

---

# Memery Bank

## Unitisation and Redetermination: Winning the End Game

---

Sean Rush examines the two-step solution developed by the oil and gas industry for managing the distribution of natural resources in a common reservoir.

### INTRODUCTION

The challenges of searching, boring and getting a substance that is hidden underground in vaguely defined sub-surface strata are numerous but none more important than answering the three questions (i) where is the resource? (ii) how much is there? and (iii) who owns it? To counter these particular challenges the oil and gas industry has developed the two step solution of unitisation and redetermination. Playing the end game of redetermination successfully requires an examination of the journey from discovery of a prospect straddling concession areas, strategising in the pre-unitisation discussions, negotiation of the UUOA and onto the end game of redetermination of unit interest, usually by an Expert, and implementation thereafter.

### UNITISATION OF OIL AND GAS FIELDS

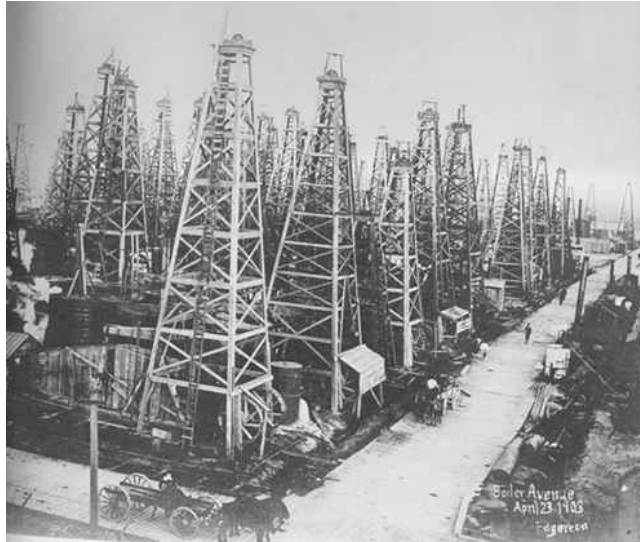
#### *Introduction to Unitisation*

Often a reservoir straddles two or more concession areas whereby the sub-surface mineral rights in the “common” reservoir are owned by different consortia. Each consortium will be constituted by Owners holding “Working Interests” in their concession areas that are established under their respective joint venture arrangements. Each consortium has an equal right in law to access the common reservoir underlying the areas of their respective concessions.

In the absence of an alternate legal construct, the common law may apply the “rule of capture” which provides that, where hydrocarbons from one owner’s area migrate to its neighbour’s area, the neighbour is entitled to extract such hydrocarbons and claim good title. In the United States the rule incentivised landowners to drill as many wells on their land and pump as much oil out as fast as possible before their neighbours drained the common reservoir. This wasteful activity led to duplication of capital spend, poor reservoir management, no secondary recovery and ultimately less oil extracted with a consequential reduction in revenue to the concession grantor, usually the Government. The below photograph of Spindletop’s Boiler Avenue, Texas (1903) illustrates the problem.



In the absence of an alternate legal construct, the common law may apply the “rule of capture” which provides that, where hydrocarbons from one owner’s area migrate to its neighbour’s area, the neighbour is entitled to extract such hydrocarbons and claim good title.



*Spindletop's  
Boiler Avenue,  
Texas (1903)*

To ameliorate the problem Governments have encouraged unitisation of fields to promote the collective development of a common reservoir by the Owners. The solution sounds simple – the Owners establish the extent of the common reservoir (the “Unit”) and then ascribe a proportion of it to each of the underlying concession groups creating each concession groups’ “Tract” with the resultant proportion that the Tract bears to the total common reservoir being the group’s “Tract Participation”. The Tract Participation is then multiplied by each of the Owners’ Working Interests as recorded in the underlying JOA to give each Owner’s share in the Tract. An Owner’s ownership interest in the unitized common reservoir (its “Unit Interest”) is the aggregate of that Owner’s interests in the various Tracts that make up the Unit. Applying these principles enables the cost effective development of fields straddling concession boundaries and maximum recovery due to consolidated reservoir management.

The legal construct of Unitisation answers the third of the questions posed above — “who owns the resource?” However, it doesn’t answer the other two questions, “where is it?” and “how much is there?” — both of which need to be answered before the process of Unitisation can proceed.

### ***Pre-Unitisation***

In the early stages of a field’s development a reservoir that straddles concession boundaries will be relatively undefined in the sense that the stratigraphic trap that forms the common reservoir may have been identified solely by seismic data perhaps in combination with data from analogues or offset wells. The concession groups may then agree to drill a further exploration or appraisal well to appraise the reservoir. Because the “where?” and “how much?” questions are best answered by well data, the location of that well and all subsequent appraisal and development wells will prove critical to the final assessment of Unit Interests. Accordingly, it is usually in each Tract’s interest to ensure that sufficient wells are drilled in its Tract to provide best evidence of reserves in the Tract.

In addition, the decision as to who is to be the Unit Operator will be important. Typically, the Owner appointed as Unit Operator will be able to steer

As the field develops and production information is received, the Owners may revisit the initial Unit Interest assessment so that by the end of field life each Owner has received the production (and cost share) that it is entitled to by virtue of its Tract Participation.

where wells are to be drilled and other data collection processes that will be payable by the unit account. Additionally, the Unit Operator will be charged with the development of a reservoir simulation model depicting the Unit Operator's view of the reservoir, including shape, flow rates, porosity, permeability, oil in place or STOOIP, and IGIP, and the distribution of both across the common reservoir, thus providing an early best estimate answer to the "how much?" and "where?" questions.

Tract Participants who share their Tract with the Unit Operator can therefore take comfort that the Unit Operator will seek to promote a work programme and field development plan that proves up reserves in the Unit Operator's Tract provided it can be justified as complying with good oilfield practice. Conversely, Owners who are not aligned with the Unit Operator need to take certain steps to protect their interests so that when a final assessment of Unit Interest is undertaken, they are able to present sufficient information to counter the Unit Operator's assertions of hydrocarbon volumes and distribution across the common reservoir.

All of these matters must be borne in mind from the initial stages. Often the groups will agree a Pre-Unitisation Agreement or other cost sharing agreement to facilitate the identification and appraisal of the common reservoir and preparation and approval of the development programme and budget. Once a development decision has been made, the historic costs borne by each concession group that relate solely to the common reservoir along with the joint costs of appraisal will feature prominently in the negotiations of the UUOA in addition to the initial Unit Interests which will govern development cost and production share going forward.

### ***The Unitisation and Unit Operating Agreement***

The UUOA, *inter alia*, is the first formal attempt by the respective Tract Participants to document the geologic answers to the questions "how much?" and "where?" and consequently "who owns?" and a process for answering these questions in the future as new data is obtained.

After completion of the work undertaken pursuant to the Pre-Unit Agreement, there will be a reasonable database to work with, including well data which gives the best information of the characteristics of the targeted reservoir. The more well data available the better the data set leading to a better assessment of initial Unit Interests. This data set will be added to over time as more information is gathered throughout Unit Operations and will be maintained by the Unit Operator as the "Project Database". It will feature prominently in the end game. Until that time, this data will provide the basis for assessing the ownership division between the Tracts which, importantly, will be the basis for which the development costs will be incurred.

As the field develops and production information is received, the Owners may revisit the initial Unit Interest assessment so that by the end of field life each Owner has received the production (and cost share) that it is entitled to by virtue of its Tract Participation. This process of revising the originally determined Unit Interests is known as "redetermination".



Broadly speaking, redetermination is a process whereby the Owners agree that at one or more dates certain in the future they will agree to revisit the Unit Interests in the light of information received from new wells or production data.

## **REDETERMINATION**

### ***Introduction to Redetermination***

Broadly speaking, redetermination is a process whereby the Owners agree that at one or more dates certain in the future they will agree to revisit the Unit Interests in the light of information received from new wells or production data and, where appropriate, adjust the Tract Participations to reflect the proportion of the reservoir and associated hydrocarbons that the new data now suggests underlies each Tract.

The basis of, and methodology for, the calculation of hydrocarbon volumes is a matter for agreement in the UUOA. It is thought that most North Sea unitized fields utilize a STOOIP approach due to its simplicity and ability to calculate early in field life. Other mechanisms include assessing the recoverable reserves, i.e. what will actually be produced over field life (problematic because it can only be calculated accurately at end of field life), and moveable oil in place which is STOOIP less the estimated oil left in the reservoir at abandonment which, again, can only be calculated with certainty at end of field life and needs to accommodate the inaccuracies associated with estimating STOOIP. Nevertheless, a Unit may choose to move away from a STOOIP approach where the hydrocarbon recovery factor per unit volume of rock may vary across the reservoir.

The Unit Operator, sometimes with assistance from non-Operators, will collate the Project Database and derive from that its best estimate of the revised Unit Interests utilizing the agreed mechanism for calculating hydrocarbons in the reservoir. This is then presented to the Unit Operating Committee, usually for unanimous approval. Failing such approval, an independent Expert will be retained to review the Project Database and provide its own independent assessment which will be final and binding. Thereafter, adjustments to capital expenditure and production up to the effective date of the redetermination are implemented in an agreed manner. Three key aspects of the process as outlined are the Project Database, the Expert and the implementation of the redetermined Unit Interests.

### ***Project Database***

Because the redetermination is based purely on what is in the Project Database it will be important for Owners to be able to contribute well or other data proving reserves in their Tract that may not be otherwise included in the Project Database due to being obtained outside of Unit Operations. Unless good oilfield practice incentivises the Unit Operator otherwise, the Unit Operator itself is unlikely to pursue any operations that may have the effect of proving up reserves in a Tract in which it has little or no interest. Not only would such activity reduce the Unit Operator's Unit Interest but the Unit Operator would have to pay its Unit Interest share of the associated costs. As a result, it will be important for Owners to retain a right in the UUOA to collect seismic data and to undertake exploration or appraisal drilling operations on a sole risk basis in order that this information can be contributed to the Project Database and eventually find itself before the Expert.

If the Unit Operating Committee are unable to agree to the redetermined Unit Interests recommended by the Unit Operator, the matter is invariably referred to a third party Expert that is typically a reservoir management service company.

Sole risk drilling activities undertaken pursuant to a UUOA have a much reduced scope than those undertaken pursuant to a JOA because the sole risk parties are attempting to prove up the extent of an existing reservoir rather than discover, appraise and potentially develop a new reservoir. Additionally, if successful, the Unit Owners who did not participate will be encouraged to “adopt” the well into the Unit and will not be subject to the punitive buy back multiples as is standard in most JOAs. The well may subsequently be used to produce Unit production and the resultant data is assimilated into the Project Database and thereby available for consideration in the redetermination assessment.

In addition, it is wise for such Owners to ensure that offset well or other data that may have relevance to the Unit Reservoir’s geology and productivity can be contributed to the Project Database with the intent that information derived outside of Unit Operations by Owners independently can be included in the Project Database.

The Project Database will also contain the Unit’s reservoir simulation model that will have been built by the Unit Operator, sometimes in collaboration with other Owners. The simulation model is likely to be the best available model dealing with the reservoir and is a fundamental tool for reservoir management during operations and for redetermination. In order for any Owner to credibly persuade an Expert that the Unit Operator’s model is incorrect and that reserves that are not accounted for in the Unit Operator’s model lie in its own Tract, such Owner will need to have a full and cohesive comprehension of the Unit Operator’s model. As such, it will be important that the Unit Operator be required to produce the reservoir simulation model in non-proprietary software format in a timely manner so that Owners are able to assess and challenge the model or adapt it to meet its own purposes.

### ***Expert Determination***

If the Unit Operating Committee are unable to agree to the redetermined Unit Interests recommended by the Unit Operator, the matter is invariably referred to a third party Expert that is typically a reservoir management service company. The Expert will usually be selected by the vote of the Unit Operating Committee. The UUOA will incorporate the Expert procedure to be followed. The type of procedures commonly used include (i) the “Shot gun” approach where the Expert delivers its own decision; (ii) “pendulum” (or baseball as it is known in the US) where the Expert must select one of the Owners’ suggested redetermination of Unit Interests; and (iii) “Guided Expert” where the Expert sits with the technical team as an observer throughout the process and is then called upon to decide selected issues that cannot be agreed.

To ensure that local arbitral legislation will not apply to the agreed process, it is important that the UUOA confirms that the Expert is to have no judicial function. The resultant work is then delivered to the Owners as a final and binding decision. However, due to the significant values involved and complexities of the subject matter, challenges to an Expert’s decision have resulted in lengthy and costly Court actions.



To minimize potentially large swings in Unit Interests, UUOAs can provide for several redeterminations. In this way the Owners seek to mitigate the risk that a final one off settlement will be excessively burdensome which may militate against an amicable settlement.

### **Implementation**

In addition to changing the allocation of costs and production on a go forward basis to align with the adjusted Unit Interests, the UUOA will provide a mechanism to reapportion historic capital costs and production that were allocated to one Tract or other in accordance with the former Unit Interests. The methodology is a form of banking system with production and cost “credits” and “debits” being identified, although, until redetermination occurs the Owners can never be sure how much debt they have accumulated or exactly when it must be settled. The key variables and mechanisms for adjustment are as follows:

- (i) *Production.* Historic production that was allocated to Owners in accordance with the former Unit Interests is commonly adjusted by allocating a proportion of production from the Owners whose Unit Interests have been reduced to the Owners whose Unit Interests have been increased for a set period until the volumes that were wrongly allocated have been repaid or “made up”. It will be important that any redetermination is held far enough away from estimated end of field life to ensure that there are sufficient volumes available for make up. No account is taken for differentials in commodity prices which can lead to windfalls depending on the difference in value of the volumes when originally produced and the same volumes when produced and re-allocated as “make up”.
- (ii) *Capital costs.* Historic capital costs and pre-production operating expenses are typically adjusted by a lump sum cash transfer from one Owner or Tract group to another, with an interest component, but even this seemingly simple process may not be without difficulty. In one unusual case of redetermination involving the Balmoral field on the UKCS the capital costs were so great and the associated make up worth so little, that the Owners were understood to be litigating to have their Unit Interests reduced rather than increased, such was the failure of that field’s performance.
- (iii) *Operating costs.* Operating costs after production commencement associated with producing the volumes originally are not subject to reallocation on the basis that such costs will be self adjusting by attaching to the equivalent make up volumes. This presupposes that operating costs on a per barrel basis remain the same throughout field life which may not always be the case.
- (iv) *Alternates to “make up”.* An alternative approach is for the Owners to agree that compensation for production, capital and operating costs wrongly allocated will be effected by lump sum cash settlement whereby the constituent value of each, as and when it was incurred or produced, is assessed and reconciled with a resultant cash settlement. However, due to the potentially high volume of production that may be lifted between determinations and its associated value, a very small percentage change in Unit Interests can result in the cash transfer of many tens or even hundreds of millions of dollars between Owners.

Unitisation and redetermination remain the oil and gas industry's best mechanism to manage the unknown distribution of hydrocarbons in a common reservoir.

The uncertainties associated with adopting such mechanisms at a time far removed from the time for make up or cash settlement provides one reason why redeterminations have been so litigious. Whilst most organizations will respect the principle that each Owner should receive its fair entitlement of production, the timing for any make up and cash settlements can be inconvenient. In times where cash has more value in the bank and credit is difficult to come by, any transfer of significant sums will likely be resisted. Similarly, organizations providing make up volumes will be reluctant to do so in a high crude price environment.

To minimize potentially large swings in Unit Interests UOAs can provide for several redeterminations. In this way the Owners seek to mitigate the risk that a final one off settlement will be excessively burdensome which may militate against an amicable settlement. Nevertheless, it is commonplace for agreed settlements to be difficult to achieve as Owners optimise the process in an attempt to ensure that cash settlements or production reallocation occur at a more convenient time. Disagreements that would normally form the subject of an amicable settlement become protracted and often litigious as Owners digest the redetermination's value proposition.

## CONCLUSIONS

Unitisation and redetermination remain the oil and gas industry's best mechanism to manage the unknown distribution of hydrocarbons in a common reservoir. It seeks to answer the "where" "how much" and "who" questions by creating a production and cost "banking" type of arrangement that can be revisited as more geologic information provides better and more accurate assessments. The process is inherently flawed because geologic uncertainty can never be completely resolved. Whilst the flaws are inherent, understanding the end game that will be played in front of an Expert from the inception of the process will provide some comfort that Owners receive as fair a distribution of cost and production as possible.

### About the Author

**Sean Rush** is a partner at Memery Crystal and an international energy lawyer with particular expertise in the oil and gas industry. Previously he was Senior Counsel for Petro-Canada's International and Offshore Business Unit and was personally involved in the negotiations of UKCS's Goldeneye and Guillemot West UOAs and the East Coast Canada's Hibernia South Extension's Unit Agreement and Unit Operating Agreement. He participated in the third Audrey redetermination (UKCS) and supervised the implementation of the Terra Nova field's redetermination.



Sean Rush  
T +44 (0) 20 7400 3237  
srush@memerycrystal.com

44 Southampton Buildings  
London WC2A 1AP  
T +44 (0) 20 7242 5905  
F +44 (0) 20 7242 2058  
**www.memerycrystal.com**  
LDE No: 156 Chancery Lane

© Memery Crystal LLP 2010 - All rights reserved. Information contained in this article does not constitute legal advice and is provided for informational purposes only. Recipients should not act upon it, but should seek legal advice relevant to their own situation.