User Manual of ICET

1 Introduction

ICET (International Cost Estimate Tool) is a tool that can estimate the respective emission reductions and costs associated with future-year control strategies based on user-specified total emission reduction, and then generate emission control strategies. ICET tracks information about control measures, their costs, and the types of emissions sources to which they apply. The analysis results can provide decision support for policy-makers to work out better emission control strategies.

1.1 Evaluation Principle

ICET models the emission reductions by matching control measures to emission sources using algorithms such as "maximum emissions reduction", "least cost", and "apply measures in series". Control strategy results can be exported to CSV files or viewed in a graphical table that supports sorting, filtering, and plotting. ICET supports data transparency and provides a wide array of options for developing control strategies.

2 Installation Guide

2.1 Software requirements and Introduction

Minimum System Environment	
CPU	Intel, Duo-Core, 1.6GHz
Memory (RSM)	1G
Free Disk Space	2GB
Operation System	32-Bit,Window XP
Recommend System Environment	
CPU	Intel, Quad-Core, 3GHz
Memory (RSM)	2CB
Free Disk Space	10GB
Operation System	64-Bit,Windows 7

2.2 Installation

➢Double-click **ICET Setup.exe**. It will bring you to the **Prepare** Window (Fig. 1)

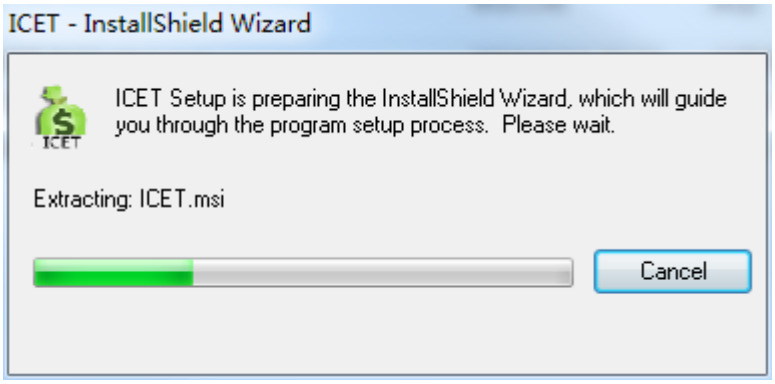

Fig. 1 Preparing Installation

➢In Welcome Window (Fig. 2), click **Next** to **Destination Folder** window (Fig. 3). By default, ICET will be installed under **C:\Program Files(X86**). If you want to save the software to another directory, please click **Change…** button to change current destination folder. Then click Next button, and enter the next window.

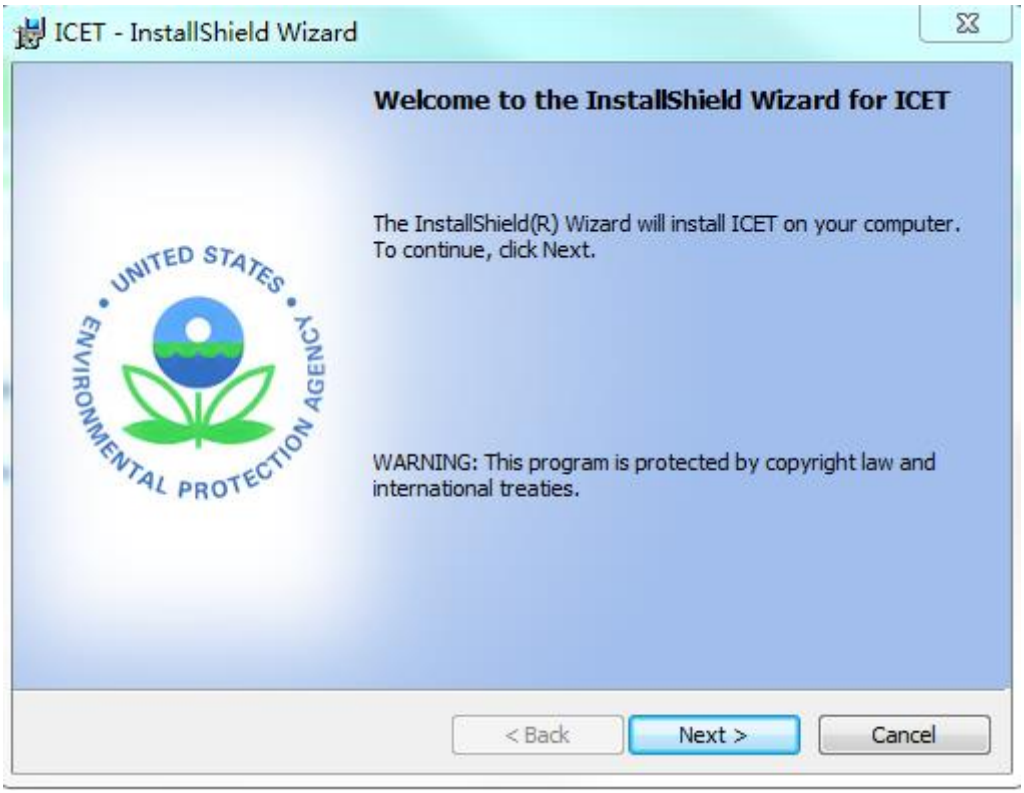

Fig. 2 Welcome Window

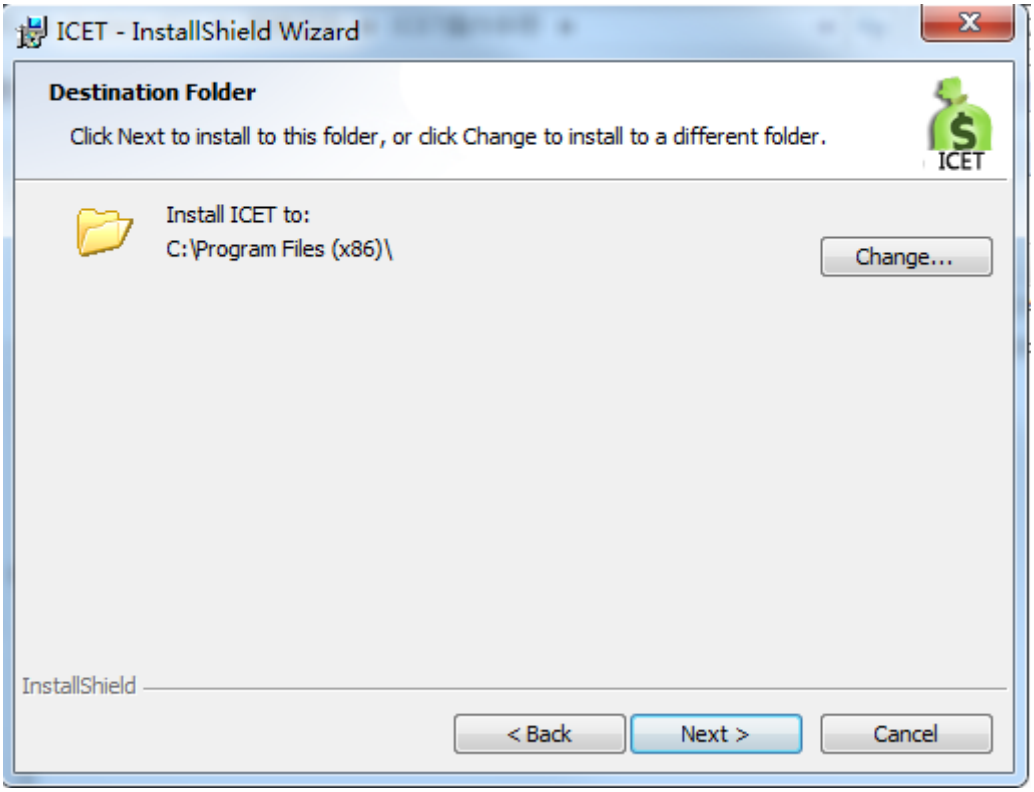

Fig. 3 Destination Folder

➢Click **Install** button (Fig. 4) to begin the installation .

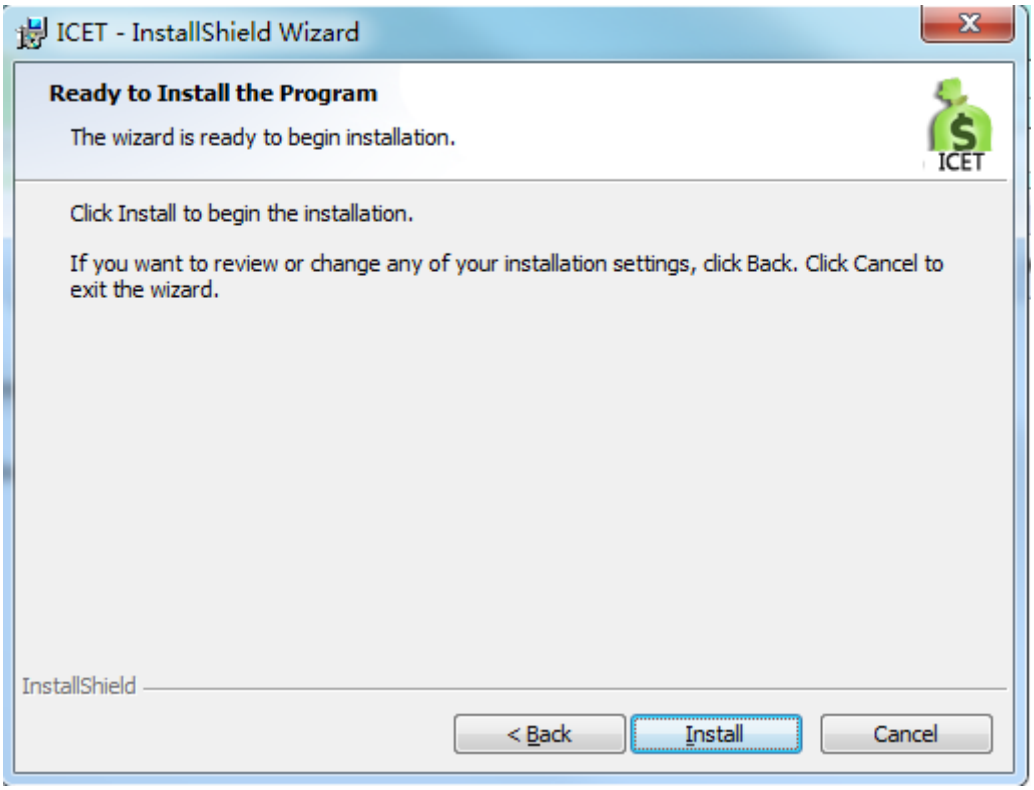

Fig. 4 Ready to Installation

➢Click **Finish** button (Fig. 5) to complete the installation.

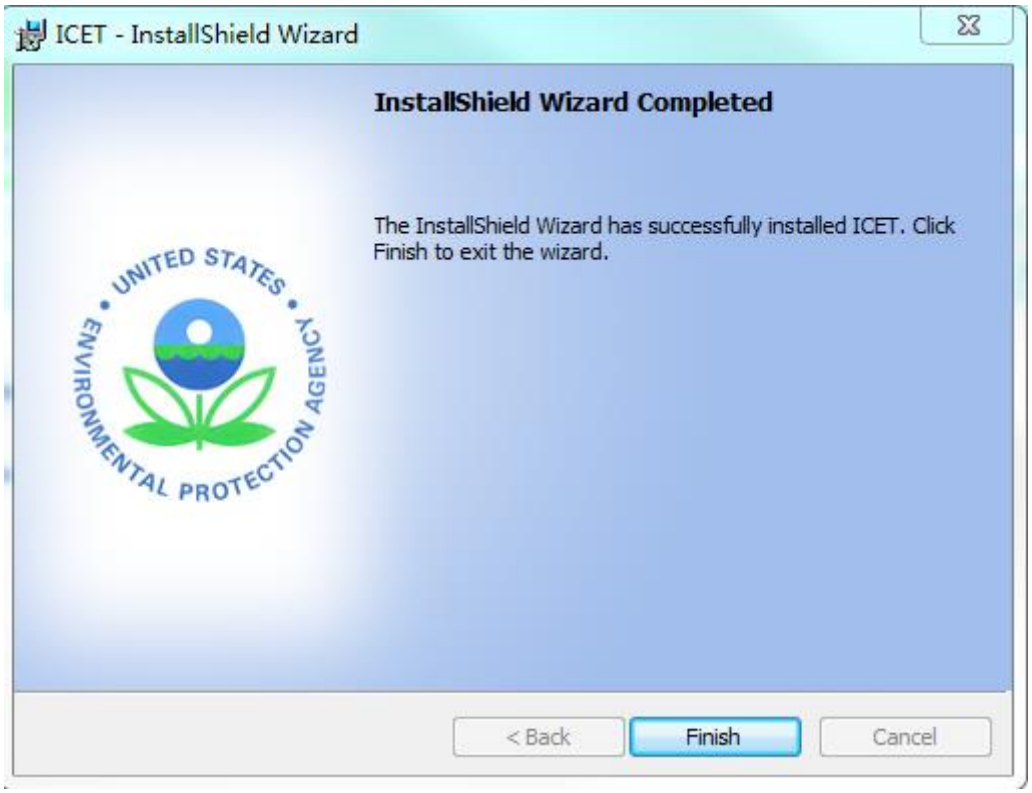

Fig. 5 Installation is complete

2.3 Uninstallation

➢Select the **Uninstall ICET** item under **Start→ All Programs →ICET** to remove **ICET** from your computer.

3 Main Interface

The main interface of ICET is shown in the following figure.

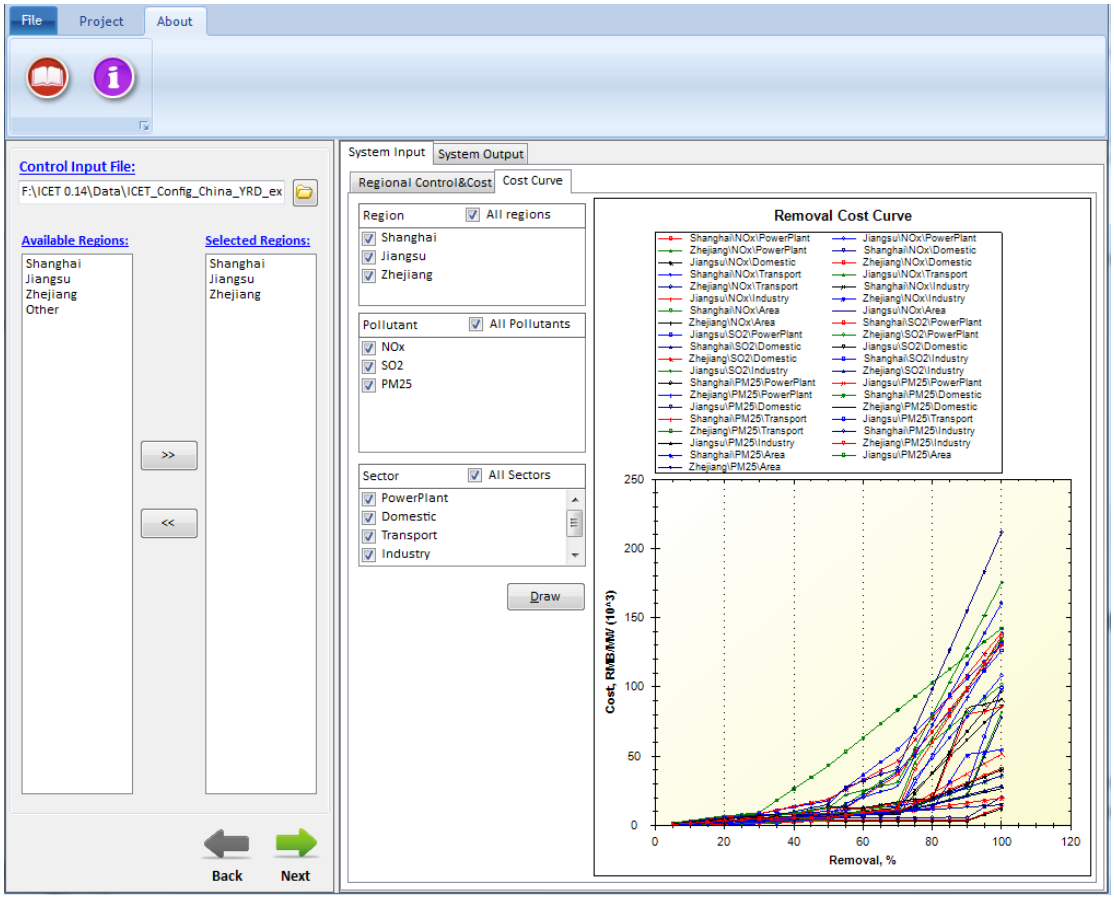

Fig. 6 Main Interface

➢Click **File** button or **Project** button on the toolbar of the main interface, there are three options that users can choose.

1) Go to file, click **Open Projec**t button, locate the *.proj file and open it.
2) Click **New Project** button to create a new project.
3) Click **Save Project** button to save a created project.

3.1 Control Input File

On the upper-left of the main interface (Fig. 6) , there is a **control input file** option that users can choose. It contains the different pollutant's control cost of different sectors in different regions as shown in Fig. 7.

Region/Sector/Pollutant Control Setup & Input:					Control Cost Setup & Input:					
	Currency	RMB	Emissions	Ton						
Available	Control_R	Control_S	Control_P	Control(%)	Region	Sector	Pollutant	Current_E	Cost_Esti	Cost_Unit($/ton)
Shanghai	Shanghai	PowerPlar	NOx	64.9	Shanghai	Power Pla	NOx	157215	5	1363.691
Jiangsu		PowerPlar	SO2	23		Power Pla	NOx	157215	10	2727.382
Zhejiang		PowerPlar	PM25	10		Power Pla	NOx	157215	15	4091.074
Other		Domestic	NOx	75.5		Power Pla	NOx	157215	20	5454.765
		Domestic	SO2	56.1		Power Pla	NOx	157215	25	6818.456
		Domestic	PM25	35		Power Pla	NOx	157215	30	8182.147
		Transport	NOx	82.2		Power Pla	NOx	157215	35	8470.084
		Transport	SO2	56.1		Power Pla	NOx	157215	40	8758.02
		Transport	PM25	77.6		Power Pla	NOx	157215	45	9045.956
		Industry	NOx	75.5		Power Pla	NOx	157215	50	9333.892
		Industry	SO2	56.1		Power Pla	NOx	157215	55	12351.54
		Industry	PM25	35		Power Pla	NOx	157215	60	15369.18
		Area	NOx	82.2		Power Pla	NOx	157215	65	18386.83
		Area	SO2	56.1		Power Pla	NOx	157215	70	21404.47
		Area	PM25	77.6		Power Pla	NOx	157215	75	40584.51
	Jiangsu	PowerPlar	NOx	75.9		Power Pla	NOx	157215	80	59764.55
		PowerPlar	SO2	58.4		Power Pla	NOx	157215	85	78944.58
		PowerPlar	PM25	78.4		Power Pla	NOx	157215	90	98124.62
		Domestic	NOx	69.5		Power Pla	NOx	157215	95	117304.7
		Domestic	SO2	74.5		Power Pla	SO2	86731	5	334.228
		Domestic	PM25	73.5		Power Pla	SO2	86731	10	668.4561
		Transport	NOx	75.7		Power Pla	SO2	86731	15	1002.684
		Transport	SO2	74.5		Power Pla	SO2	86731	20	1336.912
		Transport	PM25	86		Power Pla	SO2	86731	25	1671.14
		Industry	NOx	69.5		Power Pla	SO2	86731	30	2005.368
		Industry	SO2	74.5		Power Pla	SO2	86731	35	2561.809
		Industry	PM25	73.5		Power Pla	SO2	86731	40	3118.249
		Area	NOx	75.7		Power Pla	SO2	86731	45	3674.689
		Area	SO2	74.5		Power Pla	SO2	86731	50	4231.13
		Area	PM25	86		Power Pla	SO2	86731	55	12379.14

Fig. 7 Control Input File

3.2 Available Regions and Selected Regions

After open an Control Input File, users can extract the regions from the **Available Regions** column to the **Selected Regions** column on the bottom left of the main interface (Fig. 6) according to their own requirements.

3.3 Pollutant Control

In this module, it's mainly for users to set emission reduction ratio according to their own need to control pollutant as shown in Fig. 8.

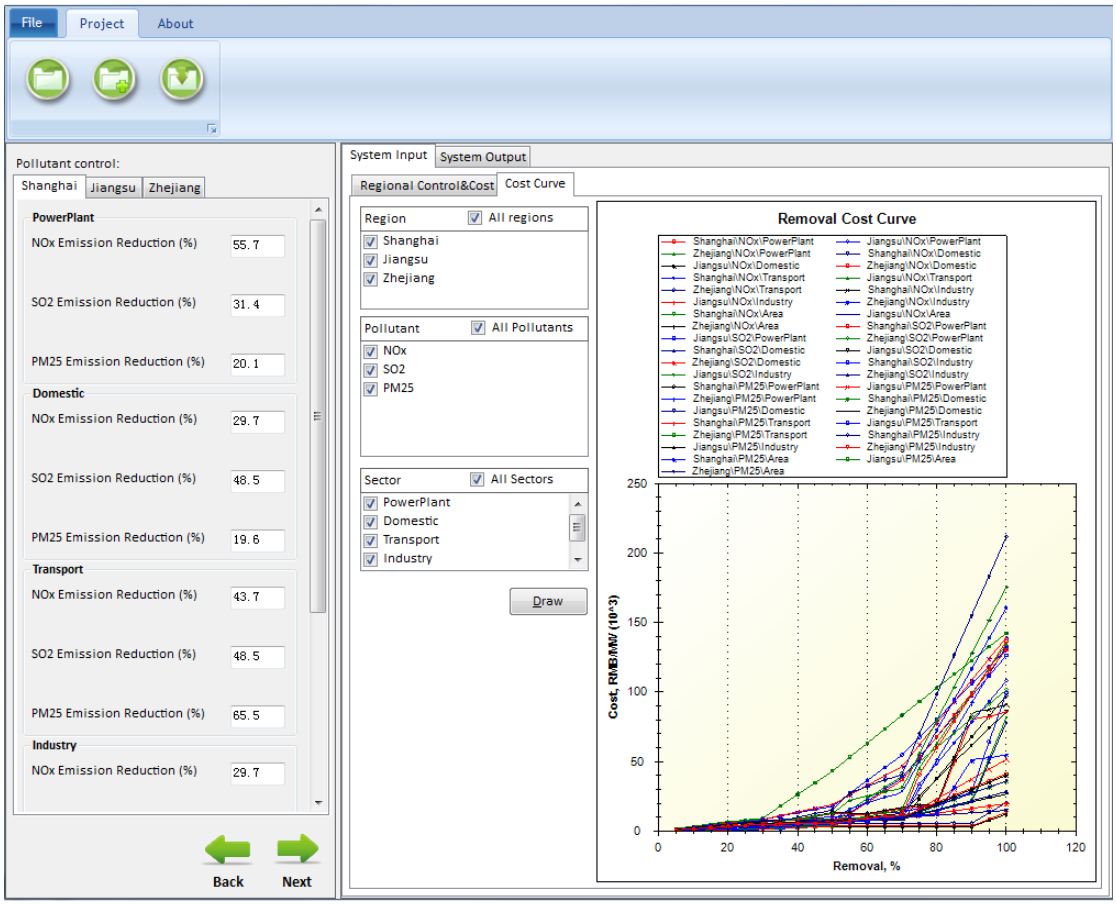

Fig. 8 Pollutant Control

4 System Input

ICET clearly define input files. Click **System Input** button, then users can see the input files, it contains two aspects: **Regional control & Cost** and **Cost Curve**.

➢Fig. 9 lists **Current Emission**, **Cost Estimate** and **Cost Unit** of different pollutants in the selected regions.

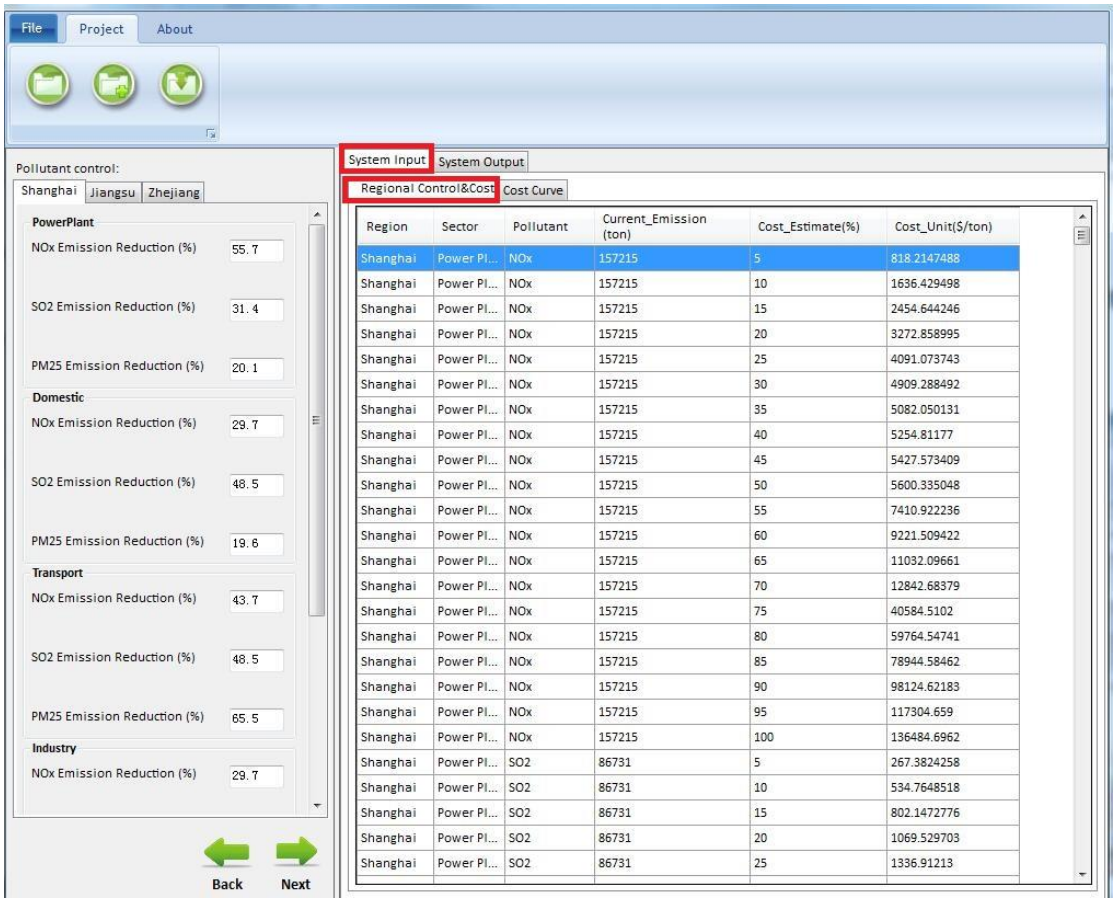

Fig. 9 Regional Control & Cost

➢Fig. 10 displays **Cost Curve** of different emission removal ratio in different regions, So we can compare the cost curve of different pollutants and sectors. It allows users to select one or multiples regions in the left side of the interface to draw the cost curve.

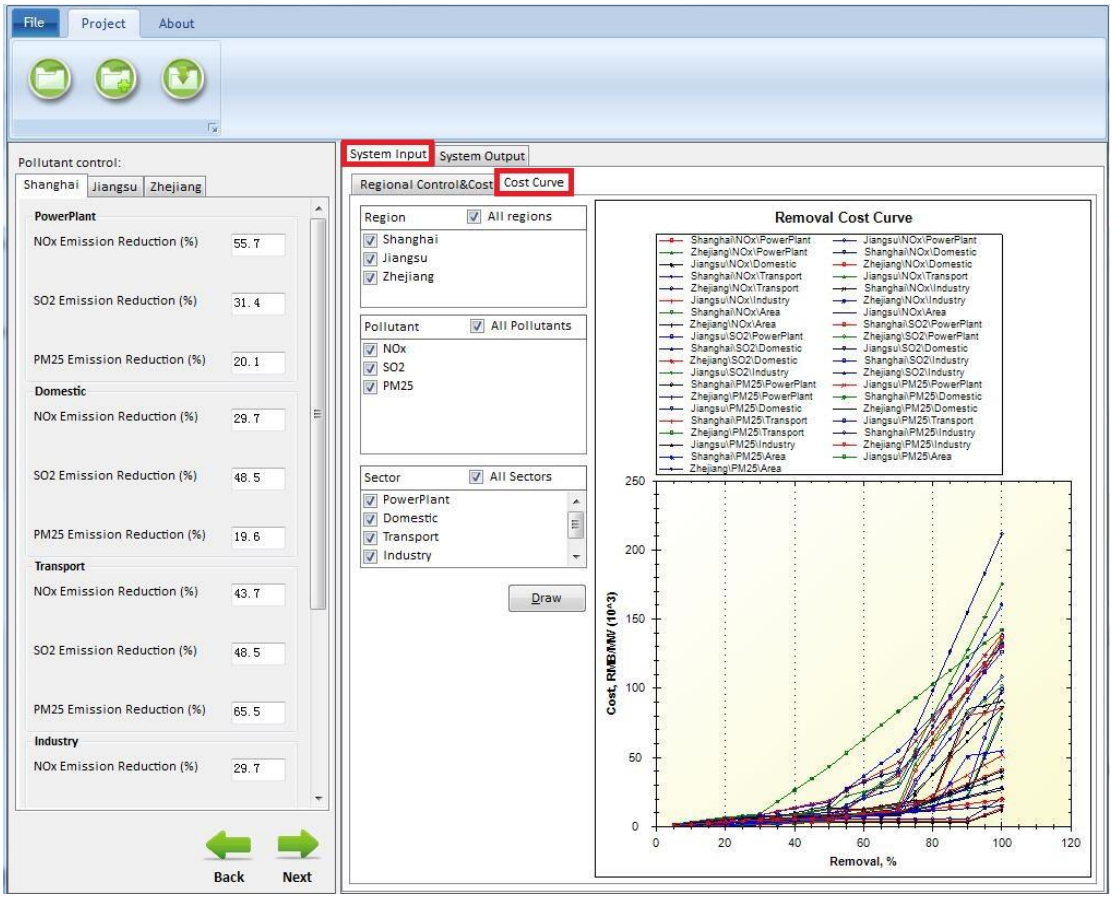

Fig. 10 Cost Curve

5 Case study in China

In order to better introduce how to use ICET, we will take a case study in China for example.

5.1 Create a new project

➢Click **File** or **Project** button, and choose **New Project** option to create a new project.

5.2 Set configuration file

➢Click the file button  which is in the upper-left of the main interface to select a Control Input File and open it.

➢Select one or more of the four options in the **Available Regions** column as shown in the Fig. 11, and then click button, the selected options will appear in the **Selected Regions** column which as shown in the following figure.(Fig. 12-Fig. 13)

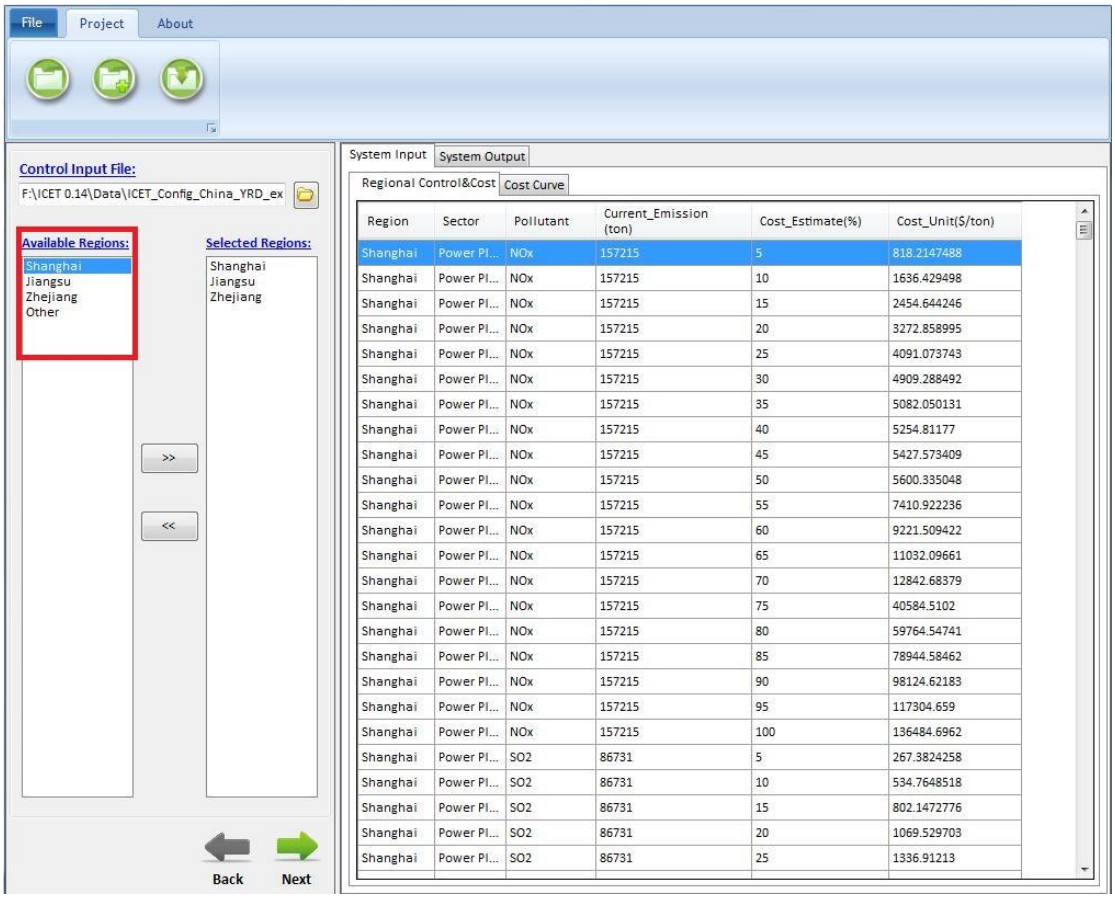

Fig. 11 Available Regions

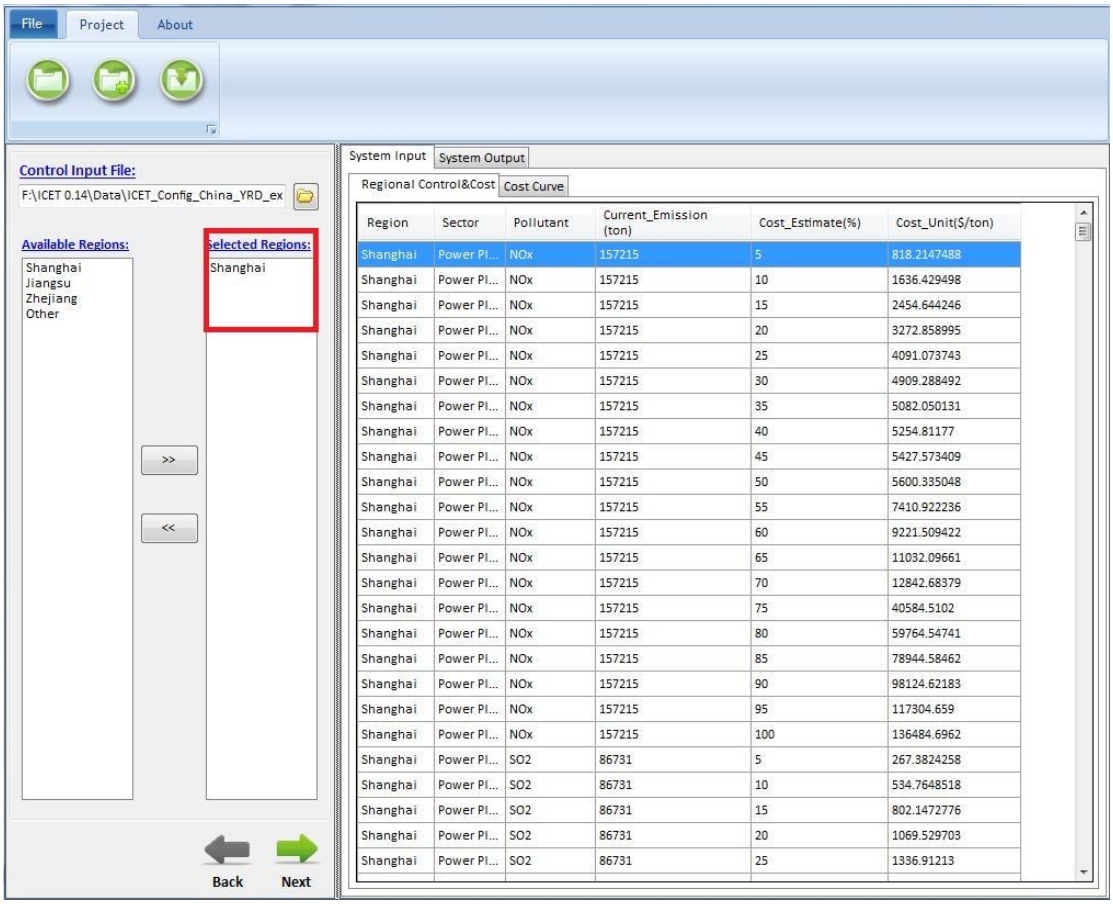

Fig. 12 Selected Regions 1

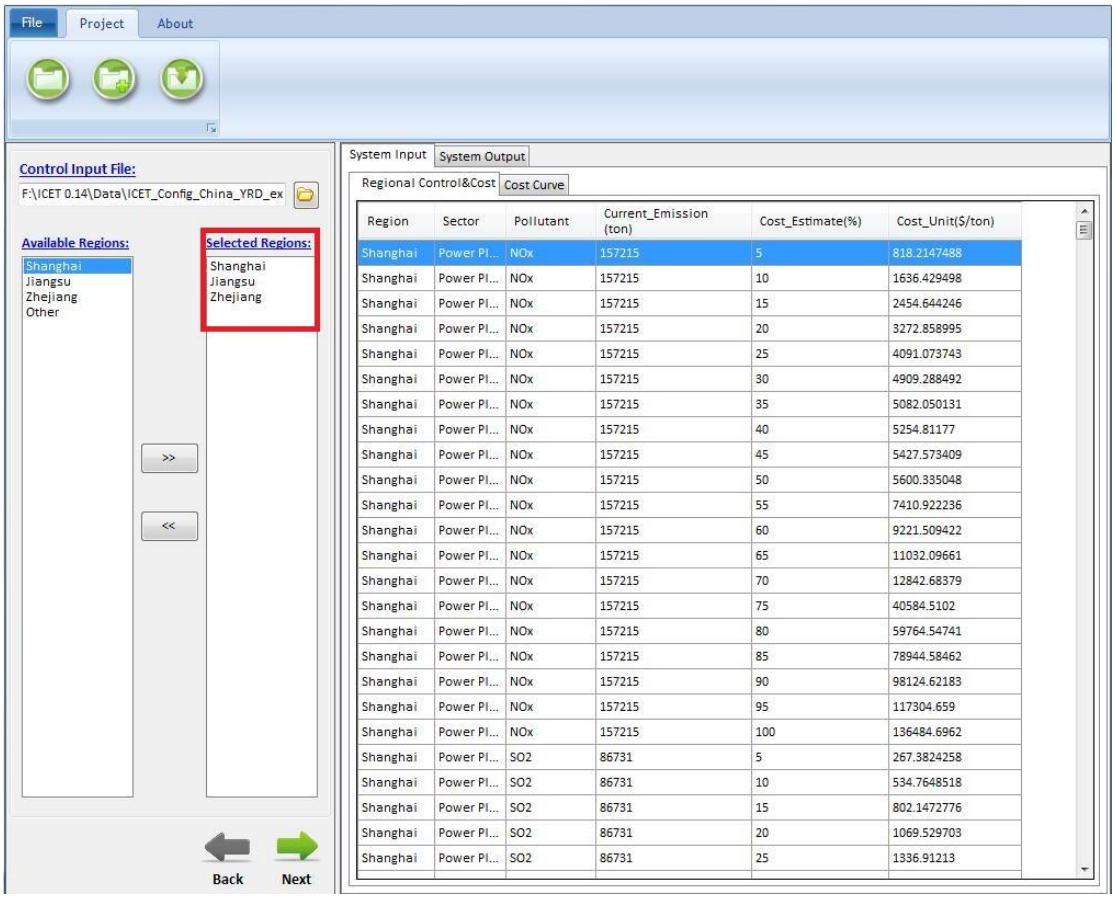

Fig. 13 Selected Regions 2

➢Click **next** button to enter the interface of **Pollutant Control** .

➢Choose one region in the **Selected Regions** column and set emission reduction ratio of different sectors for the selected region.

➢Click **Run** button and Fig. 14 will appear ,choose **yes** to run the program.

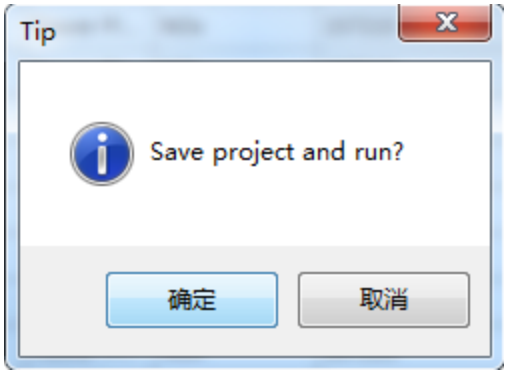

Fig. 14 Save project and run

5.3 View Result

The system will output four aspects information: **Summary Information**, **Regional Level**, **RSM Control Factor** and **Chart**. Below we will briefly introduce it.

5.3.1 Summary Information

➢**Summary Information** contains total removal cost, baseline emission and removal cost of each pollutant.

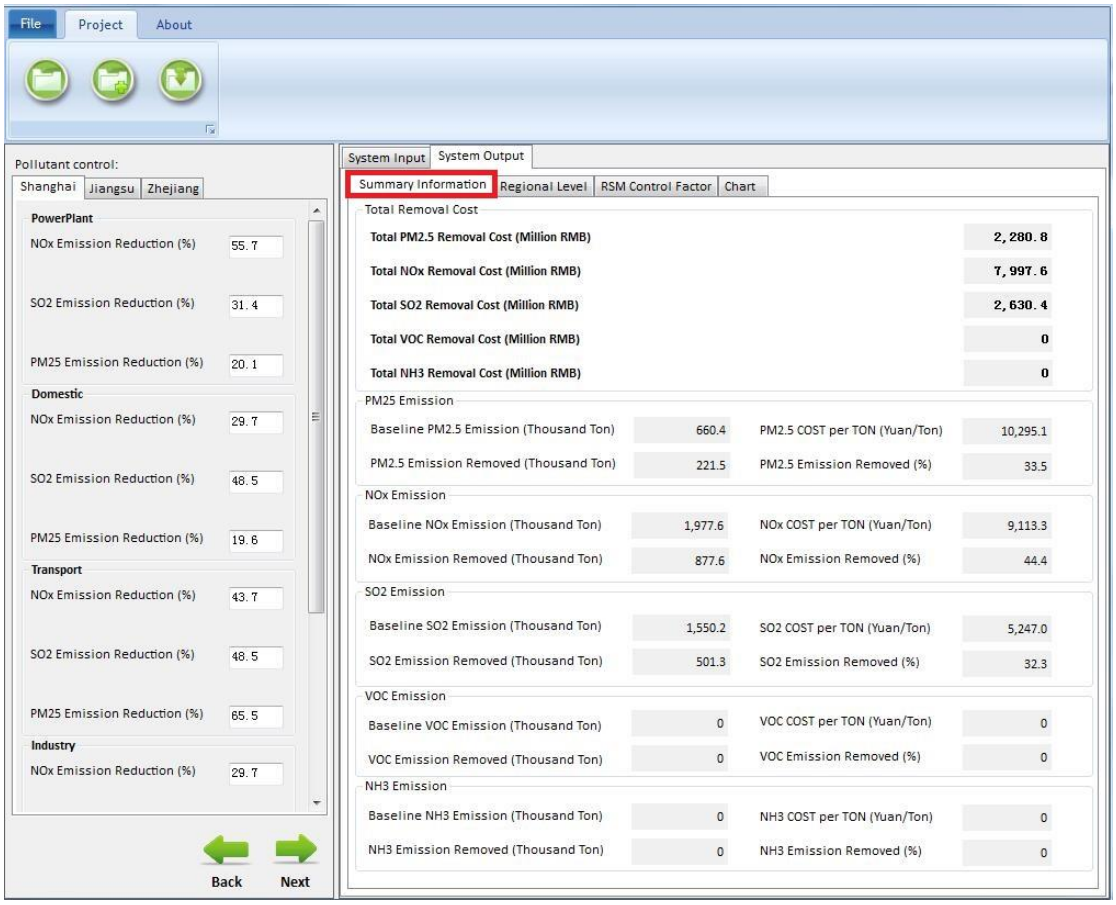

Fig. 15 Summary Information

5.3.2 Regional Level

➢The result of **regional level** are listed in the following table, it summarizes baseline emission, control cost, removed emission and remained emission of selected regions.

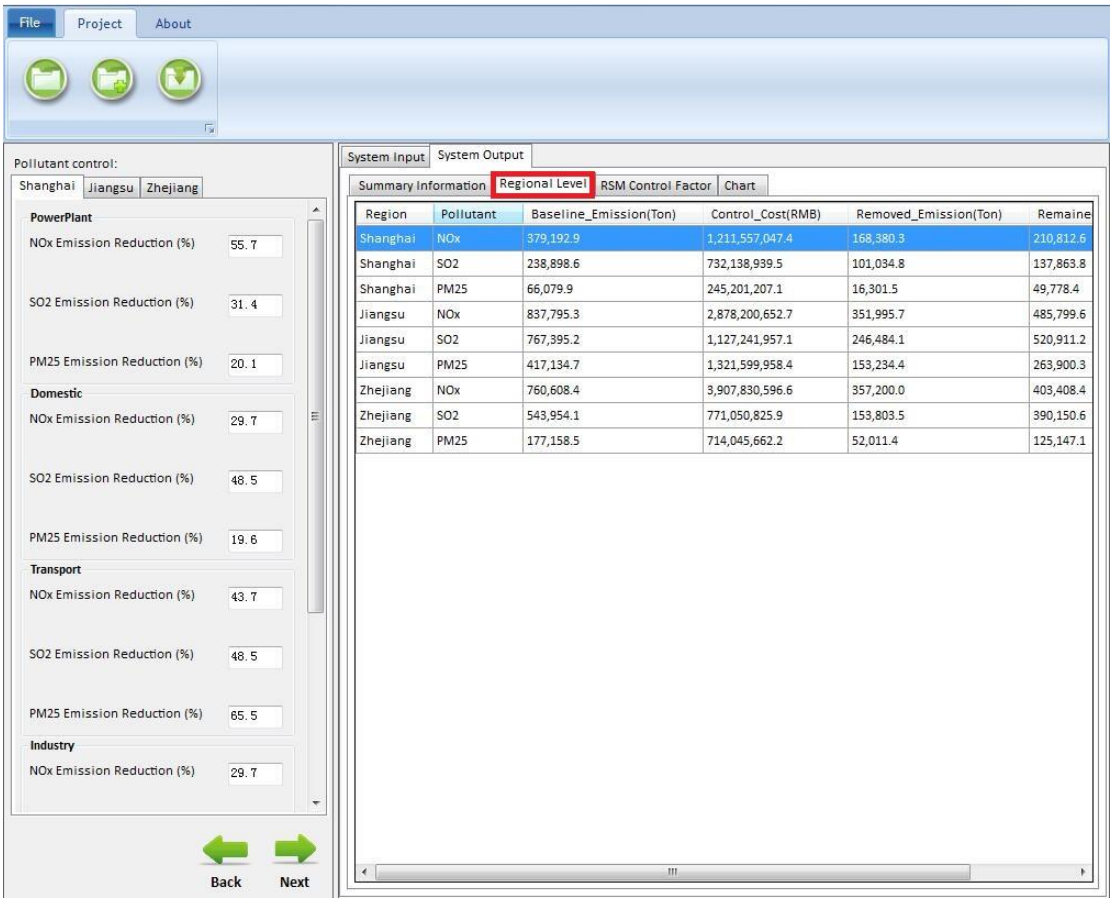

Fig. 16 Regional Level

5.3.3 Emission Factor

➢Each **emission factor** of selected regions are listed in the below table, users can click **Output RSM Control Factors** button to export the current results for further study.

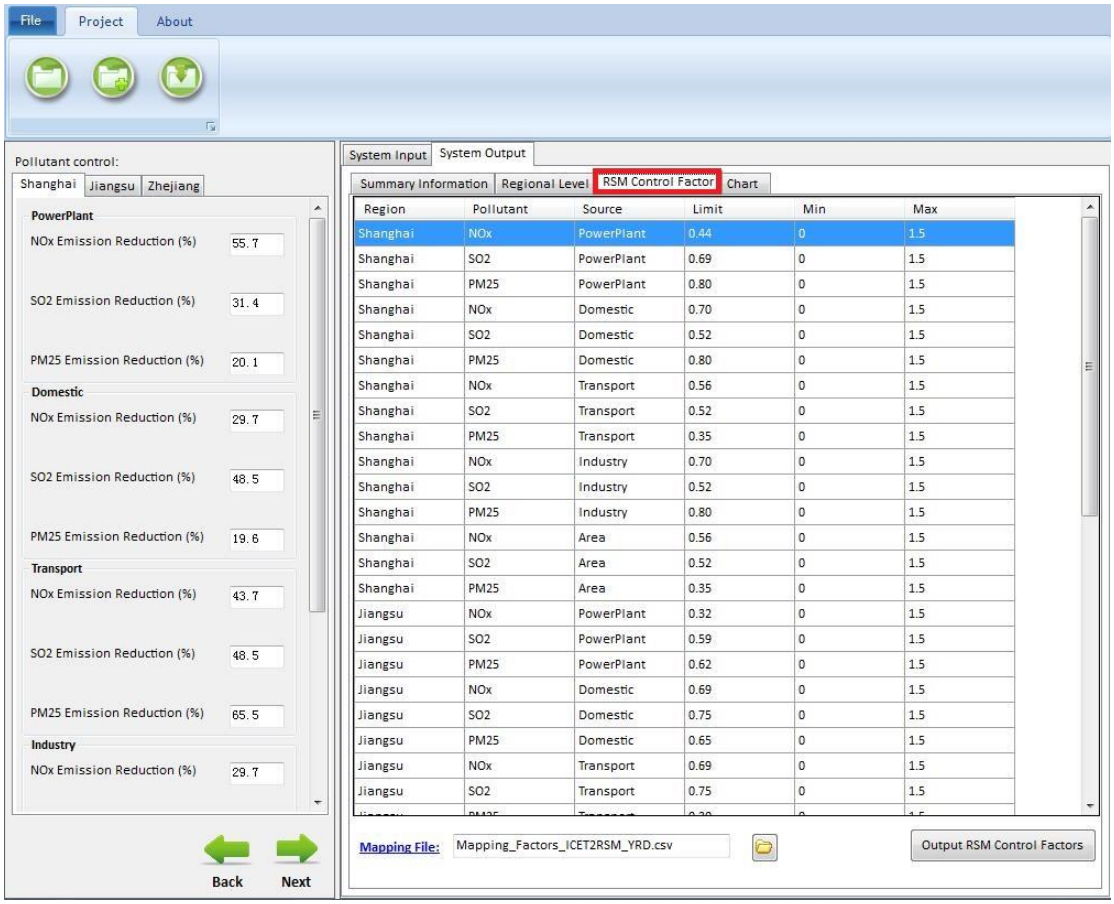

Fig. 17 RSM Control Factor

In the following figure (Fig. 18), we can see a mapping factors file that marked in a red square, the details of the file is displayed in Fig. 19. This file is used to link the Region, Pollutant, Source in ICET with RSM. For example, **Shanghai** was used in ICET while RSM used **SH** instead. To correspond with RSM, the file that defines the relationship between ICET and RSM is need.

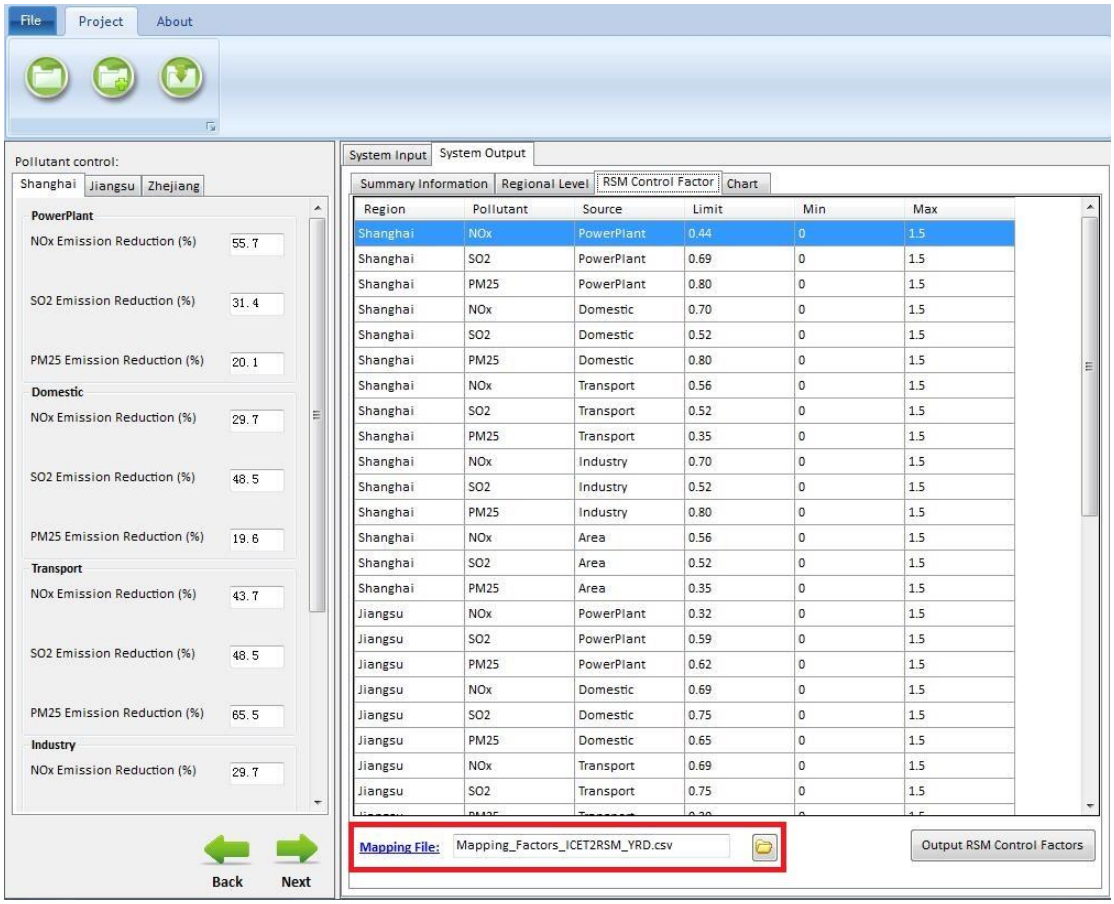

Fig. 18 Mapping Factors

A	B	C	D	E	F	G
Cost_Regi	RSM_Regic	Cost_Sect	RSM_Sectc	Cost_Poll	RSM_Pollutant	
Shanghai	SH	Power Pla	PP	NOx	NOx	
Jiangsu	JS	Industry	IN&DO	PM25	PM25	
Zhejiang	ZJ	Domestic	IN&DO	SO2	SO2	
Other	OTH	Transport	TR	NH3	NH3	
		Area	TR	VOC	VOC	
				PMC	PMC	

Fig. 19 Mapping Factors

5.3.4 Cost Curve

➢From Fig. 20, we can see emissions comparison of different pollutants between baseline and control .

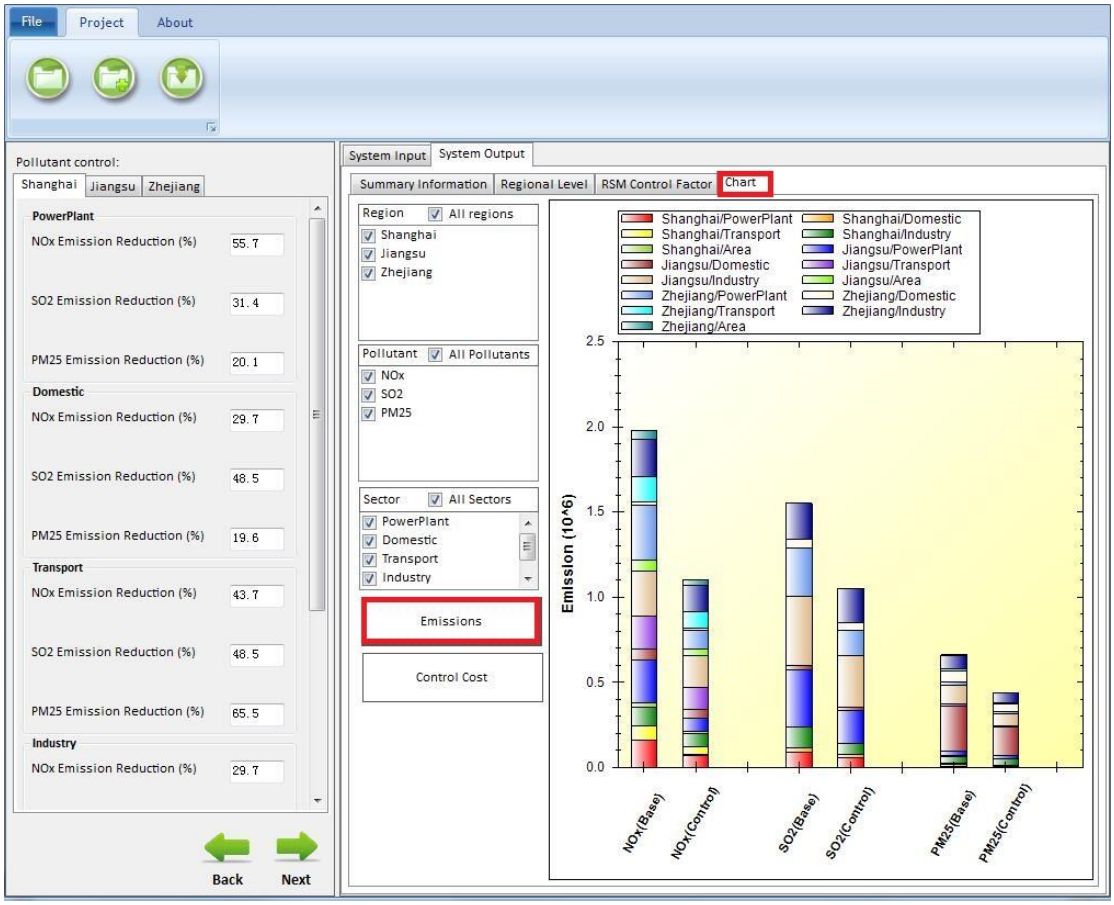

Fig. 20 Chart of Emission

➢Fig. 21 displays control cost comparison of different regions in different pollutants.

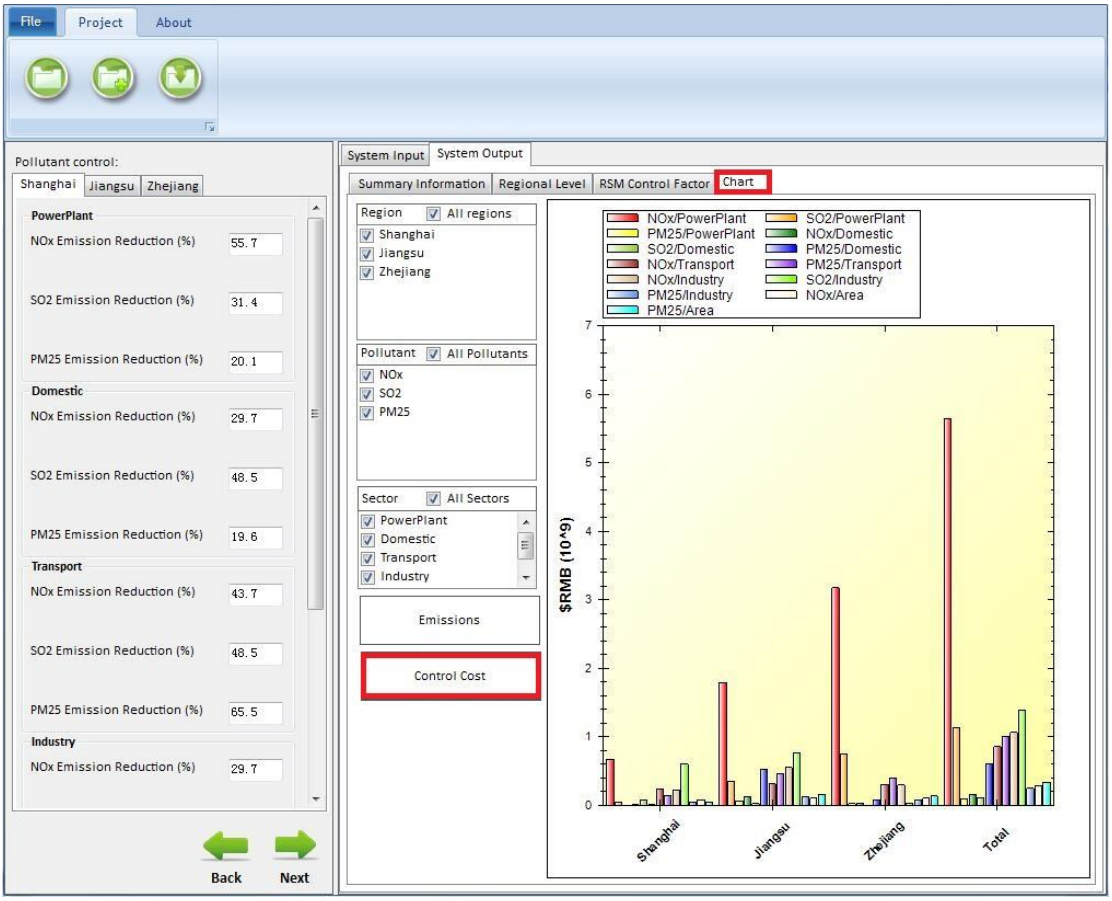

Fig. 21 Chart of Control Cost