



# **Modelling the economic impacts of addressing Climate Change**

**October 11, 2002**



## Outline

- ❑ **Purpose and context**
  - ! **Review of analytic process**
- ❑ **Description of federal “reference case” policy package**
- ❑ **Framework assumptions**
- ❑ **Snapshot under four scenarios**
- ❑ **Main results reference case**



## Purpose and Context

- ❑ **To evaluate the national, sectoral, provincial and territorial economic impacts of the federal “reference case” policy package**
- ❑ **Developed by federal officials based on results of earlier AMG (federal/provincial/territorial working group) analysis (May 2002), the Discussion Paper and the Stakeholder Consultations**
- ❑ **The reference case is not the final plan but its impacts are broadly representative of the approaches that are currently being discussed with industry and the provinces**



## Linkages to Previous AMG Modelling

- ❑ **Modelling in 2000 estimated GDP impact in range of 0 to –3%**
  - ! Highest cost estimate included 450,000 job loss, but it was assumed that Canada acted alone (i.e. no international permit trading)
- ❑ **Modelling reported in spring 2002 Discussion Paper narrowed range to +0.4 to –1.7%**
  - ! **Option 1** (broad as possible emissions trading) gave small positive overall impact of +0.1 to +0.4% (due to tax cuts financed by auctioning permits), but uneven sectoral and regional impacts
  - ! **Option 3** (mix of emissions trading, targeted measures and govt purchases) gave impacts in range of –0.6 to –1.7%
- ❑ **Most recent modelling (Reference Case) focused on Option 4 from the Discussion Paper – similar to Option 3 but**
  - ! emission reductions of 170 MT instead of 240 MT
  - ! emissions trading designed to mitigate uneven sectoral and regional impacts
  - ! gives equal weight to alternative financing assumption



## Reference Case Policy Package: Description

- ❑ Emissions reduction target is 170 Mt from business-as-usual (BAU) in 2010
  - ! Makes no assumption on how the balance of 70 Mt is achieved
- ❑ Sinks from current practices: 30 Mt (20 Mt from forestry and 10 Mt from agriculture)
- ❑ Major components to achieve remainder of the reduction
  - ! Action Plan 2000/Budget 2001 measures
  - ! Additional Targeted measures
  - ! DET applied to large final emitters
  - ! Offsets
- ❑ Government purchases international permits, if needed



## Framework Assumptions

### ❑ Four scenarios examined based on:

#### ! Two international carbon prices:

- C\$10 and C\$50 per tonne of CO<sub>2</sub> in 2010
- The balance of expert opinion favours the lower end of this range
- \$50 price is included for prudent risk management

#### ! Two Fiscal Assumptions

- Climate change initiatives and revenue losses directly affect governments' balances i.e. no tax increase (**Government Financed**); or
- Government balances are maintained by increasing personal income tax (**Tax Financed**)



## Reference Case Fiscal Assumption

- ❑ For analytical purposes, previous modelling by the AMG focused on a case that assumed tax increases to maintain constant budget balances for all governments (“Tax Financed”).
- ❑ An alternative fiscal rule (“Government Financed”) that avoids tax increases would allow the fiscal impacts to affect budget balances
  - ! Future Budgets will make the actual decisions as to how to finance the increased spending and accommodate reduced revenues – by allocating surpluses, by reallocating spending or by raising taxes
- ❑ The government financed rule results in reduced economic impacts because it avoids the negative economic effects of higher taxes



## The Results in context

- ❑ **The methodology and underlying analysis are sound**
  - ! Well established private sector models
- ❑ **BUT, all analytical undertakings of this magnitude are subject to uncertainties**
- ❑ **The details by sector and province tend to be less precise than the overall results**
- ❑ **The results from these economic models should be viewed as informing policy development by identifying the implications of different policy options**

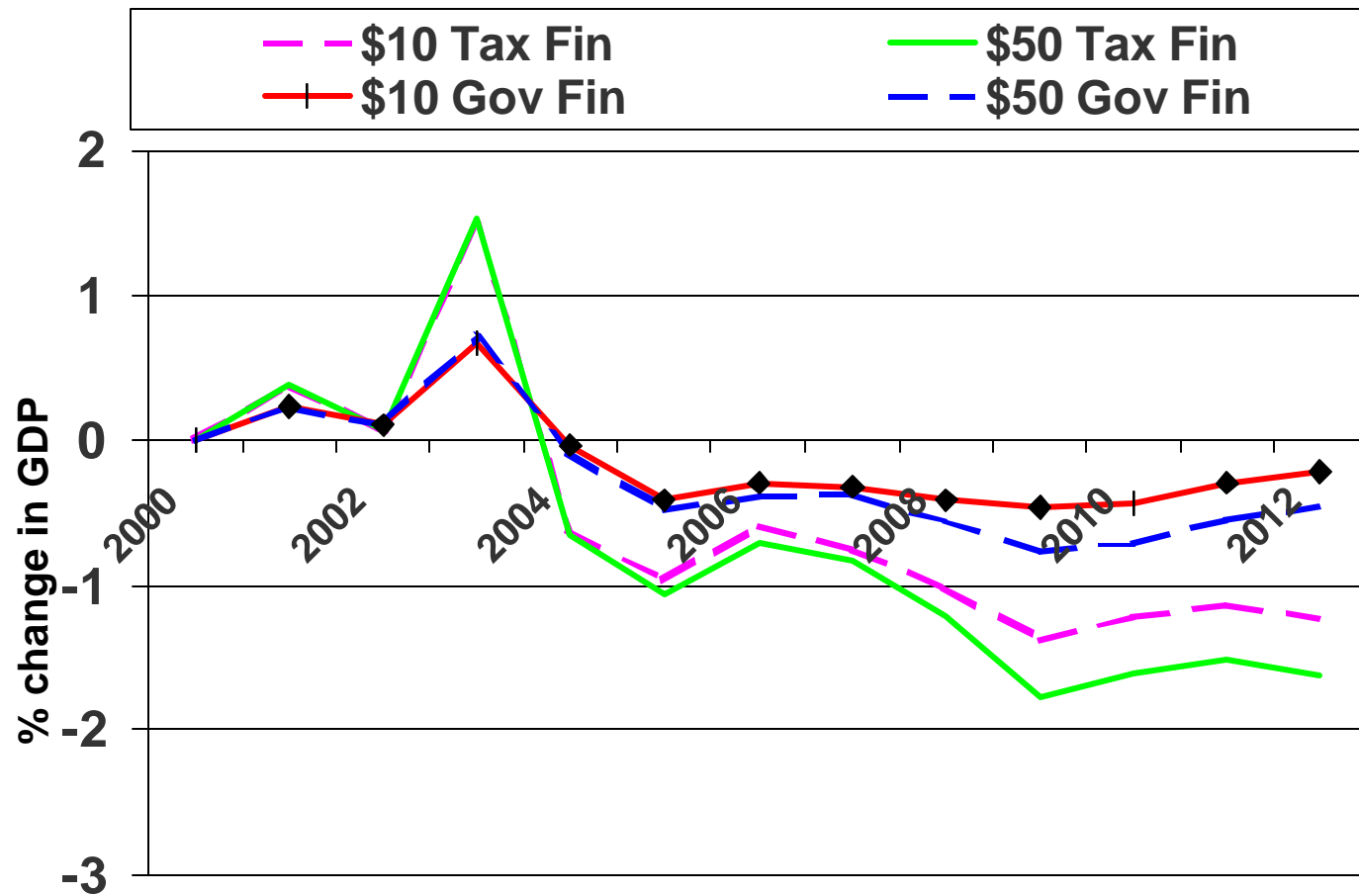


## Comparison of Impacts under four scenarios - 2010

	Pct change in GDP relative to BAU in 2010	Employment Growth 2002 to 2010 (millions)	Disposable income per household
<b>BAU</b>	-	1.32	<b>\$68,000</b>
<b>\$10 Case</b>			
Government Financed	-0.4	1.26	\$68,000
Tax Financed	-1.2	1.13	\$66,700
<b>\$50 Case</b>			
Government Financed	-0.7	1.23	\$67,800
Tax Financed	-1.6	1.08	\$66,300

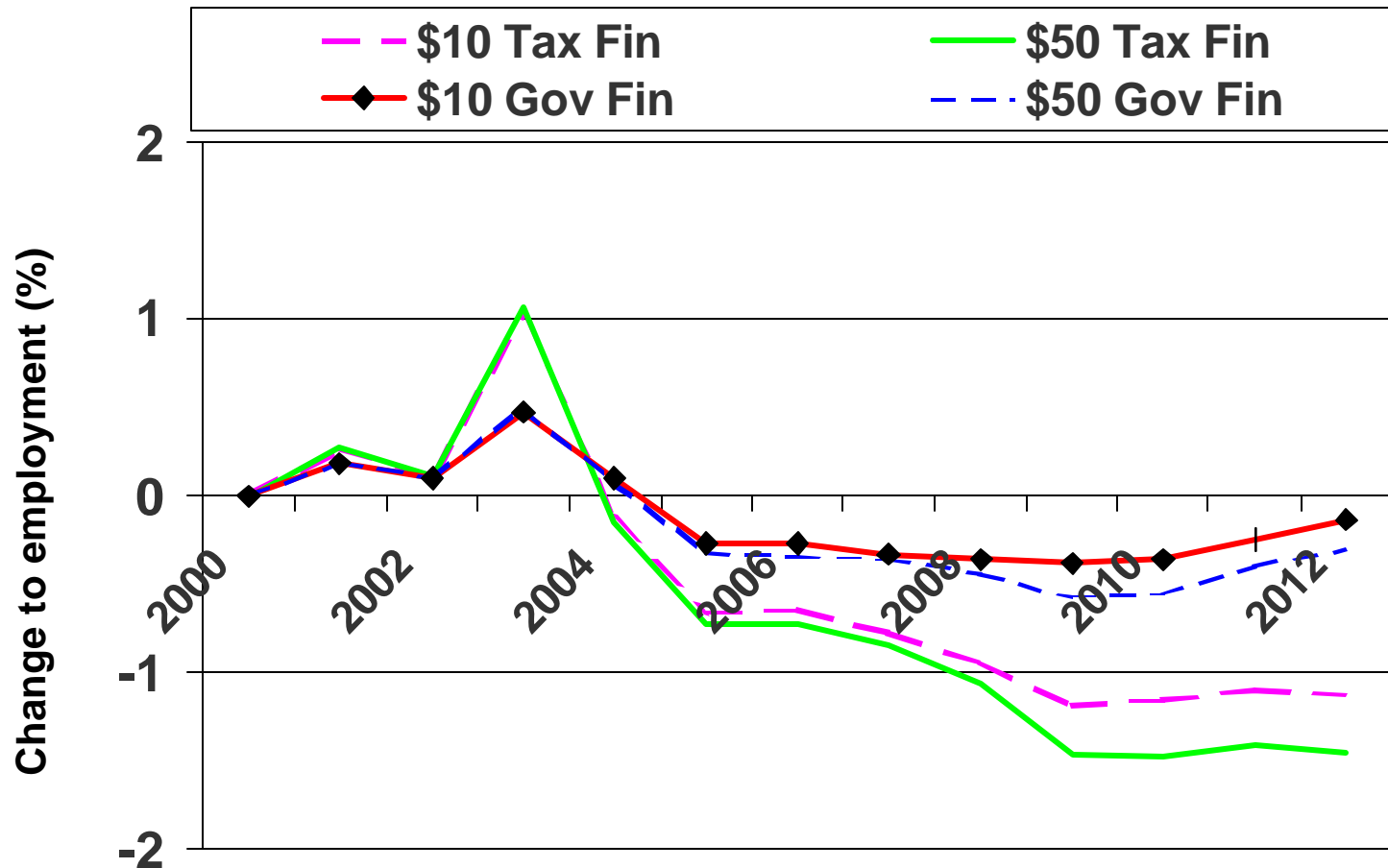
## Reference Case GDP Impacts

- ❑ Spike in 2003/04 caused by new investment
- ❑ Decline in GDP relatively modest.



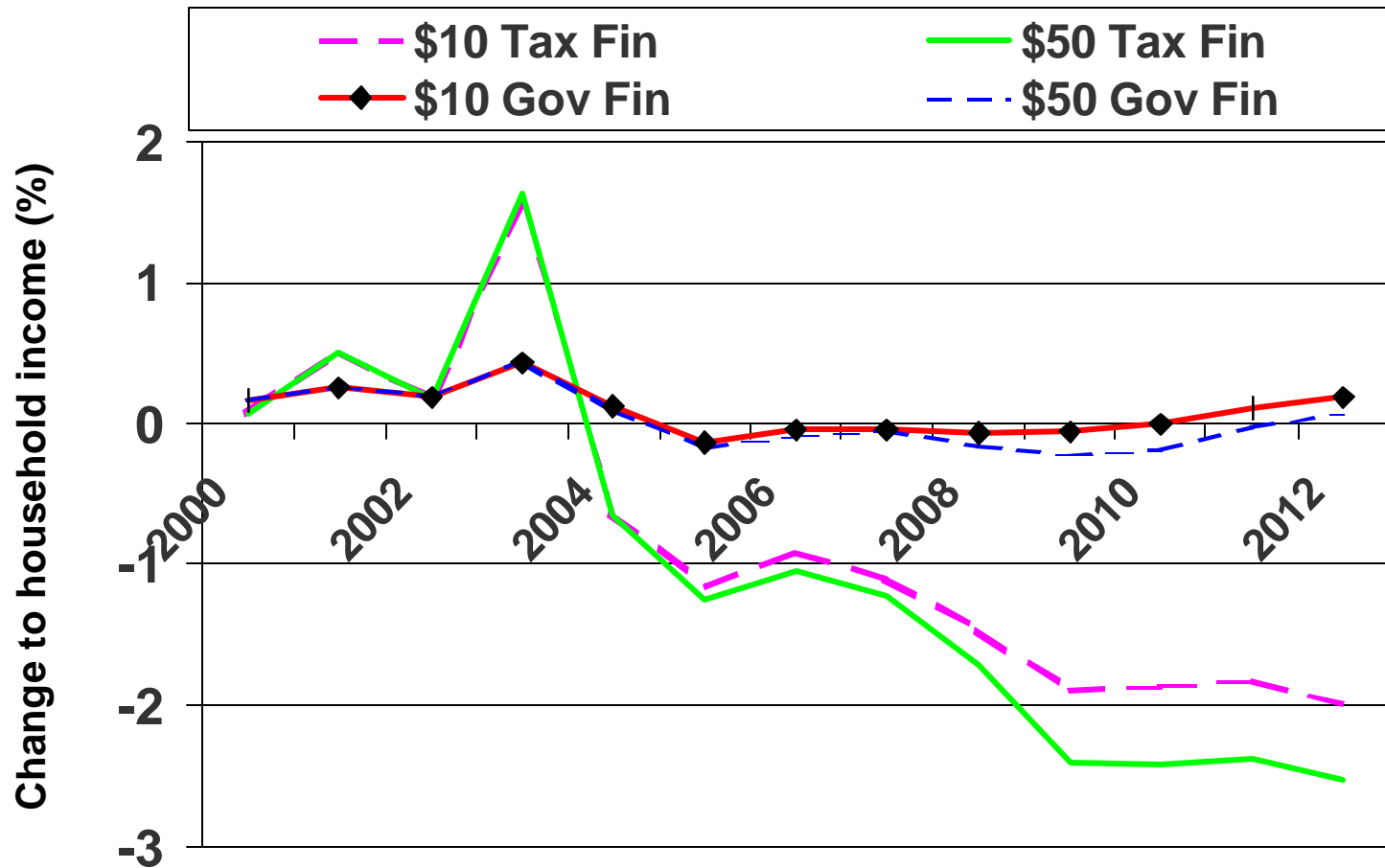
## Reference Case Employment Impacts

- By 2010, 1.08 to 1.26 million new jobs created, compared to 1.32 million in BAU - 61,000 to 244,000 fewer new jobs, depending on international permit price and fiscal assumption



## Reference Case Change to Disposable Income per Household

- Disposable income is negatively affected by the increase in personal income taxes



## Reference Case Energy Prices – 2010

- ❑ Gasoline prices are unaffected because of the assumption that increased refining costs cannot be passed on, and increased support for ethanol
- ❑ Natural gas prices reflect pass through of incremental cost
- ❑ Electricity prices reflect reduction in demand

	Pct change relative to BAU			
	\$10 Tax Fin	\$10 Gov Fin	\$50 Tax Fin	\$50 Gov Fin
<b>Gasoline</b>	0	0	0	0
<b>Natural Gas</b>				
Alberta	+8	+8	+46	+46
Ontario	+4	+4	+16	+16
<b>Electricity</b>				
Alberta	-7	-7	-2	-1
Ontario	-2	-2	0	0
Quebec	-10	-9	-7	-6



## Energy Prices

- ❑ **Impacts on energy prices are lower than most other analyses whether conducted by governments or the private sector**
  - ! **This reflects the policy design in the reference case in which 70% of the permits required by energy suppliers are issued at no cost (output-based gratis allocation)**
  - ! **Other analyses that show high increases in energy prices do so precisely because they use the price system to achieve emission reductions**

## Reference case reduces impacts on Energy Suppliers & Energy-Intensive Sectors

<b>Canada</b>	<b>Pct Share of GDP</b>	<b>\$10 Tax Fin Change in output</b>	<b>\$10 Gov Fin Change in output</b>	<b>\$50 Tax Fin Change in output</b>	<b>\$50 Gov Fin Change in output</b>
<b>Sector</b>					
Metal mining	0.7	-0.1	-0.2	-0.4	-0.4
Nonmetal mining	0.2	-0.6	-0.6	-1.7	-0.9
Pulp & paper	1.0	+0.1	+0.2	-0.1	+0.1
Primary iron and steel	0.6	+0.6	+0.4	+0.4	+0.3
Primary nonferrous metals	0.7	-0.3	-0.3	-0.6	-0.6
Motor vehicles	2.5	+0.9	+0.9	+0.9	+0.9
Cement and clay products	0.3	-2.6	-2.4	-3.2	-3.0
Refined petroleum	0.3	-4.2	-3.1	-5.1	-3.8
Industrial chemicals	0.4	-0.1	-0.3	-0.9	-1.0
Oil and Gas	2.7	-0.4	-0.4	-2.1	-2.1
Electricity	2.3	-3.2	-2.8	-4.5	-3.8
Coal	0.2	-0.9	-0.9	-4.9	-4.8

## Reference Case Impacts on the Canadian Economy in 2010

<b>Sector</b>	<b>Pct Share of GDP</b>	<b>\$10 Tax Fin Change in GDP</b>	<b>\$10 Gov Fin Change in GDP</b>	<b>\$50 Tax Fin Change in GDP</b>	<b>\$50 Gov Fin Change in GDP</b>
Energy suppliers	7.5	-2.1	-1.7	-3.6	-3.3
Energy-intensive and trade-sensitive sectors	6.7	+0.5	+0.5	+0.5	+0.6
Consumer goods & services	28.2	-1.2	-0.1	-1.6	-0.2
Construction	4.4	-3.8	-3.0	-4.7	-3.8
Transportation & storage	4.6	-1.0	-0.7	-2.2	-1.0
Communications	6.8	-1.4	+0.2	-2.9	0
Agriculture	2.0	-1.5	-0.8	-1.7	-0.7
Finance, Insurance and Real Estate	15.5	-1.3	-0.5	-1.3	-0.5
Government & social services	14.3	-0.1	+0.1	-0.2	+0.1

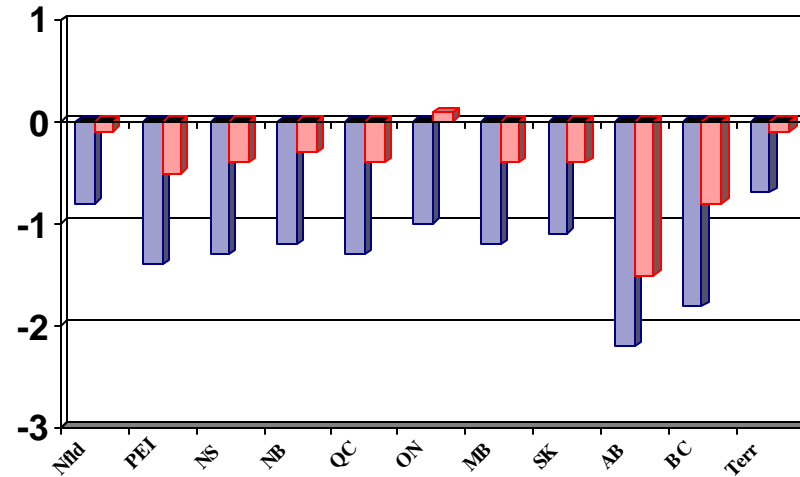
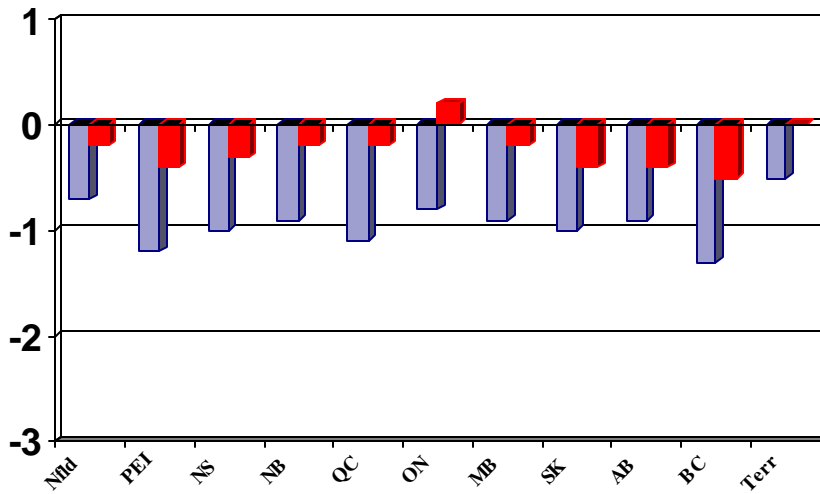


# Reference Case Provincial changes to GDP in 2010

Tax Fin \$10 and \$50  Gov Fin \$10  Gov Fin \$50 

\$10 Permit Price

\$50 Permit Price





## International Purchases

- ❑ In the \$10 case, 43% of the reductions in the DET Sector (private industry) are achieved domestically
- ❑ In the \$50 case, the majority (77%) of the DET Sector reductions are achieved domestically
- ❑ The government is not required to purchase permits to meet the target of 170 Mt under either price scenario
- ❑ Overall, it is estimated that from 73% to 90% of all reductions would be achieved domestically



## Observations

- ❑ **The analytical approach is sound**
  - ! Private sector models used
  - ! Methodology extensively vetted by provinces, stakeholders and experts
- ❑ **But, all analytic undertakings of this magnitude are subject to uncertainty**
- ❑ **Key assumptions relate to:**
  - ! The projection of BAU emissions
  - ! The contribution of sinks from current practices
  - ! The efficacy of targeted measures
  - ! The international carbon price
  - ! The pace of technological change
  - ! The fiscal approach
- ❑ **The lower end of the range is defensible, but the higher estimates remain relevant for prudent risk management**