



Biofuels Cold Flow Workshop

Pacific Northwest Diesel Fuel, Varietal, Expectations, Supply

Ward L. Fridrich, P.E.
BP Global Fuels Technology
March 22, 2012

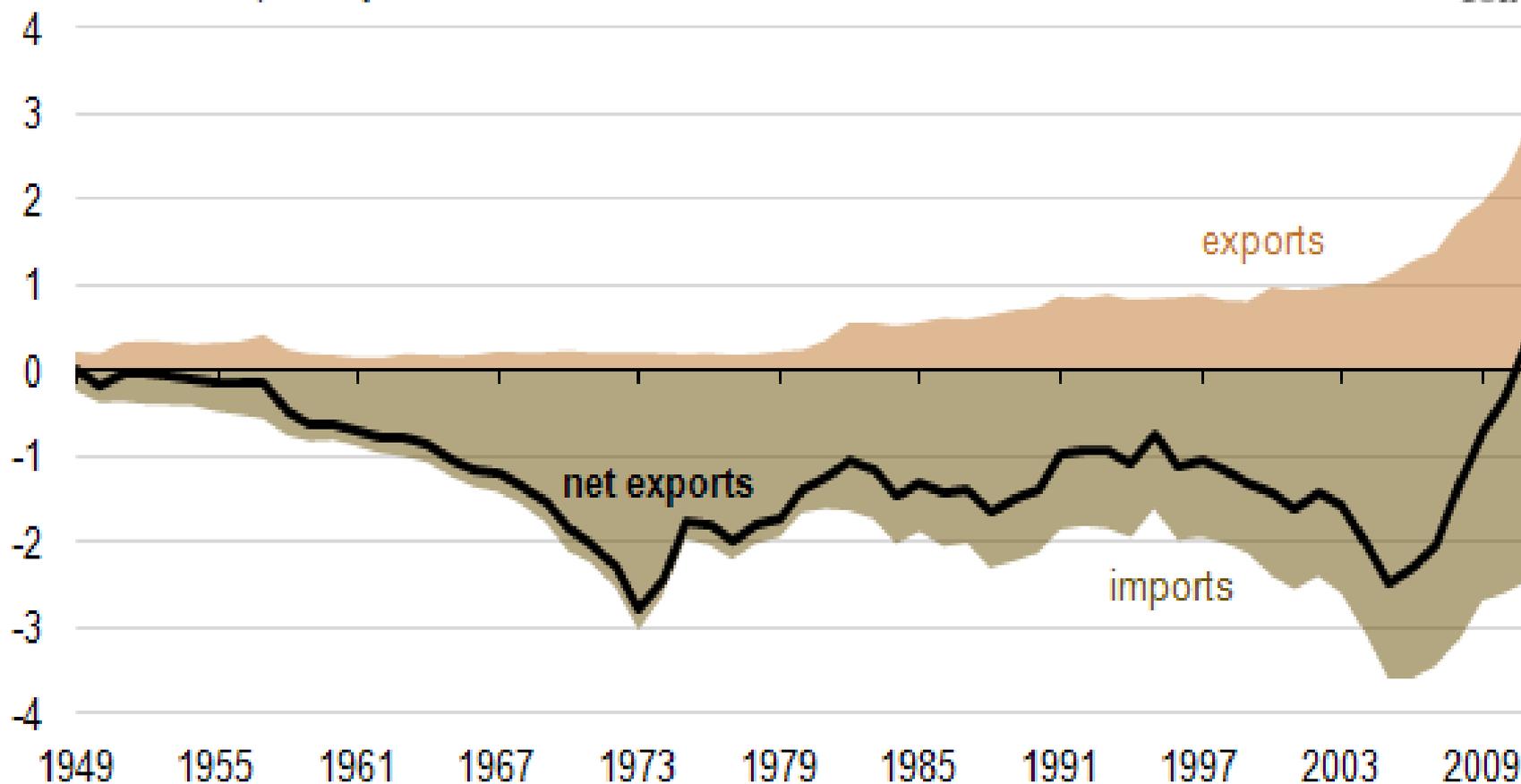
Global Fuels Technology





Annual U.S. net exports of total petroleum products, 1949-2011

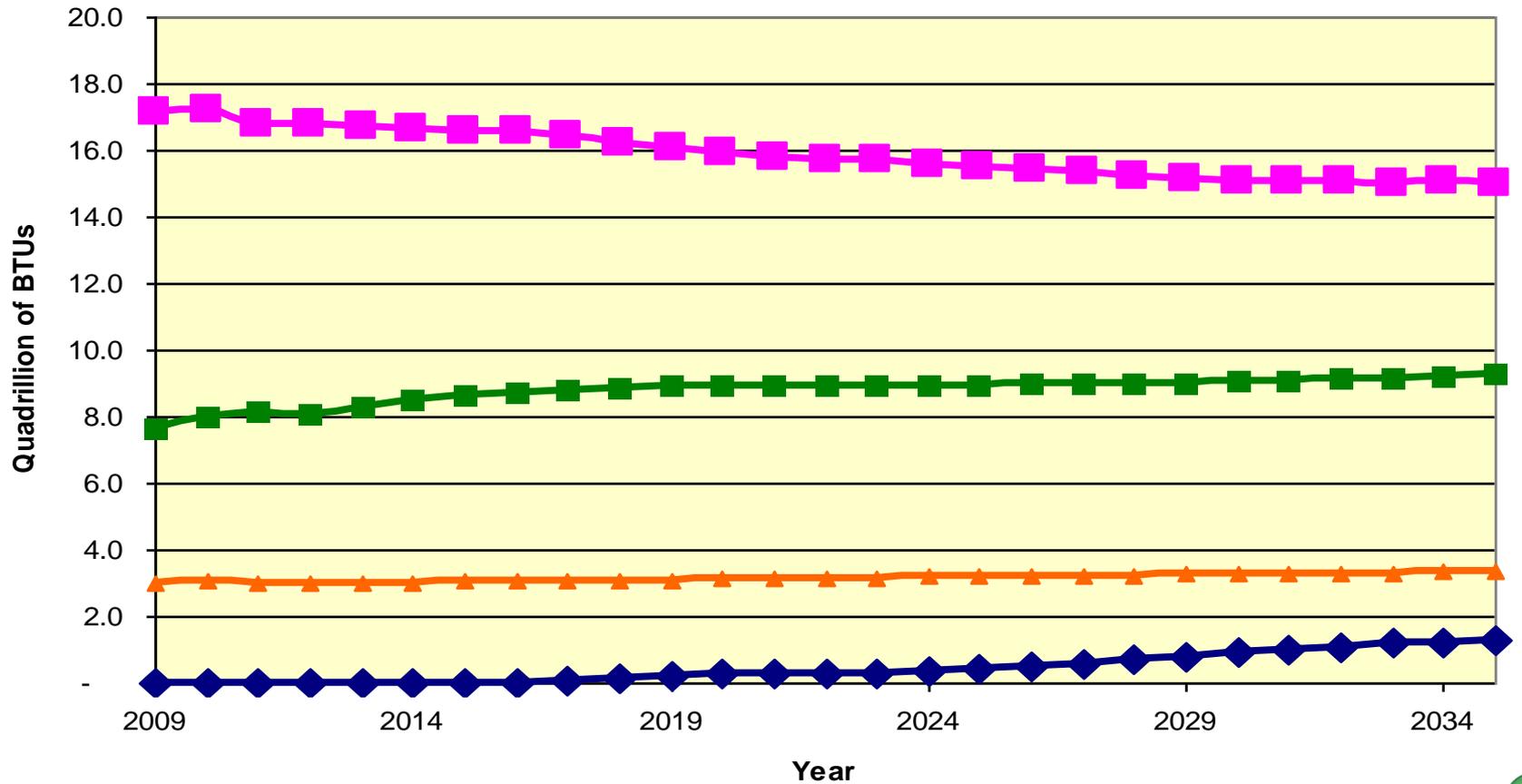
million barrels per day



EIA – Annual Energy Consumption Forecast

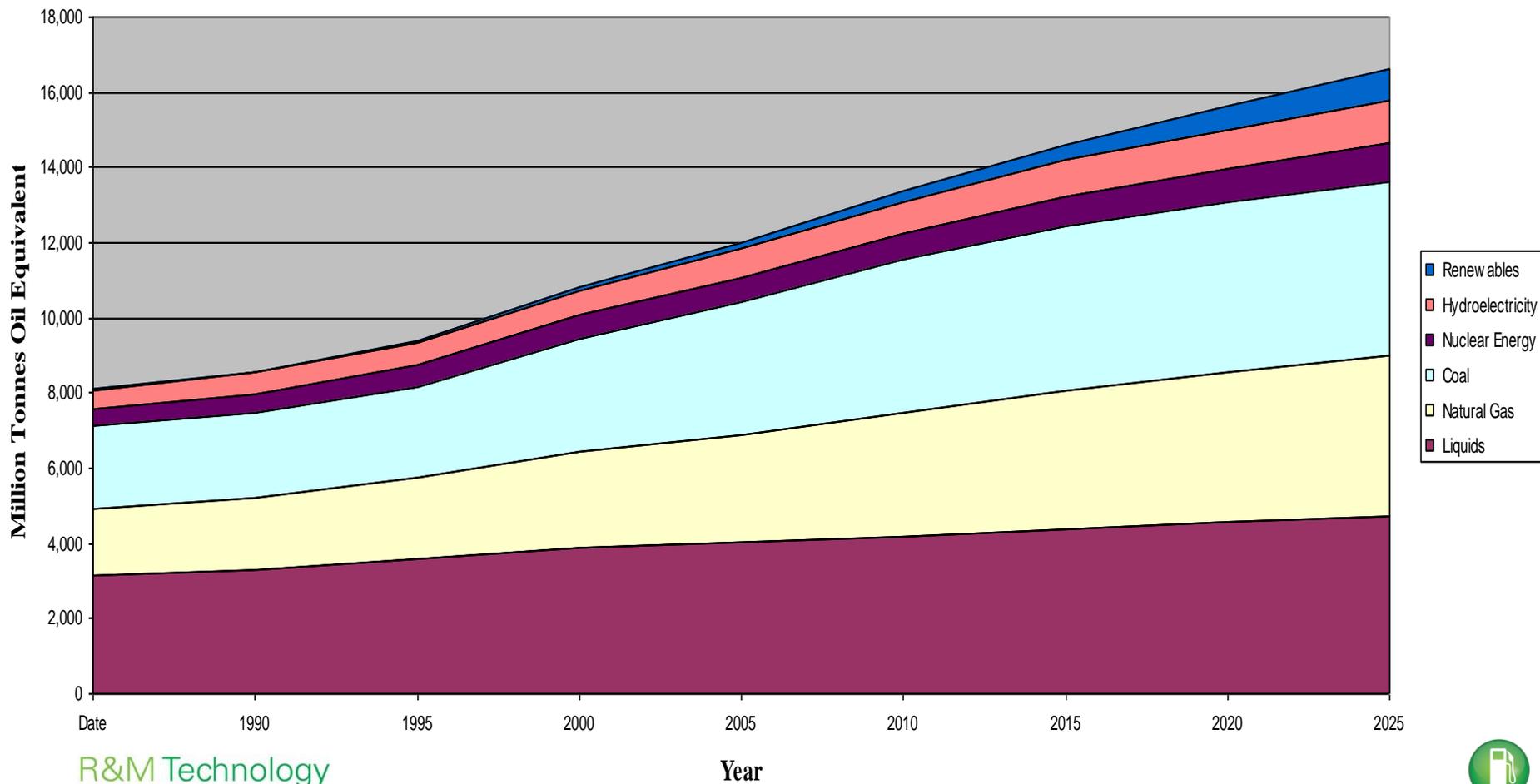


US Energy Information Administration



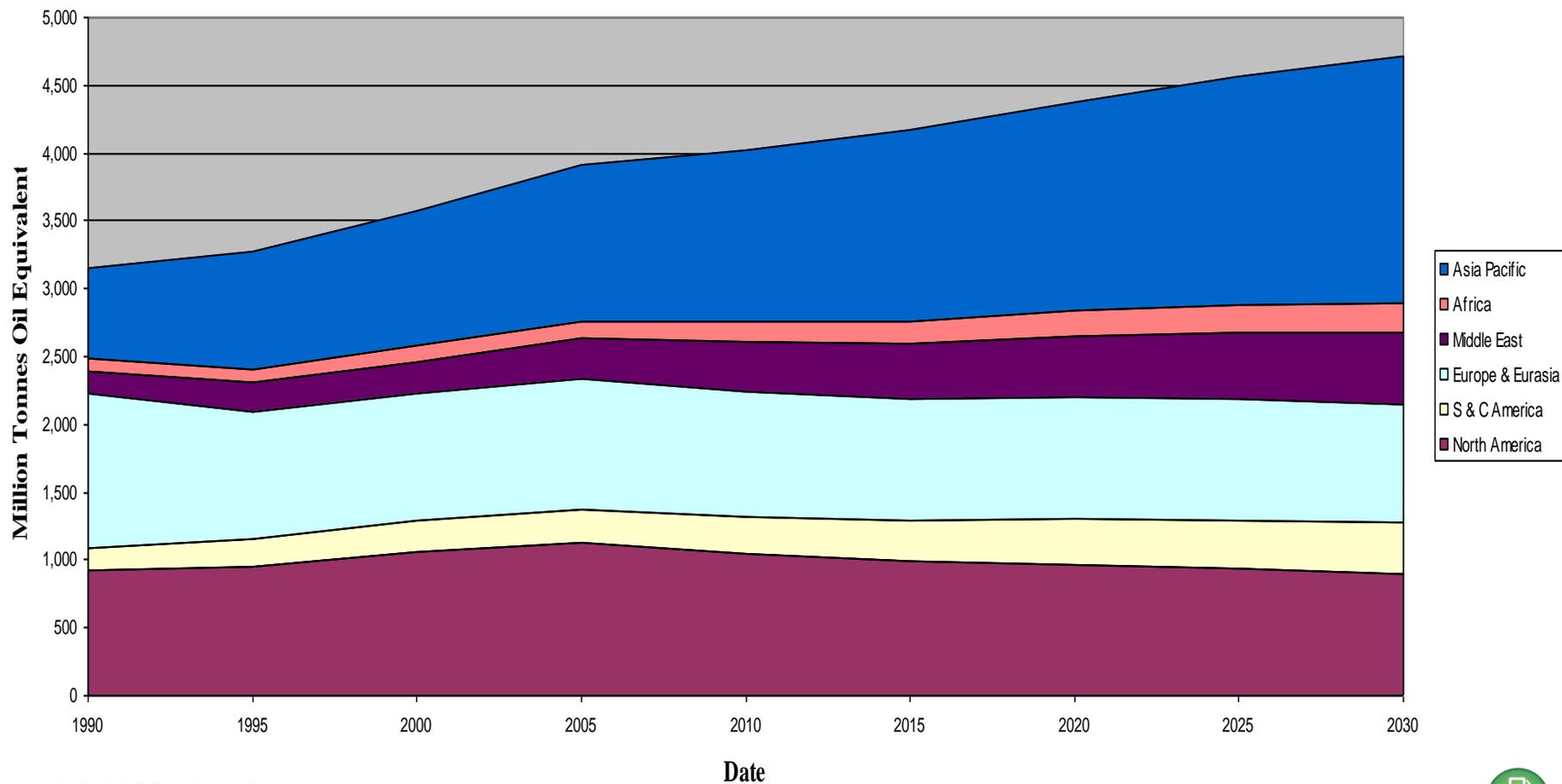


World Energy Consumption



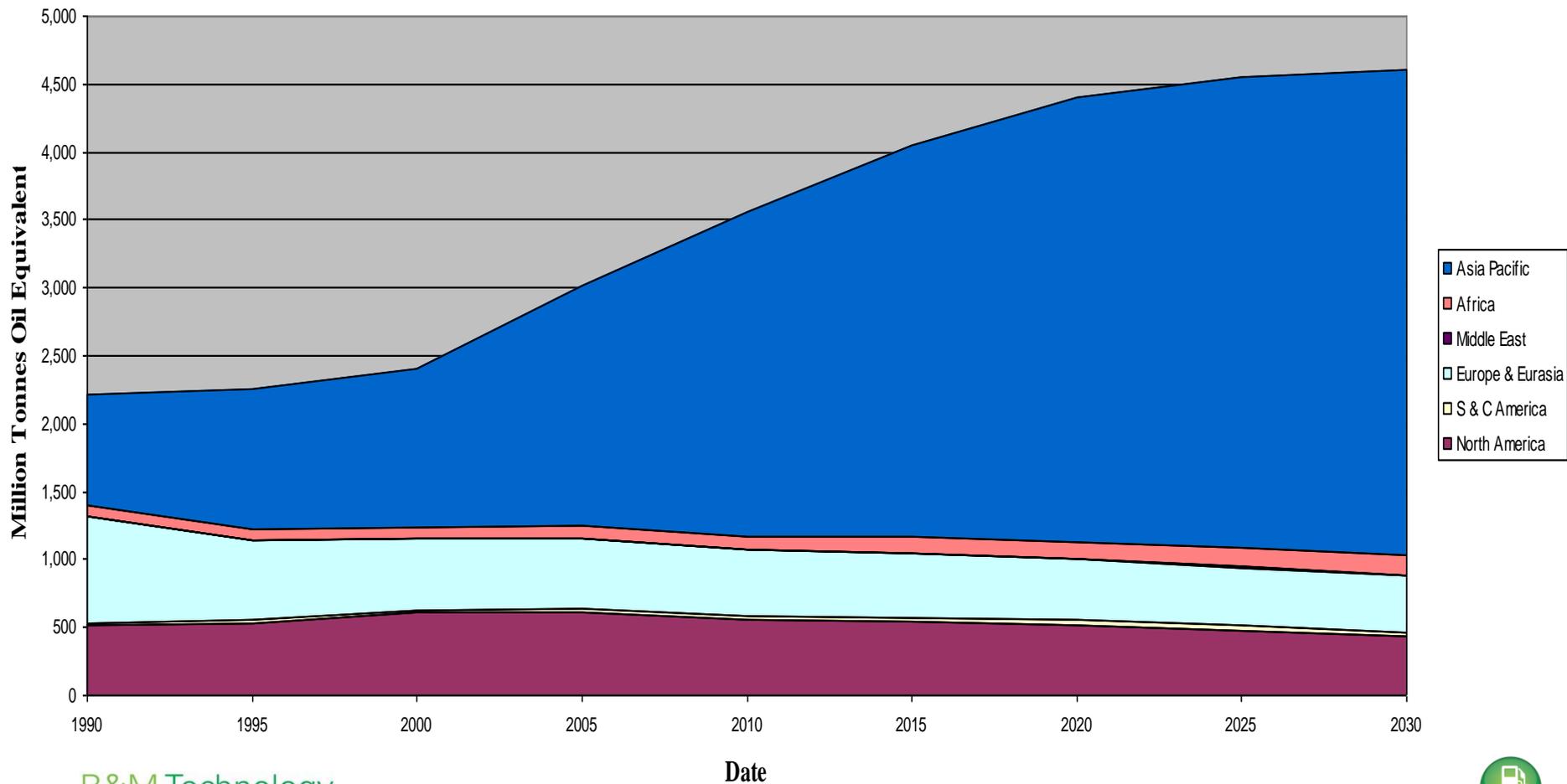


World Liquids Consumption





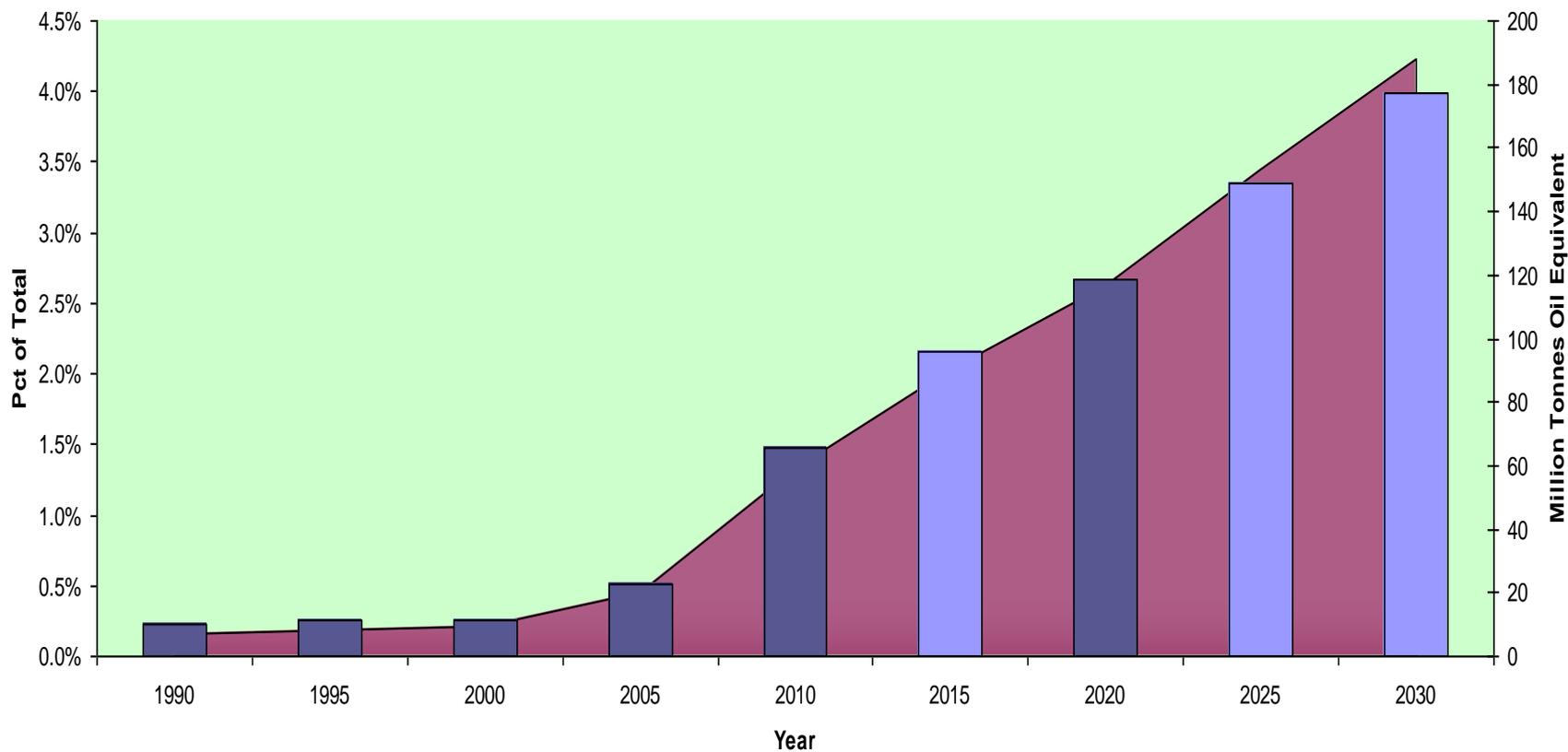
World Coal Consumption





Biofuels Contribution to World Energy Consumption

■ Million Tonnes Oil Equivalent ■ Pct of Total



PNW Diesel General Information



- **PNW is Commonly a Fungible Distribution Area**
 - Four Refineries in Washington State produce Diesel Fuel to Olympic Pipeline specifications delivered to 20+ terminals
 - Fifth Refinery not connected to Olympic in Tacoma, WA
 - Portland Terminals pump to KinderMorgan Eugene, OR
 - Portland Terminals provide fuel upriver to Eastern WA & OR Terminals
 - Diesel may also be supplied through imports into PNW
 - Diesel quality is certified at refinery, spot checked at entrance of pipeline and normally checked again at the terminal for flash and sulfur
 - Portland is import/export trading hub for PNW
 - Tri-Cities receives product from Salt Lake Refineries
 - Spokane receives product from Montana Refineries



PNW Diesel General Information



- **EPA 15 PPM Sulfur Limits**
 - Motor Vehicle ULSD as of June 1, 2006
 - Non-Road ULSD as of June 1, 1010
 - Locomotive & Marine ULSD as of June 1, 2012
 - Sulfur Credit Programs allow 500 ppm LM through June 1, 2014





- **ASTM Sets Industry Standard Specifications**

- ASTM combine interests of OEMs, Refiners, State Weights & Measures for Point of Sale requirements.
- States adopt all or part of ASTM (WA, OR & CA)
- 11 actual specs set in ASTM (Cetane, Distillation, Flash, Cleanliness, Viscosity, Corrosion, Lubricity, Conductivity)
- ASTM has recommendations on cold flow operability requirements by publishing the regional tenth percentile minimum air temperatures
- From the ASTM recommendations the Cloud Point and Pour Point limits were established.



PNW Diesel General Information



- **PNW ULSD Cold Flow Properties**

- Winter is from November 1 through end of February at Refinery gate
- Winter Cloud Point ≤ 14 F
- Winter Pour Point ≤ 0 F
- Summer Cloud Point ≤ 24 F
- Summer Pour Point ≤ 15 F
- These specs generally apply to eastern WA & OR



PNW Diesel General Information



- **PNW Typical Refinery Blending**

- Refineries blend to meet the Cloud Point spec with #1 ULSD blendstock (14 F Cloud Pt)
- Depending on blendstocks, Additive is used at Refinery to meet 0 F Pour Point spec
- Summer Cloud Point ≤ 24 F
- Summer Pour Point ≤ 15 F
- Corrosion Inhibitor used to meet NACE Rust required by Olympic Pipeline



PNW Diesel General Information



- **PNW Typical Retail Cold Flow Control**
 - West side retail requires no additional cold flow protection
 - East side retail has two steps of protection
 - First Step: Use of on-site additives
 - Second Step: Blending of ULSD #1

- **Credit to Oregon for allowing ULSD #1 blending without Biodiesel**
 - Difficult to manage extreme weather without option of ULSD #1
 - ULSD #1 not available at all terminals
 - Biodiesel is Cloud Point doesn't blend linearly with ULSD #1



Experience with Biodiesel Blending



- **Biodiesel Blending**
 - Oregon requires B5 Statewide
 - KinderMorgan Eugene is blended at head of pipe to B5
 - Portland Terminals have flexibility for B0 to B100
 - B100 Winter Related Typical:
 - 30 F Cloud Pt (Soy) (36 F Max)
 - 26 F Pour Pt (no spec)
 - 300 ppm Water (400 ppm Max*)



Questions?



Thank you,

Ward Fridrich

BP Global Fuels Technology

BP Cherry Point Refinery

Blaine, Washington

