

Exploration watch

Trinidad: New energy to low cost, low risk region

Trinidad is a well-established oil and gas producing region, with continuous production since the first field came onstream in 1902. The hydrocarbon sector has been predominantly producing gas since the 1990s and offshore gas development is dominated by the majors: BP, Shell, BHP and EOG resources. This has created an opportunity for independent companies to operate in the onshore oil fields located in the south of the island. Columbus Energy Resources (CERP), Range Resources, Touchstone Exploration and Trinity Exploration and Production all operate producing onshore oil fields, while Trinity also operates offshore in the Columbus Basin. Recent management changes or new funding at these companies has resulted in a boost to activity across assets that offer low cost, low risk development, although there are challenges in producing from older well stock in geologically complex structures.

New wells to increase in 2018

The onshore fields all contain a large well inventory of which only a fraction will be producing at any one time. All our featured companies have active programmes of well interventions, working with old wells and often with incomplete data. The interventions range from well optimisation to clean-out procedures and stimulations. Production growth is achieved through recompletions or infill wells targeting undepleted intervals. Workovers and recompletions are occurring almost continuously, while the number of new wells drilled is set to increase from eight in 2017 to at least 14 in 2018. However, further growth will need to come from exploration and EOR techniques such as waterflooding.

Upside from waterflooding or exploration

CERP and Range see waterflooding as key to unlocking significant new production and are in the process of implementing waterflood pilots and programmes in Goudron (CERP) and Beach Marcelle and Morne Diablo (Range). Water injection in Trinidad has had varying degrees of success, however even a small increase in recovery factor would transform production.

Meanwhile, the independents also see potential upside from their exploration acreage. CERP is looking to drill in the under-explored South West Peninsula in 2019, although prospect details are not yet available. Touchstone plans to start drilling in its Ortoire block in late 2018 where it has identified four prospects holding an estimated 10mmbbls each. Trinity is working on its offshore TGAL development plan with 2C resources of 20mmbbls and over 700mmbbls STOIP along the Galeota ridge.

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Range Resources
Touchstone Energy
Trinity Exploration and Production

*Columbus Energy Resources is a client of Edison

EXPLORATION WATCH

A periodic look ahead from our in-house petroleum engineer, Elaine Reynolds, focusing on interesting exploration activities with potential impact on the E&P space.

Trinidad: Mature hydrocarbon region

Trinidad and Tobago is the wealthiest country in the Caribbean as a result of the exploitation of its oil and gas reserves. Trinidad sits 11km from the coast of Venezuela in a prolific hydrocarbon basin that forms part of the East Venezuelan basin. The country has produced over 3bn barrels of oil since 1908 and is the sixth largest exporter of LNG in the world. Oil exploration began here in 1857, although development of the onshore oil fields came later, from 1908 onwards. Today, the main hydrocarbon-producing areas are in the Southern Basin, covering the onshore oil fields, and the mainly gas-producing Columbus basin off the south and south-east coast of the island. As these gas fields came onstream, Trinidad and Tobago's hydrocarbon sector switched from producing mainly oil to mainly gas during the 1990s. The deep potential of the offshore basin remains untested, however, in 2016 BHP successfully drilled the first deepwater exploration well in the region with its LeClerc well over 190km offshore and to the east of the existing gas fields.

Oil and gas production declining

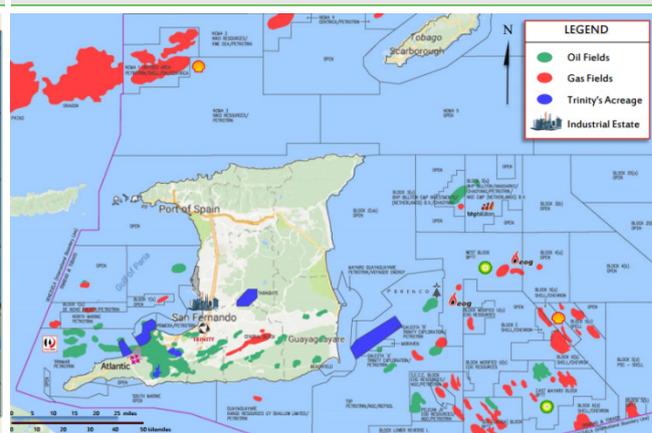
State owned Petrotrin is the country's major oil producer, currently producing 57% of the country's total oil production. The company is however undergoing restructuring as it struggles with a large debt burden (with US\$850m due in 2019 and a further US\$750m in 2022).

Exhibit 1: Trinidad and East Venezuelan basin



Source: USGS

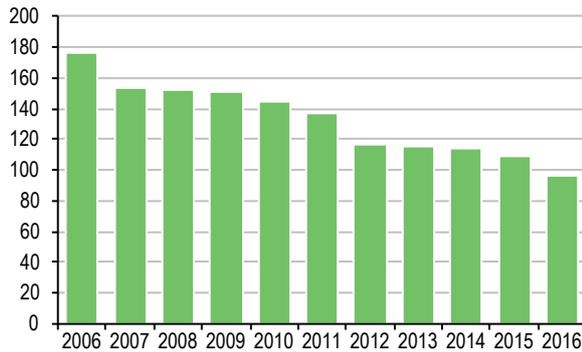
Exhibit 2: Map of oil and gas fields



Source: Trinity Exploration & Production

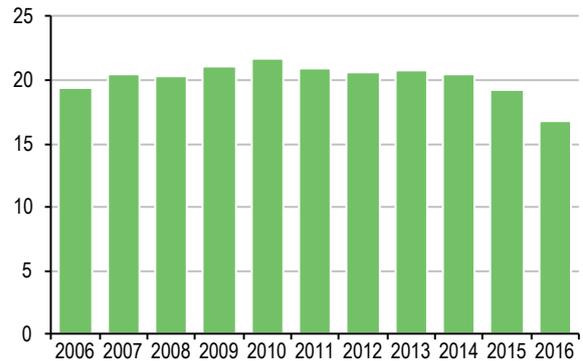
Offshore development is dominated by the majors, with BP, Shell, BHP and EOG Resources all operating fields. Northwest of the Columbus basin, the fields are predominantly oil, while those to the south are gas and gas/condensate. BP Trinidad and Tobago (BPTT) is the country's largest hydrocarbon producer, accounting for 60% of all national oil and gas production from its 14 offshore platforms. In 2017, two of BP's seven major upstream projects worldwide were located in Trinidad. The Juniper field, expected to increase BPTT's production capacity by 590mmscf/d came onstream in August 2017, while the onshore compression project, designed to deliver up to an additional 200mmscf/d from existing low pressure wells, commenced operating in April 2017.

Exhibit 3: Trinidad crude oil production, kbpd



Source: [BP Statistical Review 2017](#)

Exhibit 4: Trinidad gas production, kboepd



Source: BP Statistical Review 2017, Edison Investment Research

Oil production has been in decline since 2006 due to the mature nature of the fields and declining investment. Similarly, gas production has declined by around 20% since 2013 and further sufficient resources are not currently being developed to offset the projected decline in the producing fields of 14% per annum between 2016 and 2030. After low levels of gas discoveries in the last decade, the success of BHP’s LeClerc, together with BPTT’s 2017 Savannah and Macadamia discoveries have provided encouragement that gas resource replacement can be improved. BHP plans to return to exploration drilling in the region in 2018, with two wells in Block 5, containing LeClerc, and one in Block 14. BPTT is currently not expected to drill further exploration wells until at least 2019.

The majors’ focus on offshore gas has left an opportunity for independent operators in the low cost, low risk onshore oil fields. In this report we take a closer look at independent companies operating in the region: Columbus Energy Resources (CERP), Range Resources, Touchstone Exploration and Trinity Exploration and Production. All of these companies operate oil producing assets onshore Trinidad where smaller companies are more prevalent, while Trinity also operates offshore in the Columbus basin.

Onshore: mature fields, geologically complex

Trinidad is a young hydrocarbon province at the intersection of the North American, South American and Caribbean plates and the region has a history of tectonic activity resulting in geologically complex faulted reservoirs. One major fault that runs through the southern part of the island, the Los Bajos fault, has shifted horizons by up to 11km. Seismic acquisition is expensive due to the presence of primary rainforest, while seismic quality is affected by the presence of a heavily weathered layer close to the surface. With fields having produced since the 1930s, log data tend to be old and of poor quality and production history records are not always clear. Fields are however delineated by wells, which do benefit from dense well control.

The bulk of the oil produced onshore to date has been from the Pliocene Forest, Cruse and Gros Morne reservoirs. Oil is also produced from the deeper Miocene, where the Herrera is the major reservoir. These horizons can occur at different depths across the island due to tectonic activity. In general, the reservoirs are a series of stacked sands which can vary in thickness from 15ft to 200-300ft and produce oils ranging from 14° to 47° API (with the oil becoming heavier as the reservoirs become shallower). These shallower reservoirs tend to have high permeability and be unconsolidated, so that they often produce sand. Wells are completed and produced from the lowest reservoir up and comingling is not allowed between horizons over 500ft apart. Once the completed reservoir is depleted, the well can be recompleted across a new interval.

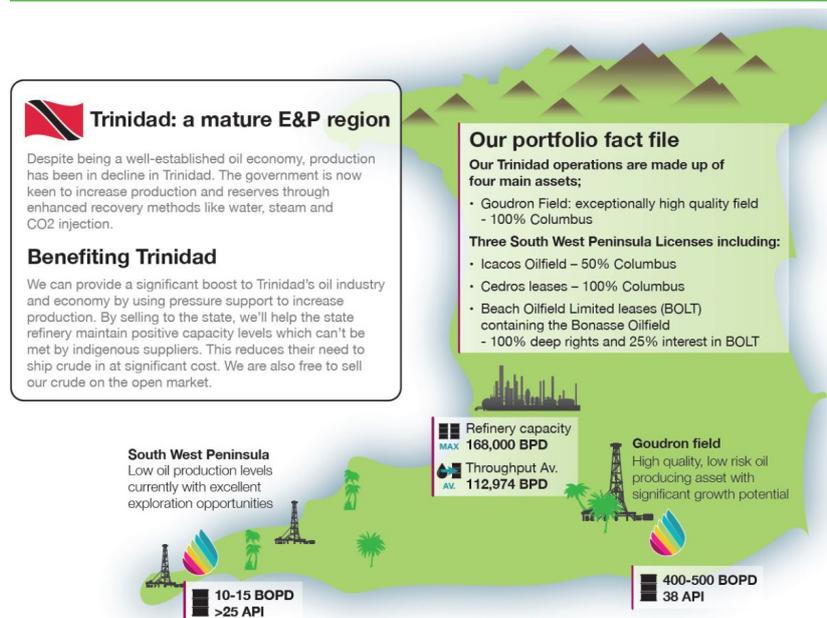
Fields in Trinidad produce under solution gas drive which leads to low primary recovery. Historically, fields were produced without pressure support, although water injection was tried in some areas,

with varying degrees of success. Effective pressure support is complicated by the faulted nature of the reservoirs, so that in recent years companies had focused on maintaining and growing production by accessing pockets of undepleted reservoirs through recompletions and infill drilling. Recently, however, water injection has recommenced onshore Trinidad with waterflood projects in Range's Beach Marcelle and Morne Diablo fields and a water injection pilot in CERP's Goudron field. To date, these projects are targeting limited areas, but both companies expect to expand these activities in the future and see water injection as key to growing production.

Columbus: Waterflood and exploration key to growth

Columbus Energy Resources (CERP) was launched in June 2017, having previously operated under different management as LGO Energy. The company's main asset to date has been the Goudron field, in which it holds 100%, but it also has three licences in the South West Peninsula (SWP) where the company is particularly excited about the exploration potential of deeper horizons below the Bonasse field. CERP currently holds 100% working interest in the deep rights below 7000ft and a 25% interest in Beach Oilfield (BOLT) and the Bonasse field. Negotiations are ongoing to close out a deal to increase the stake in BOLT to 100% and to improve and restructure commercial arrangements for the SWP assets. The company hopes to be able to announce these during H118.

Exhibit 5: CERP acreage map



Source: Columbus Energy Resources

Goudron holds gross 2P resources of 11.6mmbbls and currently produces from 50 wells out of a total well stock of 160. Production is from the shallow Mayaro sands (where the oil is 25° to 47° API) and the deeper C sands. The Mayaro is continuous across the field, while the C sands consist of lobe and channel sands that vary in geometry and thickness across the field.

CERP's first priority has been to focus on increasing production in existing wells at Goudron from the July 2017 rate of 327bopd. The company successfully implemented a series of low cost well interventions and achieved an increase in production of 71% to 561bopd by the end of 2017. The rate of improvement was slower than originally anticipated due to legacy issues with old infrastructure, process and personnel issues, which are being addressed with a programme of infrastructure and process improvements. Some issues, such as sand production, are taking longer to resolve but are being addressed with the introduction of new sand handling systems such as downhole filters, sand resistant rod pump designs and progressive cavity pumps (PCPs).

Interventions have been split between mechanical well work and well treatments. Seventy workovers have been carried out since August 2017, along with a programme of well optimisations and clean-outs. Stimulations have been particularly successful, not only removing damage from the near wellbore radius but in some cases resulting in undepleted zones being accessed.

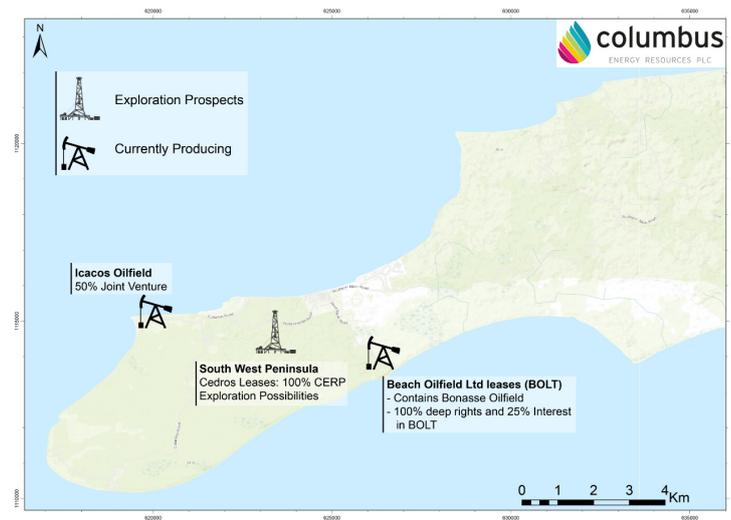
CERP is planning to further grow production in Goudron through the implementation of waterflooding. Waterflood pilot facilities were commissioned by the end of 2017 and the company is planning a series of pilot waterfloods at different locations across the field. Pilot B is now underway and is testing communication with GY-670 by injecting water in GY-669, which is located 160m away at reservoir level. GY-670 originally produced over 1,000bopd from the C sand when it was tested in 2014, so successful pressure support here could significantly increase production from the well. In 2018, injection is also expected to commence in Pilot A and Pilots C & D. Pilot A will also target the C sand and will inject water in GY-668 with a view to providing pressure support in GY-664 and GY-665. Pilot C & D will target the Mayaro sands. The continuous nature of the Mayaro sands means that waterflooding should be relatively straightforward, while the discrete C sands will need to be targeted more carefully. At present, the company has access to 500-650bwpd from existing Goudron water production. Additional water would come from recompletions of existing wells and possibly new water wells. CERP sees potential for Goudron to produce at over 2000bopd if full field waterflooding can be implemented.

The company is forecasting end of year 2018 production of 900bopd low case and over 1,500bopd in the high case, based on continuing improvements from well optimisation and stimulations, together with waterflood pilot success.

Exploration upside from South West Peninsula

The SWP licenses include a small amount of oil production from the 50%-owned Icacos oil field (10-15bopd net to CERP), the low producing Bonasse field (~10bopd net to CERP), and the Cedros leases. Lying on the Cedros Peninsular in the south west corner of Trinidad, the deeper potential is virtually unexplored and it is these underlying reservoirs that are of most interest to CERP.

Exhibit 6: South West Peninsula map



Source: Columbus Energy Resources

Once negotiations on the SWP are completed, the company plans to reactivate Bonasse, applying similar techniques to those successfully employed in Goudron to boost production in 2018, but future growth is expected to come from exploration. The company holds 3D seismic over a large portion of the peninsula, together with geochemistry data and a gradiometry survey. In addition, CERP has data from a number of wells, in particular the only deep onshore well, FRM-1, which was

drilled on the acreage in 2008 and encountered oil shows in the Lower Cruse and Lengua formations. From analysis of this data, the company has identified a significant number of prospects across both structural and stratigraphic traps and it plans to commence exploration drilling here in 2019. Details regarding the size of these potential prospects will not be made public until after the SWP deal is completed. Most prospects will be at depths less than 5,000ft with well costs between \$2m and \$4m. In addition, it is expected that it will be possible to drill multiple targets in one well. As the acreage sits in such an established hydrocarbon province, the prospect risk of source, trap and seal is expected to be low, with reservoir deliverability seen to be the key risk.

Range Resources: Focusing on waterfloods

Range Resources holds 100% WI in the Beach Marcelle, Morne Diablo and South Quarry fields onshore Trinidad and 80% WI in the St Mary's exploration block. In 2017, the company acquired RRDSL, an oilfield services company in Trinidad. Beyond Trinidad, Range also operates in Indonesia where it holds 23%WI in the onshore Perlak field.

Range produces over 770bopd in Trinidad and was independently assessed to hold 16mmbbls 2P reserves and 2C resources of 8.1 mmbbls by Rockflow Resources in its 2017 CPR. The fields have all been producing for 75 years and contain over 600 wells, of which 180 are currently contributing to production.

Exhibit 7: Range Resources acreage map

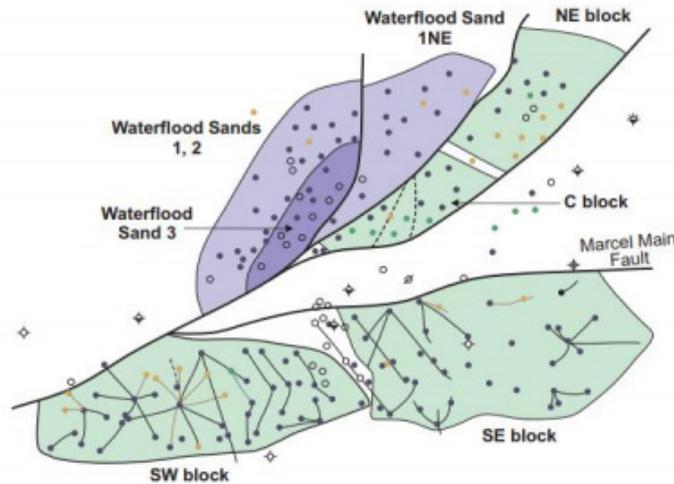


Source: Range Resources

The company has an active programme of workovers and infill drilling, but its current main focus is on implementing waterfloods, since 70% of its reserves are attributed to these programmes. In 2016, the company started injecting water in Beach Marcelle and a pilot scheme was initiated at Morne Diablo in 2009 and expanded in 2015.

Beach Marcelle is one of the oldest and most depleted fields in Trinidad having produced since 1911. It also holds the largest share of the company's 2P reserves, at 9.52mmbbls. The field is split by a large fault which acts as a top seal and is made up of a number of fault blocks with around 20-30 wells in each block. The field underwent waterflooding in the 1960s when it was operated by Texaco (in the blocks highlighted purple in Exhibit 8).

Exhibit 8: Beach Marcelle waterflood areas



Source: Range Resources

Range started up injection in the SE block in May 2016 and believes that a further five or six blocks could be viable for future water injection. Water is produced from a water source well that produces water from a shallow sand unit with an additional 550bwpd provided by Petrotrin. The water is treated and then injected at 1,200bwpd across three water injectors converted from old production wells. Production from the SE block is currently at 200bopd, which the company attributes entirely to the waterflooding. Range plans to install an additional water storage tank to increase water storage capacity by March 2018, and this should lead to more efficient water handling, resulting in an additional water supply from Petrotrin of 150bwpd. The company is looking to expand the waterflood programme to the NE and SW blocks in Beach Marcelle from late 2018/early 2019 and Range estimates that it can increase recovery rates from the field by a further 11% from the current 18%. Any further increase in the water injection rate will require further water source wells and new infrastructure.

The water injection project in Morne Diablo is smaller than that at Beach Marcelle. The pilot scheme is currently limited to a water injection rate of 250bwpd and the company estimates that this has resulted in an additional 45bopd being produced from the field, bringing total production here to 350bopd. Water injection has been at lower rates than planned due to poor casing cement seal in some of the injection wells so that further development of the scheme is on hold for the moment. Range is also planning to expand its waterflood programme to South Quarry during late 2018/early 2019. South Quarry is the smallest of the company's three fields, and currently produces 50bopd

Although waterflooding is the key focus, the company continues to identify workover candidates and worked over 233 wells in 2017. In addition, two new development wells were drilled in 2017. The GY 684 well in Beach Marcelle was completed in December 2017 and is currently producing 80bopd. In Morne Diablo, the QUN 161 well was completed in September 2017 and produced at an average of 21bopd. During 2018, Range expects to drill a minimum of two new wells.

In 2017, Range acquired 100% of RRDSL, for US\$5.5m. RRDSL is an established oilfield services company in Trinidad that operates a modern fleet of 13 rigs and has been providing all of Range's oilfield services since 2003. Range expects that the acquisition will lower its operating and drilling costs, provide greater operational flexibility and add additional revenue from work undertaken for third parties.

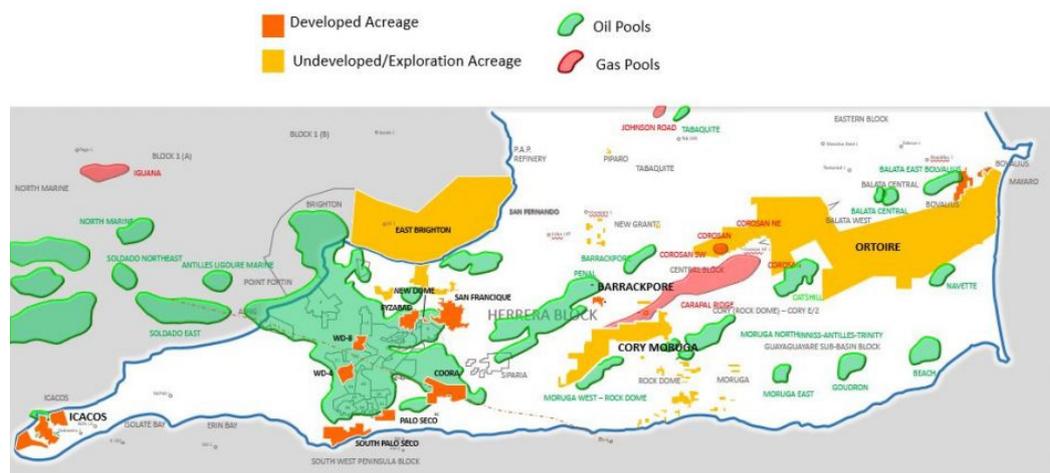
West Coast assets

In August 2017, Range entered into a deal to acquire an interest in two offshore producing licences from Trinity: Brighton Marine (BM) and Point Ligoure-Guapo Bay-Brighton Marine (PGB), collectively known as the West Coast Assets. Both licences are located offshore the West Coast of Trinidad in shallow water and currently produce around 200bopd. The company would have paid US \$4.55m for operatorship and a working interest of 100% in BM and 70% in PGB with net 2P reserves of 2.6 mmbbls. In November 2017, the company announced that it had not been possible to obtain the necessary regulatory approvals so that the sale and purchase agreement had been terminated.

Touchstone: increasing number of new wells in 2018

Touchstone entered Trinidad in 2010 when it acquired the WD-8 development block. Since then, the company has grown from producing 143bopd to 1,448bopd across 11 producing properties and holds a further nine exploration blocks. The assets hold 2P reserves of 15.7mmbbls spread across 9,709 acres, however, the bulk of the reserves and production come from the company's four lease operatorship properties, WD-8, WD-4, and Coora 1 and 2, and as such Touchstone's core focus is on developing production from these leases.

Exhibit 9: Touchstone acreage map



Source: Touchstone Exploration

The well inventory covers 1,300 wells of which 128 are producing, though up to 450 wells can produce at some point during a year. The majority of these wells were drilled by Texaco and Shell in the 1930s and there can be large variations in the production rates achieved (even across short distances), with 80% of total production coming from 15% of the wells. Texaco's objective was to produce as much oil as fast as it could, so that several horizons were bypassed and not produced, providing Touchstone with the opportunity to go back and target these neglected zones.

The company maintains its base production profile through recompletions targeting these untapped layers and plans to carry out 24 such recompletions in 2018 (compared with 20 recompletions in 2017). Further production growth has been achieved through infill drilling. Four infill wells were drilled in 2017, with two wells in Coora-1 and two in WD-4. These wells targeted horizons that were slightly riskier as they sit 1,000ft-1,500ft deeper than usual. However, the reservoir here is undepleted. The wells were successful and added an average of 283bopd during November and December 2017.

10 infill wells will be drilled in 2018 (six more wells than the four originally planned), and these new wells will be funded from the proceeds of a \$5m private placing carried out in December 2017. The work will complete the company's minimum work obligations up to 2020 and Touchstone has

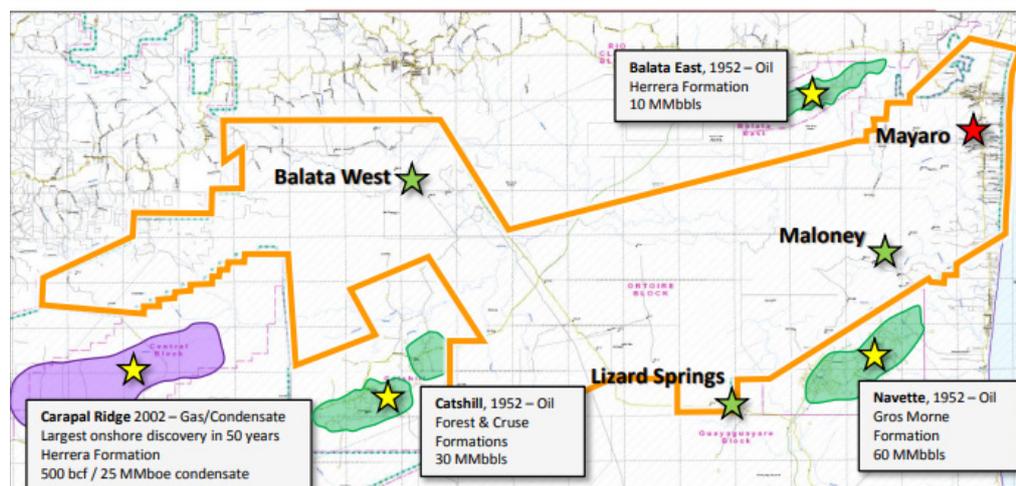
contracted a second rig to accelerate its drilling programme. The first well, WD-4, spudded in early February 2017, is targeting an undrained portion of the Upper and Lower Forest formations. The second rig is expected to commence drilling on the WD-8 block by the end of February, where two wells are planned targeting the Cruse and Forest formations in two separate areas where existing drill density has been low. Drilling will then switch to the Coora 1 and Coora 2 blocks, where two wells are planned from each property. The first Coora-2 well is an offset development well to CO-369 and is targeting upper sands that cannot be produced from the CO-369 well while also producing from a deeper zone. The second well will target a deeper horizon in a separate fault. The final three wells are expected to be drilled on Fyazabad and WD-4.

Touchstone has not implemented water injection in its fields, but is considering EOR options for the future. Primary recovery from the fields is less than 10% and the company sees an opportunity in improving sweep efficiency. Touchstone is concerned that water injection would require large quantities of water and would need to be confident of securing sufficient water volumes to ensure success. Because of this, it is looking at the feasibility of CO₂ flooding. The company produces some gas, which has historically been vented in Trinidad, so this could be used for gas re-injection. Touchstone is however planning to commence injecting water in Fyazabad in 2018, although this is for water disposal and not waterflooding purposes. This is part of the company's push to move to zero surface water effluent.

Exploration upside in Ortoire

Beyond its producing assets, Touchstone also sees potential upside in the Ortoire exploration acreage in which it holds 80% WI. Covering 35,785 net acres, the block contains four separate prospects, each believed to contain around 10mmbbls. Historically drilled between the 1920s and 1960s, there are 77 wells across the acreage, of which 25-35 have produced. Balata West and Maloney are oil bearing, while Mayaro produced gas. Lizard Springs, originally drilled in 1928, contains fractured shale oil. The company is planning to reactivate between two and four wells here in 2018, and to drill four infill wells over the next four years. Commencing from late 2018, the drill programme would be funded from cash flow.

Exhibit 10: Ortoire block



Source: Touchstone Exploration

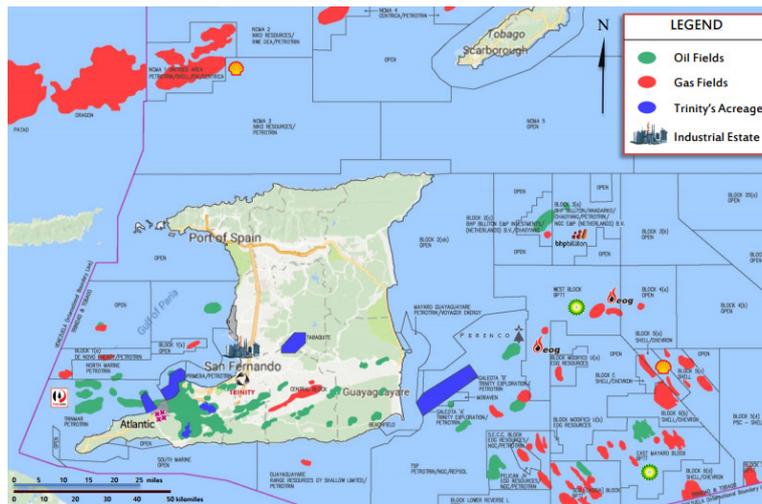
Trinity: Return to drilling in 2018

Trinity has existed in Trinidad since 2006, when it was spun out of Venture Production. In 2013, the company added the offshore Trintes field to its portfolio when it completed a reverse takeover of Bayfield Energy. The company currently produces 2,777bopd across nine licences and is the only

one of the companies covered in this report to hold producing assets offshore Trinidad. Trinity holds 2P reserves of 21.3mmbbls and 2C of 21mmbbls, together with 20mmbbls net high prospective resources associated with the Galeota Ridge in its offshore East Coast asset.

In 2015, the company carried out a strategic review, having suffered from the low oil price and a production shortfall which resulted in indebtedness. The management team was changed out at this time, with the exception of original company founder, Bruce Dingwall and the restructuring was completed by January 2017 with the raising of \$15m in new equity, enabling the company to focus now on growing production and reserves.

Exhibit 11: Trinity acreage (shown in blue)



Source: Trinity Exploration & Production

Production comes from 128 wells out of a total inventory of 1,086 and is mainly split between the onshore assets and the Trintees field offshore East Coast.

Trinity hold six onshore leases across the Forest Reserve field in the south west of Trinidad. This area has been developed since the 1920s and is a separate fenced off area of the island reserved for the development of oil and without habitation, making it easier to carry out operational work. Historically, the area was operated by Shell and BP, with peak production of around 150,000bbls/d in the 1950s/1960s. The bulk of production comes from one licence, covering WD-5 and WD-6, and accounts for around 1,000bopd of the company's total production today.

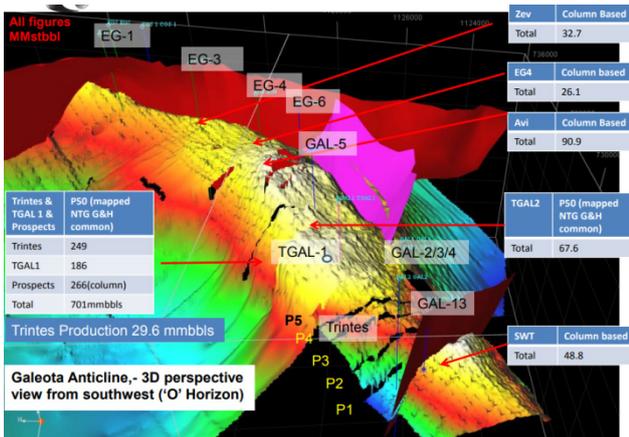
Production is from around 100 wells completed on the Forest and Cruse formations and the oil has an API of between 22 -28°. Operations to maintain and increase production are focused on low risk, low cost workovers and recompletions and, in 2018, the company will resume infill drilling with a minimum four well programme. The company has two rigs that carry out workovers that for example clean out sand from a well or remove an obstruction. Recompletions are carried out by a dedicated rig at less than 10% of the cost of a new well. Candidates with bypassed undepleted reservoir sands are identified from petrophysical and offset well studies, while the new infill wells will look to target areas that have not yet been depleted.

Trinity is not considering water injection here, as it has been able to achieve its required production rates through the workover, recompletion and infill drilling programmes. The company believes that the compartmentalised nature of the reservoirs makes it difficult to implement on a field wide basis, though it could be applicable in particular pockets. The ability to access and inject the large quantities of water necessary to achieve repressurisation, together with the varied success of historical water injection projects, was also of concern.

Offshore: Galeota Ridge offers exploration upside

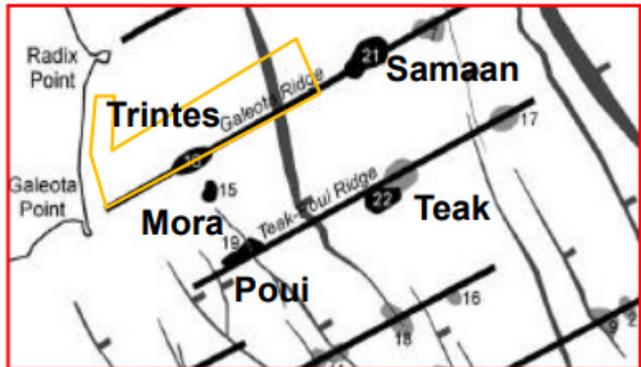
Trinity operates offshore from two producing areas, the East Coast asset and the West Coast asset, though dominated by the East Coast. The East Coast produces around 1,200bopd and holds 2P reserves of 14.7mmbbls (out of total 2P of 21.3mmbbls) together with 2C resources of 19.5mmbbls and prospective resources of 20mmbbls. The East Coast assets cover the producing Trintees field, TGAL and the Galeota ridge which all sit in one NE/SW anticline.

Exhibit 12: 3D perspective of the Galeota anticline from the SW



Source: Trinity Exploration & Production

Exhibit 13: Location of analogous fields



Source: Trinity Exploration & Production

The formation consists of thick delta front sands that can be up to 1000ft thick. However, the anticline is not full to spill so that hydrocarbons are only found in the top 300ft of sand. The company has fully integrated 3D seismic across the ridge and, as seen in fields onshore, the reservoir is faulted, though some of these faults seal while others leak resulting in fluid flow through a baffle-like system.

Trintees sits at the south-west end of the anticline and currently produces around 1,200bopd from 28 wells. The produced oil has an API between 28^o and 34^o and is lifted to the surface by Electrical Submersible Pumps (ESPs). Under Trinity's management, the ESP life has been extended from an inherited 150 days to around 2,000 days. The company has an ongoing programme of workovers and reactivations to maintain and optimise its base production from the field and is working on a programme of infill drilling which is expected to commence in 2019.

The key upside for Trinity is in developing the Galeota Ridge. Galeota is peppered with exploration wells, including Trinity's 2013 TGAL 1 discovery well, and every well drilled to date along the ridge has encountered oil. 14.5mmbbls of the company's 2C resources is associated with TGAL and is based a conservative 12% recovery factor on the best estimate STOIP of 186mmbbls. The Galeota anticline is estimated to contain over 700mmbbls STOIP. The ridge is analogous to the nearby Teak, Poui and Samaan fields which are operated by Perenco and have produced over 850mmbbls to date.

Trinity is working on the first phase of infill drilling in Trintees, which is due to begin in 2019. In addition, the field development plan for TGAL is being refined with a view to commencing drilling operations here in late 2019/early 2020. Modelling carried out by the company has indicated that high angle/near horizontal wells could potentially deliver rates of 500-800bopd. The emphasis for topside development is on minimal facilities or the use of an old jack up. Trinity may look to farm out to fund the TGAL development, though it is still maturing its strategic options.

West Coast assets: Looking to sell

Trinity is continuing to look for a buyer for its West Coast assets after a deal to sell 100% of the Brighton Marine and Point Ligoure-Guapo- Brighton Marine licences was terminated when it was not possible for Range to obtain the necessary regulatory approvals.

Future opportunities: EOR, return of exploration and Petrotrin

Maintaining production onshore Trinidad demands a continuous programme of monitoring, optimisation, recompletions and workovers across a large inventory of older well stock, often with old or incomplete data. All our featured companies are, however, looking to grow further through the application of EOR techniques, or through exploration.

At present, CERP and Range have both opted to increase recovery by providing pressure support through waterflooding. Fields in Trinidad were historically waterflooded, such as that carried out by Texaco in the north-east block of Beach Marcelle in the 1960s, but these had varying degrees of success. A number have failed, while recovery elsewhere has ranged between 2.1% to 16.1% with an average of 6.9%. This is primarily due to the compartmentalised nature of reservoirs in Trinidad and an understanding of these individual blocks is necessary in order to optimally position water injection wells and maximise recovery from these waterfloods.

Waterflooding is not the only EOR technique being considered, with Trinity looking at the possibility of CO₂ flooding since it would remove the issue of accessing sufficient quantities of water. CO₂ flooding is also the preferred EOR method of private company **KPA Group** for its Barrackpore field. Houston based **New Horizon Exploration** drilled 100 vertical wells and 10 horizontal wells to carry out steam assisted gravity drainage (SAGD) in its Parrylands Block E in south-west Trinidad, but this failed as sweep efficiency was poor and breakthrough was very quick. Clearly, EOR is challenging in Trinidad, but if successful can result in significant increased recovery.

There has not been much exploration in Trinidad in recent years, but this is likely to change from late 2018, with CERP, Trinity and Touchstone all planning to drill exploration wells in 2018 and 2019.

Finally, the ongoing restructuring at Petrotrin could provide new opportunities for independents operating in Trinidad. The company's board is currently reviewing a report that is believed to have recommended that Petrotrin is split into two or three independent business units, according to local press reports. We suggest that these developments could result in additional acreage becoming available to independents.

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