How to Develop a Tier 3 Source-Specific GHG Inventory

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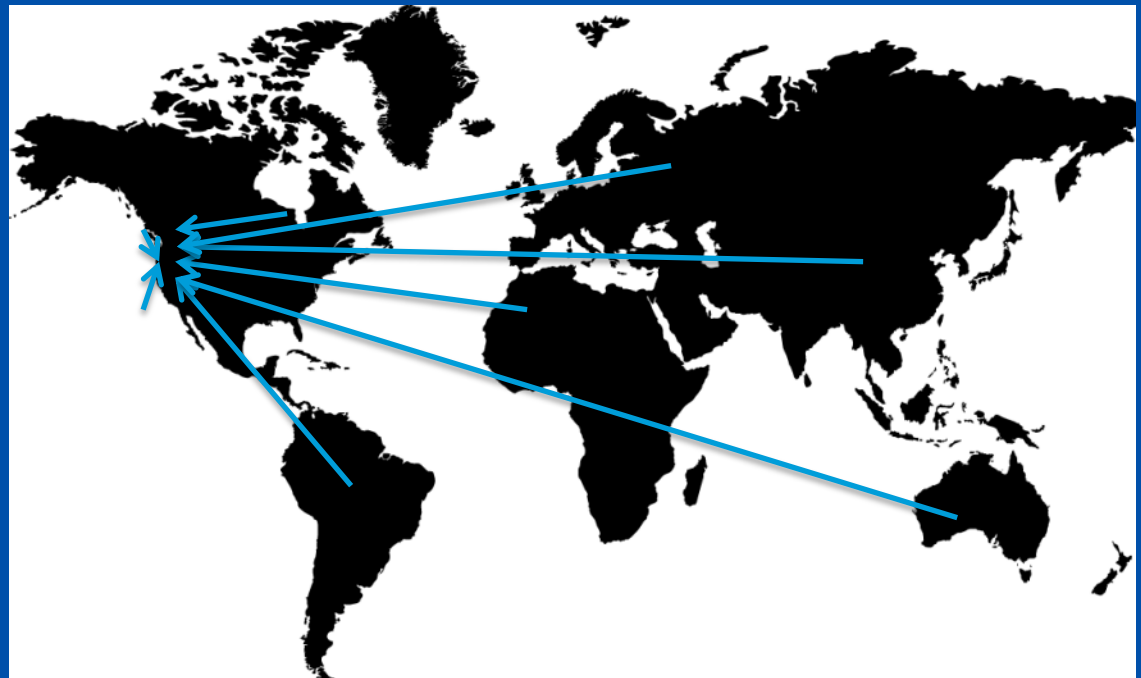# Chevron's World-wide GHG Inventory History

1997 Excel spreadsheets

2000 SANGEA

- Custom-designed
- Excel-based macros
- Given to API
- Corporate-wide audits

2010 CGERS

- Chevron GHG and Energy Reporting System
- Software based
- Corporate-wide audits

Excel
1997

CGERS
2010

SANGEA
2000

GHG Inventory Components

- Company GHG reporting policy

- Organization

- Inputs

- Calculations

- Management system

- Summary Reports

Company GHG reporting policy

- **For example, Chevron has a GHG Protocol that describes**
  - Which data should be reported
    - E.g., which point sources, which emissions, which types of operations
  - Which calculations should be used if a regulation is not in place
  - When the data should be reported
  - Who is responsible for reporting data
  - Who is responsible for approving data
  - Who is responsible for providing quality control and technical input
- **Recommendation**
  - The protocol should be complete, well-written, and kept up-to-date

Organization

Hierarchy

- Must reflect operations
- Determines summary data structure

Lessons Learned

- Match hierarchy to organization
- Consider who will be providing data
- Allow for flexibility when organizations change
- Regulations can require specific hierarchies
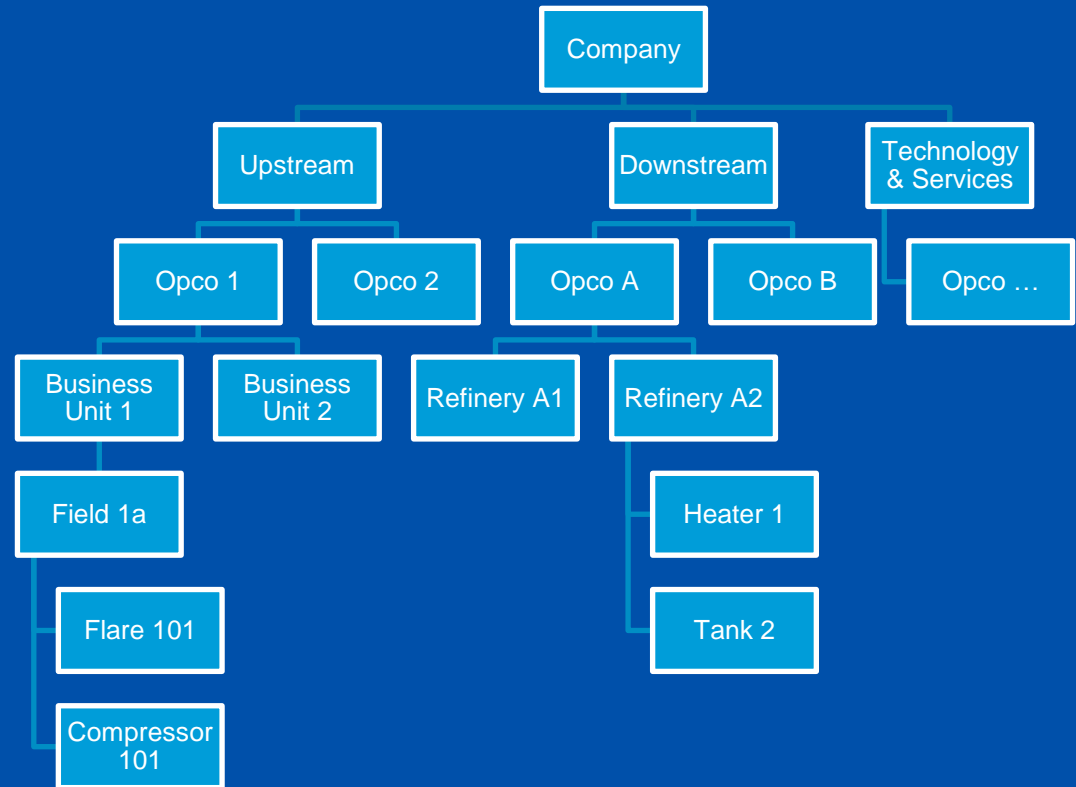
Inputs

- **Submitted by designated data collectors at the business unit level**

- **Activity Data**
  - Examples:
    - HHV
    - Fuel consumed
    - Count of values

- **Lessons Learned:**
  - Unit analysis: ensure data is entered in expected units
  - Accuracy: work processes needed to ensure accuracy due to many steps from field collection through entry into database

Calculations

Six Kyoto GHGs

- CO_2, CH_4, N_2O, SF_6, PFCs, HFCs

- CO_2e

Emission Type

- **Direct** (within "fenceline")

- **Indirect** (purchased/sold electricity and steam)

- **Products** (combustion of solid, liquid, and gaseous finished products)

Reporting Bases

- Equity

- Operational control

- Total

PFCs & HFCs
- o Refrigerants
- o Fire Suppression
- o ABU

SF6
- o Electrical Insulation
- o Only Downstream

Calculations

Calculation Methodologies

- API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry – August 2009

- CARB – California Air Resources Board

- EPA – Environmental Protection Agency

- EU ETS – European Union Emissions Trading Scheme

- NGERS – Australia National GHG and Energy Reporting

- Others

Tiers

- Tier 1 (C) – default values

- Tier 2 (B) – usually higher heating value measured

- Tier 3 (A) – usually carbon content measured

- Tier 4 (A) – usually GHG gas is measured

Calculations

Lessons Learned

- Calculations need to be stored and organized in a way which they can be easily referenced and updated

- Beneficial to have software system that can 'push' changes and updates to calculations to all relevant point source models

- Different regulations require slightly different calculations for the same emissions so it is good to be able to track multiple calculations for a given point source

Managing System

	Spreadsheet	Software
Initial configuration	🟨 Easy for small operations	🟨 Can be difficult
Learning curve	🟨 Easy for small operations	➖ Typically steep
Troubleshooting	➖ Always difficult!	➖ Always difficult!
Transparency for references and calculations	🟨 Depends on who creates it	➕
Functionality for controlling and auditing changes	➖	➕
Functionality for complex calculations	➖	➕
Reporting functionality	➖	➕

Summary Reports

Recommendations

- Give access to all data, not just final emission results

  – Emission results as well as inputted and intermediate data

- Organized in a way which makes sense to viewers

  – Lumps related information into individual reports with specific purposes

  – Some data will be included in multiple reports

- Lessons Learned

  – Usability: reports should be in a format that allows for further data manipulation and analysis

  – It is useful to have an ad-hoc reporting tool so users can build their own queries for data
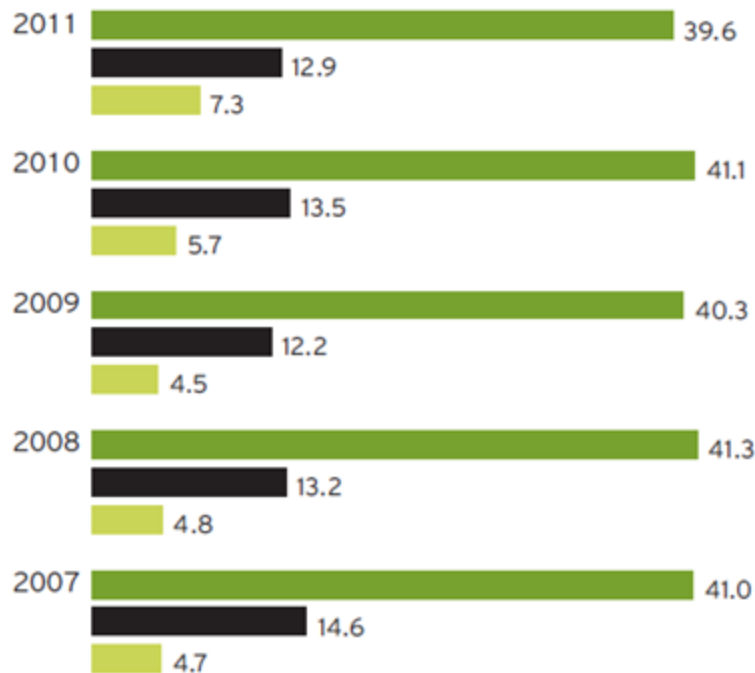
Published Data – GHG Emissions by Source

GHG Emissions by Source
Millions of metric tons of CO_2 equivalent

■ Combustion ■ Flaring and venting ■ Other

Year	Combustion	Flaring and venting	Other
2011	39.6	12.9	7.3
2010	41.1	13.5	5.7
2009	40.3	12.2	4.5
2008	41.3	13.2	4.8
2007	41.0	14.6	4.7

- Published in Chevron's *2011 Corporate Responsibility Report*

- Publically available
  - http://www.chevron.com/globalissues/corporateresponsibility/2011/

- Notes:
  - Increased production, new operations, and increased flaring due to a disruption of operations in Angola drove some of the emissions increases.
  - Chevron's GHG emissions data are reported on an equity basis for nearly all businesses in which Chevron has an interest.
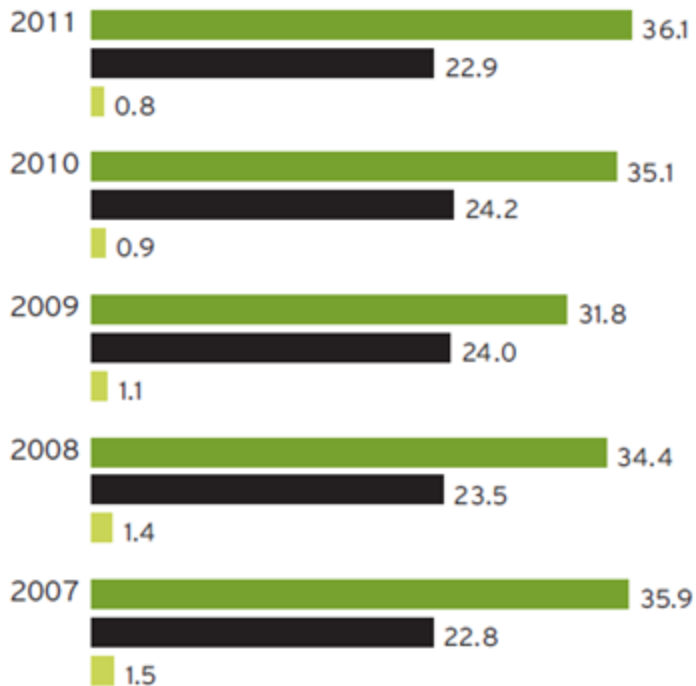 - Due to rounding, individual numbers may not sum to totals.

Published Data – GHG Emissions by Sector

GHG Emissions by Sector
Millions of metric tons of CO_2 equivalent

■ Upstream   ■ Downstream   ■ Other

Year	Upstream	Downstream	Other
2011	36.1	22.9	0.8
2010	35.1	24.2	0.9
2009	31.8	24.0	1.1
2008	34.4	23.5	1.4
2007	35.9	22.8	1.5

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Published Data – Total GHG Emissions by Type

Total GHG Emissions by Type

Millions of metric tons of CO_2 equivalent

	Direct	Indirect	Grid Credits	Net
2011	61.6	−1.8	0.0	59.8
2010	63.1	−2.9	0.0	60.2
2009	60.3	−2.4	−0.9	57.0
2008	62.7	−2.4	−1.0	59.2
2007	63.7	−2.9	−0.5	60.3

Direct - within "fenceline"

Indirect -purchased/sold electricity and steam

Grid Credits – exported electricity which is produced more efficiently than the regional or national grid. No longer accounted starting in 2010

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Published Data – Energy Performance

Energy Performance

Percentage improvement since 1992 baseline

Year	Value
2011	34
2010	33
2009	30
2008	28
2007	27

Chevron uses an energy index to measure energy efficiency improvements across its global operations.

The **Chevron Energy Index** is a measure of the energy intensity of its operations based on the estimated improvements of energy technologies and operational performance.

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Q & A