

2010 Natural Gas STAR Annual Implementation Workshop
November 1-3, 2010
New Orleans, Louisiana



INBL

2010 Natural Gas STAR Annual Implementation Workshop

Assisting in Plant Design Utilizing GHG Management Software

By:

Brian Lockard -Manager, Corporate Climate Policy

November 1-3, 2010
New Orleans, Louisiana

About Noble Energy

- ▶ Independent energy company engaged in worldwide oil and gas exploration and production
- ▶ Domestic U.S. Operations
 - Rocky Mountains, Mid-Continent, and deepwater Gulf of Mexico
- ▶ Key International Operations
 - Offshore Israel and West Africa

Noble Corporate GHG Strategy

- ▲ Awareness Programs
- ▲ Corporate Policy/Strategy Development
- ▲ GHG Reduction Projects
 - High bleed pneumatic replacements
 - VRU pilot programs
 - Heat trace/injection pump replacement
 - IR camera directed maintenance

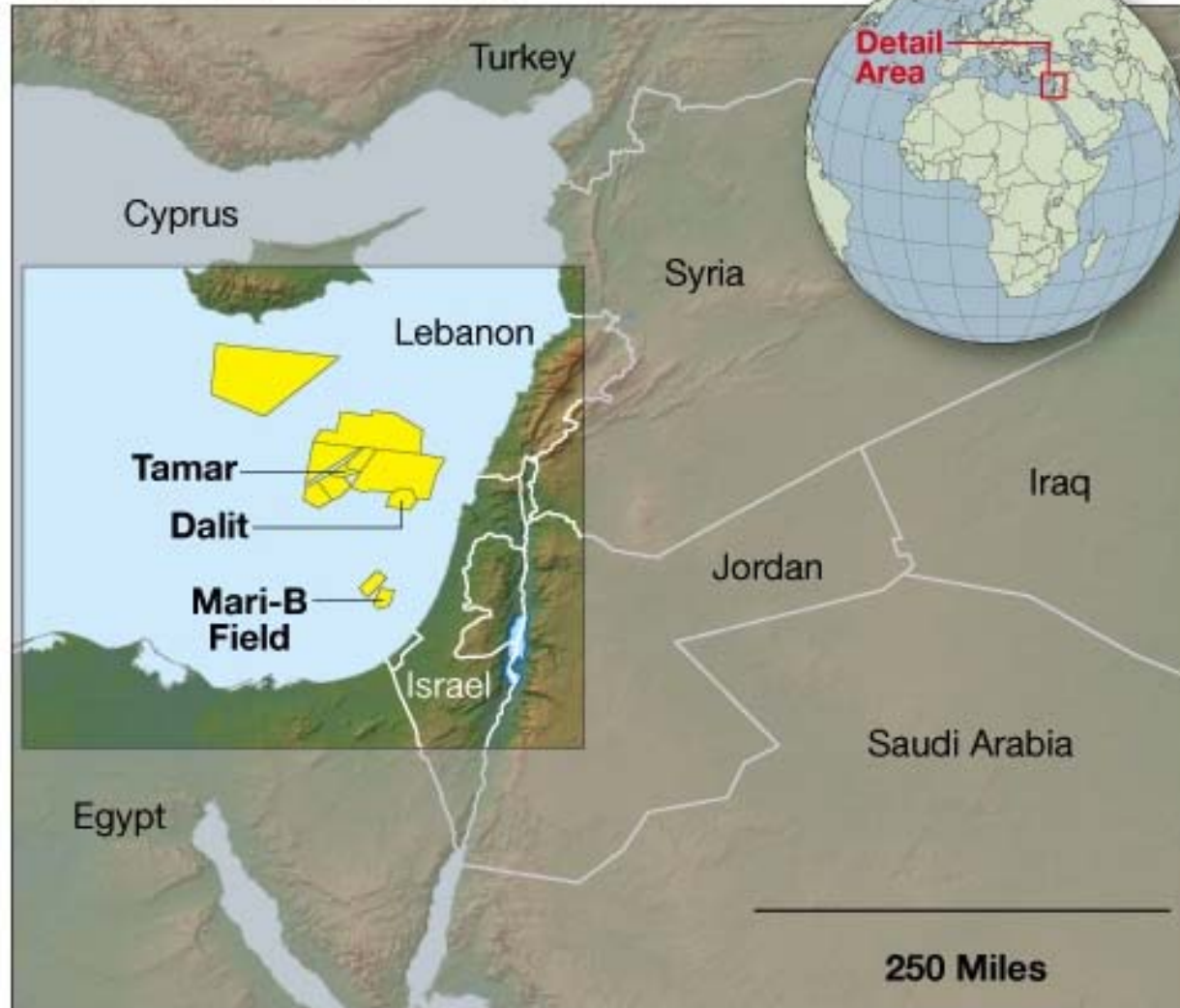
*“All **lagging** strategies”*

Noble Corporate GHG Strategy

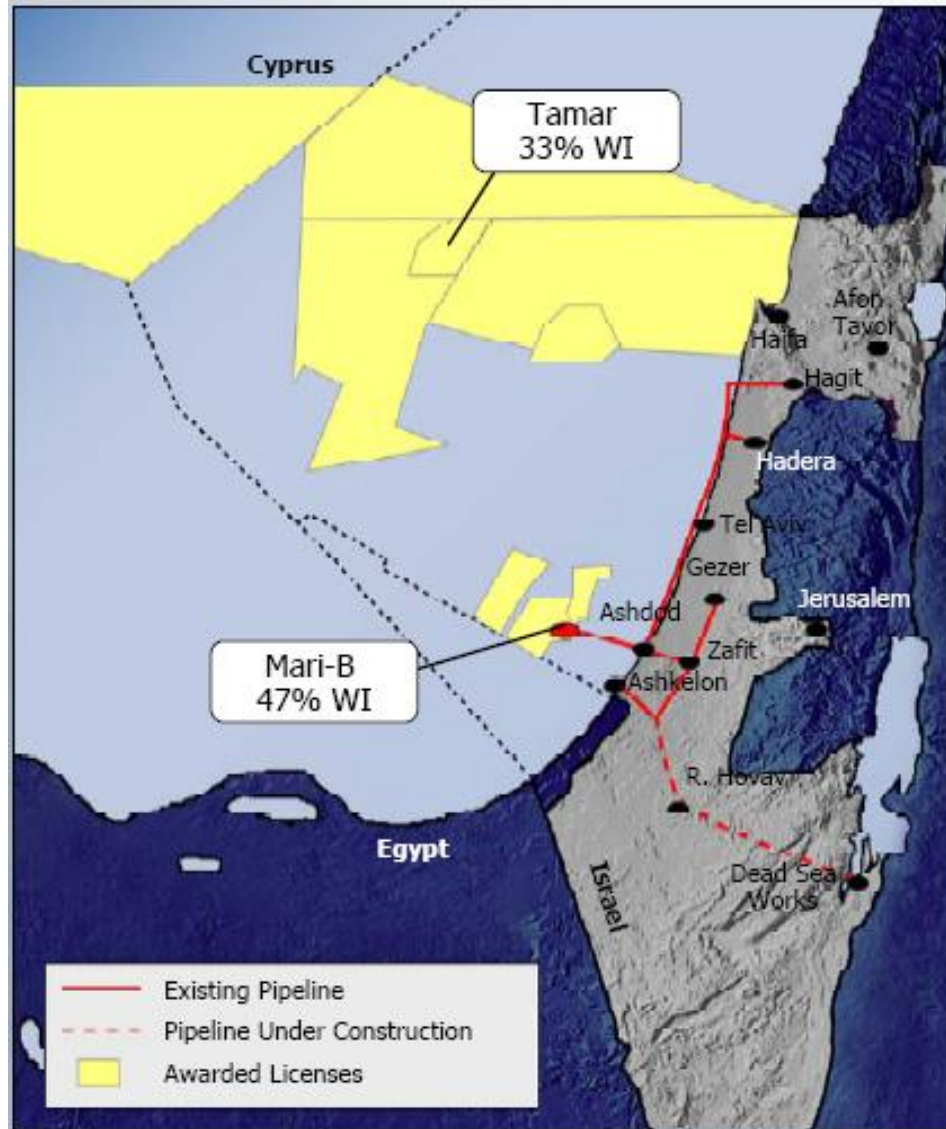
- ▲ Goal is to have “a seat at the table” during early phases of a project
- ▲ Affect design, i.e. “**Leading Strategies**”
 - ◉ Project conceptual phase
 - ◉ Early stages of new field development
 - ◉ Engineering design input
 - ◉ Focus on minimizing GHG (CH₄) footprint

Noble Energy Tamar Project

Israel Natural Gas Fields



Noble Energy Tamar Project



Noble Energy Tamar Project

Project Background

- ▲ Field discovered in 1999, located 52 miles offshore Israel in the Eastern Mediterranean
- ▲ Estimated 8.4 TCF, gross reserves
- ▲ Initial development:
 - ◉ Five subsea wells flowing 200 to 250 MMCFD of natural gas each
 - ◉ 1.0 BCFD Receiving facility for liquids removal, dew point control

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Receiving Facility Equipment

- ▲ Compression
- ▲ Electric Generation
- ▲ Dehydration (MEG)
- ▲ Stabilization
- ▲ Centralized, hot oil heat
- ▲ Condensate storage
- ▲ Dew point control (Joule-Thomson valve)
- ▲ Vapor Recovery System
- ▲ Purge System

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- ▲ ESS Essential Suite version 7.3.3
- ▲ 2008 Criteria Pollutant and GHG inventories prepared in ESS
 - Only assets under operational control
 - Criteria pollutant inventory included only “regulated” domestic operations
 - GHG inventory included domestic and international operations
- ▲ Reported 2008 Inventory to Carbon Disclosure Project

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- ▲ Mid 2010 receiving facility design changed from onshore facility to offshore
- ▲ Successes
 - Maximized VRU capture
 - Minimized purge gas flow
 - Minimized fugitive emissions
 - Engineering design
 - Directed LDAR program using IR Technology

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▲ Conclusions

- “Seat at the table” strategy had educational value with engineering and project team
- Emission reductions during design phase more effective than lagging controls
- GHG management software can be used as a design tool