ENERGY ISSUES
Dire Straits to a Brighter Future

CONFERENCES
PESA Flies the Flag at APPEA

BEST BRANDS
Shell is Top of the Pops
SECURING AUSTRALIA’S ENERGY FUTURE

TRANSFORMATIONAL DISCOVERY

The 2018 Dorado discovery was the biggest Australian oil discovery in 30 years.

A final investment decision is expected in 2022 and once online Dorado is expected to produce up to 100,000 barrels per day.

UNLOCKING OPPORTUNITIES

We’ve uncovered play opening discoveries in the Bedout sub-basin at Dorado, Pavo, Phoenix South and Roc.

With around 100 drill targets in our portfolio across the basin, there’s lots more to explore.

PIONEERING LOW-CARBON FUEL

Our joint venture business FutureEnergy Australia (FEA) is supporting Australia’s energy transition.

FEA’s planned biorefinery in WA’s Wheatbelt will produce renewable diesel, a low carbon alternative fuel.
Ocean Bottom Seismic
Advanced Acquisition Technologies

Shallow Water

Hybrid Acquisition

Deepwater

shearwatergeo.com/obs
INIDE THIS ISSUE

PRESIDENT’S REPORT
Intellectual Capital Shines Under Clouds of COVID. 5

ENERGY ISSUES
Fossil Fuels Dance to a new, old Hit Single. 6

H2 HIGHLIGHTS
CO2CRC Leads Pioneering Underground Hydrogen Storage Study. 10

GLOBAL GEOPOLITICS
Qatar Gas only a Short-term Solution to Italy’s Russian imports problem. 12

(continued on Page 3)

Deadline dates for editorial submissions for the THIRD Quarter 2022 edition of PESA News
Technical articles: June 30  |  Branch News: July 10
Alternately: Email the editor at editorial@pesa.com.au to discuss

ADVERTISERS

ISSUE #165

APPEA OBC
Carnarvon Energy IFC
Dept of State Development SA IBC

POWER PLAY: A LNG carrier sits patiently at the Santos-operated GLNG plant off Curtis Island in Queensland waiting to ship its cargo to South East Asian customers who have long-term contracts with the joint venture.

APPEA
Shearwater

PESA 49, 59, 63

OBC IFC

Shearwater

IBC

ISSUE #165

PESA News 2 | SECOND QUARTER 2022

SOVEREIGN SAFE: Concerns that Australia is running out of feedstock to fulfil LNG export obligations and risks a downgrade to its AAA Sovereign Risk rating have been allayed by a leading researcher who says the gas is in the ground.
CARBON CHRONICLES
If Chevron, Exxon and Shell can’t get it right... 14

SEISMIC AT SEA
Shearwater to Perform Third Isometrix Survey at Mariner Field. 16

BEST BRANDS
Shell Tops Oil and Gas Brands Pops. 20

STOCK STARS
Pancontinental Soars to the Top of the ASX Hit Parade. 22

CONFERENCES
PESA Members Flying the Exploration Flag at APPEA 2022. 24

SEISMIC SNAPSHOT
Clontarf Secures Stake in Sasanof-1. 29

BRANCH NEWS
Federal: Testing Times, but We’re Heading in the Right Direction. 34
NSW: Golf Gods Shine on as COVID Eases and Rain Clouds Part. 36
WA: CO2 Captures and Captivates Crowd at the Lunch Munch. 38
SA/NT: Update on CABS IV. 40
QLD: Adavale Basin, Boree Salt Core Workshop, Ides of March 2022: 41

TECH
South Australian Petroleum Review. 42

BOOK REVIEW
Understanding Amplitudes: Basic Seismic Analysis for Rock Properties. 50

GEO GEMS
Rise of the Velkerri - A Stacked Shale Play in the Betaloo Sub-basin. 53

INSPIRATIONAL IMAGES 60

CROSSWORD
Cristy Little wins a bottle of fine Aravina wine. 62

CEO’S CORNER 64
CONFERENCE CALENDAR

MAY

16-19 APPEA Conference and Exhibition
Venue: Brisbane Convention Centre
Website: appeaconference.com.au

19-20 Pathways for Geoscientists in a Net-Zero Future
Venue: Business Design Centre, London
Website: energytransition.aapg.org/2022

JUNE

20-22 Unconventional Resources Technology Conference
Venue: George R. Brown Convention Centre, Houston
Website: urtec.org/2022

AUGUST

29-30 Central Australian Basins Symposium IV
Venue: Darwin Convention Centre
Website: cabsiv@agentur.com.au

24-25 First EAGE Workshop on Faults in Groundwater, CO₂ and Hydrocarbons in Asia Pacific
Venue: Online

SEPTEMBER

7 Good Oil Conference
Venue: Hyatt Regency Perth
Website: 10times.com/oil-gas-investment-conference

OCTOBER

17-19 SPE Asia Oil & Gas Conference and Exhibition
Venue: Adelaide
Website: spe.org/events

31-Nov ADIPEC 2022
Venue: Abu Dhabi, UAE
Website: adipec.com

MARCH 2023

13-18 AEGC
Venue: Brisbane Convention and Exhibition Centre
Queries: arinex.com.au

PESA BOARD & CONTACTS

CHAIRMAN
Steve Mackie
Geosim Consulting

PRESIDENT
Bronwyn Camac
ingGauge Energy

VICE-PRESIDENT
Helen Debenham
Molyneux Advisors

SECRETARY
Phil Cooney

TREASURER
Carrisa Digance
Santos

IMMEDIATE PAST-PRESIDENT
Nathan Parker
Origin Energy

BRANCH PRESIDENTS

NSW/ACT: Titus Murray
Southern Highlands Structural Geology

QLD: Sam Ware
Origin Energy

SA/NT: Iain Campbell
Department for Energy and Mining

VIC/TAS: Tim O’Brien
Lakes Blue Energy NL

WA: Adam Craig
RISC Advisory

For all membership related enquiries please contact membership@pesa.com.au and for all other enquiries, please contact info@pesa.com.au
WELCOME to the APPEA edition of the PESA News and I’d like to use this opportunity to review some highlights of the year that was.

Enduring these last two years of pandemic precautionary measures has resulted in a silver lining for the PESA membership, and that is to show how we can function in a virtual world. We are all expert video-conference whizz kids now (even if we didn’t get out of our pjs) and there were two big success stories.

The first is our incredibly successful webinar series, since this time last year we have provided quality technical and educational seminars to nearly 1400 registrants. On average 65 people registered for the webinars every two weeks! However, the topics associated with Energy Geoscience appear more popular. Two seminars were held on the topic of CCUS over the last year. The first by Nick Hoffman in Nov 2021 attracted a whopping 143 attendees and the more recent kick-off session for the new Energy Transition Special Interest Group (ETSIG) by Ishtar Barranco attracted 151 registrations.

I want to thank Peter Hoiles for all of his hard work sourcing excellent talks and moderating each session, along with Rock Flow Dynamics for their ongoing sponsorship support. We look forward to continuing our relationship for the next year and hopefully beyond.

Over the last year, we have initiated a number of new services and offers aligned with our strategic objectives of “Creating Value for our Members” and “Building Agility”, or Future Proofing PESA, and include:

Searcher-GeoClerk Partnership: This facility allows all PESA members to access the PESA Technical Library via the GeoClerk platform. The value to members here is timely access to a quality technical data-set, with the view of streamlining day-to-day literature research and reporting.

Geologize: Practical Geocommunication 2.0 course: PESA initially endorsed this educational product for its membership as we saw significant value in improving our communication with those outside the industry, during this period of energy transition. This initial partnership offered generous discounts, but as time went on the desire for widespread expertise in this developing area encouraged us to enter into a two-year deal with Geologize to provide FREE training for all of our members. So if you haven’t taken advantage of this offer, you can access via our website. Please make sure you’re logged in as a member first to access US$400 pp worth of training for free!

Energy Transition Special Interest Group (ETSIG): last year a small group of enthusiastic members decided to instigate a new SIG to network and educate nationally. The SIG is led by Ishtar Barranco and I thank her for her ongoing efforts to make this group successful. This initiative is aligned with our objective of “Building Agility”

We at PESA are committed to continue to provide what the membership wants and needs to determine and take control of our future. Thank you all for your support and I look forward to serving you again in 2022.

Bronwyn Camac
PESA FEDERAL PRESIDENT
Fossil Fuels Swing from Dire Straits
to a Brighter Future

IN recent years tremors on the oil and gas canvas may have left many professionals still active in the industry wondering whether the beginning of the end was starting to unravel, almost as a prophetic-styled fulfilment of Dire Straits’ 1982 hit song, Telegraph Road.

Rated by some as the best rock song ever produced, the lyrics tell the story of the creation of a thriving industrial town, culminating in the crescendo of economic downturn, jobs losses and the return to a desolate landscape.

Inspired by the novel The Growth Of the Soil, Mark Knopfler wrote the song travelling down the Telegraph Road in “The Motor City” of Detroit as a metaphor for the rise of America and the death of one man’s dream as it went into decline, before collapsing altogether.

Even though he was in the band’s petrol-powered bus at the time, it’s doubtful Knopfler was conscious of the oil and gas industry when he composed lyrics which would later resonate during ever darkening days of collapsing oil prices, the sirens of global activism lobbying for no new fossil fuels and the blowtorch applied to shareholders and investment houses to cut off the flow of finance. At this crossroads, many seasoned industry veterans nostalgically reflected on the contraction of an industry acknowledged for lifting more people out of poverty in the 20th century than any other and transforming quality of life with petrochemical-related products.

As the industry retreated and redundancies were rolled out, big oil scrambled to rewrite a new playbook subscribing to cleaner, transition energy pathways, embryonic carbon abatement sciences and even a renewable narrative which would use solar to help power new hydrogen initiatives.

But even as Nero fiddled while Rome burned there was a twist in the tale and it was not long before the reality of slashed cutbacks in exploration and capital investment began to bite – witnessed by the steady upward trajectory of crude oil prices in mid-2022 off the basement of historically inflation adjusted lows.

Scroll forward to today and it’s fair to say that while fossil fuels may not entirely be back in vogue, the pragmatic, perhaps even grudging, held view is that hydrocarbons will be valuable for some time to come. We need it now and for the foreseeable future.

A new, old song, perhaps synonymous with the fastest selling US pop single in history, We Are The World chorusing to “we are the ones who make a brighter day”, is of revival. In the midst of all of these melodies the question now being asked is: how many hydrocarbons do we have and what will we need for at least the next two decades?

There are always worst and best-case scenarios when it comes to assessing future energy security, notably liquids and gas supply, and the economic incentives critical to combating a looming power supply crisis that also threatens to embarrass Australia’s long-term LNG commitments.

While the government’s National Gas Infrastructure Report (NGIP) released late last year warned that Gladstone could be squeezed for feedstock to sustain cargoes to South East Asia by as early as 2030, the report was lacking in detail on how much gas, in particular, is in place to keep the trains on track and customers happy in China, South Korea, Malaysia, Japan and Singapore.

The NGIP report red flagged the threat of a potential sovereign risk downgrade to Australia’s AAA rating status unless new gas basins are developed, mature basins are stimulated to produce more hydrocarbons and critical infrastructure is constructed to transport these molecules from far flung corners of the nation.

Compounding the issue are unabated energy supply concerns in the eastern states, notably Victoria and New South Wales, a precariously balanced socio-political landscape and continuing climate change cum carbon capture conundrums.

On the basis that issues are seldom black and white and usually a grey hue somewhere in between, PESA News decided to investigate the reality of the problem by asking: Does Australia have the resources to meet demand beyond the next decade? What hurdles must government and industry clear to alleviate domestic and export gas shortfalls and what are the solutions within ever tightening timelines to keeping the wolves from the door?
Rolling Gas Numbers to Keep Sun Rising & Shining in the East

T’S a pretty involved scenario. But what we do know from the numbers is that gas in the ground, particularly from Queensland, is not a major issue. On the flipside, the ongoing decline of conventional gas resources in Victoria is well known. Nonetheless, subject to timely capital investment, Victoria’s decline can be stabilized, particularly as we have actually seen year-to-date growth in Victorian gas supply compared to 2021 of roughly 13%. This reflects the efforts of operators to reinvest in the Otway Basin and the impact of ExxonMobil’s recent West Barracouta development. It also holds the tentative prospect that for a short while Victoria may become self-sufficient in its gas needs, so to speak. The balance of domestic gas comes from the Cooper Basin, where we continue to see stable-to-gently declining production, reflecting the ongoing reinvestment from operators such as Santos and Beach.

Simple facts and figures suggest Queensland has plenty of reserves and should conservatively be able to meet export and domestic demand for roughly 15-years. Although there is a delay in reported data from 2020 due to a change in reporting regime, the Queensland Government has indicated 31.8 exajoules of 2P gas reserve at the end of calendar year 2019. Note this figure includes all the reserve downgrades over the years in addition to the depletion from production. At current production run rates of between 1,500-1,600 petajoules a year from Queensland, which includes domestic gas, this would imply sufficient reserve to sustain production until the mid-2030s. This excludes any impacts from more reserve downgrades and exploration.

More fundamentally, future supply from the Sunshine State is subject to the impact of LNG markets on domestic prices and the creeping reality that if gas prices stay too elevated, industries that are not reliant on ultra-high temperatures from gas will seek alternative energy sources or simply shut down. We saw this trend begin to play out when prices first rose in 2014, with an estimated 40 petajoules of industrial...
demand effectively lost between then and 2020. It’s a chicken and egg situation, because in cyclical industries it always the prospect of high prices that incentivizes supply, but at the same time domestic prices are trading against higher priced LNG as an alternative, which does not help induce domestic demand growth. So, it’s a question of what are we willing to pay for the abundance of gas that’s available?

The stakes are high, because if Australia’s sovereign risk is compromised the immediate impact is in the next boom (or perhaps even now), as overseas customers will be less likely to return. Ultimately, they might not anyway from an east coast perspective, but the existing plants still have long-term contracts to fulfill this decade. There are divergent views when it comes to the domgas versus export debate. My personal view, and I’ve yet to see the opposite, is that when you get a situation in which local demand needs come under serious pressure (i.e. there are serious physical shortages), the preference is always to shore up domgas first over exports. No other country behaves in a contrary manner. Given the figures, we know this is not the case for the east coast in terms of physical volumes. It would also be remiss to criticize the export sector outright, as the coal seam gas reserves would have been unlikely to be developed at scale without an export market in the first place. Again, we come back to price.

Ultimately, I am a believer in the old aphorism that high-prices are the cure for high-prices. When cyclical companies are making sizeable profits, there will typically be a strong incentive to add volumes to the market, and before you know it, you have lower prices again. While this appears at first glance to be a dynamic that Australia has appeared to sorely miss out on – but there is nothing that says future lower prices must be at the same levels as decades ago at A$3/GJ, they only need to be lower than recent highs and sufficient to incentivize demand.

Given there is enough gas in the Queensland’ subsurface to ease east coast supply concerns, the question of cost effective and efficient transportation comes into the picture, notably to get gas to Victoria and New South Wales.

For now, the pipeline network only has a single North-South interconnection point at Moomba. There is a risk that the transportation issue gets confused in debate. APA owns the South West Queensland Pipeline and has stated it is cheaper to upgrade capacity when there is demand for gas in the south, than to build new pipeline systems. By rights it makes sense to expand on an existing system compared to the higher cost of building new pipeline systems. However, if there was a world where demand growth in gas was very high, let’s call it roughly 5% a year or more, or there was a real need on the supply side to unlock a new Basin, then a new pipeline system would make sense.

While the most feasible and cheapest form of transport is to upgrade interconnection capacity, the main problem still boils down to demand. Ultimately, industrial customers are unlikely to invest and increase their gas demand needs over long timeframes at high double digit gas prices. Ultimately demand growth relative to prices boils down to this sector and the residential sector. While gas is used in the power sector, this sector is largely indifferent to gas prices and is driven more by electricity market fundamentals.

Roughly speaking, it does not really matter if the gas price for a utility is A$10/GJ or A$18/GJ, because at an 8-10x heat rate for these plants you observe the corresponding A$80-A$160/ MWh electricity price in that market, meaning fuel costs are largely passed through. This is to be expected as fuel is a variable cost that only kicks in when Combined Cycle or Open Cycle Gas Turbines ramp up in the first place. At a macro level as coal fired power share declines, there will be increases in gas fired powered – but we must set this in the right context – gas use in power has declined in absolute levels since 2014 by nearly half – any increases over the coming years are not likely to recover prior peaks due to the ongoing rollout of renewable generation.

This brings us to the residential sector which really is the most important component. One third of gas used in Victoria is for heating in winter. Depending on the year this segment alone is anywhere between 17-26% of all annual east coast demand. This is a legacy construct from the early days of Gippsland Basin development when gas was largely seen as a lower value byproduct. Right now, there is little incentive for change from the Victorian housing stock. Growth in rooftop solar has not dented gas use. As a rule, as households get wealthier, they consume more energy but from different sources. Unless there is a large and sustained increase in household income or a way to directly replace gas for heating, the energy balance for gas barely changes. Despite the shift to electrification, Victoria is simply consuming more energy from different places. Residential gas consumption has stayed relatively constant between 120-130 petajoules a year between 2016-2020. During this period, the population of Victorian grew by half a million and the uptake of solar saw an approximate twofold increase in solar generation from people’s rooftops. In simpler words: existing gas use continues, but electrification is adding to energy needs on the margin. A direct replacement of gas in this sector would constitute the largest negative adjustment to gas demand domestically.

Ultimately, new gas development boils down to having buyers. From industry’s point
of view, the most important factor is upstream supply that is lower-cost relative to existing contracts. On the power side, gas prices are largely passed through, and demand has been declining in absolute terms. On the residential side, the outlook for Victoria is key. Ultimately, I think the public debate has been hijacked, because there is in fact no physical shortage of gas. It boils down to price, and what demand growth looks like at different prices. There are a range of scenarios that can lead to higher or lower gas prices. From the coal seam gas perspective, there is currently little incentive to drill another well unless it can break even on a wellhead price of A$4-5 a gigajoule before transport costs. We have had a few years now where gas sales prices around the A$8-$10/GJ range before transport appears to keep industrial demand stable. Contracting decisions also matter, as I personally think it’s a bit mad to try and play in the short-term gas market right now paying A$16/GJ, but perhaps buyers on that strategy are locked out of longer-term cheaper contracts, or betting future gas prices are much lower, or both. A lot comes down to how the buyer procures their gas.

On the exploration side of things - exploration decisions get harder to justify if you start to lose confidence in long-term demand. From discovery to first gas, the life cycle of a large-scale development could take as long as 10 years, although some of the smaller discoveries with access to infrastructure like in the Cooper Basin don’t need as long. Ideally the industry would have a long-dated, stable exploration funnel to move with the cycles. But in a world, such as east Australia where long-term demand growth seems challenged, its likely we will continue to see lower levels of exploration in gas for longer. This introduces the risk of supply shock over a longer time period. As we now see across the world, a dearth of exploration and/or development can have dramatic long-term consequences – geopolitical events aside.

I speak with our LNG team daily and what it boils down to is an extraordinary set of numbers. If we believe Europe is serious about its goals to shift away from Russian gas, then we need to bring online an extra 170MT of LNG by 2030 from entirely new projects. This is roughly a 50% increase in LNG production capacity compared to today, in 10 years. If we were to take every single LNG project on paper that’s been proposed, we would get 186MT by 2030. The reality is that not all of them will be approved and some that won’t necessarily start up in the expected timeframe. This really tells you about the scale of the problem.

So, are there opportunities for Australian LNG exports to vulnerable European markets? For starters, we now compete with the United States. There has been a flurry of new LNG contracts signed against new US supply. At the same time, it’s also not feasible to develop the scale of import capacity Europe would require in just a year’s time – although no doubt the impetus thrown behind these efforts will speed it up anyway. You’ve also got the added issue whereby the further west you go in Europe, i.e. closer to Spain and Portugal, the less dependent you are on Russian gas and the easier it becomes to import LNG to balance your needs. As you get closer to Russia geographically, you face the combined problem of pipeline congestion trying to bring in LNG import flows from elsewhere on the continent, and also a lack of LNG import capacity flex. Perhaps these issues are resolved in time.

“I think there could be options for Australian LNG. Recently we’ve seen Woodside starting to look seriously again at developing Browse. Browse is ultimately a backfill option, with Woodside in the past aiming to direct it to LNG facilities owned by the North West Shelf Joint Venture, where existing production is declining. There is also the subject of a second train at Darwin depending on how some of the developments in the Northern Territory play out. To my mind, it’s fair to assume the east coast is unlikely to see new LNG train developments and the focus there is on keeping the plants filled over time. Any sizeable new LNG exports to my mind would likely have to come from the North West Shelf or the NT.”
CO2CRC, along with its key research partners – CSIRO and Geoscience Australia, are collaborating on pioneering research into the technical development of geological storage of hydrogen in Australia.

The hydrogen industry in Australia is expected to increase 40% by 2030 with potential export values of $5.7billion by 2040. To facilitate a hydrogen supply chain greater than 100,000 tonnes of scale required for a net-zero future and export market, hydrogen must be stored in geological formations, CO2CRC said in a media release.

Underground Hydrogen Storage (UHS) provides the much-needed capacity to balance supply and demand and seasonal fluctuations. Current surface hydrogen storage facilities, such as pipelines or tanks will not have the sufficient storage capacity for future projected demand. The value of UHS is that hydrogen can be generated outside of peak demand, stored safely underground until required, providing long-term energy security and supply reliability. UHS is therefore an integral link to a commercially effective hydrogen value chain.

“Australia has the technical knowledge and natural resources to become a global leader in hydrogen production and export. Key to the successful implementation of a full-scale hydrogen economy requires large-scale storage, and geological formations present an ideal solution. This Underground Hydrogen Storage Project will fortify Australia’s position as a technical leader in the global transition to a hydrogen economy and net-zero future.” said Dr Matthias Raab, Chief Executive, CO2CRC.

The initial UHS study, co-led by CO2CRC and CSIRO, is aiming to answer key technical issues, including fundamental hydrogen storage processes, hydrogen withdrawal effectiveness and integration of UHS between hydrogen production and downstream distribution. This study is funded by Beyond H2, a foundation member of the NERA Clayton Hydrogen Technology Cluster, pursuing energy-efficient technologies to accelerate the development of Australia’s hydrogen economy.

“Australia has vast porous geological storage resources that are proven storage formations for methane and CO₂. These same underground storage formations can provide large-scale and long-term hydrogen storage options to enable Australia to become a leading global exporter of hydrogen. CO2CRC’s pioneering research into underground hydrogen storage in Australia will be fundamental in the development of Australia’s hydrogen economy” says Dr Max Watson, Senior Manager Technology Development, CO2CRC.

The project will develop a clear pathway for a field demonstration of underground hydrogen storage. The study will produce an optimised hydrogen storage site development methodology, with methods to screen, select, develop and operate suitable hydrogen storage sites at commercial scale. This pre-feasibility study aims to set the foundations for a hydrogen facility demonstration that will safely store and withdraw hydrogen from a geological storage reservoir.

“Underground storage allows large volumes of hydrogen to be stored to manage seasonal variation in demand. Subsurface storage is potentially a safer, lower cost option to surface storage, making use of Australia’s existing geological formations.” said Ms Allison Hortle, Research Group Leader, CSIRO.

Hydrogen Council Backs Hunter Hub

The recent commitment of another $82 million for two hydrogen hubs in the Hunter Region underlines the area’s strategic advantages in the move to a net zero economy, says the Australian Hydrogen Council.

In the Federal Budget government committed $100m for early works to make the Port of Newcastle hydrogen-ready and thereafter the Coalition pledged another $41m to the Port of Newcastle and a further $41m for Origin Energy’s Hydrogen Hub.

AHC CEO Dr Fiona Simon said co-locating hydrogen users and producers in areas with access to port, road and rail infrastructure was an important step forward for the hydrogen industry.

“The Hunter ticks all those boxes and also offers a large workforce that’s ready to make the transition to a hydrogen economy a reality,” Dr Simon said.

“This is another building block being put in place to create lasting jobs and build our export capacity.”

In recent weeks funding was announced for hubs in Gladstone and Townsville in Queensland, Kwinana and The Pilbara in Western Australia and Darwin in the Northern Territory.

“These hubs are crucial to enable Australia to meet its net zero targets. We look forward to working with industry and government to accelerate the development of hydrogen hubs around Australia,” Dr Simon said.

Newcastle’s selection was the latest in a series of recent hub roll-outs described by The Australian Hydrogen Council as “the basic building blocks of a new hydrogen economy being put in place”.

Dr Matthias Raab

Fiona Simon
The Federal Government provided $275 million to the hubs in Gladstone and Townsville following commitments for two facilities at Kwinana and The Pilbara and one in Darwin.

The Townsville hub is in addition to the seven that were part of a $464m announcement in September last year.

AHC CEO Dr Fiona Simon said co-locating hydrogen users and producers in areas with access to port, road and rail infrastructure and potential pipeline easements is an important step forward for the hydrogen industry.

“These are the hubs we have to have if Australia is to become a global player in hydrogen production and exports by 2030,” said Dr Simon.

“They will drive the creation of regional jobs and build our export prosperity.

“It’s a race and we’re at the starting gates with the flag raised.

“It’s now up to governments to work with stakeholders and local communities to ensure the hydrogen hub sites quickly move into planning and development phases.”

Dr Simon said hydrogen hubs serve an important role by grouping various users of hydrogen into defined areas.

“They minimise the cost of providing essential infrastructure and supports economies of scale,” Dr Simon said.

“The process of hubs producing and delivering hydrogen to end users will focus innovation and help build a ‘hydrogen-ready’ workforce.

“Locating the hubs so they have access to ports also enables the sector to develop as an export industry.

“We look forward to the unveiling of the remaining hub locations and working with industry and government to support the success of their roll-out,” Dr Simon concluded.

Australian hydrogen companies and project owners travelled to Rotterdam for Europe’s leading hydrogen conference, the World Hydrogen Summit, which was held from May 9-11.

Rotterdam represented the first big opportunity to engage with Europe in more than two years and Austrade said it was proud to be partnering with the Australian Hydrogen Council.

According to analysis by Deloitte, Australia’s hydrogen economy could be worth up to $26 billion by 2050, opening doors to new streams of foreign direct investment, increasing innovation within the sector and contributing significantly to a reduction in greenhouse gases.
Qatar gas only short-term solution to Italy’s Russian imports problem

The recent Ukraine crisis has hugely dented the gas supply security of Italy, according to GlobalData, which relies on 40% of its gas imports from Russia.

The data and analytics company says that while turning to Qatar for gas imports will help prevent a power crisis, that solution would only be short-term and the government will need to act fast to build renewable generation and modernize its grids to meet rising demand.

According to GlobalData’s report, ‘Italy Power Market Size and Trends by Installed Capacity, Generation, Transmission, Distribution, and Technology, 2022-2035’, total imports accounted for more than 90% of Italy’s gas needs in 2021 – sourcing largely from Southern Europe and Russia via pipelines across the Ukraine.

Attarrahman Ojindaram Saibasan, Power Analyst at GlobalData, says: “While Italy currently generates 47.4% of its energy from thermal power (coal, gas, and oil), it does not possess substantial domestic fossil fuel reserves, and heavily depends on imports. In fact, Italy imports the second largest amount of gas in Europe, after Germany. Avoiding dependence on other countries is high on Italy’s list of ‘to-do’s, with the main focus being on replacing thermal with solar.”

GlobalData estimates that Italy’s attempts to shed its gas will be a struggle, post an initial push in 2022. The country is expected to reduce its gas-based thermal generation percentage from 55.5% in 2021 to 49.5% in 2022, but then it sticks around the 51.7% mark to 2027.

Saibasan continued: “The government has started to replace thermal power plants with renewable sources to meet rising energy demand and concerns over energy security but there is some work to do yet. However, wind and solar photovoltaic (PV) have made tremendous progress in the country, and these are set to play a major role in meeting the country’s power demand in the longer term. Conventional plants will still be present to take the base load and manage fluctuations in supply.”

Saibasan added: “Focusing more on energy storage systems would be a good start, as well as modernizing current grids and building biopower and offshore wind—most of the work so far has been on-shore. However, it is noteworthy that, in the wake of the Ukraine crisis, State-controlled Terna revealed plans to spend EUR10 billion (US$11 billion) over the next four years to upgrade the country’s power grid to meet energy security and climate change demands.”

Long-term uncertainty over Russian oil & gas means a ‘boom’ for the Middle East

Moscow’s decision to escalate the conflict in Ukraine has sparked a global energy crisis, with an impact echoing the 1970s oil crisis that launched the Gulf’s first major economic boom.

This was the view of Richard Thompson, Editorial Director at GlobalData’s MEED, who said: “While the Gulf’s oil producers are keen to avoid taking sides in the Ukraine conflict, long-term uncertainty about Russian oil & gas supplies will sustain high energy prices for a prolonged period and create a renewed focus on Middle East hydrocarbons that will underpin a new economic and projects boom in the Gulf.”

The data and analytics company said the immediate impact of Russia’s invasion of Ukraine was to trigger massive volatility in global capital markets and a spike in commodity prices that has added to inflation fears already threatening the global recovery. However, the strategic impact of the crisis is to expose Europe’s overdependence on Russian energy, particularly its gas.

Consequently, the coming months and years will see a strategic realignment of global energy and a European diversification away from Russian oil & gas supplies to alternative sources such as renewables, coal, nuclear and Middle East hydrocarbons.

Thompson says: “In the longer term, unless a peace settlement is reached soon, Moscow’s actions in Ukraine will see Russian oil & gas exports reduced or even blocked altogether from the global energy supply chain.

“The scale and pace of the reductions will be shaped by the extent of Western embargoes on Russia’s oil & gas sales, which will further expose Europe’s dependence on Russia.”

The mere prospect of oil & gas sales from the world’s third-biggest oil producer and second-biggest producer of natural gas being removed from the international market saw oil prices surge to nearly $138 a barrel on March 7—their highest mark since 2008, and some 45% higher than at the start of the crisis.
GlobalData’s MEED believes that high energy prices will be maintained for as long as the conflict continues and Moscow is sanctioned, and for as long as Europe is dependent on Russian energy. In the short term, the surge in oil prices delivers a financial windfall to Middle East oil producers, who will use the money to accelerate post-pandemic stimulus infrastructure in 2022.

Over the longer term, with rising inflation creating huge economic headwinds for the global economy, Middle East oil & gas will become increasingly vital to stabilise the energy markets.

Thompson added: “With its LNG expansion program underway, Qatar is well placed to become a major natural gas supplier to Europe, while Saudi Arabia, the United Arab Emirates (UAE) and the region’s other oil & gas producers are well positioned to increase their supplies of low-cost energy. Meanwhile, Libya, Iraq and Algeria will see renewed efforts to bring their hydrocarbons back on stream in a major way.

“The Gulf’s oil producers have abundant supplies of low-cost oil & gas reserves. They have proven themselves to be reliable and stable suppliers over the past four decades, and they are investing heavily to increase production capacity.”

Thompson concluded: “Their investment in renewable energy and future fuel technology, such as hydrogen, provides an important ‘green’ angle that aligns with international action against climate change, as well as the environmental, social and governance (ESG) criteria sought by multinational corporations and institutional investors.”

MOL donates equipment to support steady operation of the Ukrainian energy network

MOL Group is standing in solidarity with the Ukrainian energy sector in times of war and is providing equipment support to assist the steady and safe operation of the Ukrainian energy network.

The Hungarian headquartered oil & gas company said it had offered a total of €290,000 (AUS $435,000) in equipment requested by the Ukrainians, which the company would deliver to the border.

MOL Group said it was continuously monitoring the ongoing energy needs of the Ukrainians under the equipment support programme and is actively working to extend the support.

MOL Group has joined the International Association of Oil & Gas Producers (IOGP) initiative and participates in the equipment support programme for Ukraine. The aim of the industry cooperation is to help remedy the damage caused by the war and to help the Ukrainian energy network to continue functioning. The programme is coordinated by the European Commission Directorate-General for Energy (DG ENER) and the Energy Community, while the Ministry of Energy of Ukraine provides regular and accurate information on equipment needed to keep the network running.

MOL Group said assemblies, tube rounds and parts that would help contribute to the continuity of oil & gas production and the continued operation of the energy network in the war-torn country would be delivered to the border. Mol would continue to monitor Ukraine’s emerging needs and work to provide further support under the initiative.

"We stand in solidarity with Ukraine and we are committed to the industry coalition that supports the continued operation of the Ukrainian energy network. MOL Group has also joined the IOGP equipment aid programme and is in full cooperation with the European institutions coordinating the programme. With joint efforts, we do our best to make the asset support as effective as possible and we hope that our donations can make a meaningful contribution to the smooth functioning of oil & gas production in Ukraine and thus the entire energy system” said Ádám Homonnay, Vice President of Upstream at MOL Hungary.
The sting in the tail is the Gorgon CCS project hasn’t worked and taxpayers will be left with the liability when it closes.

At a cost of more than A$3 billion, Gorgon, the largest carbon capture and storage (CCS) project in the world has failed to deliver, underperforming its targets for the first five years of operation by about 50% a new report from the Institute for Energy Economics and Financial Analysis (IEEFA) has found.

Carbon capture technology has historically been used as a method of enhanced oil recovery (EOR) – selling captured CO₂ to oil companies to push more oil out of depleted wells, making any initial “carbon capture” negligible. According to the Global CCS Institute, about 73% of carbon capture globally is currently used for EOR projects – called Carbon Capture Utilisation and Storage (CCUS).

In some newer projects like Western Australia’s Gorgon CCS, instead of being sold for EOR, the captured CO₂ is sequestered in dedicated geological storage structures.

Although Gorgon’s gas plant produced its first LNG cargo in March 2016, the first CO₂ injection from its CCS facility occurred in August 2019 – three and a half year late.

The Gorgon CCS project was initially planned to capture and inject underground up to four million tonnes (MT) of reservoir CO₂ each year from the extraction and production of reservoir gas. Instead, the project sequestered on average less than 1MT per year.

“Gorgon CCS failed to reach its pre-defined targets,” says report author LNG/gas analyst Bruce Robertson. “CCS technology has been operating for 50 years. If Chevron and its partners can’t get it to work these past five years at Gorgon, it’s not an effective technology for reducing carbon emissions.”

Gorgon recently agreed to buy and surrender credible greenhouse gas offsets recognised by the West Australian Government to offset its target shortfall of 5.23 million tonnes of CO₂.

“It has been estimated that it would cost up to US$184 million for Chevron and its partners to offset that shortfall,” says Robertson.

In March 2022, the upward trend of Australian Carbon Credit Units (ACCU) spot price reversed to a plunge when the Federal Government proposed a policy change which allowed previously contracted offset projects to be terminated. This consequently let a huge number of carbon offsets enter the open market.

The sudden reduction in price created an opportunity for big companies like Chevron to offset its emissions shortfall by paying around US$100 million less, if it planned to source all the required offsets from the Australian market.

“Either way, such an offset cost is an expensive outcome for a A$3+ billion investment. And will particularly affect taxpayers, as the liability of the project will be handed to government in the long-run.”

Co-author of the report energy analyst Milad Mousavian notes that Gorgon’s frequent inefficiencies, and problems that led to underperformance in capturing carbon and injecting it, are typical of the technical risks involved in CCS projects.

“Despite the technology being in use since the 1970s, each CCS project appears to have unique difficulties and uncertainties,” he says. “Apart from the credibility of carbon credits in offsetting emissions being under question, Gorgon’s underperformance in meeting its emission targets has brought about a material cost for Chevron and its major partners ExxonMobil and Shell.”

Robertson notes despite mounting evidence, governments around the world are considering subsidised investments for CCS and CCUS projects as emission reduction solutions.

“When an energy technology is consistently shown not to work, but can attract subsidies, you can be sure there are lobbyists and greenwashing at play,” he says. “The oil & gas industry are harvesting subsidies to prolong the life of their operations, not for emissions reduction.”

Robertson notes that the extent of emissions from the oil & gas industry, from production to consumption, are becoming increasingly apparent, despite the industry’s downplaying.

“Emissions from oil & gas are higher when the fuel is burnt than when it is produced. Governments and investors are focusing on a partial problematic solution by trying to capture carbon at the production end,” he says.

“The emissions unaccounted for – the Scope 3 emissions – are where the big problem lies if countries are to reach their zero carbon goals and align the world with 1.5 degrees C.”

Mousavian says there are proven methods already available for reaching net zero carbon.

“While CCS is technically feasible in some cases, the numbers don’t add up and the commercial realities are not
promising. CCS and CCUS with EOR is all about more fossil fuels, not lowering emissions.

**Worley & UWA join forces to reduce CO₂ emissions by up to 90%**

Engineering company Worley has teamed up with researchers from the University of Western Australia (UWA) to collaborate on an enhanced subsea gas tieback project which is targeting reduced operational carbon emissions in gas fields by up to 90%.

The collaboration brings together a brains trust who will focus on cost and carbon-reduction solutions enabling the development of stranded gas fields in remote areas.

Chevron Woodside Chair in Long Subsea Tiebacks, Zachary Aman, Research Fellow Bruce Norris and researchers from UWA’s School of Engineering will provide complex simulation expertise to Worley’s project. The university will bring expertise drawing on the learnings of pilot-scale projects in the United Kingdom and sophisticated simulation tools that will be fundamental to developing the new technology.

“Together, the outcomes will enable future engineers to easily test the application of this technology, and to quantify the reduction in capital and carbon intensity across future gas projects”, Aman said.

Worley recently secured £765,000 (AU$1.35 million) in funding from Scottish Enterprise and is developing a subsea pseudo dry gas (PDG) liquid removal system which eliminates topsides and compression as a result of reduced back pressure in the pipeline and resistance curve.

This is believed to create greater tie-back distance and produce more gas.

The PDG liquid removal system is driving the effort to reduce carbon emissions by up to 90%.

“This new partnership with Worley will support a new, cutting-edge industry technology with the potential to significantly reduce the capital and carbon intensity of future gas projects, constituting a critical path in the transition to emissions neutrality,” Aman said.

**Schlumberger Launches Business Dedicated to Erasing Methane & Flare Emissions**

Schlumberger has announced the launch of Schlumberger End-to-end Emissions Solutions (SEES), an enterprise solely focussed on extinguishing methane and flare emissions from drill rig operations.

The company said that SEES would offer services and technologies designed to give operators the tools for measuring, monitoring, reporting and eventually eradicating methane and flare emissions from operations.

The business was launched shortly after the Oil and Gas Climate Initiative announced zero methane emission targets set for 2030. Methane and flare emissions are responsible for more than 60% of Scope 1 and 2 greenhouse gas emissions from the oil & gas industry.
Shearwater to perform Third Isometrix Survey at Equinor’s Mariner field

Shearwater has been awarded a 4D seismic monitor project at Equinor’s Mariner field offshore UK. This will be the third Isometrix survey over the field and the second 4D monitor survey. The one-month project will be executed during the 2022 North Sea summer season.

Time-lapse seismic surveys help maximise production from existing fields by providing subsurface data to update reservoir modelling and production simulations. Shearwater’s Isometrix multicomponent towed streamer technology has been designed to provide the most advanced images for geoscientists to build models from.

“The time-lapse seismic acquisition is a critical activity for maximising value creation from offshore oilfield assets, which is why our clients select world leading technology for these surveys,” said Irene Waage Basili, the CEO of Shearwater. “We have a long-established track record of executing 4D seismic surveys for Equinor and we look forward to return to the Mariner field to capture high-quality geophysical data for our client.”

Shearwater has announced the award of a 3D multiple technology integrated geophysical survey, with an option for a second survey, for use carbon storage in Liverpool Bay, England.

“We are delighted to conduct this survey work for Eni, advancing UK carbon storage by deploying towed streamer, shallow water node, and very-high resolution methods,” said Irene Waage Basili, CEO of Shearwater. “Seismic surveys provide a safe non-invasive method for appraising CO2 storage sites, and monitoring storage integrity throughout their life.”

The surveys will involve both bathymetric and 3D seismic surveys, to give high-resolution imaging of the overburden, as well as very high-resolution data for analysis of the seabed and shallow geology. A specialised shallow water seismic node crew will be utilised for operations in the shallow water areas.

The first survey is over the Hamilton and North Hamilton fields, and the optional survey is over the Lennox field. The fields are covered by a carbon dioxide appraisal and storage licence where Eni intends to reuse and repurpose depleted hydrocarbon reservoirs and associated infrastructure to permanently store CO2 emissions captured from the pre-existing local “hard to abate” industries and the future production sites of low carbon hydrogen in the industrial district of NW England and N Wales.

The surveys will be led by the SW Bly, with each survey taking just under one-month to complete.

Nova Scotia

The Equinor award came shortly after the Bergen-based seismic exploration company had won a new multi-client 2D seismic data reprocessing project in Offshore Nova Scotia, Canada.

The 2D seismic dataset comprises of over 13,000km of 2D data throughout the Scotian Shelf, including the prolific Sable Sub-Basin that, in addition to the produced fields, contains ten undeveloped Significant Discoveries that have P50 recoverable gas reserves of 1.3 TCF.

Searcher described this basin as a great example of exploring for “advantaged hydrocarbons” and said it was offering two data products: Firstly, Searcher will apply its proprietary post-stack reprocessing method to rectify navigation, metadata, amplitude, phase and time creating a contiguous legacy database that can be easily loaded into any interpretation software. Secondly, major improvements in the data will be provided by reprocessing the data through a modern pre-stack reprocessing sequence, including shallow water demultiple and deghosting. Reprocessing is expected to reveal numerous additional leads in the form of seismic attribute anomalies which can be calibrated with discoveries and producing fields.

Neil Hodgson, Searcher’s VP GeoScience, said: “This is an incredible time to be providing the industry a ready-to-interpret dataset over a significant portion of offshore Nova Scotia including data in the vicinity of the prolific Sable Island Fields. Reprocessing the seismic in this area is likely to re-open this gas province at a time when low carbon energy security and supply is so welcomed, and our ability to see the gas before we drill has never been easier.”

Korea

Earlier, Shearwater announced a contract for two 3D seismic surveys offshore South Korea, together with seismic data processing and imaging by Korea National Oil Corporation. This is Shearwater’s first contract with KNOC.

The contract includes reservoir properties prediction analysis following processing. It will be the company’s first reservoir characterisation project in partnership with Qeye, reflecting a complete workflow from geophysical data collection through to geoscience deliverables.

“By delivering the full sequence of geophysical services, from acquisition through to final subsurface property prediction, we support our clients’ ambitions to shorten project timelines, increase technical assurance and generate additional value,” said Irene Waage Basili, CEO of Shearwater. “We look forward to working with KNOC in a new geographical market, and to deliver high-quality seismic data and reservoir characterisations.”

The Myungtae 3D survey, in Block 6-1 Central & East, covers approximately 2,575km². The data will be processed through a full time and depth imaging sequence, with delivery of predicted reservoir properties. The second survey...
covers approximately 500km² and with data processed through a full-time processing sequence.

Shearwater will use the Geo Coral to acquire the two 3D surveys. The surveys are expected to take approximately four months to complete during the summer of 2022. The Geo Coral is a high-capacity seismic vessel, capable of multicomponent acquisition, and has been operating throughout the Asia Pacific region for the past two years.

**North Sea Bottom Node Project**

The Korea award came shortly after Shearwater had announced the signing of a large 4D ocean bottom node baseline project by Equinor. The two-month survey covers the Krafla, Askja and Sentral fields in the Norwegian North Sea.

More than 7,000 nodes, using an ocean bottom "nodes-on-a-rope" system, will be utilised for the 36.3km² receiver area survey. This will be the largest project of its type performed by Shearwater to date. The survey will be conducted by the vessels SW Vespucci, SW Cook and SW Tasman with start-up early in the summer of 2022.

“Ocean bottom node projects provide our clients with an excellent baseline for future 4D time-lapse monitoring to help optimise oil & gas production over time, as well as providing advanced images for improved development planning,” said Waage Basili. “Our scale, the flexibility of our fleet and its unique technical capabilities position Shearwater to execute major value-adding projects for our clients while at the same time maximising own fleet utilisation.”

The SW Vespucci, SW Cook and SW Tasman are highly flexible seismic vessels, capable of multiple applications including source, streamer surveys and ocean bottom receiver deployment. The flexibility allows Shearwater to address a diverse range of projects safely and efficiently in succession while also delivering technical excellence.

**Searcher Hunts for Hydrocarbons in ‘Oil Rich’ Oman**

Searcher has entered into a strategic partnership with the Ministry of Energy and Minerals of Oman to acquire several new seismic surveys and reprocess legacy seismic data both offshore and onshore Oman.

Reprocessing of the offshore legacy data in the Sea of Oman has commenced already and DUG Technology have achieved extraordinary uplift by applying a modern broadband processing sequence with diligent multiple removal technologies, Searcher said in a media release.

Improving the imaging of the remarkable geology offshore Oman is both resolving uncertainties in the thrusts and fold belt plays and imaging the hitherto illusive stratigraphy below the decollement surface. These insights are revealing an exciting oil prospectivity with unexplored yet significant resource potential. Searcher envisage that the whole 2D and 3D dataset will be reprocessed in this cooperation, in addition to acquisition of new 2D and 3D seismic in 2022/23.

The offshore Oman 2D and 3D rectification project is already completed consisting of 32,000km of 2D plus 2,500km³ of 3D legacy data which has been rectified using Searcher’s proprietary post-stack reprocessing method. This resolves issues with navigation, metadata, amplitude, phase and time-shifts. The offshore Oman 2D and 3D Rectified Surveys are available via Searcher’s on-demand platform, sAIsmic which hosts global rectified seismic data as a subscription service.

Dr Neil Hodgson, VP Geoscience at Searcher commented, “We are delighted to announce our strategic partnership with the Ministry of Energy and Minerals in Oman. Our priority is to focus on the exciting offshore basins where we see significant prospectivity. Together with MEM we will reprocess legacy data and acquire new seismic to reveal new insights into the hydrocarbon system and bring new investors to this oil rich region.”

**PGS Wins 3D Seismic Award Offshore Cyprus**

PGS has been awarded a Wide Azimuth 3D acquisition contract offshore Cyprus. Mobilization is scheduled to start in mid-June with acquisition expected to complete in mid-August.

“We are very pleased with this contract award, which is an important contribution to our vessel utilization during the summer season. The Eastern Mediterranean is a prolific gas region, and a well-known area to PGS. With our Ramform acquisition platform and GeoStreamer technology we will provide the client with high quality data,” says President & CEO in PGS, Rune Olav Pedersen.

The award was included in the booked position disclosed in PGS’s Q1 2022 presentation.

PGS also announced that it had secured solid industry pre-funding for a large MultiClient survey on the Northwest shelf of the Norwegian Sea. The Ramform Atlas is currently mobilizing for the survey, with scheduled acquisition set to start around May 10 at press time.

“This is the first large-scale MultiClient survey we are acquiring offshore Norway since 2020, as we experience increasing demand for high-fidelity MultiClient data from renewed exploration interest among our clients.

“The Ramform Atlas will acquire approximately 6,000km² of new GeoStreamer data in a second azimuth to existing GeoStreamer MultiClient data in the region yielding a Dual Azimuth product,” said Olav Pedersen.
PGS Partners with ANH and SGC on Colombia Pacific Seismic Project

PGS has received a Surface Prospection Clearance from the National Hydrocarbon Agency in Colombia to reprocess existing 2D lines and incorporate these lines to a MegaProject covering the Pacific Offshore.

The MegaProject will be done in partnership with Servicio Geologico Colombiano.

PGS said the new reprocessed regional Tumaco Basin dataset will provide the entry tool for exploration in Colombia’s Pacific offshore area, improving imaging of the play elements and de-risking the prospectivity potential.

Geological Context

The project area of interest covers most of the Tumaco offshore Basin, including the San Juan Basin. This area is characterized by the forearc basin structural style in convergent margins, related to subduction of the Nazca Plate beneath the western part of South America.

Along the South Colombia pacific margin, thick Cenozoic sedimentary sequences accumulated over blocks of transitional and oceanic crust basement that accreted between the Late Cretaceous and Early Cenozoic with a sedimentary fill of predominant from Tertiary age.

The potential petroleum system is related to source rocks of late Cretaceous and early Tertiary age, migrated to turbidites fan systems associated with the Miocene interval.

Trap and seal are provided by Middle-Upper Miocene shales combined with early-Middle Miocene mud. Such a framework presents an attractive array of potential hydrocarbon-bearing traps.

“This reprocessed regional Tumaco Basin dataset will provide an entry tool for Colombia’s Pacific offshore area, improving imaging of the play elements and de-risking the prospectivity potential,” says Adriana Sola, Area Manager Latin America and Caribbean at PGS.

Southern North Sea Reprocessing Project

PGS said that its Southern North Sea (SNS) Vision data rejuvenation project would target a mature gas province in the central SNS area, with a parallel focus on post-salt carbon storage potential in the Bunter formation. The data will be ready in the spring of 2023, PGS said.

PGS said the 10,000km² PSDM reprocessing will deliver a single data volume and bring new insights into the prospectivity in a prolific gas production area. It will also provide a valuable base for energy-transition-related subsurface assessments for CCS, subsurface energy storage, and regional shallow subsurface understanding.

Several vintage datasets in the area will benefit from merging and state-of-the-art reprocessing. The data rejuvenation workflows are built on the knowledge acquired by PGS during two ongoing Vision projects in other areas.

Processing will include 2ms high-resolution broadband processing and depth conversion based on full waveform inversion.

“The goals of the SNS Vision project are to address the challenges associated with the imaging of the salt and pre-salt prospective intervals, which will be key to releasing nearfield and new energy potential. Higher-resolution imaging will target the challenges linked to CCS and subsurface energy storage, either in depleted fields, aquifers, or in the salt. Additional products will be delivered to assist in the evaluation of potential post-salt CCS sites,” says Sónia Pereira, VP Data Sales Europe at PGS.

PGS has invited those wanting to know more about the SNS data rejuvenation project, or information regarding PGS seismic data for Europe to contact them via: europe.info@pgs.com.

Cyprus Vision Phase One Data Released as Phase Two Begins

PGS announced that first data was ready on phase one of the Cyprus Vision data rejuvenation product and work has started on phase two. This project, which aims to create a 20,000km²...
contiguous, modern seismic data volume in the Cyprus EEZ, is being carried out in partnership with the Cypriot Ministry for Energy, Commerce and Industry.

Phase one, which began in May 2021, creates a seamless 3D seismic volume of 14,750km² KPSDM for Cyprus offshore blocks 8, 9, 10, 11 and 12. Processing and velocity model building are complete, and the raw data is now available for viewing. Final data volumes will be ready in June 2022.

“Cyprus has attracted strong industry interest in its context in the wider Eastern Mediterranean region. Multiple commercial gas discoveries have been made in recent years, most notably Zohr in Egypt, and similar Cypriot discoveries Calypso and Glaucus. There is also the possibility of presalt Miocene sand-hosted reservoirs,” says Joshua May, PGS Business Development Manager Africa, Mediterranean and Middle East.

CGG Wins Major 4D OBN Imaging Contract Offshore Brazil

CGG has been awarded a two-part Ocean Bottom Node (OBN) seismic imaging project by PXGEO over the Sapinhoá Shared Reservoir in the Santos Basin offshore Brazil.

The resulting data is tasked to deliver improved geological insight to the asset operator, Petrobras, to assist with better management of oil recovery and production development.

Peter Whiting, EVP, Geoscience, CGG, said: “With our unequalled track record of successful pre-salt OBN projects, CGG is without doubt the world’s leading OBN seismic imaging company. Although imaging the pre-salt is always challenging, the experts at our dedicated Rio research centre are recognized for their ability to develop technologies tailored to the needs of each individual project and deliver high-quality pre-salt 4D OBN results.”

The baseline 3D seismic survey acquired by the PXGEO Poseidon OBN crew, covering 575km², is already being processed at CGG’s Rio de Janeiro subsurface imaging centre, where geoscientists are applying CGG’s latest proprietary imaging technologies, including time-lag full-waveform inversion, internal multiple attenuation and least-squares migration, to resolve challenging structural uncertainties in the pre-salt and gain better insight into the reservoir’s geomechanical behavior.

CGG will process the 4D monitor survey after its planned acquisition, again by PXGEO, in 2023.

High EPC Spend Stimulated Offshore Rig Market in 2021

Westwood Global Energy Group has revealed that the global offshore rig market closed out 2021 up 200% in activity from the previous year.

The specialist energy market research and consultancy company said rig activity had been stimulated by significant engineering, procurement and construction spend and was worth US$41.7bn in 2021, on par with 2019 levels.

Global rig contract fixtures totalled 142 in the fourth quarter of 2021, representing 54,829 rig days, which was an 155% increase compared to the previous quarter.

Alex Middleton, Senior Market Analyst at Westwood said: “Several major drilling regions, including North America, South America and the Middle East have experienced minimal fallout. In fact, South America has fared particularly well, ending last year in better shape than before the pandemic. Brazil remained particularly buoyant, with high EPC spend coupled with no instances of contract cancellations resulting in continued drilling throughout the period.”

Nevertheless, Africa, Southeast Asia, and the North Sea were lagging as a result of drilling projects that were in limbo in a climate of political and legal uncertainty.

Westwood cited the Cambo project in the UK as a case in point. Cambo has been put on hold after Shell withdrew from the development and Siccar Point Energy, the operator, was unable to continue.

SPE has a 70% stake in Cambo and says it could produce 170 million barrels of oil over 25 years and 53.5 billion cubic feet of gas. The exploration licence is due to expire in March this year.

Middleton said: “For these regions (Africa, Southeast Asia and North Sea), contracted rigs have been on a downward trajectory, hitting rock bottom at the close of 2020. Drilling projects have been halted amidst uncertainty, however, there are several major projects on the horizon that, if picked up, could help drive a recovery.”
DESPIE COVID, the conflict in Ukraine, and increased awareness about ESG causing widespread havoc to the oil & gas sector globally, Shell (brand value up 18% to US$49.9 billion) has not only withstood the global disruption, but been able to grow its brand value this year.

That’s according to a new report from the world’s leading brand value consultancy, Brand Finance. After a tough two years due to wildly fluctuating demand, the oil & gas sector is powering ahead with the world’s 50 most valuable oil & gas brands achieving an aggregate growth of 8% this year.

Every year, leading brand valuation consultancy Brand Finance puts 5,000 of the biggest brands to the test, and publishes around 100 reports, ranking brands across all sectors and countries. The oil & gas industry’s top 50 most valuable and strongest brands in the world are included in the annual Brand Finance Oil & Gas 50 ranking.

Shell’s brand is increasingly focused on developing an energy transition strategy as it aims to become a net-zero emissions energy business by 2050, in step with society’s progress towards the goal of the Paris Agreement on climate change. While the energy transition brings risks to Shell, it also creates new opportunities for the brand to develop. Increasingly, it appears likely to sustainably lead the global oil & gas industry transition to a net zero energy system.

David Haigh, Chairman and CEO of Brand Finance, commented:

“The energy transformation is both the greatest challenge and the greatest opportunity facing the oil & gas sector. The industry can be both optimistic and realistic about the risks and opportunities that lie ahead, but it will be tough for brands to simultaneously navigate the recovery from COVID, the conflict in Ukraine, and broader concerns about environmental sustainability in the future. Shell, Aramco, and others, will be challenged to transform in coming years to leverage their brands to deliver for their customers.”

Aramco retains second place globally with 16% brand value growth

Saudi oil giant Aramco (brand value up 16% to US$43.6 billion) is the world’s second most valuable oil & gas brand and has substantially recovered its brand value lost during the pandemic. Aramco has been serving significantly increased demand for oil & gas products, correlated with large fiscal stimulus programs initiated around the world last year.

The increase in demand saw Aramco’s third-quarter profits more than triple year-on-year, helping push its market valuation to US$2 trillion. In a sign of confidence and ambition for continued growth, Aramco announced plans to increase its production capacity from 12 million barrels a day to 13 million by 2027. The company has continued to invest heavily in its brand to support growth in both core and growth businesses through a global campaign as well as investments in sports – from Formula 1 to golf.

Aramco is well placed to drive significant further brand value growth supported by surging commodity prices driven by the recovery in global energy demand as key economies reopen and travel restrictions ease amidst higher COVID-19 vaccination rates around much of the developed world.
ADNOC grows strongly, benefits from top brand guardian CEO in industry

Abu Dhabi National Oil Company (ADNOC) continues to achieve significant ongoing growth in brand value, having delivered 174% growth in brand value since the start of their brand transformation journey in 2017. This year, its brand value is up a further 19% to US$12.8 billion, and ADNOC has improved its ranking by one place to become the ninth most valuable oil & gas brand in the world.

Beyond the oil & gas sector, ADNOC was also the UAE’s most valuable brand overall, and the second most valuable brand in the Middle East region. With an eye on the future, and in line with the UAE leadership’s 2050 net zero strategy, ADNOC is embracing the energy transition through several strategic initiatives including its global clean energy joint venture with TAQA and Mubadala on renewable energy and green hydrogen. The ADNOC brand is also likely to benefit from UAE’s effort to become a global sustainability leader as the nation plans to host COP28, the 2023 UN Climate Change Conference.

Further, ADNOC’s Dr Sultan Ahmed Al Jaber is the top brand guardian CEO for the global oil & gas sector according to Brand Finance’s Brand Guardianship Index. Since becoming ADNOC’s Group CEO in 2016, Dr. Sultan has led a rapid and comprehensive transformation of the business, strengthening the company’s overall performance and helping to foster a more commercial mindset.

As the CEO of one of the world’s leading oil companies, Dr Sultan has taken a progressive yet pragmatic position in relation to the global energy transition; extending ADNOC’s legacy as a responsible oil & gas producer, by further reducing the company’s carbon intensity, while driving investment in new energy technologies, such as hydrogen. Within the Brand Guardianship Index, Dr Sultan performs particularly well on “strong strategy & long-term vision, net positive online coverage, and employee approval rating. Since Dr Sultan became CEO of ADNOC in 2016, the ADNOC brand value has grown by 22% per year on average.

China’s PetroChina and Sinopec struggle, behind continuing COVID curtain

In China, the largest two oil & gas brands remained PetroChina (brand value down 6% to US$29.7 billion) and Sinopec (brand value down 5% to US$25.2 billion) which were ranked as the third and fourth most valuable brands globally. Each of the challenges faced by Western oil & gas brands have been exacerbated in China: the continuing COVID curtain of restrictions have subdued demand for oil & gas products.

Petronas is world’s strongest oil & gas brand with AAA rating

In addition to calculating brand value, Brand Finance also determines the relative strength of brands through a balanced scorecard of metrics evaluating marketing investment, stakeholder equity, and business performance. Compliant with ISO 20671, Brand Finance’s assessment of stakeholder equity incorporates original market research data from over 100,000 respondents in more than 35 countries and across nearly 30 sectors. Petronas (brand value up 13% to US$13.6 billion) is the strongest brand in the ranking with a Brand Strength Index (BSI) score of 87.7 out of 100 and a corresponding brand rating of AAA.

Petronas is well placed to further strengthen its brand as it aims to sustainably provide a diversified range of energy options and fuels as it targets net zero carbon emissions by 2050.

Devon triples in brand value to be world’s fastest growing oil & gas brand as merger completes

Devon (brand value triples to US$2.3 billion) was the fastest growing brand globally in the oil & gas sector. Devon’s brand value tripled and was ranked as one of the top 50 oil & gas brands in the world for the first time as a result of the completion of its merger with peer WPX Energy last year. As a result, the combined brand value has increased substantially, with the combined brand focusing on on-shore exploration and drilling in the continental USA, primarily in the Delaware Basin of Texas, and to a lesser extent, operations in New Mexico and North Dakota. The brand is benefiting from higher commodity prices and an increased focus on addressing environmental, social and governance priorities.
STOCK STARS

PETER CAMERON, a geophysicist, who worked for the Australian Government and the oil & gas industry in a technical and managerial capacity. He has consulted as an analyst, adviser and independent expert to the energy and finance sectors for the past 25 years. His publication, Australian Oil & Gas Research (AOGR), offers peer group analysis, and performance indicators for Australian oil & gas companies. He can be contacted at: pcameron@aogr.com.au

Pancontinental Soars to the Top of the ASX Hit Parade

DALE GRANGER

THE Bulls were on the run and showing no signs of fatigue as oil & gas stocks continued to climb in April with the top end of town Australian supermajors leading the charge.

Australian Oil & Gas Research (AOGR) data revealed all five billionaire (AOG1) companies beaming with far peachy dispositions on the ASX ticker than a year ago – growing 56% in the 12 months to 29 February 2022 with Santos (86%) in the vanguard followed by Origin (64%), Karoon Gas (62%), Woodside (39%) and Beach (27%).

In AOG2 (market cap greater than AU$100 million), results were less flattering with an overall contraction of 8% for the same period. However, any disillusion in the performance of the midcaps was somewhat diluted by the delivery of the rising minnows in AOG3 (market cap greater than AU$10 million), which delivered collective growth of 40%. The fledgling penny stocks in AOG4 (market caps less than AU$10 million) were still flapping their wings striving to get airborne and shrunk 31% as a grouping.

Overall, the 61 oil & gas companies trading on the ASX increased 51% in market cap value in the 12 months to the start of May.

West Perth based Grand Gulf Energy, which is solely focused on helium exploration and production in the USA, topped the charts on growth over the past 12-months with a spectacular market cap spike of 1024%. The company is drilling the Jessel-1 well...
within its Red Helium project in Utah and has taken the prospect from acquisition to spudding in just eight months and signed an offtake agreement with the nearby Paradox Resources Lisbon helium processing plant.

Pancontinental Energy, nevertheless, is our Stock Star as the West Perth player saw its share price soar 67% in April along with a market cap that has climbed 507% over the 12-month period. This materialised after Shell had earlier confirmed the first oil discovery offshore Namibia at the Graff-1 well. Graff-1 is on trend with PCL’s PEL 87 licence area.

"The highly significant Graff-1 oil discovery is hugely important to our efforts offshore Namibia and to oil exploration offshore Namibia in general," said PCL Technical Director Barry Rushworth. All eyes are now on Total’s Venus-1 well, which was being drilled at press time in the Orange Basin. Melbana Energy also stayed in the spotlight in April with the Sydney explorer’s market cap surging 490% in 12 months off the Alameda-1 onshore exploration well in Cuba. McDaniel & Associates has estimated a prospective resource of 119 million barrels of oil and an 86% chance of geological success in at least one of the three oil bearing units. On April 28 MAY said preparations were underway to drill the Zapato-1 well in the last week of May.
No less than 24 PESA Members will be playing a key role, as lead authors, at this year’s APPEA Conference in Brisbane.

Fifteen of those will be speaking at a number of the technical and business sessions over three days from Tuesday, 17 May to Thursday, 19 May and nine will be showcasing their insights in the gallery of technical and business posters arena located in the exhibition hall.

The poster presentations will also run over three days and delegates can meet the authors and discuss their work on Wednesday, 18 May from 1pm to 2pm.

PESA will be active throughout the Conference with a booth in the exhibition hall and, of course, the annual PESA Deal Day taking place on Monday, 16 May from 1pm to 5pm.

This comprehensive Farm-In Report will present opportunities available in Australia in a paper presentation format. Registration is from 12pm and includes lunch and refreshments. Take note: Registration is not included in the APPEA Conference registration fee and participants need to do so at www.pesa.com.au

Alternately, for enquiries about sponsorship, presenting acreage, attending or to receive information contact: Wendy Ronda, 2022 PESA Deal Day Administrator at dealday@pesa.com.au

If you come across PESA Chairman Steve Mackie, don’t forget to thank him. Steve is once again Chair of the APPEA 2022 Technical Program Committee that puts together the technical and business sessions, publishes The APPEA Journal and will also decide on four prestigious awards related to the program, which are:

- Best Extended Abstract published in the supplement to The APPEA Journal
- Best Oral Presentation at the APPEA Conference
- Best Poster Presentation at the APPEA Conference.

The four-day APPEA Conference is all about networking, enlightenment and making new friends. What better a place to meet your fellow PESA members, get to know them and forge new alliances.

For the first time, PESA News has been able to compile a comprehensive list of all PESA members who are lead authors for presentations at the conference.

Many more will be active in their company booths, but don’t forget to go along and support your members who can be seen and heard at the following sessions and times.
**LEAD AUTHORS**

**TOM BERNECKER** (Geoscience Australia): Geological Context of the 2022 Offshore Acreage Release Areas

**Session 9**: Acreage Review  
**Date**: Wednesday, 18 May  
**Time**: 3:45pm - 5pm

**BARRY BRADSHAW** (Geoscience Australia): A regional chronostratigraphic framework for play-based resource assessments in the Eromanga Basin

**Session 1**: Exploration - Keeping the Funnel Full  
**Date**: Tuesday, 17 May  
**Time**: 2pm to 3:15pm

**ADAM CRAIG** (RISC Advisory): 2021 Exploration Review

**Session 13**: PESA Year in Review  
**Date**: Wednesday, 18 May  
**Time**: 2pm to 3:15pm

**HELEN DEBENHAM** (Molyneux Advisors): Passive Microseismic - Direct Hydrocarbon sensing with minimal environmental impact

**Session 1**: Exploration - Keeping the Funnel Full  
**Date**: Thursday, 19 May  
**Time**: 11am to 1pm

**JARRAD GRAHAME** (CGG): New imaging results and improved interpretation of Late Triassic to Middle Jurassic successions within the Browse Basin, North West Shelf of Australia

**Session 14**: New Perspectives, New Insights - Mature Basins  
**Date**: Wednesday, 18 May  
**Time**: 2pm to 3:15pm

**AMBER JARRETT** (Northern Territory Government of Australia): Petroleum supersystems in the greater McArthur Basin, Northern Territory, Australia: Proximity of the world’s oldest stacked petroleum systems with emphasis on the McArthur Supersystem

**Session 17**: New Data, New Ideas - New Frontiers  
**Date**: Wednesday, 18 May  
**Time**: 3:45pm to 5pm

**ROSIE JOHNSTONE** (Full Circle Carbon): The Petrel Sub-Basin: A world class CO2 store - mapping and modelling of a scalable and commercially viable CCS development

**Session 12**: Operations and Managing Assets  
**Date**: Thursday, 19 May  
**Time**: 2pm to 3:15pm

**MIKE MARTIN** (Westside Corporation): The transformation of Australia’s first commercial CSG field into a major gas project; How innovation and subsurface understanding has driven its success

**Session 14**: New Perspectives, New Insights - Mature Basins  
**Date**: Wednesday, 18 May  
**Time**: 2pm to 3:15pm

**SIMON MOLYNEUX** (Molyneux Advisors): Gas supply potential of the Perth Basin - A subsurface-led assessment

**Session 3**: Australia’s Future Energy Strategy  
**Date**: Tuesday, 17 May  
**Time**: 2pm to 3:15pm

**CHRIS NICHOLSON** (Geoscience Australia): Stratigraphic and Structural architecture of the deep-water Otway Basin - implications for frontier hydrocarbon prospectivity

**Session 17**: New Data, New Ideas - New Frontiers  
**Date**: Wednesday, 18 May  
**Time**: 3:45pm to 5pm

**JULIE PEARCE** (University of Queensland): Multiple tracers for dis-connectivity of shallow aquifers, alluvium, and coal seam gas wells in the Great Artesian Basin

**Session 5**: Unlocking Resource Value with Geoscience  
**Date**: Tuesday, 17 May  
**Time**: 3:45pm to 5pm

**MATTHEW QUINN** (IHS Markit): Carbon Capture Utilization and Storage: A Review of Australian Projects

**Session 8**: The Business of CCUS  
**Date**: Tuesday, 17 May  
**Time**: 3:45pm to 5pm

**ADRIAN SIKORSKI** (Decision Frameworks): Strategic Decision Making for Late Life Assets

**Session 12**: Operations and Managing Assets  
**Date**: Wednesday, 18 May  
**Time**: 3:45pm to 5pm

**STEVEN SPENCER** (Esso Australia): The story of Esso Australia’s push to explore the frontier Gippsland Basin with the ultra-deep water Scuplin-1 exploration well

**Session 17**: New Data, New Ideas - New Frontiers  
**Date**: Wednesday, 18 May  
**Time**: 3:45pm to 5pm

**MATTHEW WRIGHT** (Strike Energy): Reservoir Quality and Diagenesis of the West Erregulla Field, North Perth Basin, Western Australia

**Session 1**: Exploration - Keeping the Funnel Full  
**Date**: Tuesday, 17 May  
**Time**: 2pm to 3:15pm

**POSTER PRESENTATIONS**

**NATALIE DEBENHAM** (Esso Australia): Optimizing value in the mature Turrum Field: Integrating modern seismic, high-resolution sequence stratigraphy and production data in a 3D geological model

**SIMON HOLFORD** (University of Adelaide): Application of a probability model to detect unrecognised igneous intrusions in sedimentary basins

**RYAN OWENS** (Geoscience Australia): Addressing exploration uncertainties in the southern Bonaparte Basin: enhanced stratigraphic control and well failure analysis for upper Permian plays

**JEROME PAZ** (Xodus Group): Global energy outlooks and Australia’s net zero energy future

**LUDOVIC RICARD** (CSIRO): Monitoring well cementing operations using distributed fibre optic sensing

**STEVEN SCOTT** (Australian Gas Company): The Reids Dome Beds – Queensland’s latest Coal Seam Gas Target

**ALISON TROUP** (University of Queensland): Old Basins, new seismic data – architecture of Proterozoic basins in North West Queensland

**KATARINA VAN DER HAAR** (University of Adelaide): A New Approach for Production Forecasting from Individual Layers in Multi-layer Commingled Tight Gas Reservoirs

**LIUQI WANG** (Schlumberger): Petrophysical characterization of the Cambrian and Neoproterozoic successions in the Officer Basin.
CABS IV WILL ROCK YOU IN THE TOP END

Darwin Convention Centre | August 29-30

PESA’s fourth Central Australian Basins Symposium (CABS IV) is approaching rapidly. With the Early Bird registration ending on the 30 June, and airline seats and hotel rooms in high demand, PESA members are urged to complete their registration and bookings as soon as possible.

The Symposium will be held in the state-of-the-art Darwin Convention Centre on the Darwin Waterfront.

A full program of excursions, presentations, posters, exhibition booths and workshops promise a total immersion into the geology of some of the most exciting, resource-rich and under explored basins in Australia. The theme of the Symposium is appropriately ‘Exploring Australia Resource Frontier’.

Presentations at the Symposium will highlight the massive strides made in recent years in understanding the geological setting and resource potential of the vast, basins of Central Australia. CABS IV is a timely event where geoscientists from all disciplines, oil and gas, minerals, academia and geoscience organisations can meet and exchange new ideas and view the progress in the understanding of the evolution of Central Australian Basins.

A full program is planned with both preconference and post conference events.

A pre-conference Top End Basin Tour (27th and 28th August) is for those seeking an introduction and insight to some of the geology of the Northern Territory. Geologists from the Northern Territory Geological Survey will guide you through the ‘Top End’ exploring outcrops spanning the Palaeoproterozoic through to the Cretaceous. This Basin Tour includes a river cruise on the spectacular and unforgettable Katherine Gorge/ Nitmiluk.

On the Sunday evening of the 28th Sundowner Welcome Drinks at Wharf 1 will kick off the Conference with an opportunity to catch up with old friends and make new acquaintances.

The main program will then take place on the 29th and 30th of August at the Darwin Convention Centre. On Day 1 a Welcome to Country ceremony and Plenary session, opened by Dorothy Close of the NTGS, will be followed by two parallel technical sessions. One session will focus heavily on the gas-rich Beetaloo Sub-basin delving into its tectonic and sedimentary evolution.

The sheer beauty of the Top End is sure to delight delegates.
This will set the conference for the Core Workshop on the following day. The other session on the first day will cover the Carrara sub-Basin, Resource Management and Regional Geology.

On the evening of the first day the conference dinner will be held at Pee Wees at the Point. This will provide an opportunity to relax, reflect on the first day’s proceedings and enjoy the company of fellow geoscientists.

On the second day an interactive Core workshop, focussed on Beetaloo Sub-basin cores, will be led by Prof Howard Johnson (Imperial College) and Vincent Crombez (CSIRO) and supported by Amber Jarrett (NTGS), Tim Munson (NTGS), Claudio Delle Piane (CSIRO) and Morgan Blades (University of Adelaide), expert geologists knowledgeable in the geology of the Northern Territory. The primary objective of the core workshop is to review and discuss key cores from the Roper Group in the Beetaloo Sub-basin of the McArthur Basin, the world’s oldest petroleum system. The workshop is interactive and attendees will fully participate in the workshop by sharing their observations and interpretations.

The four selected cores will reflect the variety of sedimentary environments present in the upper Roper Group, including organic rich shales of the Velkerri Formation, and will illustrate the stratigraphic trends present in the basin. In teams of five, attendees will observe cores and through team discussions and interaction with the workshop leaders develop an understanding of the sedimentary system. This will include insights into depositional processes, controls on the vertical and lateral facies organisation, and the distribution and evolution of depositional environments across the Beetaloo Sub-basin.

OtherBasins will be covered in parallel sessions on Day 2 including, the Cooper, Pedirka, Amadeus and Officer Basins. Other themes on Day 2 include Minerals Resources and the Energy Transition.

The second day will culminate in a closing ceremony including awards for best presentations

Following the conference there is the possibility to participate in a Shale Sedimentology and Sequence Stratigraphy course hosted by the world-renowned shale expert Juergen Schieber of the University of Indiana.

This course is proudly supported by the NTGS (see PESA NT-SA Branch Report).

The Conference has attracted some outstanding speakers who will ensure that aspects of the geology of Central Australian Basins are covered from the regional setting to details of the sedimentology and stratigraphy. These include Karen Connors (University of Queensland), Alan Collins (University of Adelaide), Teagan Blakie and Lidena Carr (GA), who have been heavily involved in unravelling the evolution of the McArthur and associated basins. Sandy Menpes (Santos) has been exploring Northern Territory Basins for over 30 years. Kitty Milliken (Bureau Economic Geology, Austin), Howard Johnson (Imperial College), Juergen Schieber (Indiana Uni) and Peter McCabe (ASPER) are all world class authorities on the sedimentology and stratigraphy of shale rocks and associated depositional systems.

The conference welcomes geoscientists of all ages. CABS IV is intended to provide a supportive environment to help all geoscientists maximise their full potential.

The program promises a scintillating overview of the progress in understanding Central Australian Basins. If you are a geoscientist working on, or interested in, any of the basins in Central Australia this conference is a must for you.

Registration is via the Conference website.

https://agentur.eventsair.com/cabsiv
CONFERENCES: CABS IV

CABS IV PROGRAM

Monday 29 August 2022

08:30 - 09:45: Opening Ceremony/Welcome to Country/Plenary Session
09:45 - 10:10: Morning Break

BETALOO SUB-BASIN REGIONAL
10:10 - 10:55: J Schieber (Keynote)
10:55 - 11:15: K Connors (UQ)
11:15 - 11:35: A Wilson (ImageStrat)
11:35 - 11:55: H Johnson (Imperial College)
11:55 - 12:00: Session Discussions

RESOURCES EXPLORATION & MANAGEMENT
10:15 - 10:35: J Smith (Geoteric)
10:35 - 10:55: B Clennell (CSIRO)
10:55 - 11:15: L Carr (GA)
11:15 - 11:35: D Ferdinando (GA) - part one
11:35 - 11:55: D Ferdinando (GA) - part two
11:55 - 12:00: Session Discussions

12:00 - 13:00: Lunch Break with Poster Session

BETALOO SUB-BASIN
13:05 - 13:45: K Milliken (Keynote)
13:45 - 14:05: V Crombez (CSIRO)
14:05 - 14:25: C Delle Plane (CSIRO)
14:25 - 14:45: A Nixon (UoA)
14:45 - 14:50: Session Discussions

GEOLOGICAL SOCIETY OF AUSTRALIA
13:05 - 13:25: Alan Collins (UoA)
13:25 - 13:45: D Subarkah (UoA)
13:45 - 14:05: T Blakie (SGC)
14:05 - 14:25: P Haines (GSWA)
14:25 - 14:45: H Allen (GSWA)
14:45 - 14:50: Session Discussions

14:50 - 15:30: Afternoon Break with Poster Session

BETALOO SUB-BASIN INDUSTRY
15:35 - 15:55: D Garrad (Empire)
15:55 - 16:15: Origin
16:15 - 16:35: A Hill (Santos)
16:35 - 16:55: J Farkas (UoA)
16:55 - 17:00: Session Discussions

CARRARA SUB-BASIN
15:35 - 15:55: J Hope (GA)
15:55 - 16:15: A Bailey (GA)
16:15 - 16:35: V Crombez (CSIRO)
16:35 - 16:55: A Jarrett (NTGS)
16:55 - 17:00: Session Discussions

17:00 - 17:30: Closing Expert Discussion
19:00 - 22:00: Conference Dinner (Pee Wee’s at the Point)

TUESDAY 30 August 2022

COOPER BASIN
09:00 - 09:25: P McCabe, Professor Peter (UoA)
09:25 - 09:45: S Notiyal (TGS)
09:45 - 10:05: C Wainman (UoA)
10:05 - 10:25: C Cubbitt (Independent)
10:25 - 10:30: Session Discussions

REGIONAL GEOLOGY
09:00 - 09:25: GA Keynote
09:25 - 09:45: GA Keynote
09:45 - 10:05: L Nomore (GSWA)
10:05 - 10:25: N Rollet (GA)
10:25 - 10:30: Session Discussions

10:30 - 11:00: Morning Break

PEDIRKA BASIN
11:05 - 11:25: P Strong (DEM) Keynote
11:25 - 11:45: A Doig (NTGS)
11:45 - 12:05: B Bradshaw (GA)
12:05 - 12:25: J Iwaniec (GA)
12:25 - 12:30: Session Discussions

MINERAL RESOURCES
11:05 - 11:25: S Schmidt (CSIRO)
11:25 - 11:45: P Farias (NTGS)
11:45 - 12:05: C Krupf (DEM)
12:05 - 12:25: TBA
12:25 - 12:30: Session Discussions

12:00 - 13:00: Lunch Break with Poster Session

AMADEUS/OFFICER BASINS
13:55 - 14:15: C Loyola (UoA)
14:15 - 14:35: D Lockhart (Central Petroleum)
14:35 - 14:55: D Riley (Chemostrat)
14:55 - 15:00: Session Discussions

ENERGY TRANSITION
13:55 - 14:15: T Massey (Santos)
14:15 - 14:35: H Clarke (META Pty Ltd)
14:35 - 14:55: S Menpes (Santos)
14:55 - 15:00: Session Discussions

15:00 - 15:30: Closing Expert Discussion
15:30 - 17:00: Afternoon Break
16:00 - 17:00: Closing Ceremony and Awards
Clontarf Secures Stake in Sasanof-1

With drilling imminent, LSE listed Clontarf Energy has acquired a 10% interest in the highly-anticipated Sasanof-1 exploration well.

West Perth based explorer Western Gas said that in terms of the deal, Clontarf will fund 20% of the Sasanof-1 well having acquired 10% of Western Gas (519P), the holding company for Sasanof, and issuing 250 million Clontarf ordinary shares to Western Gas.

Western Gas retains a strategic 52.5% interest in Western Gas (519 P) following the farm out.

Western Gas said in a statement that in January 2022, IHS Markit had released a report on the contribution of high impact wells in 2021 to global gas resources “with an expectation that high impact exploration drilling in 2022 will continue to have a global impact”.

“IHS Markit noted the Sasanof Prospect as one of only two high impact wells in the Asia Pacific region of the 20 global high impact wells planned to be drilled in 2022.”

UK-headquartered energy consultancy ERCE estimates the Sasanof Prospect to contain a 2U Prospective Resource of 7.2Tcf gas and 176 Million bbls condensate (P501), with a high case 3U Prospective Resource estimate of 17.8 Tcf gas and 449 Million bbls condensate (P101).

“Western Gas is delighted to welcome Clontarf Energy to the Sasanof campaign. The start line is in sight with only a matter of days before the rig departs for the Sasanof location on the North West Shelf,” said Will Barker, Executive Director of Western Gas.

Western Gas had mobilised equipment to the Valaris MS-1 semisubmersible drill rig in preparation for rig deployment to drill the Sasanof-1 well on 24 May 2022.

The Sasanof Prospect is approximately 200km northwest of Onslow, Western Australia, and the well will be drilled vertically to a total depth of 2500m in 1070m of water.

“We are thrilled to have commenced the mobilisation process for the drilling of Sasanof-1 after multiple years of technical studies, regulatory approvals, contracting and planning. The rig is due to leave port on 16 May, enabling this short duration and high impact well to deliver results by early June. We look forward to working with our partners and contractors to complete a safe and rewarding drilling program,” said Barker.

Dorado Clears Key Hurdle Towards FID

The Santos-Carnarvon joint venture has made an important step towards a final investment decision on the Dorado oil project offshore Australia. This follows the granting of a production licence for the Dorado field, located in the Bedout Sub-Basin in...
Commonwealth waters about 150km north of Port Hedland.

Carnarvon said the production licence empowered the joint venture to produce petroleum and continue exploring and appraising hydrocarbons within the area.

“At a time when Australia needs energy security more than ever, it’s great to see a new Australian oil project, discovered by Australian companies Santos and Carnarvon Energy, moving closer to being production-ready,” Australia Minister for Resource and Water, Keith Pitt said.

“The original Dorado-1 discovery made in 2018 represented the most significant new oil play offshore Western Australia in the last decade and opened up the Bedout and Beagle sub-basins as a major new oil & gas province for Australia.”

In February the successful Pavo-1 exploration well, located 46km east of the Dorado field discovery, delivered the option for a low-cost tie-back to the first phase of the Dorado development and preparations are underway to drill the second well in campaign.

Santos Chief Executive Officer, Kevin Gallagher, described the Production Licence as a significant step on the path towards a final investment decision.

“The Production Licence builds on recent momentum for the Dorado Project following the significant Pavo-1 discovery last month that has the potential to add further material value to the development,” Gallagher said.

“Global oil & gas markets are seeing increased volatility and western countries are looking to diversify their supply sources away from Russia which, according to the International Energy Agency, currently produces 18% of the world’s gas and 12% of its oil.

“In this environment, Dorado and Pavo have the potential to bolster Australia’s national energy security while Australian LNG projects help to meet the energy needs of our allies.”

Minister Pitt said the multi-billion dollar Dorado project would safeguard Australia’s oil security.

“There is no doubt Australia needs new oil projects if we are to maintain our energy security and ensure our long-term national security. These projects bring new jobs and new investment into our oil & gas sector. Australia’s security and that of our friends, allies and trading partners will be founded on our ability to continue to attract new energy and resources investment, and our success in bringing on new projects like Dorado.”

At the South Australian Department for Energy and Mining, they toasted a milestone anniversary of the Acrasia 1 oil discovery in March.

Minister Pitt said the multi-billion dollar Dorado project would safeguard Australia’s oil security.
The opening up the South Australian Cooper Basin for competitive bidding 20-years ago paid off when Stuart Petroleum, one of the new generation of explorers, kicked off a new phase of activity in the basin by making their first commercial oil discovery at Acrasia-1.

The expiry of 40-year-old petroleum exploration licences over the Basin in February 1999, together with the new Petroleum Act 2000 enabled the South Australian government to use phased acreage releases to attract a new generation of explorers to the basin. Three major competitive tender acreage releases were held in 1998, 1999 and 2000, attracting huge interest and multimillion dollar bids. It was the most significant structured release of onshore Australian acreage in the petroleum industry’s history and changed the makeup of Australia’s onshore exploration industry through a number of ‘company-making’ discoveries.

Since 1998, 10 acreages releases staged by the department have generated:

- $560 million in royalties,
- $8.4 billion in gross sales,
- $706 million in guaranteed drilling and seismic surveys in successful work program bids and $262 million of non-guaranteed work (both in in 2021 dollars),
- 37 land access conjunctive agreements signed with native title claimants/holders,
- sharply increased oil success rates (Fig 1) due to new approaches to exploration in under-explored parts of the basin and improved 3D seismic technology and
- increased gas supply-side competition.

Woodside has announced that the processing of gas from the Pluto fields’ Pyxis hub has begun at the Karratha Gas Plant on the North West Shelf.

This follows the start-up of the 3.2km Pluto-KGP Interconnector pipeline, linking Pluto LNG with the Karratha Gas Plant, which is now expected to process approximately 2.5 million metric tons of LNG in aggregate and about 20 petajoules of domestic gas from Pluto between 2022 and 2025.

Woodside CEO Meg O’Neill said: “The start-up of the Pluto-KGP Interconnector provides access to spare capacity at Karratha Gas Plant to process gas owned by other resource owners, both onshore and offshore Western Australia. The processing of gas from the offshore Pluto field also enables Woodside to deliver additional LNG cargoes into the international gas market.”

Woodside is operator of the North West Shelf Project which is partnered with BHP Petroleum, BP, Chevron, Japan Australia LNG and Shell. Woodside has a 90% interest in Pluto LNG.

Oil major ExxonMobil has made a final investment decision to expedite more gas from the Kipper field in the Gippsland Basin.

Esso Australia, a subsidiary of ExxonMobil, is the operator of the Gippsland Basin Joint Venture and said the project was needed to stimulate production to secure critically needed supply for the Australian domestic market.

The company said in a statement it was also considering optimising production from the Turrum field.

ExxonMobil said an estimated AU$400 million investment in these fields could inject an additional 20 petajoules of gas over the next five years, with about 30 petajoules coming online next year as critical supply to offset winter supply risk forecasts for the southern states, which have been red flagged in the Australian Energy Market Operator’s 2021 Gas Statement of Opportunities report.
ExxonMobil Australia Chair Dylan Pugh, said: Natural gas has an increasingly important role in meeting demand for cleaner fuel, lowering GHG emissions in the power sector and supporting higher penetration of renewables by maintaining reliability, resilience and stability of the grid.

“Our ongoing investment and commitment to supplying Australian customers means that the Gippsland Basin remains the largest single source of natural gas for Australia’s east coast.

“There is still plenty of gas remaining in Bass Strait and we are working hard to unlock its full value. More investment will be required for Victoria to maintain its reliable supply of natural gas, especially during winter.”

AGL Signs up for Vali Field Gas

Metgasco has announced execution of a gas sales agreement between the ATP 2021 JV partners and AGL for the delivery of all gas produced from the Vali Field from field start-up.

The Vali field is expected to start production in mid-2022 and on 6 December 2021 the JV, comprising Metgasco, New Hope and Vintage Energy, signed a heads-of-agreement with AGL.

Production from the Vali gas field, discovered in CY2020, is expected to commence following completion of the field’s three wells and connection to the nearby Moomba gas gathering network.

Located in the lightly explored southern flank of the Nappamerri Trough of the Cooper Basin in southwest Queensland, the project was initially brought from farm-in to discovery and resource assessment in nine months.

Gas produced during the production appraisal is to be sold to AGL on a mix of firm and variable pricing at market rates. Under the terms of the GSA, the joint venture will receive pre-payments totalling AU$15 million in three equal tranches from AGL on achievement of milestones as the project moves to first gas. These funds are to be applied specifically to funding the work program to take Vali to first gas.

Metgasco is fully funded for capital expenditure at Vali through to first cash flow.

The first pre-payment of AU$15 million is to be made on signing of the GSA and satisfaction of its conditions precedent which include execution of upstream transportation and processing agreements.

Total volume of the field has been estimated at 9PJ to 16PJ (gross).

Searcher Expands South African Data Library

Searcher Seismic has announced the significant expansion of its South Africa 2D and 3D data library in cooperation with the Petroleum Agency of South Africa (PASA).

The Orange Basin has recently astonished the world with the discovery of multiple billion barrels of light oil in Namibia, very close to the border with South Africa. The discovery plays extend into South Africa, and it is into the industries excitement for the Orange Basin that Searcher has announced its extended South Africa 2D and 3D rectified seismic dataset which now comprises 107,500km of 2D data and 8,790km² of 3D data.

Searcher has applied its proprietary post-stack reprocessing method which rectifies navigation, metadata, amplitude, phase and time to create a contiguous database that can be easily accessed on its web-platform, sAIsmic.

The success in the Orange Basin comes on the back of significant discoveries of gas condensate in South Africa’s
Southern Outeniqua Basin in 2019. The dataset facilitates the investigation of the distribution of plays and traps in South Africa and is suitable for preliminary exploration analysis – basin modelling, isopach and play fairway building.

“We congratulate TotalEnergies and Shell on their successes in the Orange Basin and South Outeniqua Basin, and are very pleased to also announce the extension of our 2D and 3D data library and to be expanding our presence in South Africa”, said Neil Hodgson, VP Geoscience at Searcher.

“The recent and significant oil discoveries from Venus 1-X and Graff-1 wells in the Orange Basin, Namibia proves the potential of this basin which also extends into South African waters. It is a very exciting time for this region and the long under-valued Orange Basin.”

The South Africa 2D and 3D rectified seismic database is available on Searcher’s subscription platform, sAIsmic, for access to explorers.

CGG Joins Norway’s Centre for Geophysical Forecasting

CGG has become a member of the Centre for Geophysical Forecasting, a world-leading research and innovation consortium based in the Norwegian University of Science and Technology (NTNU).

The Centre for Geophysical Forecasting aims to leverage the combined expertise of its 15 members from a wide range of business sectors, both private and public, to “catalyse a new wave of geophysical capabilities, applying disruptive new technologies to novel enterprises that will be game-changers” in the energy transition.

CGG said it would bring its industry-leading expertise in seismic modelling and imaging to the work of the consortium. More specifically, it will contribute to the development, modelling, implementation and field testing of a new subsurface imaging and monitoring system designed to support a range of energy transition activities.

Dave Priestley, VP, Energy Transition & Environment, CGG, said: “CGG looks forward to actively participating in the development of ground-breaking technologies, particularly in the Centre for Geophysical Forecasting’s key innovation areas of carbon capture and storage management, and geohazard monitoring and forecasting. We are highly motivated to work with the other consortium experts and see significant alignment with our strategy and technology focus to support the energy transition.”

New UK HPC Hub Boosts Computing Capacity

To support continued differentiation in its core business and accelerate the development of its new activities, CGG announced that it was significantly expanding its high-performance computing (HPC) capacity and associated service offerings.

The company recently signed a lease to build a new European HPC hub in Southeast England that will become operational in H1 2023 and increase its cloud HPC capacity by up to 100 petaflops.

Peter Whiting, EVP, Geoscience, CGG, said: “The expansion of our HPC capability at this new UK facility supports both the continued advance of our industry-leading subsurface imaging technology and services, as well as the growth of our specialized HPC offerings to new and existing clients in the energy, environmental and other industry sectors. It reflects CGG’s strategy of continued leadership in specialized digital sciences, through the dedication of considerable resources, R&D efforts and partnership initiatives to deliver highly differentiated digital capabilities that address our clients’ advanced HPC, software, cloud and digital transformation requirements.”

Building on over a decade of cutting-edge HPC innovations and experience, including liquid cooling to implement high power density and high-efficiency full-immersion environments at its Houston facility, the new UK HPC Hub will leverage new innovations in all areas, including industrial HPC and energy efficiency to bring significant advantages to specialized HPC application. In addition, as part of CGG’s commitment to green energy and reduction of its GHG Scope 2 emissions to meet its pledge to become carbon neutral by 2050. The new hub will be powered with 100% renewable energy, as are CGG’s other UK operating sites.

CGG’s HPC innovations will including liquid cooling to implement high power density and high-efficiency full-immersion environments.
PESA News
SECOND QUARTER 2022
BRANCH NEWS: FEDERAL

Testing Times Yes, But We are Heading in the Right Direction

Everyone loved it when COVID restrictions eased and people could meet in the flesh again.

Bronwyn Camac

PESA have held 53 face-to-face events since May 2021, plus webinars, which is still about half of what we would do in “normal” times. Hopefully, over the next year we will all be back to normal and can meet up with old friends and meet new ones in the industry.

The Board and committee chairs are planning to spend a day prior to the AGM on updating the current strategy for PESA. The Strategic Plan (Towards 2024) can be found on the website, but whilst still current in so many ways, we felt there was a compelling reason to re-look at each of the objectives in light of our changing industry. Importantly, the long-term impact of the virtual platform on how we can deliver training and development opportunities in the future and also positioning PESA to deliver its best service to our community during the energy transition, whilst maintaining ongoing support and education in the traditional oil and gas sector.

We have been able to progress the technical library by sourcing all back issues of PESA News, which are now all available online for everyone to enjoy. Thank you to Martin Berry and Paul Marty for their generous donations of the missing issues. The website has undertaken several rounds of upgrades during 2021 and continues to be a central repository, means of supplying key services and communicating with the membership.

If you have any suggestions for ongoing improvement, please let Phil Cooney (chair of the publication committee) know.

Advertising of events is fairly rampant on our LinkedIn page, so please follow us for info on events coming up, if you like using that social platform to find out what’s going on, go to:

www.linkedin.com/company/petroleum-exploration-society-of-australia-limited/

The PESA Membership survey was once again held during 2021. Thank you to everyone who took the time to respond. A full overview of the survey was published in PESA News edition #163 if you missed it.

2021 saw a turn-around in membership numbers and whilst we’re not back at 2019 levels yet, we are now heading in the right direction. The popularity of webinars; additional membership value services; some states getting back to in-person events; and being in an AEGC conference year all may have been a part of driving that increase. We’ll keep working hard to improve services, be relevant and offer the membership what they want in 2022. I’m keen to see if this trend continues.

One of our ongoing concerns is the lack of students coming through the education system over the last few years. Many universities across the country have closed their geology programs due to lack of student interest. We know this student intake decline can be related to low commodity prices,
we’re all used to those swings and round-about, but in addition to this, we have a bigger threat to our early career professional intake. As Australia moves towards a carbon neutral future, it is imperative that we all find our voice in encouraging young students to engage with geoscience.

We need to help them see that they are still very much required in our industry to explore and develop resources to continue the supply of clean energy to our world. Being part of the solution, finding suitable storage reservoirs for CO2, developing resources sustainability, providing natural gas products into Asia, all of these things and more, are critical to our energy future. To help our members with this messaging, we have invested in Geologize’s Practical Geocommunication 2.0 – you can access this training for free through our website and it is a marvellous course to improve your communication skills. Even if we can get a few interested kids or encourage those looking for a career change, back to geology at uni, things can turn around.

CABS1V

I’m sure everyone has seen the adverts for the wonderful Central Australia Basins Symposium (CABS1V) to be held in late August this year up in Darwin. I would like to thank Rhodri Johns and his hard-working committee for putting on this event after seven long years of NT exploration uncertainty.

NT exploration acreage is hot property at the moment with a lot of exciting activity and opportunity. Please get yourselves to Darwin for a great conference, field trip, post-conference course on shale sedimentology and core workshop, check out the website for more details.

APPEA/EAGE/AAPG discounts for members

Please make sure you avail yourselves of these discounts via our website. You can register for EAGE and AAPG events hosted in Australia over the next year at member prices, in particular the AAPG “Structural Geology and Our Future” workshop in Sydney in early July and also the EAGE “Workshop on CO2 Storage” to be held in Perth just before the CABS1V Symposium in August 2022. And of course the APPEA conference following this AGM. These deals offer many $$ of member value, so take advantage of them.

2021 had been an interesting and challenging year but I have enjoyed every minute. I have a brilliant and truly national team working with me. This is the first time in PESA history where our executive team is located across the country from SA, WA, NSW and QLD.

Another benefit of a virtual platform (thanks COVID!). As you are aware, Max Williamson our Federal Treasurer resigned from the position at the end of 2021 for health reasons. Max is one of our most esteemed PESA members and it is fair to say that PESA runs in his blood. I and the board are so grateful for his contribution not just over the last year but also for the many, many years before then and hope the future is filled with good health and happiness.

And to all the volunteers across the country, I am in awe of what you do for our society. From conferences, seminars, webinars, field trips, core workshops, technical talks, social functions, there are so many people giving up their time to provide the highest quality service to the membership. And lastly to you, the member. We are all going through so much change. Many of us have lost our jobs in the down-turn, constant re-organisations within the companies, the need to keep abreast of new and exciting ventures – the learning is life-long.

Lockdown was lonely, but at least members got to have some trivia fun online.

We got to make new friends and meet colleagues from all over the world as the globe zoomed in.
As if COVID wasn’t bad enough then came the floods. However, the New South Wales branch finally got to tee it all up at the PESA NSW Golf Weekend Away at Cypress Lakes in the beautiful Hunter Valley wine region.

Cameron Fink, chairman of the NSW Branch Golf Committee, said the players, and their partners, leapt into action over the weekend of April 1-3 as blue skies broke through the wet blanket that had smothered the state for weeks.

“The PESA NSW Weekend Away, which is separate from the PESA NSW Golf Day, has been lucky in that we have had no cancellations of the event due to COVID – just by fortune of its late summer/early autumn timing. In March, 2020 the Weekend Away predated any lockdowns and in 2021 we had a brief spell of relaxed measures and were able to hold the W.A. down Mollymook in mid-March. This year we squeezed in a sunny weekend between deluges,” Cam said.

The top team was Adam Wilson and Debs Majunder with a winning Stableford score of 76 (over two rounds). The top male player was Barry Smith, and the top female was Barbara Bohdanowicz, partner of PESA member Andrew Nelson.

In between driving for show and putting for dough, the golfers and their partners visited wine estates in the area and held a hilarious April Fools fancy dress party, which was won by Nick Glover, Nancy Fink and Adam Wilson.

Pencil in the date. The annual PESA NSW Golf Day, an event which had been held for 56 consecutive years pre-COVID, is scheduled for October 6.

“This will be the first Golf Day to proceed since 2019, barring any unforeseen disaster,” Cam said wistfully.
Meet Titus Murray, Your New Branch President

PESA NSW Branch has a new President with a Roman name, who was born in Scotland, raised in Australia and has long since lost his Glaswegian accent.

So, who is Titus Murray? He is a director of Southern Highlands Structural Geology, a geologist with extensive experience in the study and characterisation of faulted and fractured reservoirs in over 30 countries and a man whose mission statement is to provide services and tools that improve oil & gas discovery and production as well as groundwater industries.

More recently he started an active research research and development Program to produce technology that characterises groundwater flow across and through faults, as well as 2D and 3D interpretation and structural restorations for offshore frontier exploration and complex onshore fold and thrust belts based on borehole and outcrop data.

He also loves flying his drone to capture images of rocky marvels in far flung places such as Vietnam and when he isn’t earning his crust, you’ll find him out orienteering, running or skiing when there’s snow close by.

Titus, after setting up practice in Sydney, is now based in Mittagong. He worked for Midland Valley, a structural R&D group in Glasgow, Scotland, British Nuclear Waste disposal company UK Nirex and 3D geologic modelling company Maptek. Before that he worked for Mike Wiltshire with PESA President Bronwyn Camac at Wiltshire Geological Services.

Mike is pretty busy these days researching and advising gas and coal companies on how to deal with faults and look after near-surface aquifers to safeguard the environment, but said he was excited about his new role in PESA and looking forward to some stimulating activities in the NSW Branch.

Our Library of PESA News Back Issues is Now Complete

Phil Cooney, PESA Publications and Media Committee Chair, has thanked Martin Berry, of Twin Waters in Queensland and Paul Marty, from Bureau Veritas Minerals Pty.Ltd, in Murarrie, Queensland, for finding the missing pieces to complete the PESA News puzzle.

Phil explained that when PESA’s new website was being set up, it was noticed that some issues appeared to be missing from the website library. Upon investigation it was discovered that 25 issues between and including No. 4 and No. 128 were inaccessible or missing altogether.

“A call for the missing copies from our PESA membership last year met with a very generous response but a special thank you for their assistance is due to Martin and Paul,” Phil explained.

“I am happy to be able to announce that our collection of the past issues of PESA News from No. 1 (November 1992) to the most recent No. 164 is now complete and available to our members. Why not have a look, there is a lot of interesting material there and our more senior members will find any number of ghosts from the past in our earlier issues.”

To view the complete library and the previously missing issues, go to: pesa.com.au/pesa-news-magazine/
If the turnout at the April WA lunch was anything to go by, PESA WA Branch should consider making a movie called Capturing Carbon because by all accounts it would be a blockbuster.

CCS is proving to be a real drawcard these days and such is the interest among geos, not to mention industry professionals in general, that close to 80 people gathered at the Parmelia Hilton eager to see what role they might play in projects and initiatives of this nature in the future.

The speaker was Mark Trupp, who is well versed in the challenges and conundrums of CO₂ capture and incarceration dynamics and spoke on the fundamentals of the science, encompassing existing and proposed projects, storage mechanisms and monitoring requirements.

With over 33-years of experience with companies such as Shell, Woodside, Chevron and Buru Energy, Mark is now an independent consultant specialising in CO₂ storage – having previously worked extensively on Gorgon Subsurface as team leader. He also co-authored several conference papers on the subject.

Mark spoke about the fundamentals of carbon capture and storage, including existing and proposed projects, storage mechanisms and monitoring requirements.

As geoscientists, PESA members have an important role to play in the development and implementation of commercial CCS projects now and into the future. Member interest in CCS is considerable as evidenced by the large turnout.

The popularity of the lunches was reflected in encouraging attendances numbers that were sustained this year in spite of tightened COVID-related restrictions in WA that were eased at the end of April.
T is likely that Carbon Capture and Storage will play a major role in the energy industry in the coming decades. To develop the technology for industry use, Australia’s national science agency, CSIRO, has significantly invested in research and development of CCUS, participating in the Southwest Hub and development of the In Situ Laboratory (ISL).

On 8 April, PESA WA’s Energy Transition and Sedimentology and Stratigraphy interest groups organised a visit to the ISL in Harvey, 100km south of Perth. The site visit was followed by a core workshop at the WA Department of Mines, Industry Regulation and Safety (DMIRS) core library in Carlisle to look at the targeted interval for CO2 injection of the ISL.

The tour of the laboratory was facilitated by Ludovic Ricard and Jérémie Dautriat (CSIRO). Following a safety briefing, the two researchers presented the history of the site covering the Southwest Hub CCS project background. This covered the role of faults in a CCS context, the importance of a dedicated research site for investigating the impact of faults on CCS deployment, and the benefits of advancing conventional and innovative monitoring technologies to accelerate the uptake of CCS projects.

The trip was engaging and saw lots of questions asked with attendees visiting two stations, one showing the geology of the site and the other the current monitoring system. The visit included live demonstrations of surface and downhole surveillance systems (pressure, temperature, and fibre optic sensing for temperature, acoustic and strain), and a display of the new sensors (tiltmeters and surface geophones) soon to be deployed at the site. Participants learnt how these monitoring technologies help reduce risks by providing mitigation controls and enabling the early detection of events.

Back in the Carlisle core library, the group had the opportunity to look at several intervals of core from wells located around the ISL. Comparisons of sections extracted from Harvey-1 and Pijarra-1 showed the effects of different compaction and diagenetic histories on the commercially targeted interval. The section from Harvey-3 allowed attendees to examine the regional buffer present at the top of the Lesueur Formation. Lastly, using core from Harvey-2 (below the ISL) attendees were given the opportunity to observe the faulted interval where CO2 injection is currently being trialled and monitored.

This field trip was the first event jointly organised by the Energy Transition and Sedimentology and Stratigraphy interest groups. It will be followed by another core workshop on the Dupuy Formation in late April 2022.
Branch News: SA/NT

As reported in the last edition of PESA News, the Central Australian Basins Symposium will convene in the Darwin Conference Centre 29th-30th August 2022.

The conference committee has been working hard behind the scenes to increase the exposure of the key international speakers to the conference. For example, although the one-day short course option lead by Dr Juergen Schieber is still available, there is now also a three-day option for those that can stay longer and dive deeper into understanding shales.

It is likely the practical side of the expanded course will include the Mesoproterozoic Kyalla Formation shales in addition to the Velkerri Formation in order that the two classic Beetaloo Basin shales can be compared and contrasted.

Check out all the latest information on the symposium at https://agentur.eventsair.com/cabsiv or contact the organising committee via email cabsiv@agentur.com.au.

Registrations are open so book early to save and avoid missing a spot on either of the short courses or the field trip.

PESA SA/NT Branch Update

Plans are also underway for Dr Juergen Schieber to present a two-day shale short course in Adelaide and a talk on his work on the geology of Mars.

Two-Day Shale Short Course:
A two day Shale Sedimentology and Sequence Stratigraphy short course will be held at the Tonsley Core Library on the 16th and 17th August https://tonsley.com.au/our-community/south-australia-drill-core-reference-library/.

The short course will combine both lectures and practical sessions. Lectures will cover shale facies variability, classification and description, flume studies of shale deposition and erosion, early diagenesis and microbial processing, and shale sequence stratigraphy.

The course will also include a lecture on “what makes a good shale gas candidate” from a sedimentology and diagenesis perspective. Practical sessions will include examination of a selection of shale cores from the Arckaringa Basin (Early Permian organic rich marine shales), Officer Basin (Neoproterozoic marine shales including Acraman impact layer), Cooper Basin (Early Permian lacustrine shales), Eromanga Basin (Cretaceous marine shales) and Otway Basin (Jurassic/Early Cretaceous lacustrine shales).

Geology of Mars Talk:
A joint PESA-SPE-Adelaide Uni function, scheduled for 5pm on the 19th of August, will have Dr Juergen Schieber report on his work as a member of the science team that currently explores the geology of Gale Crater on Mars with NASA’s Curiosity Rover. The function will be hosted by Adelaide Uni at the Mawson Lecture Theatre (inside the Tate Museum https://sciences.adelaide.edu.au/physical-sciences/tate-museum).

The talk will be followed by drinks and nibbles. Watch the PESA website events page for further details.

Update on CABS IV

Juergen Schieber will present a two-day shale short course in Adelaide.

NASA's Curiosity rover has been exploring Mars' Gale Crater since touching down on its floor in August 2012. (Image credit: NASA/JPL-Caltech/MSSS)
Adavale Basin, Boree Salt Core Workshop, Ides of March 2022

PESA QLD division in cooperation with Geoscience Australia (GA) held a very successful one day workshop focused on the Boree Salt Formation of the Devonian Adavale Basin, with added discussion on the potential for the formation extent into the adjacent Warrabin Trough.

The morning was spent with presentations and during breaks and throughout the afternoon complete core and cuttings for all wells that intersected the Boree Salt were on display. There was much discussion about the variety of salt flavours.

Recent heightened interest in the hydrocarbon prospectivity of the basins, plus the Boree Salt as a potential high-quality seal suitable to allow for future H2 storage was shown by the broad cross section of 26 interested and engaged attendees from industry, government and academia. A special mention for effort of attending goes to GA staff travelling from Canberra, but honours in that regard going to Dr Asrar Talukder from GA, who travelled from Perth. Interstate participation was one highlight of the event. Another was being able to gather in-person for prepared and ad hoc presentations, not to mention lively discussion over the laid-out core in the current relaxed COVID requirements – the first opportunity to do so for two long years.

The event was held at the recently refurbished QLD Government Exploration Data Centre core facility, taking advantage of the excellent conference, core viewing and even catering facilities at the Pineapple Street (it is QLD after all) site.

Special thanks goes to the organizer of the highly successful event, Simon Atkinson of Axiom Geoscience, whose approach to catering also was much appreciated by attendees with larger appetites.

SPEAKERS WERE:

- Diane Jorgensen – Geoscience Australia
- Alison Troup – Formerly of GSQ and the Department of Resources
- Pascal Asmussen – UQ Sustainable Minerals Institute
- Henk van Paridon – Energeo Pty Ltd

WITH AD HOC PRESENTATIONS BY:

- Tony Rudge – Thunderstone Energy/Ecostorage Solutions
- Howard Bassingthwaite – Chi Oil and Gas

Feedback from this event has been very positive, so stay tuned for future core workshops focusing on other QLD basins of current interest. If any members have specific ideas or suggestions for future events please contact one of the PESA QLD committee members.

PESA QLD SYMPOSIUM IS BACK ON THE CALENDAR FOR 2022

After a two-year hiatus due to COVID the symposium will be held this year at the Brisbane Convention and Exhibition Centre, South Bank on Friday 9th September 2022.

2022 PESA Symposium Committee Chair, Toby Colson, extended invitations to potential sponsors and said options were available in the Sponsor and Exhibitor Packages guide.

“This mostly annual event has been a feature of the Queensland Petroleum Industry since 1977, and brings together speakers and delegates from across the wider energy industry for a fantastic, networking and information sharing day. The organising committee anticipates up to 150 industry delegates in attendance with 12 presentations scheduled over the day in the four sponsored sessions. A selection of display booths will greet the attendees and will be a feature of the break-out area between sessions,” Toby said.

The PESA Queensland Symposium is made possible with the support of event sponsors and this year PESA QLD is again offering three sponsorship categories – Platinum, Gold and Silver Sessions Sponsors. Companies are also welcome to purchase an exhibition booth display and/or support PESA by sponsoring the coffee cart and AV costs or subsidised attendance for students. Other options are available upon request.

“We certainly hope that you will choose to join the list of peer companies and support the 2022 PESA Queensland Symposium,” Toby said. As an event sponsor your company would be:

- Recognised on program and posters;
- Acknowledged throughout the day;
- Have access to display booths and discounted attendance;
- Be able to display banners on the main stage.

Event sponsorship package or a display booth can be secured by contacting the Symposium Committee Sponsor Chair, Mel Fitzell. Registration will be via the PESA website, with tickets opening shortly.
South Australian Petroleum Review (April 2022)

INTRODUCTION

The Energy Resources Division – South Australian Department for Energy and Mining (DEM) manages the State’s petroleum resources as the lead agency facilitating ecologically sustainable petroleum exploration and production. Its operations cover investment attraction through provision of geoscientific data, regulation through policy and legislation and royalty optimisation.

South Australia offers explorers and investors:

- Petroleum Exploration Licences (PEL) up to 10,000 km²,
- easy access to comprehensive well and seismic data,
- blue sky opportunities in frontier basins with oil & gas shows,
- acreage releases in producing basins,
- diverse Neoproterozoic to Cretaceous marine and non-marine plays,
- in place gas storage and CCS licensing regime, and
- exploration for natural hydrogen can occur under a PEL.

PETROLEUM EXPLORATION AND PRODUCTION ACTIVITY

Onshore Petroleum Licensing

Petroleum Exploration Licences: Petroleum Exploration Licence applications (PEwLAs) can be lodged at any time ‘over-the-counter’ over much of the State excluding the Cooper and Otway competitive tender areas (Figure 1). The application fee is currently A$4,845 (subject to change from 1
July 2022), applications must include a five year work program with at least one exploration well and evidence of the applicant’s technical and financial capacity. A ‘top filing’ option exists over PELAs where the first ranked applicant does not make timely bona fide efforts to progress their application – the first application may be refused, then the second assumes primacy (excluding PELAs with ‘good faith’ efforts to conclude Native Title agreements).

In competitive tender basins vacant acreage is only available via acreage releases where applicants bid five year work programs. At the time of writing (March 2022) a new acreage release in the Otway Basin is under consideration and industry consultation is planned at the 2022 APPEA conference and Exhibition.

All blocks from the most recent Cooper Basin release (CO2019) are under application and PELs have been offered to successful applicants. Farm-in opportunities exist for some Cooper Basin licences. In the Otway, Block OT2019-B has been granted (PEL 680), OT2019 A and B did not attract applications. DEM geoscientists are working to complete a hydrocarbon generation model for the Otway Basin for release this year and have identified new source rocks and plays.

Most of the State’s prospective acreage is covered by 38 PELs (area 177,813 km²) and 78 PELAs (area 582,119 km²) as at 18/1/2022 (Figure 1).

Information about how to apply, the licence register and maps showing current licences and applications can be accessed here: [https://www.petroleum.sa.gov.au/licensing-and-land-access/onshore-licensing](https://www.petroleum.sa.gov.au/licensing-and-land-access/onshore-licensing)

**Petroleum Retention and Production Licences:** A total of 211 Petroleum Retention Licence (PRLs) have been granted over an area of 17,052 km² and Petroleum Production Licences (PPLs) cover 7,410 km² of the Cooper and Otway basins. (Figure 2)

**Natural hydrogen exploration:** on 11 February 2021 the Petroleum and Geothermal Energy Regulations 2013 were amended to declare hydrogen, hydrogen compounds and by-products from hydrogen production to be regulated substances under the Petroleum and Geothermal Energy Act 2000. Companies are now able to apply to explore for hydrogen via a PEL and the...
transmission of hydrogen or compounds of hydrogen are now permissible under the transmission pipeline licencing provisions of the PGE Act.

Potential exists for native hydrogen plays in South Australia – potential sources and indications include:

- **basement complexes** which contain Fe2+ and/or uranium-rich rocks – generate hydrogen via radiolytic and oxidation processes (e.g., Archaean greenstone and Precambrian basement terranes);
- **fractured and seismically active source areas** – deep-seated faults can both channel migrating hydrogen from deep sources to surface and introduce water downward for further chemical reaction with exposed Fe2+ rich rocks;
- **sedimentary cover** may trap migrating hydrogen, particularly if aquifer systems and/or seals like evaporites are present. Evaporites (carnallite, sylvite) may also constitute a hydrogen source;
- **Surficial hydrogen seeps** – can be blind or coincident with visible sub-circular topographic depressions on the metre to kilometre scale (‘fairy circles’);
- **Hydrogen shows in drillholes** – e.g. Yorke Peninsula, Kangaroo Island, northern Otway Basin and in the SW Eromanga Basin region.

A total of 30 ‘over the counter’ applications have been lodged for PELs targeting natural hydrogen since February 2021 (Figure 3). The first PEL was granted in July 2021 to Gold Hydrogen Pty Ltd.

**Hydrogen Generation**

Additional proposed amendments to PAGEA2000 aim to provide hydrogen generators with a leading practice regulatory and one-window to government regime.
Hydrogen Generation Licences (HGL) will cover generation currently not under PAGEA2000 – e.g. green hydrogen from electrolysis of water; Hydrogen or hydrogen compounds will be covered by transmission Pipeline Licences for transport; Amendments will be made to Gas Storage Licences to enable the withdrawal of stored regulated substances (e.g. green or blue hydrogen).

Production of hydrogen from processing natural gas or underground gasification of coal in combination with CCS (blue hydrogen) can occur through a Petroleum Production Licence and Gas Storage Licence. Santos are progressing clean hydrogen and by 2030 aim to use Carbon Capture and Storage (CCS) technology to improve the economic feasibility of blue hydrogen while reducing Cooper Basin emissions.


South Australia’s Hydrogen Action Plan aims to scale-up renewable (green) hydrogen production for export and domestic consumption. For more information and to access the free export modelling tool: https://www.renewablessa.sa.gov.au/hydrogen-in-south-australia

Proposed OT2022 Acreage Release

A new acreage release is planned in the SA Otway Basin in 2022 and industry feedback is sought. The Otway Hydrocarbon Generation Model is planned to be released in Q3 or Q4 and will inform release block design. So far research for the model has led to a new stratigraphic framework and identified new potential source rocks.

Native Title/Land Access

Right to Negotiate: As at March 2022, the relevant registered native title claimants/holders, petroleum explorers and the State Government have concluded 55 land access agreements in relation to a total of 51 licence areas:

- 7 in the Arckaringa Basin;
- 37 in the Cooper Basin;
- 4 in the Eromanga Basin;
- 1 in the Officer Basin; and
- 2 in the Arrowie Basin.

All of these South Australian agreements cover the full cycle of petroleum activities including exploration, development and production. An additional 12 PEL applications are currently progressing through the Right to Negotiate process, pursuant to the Native Title Act 1993 or will alternatively enter into an existing Indigenous Land Use Agreement.

Conjunctive Indigenous Land Use Agreements (ILUAs)

The following conjunctive ILUAs are in place over much of the Cooper Basin:

- In February 2007, the Yandruwandha/Yawarrawarrka people entered into the first petroleum ILUA in the South Australian Cooper Basin over approximately 40,000 km². This agreement also represented the first conjunctive petroleum ILUA in a productive province in Australia;

- On 2 February 2012, a second conjunctive petroleum ILUA with the Wangkangurru/Yarluyandi people was registered with the National Native Title Tribunal.

A meeting was held with representatives of the Dieri native title holders in February 2020 to initiate discussion on the development of a similar conjunctive ILUA.

To date, industry has signed on to at least 19 ILUA’s with the Yandruwandha/Yawarrawarrka and Wangkangurru/Yarluyandi people, of which 12 related to the granting of PELs in the Cooper/Eromanga Basins.

Cooper/Eromanga Basins Aboriginal Conference: The Cooper Eromanga Basins Aboriginal Conference (CEBAC), supported by the South Australian Government, was most recently held in October 2019 and continues to bring representatives from the Dieri, Yandruwandha/Yawarrawarrka and Wangkangurru/Yarluyandi people together with executives of oil & gas industry participants within the basins, as well as government officials in order to foster ongoing relationship building and increased Aboriginal participation in the oil & gas sector workforce.

In late 2021, DEM engaged KSJ Consulting Services Pty Ltd (KSJ) to undertake a review of the current and prospective CEBAC opportunities. As part of the review, KSJ will focus on three key areas; Aboriginal business capability, Industry review and program review with recommendations and implementation.

Drilling and Seismic Surveys

Cooper Basin: Petroleum drilling levels dropped in 2021 from 109 wells in 2020 to 52 in 2021, with five exploration wells, down from 10 in 2020 (Figures 3, 4 and 5). Exploration successes include Beach Energy’s Lowry South 1 and Rosebay 1 and Vintage Energy’s Odin 1 and Vintage Energy’s Odin 1 natural gas discoveries. Drilling of gas appraisal and development opportunities continue as the main focus in the Cooper Basin.

As at 27 March 2022, two exploration, six appraisal and seven development wells have been drilled in the Cooper/Eromanga basins this year with another two wells which are currently drilling. Current success rates are shown in Table 1, below.

<table>
<thead>
<tr>
<th>'New entrants'</th>
<th>Santos Joint Venture</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration wells drilled</td>
<td>308</td>
<td>55</td>
</tr>
<tr>
<td>Commercial success rate (%)</td>
<td>40</td>
<td>52.7</td>
</tr>
<tr>
<td>Technical success rate (%)</td>
<td>44</td>
<td>54.5</td>
</tr>
<tr>
<td>Appraisal and development wells drilled</td>
<td>311</td>
<td>755</td>
</tr>
<tr>
<td>Commercial success rate in appraisal and development wells (%)</td>
<td>88</td>
<td>94</td>
</tr>
</tbody>
</table>

Table 1: Cooper Basin conventional oil & gas success rates, January 2002 to March 2020.
Otway Basin: No petroleum wells were drilled in the SA Otway Basin in 2021.

Leigh Creek Energy’s Underground Coal Gasification Project: Leigh Creek Energy plans to produce energy from coal using a process known as underground coal gasification (UCG), also known as In-situ Gasification (ISG). The UCG process converts coal from its solid state into a gaseous form, resulting in the generation of synthesis gas (syngas) containing methane, hydrogen and other components.

The syngas is proposed to be used to either produce electricity directly or further refined into a variety of products such as ammonia.

Leigh Creek Energy in 2018-19 constructed and operated a UCG pre-commercial demonstration plant (PCD) at Leigh Creek, within the old mine site. This demonstration plant involved the establishment of a single gasifier chamber and associated above-ground infrastructure to produce syngas for a short period of time, to test the syngas composition and process performance to enable consideration of potential commerciality.

Any future exploration or UCG activities will be subject to relevant approvals under the Petroleum & Geothermal Energy Act 2000.

Seismic acquisition: No seismic was acquired in South Australia during 2021 although surveying for the Dombey 3D seismic survey in the Otway Basin commenced in December. Acquisition of the Dombey 3D and the nearby Lodwick 3D both commenced in February 2022 and was completed in March.
Cumulative petroleum production is shown in Table 2 and Figures 6-10 show sales and production trends. Detailed production data (to well and individual pool level) can be accessed via the PEPS South Australia online database: https://peps.sa.gov.au/home

Petroleum royalty payments to the State for the 2020/21 financial year were $86.1m, with estimated total product sales of $1.36b. This brings the cumulative royalty paid since 1970 to $3.5b (2020/21 dollars) and cumulative sales to an estimated $57.16b (2020/21 dollars). Since 1991 the average royalty paid equals a globally competitive 6.77% of the sales value.

### Cumulative Production (2020-21)
- 5.65 TCF sales gas (since 1970), 234.3 mmbbl oil (from 1983), 90.45 mmboe LPG (from 1984), 88.18 mmboe condensate (from 1983)

### Annual Production (2020-21)
- 69.65 BCF sales gas, 9.3 mmbbl oil, 1.15 mmboe LPG, 0.55 mmboe condensate

CCS UPDATE

South Australia has a large endowment of onshore storage reservoirs suitable for carbon capture and storage (CCS), particularly in the depleted oil & gas fields of the Cooper and Otway basins. The implementation of carbon capture and storage will decarbonise existing emissions intensive industries and increase their global competitiveness – especially in sectors with difficult to abate process emissions such as cement, steel and iron manufacturing; natural gas processing; and biofuel production. Furthermore, carbon capture and storage can also enable new technologies such as low carbon hydrogen production from natural gas, enhanced oil recovery and direct air carbon capture and storage.

Santos and joint venture partner Beach Energy announced their final investment decision on the $220 million Moomba Carbon Capture and Storage project on 1 November 2021, with start-up expected in 2024. The Moomba CCS project will permanently store 1.7 million tonnes per year of carbon dioxide into the depleted oil & gas fields of the Cooper Basin, representing a cut of more than seven per cent to South Australia’s emissions.

The Santos Carbon Storage Statement of Environmental Objectives was approved and gazetted on 22 April 2021. Santos is now in the process of acquiring activity specific approval for CCS, which will include the submission of a Monitoring and Verification Plan, before on-ground works may begin.

The Moomba CCS project is eligible for Australian Carbon Credit Units under the Commonwealth Emissions Reduction Fund, after a CCS methodology was approved by the Federal Government on 1 October 2021. Furthermore, the Federal Government announced a $250 million grant program on 30 September 2021 to deploy carbon capture, use and storage at scale.

Chevron announced on 5 October 2021 that it is contributing more than $2.45 million to a new laboratory and research at the University of Adelaide’s Australian School of Petroleum and Energy Resources.

NEW 2D-CUBED DATA PRODUCTS

Two exciting new data products are available to assist explorers evaluate SA basins:

- SA Cooper Basin 2DCUBED project: 2D seismic data over the Cooper Basin is being reprocessed using TGS’s 2DCUBED technology to produce pseudo-3D volumes, the project is supported by Chevron Pty Ltd. The initial 2D Pre-Stack Time Migrated lines can be accessed via the DEM website, with pseudo-3D outputs and Pre-Stack Depth Migrated outputs to be released progressively during 2022.

ROUNDTABLE FOR OIL & GAS IN SA

The Roundtable for Oil & Gas Projects in South Australia was formed in 2010 and its members come from industry, governments, peak representative organisations for industry, environment protection organisations, aboriginal people, research institutions and individuals. The aim of the Roundtable is to provide a forum for members to help inform the South Australian Government on the key priorities that will underpin the Roadmap of Onshore and Offshore Oil & Gas Projects.

The last meeting was held on December 9, 2021. You are invited to attend the next meeting of the Roundtable for oil & gas projects in South Australia:

WHEN: Date TBC – Q3 2022

WHERE: National Wine Centre of Australia, Corner of Botanic and Hackney Roads, Adelaide SA 5000.

DEVELOPMENT OF ANNUAL REPORTING

The Petroleum and Geothermal Energy Act is designed as an effective, efficient and flexible regulatory system for all exploration and production activities for petroleum, gas storage and geothermal resources onshore in South Australia, as well as the construction, operation and technical regulation of high-pressure transmission pipelines.

Key objects of the Act include:

- protecting the public and the environment from risks inherent in activities regulated under the Act;
- establishing appropriate consultative processes, both with people directly affected by activities regulated under the Act, and the general public; and
- ensuring appropriate levels of security of natural gas supply.

PESA News is the magazine that brings brand awareness to Australasia’s oil & gas sector.

Distributed within Australia and overseas, it is the perfect publication to showcase your company to professionals making key decisions in this industry.

Read by leading geoscientists and executives, PESA News will take your business into a dynamic realm of marketing to an engaged, interactive audience.

Whether you are in the public or the private sector, PESA News - online or in print - will capture the spotlight you are looking for.

To advertise, email advertising@pesa.com.au or phone Dale on 0466 325 020
THIS is the second book from Michael Burianyk, a gifted geoscientist with an elegant skill in making the mundanely difficult seem appealing and fundamentally comprehensible.

Understanding Amplitudes is written in an engaging style with a sprinkling of dry humour. Generally, if you are a professional who wants to understand what your contractors and technical specialists are telling you (apart from trying to convince you to spend more money), this is the perfect book for you.

Quoting the author, his goal is to “present as digestible an outline of the methods and techniques used to extract rock properties from seismic data.” Even a quick glance through the text will highlight that this goal is more than achieved.

The material properties of rocks begin the technical discussion in Chapter 2 after a brief introduction and outline in Chapter 1. Elasticity within isotopic rocks introduces deformation. The effects of stress and strain and the resulting pressure deformation of materials in terms of length, volume and shape are used to introduce the concepts of moduli.

After a brief discussion of Hook’s Law an analogous behaviour of simple springs is coupled with the concept of continuum mechanics and used to describe the bulk, shear and Young moduli. Lame’s first modulus and Poisson’s ratio are also discussed in terms of compressional and shear stresses creating P and S seismic waves and the resulting quantification of seismic velocity. Various velocity formulations in terms of the moduli and ratio’s are presented as a prelude to the response of seismic velocities to impedance contrasts.

Chapter 3, the physics of rocks begins with a simplistic introduction to basic rock properties using the classic sponge and Swiss cheese analogies. A mathematical understanding of how various rock components interact with each other coupled with the understanding of seismic wave propagation through these rocks defines the study of rock physics.
Empirical and theoretical relationships describing rocks is introduced in a conceptual manner highlighting that all models are valid in some form, but not always.

The discussion then moves to the derivation of bulk density of porous saturated rock. This is followed by a high level discussion of the factors affecting rock density and hence seismic velocity. The Wyllie time-average equation for predicting P-wave velocities for varying porosity is then introduced, with examples, leading into the Gardner equation for predicting density from P-wave velocity.

Each equation is discussed conceptually thus providing the ‘casual’ audience with an excellent understanding of the general applicability of the equations. The rock physicist may find the discussion a little too simplistic, but the general audience will find the discussion extremely engaging.

A brief history of velocity prediction begets the Castagna ‘mudrock’ line with the overall point being that S-wave velocity prediction requires local calibration if it is to be at all accurate. A very worthwhile discussion for those readers requiring a general understanding of their vendors’ approach to petrophysics and log prediction prior to seismic inversion studies. Theoretical models, under the heading of effective media theories are then introduced. Again a simplistic spring model is used to describe the now classic Oreo cookie model to introduce the upper (Voigt) and lower (Reuss) bounds to elastic moduli. A long numerical example is provided to highlight the computation of constituent fractions and the subsequent upper and lower (end member) bulk and shear moduli for a composite porous rock with two different fluid saturations.

The moduli are then used to calculate the P- and S-wave rock velocity for the specific example. Following a simplistic introduction of the Hashin-Shtrikman model and subsequent upper and lower bounds, the bulk and shear moduli calculation is repeated.

The formulae for these bounds are presented in a slightly different form than other references (e.g. Avseth, 2005). A quick introduction to Gassmann fluid substitution along with a general discussion of the requirement for seismic modelling and amplitude response of hydrocarbon rock is provided. Current work practices often hide the mathematical complexity behind rock physics studies. The conceptual understanding of the concepts presented in this chapter should assist the reader with using software for rock physics, modelling and fluid substitution in a meaningful way.

Seismic amplitude fundamentals are examined in chapter 4. Here Burianyk delves into the nuts and bolts of understanding the information contained in the sonic log, its integration into seismic two-way-times and creation of impedance and reflectivity curves. These are related to wavelet convolution and the creation of synthetic seismic traces. The discussion represents a theoretical background that at times is glossed over by many due to the excellent tools available in most present day interpretation software. A vital read for the less technical audience and any geoscientist on a graduate rotation or early career stage.

Synthetic well curves and high quality illustrations are employed to highlight the major points of seismic amplitude analysis. Theory is then expanded into non-normal incidence reflection and transmission prior to leading into a brief historical review and development of AVA analysis. Here the Zoeppritz equations are introduced along with the Bortfeld, Aki-Richard’s and Shuey approximations. Many readers should find the short biographical review of Ralph Shuey, Keiiti Aki and Paul Richards very interesting. Knowing the person gives one a greater appreciation for their work.

Amplitude preserving seismic processing kicks off the brief but highly important chapter 5. Amplitude interpretation is simply ineffective without a comprehensive understanding of relative-amplitude processing, its assumptions and limitations. Many references are provided for the interested reader who prefers to gain further insight into the technicalities of seismic processing, energy dispersion and divergence, anelasticity and its corrections, inverse-Q filtering and the CDP method introduced by Mayne (1962), or simply email this reviewer.

The hyperbolic moveout observed on CDP traces is discussed intuitively with no mathematics, a point that should be appreciated by many. Figure 41 describing spherical divergence and energy attenuation is one of the best this reviewer has seen in the multitude of geophysical textbooks published over the years. Expanding on this point, the text contains many full colour high quality images, many of which are recreated using original data from previous works (Gardner, Castagna, Mavko and Telford to name a few) – rather than the obligatory, ‘adapted from...’ approach in some low quality reproductions observed in other texts.

High quality colour images breathe new life into what can be seen as mundane theory. This helps to elevate the message and makes the text a very enjoyable read. Other colour figures are created from the author’s research work.

Chapter 6 discusses qualitative amplitude analysis. With a reliable processed seismic dataset, (why would we deliver anything but that?) the analyst should consider what the seismic data is saying and produce attributes to help describe the information inherent in the amplitudes.

Chapter 6 expands on these points. The technical specialist who feels they may have a strong understanding of AVA analysis can begin reading at this chapter and skip back to the preceding sections if required. Given the enjoyable read to this point and the sprinkling of dry humour and excellent discussions on the basics of amplitude analysis and rock physics.
I would suggest beginning your read from Chapter 1. An excellent discussion on DHI’s begins the dialogue. The effects of simple model combinations of gas/oil sands encased within impermeable shales are used to discuss the expected seismic amplitude response through bright spot polarity reversals, flat spots and velocity induced push-down effects.

The development of Ostrander gathers is described quite well with excellent diagrams showing ideal offset gathers and the creation of partial stacks through various 3D binning methods. This ultimately leads into a discussion of corridor and angle stacks.

The methods are introduced from the point of view of earlier AVA development where access to pre-stack data was limited due to hardware (and sometimes) software limitations. This is less of a problem today as many interpretation systems allow the loading of entire 3D pre-stack gather datasets to disk for instant viewing and interpretation.

The development of various forms of pre-stack data display is quite interesting and still provides value to this day in the form of ‘historical’ angle stack analysis. Again, polarity is always an important property to understand when analysing any type of AVA characteristic, a point that is not lost in this qualitative discussion. Practitioners should understand the nature and limitations of their processed datasets. Ignorance is not an excuse for ineffective AVA interpretation. Rather than a separation of processing, interpretation, QI, rock physics or even petroleum engineering, the increased complexity of remaining undiscovered resources demands a well rounded geoscientist working in conjunction with other technical specialists.

Quantitative amplitude analysis is discussed in chapter 7. A brief discussion of seismic ‘pre-stack’ amplitude attributes introduces the art of quantitative AVA – although very briefly. The Shuey (2- and 3-term) formulations are first linearised and discussed in relation to the Aki-Richards formula. Different aspects and limitations of these relationships are discussed in some detail. More interesting for this reviewer was the excellent discussion of the history and development of the field and the main players involved such as Wiggins, Shuey, Smith, Gidlow, Castagna, Fatti, Verm, Hilterman, Connolly and Whitcombe.

What is apparent in this historical review are that many companies were using their own (similar) derivations of the AVA formulations. The above authors were first published but the application of the science was well understood within the industry. Competitive advantage begets secrecy.

The historical development of quantitative analysis is told in a dramatic and fascinating way that I think many readers would find quite riveting. Some of the later developments such as Verm, Hilterman, Connolly and Whitcombe are described very briefly but just enough for casual reader to understand the basic use of the theory. Adequate references are provided for those keenly interested in more complete theoretical developments.

The difficult but interesting part, quantitative amplitude interpretation is examined in chapter 8. The underlying message is the requirement for careful P-wave processing designed to compensate for amplitude effects that cannot be directly related to elastic property contrasts at reflective boundaries. The message – get involved with your processing. A thorough review of the Rutherford and Williams (and Castagna) AVO classes begins the dialogue. Clear diagrams are used to describe the results and common pitfalls of derived attributes such as the A*B product. A general discussion on the effectiveness of cross plots is applied to intercept-gradient diagrams and the associated highlighting of anomalous zones on seismic sections.

Seismic amplitude inversion is handled in chapter 9. Sophistication demands quantification and this is the main focus of seismic inversion methods. This chapter is not for the faint hearted and there is a lot of mathematics – which may not suit the original wide audience of the book. I am not sure if this was a ‘bolt-on chapter’, as its style is different than the rest of the text. However, the more advanced practitioner may appreciate the point of view from which inversion is described. The practicalities of inversion are demonstrated through various synthetic examples. The impact of a low frequency model for absolute inversion results is clearly shown. Coloured inversion is described in some detail. Many references are provided for readers who wish to develop further skills or a more in-depth understanding of sparse-spike, model based and stochastic inversion methods.

I found the text quite readable, most likely stemming from the minimal quotations and references within the text body. There are obviously voluminous references available for rock properties, amplitude analysis and AVA studies and Burianyk ensures the reader is not overwhelmed with these distractions. The book concludes with an excellent glossary and reference section citing many of the more common works in AVA analysis and some additional ‘non-mainstream’ works that provide alternate view points to understanding seismic amplitude analysis.

Although not reviewed by this author, I highly recommend Burianyk’s first book, ‘Understanding Signals: Basic waveform analysis from a geophysical perspective’, also published by the SEG. It is more a booklet, written in an engaging free flowing style, making the parched nature of classic seismic signal analysis a little more digestible. Treat it as a primer. Both of Burianyk’s works are current and relevant to today’s methods of seismic signal and AVA analysis and should take pride of place in any geoscience bookshelf.

I hope you also enjoy reading these works as much as I have.
Introduction

Empire Energy Group Limited (Empire) operates unconventional shale gas assets in the Northern Territory as Imperial Oil and Gas. In 2010, Empire successfully secured seven exploration permit applications across the greater McArthur Basin (Close 2014). During 2021, Empire increased its acreage holding in the Beetaloo Sub-basin and greater McArthur Basin with the acquisition of the Pangaea (NT) and Energy & Minerals Group (EMG) joint venture assets (EP167, EP168, EP169, EP189; Figure 1). This paper summarises Empire’s exploration and appraisal activity in EP187, which is located ~650km southeast of Darwin on the eastern margin of the Mesoproterozoic Beetaloo Sub-basin.

The Beetaloo Sub-basin is a 28 000 km², completely subsurface, composite depocentre located in northern central Northern Territory (Williams 2019). The shale gas target intervals are contained within the Roper Group (Figure 2), where thickness preservation can be more than 5000m in the relatively flat-lying sub-basin. The primary marine organic-rich shale targets of the Beetaloo Sub-basin are the Amungee Member of the Velkerri Formation (1417 ± 29 Ma to 1361 ± 21 Ma; Creaser and Kendall 2007, Kendall et al 2009) and the Kyalla Formation. The shales of the Amungee Member, herein termed the ‘Velkerri shales’, are split into four stacked target intervals, listed in depositional order: A, Intra A/B, B and C Shale. The A, B, C Shales are organic-rich marine shales, whereas the Intra A/B is a hybrid shale-tight gas play. Most of the Beetaloo Sub-basin is unconformably overlain by the Neoproterozoic to Paleozoic Georgina Basin and the Mesozoic Carpentaria Basin, with Roper Group outcrop only observed toward the basin margins.

Exploration history of the Beetaloo Sub-basin

Petroleum exploration drilling in the Beetaloo Sub-basin commenced in 1987 when Pacific Oil and Gas targeted conventional traps in the upper Roper Group, with no commercial success. Dedicated drilling of unconventional targets began in 2011 with deepening and testing of the Shenandoah-1A well by Sweetpea Petroleum. This well subsequently flowed from one hydraulically stimulated...
GEO GEMS

River mine located ~100 km east of the EP187 resources area.

The Beetaloo Sub-basin is a 28 000km², completely subsurface, composite depocentre located in northern central Northern Territory (Williams 2019). The shale gas target intervals are contained within the Roper Group (Figure 2), where thickness preservation can be more than 5000m in the relatively flat-lying sub-basin.

The primary marine organic-rich shale targets of the Beetaloo Sub-basin are the Amungee Member of the Velkerri Formation (1417 ± 29 Ma to 1361 ± 21 Ma; Creaser and Kendall 2007, Kendall et al 2009) and the Kyalla Formation. The shales of the Amungee Member, herein termed the ‘Velkerri shales’, are split into four stacked target intervals, listed in depositional order: A, Intra A/B, B and C Shale. The A, B, C Shales are organic-rich marine shales, whereas the Intra A/B is a hybrid shale-tight gas play.

Most of the Beetaloo Sub-basin is unconformably overlain by the Neoproterozoic to Paleozoic Georgina Basin and the Mesozoic Carpentaria Basin, with Roper Group outcrop only observed toward the basin margins.

**Exploration history of the Beetaloo Sub-basin**

Petroleum exploration drilling in the Beetaloo Sub-basin commenced in 1987 when Pacific Oil and Gas targeted conventional traps in the upper Roper Group, with no commercial success. Dedicated drilling of unconventional targets began in 2011 with deepening and testing of the Shenandoah-1A well by Sweetpea Petroleum.

This well subsequently flowed from one hydraulically stimulated stage in the C Shale at 34 thousand standard cubic feet of gas per day (Mscf/day; Figure 3). In 2014, in the western area of the basin, Pangaea (NT) drilled the Tarlee-S3 well to appraise the Velkerri shale; and in 2015, spatially drilled Birdum Creek-1, Tarlee-1, Tarlee-2 and Wyworrie-1, which led to a gas discovery for the B Shale.

During 2014, Santos announced encouraging results of its first vertical well in the basin, Tanumbrini-1, which targeted Velkerri shales within the

---

**Figure 2:** Beetaloo Sub-basin simplified stratigraphic column. Age dating adapted from Collins et al 2019.

**Figure 3:** Cumulative unconventional drilling and well testing activity in the Beetaloo Sub-basin. Horizontal drilling and production testing is steadily increasing. Note: conventional target drilling activity predates the graphed timeline.
Velkerri shales are brittle with typically 50–60% quartz. Pre-drill expectation, with net pay of between 40 to 50m and 14 million barrels (MMbbl) of condensate in the lower.

October 2020, the Carpentaria-1 well was drilled vertically identified from the acquired seismic. During September to survey, a best estimate (2U) Prospective Resources of 3.446 Tcf of gas and 27 MMbbl of condensate was independently assessed in the EP187 permit following the drilling of Carpentaria-1. Diagnostic fracture injection tests (DFITs) indicate that the target intervals (A, Intra A/B, B and C).

A revised 2U Prospective Resources of 3.446 Tcf of gas and 27 MMbbl of condensate was independently assessed in the EP187 permit following the drilling of Carpentaria-1. Diagnostic fracture injection tests (DFITs) indicate that the target intervals (A, Intra A/B, B and C).

The Carpentaria-1 well location was selected in the deepest area of the sub-basin. Santos also drilled the shallow Marmbulligan-1 well on the flank of the sub-basin. Origin Energy commenced its drilling activity in 2015 with the Kalala-S1 and Amungee-NW1/1H vertical and horizontal wells, followed by Beetaloo-W1 in 2016.

The following year, the sub-basin’s first horizontal well, Amungee NW-1H, was successfully fracture stimulated and production tested in the B Shale. The well had an average flow rate of 1.1 million standard cubic feet of gas per day (MMscf/day) for 57 days with minimum decline. A second production test with production logging of the well in 2021 showed that of the 1100m cased section, 85–95% of production was from a 200m zone near the heel (Falcon Oil & Gas 2021).

This was likely due to a casing restriction and or plugs not being milled out, and resulted in a normalised flow rate of between 5.2–5.8 MMscf/day/1000m.

A moratorium on hydraulic fracturing of onshore unconventional reservoirs commenced in mid-2016 and was lifted during 2018, following which there was a period of baseline and regulatory updates. In late 2019, Santos fracture stimulated the vertical Tanumbirini-1 well over four stages of the Velkerri shales and conducted a 130-day flow test that exceeded 1.2 MMscf/day and stabilised at 0.4 MMscf/day with minimal decline.

Due to COVID-19 restrictions, the flow test was shut-in for 160 days; on restart, the well initially flowed at 10 MMscf/day and had an average flow rate of 1.5 MMscf/day for nine days (Tamboran Resources Limited 2020, Riddle 2021).

**Empire’s activities in the eastern Beetaloo Sub-basin**

At the time of Empire’s EP187 permit grant in 2015, the available data was limited to surface outcrop, shallow mineral boreholes, and publicly available potential field geophysical data.

There was no seismic data over the permit or petroleum wells. However, numerous petroleum wells and legacy 2D seismic data in adjacent permits, combined with the available EP187 data, gave some indication that the...
shales of the Velkerri and Kyalla Formations extended into Empire’s permit at prospective depths and thicknesses (Figure 4).

Empire acquired the Broadmere 2D seismic survey during October 2019. The 231km, 6-line seismic survey was designed on the basis of surface outcrop, potential field geophysics and shallow boreholes (Figure 5).

The seismic survey had a nominal line spacing of 8km with three of the lines on an approximately north-south trend to optimise for horizontal drilling; two lines oriented east-west, and a single line orientated southwest-northeast, with all intersecting the other lines in the survey.

Two resources areas were identified and mapped, Carpentaria and Carpentaria East, separated by a north-northeast trending faulted anticline.

Interpretation of the Carpentaria area was reasonably well constrained by ‘jump correlations’ to legacy seismic in the area to the west, which included a tie in to the Tanumbirini-1, well located 50km northwest of the permit boundary.

The Carpentaria East area was less well constrained, being separated from the Carpentaria area by a structurally complex anticline. Following the acquisition of the Broadmere 2D seismic survey, a best estimate (2U) Prospective Resources of 2.3 trillion cubic feet (Tcf) in the Velkerri shales (A, B and C) and 14 million barrels (MMbbl) of condensate in the lower Kyalla Formation was independently assessed.

The Carpentaria-1 well location was selected in the Carpentaria area within a structurally benign interval identified from the acquired seismic. During September to October 2020, the Carpentaria-1 well was drilled vertically to a total depth of 1915m.

The well encountered the target intervals shallow to pre-drill prognosis but provided a robust well-to-seismic tie to minimise depth uncertainty in future drilling; the seismic interpretation was subsequently updated. The Kyalla Formation shales were determined to be too shallow and organically lean to be prospective in EP187.

The Velkerri shales A, Intra A/B, B and C targets exceeded pre-drill expectation, with a net pay of 40 to 50m per shale target and average total porosity of ~7–9%. The Velkerri shales are brittle with typically 50–60% quartz.

Total organic carbon (TOC) averaged between 4 and 5% across the shale target intervals with a strong correlation to total porosity, which indicated organic porosity. Furthermore, the mud gas response had higher ethane, propane, butane, and pentane+ percentages than originally forecast. Openhole Diagnostic fracture injection tests (DFITs) indicate that the Velkerri shales are

<table>
<thead>
<tr>
<th>Stage</th>
<th>Target</th>
<th>Proppant Placed (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>C Shale</td>
<td>454 000</td>
</tr>
<tr>
<td>3</td>
<td>B Shale</td>
<td>375 000</td>
</tr>
<tr>
<td>2</td>
<td>Intra A/B</td>
<td>252 000</td>
</tr>
<tr>
<td>1</td>
<td>A Shale</td>
<td>305 000</td>
</tr>
</tbody>
</table>

**Table 1: Carpentaria-1 Fracture Stimulation Proppant Volume by Stage.**

<table>
<thead>
<tr>
<th>Component</th>
<th>Mole %</th>
<th>Hydrocarbons</th>
<th>Inerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₁</td>
<td>~76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₂</td>
<td>~16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₃</td>
<td>~3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₄</td>
<td>~0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C₅⁺</td>
<td>~0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>He</td>
<td>~0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H₂</td>
<td>~0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO₂</td>
<td>~0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Inerts</td>
<td>~2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2: Carpentaria-1 Commingled Flowback Gas Chromatography.**
overpressured, which is consistent with observations throughout the sub-basin.

A revised 2U Prospective Resources of 3.446 Tcf of gas and 27 MMbbl of condensate was independently assessed in the EP187 permit following the drilling of Carpentaria-1 and updating seismic mapping.

The increase of Prospective Resources post-drill was to the four target intervals (A, Intra A/B, B and C).

During June 2021, the Carpentaria-1 well was fracture stimulated across the four-target shales, one stage per shale. The volume of proppant placed per stages is summarised in Table 1. Tracers were pumped into each stage to determine relative gas and water production during production testing. The relative contribution of each stage was determined during flowback and is displayed in Figure 6; the gas chromatography is summarised in Table 2.

The gas has a high calorific content (mostly due to higher levels of ethane) and has low CO2 (<1%). Two phases of flowback were undertaken, with a hiatus due to operating constraints from COVID-19 restrictions.

The initial production test in July 2021 had an instantaneous peak flow rate of >1.6 MMscf/day, an average flow rate of 0.25 MMscf/day and final rate of 0.25 MMscf/day (Figure 7). The second production test in October had a 10-day average flow rate of 0.364 MMscf/day, representing a 45% increase.

The mechanism for the improved production rate following the pause is an area of ongoing investigation; however, diffusion of stimulation fluid in the Velkerri shales is theorised to be a potential driver. This may be a similar phenomenon to ‘soaking’ shales in the USA that has been observed to improve productivity. A discovery report was lodged with the Northern Territory government following the production test.

During November 2021, after the positive drilling and production testing results, Empire acquired the Charlotte 2D seismic survey. The seven-line 164-km survey provided infill to the 2019 Broadmere 2D seismic survey.
The nominal line spacing following infill was 4km. Four of the lines were oriented east-west and two were north-south to aid geosteering of future horizontal wells.

The survey provided additional coverage in the southern area of the permit over Carpentaria East. Following seismic processing and remapping in January 2022, the Carpentaria East area was shown to be at equivalent drill depths or deeper than the Carpentaria area over a much larger area than previously interpreted. A minor fault in the southern end of the Carpentaria East area split the previously single resources areas into a Carpentaria East and the smaller Carpentaria South.

Whilst the Charlotte 2D Survey was being acquired, drilling commenced for the Carpentaria-2 vertical and Carpentaria-2H horizontal wellbores on the same seismic line as Carpentaria-1 (Figure 8 and Figure 9). The Carpentaria-2 well was drilled through the Velkerri shales for formation evaluation and depth control purposes.

The well was then plugged back within the wellbore and kicked-off to drill the Carpentaria-2H horizontal well section. The Carpentaria-2 well intersected the same stratigraphic interval as Carpentaria-1 with near-identical thickness and reservoir properties, but ~240m deeper.

The Carpentaria-2H well targeted the Velkerri Formation B Shale and a 1345m horizontal section was drilled within a 10-metre vertical target window (Figure 10). After drilling the well, the horizontal wellbore was successfully cased and suspended to total depth. Empire plans to fracture stimulate and production test the Carpentaria-2H well during 2022.

Following the vertical and horizontal Carpentaria-2/2H wellbores and 2D Charlotte seismic survey, the Contingent Resources 2C was updated to 396 Bcf of gas and the 2U to 4.25 TcF of gas and 33 MMbbl of condensate in EP187.

The 2U Prospective Resources increase was primarily driven by the greater area of mapped shale at prospective depths in the Carpentaria East area following the acquisition of the 2D Charlotte seismic survey.

Other company exploration activities in the Beetaloo Sub-basin

Other operators have also been active in the sub-basin over the last few years. In 2021, Origin Energy drilled the vertical Velkerri-76 well to appraise the liquids rich potential of its acreage in the Velkerri shales. Also in 2021, Santos drilled, stimulated and commenced production testing of two horizontal wells from the Tanumbirini-1 well pad in the B Shale.

Tanumbirini-2H had 11 fracture stimulation stages across a 660m...
horizontal section and Tanumbirini-3H had 10 stages across a 600m horizontal section. During early production testing, Tanumbirini-2H had a 14 day average rate of 1.7 MMscf/day and Tanumbirini-3H had a rate of 1.5 MMscf/day (Tamboran Resources Limited 2022).

**Looking ahead**

Empire holds a large acreage position throughout the Beetaloo Sub-basin, both in the east (EP187) and the west following the 2021 acquisition of the Pangaea (NT) and EMG permits.

Each permit is 100% held and operated by Empire. Since the original EP187 2D seismic acquisition in 2019 and following on from the drilling and testing results of Carpentaria-1, which flowed from all four stages in the stacked Velkerri shales, Empire has acquired the Charlie 2D seismic and drilled the Carpentaria-2H well within a few kilometres from an existing pipeline.

The Carpentaria-2H well is scheduled to be stimulated and production tested during 2022; this will represent the sub-basin’s fourth and longest horizontal well to be tested in the Velkerri B Shale. Both the vertical Carpentaria-1 and Carpentaria-2 wells intersected stacked Velkerri shales with excellent porosity, TOC, brittleness and gas calorific content.

Successive seismic acquisition programs have shown the Velkerri shales to be at prospective depths across greater areas.

The seismic and drilling results have provided Empire with a 2U Prospective Resources estimate of 4.25Tcf, 33MMbbl and 2C Contingent Resources of 396 Bcf in EP187 within the Velkerri shales.

**REFERENCES**


Falcon Oil & Gas, 2021, Amungee NW-1H Normalised Gas Flow Rate Equivalent to 5 MMscf/d per 1000m Horizontal. SEDAR announcement: FO, 03 September 2021. http://www.sedar.com


Done anything incredible lately and captured it on camera? If so, PESA News would like to showcase your adventures, experiences and special moments in our creative competition, Inspirational Images.

So, whether you’re shooting seismic in some far-flung corner of the globe, bungee jumping in New Zealand or simply shooting the breeze, don’t neglect to send and share your images worth 1000 words or more. After six or so editions, PESA News will publish the best portrait picture on the cover and award a prize to the winning photographer. It might not be the lotto, but you still have to be in it to win it.

So, don’t forget to send your images to: editorial@pesa.com.au

Inspired by his better half, Junko, winning best portrait picture in the Inspirational Images competition, Ian Cockerill decided to stop on the South Perth foreshore during his ride home from work to snap the most glorious of sunsets over the Swan River.

For good measure Ian included a captivating image taken on one of his travels to the desert in Oman.

Not to be outdone June Then, who won the best landscape picture prize, sent us some eye candy from Hawaii which included a volcano erupting, a sea turtle on the beach and the Milky Way in all of its universal glory.

Rounding the action off was Stuart Munday’s image from Rob Seggie’s field trip to the Dalkeith foreshore in March.
4. INFINITE: The glory of the Milky Way reflecting the magnitude of the heavens as seen from Mauna Kea, Big Island. Picture: June Then

5. MESMERISING: Lava from Kilauea flowing into the Pacific Ocean for the first time in nearly three years. Picture: June Then

6. OH MAN: Man and woman, believed to be Ian and Junka, connect in the spiritual solitude of the Oman desert. Picture: Ian Cockerill
NEW and improved Rockin’ Words will now not only test your knowledge of the geosciences, but also a combination of recent, newsworthy events in the oil & gas industry with many of the answers to be found in this edition of PESA News. To be in the running to win a bottle of wine and 15-minutes of fame in PESA News, send your answers to editorial@pesa.com.au

ROCKIN’ WORDS:
CROSSWORD PLAY & WIN!

ACROSS
5. An arch-like fold with the oldest strata at the core
6. The NSW port earmarked to be one of Australia's hydrogen hubs
8. A production licence was granted in April for this field in the Bedout Sub-basin
9. The name of the depositional environment (zone) between the high and low tide
10. ExxonMobil took FID to expedite more gas from this field in the Gippsland Basin

DOWN
1. An ichnofacies mostly without vertical burrows
2. The 20th anniversary of this South Australia oil discovery was in March
3. Major Norwegian oil field with a shoreface sandstone reservoir is Johan...
4. The transport of sediment in short jumps and bounces
7. AGL signed a sales agreement for start-up gas from this field the Cooper Basin

#25

Rockin’ Words #25 Clues

ACROSS
5. An arch-like fold with the oldest strata at the core
6. The NSW port earmarked to be one of Australia’s hydrogen hubs
8. A production licence was granted in April for this field in the Bedout Sub-basin
9. The name of the depositional environment (zone) between the high and low tide
10. ExxonMobil took FID to expedite more gas from this field in the Gippsland Basin

DOWN
1. An ichnofacies mostly without vertical burrows
2. The 20th anniversary of this South Australia oil discovery was in March
3. Major Norwegian oil field with a shoreface sandstone reservoir is Johan...
4. The transport of sediment in short jumps and bounces
7. AGL signed a sales agreement for start-up gas from this field the Cooper Basin

ROCKIN’ WORDS: ANS WERS TO CROSSWORD #24

ROCKIN’ WORD CROSSWORD
#24 WINNER

Congratulations to CRISTY LITTLE, Senior Account Manager at Schlumberger, who was first in with her Rockin’ Words crossword competition entry for the first quarter, 2022. Cristy was rewarded with a bottle of Wildwood Ridge Reserve, Margaret River 2020 Chardonnay, courtesy of the award-winning Aravina Estate located in the premium wine growing region of Margaret River, in Western Australia. 

Aside from the stunning restaurant overlooking the vines, the manicured gardens, organic kitchen and sports car gallery feature among the many attractions at the Estate. Aravina produces trophy wines across its 14 varieties. It is also proud to be the number one wedding and events destination in the South West of WA, hosting more than 50 wedding and events per year.

To advertise, email advertising@pesa.com.au or phone Dale on 0466 325 020

PESA News is the magazine that brings brand awareness to Australasia’s oil & gas sector.

Distributed within Australia and overseas, it is the perfect publication to showcase your company to professionals making key decisions in this industry. 

Read by leading geoscientists and executives, PESA News will take your business into a dynamic realm of marketing to an engaged, interactive audience.

Whether you are in the public or the private sector, PESA News – online or in print – will capture the spotlight you are looking for.
‘The World Needs Oil & Gas to Power Our Energy Needs’

INDER CEO Damon Neaves is unapologetic about seeking new oil reserves. Finder’s recent successful IPO shows equity markets are ‘risk on’ when it comes to oil & gas. The headwinds are gone and energy is once again a global security issue. The industry needs to answer the call and find and produce more oil & gas.

Today the world consumes more than 100 million barrels of oil each day, and oil consumption continues to grow. The transition to renewables has not had the effect that many expected. Last year the IEA famously touted ‘no new investment was needed in fossil fuels’ in its roadmap for global energy, this year the IEA back-tracked by saying that the world will need to work with all of the current sources of energy.

Current events in Europe have sharpened the focus on energy – with oil returning to price levels not seen since 2014 and gas prices at record highs. But to consider the current pricing environment to be a product of Russia’s invasion of Ukraine would be to miss the full story – and the opportunity it represents.

The reality is that oil reserves have run down, and investment in oil & gas exploration has fallen well short of what is required to meet growing global consumption, which is being driven by rebounding in economic activity as the world emerges from the COVID pandemic. Renewables are increasing their penetration into energy markets, but not as quickly as many predicted.

On the supply side there has been a shift in approach by some parts of the industry. Funding is still available for oil & gas projects, but its sources are changing. Some of the big players are scaling back their investments in oil & gas to meet ESG targets. The consequence is plainly visible with oil consistently over $US100/bbl and expected to go to $US130/bbl in Q3. Consensus forecasts show a growing gap between supply and demand without significant investment in exploration and production.

In terms of oil production, the overwhelming majority of Australian oil comes from the North West Shelf (NWS), a region is still under-explored by global standards. The Dorado discovery was the biggest in the NWS in 30 years, and demonstrates that new ideas can lead to big new oil resources. It shows we need to get back to grass roots exploration in the NWS and to do that we need to attract risk capital from both industry and equity markets.

Finder Energy listed on the ASX in April this year, after a 17-year journey as a private exploration company. Our story is proof that there are investors who back the oil story and realise the opportunity that lies ahead of us.

For our company, listing on the ASX provides access to capital, which will enable us to participate in the commercialisation of any discoveries and maximise the reward to our shareholders for backing our track record of exploration success.

Right now we are drilling Kanga-1, which is located near existing oil fields in the heart of the Carnarvon Basin. The well has an independently assessed chance of success of 36%. A discovery at Kanga has the potential to be a company maker with the P50 case representing over 25 million barrels net to Finder.

We also have multiple large prospects along trend from the Dorado field. Finder is strategically positioned to take advantage of the enormous industry interest and activity as that trend is actively pursued by the industry.

Finder has also built an infrastructure-led portfolio of exploration and development opportunities in the UK North Sea. We are in the right place at the right time, given the likely embargoes of Russian oil into Europe that will come into effect early next year. The situation in Europe is the same the world over. Under investment in supply, and growing demand.

We all know the world is trying to reduce its reliance on fossil fuels, and somewhere over the horizon that will start to take hold. But we can’t be blind to the reality that right now, the world needs oil & gas to power our industry, mobility and household energy needs.

Let’s be explorers again.
South Australia’s door is open.

- Easy access to extensive well and seismic data holdings
- Cooper Basin is Australia’s premier onshore oil and gas province
- PEPS database now online at the new website
- Oil and Gas Roundtable with thousands of members working to address industry priorities
- Efficient regulatory investment frameworks
- A framework placing local companies into a global supply chain
- SA offers mature producing basins and blue sky frontier acreage
- Legislation is ‘energy transition ready’ and includes hydrogen and CCS

www.petroleum.sa.gov.au
APPEA 2022

CONFERENCE AND EXHIBITION

BRISBANE 16–19 MAY

POSITIVE ENERGY FOR A CHANGING WORLD

Both in-person or virtual options available

Principal Partners

Woodside

ExxonMobil