

Opportunities in Sustainable Mobility

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SAE and Sustainable Mobility Initiatives

- SAE Sustainable Development Program Committee
Ron Williams, SDPC Chairman
- UNEP “Industry as a Partner for Sustainable Development”
Automotive Chapter by international automotive manufacturers coordinated
by Auto Alliance, ACEA, and JAMA
Printed in the UK 2002
- International Automotive Manufacturers Charter on
Sustainable Development 2004
- “Mobility 2030: Meeting the Challenges to Sustainability”
The Sustainability Project
WBCSD 2004

SAE International

Sustainable Development Program Committee

- A committee of the Engineering Meetings Board. Provides leadership and direction to promote, facilitate, and coordinate an approach to sustainable mobility
- Facilitates meetings, panels, summits, and conferences on concepts, issues, and progress in sustainable mobility
- Recent activities:
 - SAE World Congress in Detroit
 - co-sponsor Italian Thermotechnical Association Sustainable Mobility Challenge in Perugia Italy
 - participation in World Recycling Conference in Shanghai China,
 - program responsibility for APAC14
 - co-sponsorship InLCA/LCM 2006 and 2007

Participants in the International Automobile Manufacturers Charter on Sustainable Development

BMW

MAN

DAF

Porsche

DaimlerChrysler

PSA

Fiat

Renault

Ford Motor Company

Scania

General Motors

Toyota

Honda

Volkswagen

Hyundai

Volvo

Why the Automotive Industry Needs to be Sustainable

- Worldwide vehicle production is nearly 60 million vehicles per year
- Worldwide transport activity (vehicle kilometers traveled (VKT)) is nearly 20 billion per year
- Worldwide Vehicle CO₂ emissions are nearly 12% of the total anthropogenic emissions

3 Pillars of Sustainable Development

Sustainable Development

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graph TD; A[Sustainable Development] --- B[Social Advancement (Progress)]; A --- C[Environment Protection (Respect)]; A --- D[Economic Wealth (Development)];
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Social Advancement
(Progress)

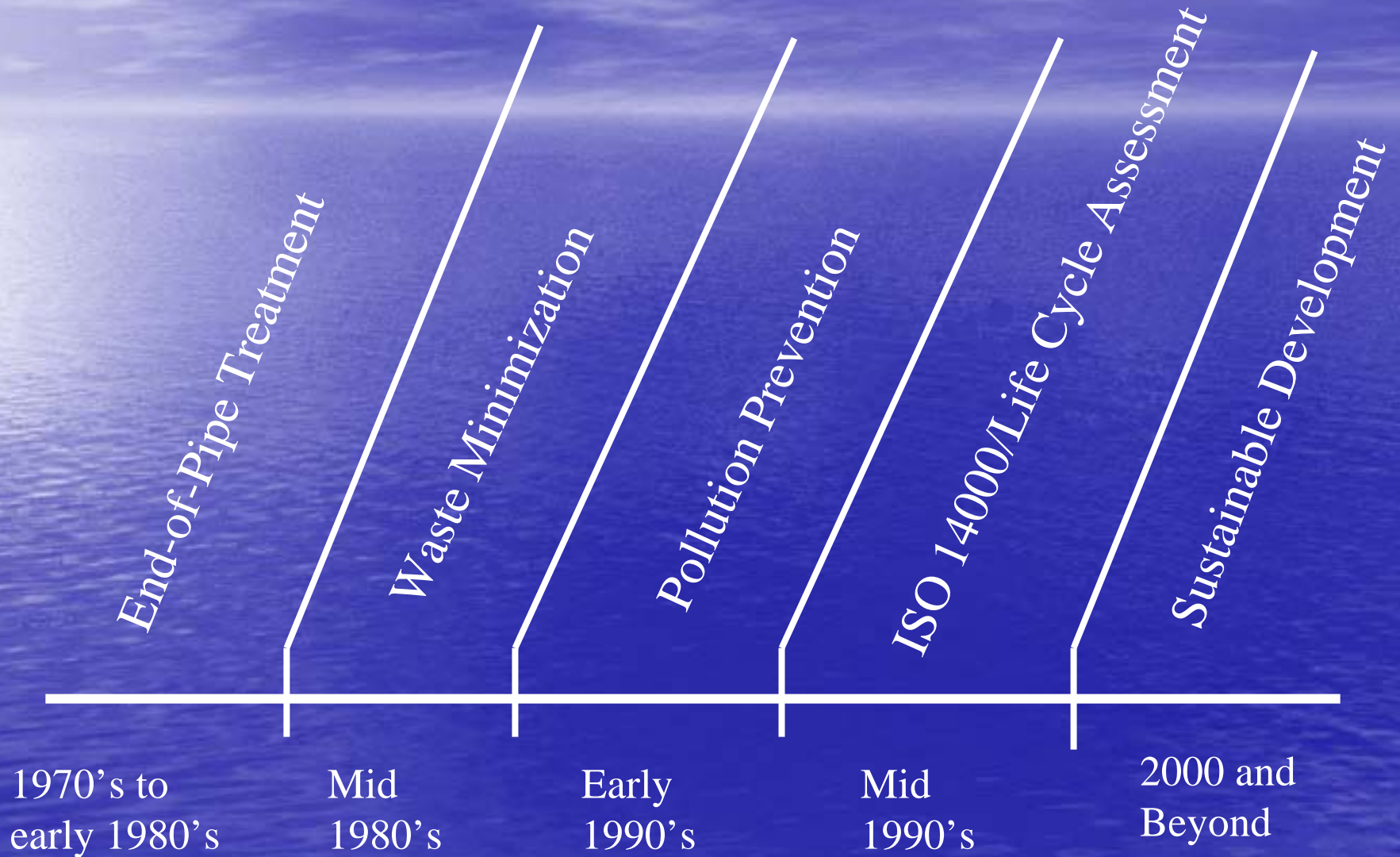
Environment Protection
(Respect)

Economic Wealth
(Development)

What is the Business Case for Sustainable Mobility?

- Decreasing environmental impacts causes positive social impacts
- Advantages include:
 - Internal cost reductions
 - Product differentiation
 - Increased regulatory compliance
 - Redefine the market (lower cost, increase value)
 - Better management of environmental business risk

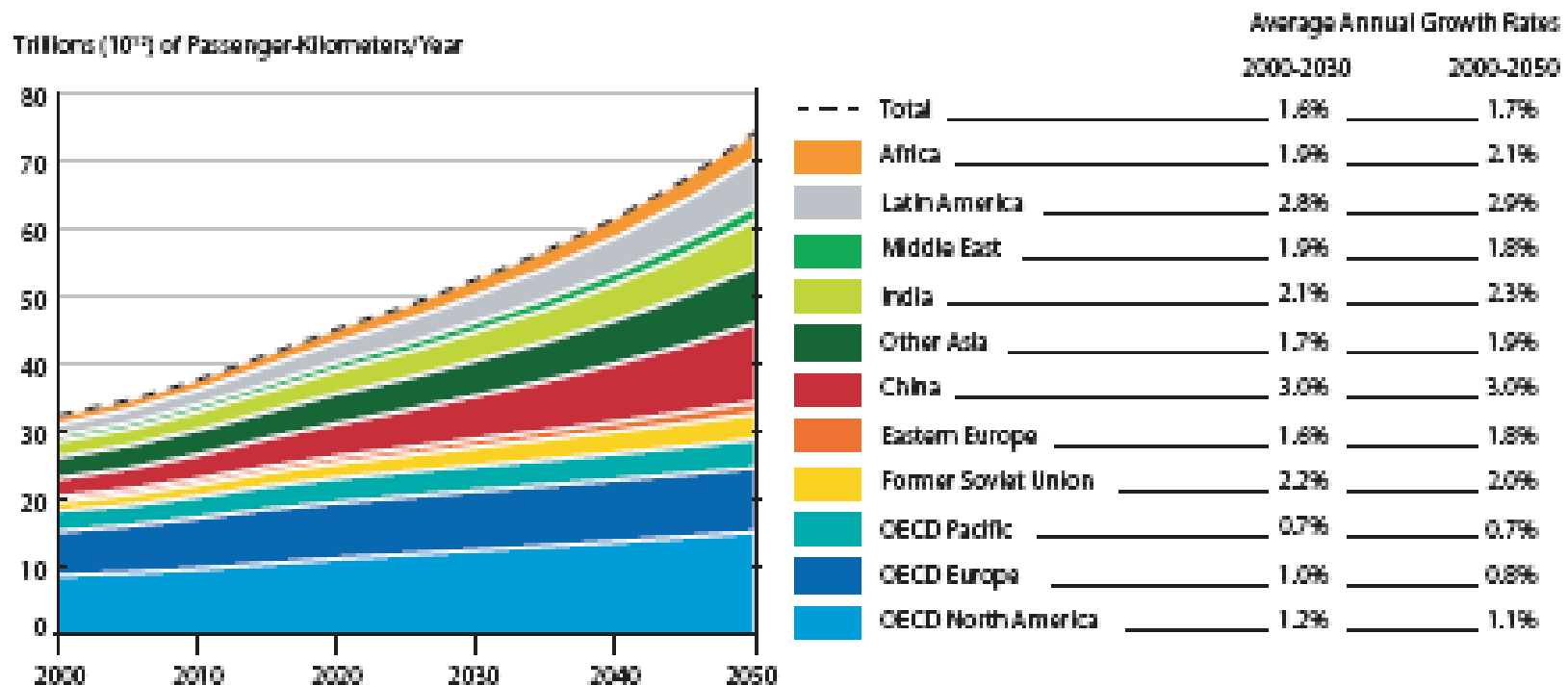
Evolution of Environmental Protection Strategies



Aspects of Sustainability

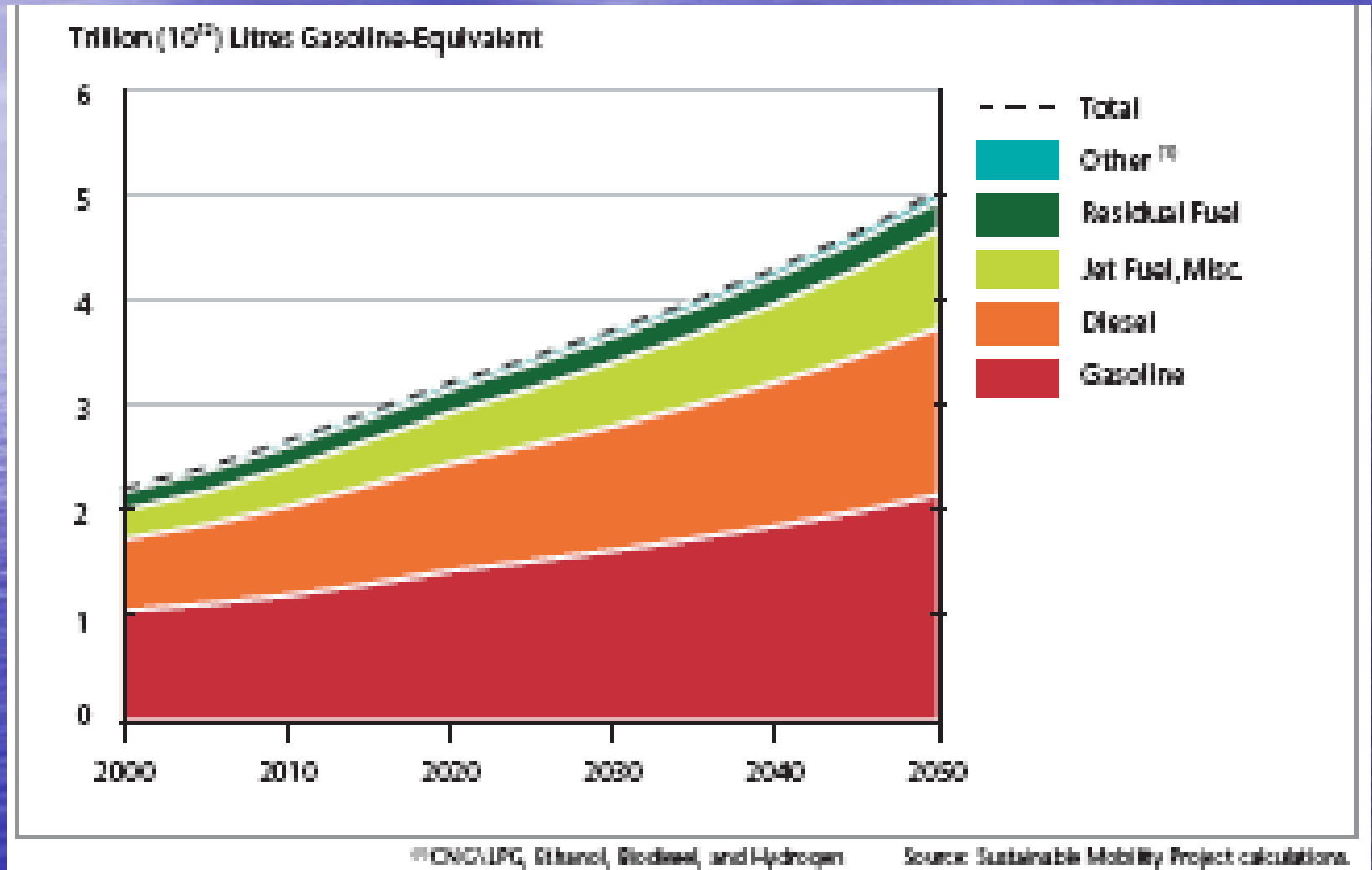


Personal Transport Activity by Region



Source: Sustainable Mobility Project calculations

World-wide Transport Related Fuel Use



Goals of Integrating Sustainable Development



Key Commitments

- The sustainability of the automobile industry and mobility can no longer be viewed from economic criteria alone
- Establish a balance between economic, environmental, and social goals
- Engage in global initiatives to promote sustainable development
- Accept responsibility in this process and actively and constructively work towards further dialogue worldwide

LCA and the Auto Industry

- SAE/OIAV (Austria) Total Life Cycle Conferences
John Sullivan/Bob Kainz
- ISO-14040 and Methodology Development
Jim Fava, UNEP, SETAC
- US Automotive Materials Partnership
APC, IISI, Aluminum Association
- Car Recycling Workshops (European Directive)
AAMA, ACEA, JAMA
- Data Bases and Software Tools
Franklin, Boustad, EcoBalance, PE GaBi

Strategic Leadership for the SAE SDPC

- “Mobility 2030: Meeting the Challenges to Sustainability”

The Sustainability Project: WBCSD 2004

GM

DaimlerChrysler

Honda

Renault

Shell

Michelin

Ford

Toyota

Nissan

VW

BP

Norsk Hydro

Goal Areas to Achieve Sustainable Mobility

- Ensure emissions are not a public health concern anywhere in the world
- Limit GHG releases to sustainable levels
- Reduce the number of road vehicle-related deaths
- Reduce transport-related noise
- Mitigate congestion
- Narrow the mobility opportunity divides internationally
- Preserve and enhance mobility opportunities

Goal: Limit GHG Releases to Sustainable Levels

- LCA of Current and Future Systems
- Quantify the Economic and Social Factors
- Define Sustainable Levels of GHG
- Evaluate the Tradeoffs Among Options

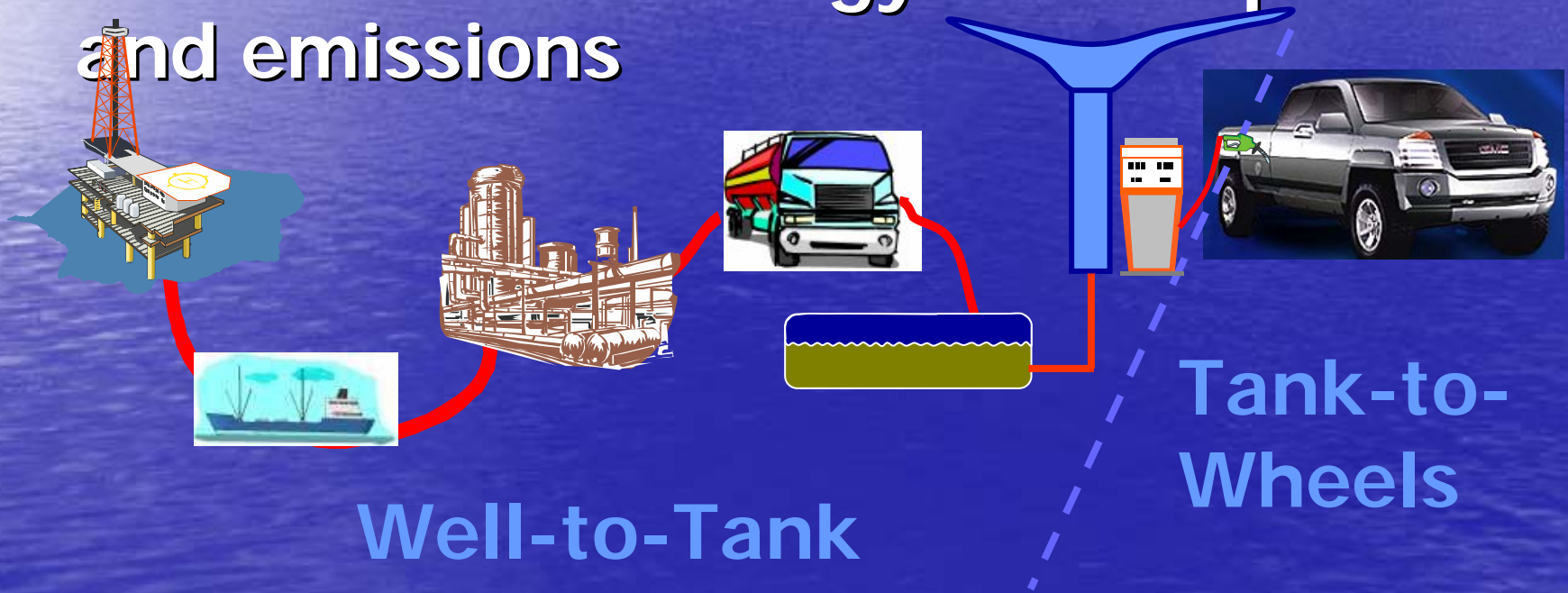
Well to Wheels Studies: Comparisons Between Europe and North America

General Motors R&D Center



What is a Well-to-Wheels Analysis?

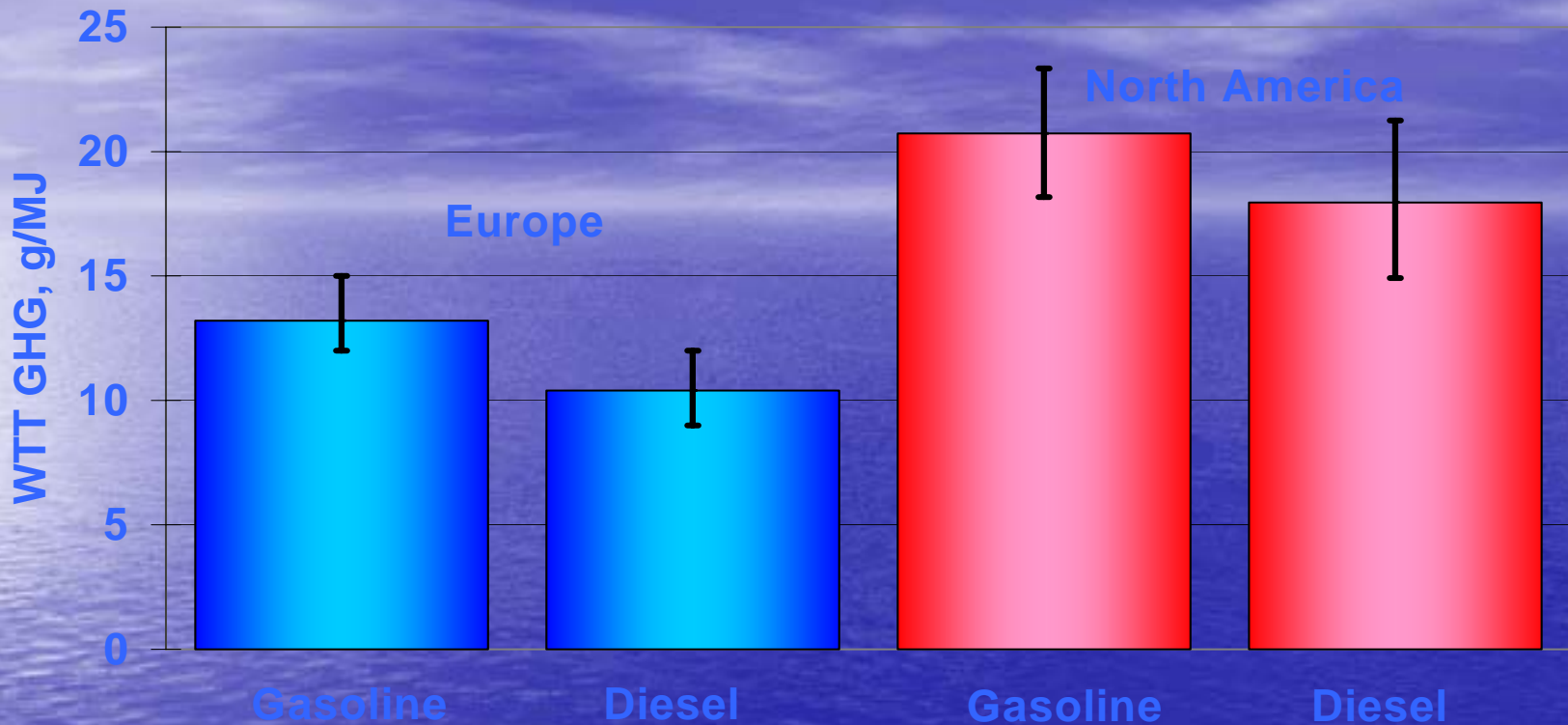
- Systems approach
- Assessment of energy consumption and emissions



Well-to-Wheels Energy Issues

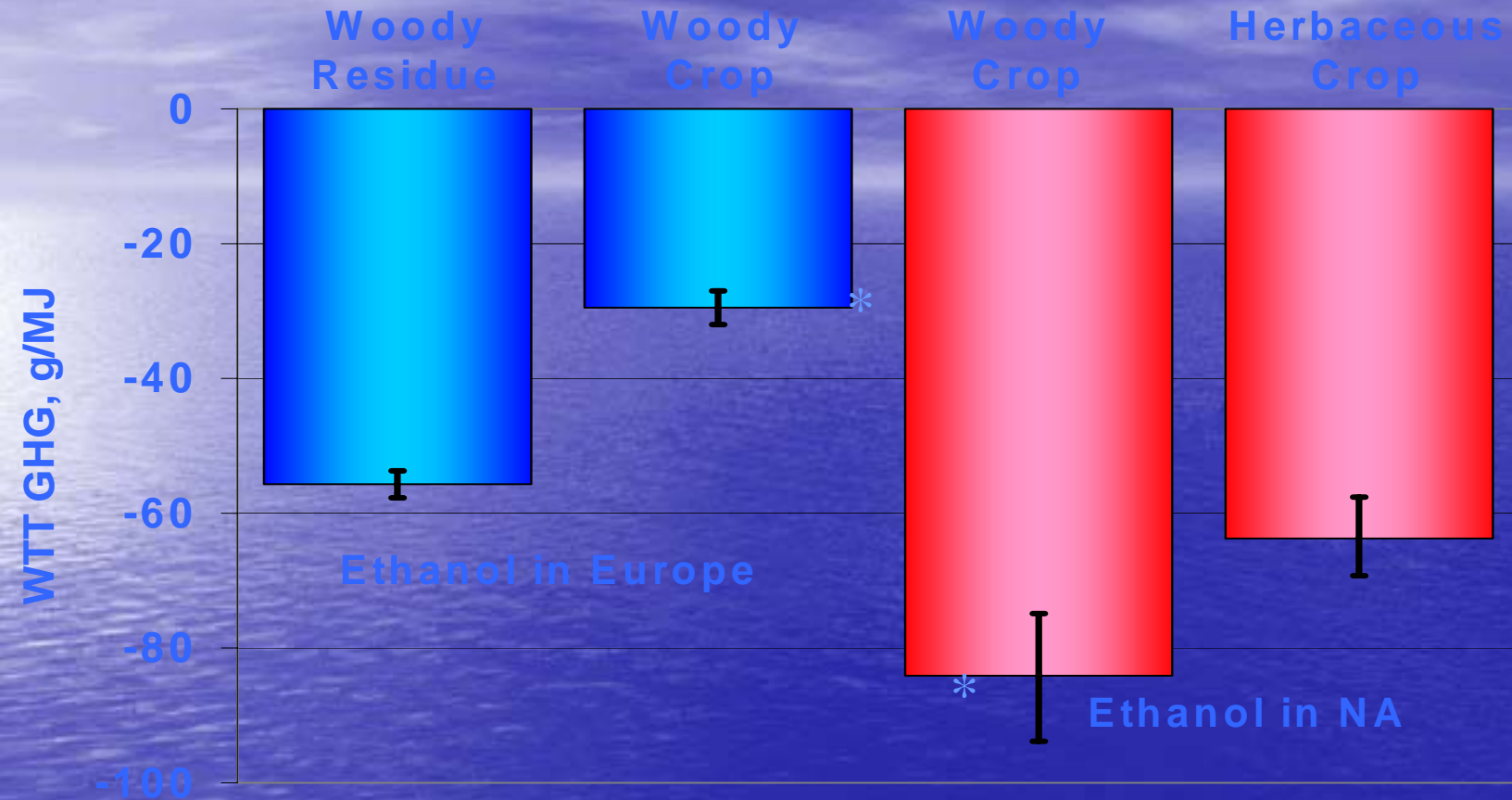
- Comparing energy usage across different resources not meaningful
 - No clear definition of energy resource for biofuels, other renewables, and nuclear
 - No definitive method to handle multiple products for both biofuels and oil refining
- Evaluation of petroleum or fossil fuel savings more meaningful
 - Reducing petroleum usage a high priority for transportation

Well-to-Tank GHG - Gasoline/Diesel



- Gasoline refining more energy intensive – higher GHG than diesel
- European refineries more efficient than U.S. refineries due to more optimum gasoline/diesel split

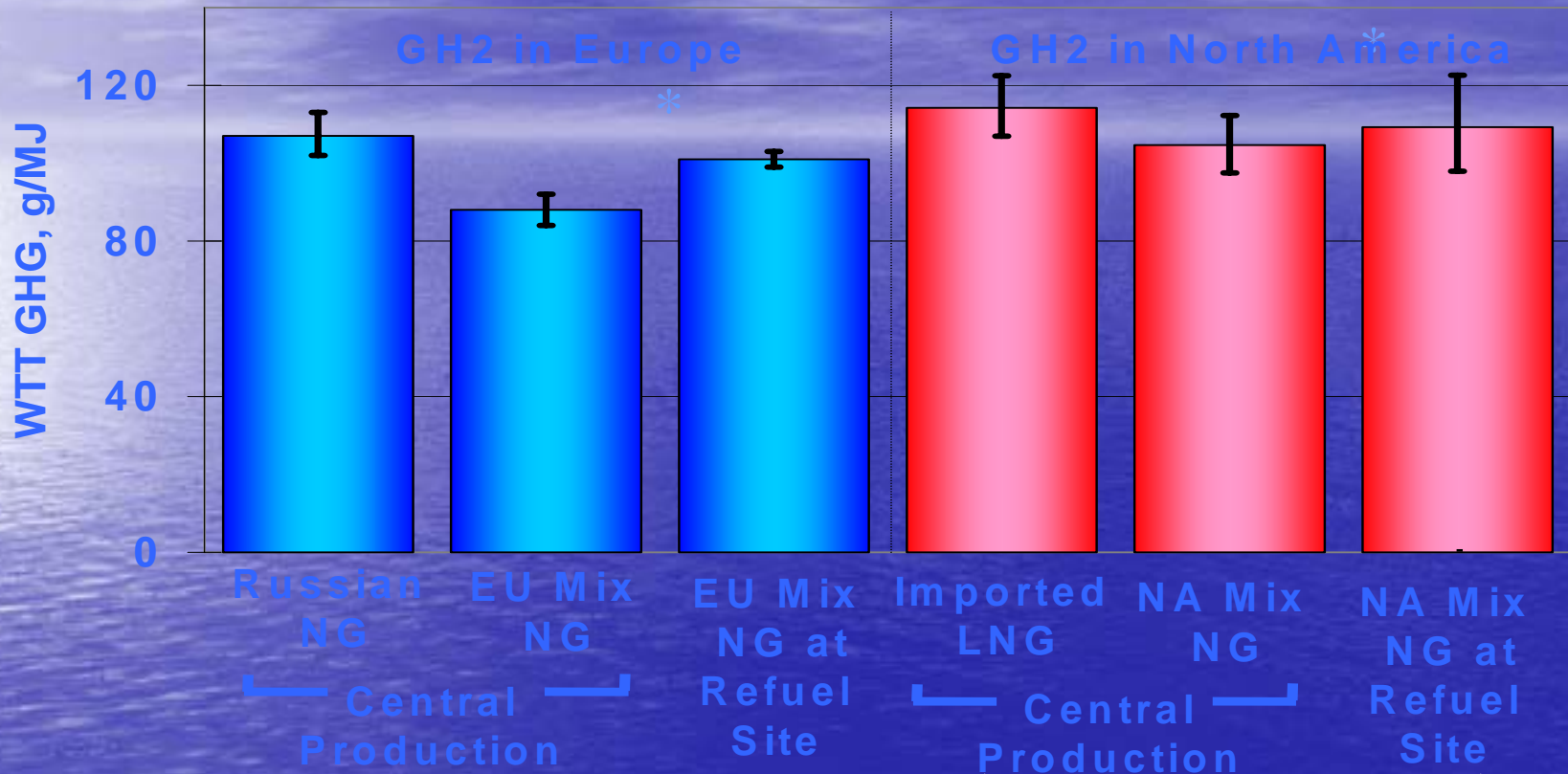
Well-to-Tank GHG – Cellulosic Ethanol



- NA had more favorable assumptions of land use change (sequestration), N₂O and energy for conversion

*Used in Well-to-Wheels Chart

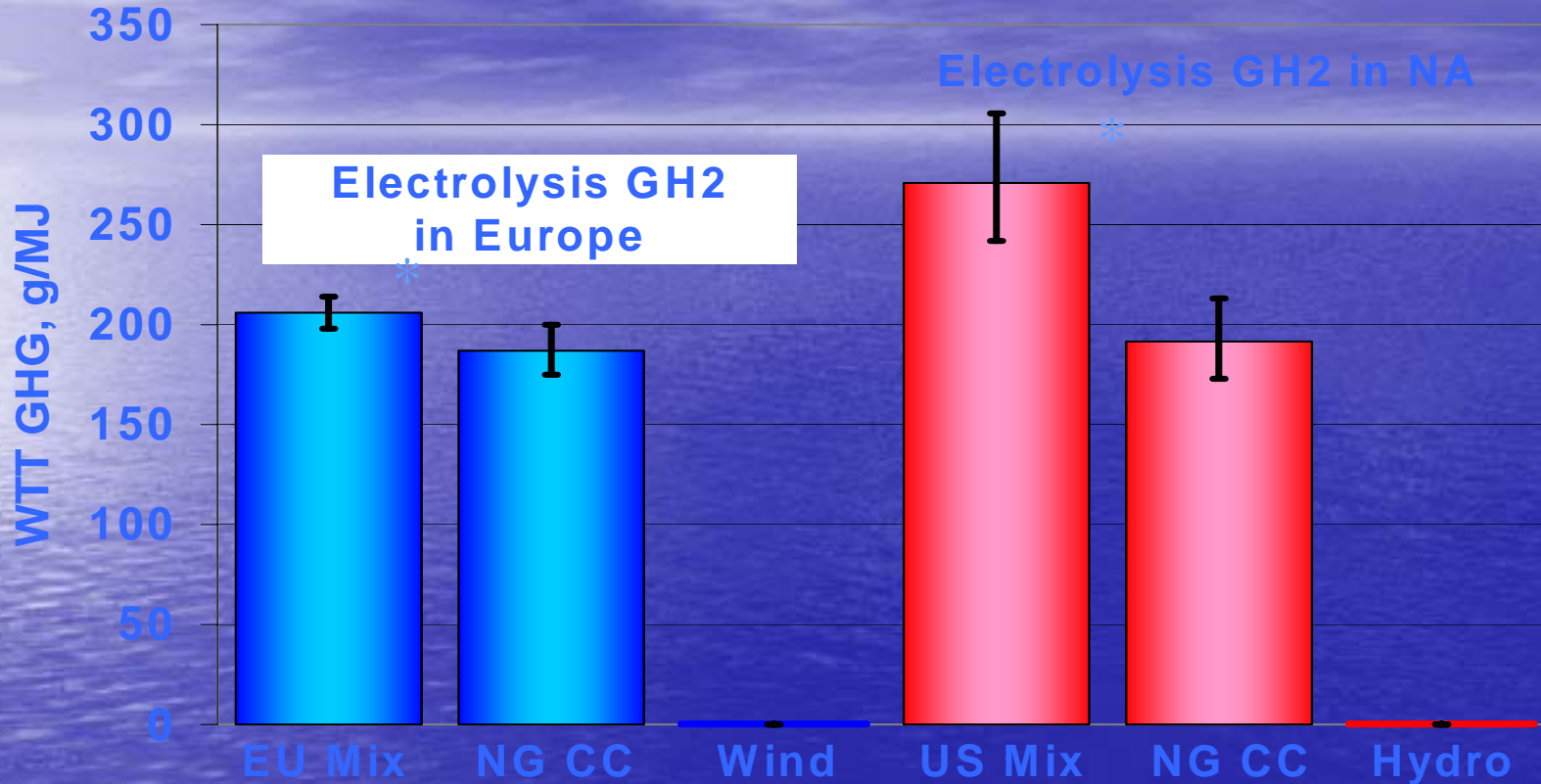
Well-to-Tank GHG – NG based H2



- Imported gas gives higher GHG (transport distance)
- Central production provides efficiency and GHG advantage
- About 1/3 of NA GHG due to electricity for compression

*Used in Well-to-Wheels Chart

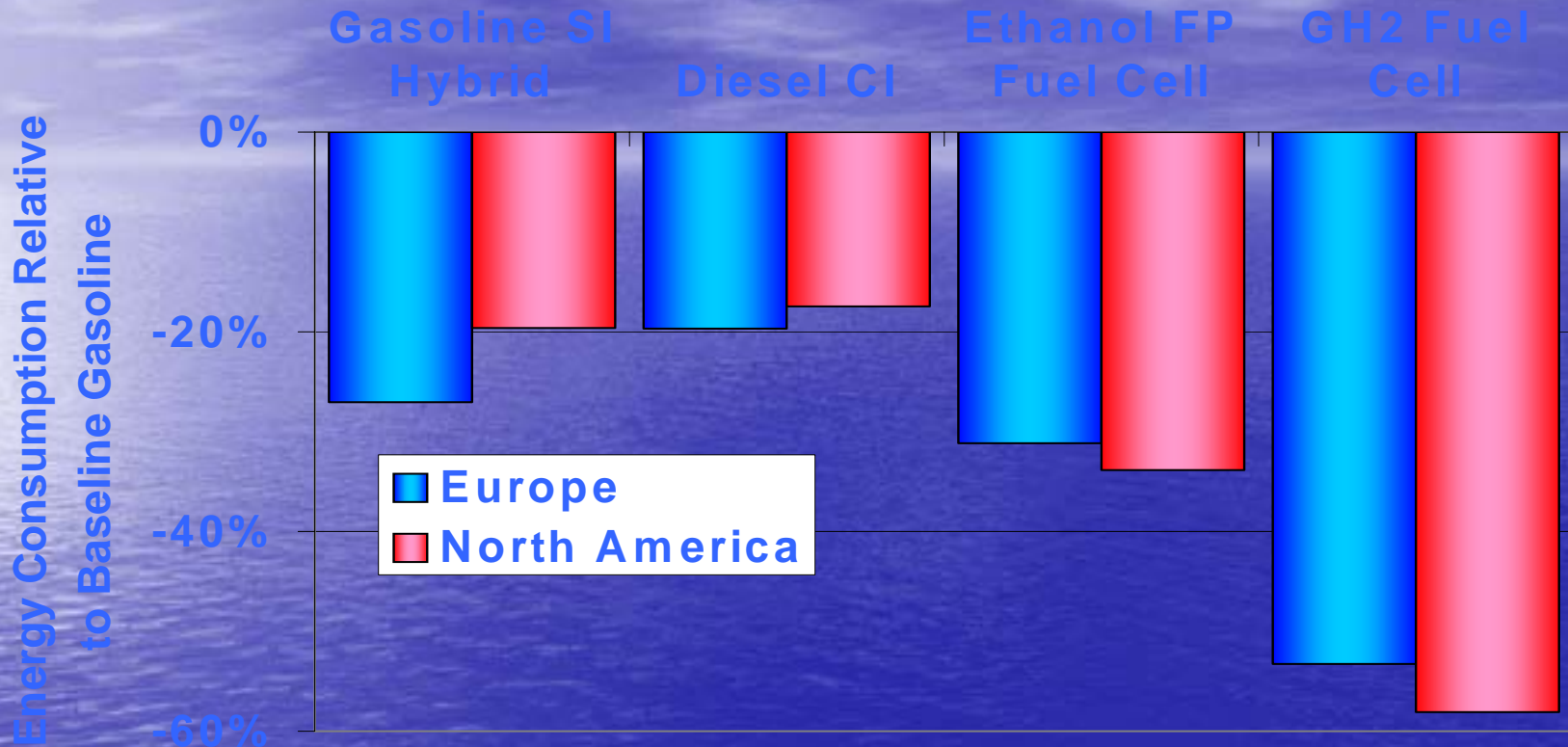
Well-to-Tank GHG – Electrolysis H2



- US Mix higher GHG due to greater share of coal combustion
- Non-renewable sources higher than that for NG reforming

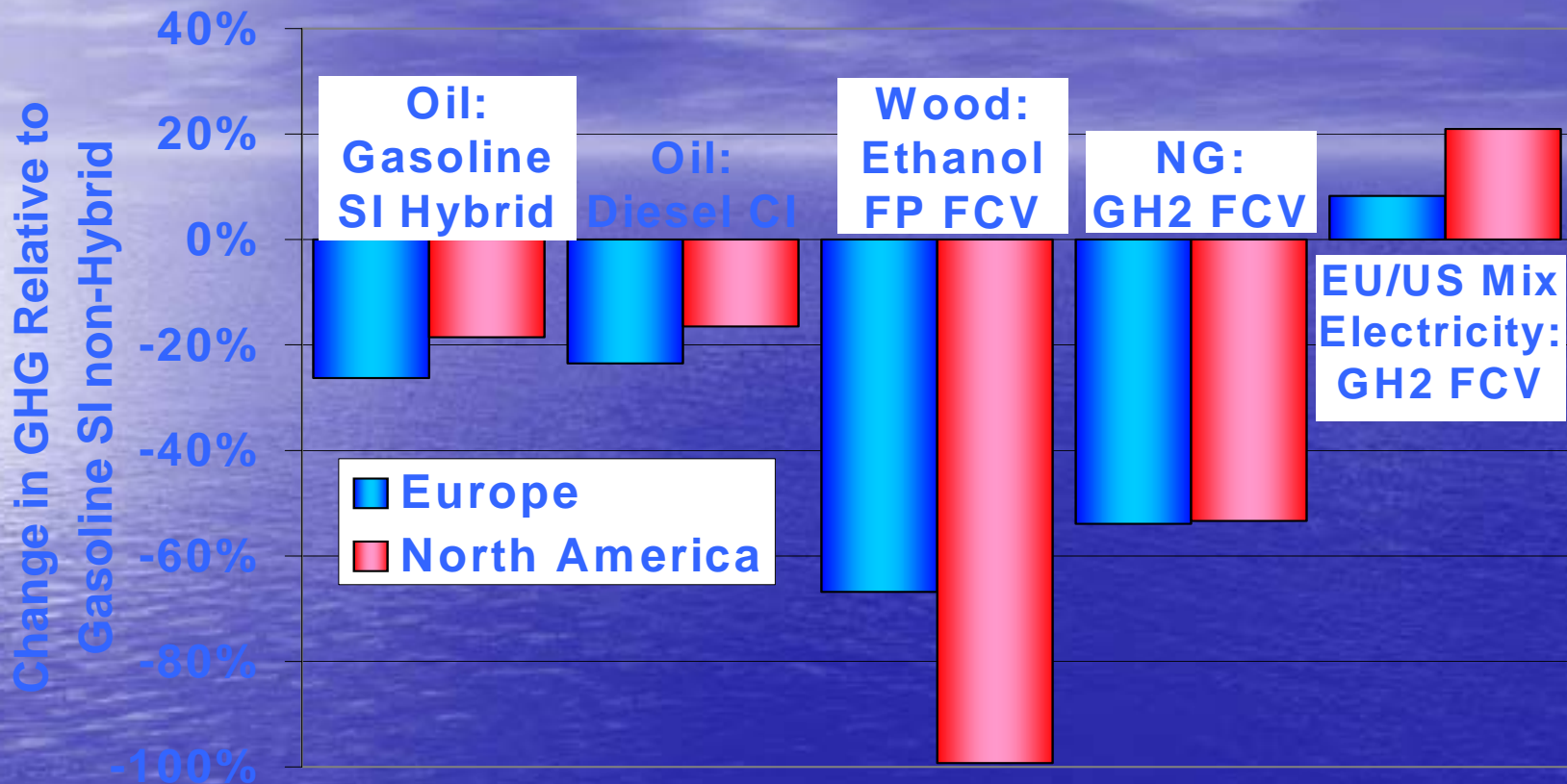
*Used in Well-to-Wheels Chart

Tank-to-Wheels Energy Consumption



- Hybridization benefit greater on European driving cycle
- Benefits of other technologies similar for Europe and NA

Well-to-Wheels Greenhouse Gases



- Hybrid and diesel impact greater in Europe
- More favorable wood: ethanol assumptions for North America
- U.S. electricity mix unfavorable for electrolysis hydrogen

Ethanol From Corn

The Rest of the Story

- A life cycle financial study is needed
 - Impact of the corn market
 - Interaction with federal farm programs
 - Economics of foreign vs. domestic energy sources
 - Financial impact on growth of cellulosic ethanol
- Complete impact assessment is needed
 - Social as well as environmental
 - Markets and the benefits to US agriculture
 - Impact of corn prices and corn exports
- Is ethanol fuel a step towards sustainable mobility?

Hybrid Powertrains

The Rest of the Story

- A life cycle financial study is needed
 - Impact of resource use in production
 - Economics of foreign vs. domestic energy sources
 - Financial impact on growth of Fuel Cell Vehicles
- Complete impact assessment is needed
 - Social as well as environmental
 - Markets and the benefits to US motorists
 - Impact of fuel prices and sources
- Are hybrid powertrains a step towards sustainable mobility?

Progress Towards Sustainable Mobility

- Ensure emissions are not a public health concern anywhere in the world
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- Reduce transport-related noise
- Mitigate congestion
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- Preserve and enhance mobility opportunities