



SOCIETY OF PETROLEUM ENGINEERS

# SPE NEWS

COPENHAGEN SECTION



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## FUTURE MEETINGS

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## IT'S THE ENVIRONMENT, SILLY!

What do people generally think are the most critical aspects of our oil and gas industry?

Is it something positive, like the role it plays in supporting a modern society, providing food to the people and protection against the elements? Or is it something negative, such as its environmental impact, the dependencies it has created, or the fact that oil will be running out someday, or, or?

Chances are that the general public is neutral towards our industry at best, and quite hostile at worst. And many of us, consciously or not, assume a defensive position when asked the question. Now, with global warming and reduction of carbon emissions high on many agendas it is indeed an uphill struggle to get a positive impression of the fossil fuel industry, but that argument shouldn't drive the opinion of the majority of people not particularly alarmed by the historic or current trends of global temperatures. Something else however that most people have seen on television with their own eyes is cases of pollution such as those due to the Deepwater Horizon or Amoco Cadiz oil spills. The visual impact of these facts are long lasting.

In the month of March yours truly went to the Danish Technical University to talk about good and bad aspects of Petroleum Engineering to Batchelor students who are not involved in the oil business. Afterwards I asked some of them what their main impression was of what was presented, and the thing that stuck most was a video of subsea inspections by a remotely operated vehicle that showed a host of tropical fish and molluscs feeding on coral reefs and plants growing on steel jackets and pipelines of oil field development infrastructure. The fact that these videos, being made for the purposes of ensuring system integrity and avoidance of spills, show a thriving and beautiful marine ecosystem that many think is incompatible with oil producing infrastructure is indeed quite a surprise and an eye opener to most. But how many have seen these kinds of images? Who actually knows that what's down there is as pretty and as clean as, say, the Blue Planet's aquariums?

Perhaps it's time to elevate the positive aspects of our industry and help build a more balanced view. The environmental standards of responsible oil companies is much better than many people are aware of.

**Hans Horikx,**  
**SPE Copenhagen**  
**Section Chairman**

# Summer Party

Dear SPE Member,

**YOU AND YOUR PARTNER ARE CORDIALLY INVITED TO THE 2014 SPE SUMMER PARTY ON THE 20TH OF JUNE IN PARADEHuset IN FREDERIKSBERG HAVE.**

Welcome drinks will be served at 18:30 in the secluded garden surrounding the old conservatory built in the 1830s.

Restaurant Mielcke & Hurtigkarl will cater to our culinary needs with a gourmet dinner and again this year, entertainment shall remain a hopefully pleasant surprise.



Please register by e-mail to Gitte Jakobsen: gjakobsen2@slb.com and pay 350,- DKK per person to the SPE bank account at Nordea: 2274 - 5360 613 323. Please mark payment: "SPE - Your name".

RSVP and payment: 22nd of May.  
Dress code: Suit or Black Tie.

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# HESS MAKES S ON GLOBAL DE

Hess is continuing to make progress on a number of global developments, including a critical deepwater asset in the Gulf of Mexico called Tubular Bells. The company expects first oil to flow from the project in the third quarter this year.

Tubular Bells -- or T. Bells, for short -- is a project Exploration and Production (E&P) leaders including Chuck VanAllen, Vice President, Offshore Americas and West Africa, describe as a "must do" for Hess. It involves the development of the Tubular Bells deepwater oil and gas field using a subsea wet tree infrastructure tied back to a three-level topside structure and supported by a design spar.

Discovered in 2003 and sanctioned by the Hess Board of Directors in 2011, T. Bells is located about 135 miles southeast of New Orleans in water depths ranging from 4,300 to 4,600 feet. The development is expected to cost \$2.3 billion, with additional commitments for production handling, export pipeline, and oil and gas gathering and processing services.

Hess, the operator of the field, holds a 57.14 percent interest. Chevron holds the remaining 42.86 percent.

T. Bells, along with assets in North Dakota's Bakken shale and Norway's Valhall field, will be main contributors to the company's near-term production growth. The project is expected to have a peak production capacity of 40,000-45,000 barrel of oil equivalent per day (BOE/d), with production net to Hess expected to be 25,000 BOE/d this year.

In addition to T. Bells, Hess is working on a second major operated development in the GoM. A sanction decision on that project, Stampede, is expected this year. Located in water depths of about 3,300 feet about 170 miles southeast of New Orleans, the Stampede project is a unitization of the Knotty Head and Pony developments. Knotty head was discovered in 2005 and Pony was discovered in 2006.

The project is a deepwater subsea development with a tieback to a newly constructed, dedicated Tension Leg Platform (TLP) host. It includes two drill centers, gas lift and an upfront waterflood program. A total of 6 producers and 5 water injection wells will be drilled.



Malaysia/Thailand Joint Development Area

# IGNIFICANT PROGRESS VELOPMENTS



*Valhall field.*

Two significant developments were completed in late 2013 — one on the Europe and the other in Asia Pacific.

In the Danish North Sea, Hess completed a key portion of its \$1 billion (DKr 5 billion) Phase 3 expansion of the South Arne field in late 2013 and moved quickly to production from the first of multiple new wells. First oil production was announced last November.

Hess has a 61.5 percent interest in the field. It operates it in partnership with Dong (which has a 36.8 percent interest) and Danoil Exploration A/S (1.7 percent).

The project was launched three years ago to extend the life of a mature asset and make it as much as 50 percent more productive. It includes drilling, completion and stimulation of 11 new wells, which will be produced through two new wellhead platforms (WHP) that connect to the existing South Arne production platform. The South Arne platform comprises a combined wellhead, processing and accommodation platform with an oil storage tank on the seabed and buoy loading facilities for oil.

In Asia Pacific, gas is flowing for the first time from a Hess operated asset in the North Malay Basin. The \$5.2 project involves the development and commercialization of nine stranded gas fields offshore Terengganu in Peninsular Malaysia. The project also includes the development of a new gas gathering, processing and transportation hub in Terengganu.

Malaysia is the second largest oil and natural gas producer in Southeast Asia, the second largest exporter of liquefied natural gas globally and is strategically located amid important routes for seaborne energy trade.

In June 2012, Hess signed three Production Sharing Contracts (PSCs) with Petronas Carigali, the upstream arm of Petronas, the national oil company of Malaysia. Hess, the operator of the project, is implementing it in two phases: an EPS -- a Gas Acceleration Initiative (GAIN) by the Malaysian Government to meet the country's increasing demand for natural gas -- followed by Full Field Development (FFD) in late 2016.

Production from the EPS began last October with the introduction of gas into the export pipeline. ◀





SPE MEETING SCHEDULE

# 2013-2014

<b>September 16</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>New Lens Scenarios</b>			Denmark; Fossil free in 2050?
SPEAKER	Wim Thomas, Chief Energy Advisor, Shell			Prof. Katherine Richardson, Univ. of Copenhagen
LOCATION	Shell Mikado House			
SPONSOR	SHELL			
<b>October 28</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>Fluid Profiling - A Modern Technique for Reservoir Characterization</b>			
SPEAKER	Michael O'Keefe - SPE DL (Schlumberger)			
LOCATION	GEUS			
SPONSOR	GEUS			
<b>November 26</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>DTU Research Projects</b>			CERE – A Success Story of University–Industry Collaboration
SPEAKER	PhD students, DTU			Professor Erling H. Stenby
LOCATION	DTU			
SPONSOR	DTU			
<b>January 27</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>Hydraulic Fracturing Myths, Reality and Environmental Stewardship through Better Chemistry</b>			Unconventional Resources
SPEAKER	Daniel J. Daulton - SPE DL (Baker Hughes)			Gavin Lewis, Geoscience Team Leader - Chevron Onshore Europe
LOCATION	Charlottehaven			
SPONSOR	Chevron			
<b>February 19</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>Development of Mature Oil Fields: Enhanced Oil Recovery Option</b>			A New, Safer Development in Pipe Recovery
SPEAKER	Tayfun Babadagli - SPE DL (University of Alberta)			Christian Krüger - Welltec
LOCATION	Admiral Hotel			
SPONSOR	Welltec			
<b>April 3</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>Using 4D Seismic in the Halfdan Field to Optimize Production and Define New Opportunities</b>		<b>SPE PRESIDENT VISIT</b>	Memories of 30 years of SPE Copenhagen
SPEAKER	Monica Calvert - Maersk Oil			Former Section Chairpersons
LOCATION	Maersk - Esplanaden			
SPONSOR	Maersk Oil			
<b>April 23</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>South Arne Phase 3 Development – Geomechanics, Drilling &amp; Completions</b>			Gas Hydrates as an energy source
SPEAKER	Ole Valdemar Vejrbæk and Alex Bolinger			Martin Ring - HESS
LOCATION	Moltke's palæ			
SPONSOR	Hess			
<b>May 19</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>Optimization of water injection and gas lift on the South Arne field using streamline simulation</b>			<b>ANNUAL GENERAL MEETING</b>
SPEAKER	Kent Johansen. DONG E&P			
LOCATION	DONG - Gentofte			
SPONSOR	DONG			
<b>June 20</b>			MAIN SPEAKER	AFTER DINNER
TOPIC	<b>SPE Summerparty</b>			
SPEAKER				
LOCATION	Paradehuset - Frederiksberg Have			
SPONSOR	Schlumberger			

# SPE MEMBERSHIP DUES

PLEASE REMEMBER TO PAY FOR THE SPE MEMBERSHIP FOR 2014, AND ALSO REMEMBER TO UPDATE MEMBERSHIP DETAILS AT [SPE.ORG](http://SPE.ORG), so as to receive the Copenhagen Section Newsletter and corresponding e-mails if based in Copenhagen/Denmark or otherwise interested in the section activities.

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# GETTING READY TO OPERATE A NEW FIELD

THE HEJRE FIELD IS A HPHT DEVELOPMENT LOCATED IN THE CENTRAL PART OF THE NORTH SEA NEAR THE DANISH/NORWEGIAN BORDER SOME 292 KILOMETRES NORTHWEST OF ESBJERG.

DONG E&P, Hejre Operator and partner Bayerngas sanctioned the Hejre Project in early 2012. The development is currently ongoing full steam ahead, with the platform being designed and constructed by a consortium of Technip and Daewoo Shipbuilding and Marine Engineering. The first Hejre wells will be pre-drilled and completed by the rig Maersk Resolve after the platform jacket is installed this summer. Concurrently, tie-in of the new gas and oil pipelines to existing infrastructure will take place. First oil will be achieved once the top-sides have been installed and commissioned. The remaining wells will be drilled and completed after first oil. Hejre is being developed with 5 wells in total.

While the development project is constructing the facilities and wells, DONG E&P are also getting ready to operate the field once the platform comes on stream. This is the first major development project managed by DONG E&P, it is the first HPHT development in Denmark, and it is our second operated platform in DONG E&P. Therefore a number of challenging and exciting tasks lie ahead until we are ready for first oil.

## The Ready For Operation team

We have established a team that coordinates the work to get our Danish organisation ready to operate Hejre. The main goal for this group is to ensure that we are ready to operate Hejre safely and efficiently as soon as the development project is ready for first oil. In order to achieve these goals, virtually all of the departments in DONG E&P need to conduct a number of activities to be prepared to undertake the operation of the new Asset, and we have to increase our manning in almost all areas of the company.

- Operations are building a new offshore organisation, establishing the culture, the systems and the procedures for offshore operations and onshore support.
- Maintenance are setting up the maintenance plans and procedures, for the dry facilities, subsea structures and pipelines
- Well service plans maintenance, inspection and potential interventions of the wells.
- Subsurface engineering are responsible for reservoir management plan, the well operating procedures, the allocation procedures and the reporting systems.
- Logistics ensures that we have the necessary warehouse capacity, helicopter capacity and supply vessels available.

- Our technical integrity department (technical authorities and technical safety) provide review and assurance of the facilities design details, and the plans for maintenance and inspection.
- Corporate QHSE defines our QHSE management system, 2nd line emergency response, and spill response.
- DONG E&P Denmark's QHSE department are responsible for coordinating all the applications and consents with the development project and with the authorities. They also set up the procedure structure in our management system.
- Finance set up our financial systems, OPEX and CAPEX models and licence controlling structure.
- Commercial agreements, sales agreements and insurance policies are established by the asset management team.
- Finally we need support from IT, procurement, Human Resources, finance and project services to be able to plan and execute the readiness for operation tasks.

To ensure that we cover everything, we have established a detailed schedule that contains activities down to procedures level. The schedule contains more than 1400 specific activities spread over several years. The schedule represents around 130 man-years to be executed in order to increase our operational capability, including training of personnel, documentation assurance and planning operational activities. So clearly the RFO coordination team is essential to coordinate work between the various departments. There are also a huge number of interfaces that needs to be accurately captured in the schedule. There are a great deal of dependencies between the various departments directly involved in the RFO work. But in addition, the schedule also needs to show key milestones where there are interfaces with the Hejre development project, the asset management team, the licence partners and the Danish authorities.

## The HPHT operating challenge

Because of the high pressure, all the pipework upstream of the 1st stage separator has extremely large wall thickness. This means that all the pipework, valves and vessels contain a lot of steel, so they become very heavy and take up much more space than we are used to from conventional platforms. But another consequence of the high pressure is that the force needed to open and close valves becomes large. Figure 1 shows a 2" valve that is pneumatically actuated. Because of the large force needed to move the valve, the actuator becomes huge compared to the size of the valve. You can also see the size of the valve body compared to the bore, indicating typical wall-thickness of 15000 psi class pipework.



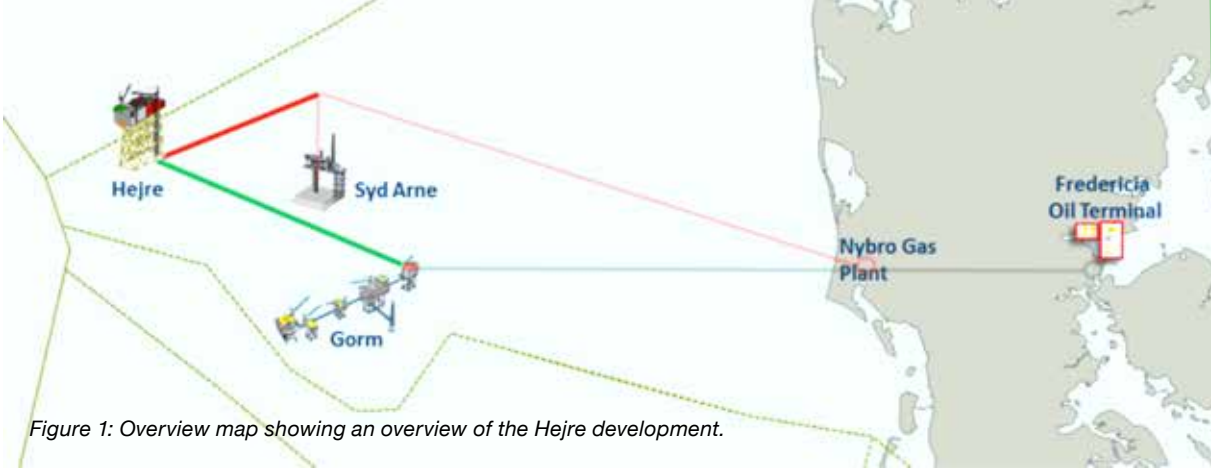


Figure 1: Overview map showing an overview of the Hejre development.



Figure 2: 2" 15000# pneumatically operated valve.

The high temperature also introduces some practical challenges. This is particularly true in the wellhead area where the huge well trees heat up to more than 100°C. In fact, analysis performed by Cameron shows that some parts of the trees will reach temperatures up to 150°C. Because of the huge amount of steel in these trees, they will take days to cool down enough to allow people to work on them. The heat radiation from neighbouring trees will be sufficient to cause skin burns. We therefore implement automated systems, physical barriers and procedures to protect personnel and to allow operations on well trees without having to shut in the other wells.



Figure 3: Wellhead section for Hejre, stack-up test.

Annulus management is a key issue for our well integrity, and even more so than for more conventional fields. When the annulus heats up, any water will evaporate and expand to potentially overstress the casing and tubing. Therefore we have to ensure that the annulus is filled with an inert gas that can be compressed to compensate for any volume changes caused by large temperature fluctuations. An excellent description of these issues can be found in SPE paper 163557.

One of the uncertainties in the Hejre development is the composition of the formation water. Nearby fields contain high salinity / high scale potential water. Therefore the readiness for operation team also focuses on obtaining samples of the formation water and analyse this in order to implement the correct measures for avoiding and mitigating scale formation in the wells and topside pipework.

## Allocation and sales

At Siri we export oil via tanker and re-inject excess gas. At Hejre we will be exporting live oil via a pipeline to Gorm E, where the product is mixed with stabilised crude from other Danish fields and pumped to the oil terminal next to the Shell refinery in Fredericia. DONG Oil Pipe, an affiliate company of DONG Energy, are extending the existing crude stabilisation plant at the Fredericia oil terminal in order to separate the live oil stream into sales products (Crude oil, Butane and Propane). This poses some challenges in terms of metering and allocation, which has to account for the mixing and separation of these more volatile components into heavier, stabilised crude from other Danish fields.

Gas is exported via a 12" pipeline that ties into the South Arne - Nybro pipeline at a subsea Y near the Harald platform. We therefore also need to establish procedures and systems for gas sales. So in order to handle a new mode of oil export, which at Siri is via tanker, and to handle the gas sales, we need to upgrade our sales systems and reporting software. But we also need to introduce new procedures and implement some significant changes in our sales organisation.

## Conclusion

Hejre is DONG E&P's second manned platform in the Danish North Sea, and therefore represents a huge increase in work load for our organisation. Hejre is also the first HPHT field to be developed in Denmark, and there are a number of technical challenges that we need to manage in addition to increasing our organisational capabilities.

# The more you see it the better it gets

SPE President Helge Haldorsen visited the Copenhagen section on April 3rd to take part in the 30 year anniversary of SPE in Copenhagen. He made presentations to students at the DTU (picture) and Young Professionals and engaged with them on topics related with career and industry prospects, such as adaptability, innovation, initiative, creativity and passion. Talking in metaphorical terms he compared the flow of information with that of water, and while showing a picture of the Niagara falls concluded: information is like water, and where do you get it? At the SPE! Similarly, after a fine presentation by Monica Calvert on evaluation of the aligned fracture waterflood of the tight chalk reservoir in Halfdan he praised Maersk Oil for having 'raised the tide that lifted many other boats' in tight field development.



Over dinner a number of former chairmen of the SPE Copenhagen board held speeches with their perspectives on the Copenhagen section which became ever more entertaining as the evening and wine consumption progressed. Discourses by Bjarne Skovbro (picture), Erling Stenby, Nijs Nederveen, Nils Jacobsen, Preben Jensen and Morten Stage also made it increasingly evident that only a minority of the former chairmen of the Society of Petroleum Engineers actually were Petroleum Engineers!

Helge Haldorsen aptly summarised his impression of our Copenhagen section by repeating a statement made earlier that day: the more you see it the better it gets!

*Hans Horikx, current chairman.*

## DTU STUDENT CHAPTER ACTIVITY

On 20 February 2014, SPE Student Chapter organized an the event "Job Seeking, CV and Interview Seminar from HR Perspective" at the Chemical and Biochemical Engineering Department. Lee Milligan, the global MITAS recruiter from Maersk Oil was invited to give a talk about tips and tricks to apply for jobs. The event was attended by 20 students and 6 SPE student board members. Lee gave a very interesting and interactive presentation, actively communicating with the students. The event included individual CV feedback.

On 18 March 2014, SPE student chapter organized a guest lecture by Son Huu Do from 3Dos Global Energy, San Diego, USA. Son Huu Do's lecture was entitled 'Enhanced Oil Recovery (EOR) with Emphasis on Gas/WAG'. The lecture was attended by more than 70 students. The lecture included an introduction to EOR, 'what and why', major EOR options, and key factors to consider. Son Huu Do gave an in-depth explanation on solvent injection, choices of solvents and miscibility of the solvents. He showed how injectant composition affects the viscosity reduction. The students really appreciated the event where the subject of EOR was considered from mainly industrial point of view, but with clear links to Academy.



Son Huu Do

On 27 March 2014, 18 students of the SPE Student Chapter visited Schlumberger drilling facilities at Esbjerg. The visit was hosted by Børge Mathiesen. There were 4 presentations by Schlumberger covering an overview of Schlumberger company and their activities in Esbjerg, coil tubing and its application, wireline and logging tools, and well testing. After the presentations, the students went to see the facilities in the Schlumberger yard. After this, the students went to the M-I SWACO/D&M office where they were hosted by Søren Brink Jensen. Here the students listened to presentations on drilling fluids and directional drilling technologies. The presentation followed by a tour to M-I SWACO/D&M yard to see drilling pipes, drill bits, and cuttings separators. For many students, this was the first touch of the real drilling technology in field conditions, and this was a fruitful experience. The field trip was generously sponsored by Schlumberger and the SPE Copenhagen section.

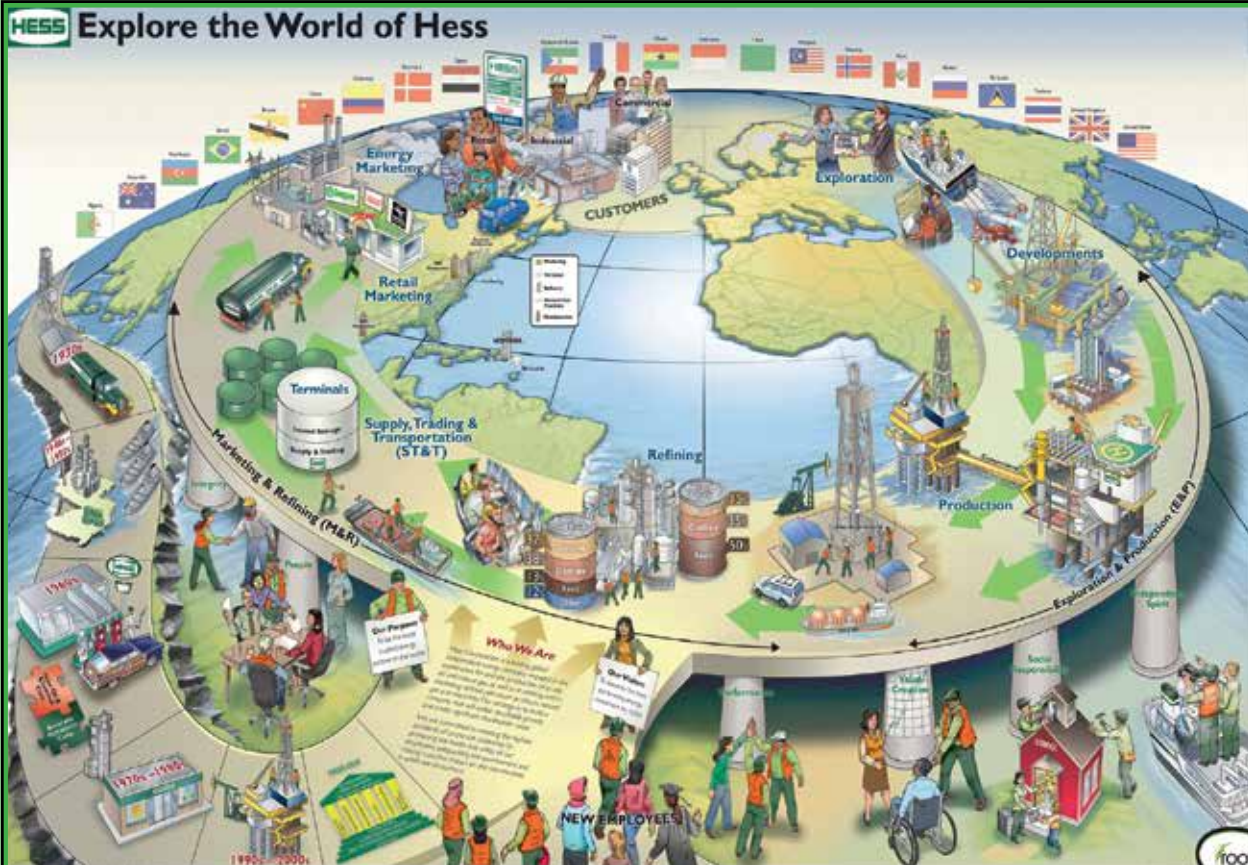




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