

*G&I has been working this spring and summer to produce a series of reports on the Tohoku Earthquake's impact on the industrial gas market as well as a range of articles on climate change and greenhouse gas (GHG) emissions.*

## Reports on Greenhouse Gas (GHG) Emissions

Articles that have appeared in previous newsletters include:

### **Greenhouse Gases Explained**

(published online August, 2010)

An in-depth look at the state of greenhouse gases and the use of GHGs in industrial processes. This is the first of a series of articles discussing the global warming effect of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, as well as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF<sub>6</sub>), which were introduced to replace the ozone-depleting, global-warming chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). Most GHG emissions are produced as by-products of industrial processes such as refrigeration, fossil-fuel burning, semiconductor fabrication, and photovoltaic manufacturing.

### **Fluorinated Substitutes: the Lesser Evils?**

(published online September, 2010)

Fluorinated compounds are very potent GHGs because of their long atmospheric lifetimes and high global warming potentials (GWPs) that are several hundred to several tens of thousands of times that of CO<sub>2</sub>. There are currently no alternatives to the use of fluorinated gases for plasma etch and CVD chamber cleaning in semiconductor manufacturing. Although industry leaders have adopted fluorinated substitutes (fluorocarbons and other fluorinated compounds) with lower GWPs, optimized processes to more efficiently use PFCs to reduce emissions, and implemented abatement or recycling technology to properly contain emitted GHGs, the manufacture and use of substitute gases that provide fluorine involve highly-reactive source gases that are volatile or corrosive. Production, delivery, and storage of other low/zero-GWP gases such as F<sub>2</sub>, COF<sub>2</sub>, and ClF<sub>3</sub> involve high risks to safety, high costs of implementation, and uncertain environmental impact.

### **Carbon Trading Ineffective in Curbing Greenhouse Gas Emissions**

(published online November, 2010)

Emissions-credit trading is a market-based approach adopted by the United Nations to encourage nations and individual companies to voluntarily reduce GHG emissions. In 1992, over 150 countries and the European Economic Community adopted and signed the U.N. Framework Convention on Climate Change (UNFCCC) to stabilize GHG concentrations in the atmosphere. But what are the results?

## **Metrics for Greenhouse Gas Emissions**

(published online July, 2011)

### **International Carbon Trading Prone to Abuse and Fraud**

(published online July, 2011)

Critics have described emissions-credit trading initiatives as flawed and ineffective. Known commonly as carbon trading, the programs have been the topic of much heated debate in the U.S. in the past few months. In a country where energy-related decisions are guided more by politics than science, this hardly comes as a surprise.

## **NEW: G&I GHG Research Reports**

In addition to the above listed in-depth articles, our new G&I Research reports cover a range of interesting and controversial topics related to climate change. **They are available for purchase** through MetaWord Publishing, publisher of Gases & Instrumentation.

### **Fossil fuel combustion as leading source of CO<sub>2</sub> emissions and frequent subject of political debate in the U.S.**

(\$100.00 Contact pnesdore@gasesmag.com to order a copy)

### **Regional Greenhouse Gas Initiative (RGGI) — Only GHG cap-and-trade program in North America**

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- How RGGI and carbon pricing work — Carbon cap-and-trade is not a tax
- Plunging carbon prices and dwindling interest in U.S. carbon market during recession
- State investments and benefits using RGGI CO<sub>2</sub> auction proceeds
- Effectiveness of RGGI questioned by state legislators and conservative groups
- RGGI under attack in Delaware, Maine, New Hampshire, New Jersey, and New York

### **Other regional cap-and-trade initiatives in the works: Western Climate Initiative and Midwestern Greenhouse Gas Accord**

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## **A closer look at alternative fluorinated chemicals for electronics**

(\$250.00 Contact pnesdore@gasesmag.com to reserve a copy)

## **Complete series on Climate Change (including past newsletter articles)**

(\$800.00 Contact pnesdore@gasesmag.com to reserve a copy)

## **Reports on the Tohoku Earthquake's impact on Gas-related Markets and the Global Value-added Supply Chain**

### **Triple Disaster Pulverizes Japan**

(Published online April, 2011; updated version available in Research Package—see below)

A chronology of the earthquake, tsunami, and subsequent nuclear crisis that struck the Tohoku region of Japan in March, 2011. Included in the article are a discussion of energy resources in Japan as well as a special report on the Fukushima reactor design, damage incurred by the earthquake, radioactive releases and hazards, and preparations for cold shutdown, written by and reproduced with permission of World Nuclear Association.

### **Shaken and Stirred: Japan in Numbers**

(Published online May, 2011; updated version available in Research Package—see below)

This compilation of economic data shows the industrial and financial activities in Japan before and after the Tohoku Earthquake. Selected from informative analytical reports released by government offices and financial institutions, they provide snapshots of the supply-and-demand dynamics in Japan and its trading network.

#### **Figures and tables include data on**

- Japanese international trade activities prior to March 11, 2011
- Industrial production and output within disaster zone
- Impact of Tohoku Earthquake on industrial production
- Economic activity in Japan under two post-earthquake scenarios
- Import and export between Japan and trading partners
- Products traded between Japan and other countries
- Asian exports to and imports from Japan
- Implied Impact of Tohoku earthquake on global manufacturing using regression model
- Implied Impact of Tohoku earthquake on GDP worldwide using regression model

### **Interruptions to Industrial Gas Supply in Japan and the Repercussions**

(\$350.00 Contact pnesdore@gasesmag.com to reserve a copy)

- Economic Aftershocks
- Direct impact on the industrial Gas Market
- ❖ **Industrial gas market in Japan prior to the Earthquake**
  - **Bonus material: A look at the major gas suppliers in Japan**

- Niche companies are pioneers of electronic specialty gases
- ❖ Earthquake damaged gas facilities; Interrupted operations prolonged by rolling power outages
- ❖ Electronic gas supply-and-demand in Asia
  - **Bonus material — Nitrogen trifluoride (NF<sub>3</sub>) and monosilane (SiH<sub>4</sub>) market**
  - Nitrogen trifluoride demand increasing faster than supply prior to earthquake
  - Monosilane supply holding steady

#### **Figures and tables include data on**

- Major production sites for bulk gases and electronic specialty gases in Japan
- Top Japanese gas producers' earnings
- Annual sales (billion yen) of leading semiconductor gases in Japan 2005–2009
- Disaster loss of gas suppliers in Japan vs. annual revenue
- NF<sub>3</sub> supply/demand trend and forecast
- NF<sub>3</sub> demand trend and forecast by segment
- NF<sub>3</sub> capacity trend and forecast by producer 2000–2013
- NF<sub>3</sub> price trend and forecast
- Location of NF<sub>3</sub> and SiH<sub>4</sub> plants in Japan
- SiH<sub>4</sub> supply/demand trend and forecast
- SiH<sub>4</sub> demand trend and forecast by segment
- REC's polysilicon production and monosilane sales
- SiH<sub>4</sub> capacity trend and forecast by producer

### **Impact of Tohoku Earthquake on Industrial Gas Demand: Disruption to the global technology supply chain affects demand of gases in manufacturing across industries**

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This report begins with a brief introduction to gas usage in different manufacturing processes (e.g., production of automobiles, steel, petrochemicals, electronics), providing a background on how production disruptions across these industries in the aftermath of the Tohoku Earthquake affect the gas market. Topics covered include long- and short-term shortages of materials, such as auto parts, equipment components, steel, electronic chemicals and substrates, electronics, ethylene and naphtha, that affect the production or consumption of gases in Japan, Asia, and beyond. As Japan plays a pivotal role in the global technology chain, producing value-added components critical to industries worldwide, the speed of its economic recovery and industrial production will have far-reaching, cross-sector consequences in Asia, Europe, and America.

## **Research Package: Complete series of updated articles and reports on the Tohoku Earthquake**

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