

ANALYTICAL TOOLS FOR LOW CARBON DEVELOPMENT PLANNING



Agenda

- Overview
- **META** | Help countries choose electricity supply options
- **EFFECT** | Build development scenarios and forecast their impact on GHG emissions
- **MACTool** | Identify the marginal abatement costs associated with each scenario
- **TRACE** | Assess energy efficiency opportunities at the city-level

Why Low Carbon Development Planning?

Strong demand from countries

- Accessing energy
- Accessing finance
- Reducing energy costs
- Improving energy security
- Participating/creating carbon markets
- Developing industrial advantage



ESMAP's LCD Planning Tools

META | EFFECT | MACTool | TRACE

- ESMAP is building upon its LCD work:
 - ESMAP Mandate – help developing countries “*achieve environmentally sustainable energy solutions for poverty reduction and economic growth*”
 - Completed or ongoing low carbon development work in 18 countries
- Countries need LCD analytical tools:
 - LCD work is often complex involving many variables over time
 - Focus on low carbon in development is not a well-trodden path
 - Many countries lack capacity to perform the detailed analysis

Tools are Informing Policy and WB Lending

IMPLEMENTED (OR ONGOING) IN 18 COUNTRIES SO FAR

Country	Tool Used
Bosnia and Herzegovina	TRACE
Brazil	TRACE, MACTool, EFFECT
China	EFFECT
Ethiopia	TRACE
Georgia	TRACE, EFFECT
Ghana	TRACE
India	EFFECT
Indonesia	TRACE
Kenya	TRACE
Kosovo	TRACE
Macedonia	TRACE, EFFECT, MACTool
Nigeria	EFFECT
Philippines	TRACE
Poland	EFFECT
Serbia	TRACE
Thailand	EFFECT
Turkey	TRACE
Vietnam	TRACE, EFFECT, MACTool

EXAMPLES OF IMPACT

EFFECT, India | Brought together disparate government departments. Highlighted the importance of two things: (1) regional transmission - Bank has loaned US\$2B towards those projects (2) hydropower - Bank is currently preparing studies for mobilizing US\$20B for hydropower projects

MACTool, Brazil | Government designing a domestic cap and trade program using MACTool for supply and demand analysis at different CO₂ price levels (with Partnership for Market Readiness)

TRACE, Turkey | Informed the creation of the Sustainable Cities pillar in the US\$4.45billion, 2012-2015 Country Partnership Strategy

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A convenient way to assess electricity supply technology options



Why META?

Strong demand from countries:

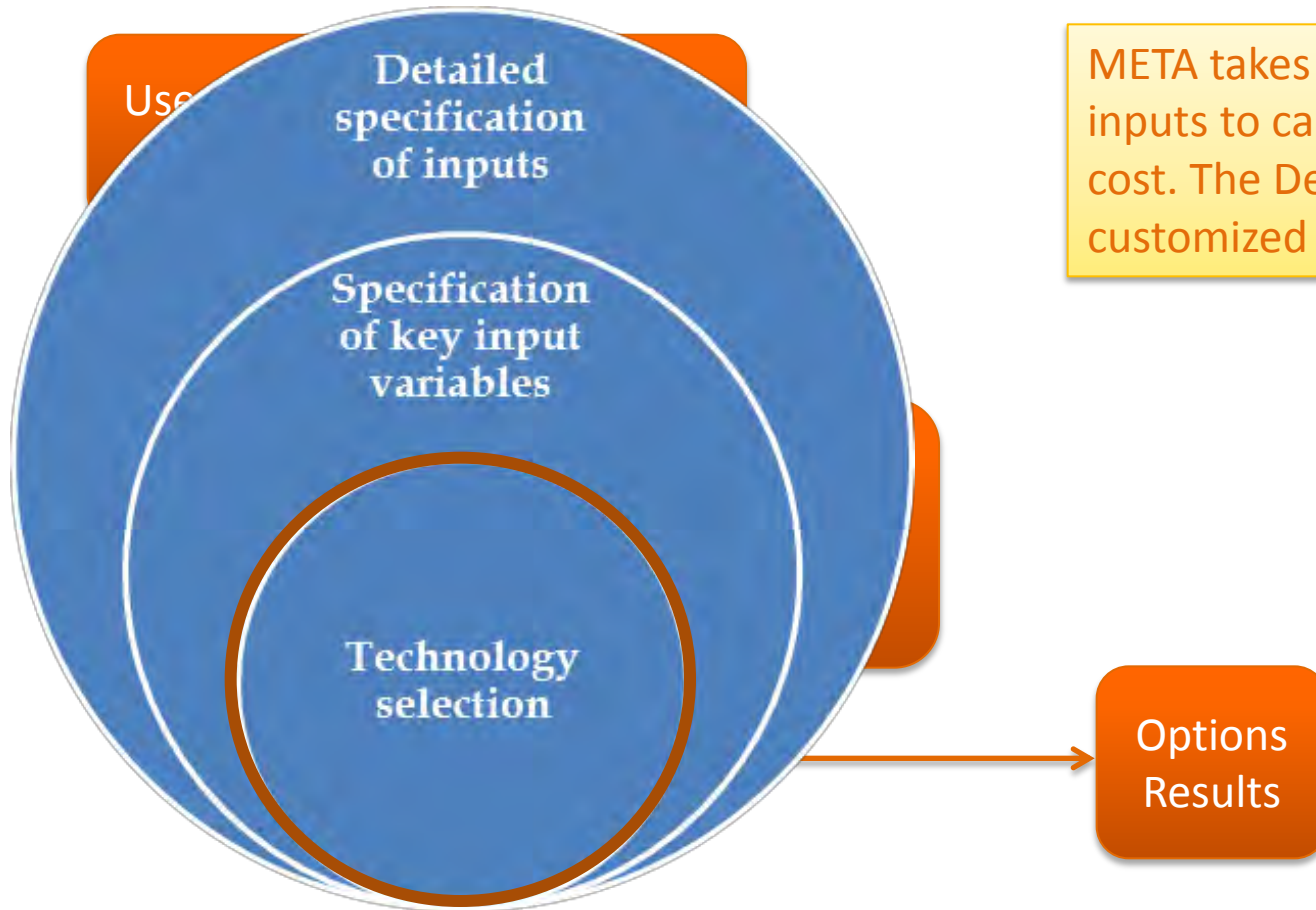
- To screen electricity supply options
- To assess electricity supply environmental externalities

Key advantages of META

- Focuses on particular projects, unlike other tools which look more at system-wide options for meeting a given level of demand
- Helps client countries evaluate various technology options at early stages of planning
- Factors in environmental externalities while calculating levelized costs



META | How it works



META takes user input and default inputs to calculate delivered energy cost. The Default Inputs can be customized for a specific country

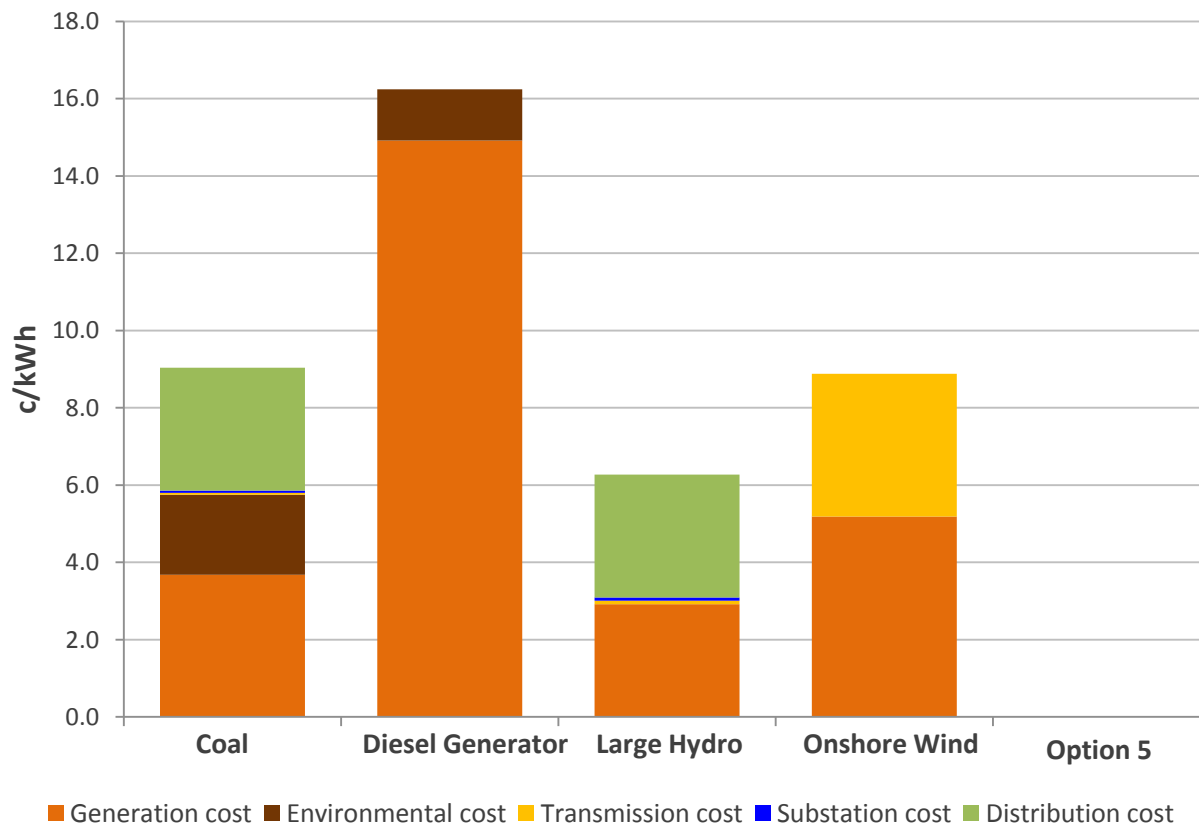
Different Levels of Use

Results | Delivered Energy Costs

META provides:

- Energy cost
- Transmission cost
- Substation cost
- Environment cost

Comparison of delivered energy costs

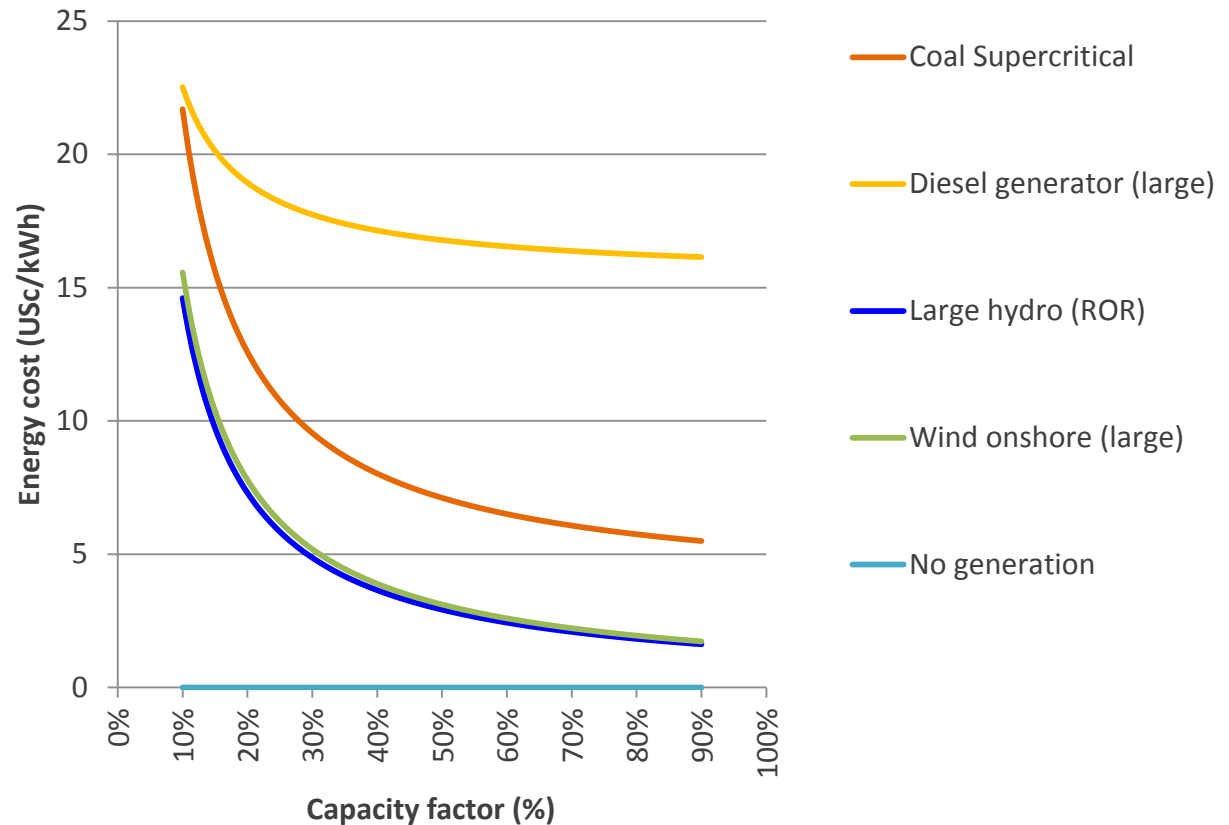


Assumed CO2 price = US\$23/tCO2e

Results | Screening Curves

Screening Curves allows the user to analyze the variation in cost as the capacity factor changes.

Screening curves for technology options



META is Customizable by Country

Default values are derived from the following countries:

- US - default values for developed countries
- Romania - default values for middle-income countries
- India - default values for developing countries

Default values can be changed easily to match local conditions: E.G.

- Unit capital and O&M cost
- Interest during construction
- Fuel heating value
- Emission factors
- Projected fuel prices
- Transmission losses
- Transmission peak load
- Distribution losses
- Operation and maintenance



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EFFECT

Energy Forecasting Framework
and Emissions Consensus Tool

**An Open Tool for Building Low Carbon
Development Scenarios and Forecasting
GHG Emissions**



Why EFFECT?

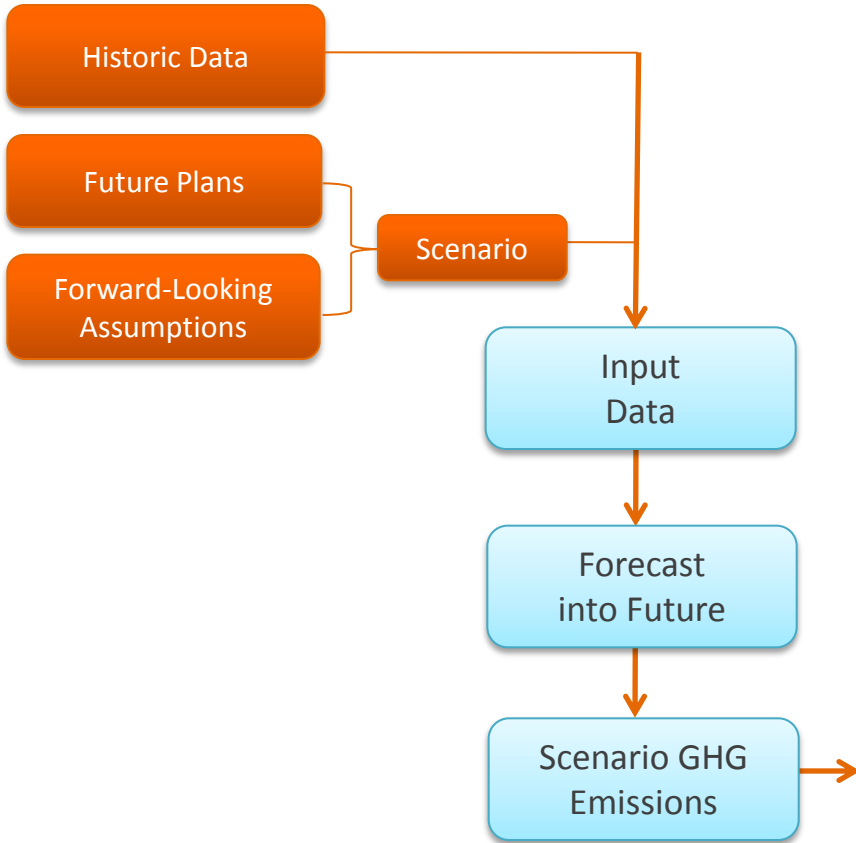
Strong Demand from Countries:

- Building LCD scenarios consistent across sectors
- Forecasting GHG emissions
- Improving access to climate change finance
- Developing industrial advantage

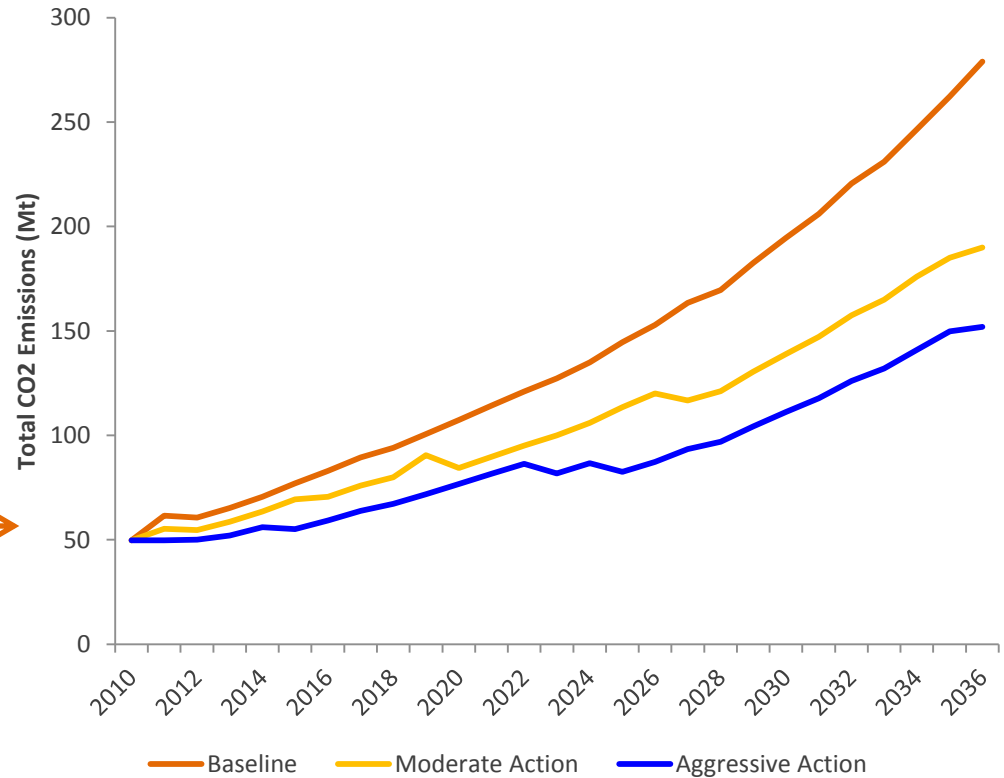
Key Advantages of EFFECT:

- Transparent - Enables consensus building among a wide range of stakeholders
- Flexible - Enables customization to suit local conditions
- Adept - Compiles a large amount of local data from multiple sources





EFFECT yields economy-wide GHG emission forecasts from data about energy producing/consuming assets in development scenarios





Ministry of Economy and Sustainable Development
OF GEORGIA

Objective

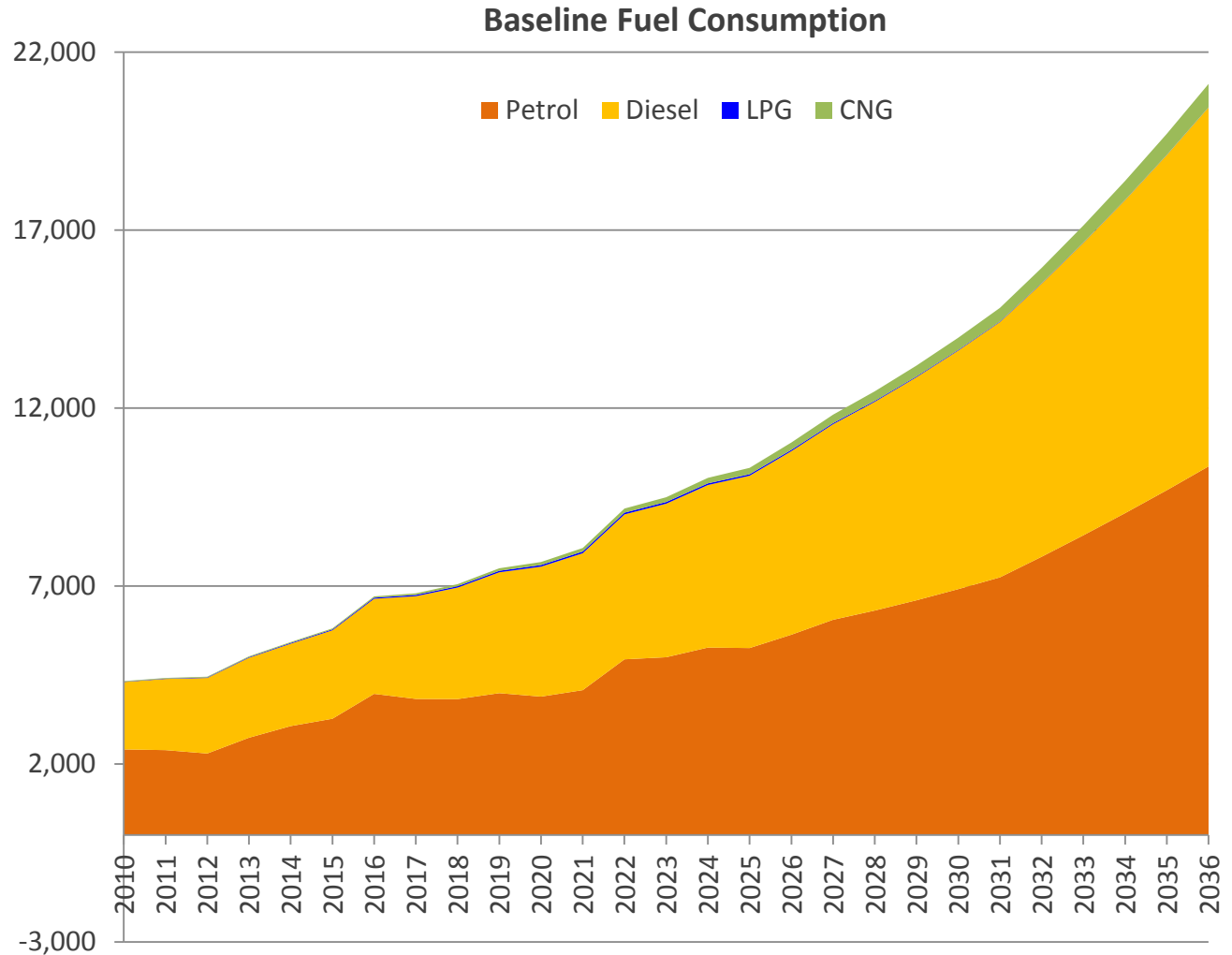
- Reduce fossil fuel use in order to improve balance of trade and energy security

Symptoms

- Chronic current account deficit (above 10%)
- 10-fold increase in petroleum imports between 1998 and 2008
- 27% increase between Jan and May 2011 (year study started)

Option 1 | Baseline Fuel Consumption

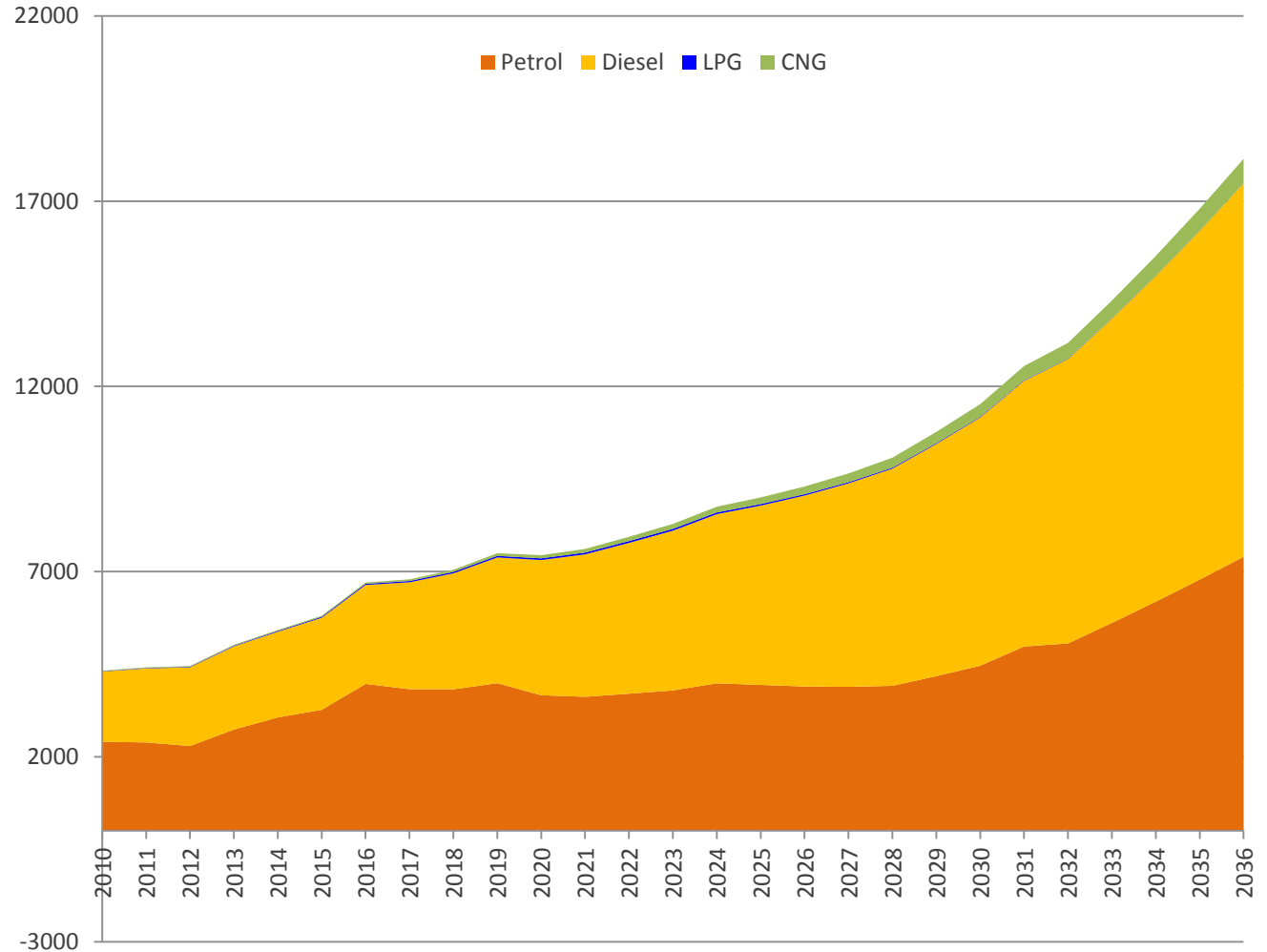
Significant increase in total fuel imports if the government takes no action



Option 2 | Greening Private Cars Scenario

- Introduce vehicle emission standards
- Increase vehicles taxes on older imported cars

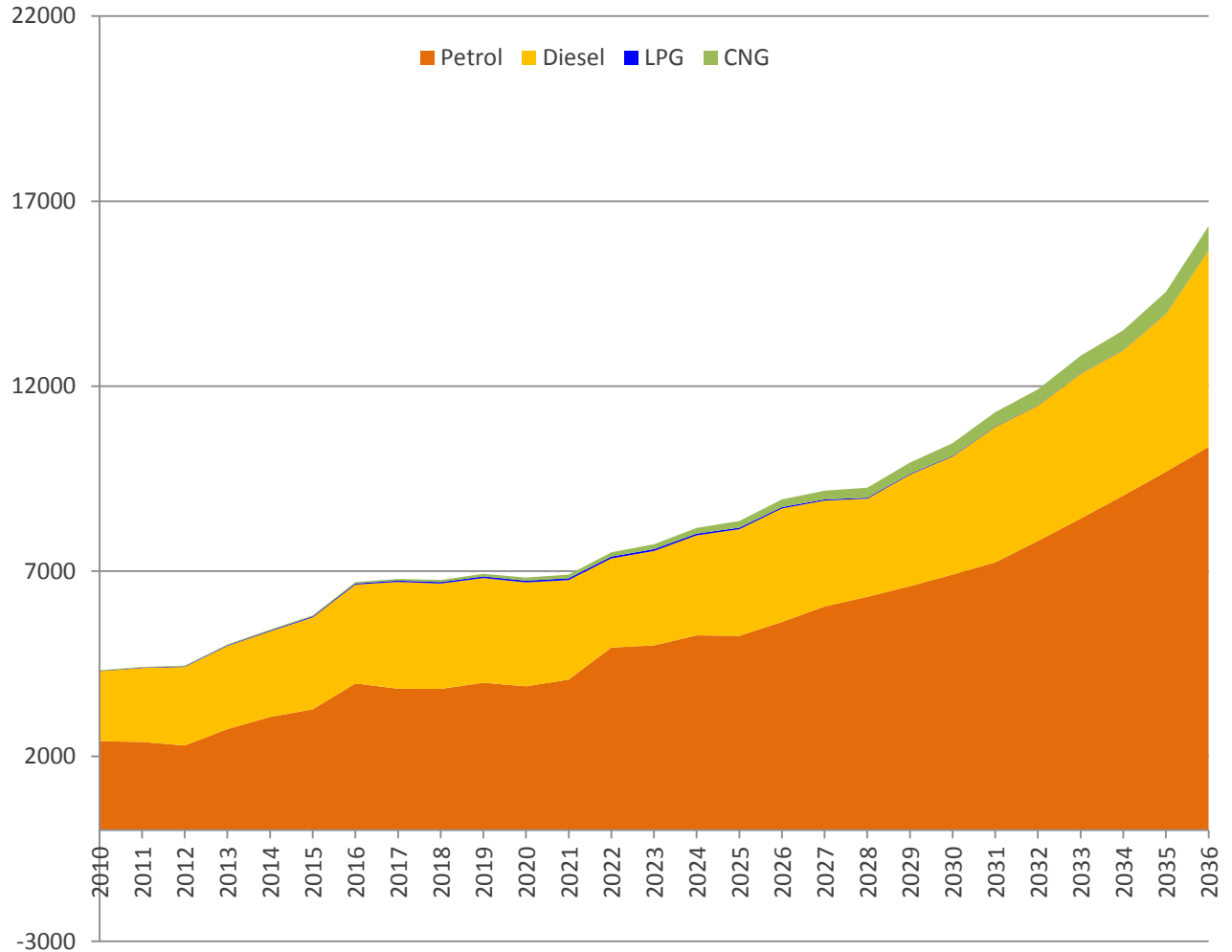
Private Cars Intervention Fuel Consumption



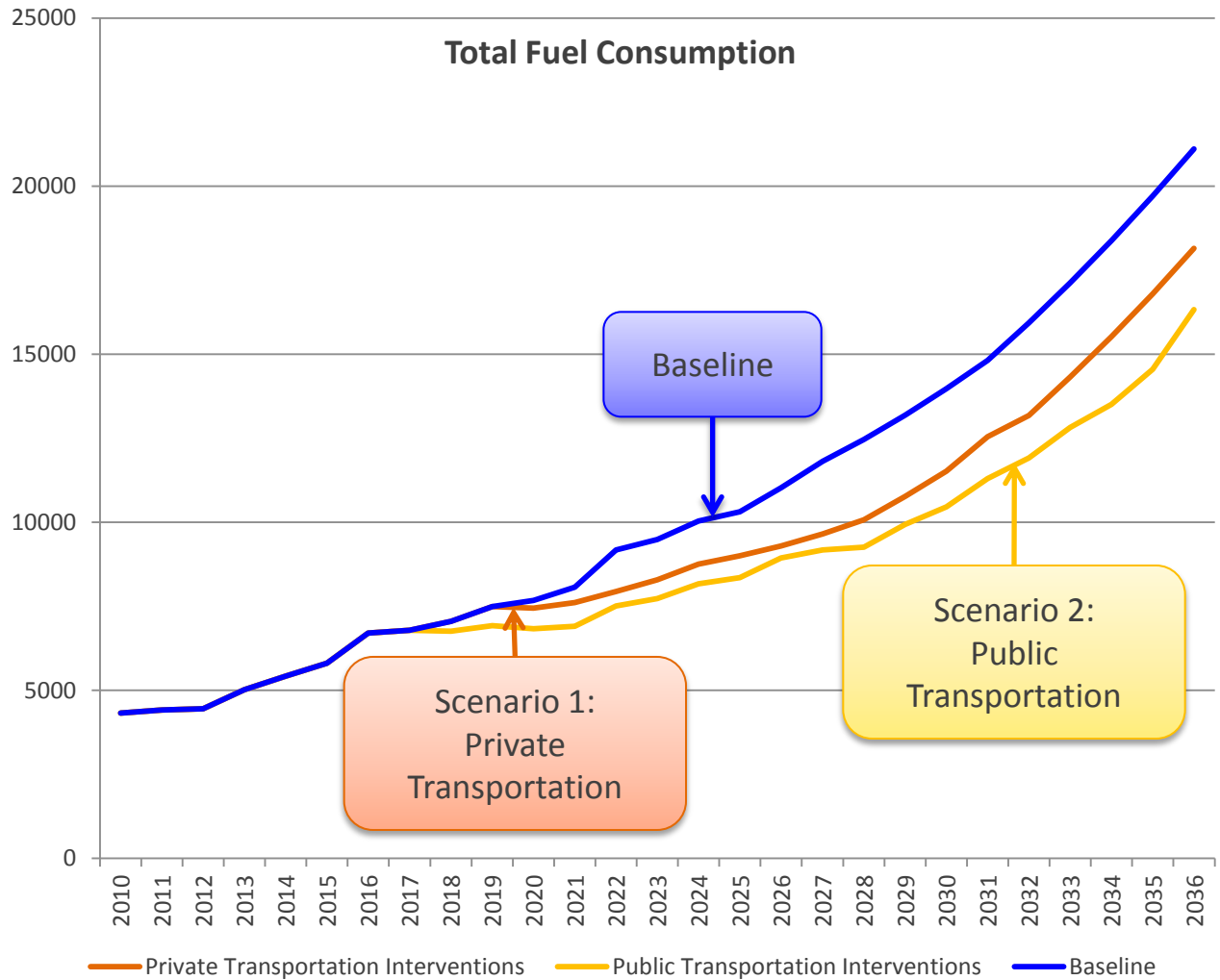
Option 3 | Greening Public Transportation Scenario

- Correct mini-bus market failures
- Support development of sustainable urban transport
- Support commercial intercity public transportation services

Public Transportation Interventions Fuel Consumption



With all else being equal, public transportation interventions result in a greater reduction in fuel consumption





Transport (road + rail)



Power



Industry



Households



Agriculture



Nonresidential

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MACTool

**An Easy and Transparent Way to Build
a Marginal Abatement Costs Curve**



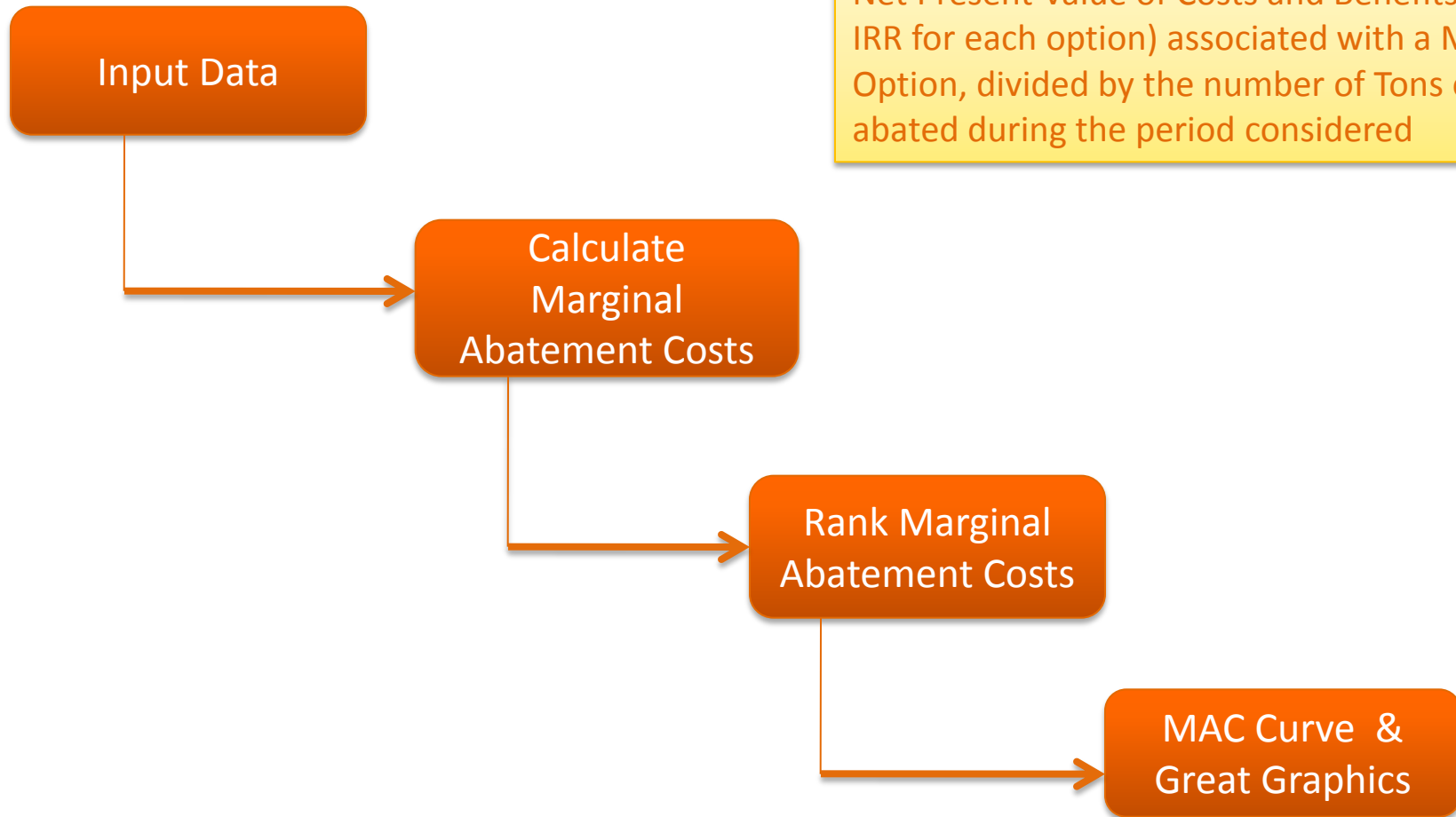
Countries conducting low carbon studies/implementing Cap-and-Trade systems to achieve voluntary emission reductions. There is need to:

- Achieve the targets efficiently
- Choose among many mitigation options
- Know the potential results
- Know the potential costs

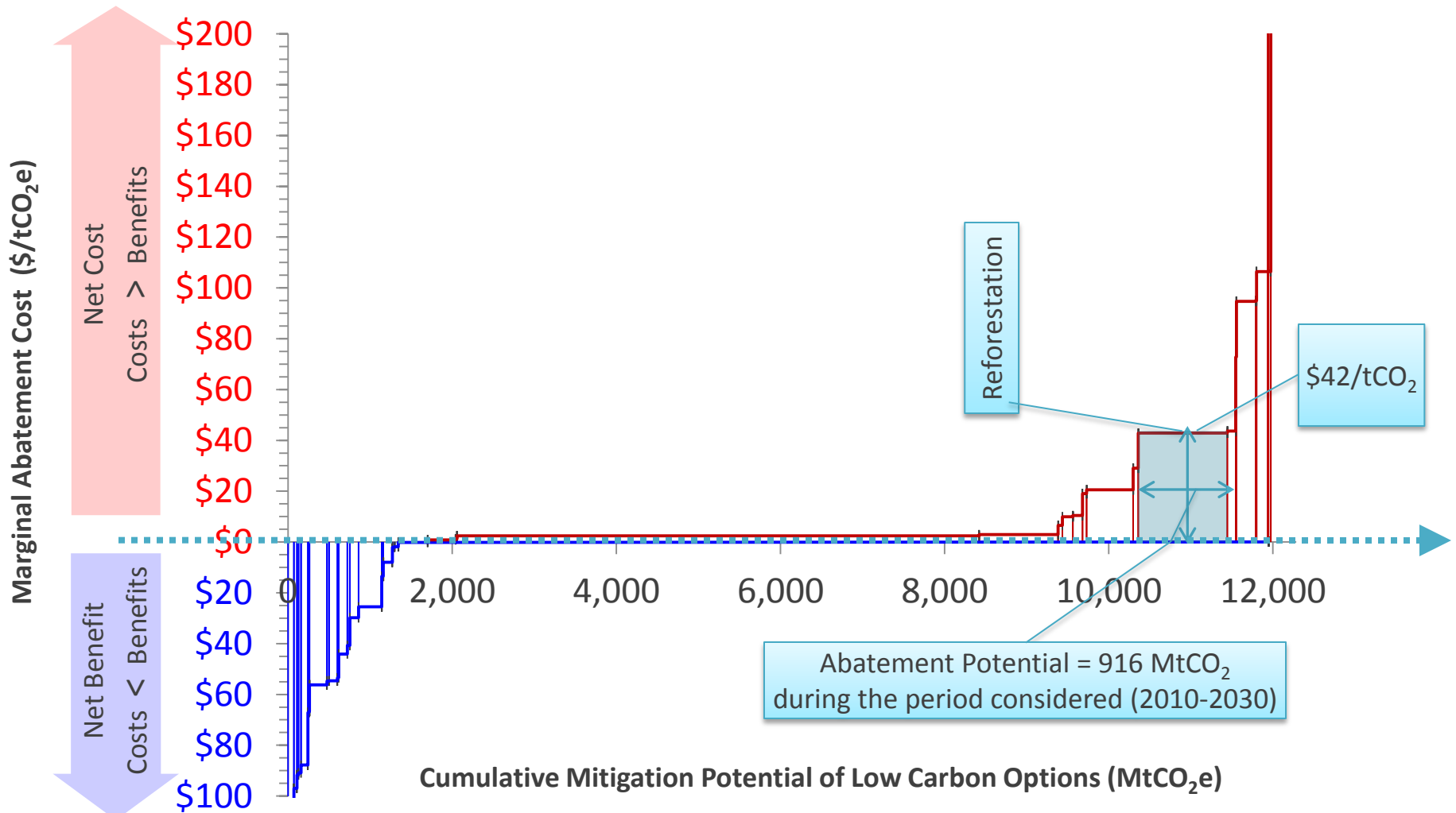
Key Advantages of MACTool:

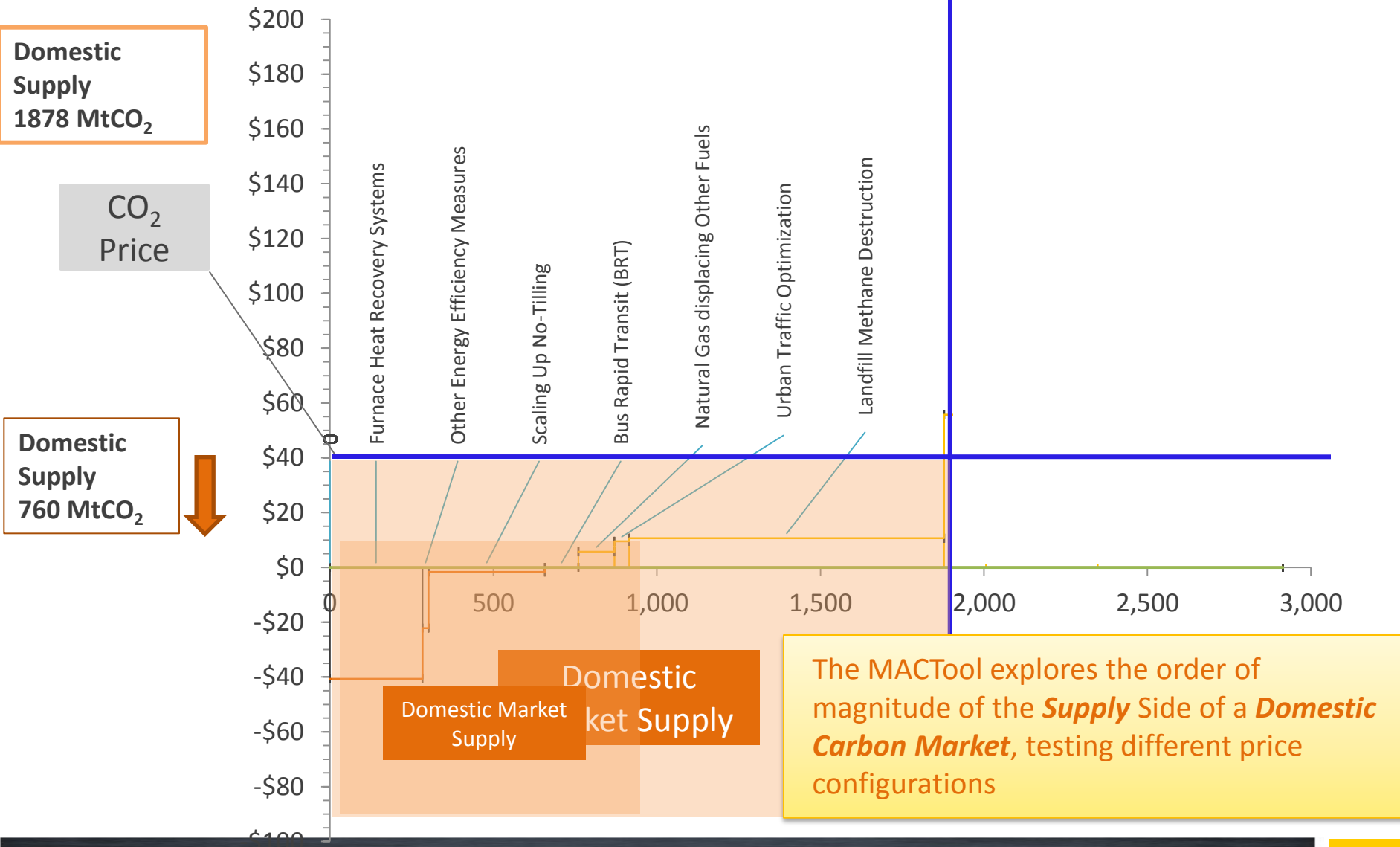
- Considers the break-even carbon price
- Discount rate customizable by technology
- Visual display of the results easy to share with stakeholders





Marginal Abatement Cost (MAC):
Net Present Value of Costs and Benefits (unique IRR for each option) associated with a Mitigation Option, divided by the number of Tons of CO₂ abated during the period considered





The MACTool explores the order of magnitude of the **Supply Side** of a **Domestic Carbon Market**, testing different price configurations

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TRACE
Tool for Rapid Assessment of City Energy

A Decision Support Tool for Evaluating Energy Efficiency Opportunities in Cities



TRACE Why TRACE?

Strong Demand from Cities

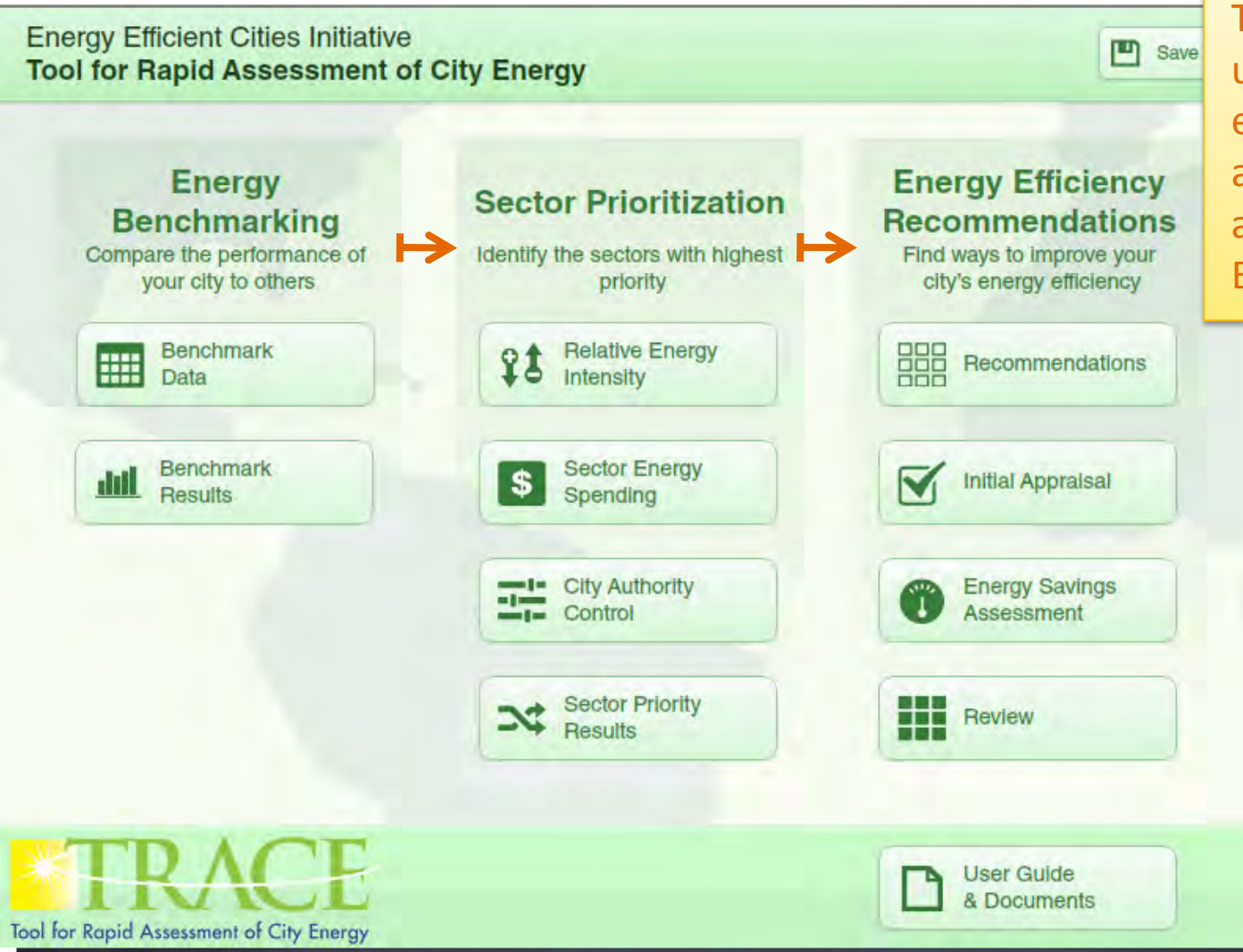
- Strong desire to reduce energy costs through EE improvements
- A lack of decision-support tool to identify major EE interventions across urban sectors
- Desire to learn from peer cities' and international best practices

Key Advantages of TRACE

- Cross-sectoral
- Focuses on areas under the control of the city authority
- Relatively low data requirements, low cost, intuitive and quick to implement
- Strong ownership of cities



TRACE How it Works






TRACE helps cities identify under-performing sectors, evaluate improvement and cost-saving potentials, and prioritize sectors and EE interventions.

Visual depiction of how a city compares with peer cities



Comprehensive sector prioritization with quantified potential benefits

 Home
Sector Prioritization
 Export
 Save

Based upon the answers to the sector prioritization questions, two separate lists of sectors have been created: CA Control and City-wide. 6 of 8 selected

City Authority Sector Ranking

Rank	Sector	REI%	Spending CA (US \$)	Control	Score	Check to Select
1	Potable Water	86.1	20,046,760	0.80	13,819,468	<input checked="" type="checkbox"/>
2	Municipal Buildings	54.8	13,836,029	1.00	7,586,851	<input checked="" type="checkbox"/>
3	Solid Waste	48.2	500,000	0.75	180,803	<input checked="" type="checkbox"/>
4	Wastewater	5.0	1,194,840	0.90	53,767	<input type="checkbox"/>

City Wide Sector Ranking

Rank	Sector	REI%	Spending CA (US \$)	Control	Score	Check to Select
1	Public Transportation	40.6	53,775,872	0.55	12,015,546	<input checked="" type="checkbox"/>
2	Private Vehicles	36.5	199,442,747	0.15	10,930,996	<input checked="" type="checkbox"/>
3	Street Lighting	51.2	12,999,355	0.90	5,998,875	<input checked="" type="checkbox"/>
4	Power	31.5	538,517,487	0.01	1,701,657	<input type="checkbox"/>

TRACE Recommendations

A matrix of recommendations based on savings potential, first cost, and speed of implementation

Home Recommendations Matrix Export Save

The matrix below shows all recommendations from prioritized sectors sorted by First Cost and Energy Efficiency. The check boxes allow the user to alter the display based on Speed of Implementation.

Filter by speed of implementation: < 1 year 1-2 years > 2 years

Back To Review Final List

Energy Savings Potential	First Cost		
	> \$1,000,000	\$100,000 - \$1,000,000	< \$100,000
>200,000 kWh/annum	Municipal Offices Audit & Retrofit Program	Improve Efficiency of Pumps and Motors Improve Performance of System Network	
100,000 - 200,000 kWh/yr	Municipal Residential (Public Housing) ...	2-Stroke Engine Replacement or Retrofi	
<100,000 kWh/annum	Municipal Hospitals Audit & Retrofit Prog...	Street Lights Audit and Retrofit Program Public Spaces Lighting Audit and Retrofit...	
		Active Leak Detection and Pressure Man...	Buildings Benchmarking Program
		EE Sorting and Transfer Facilities Traffic Restraint Measures Travel Planning	Waste Composting Program
		Water Meter Program	Waste Vehicle Fleet Maintenance Audit a...
		Municipal Schools Audit & Retrofit Progr...	Street Signage Lighting Audit and Retrofi...
		Traffic Signals Audit and Retrofit Program	

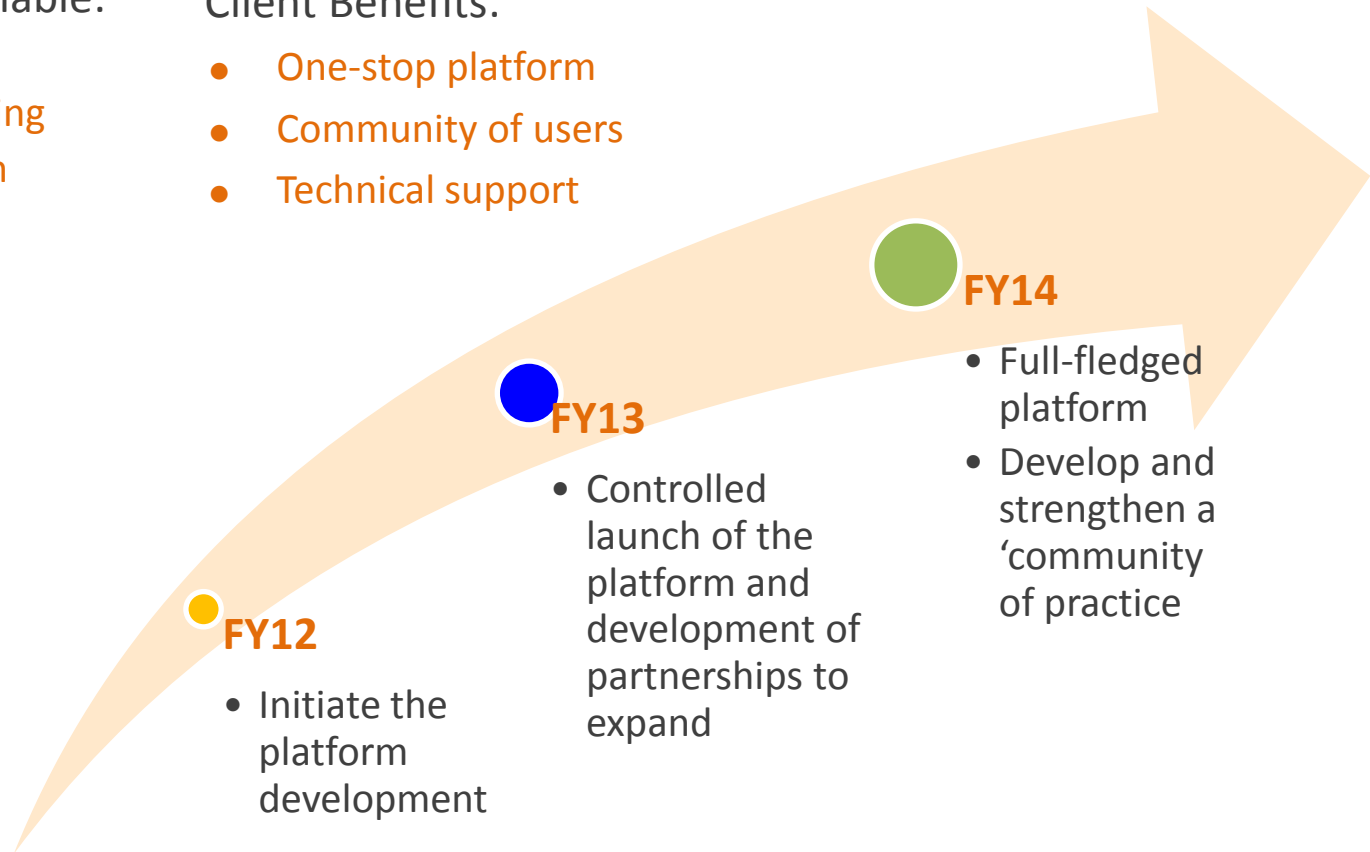
An Open Platform *for* Low Carbon Development Planning Instruments

Platform will enable:

- Open-access
- Crowd-sourcing
- Collaboration
- Data sharing

Client Benefits:

- One-stop platform
- Community of users
- Technical support





FOR ADDITIONAL SUPPORT, CONTACT:
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Thank You.

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