Environment and Climate Change Canada's changes to the NONROAD model

My passport photo

High level objectives

- Try not to be too boring, given the subject
- Talk about NONROAD
- Do not cause international incident

ECCC's use of NONROAD

- Inform inventories; APEI, NIR and Black Carbon

As a signatory to the UNFCCC and UN-ECE, Canada is obligated to annually prepare national inventories.

Also used in regulatory development.

Environment and Climate Change Canada

Environnement et Changement climatique Canada

Canada

Changes to NONROAD

- Fleet data for Canada
- User-defined age distribution
- Custom SCCs
- Renewable fuels
- 2-stroke and 4-stroke
- GHG estimates
- Black Carbon estimates
- Updates from MOVES

Fleet data for Canada

Fleet data for Canada

Biggest challenge is reliable fleet data

"All….emissions from all remaining transport activities…..not otherwise reported."

Power Systems Research

By SCC, model-year, power range, load factor, activity, median life

Time-series developed, centred on 2010

User-defined age distribution

User-defined age distribution

- Age profile derived from PSR data
- Fractional distribution by population age
- Model changed to read in AGE file
- Can replace default age distribution

Custom SCCs

Custom SCCs

- Level of resolution derived from PSR data

- 40 custom SCCs

- Changes made to internal master list
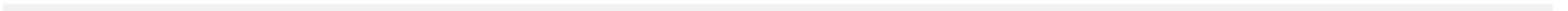
- Coordination between all input files

Renewable fuels

Renewable fuels

- Enhanced impacts of ethanol

- FCR impacted by fuel energy content

- CO_2 impacted by fuel carbon content

- Biodiesel, renewable Diesel and FT Diesel
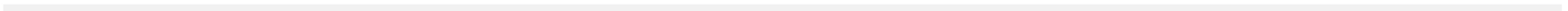
2-stroke and 4-stroke

2-stroke and 4-stroke

- 2-stroke and 4-stroke assignment made more precise

- Imprecision result of regulations

- Adjustments and speciation based on SCC

GHG estimates

GHG estimates

- US and Canadian models estimate CO_2
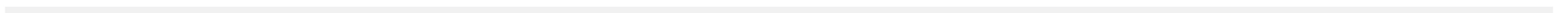- Canadian version directly estimates N_2O and CH_4

Black Carbon estimates

Black Carbon estimates

- Speciation profile (ratio to PM) is user-defined

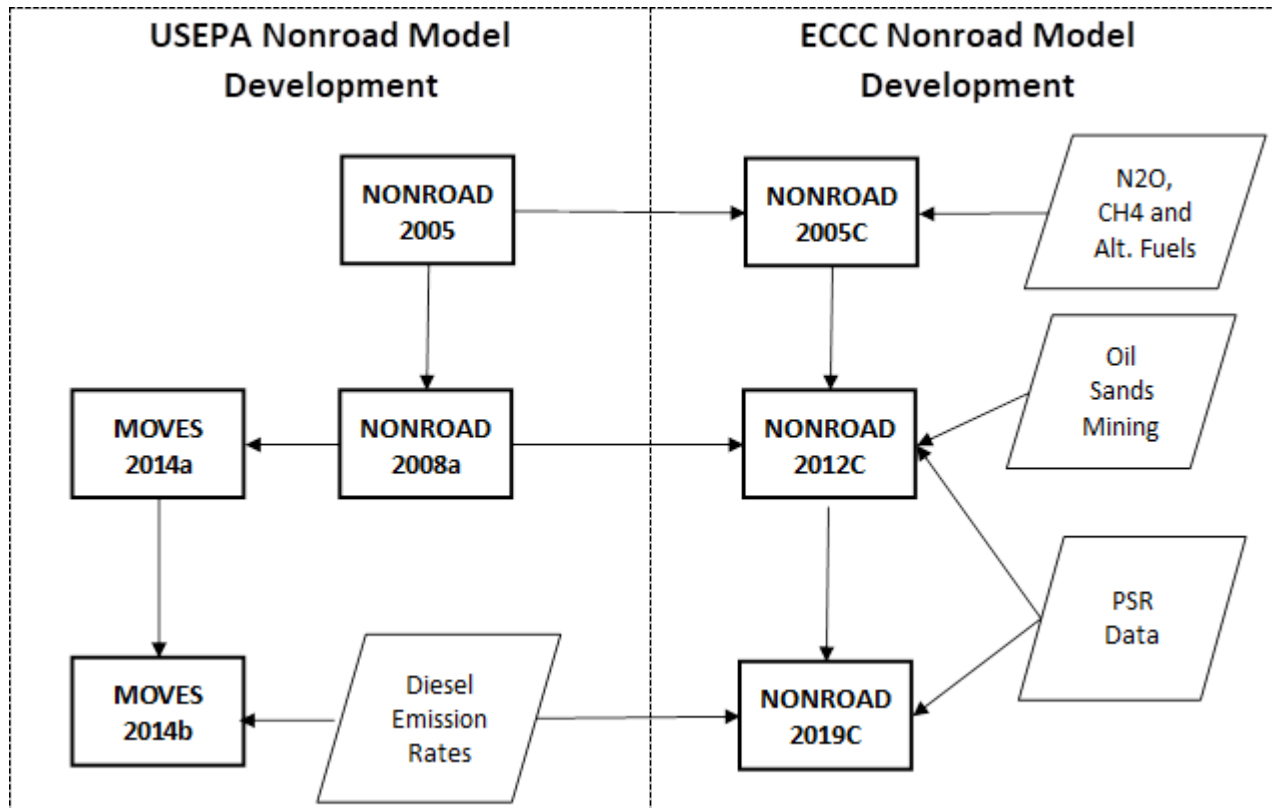- Default profile consistent with current EPA assumptions

MOVES

MOVES

- EPA integrated NR2008 into MOVES
- Canadian version will continue to be stand-alone for now

Bonus slide: NONROAD evolution

Bonus slide: Renewable fuels

Modeling element	Model	Renewable/alternate blending component			
		Ethanol	Biodiesel	Renewable Diesel	FT Diesel
Impact on CO2	US	No	No	No	No
	Canada	Yes	Yes	almost	almost
Impact on CAC exhaust	US	Yes	No	No	No
	Canada	Yes	Yes	Yes	Yes
Impact on HC evap	US	Yes			
	Canada	Yes			
Impact on fuel consumption	US	No	No	No	No
	Canada	Yes	Yes	almost	almost

Bonus slide: 2-stroke and 4-stroke

- 2-stroke off-road motorcycles US model assumptions (SCC 2260001010)

Model-year	Exhaust rate assignment	
	2-stroke tech	4-stroke tech
pre-2006	100%	0%
2006	76%	24%
2007	53%	47%
2008	49%	51%
post-2008	46%	54%

For advanced class only - Normalization

- Fuel use$_{NIR}$ = BSFC / D * Act * LF * RP * Pop

    BSFC = Brake specific fuel consumption (mass/hp-hr)
    D = Density (mass/gallon)
    Act = Activity (hours/year)
    LF = Load Factor (unitless, fraction of RP)
    RP = average rated power (hp)
    Pop = Equipment population (units)

    'Thou shalt respect the national energy balance.'

- Fuel use$_{NIR}$ must equal Fuel use$_{RESD}$

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