Oil and Gas Exploration in East Africa: A Brief History*

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Abstract

The latest round of petroleum exploration in East Africa has seen major oil discoveries onshore Uganda and Kenya and giant gas accumulations offshore Tanzania and Mozambique. East Africa is widely touted as one of the emerging hydrocarbon provinces of the 21st Century. This presentation presents the historical background to this success, looking at past exploration efforts dating back to the 1930s. The East Africa region was considered highly prospective by the world's leading oil companies in the mid 20th Century but lack of success, among other reasons, saw interest fall away in the 1970s, revive in the 1980s and then fall almost to zero. The Uganda oil discoveries put East Africa back on the oilman's map and the region is certainly ‘hot’ again. Outside of Somalia, most of the Paleozoic, Mesozoic and Tertiary basins in the region are under permit, largely by small to medium-sized independents and national oil companies, and with large international companies active in the offshore basins. This presentation presents maps showing the permit activity and drilling results by decade and by country for Tanzania, Kenya, Uganda, Ethiopia, Somalia, Somaliland and Eritrea, commencing with the 1950s. The changing pattern and level of activity, and the causes of those changes, provide an historical background for the current activity and future success.

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Oil and Gas Exploration in East Africa: A Brief History

Peter Purcell

P&R Geological Consultants Pty Ltd

AAPG ICE,
Istanbul, September 2014

Presenter's notes: **Introduction.** East Africa is widely seen as the newly emerging hydrocarbon province of the 21st Century. It is worth remembering that this success comes after six decades of unsuccessful exploration. Three, maybe four billion barrels of oil have been discovered onshore in Uganda and Kenya and 200 Tcf or more of gas offshore Tanzania and Mozambique. Suddenly East Africa is on everyone's radar. So, let us look at the history behind the apparently sudden success.

Summary of Presentation

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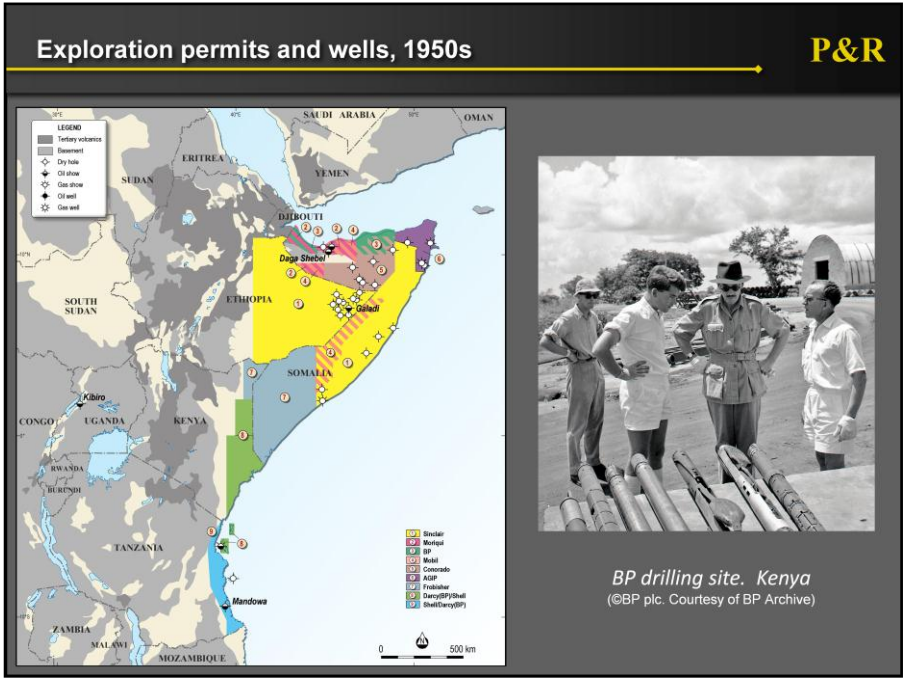
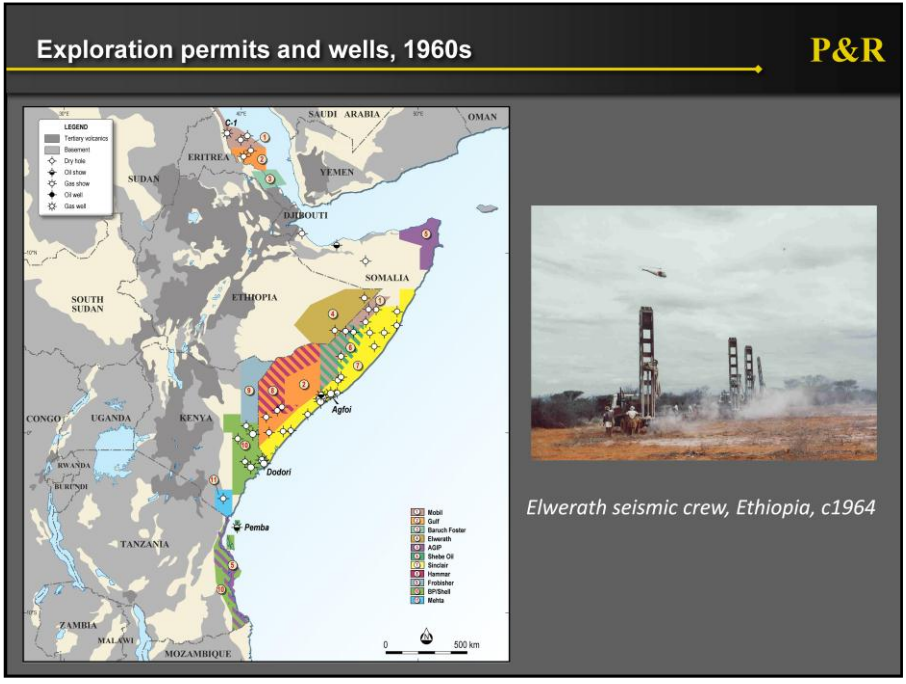
- Introduction
- Exploration history
- Company activity
- Drilling statistics
- Challenges

Dudley Expedition to Abyssinia, 1920/1

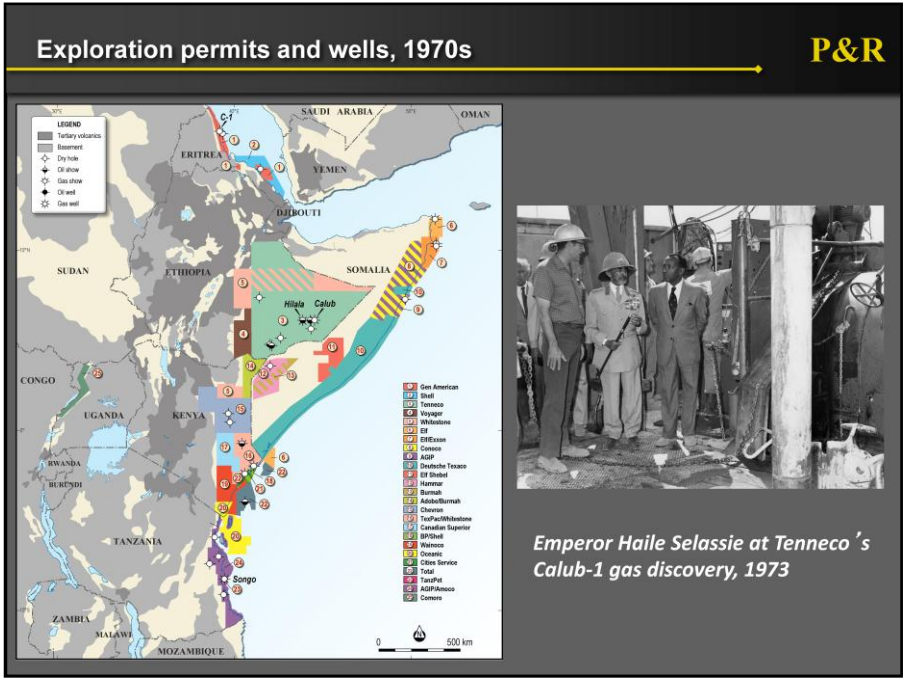
Presenter's notes: **Summary of presentation.** Oil exploration in East Africa actually commenced early last century, arguably with Anglo-American's Dudley Expedition to Abyssinia in 1920. In the 1930s and 1940s, there was shallow drilling around oil seeps in Uganda and the Eritrean Red Sea but systematic exploration did not commence until the 1950s, and it is there we will begin this review, looking at the pattern of exploration, decade by decade, the companies involved, the objectives they pursued, and the results. In closing, we will look briefly at some of the lessons of that history.



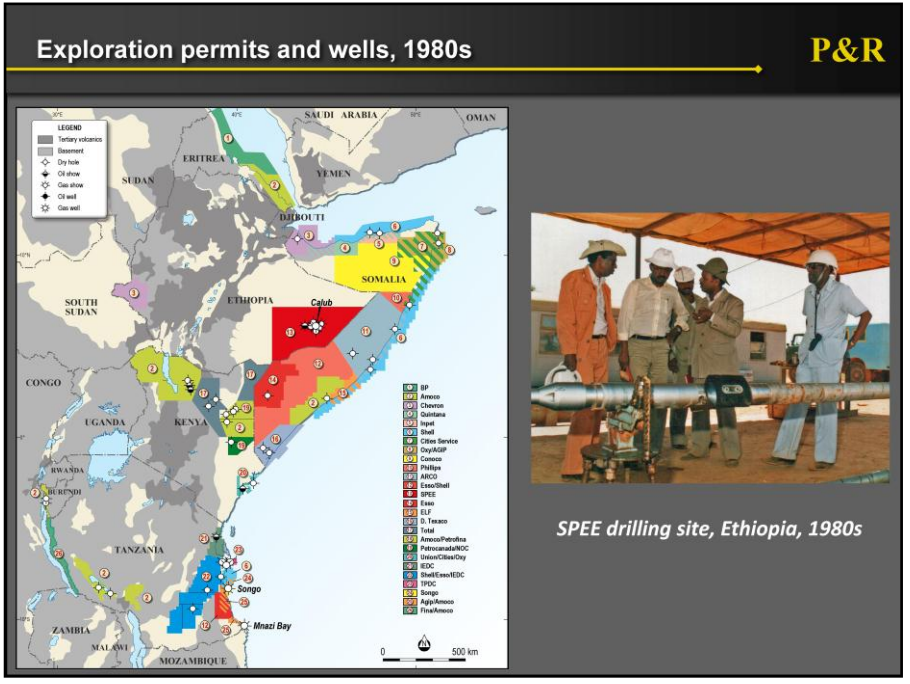
Presenter's notes: **1950s Permits and wells**. In the 1950s, during the worldwide surge in exploration after WW2, the Horn of Africa was seen as a possible extension of the Arabian oil province. When Sinclair Oil commenced fieldwork in Ethiopia their first activity, they reported, was to scan the region for structures similar to Saudi Arabia's legendary Ghawar field. BP/Shell was prominent in the then British colonies of Kenya and Somaliland but large American companies such as Mobil and Sinclair were prominent too, as was the Italian AGIP. Thirty-six wells were drilled that decade, with many stratigraphic tests, including wells on the seeps along the shore of Uganda's Lake Albert. There were encouraging oil shows in Sinclair's Galadi well in Ethiopia and Stanvac's wells on the Daga Shebel seep in what was then British Somaliland. This map –and those that follow - show only the wells drilled during that particular decade. You see here a very pucker group at the BP well site.



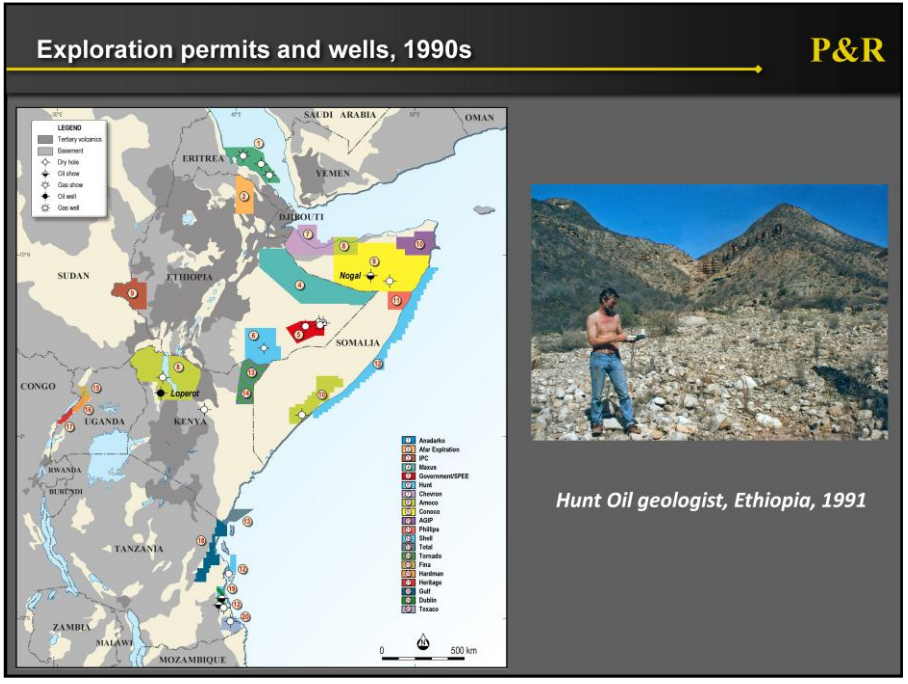
Presenter's notes: **1960s Permits and wells.** Exploration activity increased slightly in the 1960s although permit areas decreased overall in Ethiopia and northern Somalia. The number of large and small companies was about in balance – thought the large companies were still the dominant players. Forty wells were drilled, many based on reflection seismic surveys but few wells had significant shows. Kenya's Dodori-1 was an encouragement. Exploration commenced in the Ethiopian Red Sea, and Mobil's C-1 short-lived gas blowout pointed to potential there. The high point of the decade onshore was probably the gas flow at Sinclair's Agfoi-1 in Somalia.



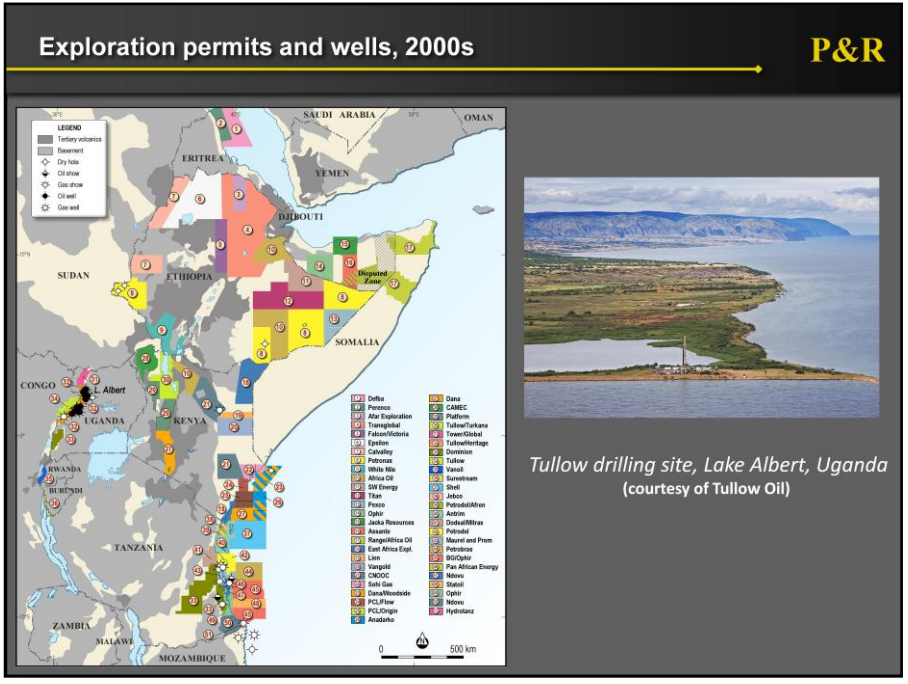
Presenter's notes: **1970s Permits and wells.** The 1970s brought an influx of major companies, primarily into Kenya and Ethiopia. Exxon, Elf, Total, Chevron, Tenneco, - all made first entry to the region and Conoco took industry's first look at the Lake Albert basin. There were few small companies active – I worked for one of them, Whitestone, a Dallas-based independent, with four permits in Ethiopia and Kenya. Twenty-seven wells were drilled. Tanzania enjoyed the Songo Songo gas discovery, while Tenneco's Calub and Hilala gas discoveries and nearby oil shows established Ethiopia's western Ogaden as a potential new hydrocarbon province. Unfortunately, the military coup and war with Somalia war brought that exploration there to an end. Kenya and Somalia drilling, including Kenya's first offshore well, yielded only minor shows.



Presenter's notes: **1980s Permits and wells.** Activity rose to a new peak in the 1980s, driven by the soaring oil price and encouraged by big discoveries nearby in Sudan and Yemen. Exploration moved into the Anza Graben in Kenya, into the interior Karoo basins in Tanzania, and along the lake basins of the Western rift in Tanzania and Burundi. Fifty-eight wells were drilled, 42 wildcats, with oil and gas shows here and there but nothing major. Of the 16 appraisals: eight were drilled by the Russian SPEE on Tenneco's Ethiopian discoveries; two were trying unsuccessfully to prove commerciality at the Agfoi gas field in Somalia, and five confirmed Tanzania's Songo Songo gas field. Tanzania enjoyed a second gas discovery at Mnazi Bay. You can see that the logging tools have improved since the 1950s but the fashions have not.

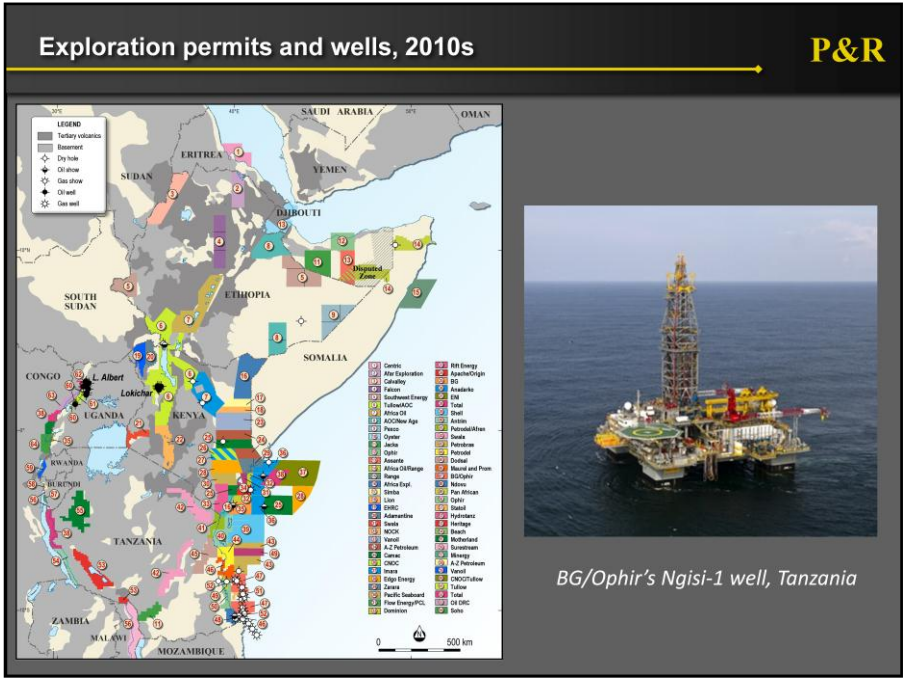


Presenter's notes: **1990s Permits and wells.** The 1990s were a different story. The oil price had collapsed in the late 80s and got worse through the 1990s. Local security problems exacerbated the situation. Promising exploration efforts in Somalia were aborted after the 1991 coup. However, not before Conoco's Nogal well encountered encouraging oil shows in the Nogal Rift in the north. The civil war ended In Ethiopia and Eritrea seceded, but conditions remained difficult for explorers. Four wildcat wells were drilled, three in the Red Sea, without shows. The five wells in Tanzania were also unsuccessful. In Kenya, however, Shell's Loperot well discovered an a small oil accumulation in the Lokichar Basin near Lake Turkana the low oil price and a perceived lack of structure discouraged further activity. In Uganda, Hardman and Heritage commenced exploration at Lake Albert.

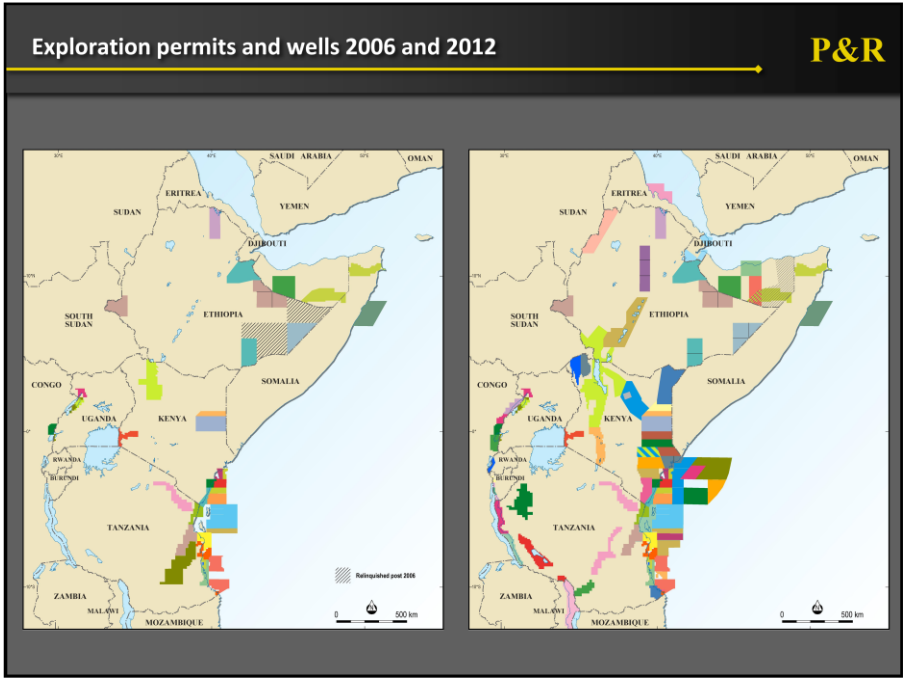


Tullow drilling site, Lake Albert, Uganda
(courtesy of Tullow Oil)

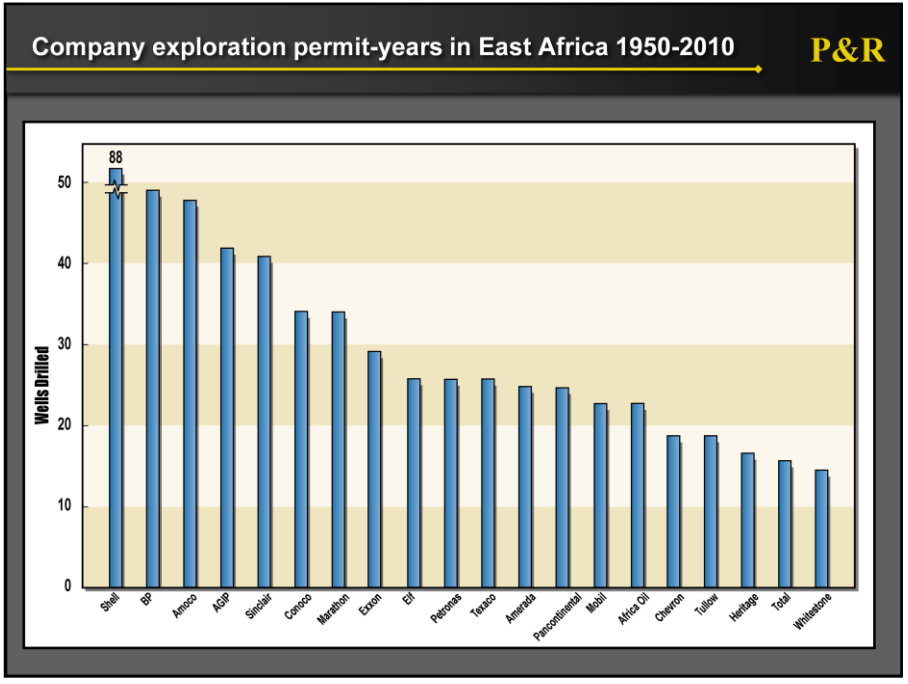
Presenter's notes: **2000 Permits and wells.** In the 2000s, the oil price hike set a swarm of exploration companies across East Africa. However, for the first time, the larger companies were not part of the onshore scene. The main players were NOCs such as Petronas, proven explorers such as Lundin, and a plethora of small independents, not all of whom were well equipped financially or technically. Vast regions were taken up but the permitting frenzy did not lead everywhere to a boom in activity. Across Ethiopia, Kenya, and Somalia only five wells were drilled – all disappointingly dry. It was a different story in Uganda's Lake Albert basin: the Turacao wells discovered gas and Hardman's Mputa-1 oil discovery in 2006 changed the game. Twenty-five of the following 28 wells were oil discoveries. Lake Albert was established as a new giant oil province. In Tanzania's coastal basin, a string of modest gas discoveries was an omen of what was to come offshore.



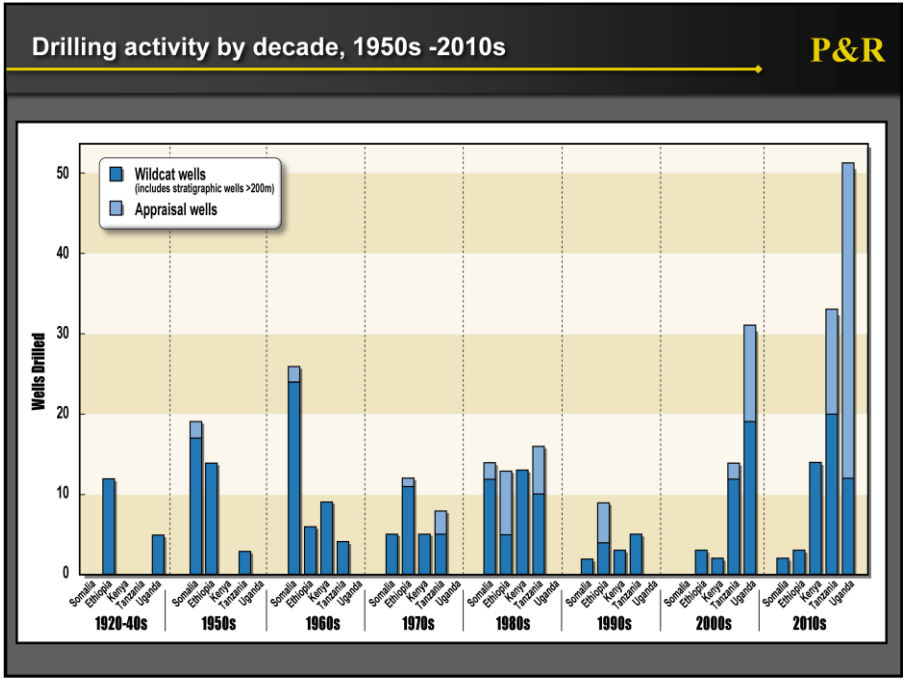
Presenter's notes: **2010s Permits and wells.** Which brings us to the present. There has been a massive surge in permitting in response to the discoveries and almost the entire basin area is under permit, save for most of Somalia where security remains a major problem. Ninety-five wells were drilled to end 2013. In 2010, Ophir's Pweza-1 discovered gas in deep-water Tanzania and numerous other major discoveries have followed. In Kenya, Tullow discovered oil in Ngamia-1 in the Lokichar Basin, and have since made several more discoveries. In Uganda, there have been numerous new discoveries and successful appraisal on the Albertine oilfields. Much-anticipated drilling in Ethiopia's Omo Basin and tin the Darror Basin northern Somalia has not been successful but East Africa is definitely the place to be.



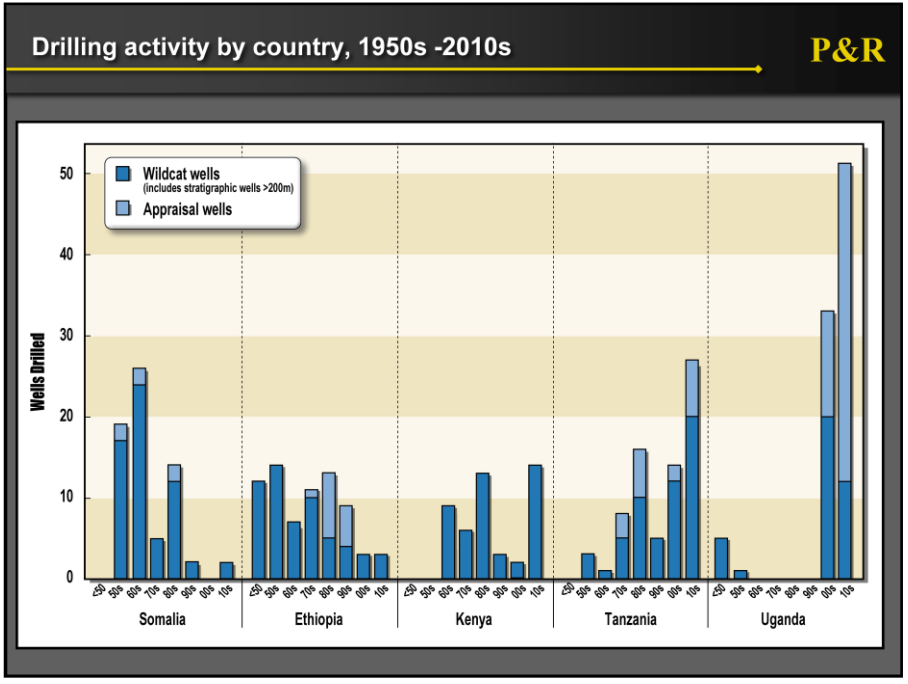
Presenter's notes: **2006 versus 2012.** This surge in permitting and exploration has been very rapid, as you can see here in this comparison of the permits in 2006 and 2012.



Presenter's notes: **Company log.** The exploration activity across the decades has been dominated the large international companies, a point which commonly surprises explorers new to the region. Their dominance is clearly seen on this histogram, which shows the number of permit-years that companies have explored in the region. If size of permit were factored in, the dominance would be even more pronounced, because the permits in earlier decades were larger. The companies heading the list - Shell, BP, AGIP, Amoco, Conoco, Exxon, and Elf - are an impressive group, to say the least, and they have held East Africa in high regard for a long time. They lost interest in the 90s but many have been lured back by the scale of the recent discoveries.



Presenter's notes: **Well by decade histogram.** If we look at the wells drilled by decade, to end 2013, we see the early shallow drilling on the Uganda and read sea seeps and the dominance Somalia in the early decades. Then the decline in the 1970s, the peak with the 80s oil price, and the collapse in the 90s. Then, in the 2000s, the exploration surge in Uganda and Tanzania overwhelms all other activity. In these plots, I have included stratigraphic wells deeper than 200 m and I have shown appraisal wells in lighter blue.



Presenter's notes: **Wells by country.** If we look at the wells drilled by country, we see distinct and very different trends. Somalia has been in decline since the 1960s and Ethiopia, since the 1980s. Kenya was declining too, but the Lokichar oil discoveries have changed that –and the trend there is rising sharply. Tanzania has seen a relatively steady increase in activity across the decades, while Uganda has gone from nothing to boomtown.

Drilling results by country, 1950s -2010s

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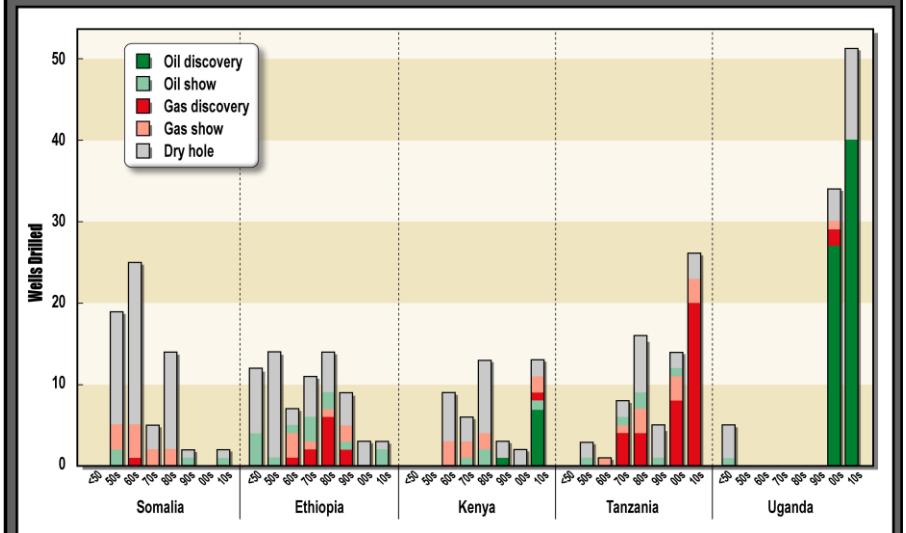
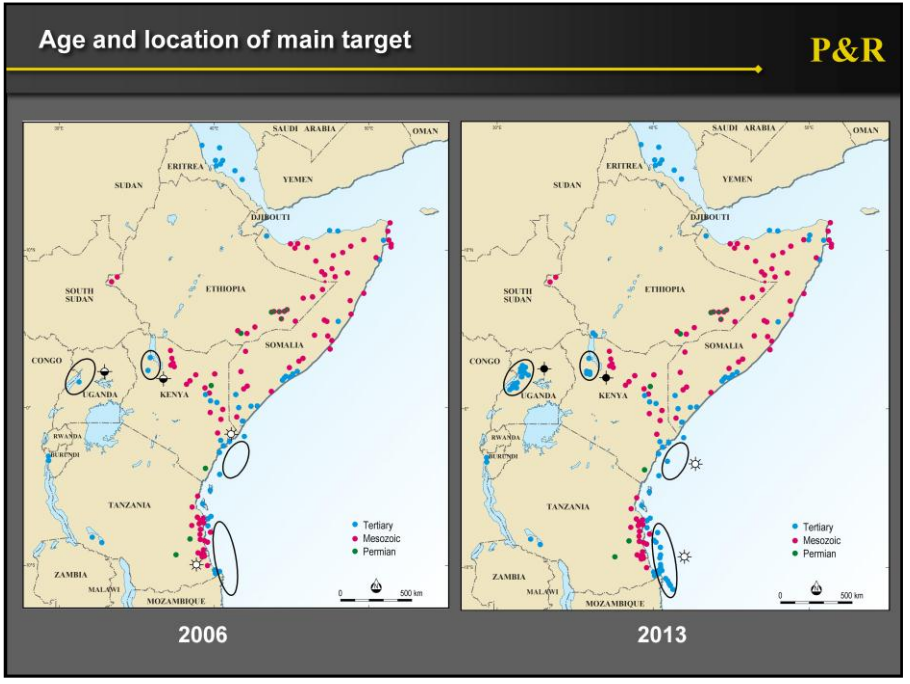
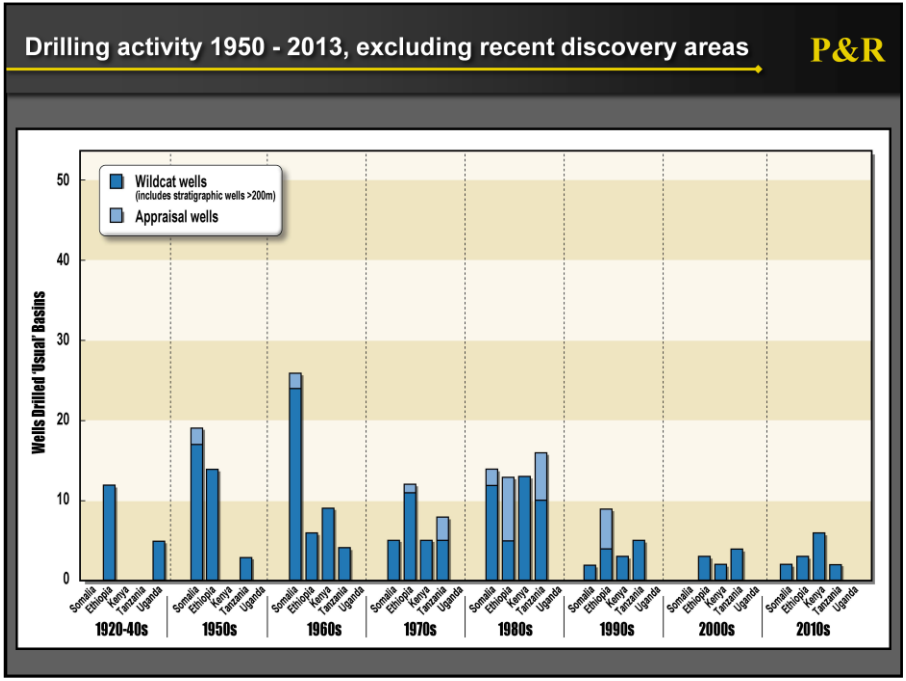
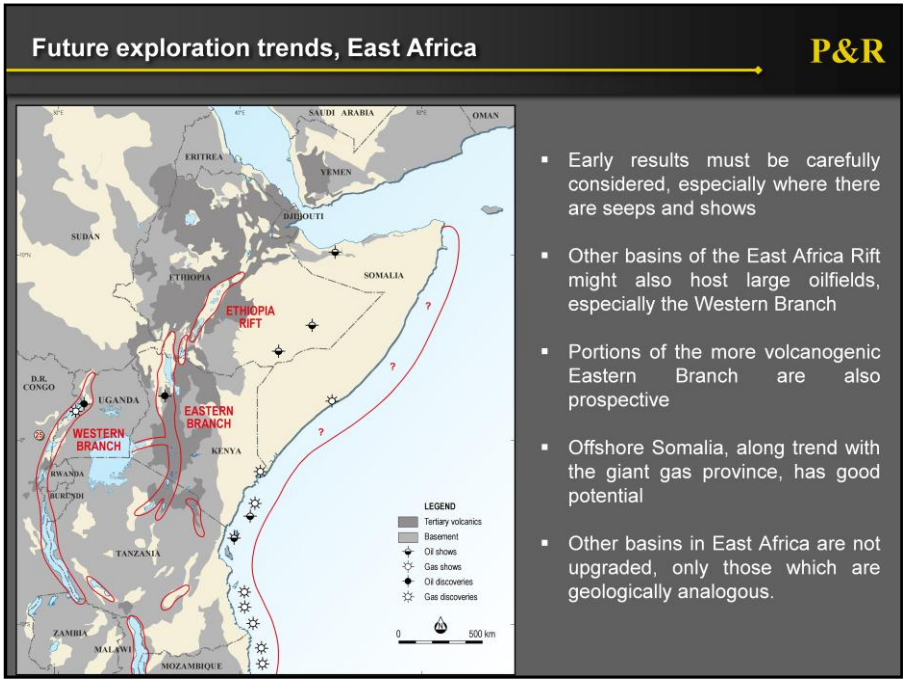




Presenter's notes: **Discoveries and shows.** This slide is rather busy but I have tried to colour code the wells for discoveries, strong shows or dry. By strong show, I mean live oil or a gas flow. Somalia has the Agfoi gas discovery in the 1960s but otherwise has had only modest results Ethiopia had the Tenneco Calub and Hilala gas discoveries, but size and security problems have weighed against development. The Ogaden has an impressive pattern of good oil shows but no significant flow. Kenya had oil and gas shows in early drilling but the omen of good things to come was Shell's Loperot oil discovery in the 1990s. Tanzania has the early onshore gas discoveries at Songo Songo and Mnazi Bay and then spectacular multi-Tcf gas discoveries as deep water drilling commenced. Uganda had early shows in stratigraphic wells in Lake Albert, and then nothing until the incredible success since the mid 2000s. The trend has changed. From Kenya through Tanzania to Uganda, the trend is up. The potential for further discoveries is high.

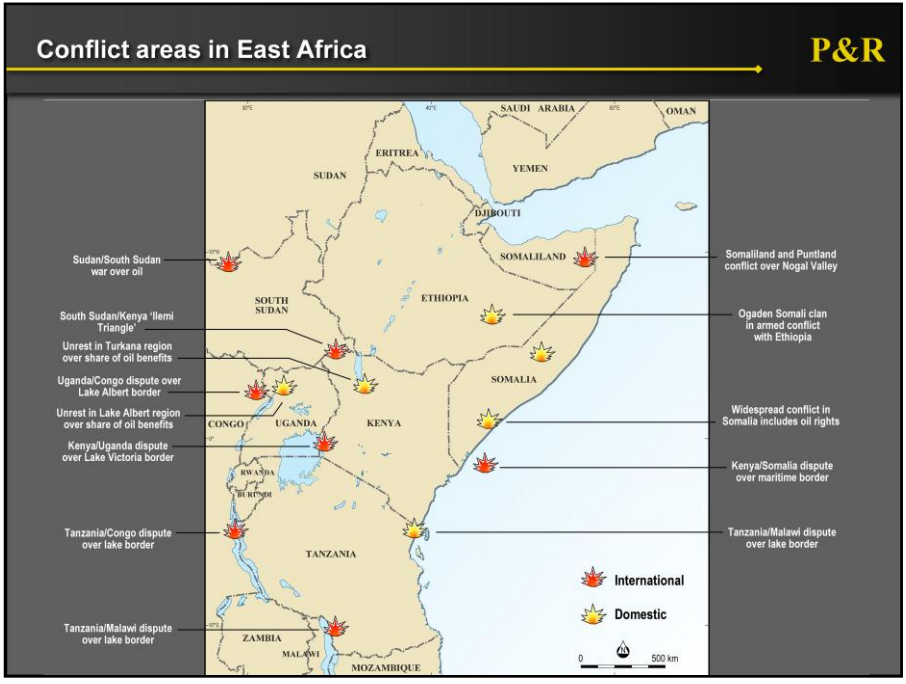


Presenter's notes: **Wells by country, excluding the discovery areas.** We can look at this in another way, by removing from our country histograms the wells drilled in 2006 through 2013 in the three discovery areas - Uganda's Lake Albert, Kenya's Lokichar and deep-water Tanzania. This shows clearly that exploration has actually declined markedly in recent decades in those basin areas where exploration has historically been focused.



Presenter's notes: **History lessons.** So what are the lessons we might learn from this history? For explorers, the always-useful reminder that early results must be carefully considered, especially where there are seeps and live oil shows involved. There is the encouragement, already taken up by many companies, that the other Tertiary rift basins of East Africa might also host large oilfields, perhaps especially the Western branch. There is encouragement from the Lokichar discoveries that portions of the more volcanic Eastern Branch can also be petroliferous. There is also encouragement regarding the potential of offshore Somalia, along trend with the giant gas province to the south. However, there is also a sharp caution that the recent discoveries do not upgrade all the basins of East Africa, only those that are geologically analogous.

The history also offers some insights into the complex social and political situation now challenging our industry in these countries. Those decades of unsuccessful exploration bred intense economic frustration, as people yearned for the oil wealth of the Arab countries. That frustration bred a mythology, widespread since the 1970s that the exploration was not unsuccessful at all but actually discovered large oil fields, which have been kept secret by conspiracies between the companies and the Arab oil-countries. This is a complex phenomenon, which I have described elsewhere and will not discuss here. Suffice to say that the recent success is seen as proof of this mythology and many now view East Africa as a vast oil province with huge discoveries expected across the region, along with the attendant wealth. Expectations are high, unrealistically so, at all levels of society, right up to the Ministerial offices.



Presenter's notes: **Trouble spots.** These expectations are adding to conflicts in the region, as groups - local, tribal, national - vie for control of land where they expect oil or gas will be found. Many of the underpinning issues are old, but the proximity or promise of oil or gas wealth is an added and complicating factor. For instance, there are several international border disputes near the discoveries or areas of potential, real or imaginary. The South Sudan/Kenya dispute over the Ilemi Triangle area, for example, is adjacent to the Lokichar discoveries. Uganda and Congo disagree over Lake Albert borders. Tanzania has disputes with both Malawi and Congo over lake-basin boundaries. Armed conflicts in the Ethiopian Ogaden and between Somaliland and Puntland are both invigorated by the perceived promise of oil riches. Offshore, oil and gas potential is a factor in the Kenya/Somalia dispute over their maritime boundary and a contributor to increased tension between Tanzania and Zanzibar.

In the regions where the discoveries have been made in Uganda and Kenya, conflicts over entitlements and revenue sharing between local and national communities are challenging the Governments and companies involved. Similar challenges can be expected wherever new discoveries are made. Knowledge of the history of exploration in East Africa cannot solve these problems, of course, but an awareness of that history, of the role it has played in shaping community beliefs and expectations, may help companies understand and manage the complex social and political demands that now confront their exploration and development projects in this region.

Thank you

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Sometimes the past does look like another country:

Ethiopian Airforce officers and Elwerath staff rest in the shade of their aircraft in the Ogaden, circa 1962