UCAYALI/ENE BASIN, PERU, HYDROCARBON EVALUATION
PERUPETRO S.A./PARSEP

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1. INTRODUCTION
This presentation is a summary of the Ucayali/Ene Basin Technical Report1 one of five PARSEP evaluations of the hydrocarbon potential of the Peruvian Sub-Andean Basins.

2. SCOPE OF PROJECT
This project was intended to be a regional geophysical and geological evaluation to identify new play types through the interpretation of digital seismic and well data, defining the stratigraphic and structural framework of the basin, combined with an analysis of the exploratory drilling since 1990. The project succeeded with the completion of a database to include standardized geological data, quality control of over 15,000 km of 2D SEGY seismic data, synthetic seismograms tied to seismic and wire-line logs from 40 new field wildcats, a well database in Access and technical reports of old and recent exploration activities.

A series of stratigraphic and structural cross-sections were strung across the basin to standardize the stratigraphy. SEGY seismic data was interpreted using UNIX based and PC based seismic interpretation softwares. Geological softwares were used for mapping, well log editing and cross-section construction. Supplementing the work was a Tectonic Study by A. Tankard. The Ucayali/Ene study represents a staging point to be continued by a more detailed study.

3. PREVIOUS WORK
Well Ganso Azul 1 discovered 43° API oil in the Cretaceous Cushabatay Formation in the Agua Caliente structure in 1937. It was followed by discovery of 37° API oil from Vivian sands in Maquia in 1957 and gas and condensate in Cushabatay reservoirs in Aguaytia by Mobil in 1962. In the 80’s the San Martin 1X and Cashiriari 1X Shell wells tested 41 MMcf/d gas and 1,626 b/d condensate and 56.7 MMcf/d gas and 1,553 b/d condensate from a Cretaceous/Permian section, within the Camisea Fold Thrust Belt (FTB). Appraisal wells on each of these two fields proved world-class reserves. The Mipaya 1X well was a small gas discovery. Shell made the Pagoreni 1X gas/condensate discovery in the Camisea area in 1998. Perupetro S.A. took over Petroperu former role in exploration contracts negotiations in 1993. Pluspetrol and partners won development of the Camisea gas project in 2000.

Figure 1: Area of investigation of PARSEP.

Figure 2: Structural Features, Seismic and Wells.
PARSEP is a joint technical agreement between Peru and Canada. Teknica Overseas Ltd. and Perupetro S.A. performed the technical work on this project. Other evaluations include the onshore Huallaga, Santiago and Marañon Basins and the offshore Trujillo/Salaverry Basin (Figures 1 and 2).

Figure 3: Stratigraphic Columns for the Sub Andean Basins of Peru.

- Production
Three oilfields (Agua Caliente, Maquia and Pacaya) and five gas-condensate fields (Aguaytia, San Martin, Cashiriari, Pagoreni and Mipaya) have been discovered in the Ucayali Basin. Current oil production amounts to approx 600 b/d from A. Caliente, Maquia and Aguaytia.
and over 500 MMb liquids) to be on the surface. The Marañon to the Madre de Dios Basins merges with the greater Marañon, the Solimoes (in Brazil) basins and pinches out onto the Brazilian and Guiana Shields. PARSEP intends to standardize the stratigraphy to keep it in a consistent digital database to facilitate mapping and interpretation, especially with changes made after the Camisea discoveries. The lesser-known Paleozoic stratigraphy is reviewed and condensed, since it also constitutes a potential play in the basin. The 10 stratigraphic cross-sections (two in Figures 4 and 5) include all NFW’s to show the widespread distribution of all units in the basin.

Two regional tectonic systems, the pre-Andean and Andean Systems control the geological evolution of the sub-Andean basins of Peru.

4.2 Regional Geology
The sedimentary sequence beyond the Brazilian border (Figure 2). A 5,000+m thick sedimentary section of Paleozoic to Recent ages was deposited overlying Basement (Figure 3). The dominant structural form is major basement-involved thrusting, mainly along reactivated Paleozoic normal faults and detached thin-skinned thrusts along its western margin. This study considers the Ene Basin to be a continuation of the Ucayali Basin.

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event established the NS structural trend in the basin. A trend affected by Andean structural inversion. The Permo-Carboniferous rests unconformable over the Devonian Cycle and/or Basement in uplifted areas. Sedimentation began with the Ambo Group, a continental to shallow marine siliciclastic unit, followed by the clastic-rich transgressive Tarma Formation with its basal Green Sandstone, and overlain by massive shelf carbonates of the Copacabana Group. Copacabana is present in most of the Andean basins conformably overlain by the Ene Formation/Red Bed Group whose deposition was interrupted by a regional uplift and a pronounced unconformity that marks a first order sequence boundary in late Permian.

The Andean System

The Andean System along the Peruvian Eastern Range was initiated with the beginning of subduction along the Pacific margin during the Pangea break up in Late Permian to early Triassic times. The PARSEP tectonic study (Tankard, 2001) correlates the Jurua Orogeny identified in the Acre and Solimoes Basins of Brazil with the onset of the Andean System. The Andean tectonic system is preserved in the western and NW extremes of the Ucayali Basin, where Late Permian–Triassic syn-rift Mitu continental red beds were deposited in isolated rift segments overlain by a Triassic to Jurassic-aged marine to transitional carbonates and evaporites of the Pucara Group.

**Figure 8:** Rashaya Sur 1X well, salt and 1.0-second displacement on the western-most bounding normal fault.

The Aramachay Formation represents the maximum flooding event. The Pucara marine sequence of the FTB changes to a continental facies in its eastern subsurface occurrence, except Aramachay which maintains its marine character in the San Alejandro 1X and Agua Caliente 31D-1X wells. The eastern Pucara (and Sarayaquillo) shoreline has a N–S trend from west of the Contaya Arch to the Agua Caliente field north of the Shira Mountains. The Pucara has been observed in a carbonate facies in the NW part of the Ene Basin area.

A less known carbonate/ evaporitic sequence is known in the Oxapampa wells (Figure 5). An evaporitic environment as the result of sarkkha deposition developed at the transition between Pucara and Sarayaquillo, beginning the continental and shallow marine deposition (Figure 7). Evaporites were drilled by the Oxapampa 7-1 and Chio 1X wells in the Ucayali Basin and they outcrop extensively in the Huallaga Basin and in the FTB for over 700 km. PARSEP interprets that the basin was segmented into a series of smaller Paleozoic wrench related restrictive depocenters, as west of Rashaya (Figure 8) and in the inverted half graben in Aguaytia (Figure 9).

**Figure 9:** Aguaytia structure with salt (?) within an Andean inverted graben.

With further regression the Pucara and evaporites were overlain by Middle to Late Jurassic continental red beds of the Sarayaquillo Formation. Termination of Sarayaquillo deposition is represented by the regional Nevadan unconformity over which lies sediments of Cretaceous age.
4.3 Pre-Cretaceous Stratigraphy

basins and to the north Ucayali. (Pozo Shale) restricted to the northern punctuated by a marine transgression dominant foredeep molasses deposition Orogeny in Late Cretaceous beginning arrival of the first pulses of the Andean Cretaceous deposition terminated with the remained protected from flushing. The discontinuous shales and sands that have the Cachiyacu cycle that contains Upper and Lower Vivian are separated by with good intergranular porosity. The deposition with quartz arenites complex represents the end of Cretaceous with excellent seal character. Vivian includes the maximum flooding surface beginning of a regressive episode and it of a regional transgression and the and Upper Nia. Chonta represents the end Caliente Formation to the Camisea area to wedge. PARSEP extends the upper Agua Formations disappear in a NNE/SSW 10 and 4) where Cushabatay and Raya progressively onlaps Paleozoic (Figures 5). The /Taconian Orogeny.

• Basement, Ordovician and Silurian

Several wells penetrated metamorphic and crystalline Basement to the north and east of the Shira Mountains (Figures 4 and 5). The Ordovician Contaya Formation consists of gray and black laminated hard slates. It was drilled and it is interpreted by seismic in the northern Ucayali Basin. It outcrops in the Contaya Arch and south of the Oxpampa wells underlying Cretaceous sediments. The Silurian cycle is represented by argillites, flysch and tillites possibly drilled in the Panguana and Sepa wells. This cycle ends with tectonic movement during the Caledonian /Taconian Orogeny.

• Devonian-Cabanillas Group

The Cabanillas Group has a widespread distribution in outcrops and subsurface throughout the basin reaching a thickness of 2000 and 1000m in the south and northern Peru. It is made of dark gray mudstones, shales, siltstones and sandstones deposited in moderately deep water as turbidite and hemi-pelagic deposits. Coarsening upward sequences end in flooding events with organic-rich source rock facies in the upper section.

carbonate sedimentation. The Cretaceous section thins from NW to SE as it progressively onlaps Paleozoic (Figures 10 and 4) where Cushabatay and Raya Formations disappear in a NNE/SSW wedge. PARSEP extends the upper Agua Caliente Formation to the Camisea area to include Shell’s Basal Chonta Sandstone and Upper Nia. Chonta represents the end of a regional transgression and the beginning of a regressive episode and it includes the maximum flooding surface with excellent seal character. Vivian represents the end of Cretaceous deposition with quartz arenites complex with good intergranular porosity. The Upper and Lower Vivian are separated by the Cachiyacu cycle that contains Upper and Lower Vivian are separated by with good intergranular porosity. The deposition with quartz arenites complex represents the end of Cretaceous with excellent seal character. Vivian includes the maximum flooding surface beginning of a regressive episode and it of a regional transgression and the and Upper Nia. Chonta represents the end Caliente Formation to the Camisea area to wedge. PARSEP extends the upper Agua Formations disappear in a NNE/SSW 10 and 4) where Cushabatay and Raya progressively onlaps Paleozoic (Figures 5). The /Taconian Orogeny.

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similar in rock character resting on a dark gray organic rich mudstone with strong petroleum odor and resting on limestones of Copacabana. In the Huaya 3X and Orellana 1X wells, a 160-200m thick sandstone overlying Copacabana is possibly equivalent to these units. The Shinai Member is an organic-rich carbonate mudstone with algal laminates, preserved south of the Runuya 1X well. In the Ene Basin, Ene has four units more or less identical to Ene in Camisea.

Figure 13: Stratigraphic cross-section shows detailed late Permian stratigraphy. Note excellent log correlation in Shinai.

- Red Bed Group/Mainique (Figure 13) Biostatigraphic analyses in the Mainique Gorge/Camisea area by Shell reveal the presence of the Red Bed Group of latest Permian age overlying the Ene Formation. This group is made up of the basal Lower Sandstone or Lower Nia Formation, a massive, medium to coarse-grained arkosic arenites with eolian cross bedding and good porosity. A thickness of 90 to 130m in Mipaya 1X, contrast with the 40m in the San Martin and Casiriari. The Middle Mudstone Formation is a red mudstone unit. The Upper Sandstone Formation is medium to fine-grained partly eolian moderately to well sorted. The unconformity at the Base of Cretaceous has stripped off much of these units in the fields, leaving the Lower Nia in contact with the Agua Caliente Formation, a sand-to-sand relationship forming a single reservoir.

4.4 Structural Analysis
Prominent Devonian to late Tertiary tectonic features influenced sedimentation at various stages of basin development and gave the basin its present geometry. Figure 15 is one of six structural profiles across the basin that shows several of these features.

- Devonian Faults
Two ages for Devonian faulting can be documented in the south Ucayali. The earliest represents a series of extensional faults that created deep half grabens during the Devonian (or earlier) with thick pre-Carboniferous sediments, possibly local source kitchens of Cabanillas Shales (Figure 6). The Devonian to Basement Isochron map shows very significant north-south trending features (Figure 21). The second is a compression faulting in response to the Eohercynian in Late Devonian that produced NS oriented faults.

- Late Paleozoic Faults/Structures
Almost the entire Ucayali Basin shows remnants of the late Permian extensional event, one of the most significant tectonic events being particularly important from a hydrocarbon exploration perspective. Structural features as the Contaya Arch and Shira Mountains were initiated as significant horst blocks during this extension and their current NW and NNW orientations reflect Andean imprint. Thick sequences of Carboniferous to late Permian sediments containing source rock and reservoir sequences were protected in grabens from later penepalination by early Cretaceous erosion. Low areas and isolated grabens of lower Mesozoic sedimentation and preservation were created, as the thick salt sequences and the Pucara Group. Development of subtle highs and lows influenced deposition environments and reservoir development (Pucara in Shannus 1X). The late Permian faults have a northerly direction with a tendency to favour a NNE orientation and were locally reactivated during Andean Orogeny as inversion features (Aguaytia).

- Late Andean Foreland Faults/Structures
Most wells in the basin drilled Andean aged structures with strong surface expression. In the northern Ucayali Basin, the Pisqui–Coninca–Rashaya Sur and Maquia–Casiboya trends, represent very distinctive NW Andean structural trends. Production was established only on the latter trend. In the southern Ucayali Basin, the most significant pure Andean aged structure is Sepa, which tested small oil and gas quantities in the Green Sandstone.

- Cushbatay Mountains, Contaya Arch and Shira Mountains (Figure 2)
The Cushbatay Mountains is a prominent structural feature interpreted by PARSEP as a half graben filled with a very thick succession of Mitu, Pucara and Cretaceous age. It developed concurrently with the NW–SE trending horsts and grabens seen in the SW Marañon Basin in response to the Permo-Triassic extensional event. The thick graben succession was inverted prior to Chazuta thrusting in late Tertiary. Being an old structure, it acted as a buttress to the eastward advancement of the FTB.

The Contaya Arch is a NW-SE trending horst of Permo-Triassic and Jurassic age uplifted by compression in the Neogene. Tankard postulated an origin along the NE trending Contaya Shear zone.

The Shira Mountains is the most prominent tectonic element in the basin. Its subsurface continuation to the north aligns with the Sarayaquillo and Pucara eastern wedges that divides the Ucayali into a deep western basin with a more
complete sedimentary section to the north merging with both the Pachitea sub-basin and the Oxapampa/Eno Fold Thrust Belt. In the shallower eastern and larger basin Cretaceous overlies Paleozoic. The Shira Mountains is a late Permian basement-cored horst block with a significant uplift in late Neogene that pre-date the latest deformation. It acted as a buttress to the eastward advancement of the Oxapampa/Eno FTB and Camisea FTB’s (Figure 2).

- **Fold Thrust Belt (FTB) of Western Ucayali and Ene Basin**
  - North and Central Areas (Figure 2)
    The FTB of the northern Ucayali begins between the Chazuta thrust west of the Cushabatay High, and continues south separating the Huallaga from the Ucayali Basin. On the north, the FTB is offset to the east by a northwest trending lateral ramp after which the fold belt trends almost NS to near the Oxapampa Area. PARSEP structural sections show west and east verging thrusts fronts with overturned beds.
  - Oxapampa and Ene Basin Areas (Figure 2)
    The northern edge of the Oxapampa/Eno FTB segment is offset to the east by another lateral ramp. The eastward leading edge of the FTB, the San Matias Fault, separates it from the Pachitea sub-Basin and terminates into the Shira Mountains. South of the Oxapampa wells Paleozoic. PARSEP structural profile through this FTB segment interprets two major thrusts with a detachment surface near the base of salt and Mitu levels. A second profile by Elf in the central Ene Basin, shows the principal detachment surface within the Cabanillas Formation. Elf divided the Ene Basin into three regions based on magnetic, gravity and seismicity data. The **Northern Ene** includes the Cordillera San Matias and the Oxapampa wells area and is limited to the south by the Tambo Fault, a deep magnetic basement that might have influenced the paleogeography of the basin. The **Central Ene** is occupied by a huge Tertiary syncline whose axis crosses the Tambo Fault into the northern sub-basin without any displacement and a NW Gravimetric step marks the southern boundary. The **Southern Ene** has continuous structures with less deformation, larger wavelength, shallower basement and the seismicity reveal a change in decollement folds with the principal detachment surface within the Ambo/Devonian section. Advancement of the thrust front was controlled by a depositional hingeline within Ambo (Figure 11). Termination of the Camisea FTB against the Shira Mountains is through a gradual horizontal and vertical diminishing of fault throw from east to west, roughly coincidental with the Tambo Fault. This decrease in amplitude resulted in the development of much smaller structures to the west (Mipaya) relative to the large San Martin, Cashiriari, and additional undrilled anticline trends further east (Figure 14).

- **Figure 14:** Seismic line shows the San Martin structure, and an un-drilled structure.

- **Figure 15:** Structural section from the North FTB to Santa Clara-Orellana areas.

- **Structural Profiles**
  The six structural cross-sections prepared use available, seismic, wildcats and surface geologic data. Section A on the north shows a triangle zone developing in the eastern area of the FTB.
and an unusually thick section of Ene preserved in subsurface (Figure 15). The other profiles cross the Pisqui and Cashiboya Sur anticlines, the Aguaytia gas field an inversion feature with the evaporitic unit in the Sarayaquillo/Pucara contact, thick salt swells of lower Mesozoic age drilled by the Chio well, the Agua Caliente oil field with associated Shira Structure and other Andean age anticlines, the highly deformed western FTB structural province with multiple thin-skinned thrust faults, the Camisea thrust and the less deformed eastern foreland province.

Figure 16: Base Cretaceous Time Structure, Ucayali North.

5. GEOPHYSICS
Seismic interpretation was carried out successfully in two halves–North and South of La Colpa/Runuya wells. No detailed mapping was accomplished, but the overall structural elements are clear in the mapping.

5.1 Maps Plotted
Seismic mapping was performed for five structural horizons and three isochron intervals for each the South and North Ucayali. All mapped horizons exhibit a NS trend, with shallow NE/SW trends affected by SE/NW trending faults in the Ucayali North. In the Ucayali South, there are common characters to all the horizons above the Devonian. In the northern part of the Southern Ucayali area high-angle reverse faults with small throw are re-activations of older normal faults marking the edges of grabens and half-grabens. A large Cretaceous channel occupies one of them (Figure 21).

Figure 17: Base Cretaceous Time Structure, Ucayali South.

5.2 Time Structure Maps
The Pozo Formation is a regional marker in the Marañon and northern Ucayali Basin and good time equivalent reflectors allow extrapolation further south. It exhibits the same features as the Base Cretaceous. The near Vivian Upper Cretaceous horizon is heavily fault controlled with good rollover into the faults in the Mipaya/San Martin area. It shallows to the east, over an extensive basement high. The Base Cretaceous is an easily recognizable unconformity on seismic data in the whole basin (Figures 16 and 17). It shows two large structures, the Rio Caco and Rashaya Norte (Figures 22 and 23) with closure of 100ms. The map of the South Ucayali (Figure 17) mirrors the Upper Cretaceous except where the surface is eroded and PARSEP interprets a channel feature (Figure 27). This horizon also shows good rollover into the San Martin fault. The Copacabana Group exhibits an important structural closure in the Southern portion of the Rio Caco area. The Tarma reflector has the same characteristics of the younger horizons with rollover into the main San Martin fault. The Top Devonian is the nearest horizon to basement being largely controlled by basement structuring. Along the San Martin thrust belt, it is slightly displaced by the old nearly horizontal thrust or Devonian-Ambo decollement surface that appears to control the movement of the main San Martin Thrust. In the northern part of the South Ucayali, the Devonian is faulted by the younger rejuvenated reverse faults over Basement grabens and half grabens. Contaya is a near-Basement pick with depths up to 5300ms TWT restricted to the Eastern part of the basin. Basement becomes steadily shallower to the East until it becomes almost the same as top Devonian (Figure 18). Block faulting of the basement controls much of the overlying structuring and faulting along grabens and half grabens controls younger near-vertical reverse faults.

Figure 18: Basement Time Structure, Ucayali South.

5.3 Isochron Maps
The Pozo to Base Cretaceous and Base Cretaceous to Contaya Isochrones (Figure 19) show thickening dramatically from south to north (400-1000ms TWT in the former). The latter indicates a Paleo structural high in the Rashaya structure (100+ms closure, Figure 22). An ancient depression running through the center of the Aguaytia structure indicates Andean inversion. As this is the only productive anticline in this immediate area a relationship is implied. The Salt Isochron map in Figure 7 shows the distribution of the evaporitic unit.

The main feature on the Cretaceous Isochron map is the thickening from North to South along the major channel feature (Figures 20 and 26). Further study of this feature is recommended as a new
play type is involved. The Upper Cretaceous to Tarma Isochron map indicates that the interval generally thins to the Northeast, as the Tarma becomes thinner and eventually pinches out, whereas there is a very thick late Permian unit in the Southwest. The Devonian-Basement Isochron in Figure 21 is the most significant map of the present interpretation where the following features are identified: the graben system controlling the channel feature, a major half-graben feature in the Eastern part and major thickening of the unit to the South.

Figure 19: Base Cretaceous-Contaya Isochron, Ucayali North.

- The Cretaceous Channel Play
  See Prospects/Leads.

6. WELL SUMMARY
An evaluation was done of the 10 wells drilled between 1990 and 2002 and for the Cashiriari 1X and San Martin 1X wells. A separate report has been prepared for this evaluation.

7. PETROLEUM GEOLOGY
7.1 Geochemistry
Perupetro archives include numerous modern Geochemical studies in the Peruvian sub-Andean basins that evaluate potential source rocks, oil-source rock correlations, genetically classify oils, basin modeling, hydrocarbon generation timing and location of hydrocarbon kitchens. The PARSEP group did not evaluate in detail the geochemistry of the Ucayali Basin. One of the objectives of this study was to identify potential kitchen areas for the known source rocks.

Figure 20: Cretaceous Isochron, Ucayali South.

Figure 21: Lower Paleozoic Isochron, Ucayali South.

- Source Rocks
  The Ucayali Basin has multiple source rocks in the Mesozoic and Paleozoic sequences. Commercial hydrocarbon production and most wildcats with shows point to their presence. The Triassic/Jurassic Pucara Group is a bituminous carbonate with interbedded organic rich shale sections considered the principal source rock for the oil and gas in the southern Marañon and northern Ucayali Basins (Maquia, Aguaytia and tests). The Late Permian Ene Formation is the source of the oil in the Agua Caliente Field and the oil tested in well La Colpa 1X. Excellent quality source rocks have been found within the Ene in the Ene Basin. The Ambo/Tarma -Copacabana Formations have marine shales and carbonates in the southern portion of the basin. A middle deltaic section has commonly TOC’s of 1.0 and locally over 8.0 wt% mainly humid organic matter with potential gas and oil generation capabilities. Ambo has sourced the giant gas/condensate fields of Camisea. The Devonian Cabanillas Formation has extreme maturity and moderate present-day TOC values in the SE Marañon.

- Reservoir and Seals
  Reservoirs within the basin include the Cretaceous Cushabatay, Chonta, Upper and Lower Vivian and Cachiyacu Formations. The Camisea area has proven reservoirs in the Cretaceous Vivian, Chonta and Agua Caliente (Upper Nia) and in the Permian Lower Nia and Ene (Ene and Noipatsite sands). The widely distributed Cretaceous sandstones have the best petrophysical quality and the Permian sandstones distribution is dependent upon erosional inliers. The Green Sandstone is widespread throughout a large part of the basin and in La Colpa well, it has good SP deflection, a blocky and clean GR, with 19% porosity in 38m pay. Other reservoir targets include deltaic sandstones of Ambo, the intratidal carbonates of the Pucara Group and Karsted Copacabana carbonates. In the Ene Basin, the main reservoir is the Cushabatay and potential reservoirs are within Agua Caliente and Ene sandstones. Regional seals are within the Lower Tertiary, Cretaceous Cachiayucu, Huchpayacu, Chonta and Raya Formations, in the sabkha evaporites and in the Permian Shinai Mudstone.

8. PROSPECTS/LEADS
Although the study was intended to investigate new play concepts, two structural prospects and two stratigraphic (new concepts) leads were defined. The Perupetro “Catalogo de Prospectos No Perforados” documents other structures.

8.1 Structural Prospects
- Rashaya Norte (Figure 22)
  PARSEP interprets the structure as a Paleozoic horst block where Cretaceous overlies Cabanillas on the crest. It is a much larger than Rashaya Sur where a well had gas shows, fluorescence in Raya,
Cushabatay and Pumayacu and a DST in upper Raya tested SW and 40.6° API oil.

concepts developed for the Pucara in the Shanusi 1X well that found gas/condensate from the Pucara on a paleo-horst block believed to have influenced deposition during Pucara time. Gas charged porous, high-energy carbonates or even reef deposits in a porous fairway trend within this paleo Pucara high. The CSPL lead is located within a low between two NW trending Andean aged high angle reverse faults (Figure 25A). The play is set up by an erosional high in the Paleozoic over which the Pucara was deposited with presumably high-energy carbonates. It is best demonstrated on the Pucara flattening in Figure 25B where the erosional high coincides with the subcrop edges of the Copacabana. The reflectors parallelizing the Pucara within the Paleozoic section may represent a karstified zone. Seals would be the tighter, basin carbonates of the Pucara to the east and the evaporites that separate the Pucara from the Sarayaquillo.

9. CONCLUSIONS
The regional evaluation of the Ucayali/Ené Basin developed a regional stratigraphic and tectonic framework to be used as a building block for future studies. The work completed a standardized seismic and well database digital set consisting of tied SEGY data of a large portion of available seismic, log LAS files and Access with wildcats’ data.

The Ucayali Basin is one of several under-explored Sub Andean Basins with mixed exploration success. It is a poly-histary basin, with elements of both extensional and compressional tectonics, with older, major Paleozoic normal faults being rejuvenated as reverse faults that have controlled much of the structuring and hence the trapping mechanisms.

The western boundary of the basin is dominated by a thin-skinned FTB along almost its entirety, interrupted by the Shira Mountains south of which the giant Camisea fields were discovered. The FTB...
comprises the most attractive exploration area particularly, the Camisea and the Oxapampa wells area where a significant gas column in one well was discovered.

**Figure 27**

The principal reservoirs are in the Cretaceous and the Permian Lower Nia and others in the Late Carboniferous Green Sandstone and the shoreface and fluvial sandstones of the Late Permian Ene have been targeted. The latter is a major contributor to the reserves of the Camisea fields.

The basin has multiple, mature source rocks and there has been large quantities of oil migrating through the system as evidenced by the numerous shows in most wells. Stratigraphic traps as the two documented should have an excellent chance of receiving a significant hydrocarbon charge. In the foreland, there are still a large number of undrilled structural closures of which two are documented.

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1 Ucayali/Ene Basin Technical Report available at Perupetro S.A. consists of Text with 96 pages and Illustrations in 4 Volumes.