tsinghua University
- Feasibility study in 3 localities (city, town and village)
- Local and renewable resources are preferred
- Non fuel resources are preferred
- Method: Cheapest heat solution in a 20 year period, as a 3 or 5 year focus often rewards inefficient technologies that end up being more expensive in the long run.

Saved emission by waste incineration

Waste suitable for incineration	Yaozhou	Xinqu	Wangyi	Yijun	Yintai	Total
Waste available ton	32,354	24,977	60,557	9,114	25,579	152,581
CO ₂ emission by landfilling ton CO ₂ /ton W.	1.22	1.22	1.22	1.22	1.22	1.22
CO ₂ emission by modern landfil. CO ₂ /ton W.	1.02	1.02	1.02	1.02	1.02	1.02
CO ₂ emission by incineration CO ₂ /ton W.	0.47	0.47	0.47	0.47	0.47	0.47
Saved CO ₂ -emission by modern landfil. ton	6,471	4,995	12,111	1,823	5,116	30,516
Saved CO ₂ -emission by incineration ton	24,266	18,733	45,418	6,836	19,184	114,436

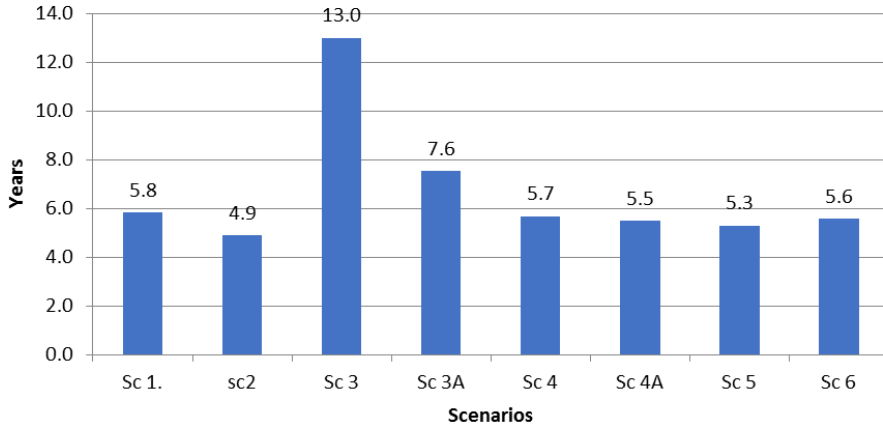
It is expected that all waste suitable for combustion are incinerated in a cement plant and the heat used for cement production purpose year round

Scenario Wangyi and Yintai

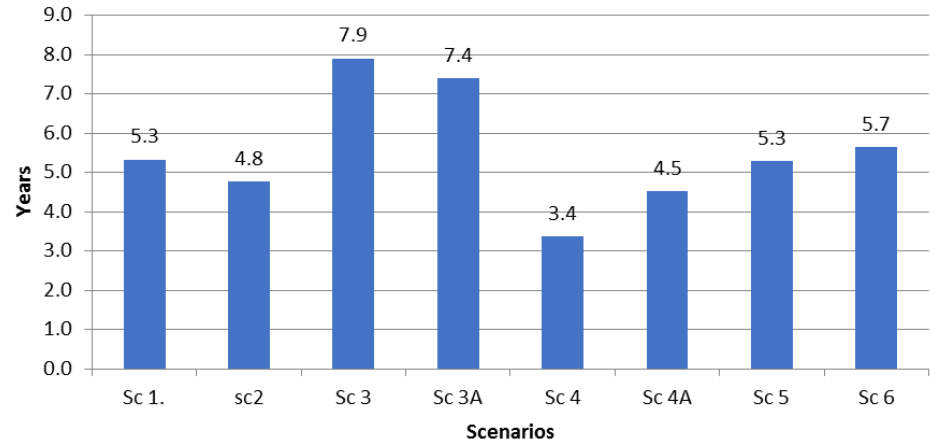
Solutions/scenarios	1	2	3	3A	4	4A	5	6
Surplus heat Wangyi	x	x	x	x	x	x	x	x
Heat pump	x	x	x	x	x	x	x	x
Surplus heat Yaozhou	x							
Excess heat power plants Xinqu		x					x	
New Coal CHP			x	x				
Biomass boiler					xx	xx		x
Gas boiler	x		x	x	x	x		x
Storage tank				x		x		x
Efficient distribution system							x	x

Results Wangyi and Yintai

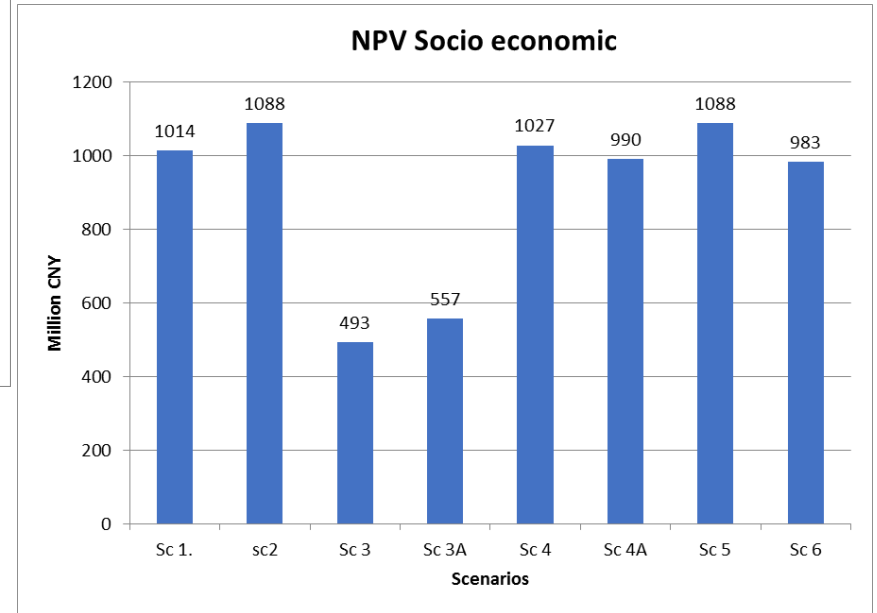
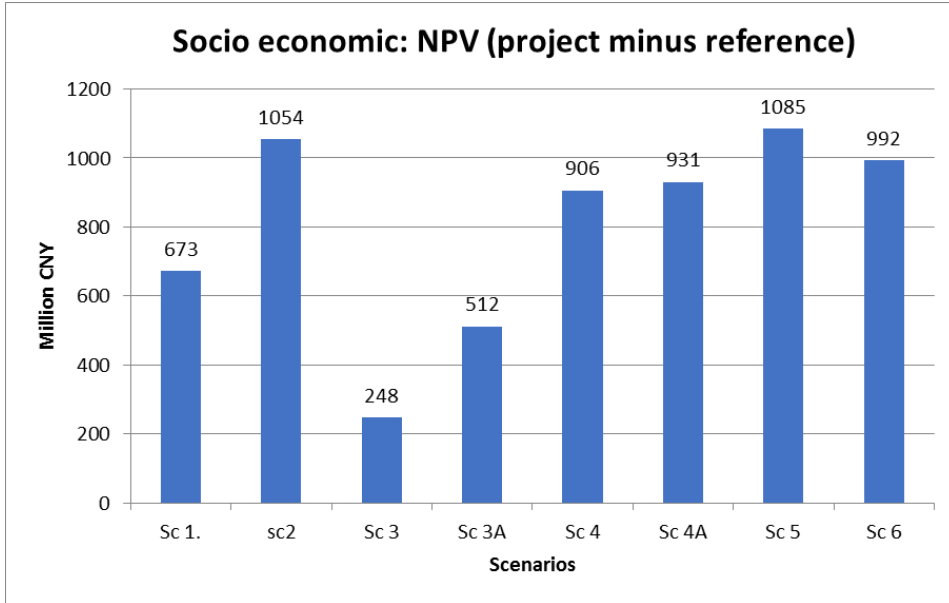
Simple pay-back



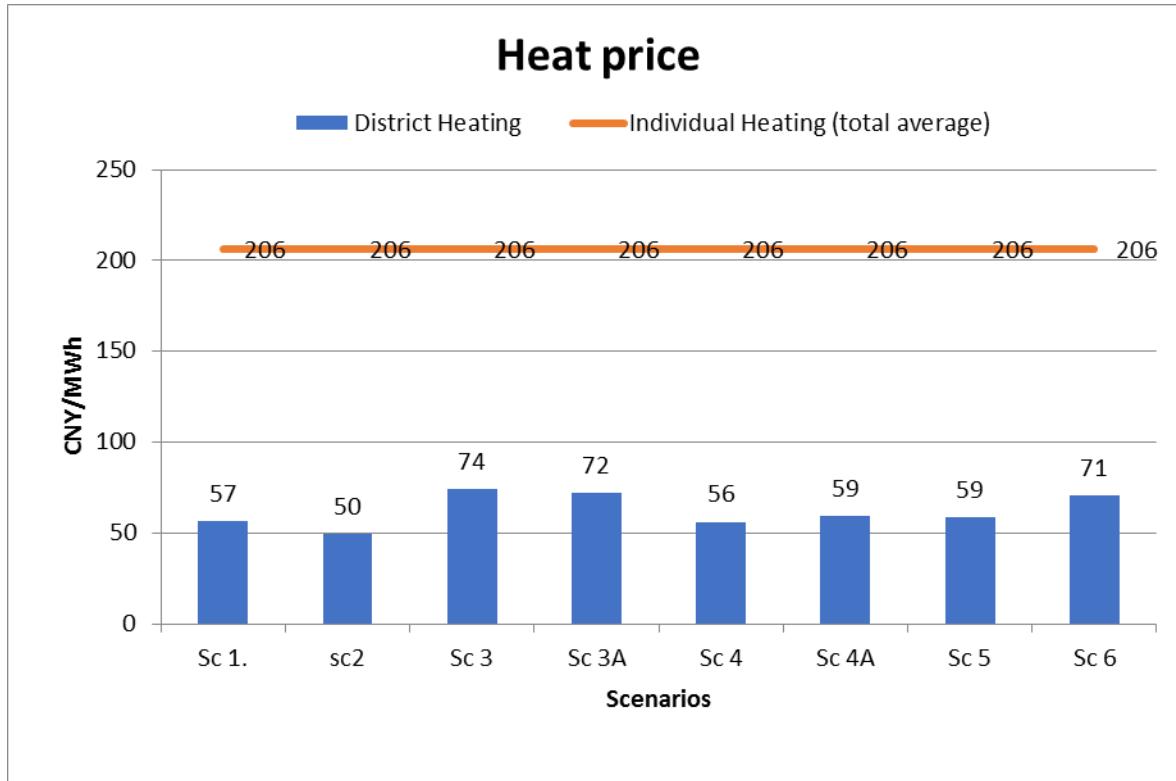
Simple pay-back



Results Wangyi and Yintai



Results Wangyi and Yintai



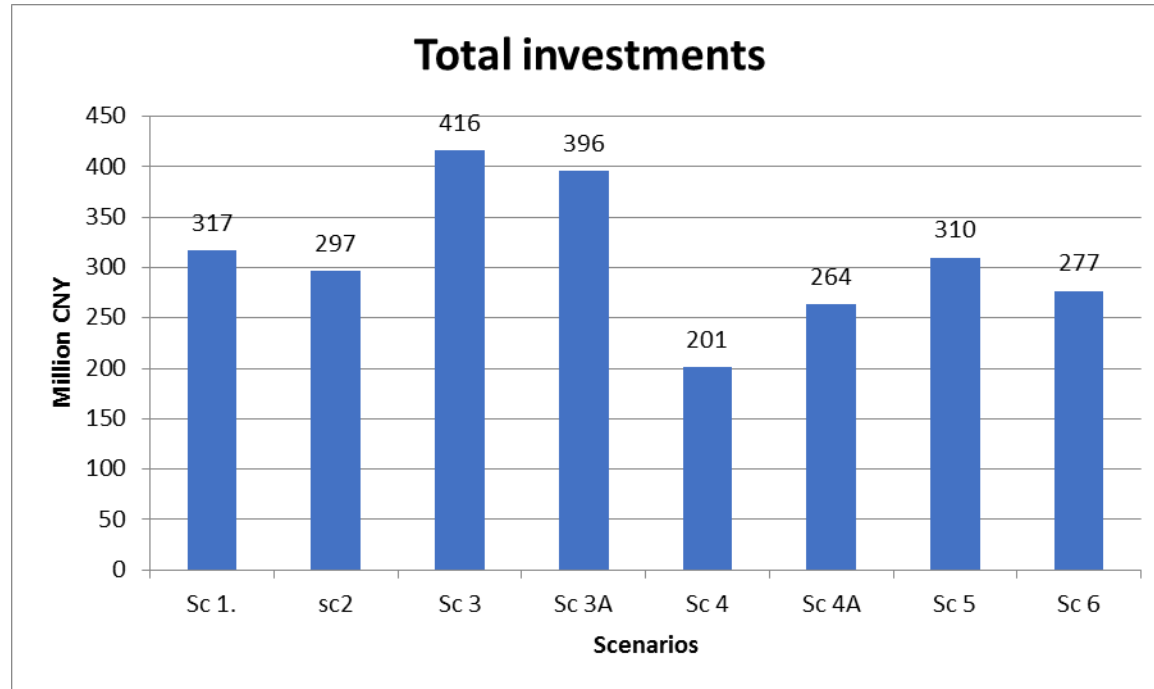
Alternative Individual heat prices:

Coal stoves: 185 CNY/MWh

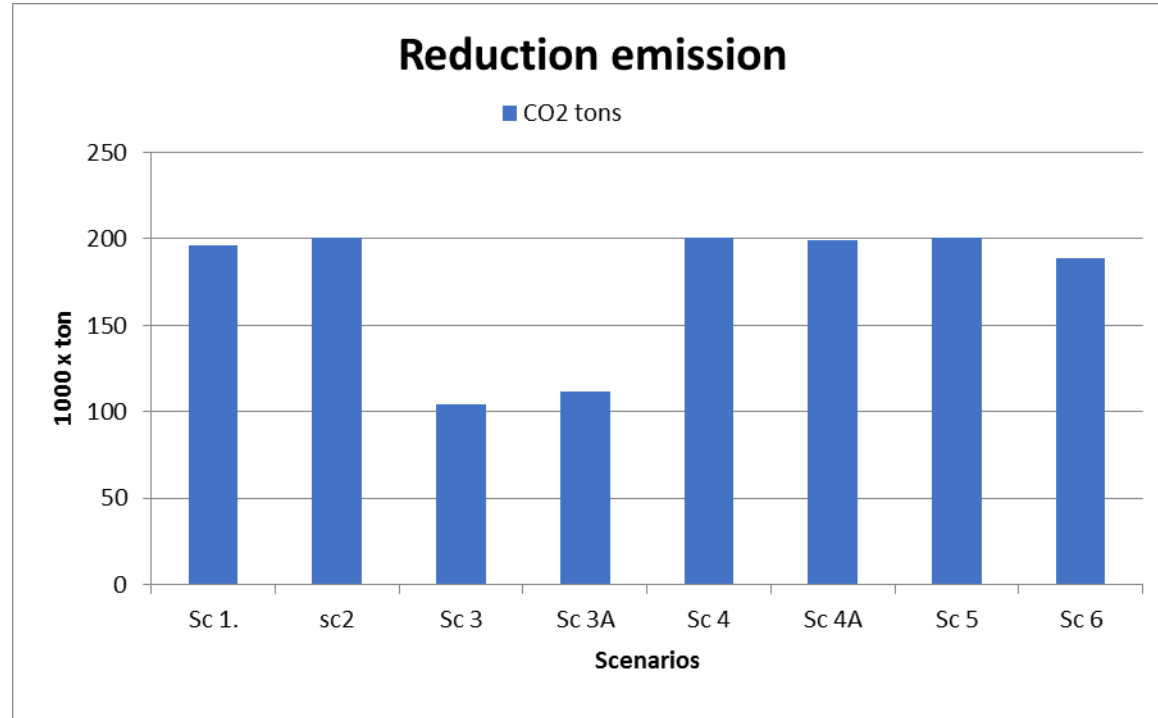
N-gas boiler: 238 CNY/MWh

Heat pump: 209 CNY/MWh

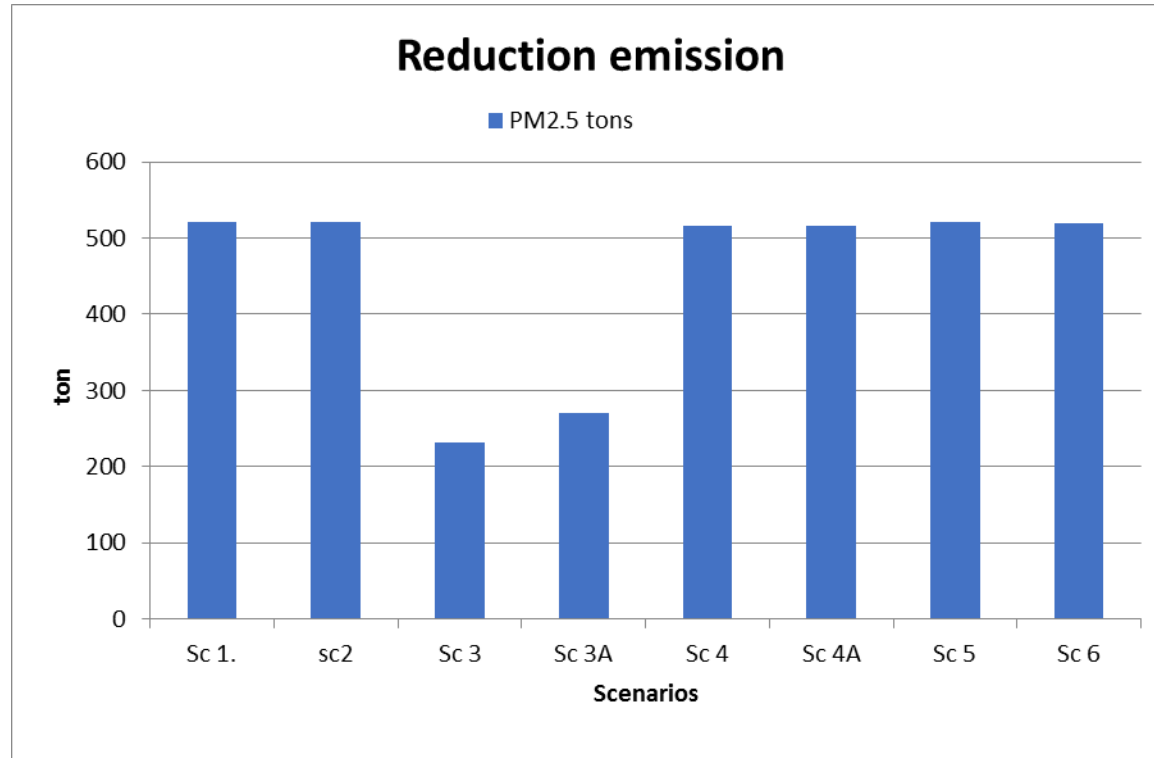
Results Wangyi and Yintai



Results Wangyi and Yintai



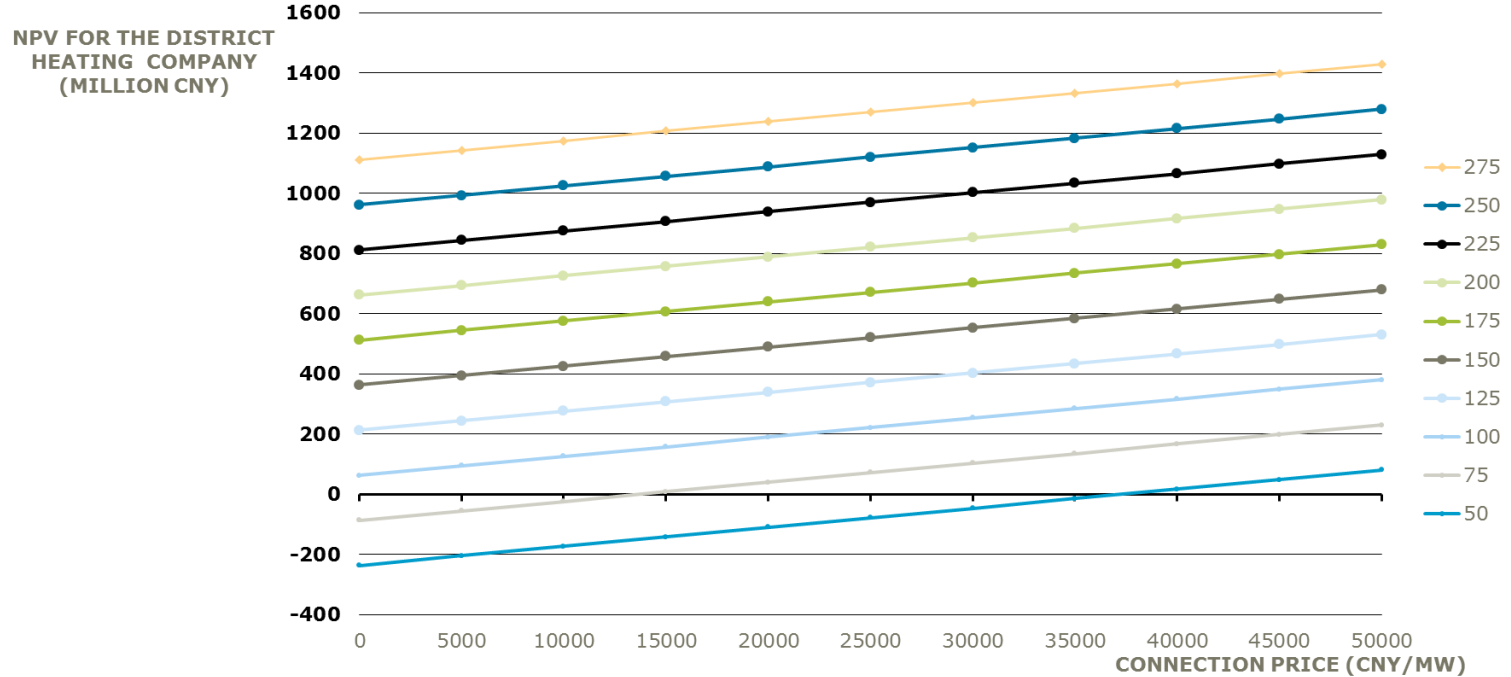
Results Wangyi and Yintai



Results Wangyi and Yintai

Sensitivity analysis sc. 2

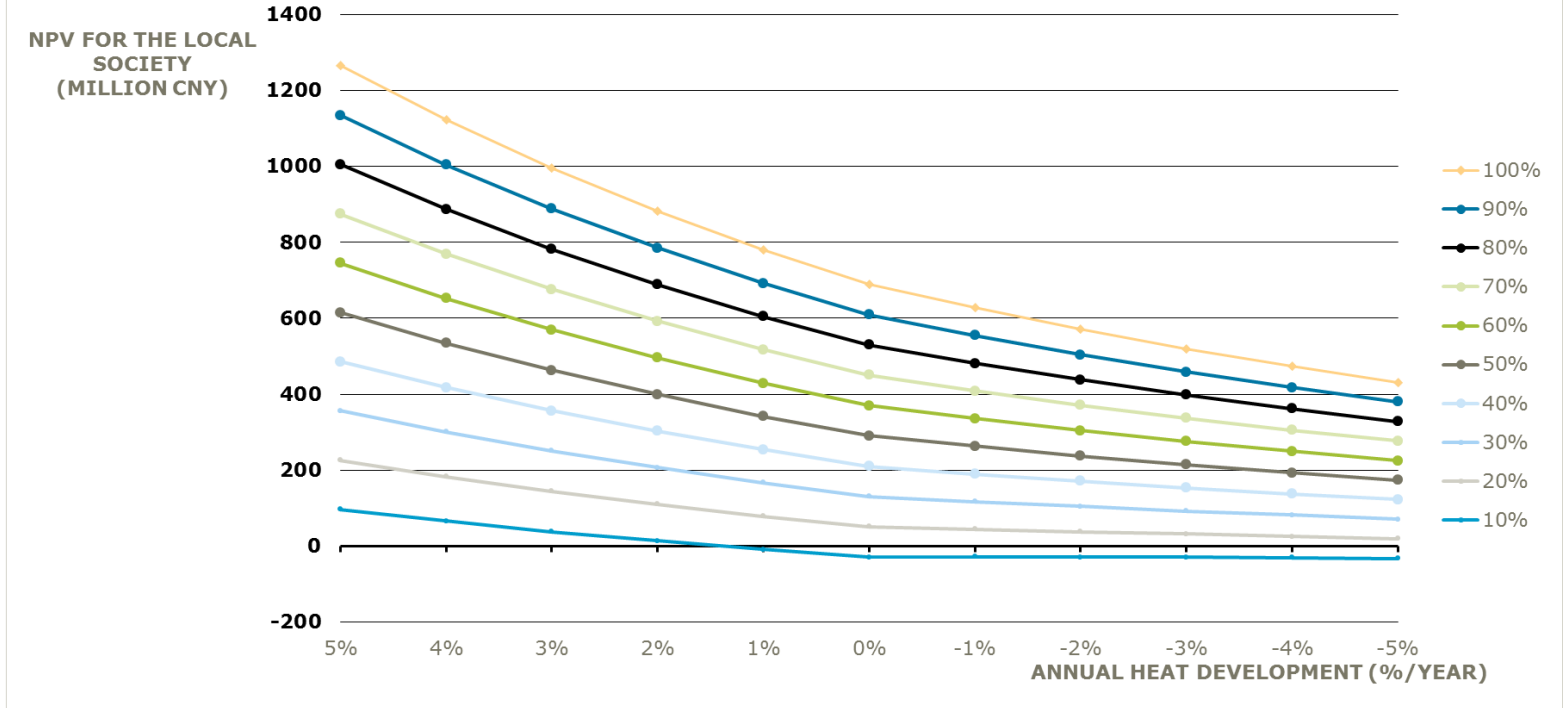
SENSITIVITY ANALYSIS FOR THE PROJECT (NPV FOR THE DISTRICT HEATING COMPANY AS FUNCTION OF CONNECTION PRICE AND HEAT PRICE)



Results Wangyi and Yintai

Sensitivity analysis

SENSITIVITY ANALYSIS FOR THE PROJECT (NPV FOR THE LOCAL SOCIETY AS FUNCTION OF ANNUAL HEAT DEMAND DEVELOPMENT AND EXPECTED AMOUNT OF CONNECTED CONSUMERS)

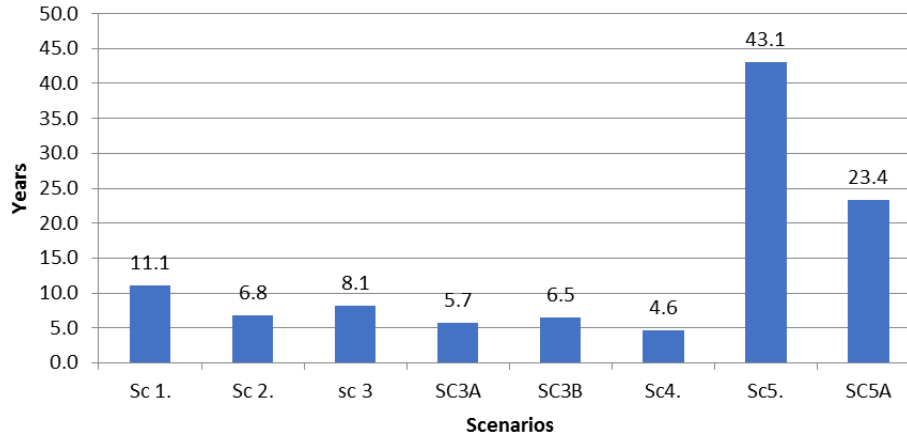


Scenarios Yijun

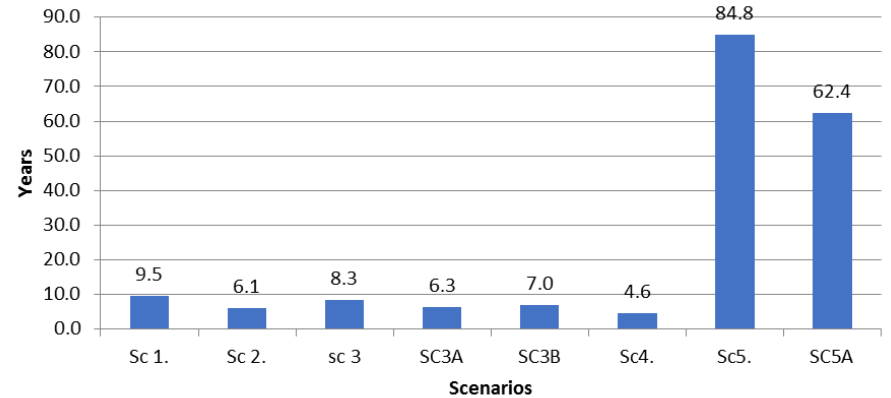
Solutions/scenarios	1	2	3	3A	3B	4	5	5A
Biomass Boiler	x	x	x	x	x			x
Gas boiler	x		x				x	
Gasification to boilers						x		
Gasification to CHP							x	x
Storage tank			x	x	x		x	x
Efficient district heating network					x			x

Results Yijun

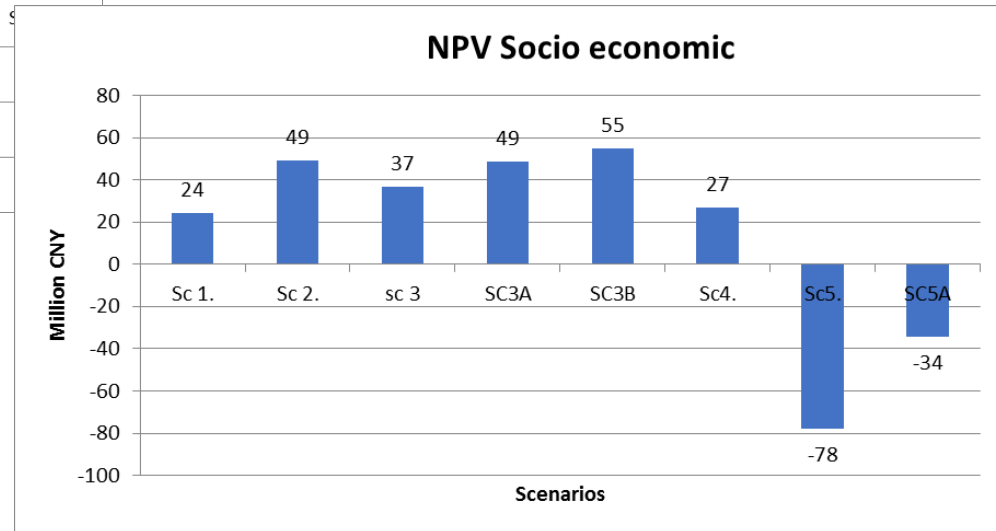
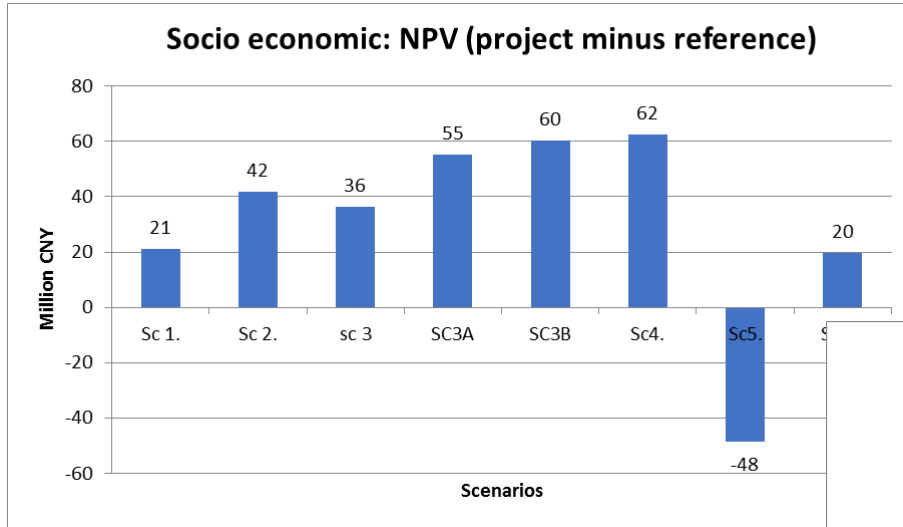
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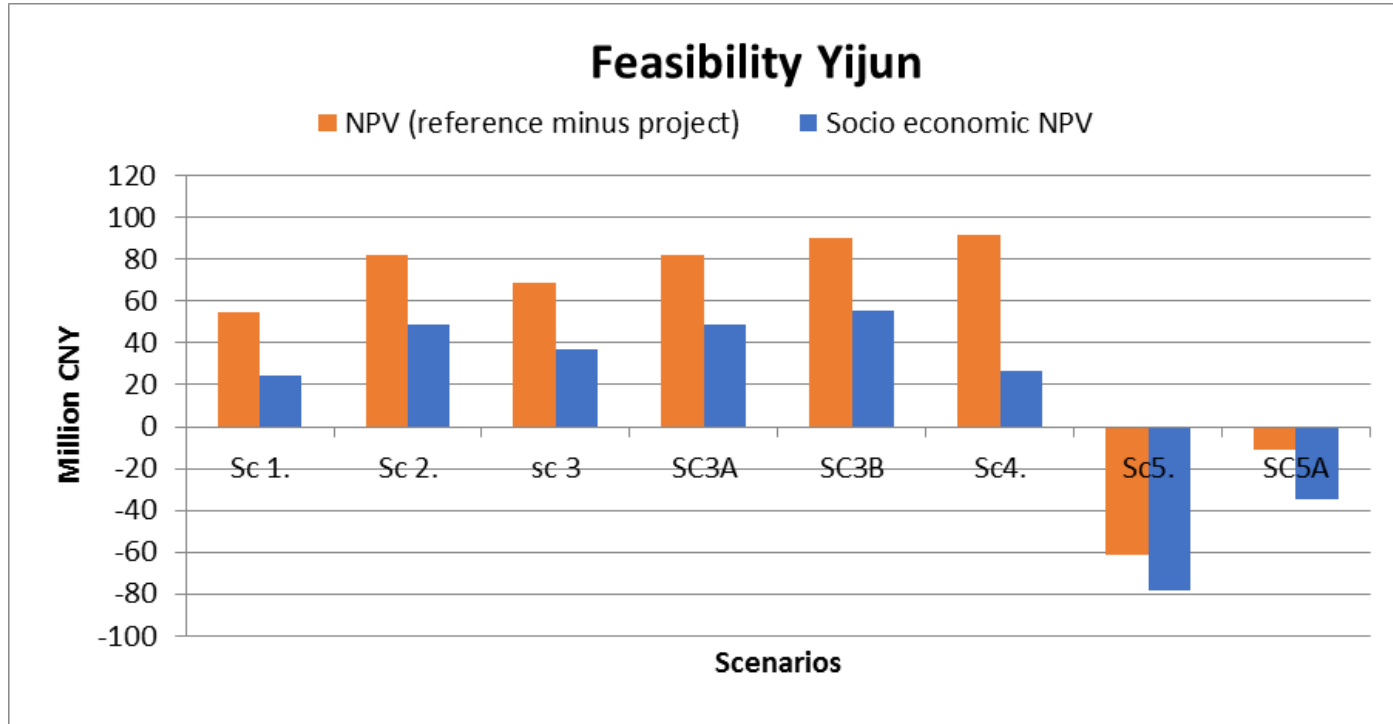
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Results Yijun

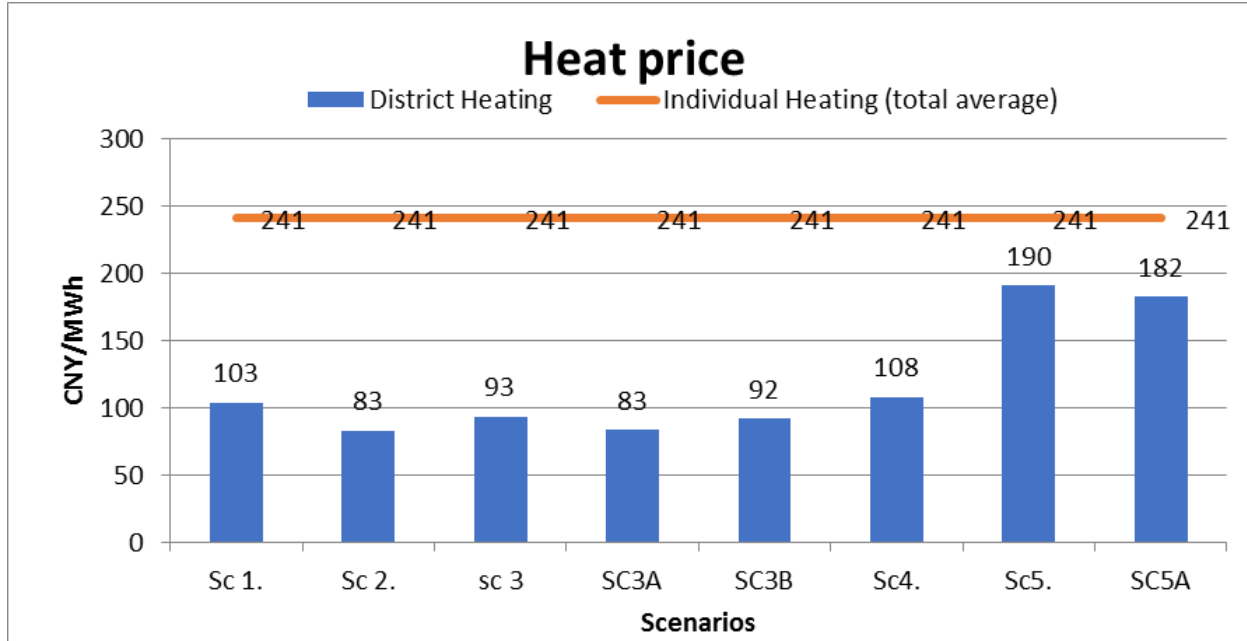


Results Yijun



The positive effect from CO₂ reduction is outweighed by high NO_x and PM_{2.5}

Results Yijun



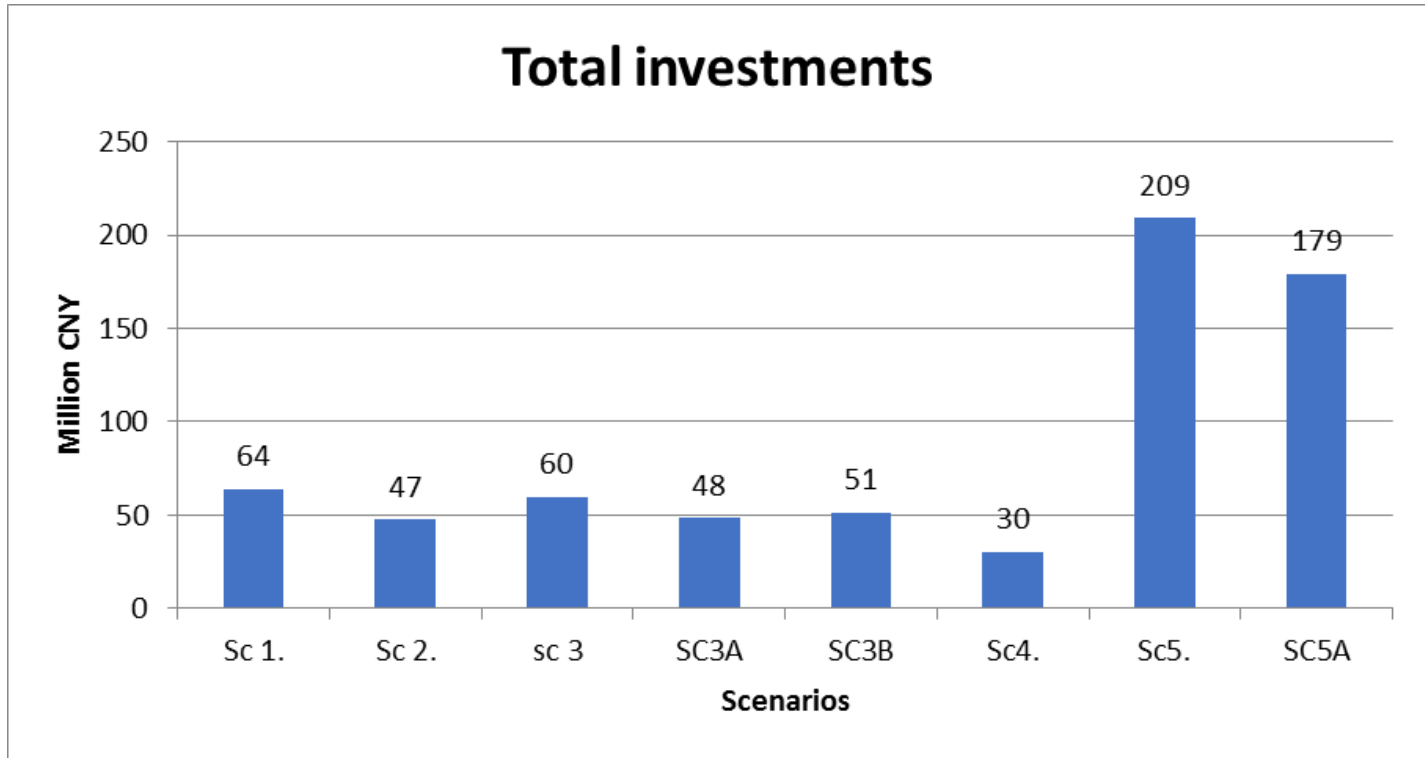
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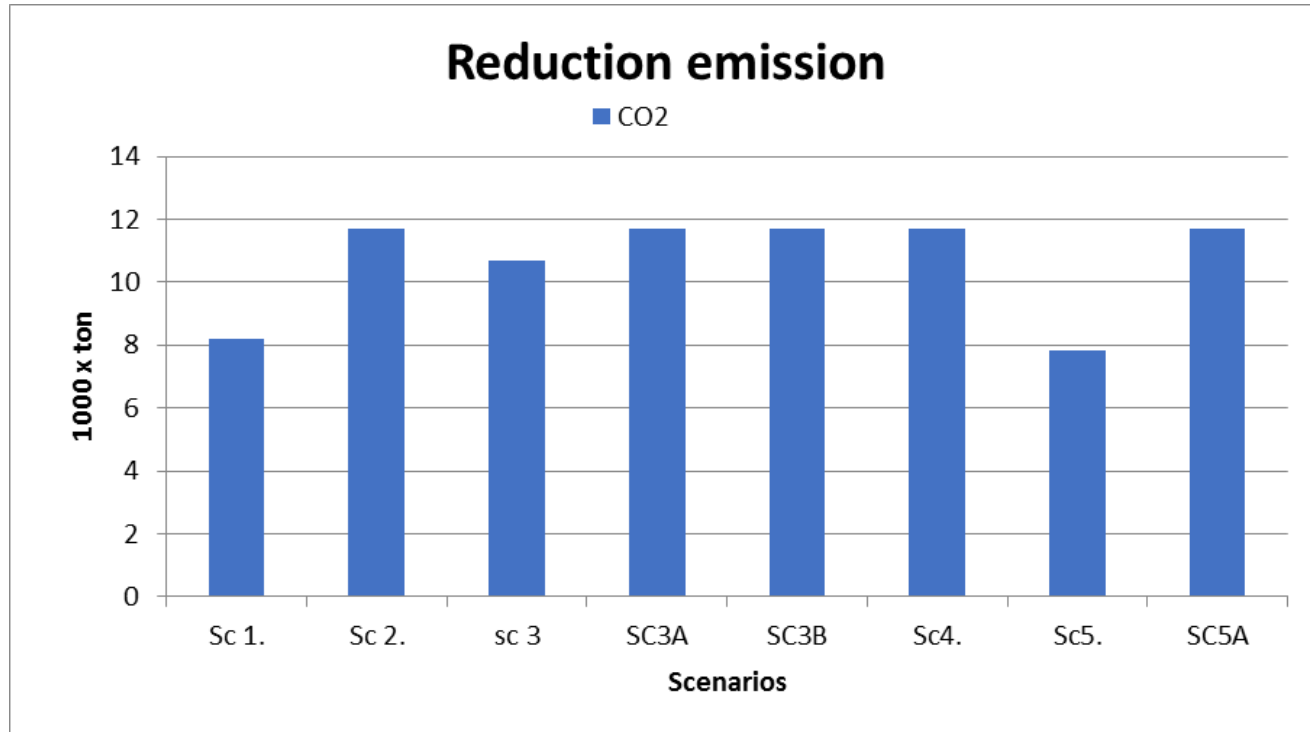
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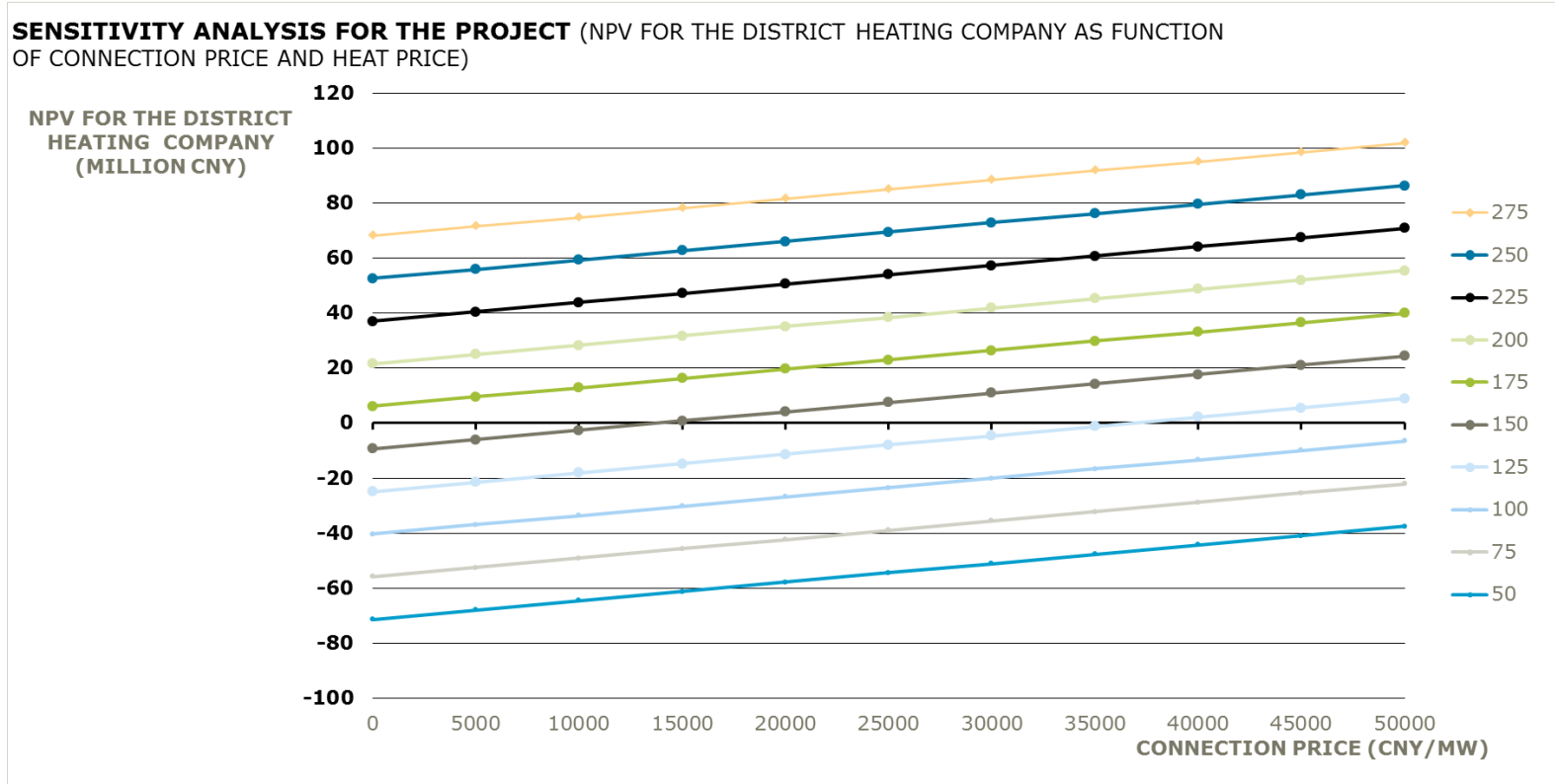
Results Yijun



Results Yijun

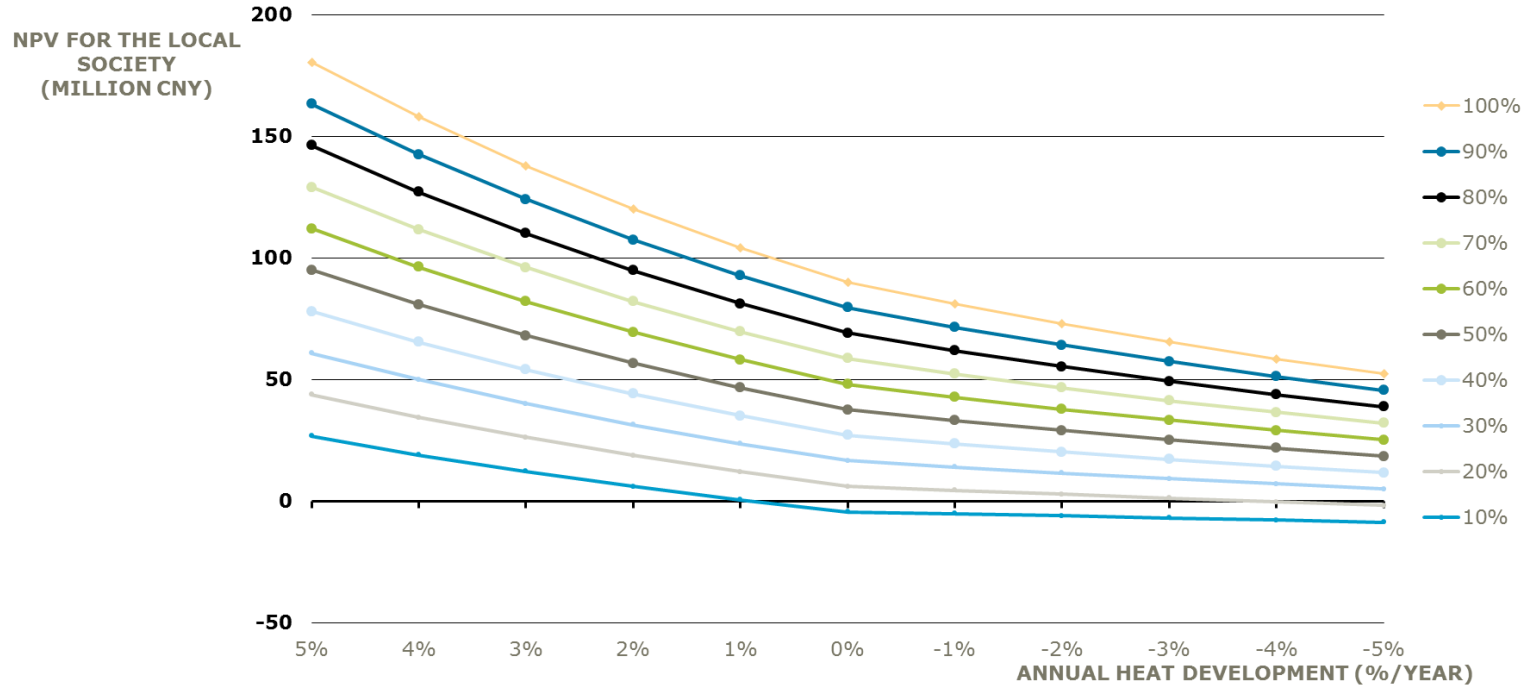


Results Yijun – Sensitivity analysis Sc.3B



Results Yijun – Sensitivity analysis Sc. 3B

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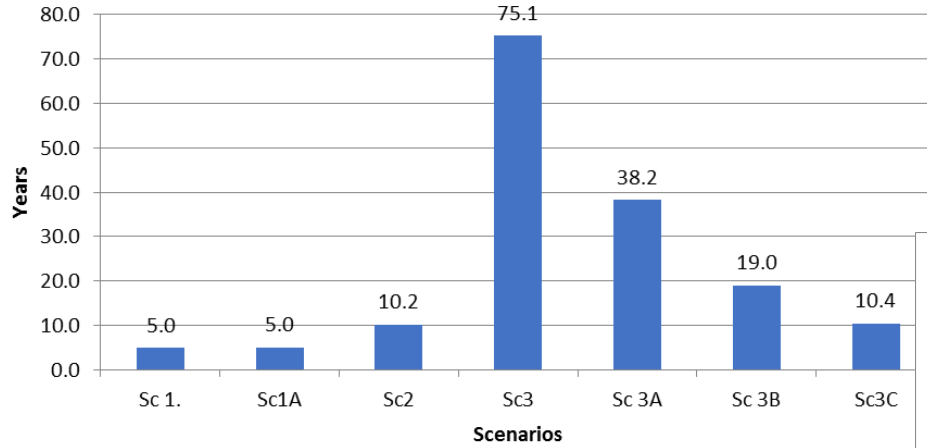
Scenarios Peng Zhen Zhen Qu

Solutions/scenarios	1	1A	2	3	3A	3B	3C
Biomass boiler	x	x	x				
Heat pump				x	x	x	x
Storage tank	x	x	x	x	x	x	x
Efficient district heating network		x			x	x	x
Investment subsidy							30%
Electricity price CNY				0.798	0.45	0.3	0.3

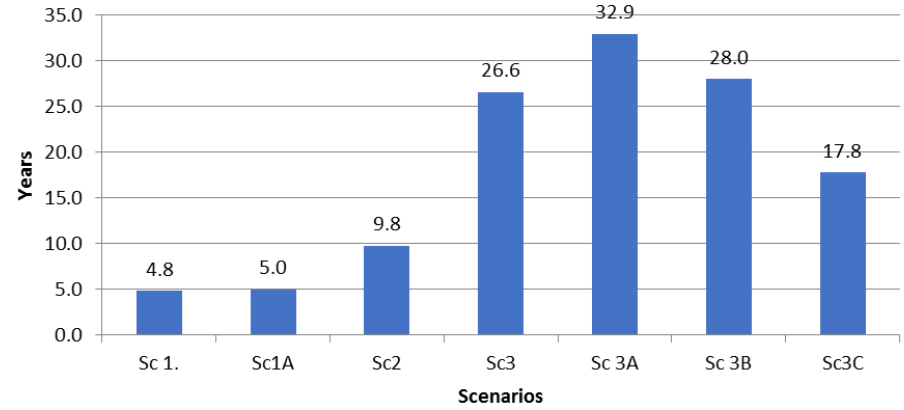
Reference in scenario 2 is coal instead of Natural gas. Scenario 2 same as scenario 1

Results Peng Zhen Zhen Qu

Simple pay-back

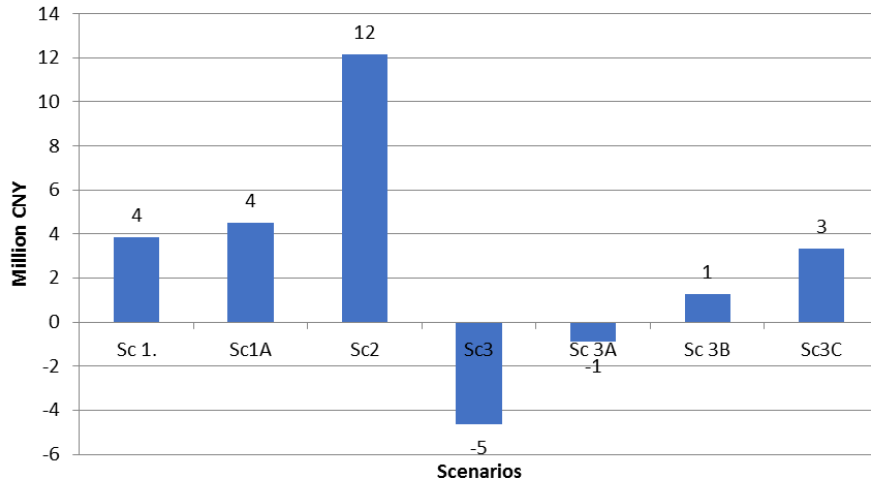


Simple pay-back

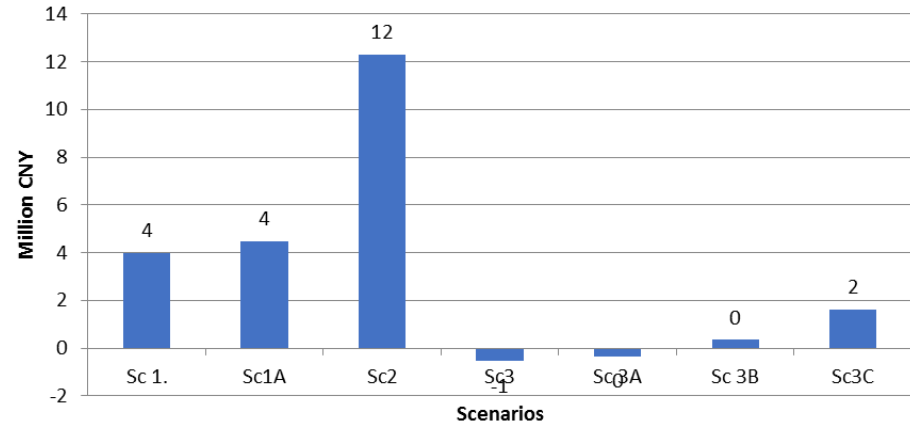


Results Peng Zhen Zhen Qu

Socio economic: NPV (project minus reference)



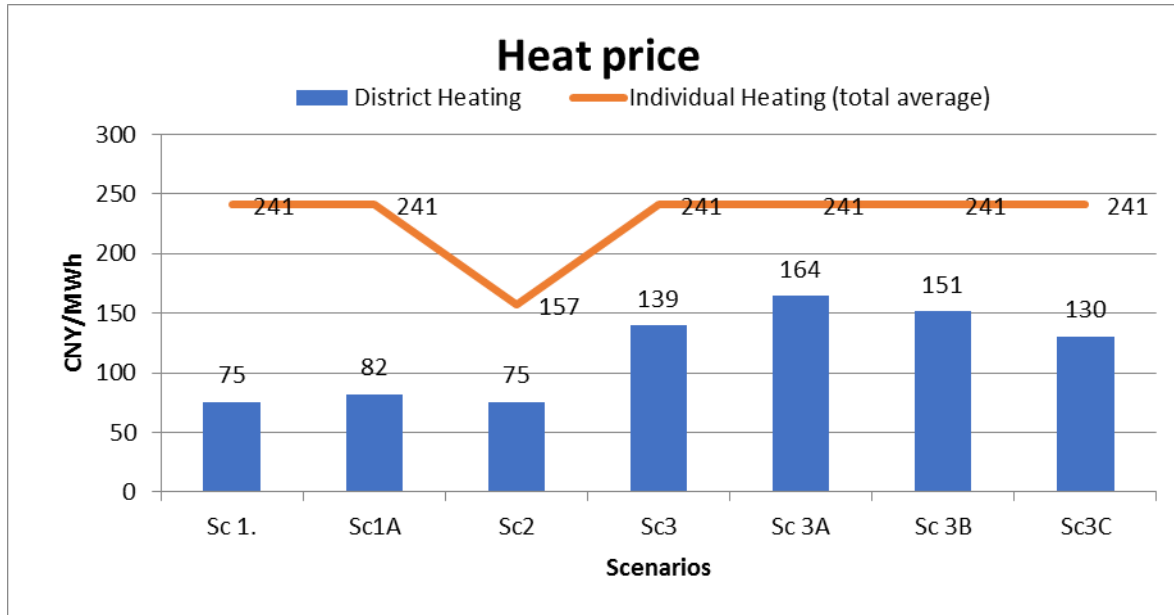
NPV Socio economic



The very high scenario 2 is by replacement of coal

NECC

Results Peng Zhen Zhen Qu



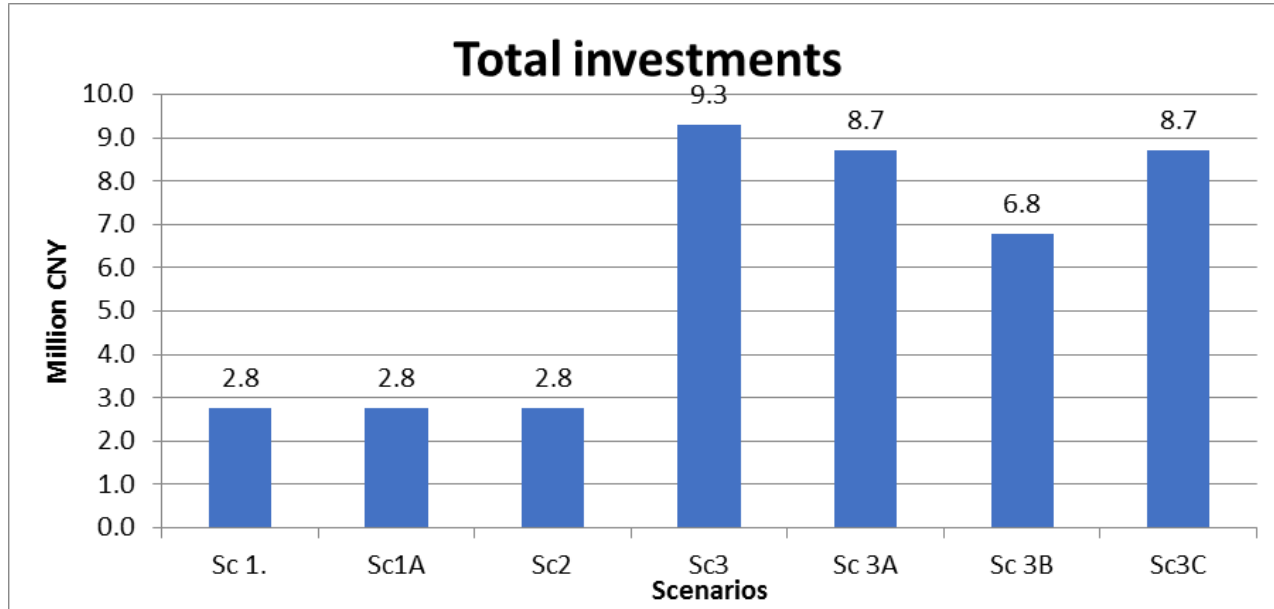
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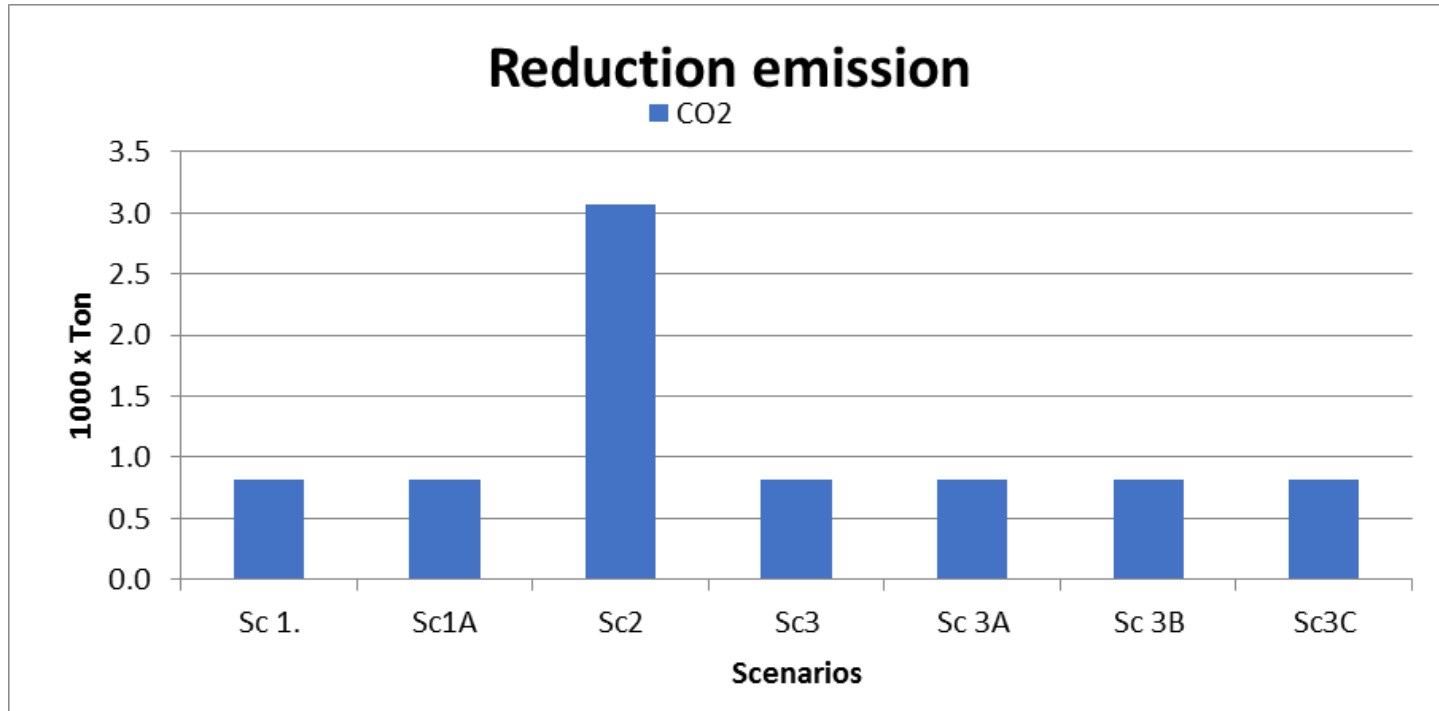
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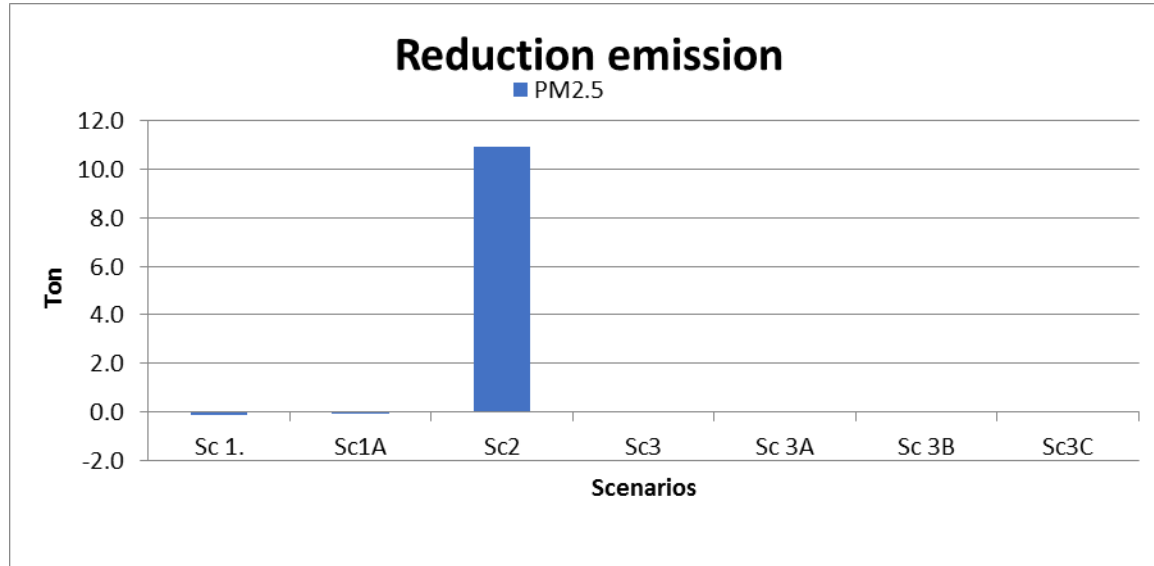
Results Peng Zhen Zhen Qu



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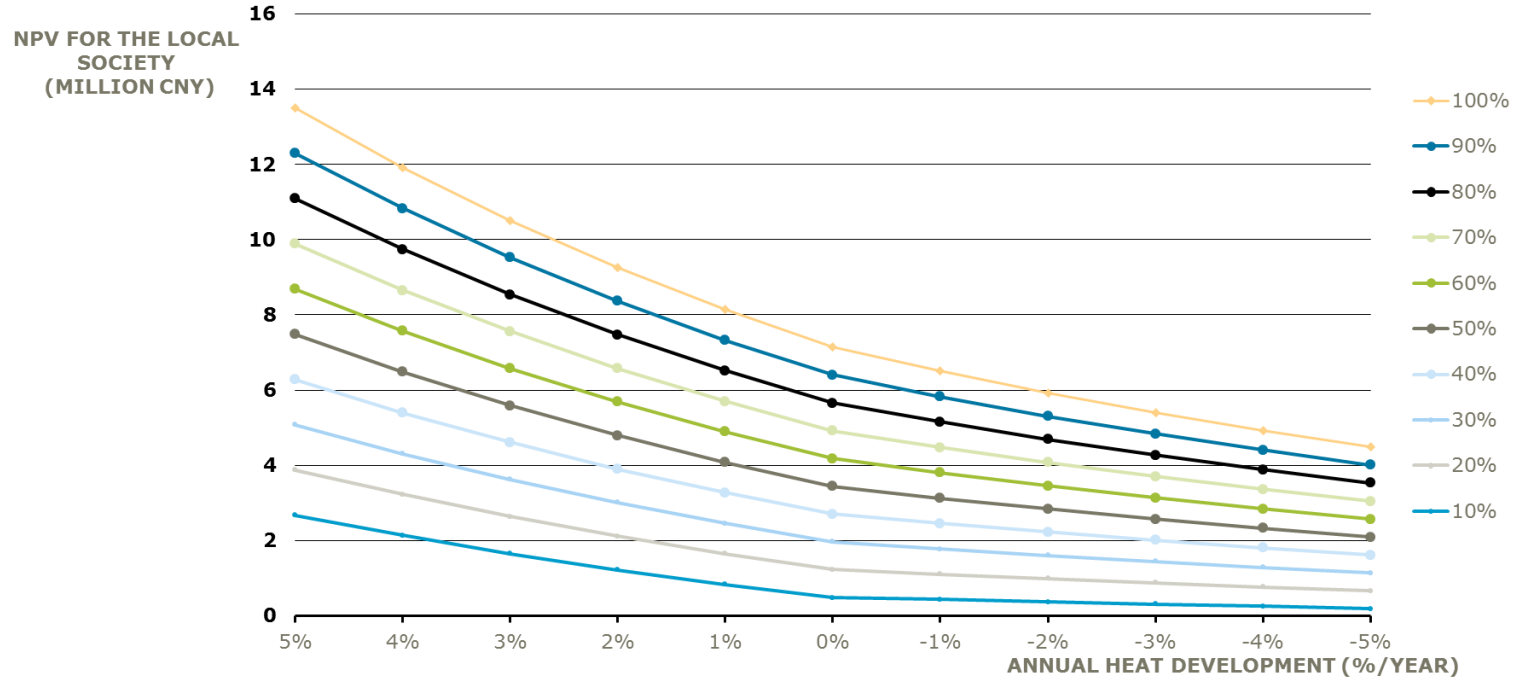
Results Peng Zhen Zhen Qu



Dust reduction high when replacing coal

Results Peng Zhen Zhen Qu

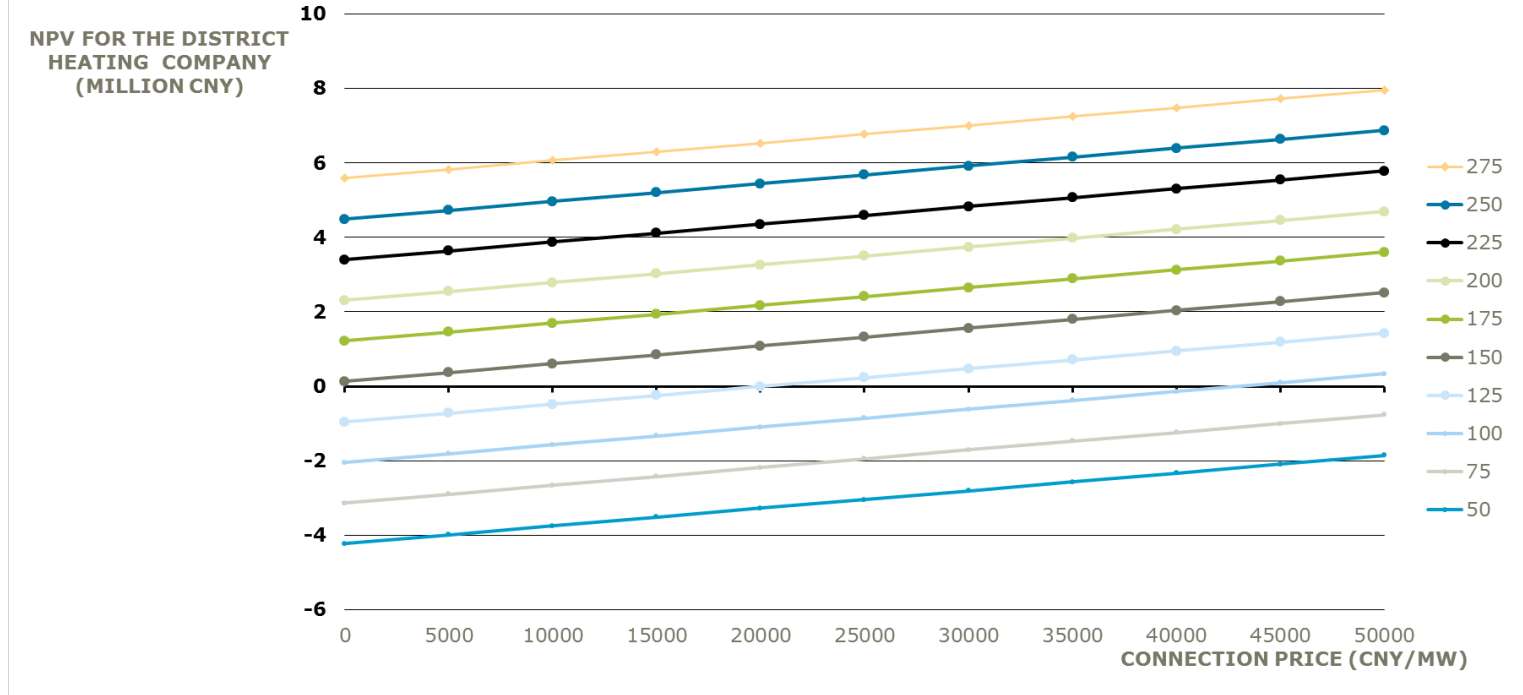
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Results Peng Zhen Zhen Qu

Sensitivity analysis Sc 1A

SENSITIVITY ANALYSIS FOR THE PROJECT (NPV FOR THE DISTRICT HEATING COMPANY AS FUNCTION OF CONNECTION PRICE AND HEAT PRICE)





Thank you!
谢谢

John Tang – DEA/NECC - +86 185 1895 7470 - jta@cnrec.org.cn