



# Reservoir ⚙️ Settings

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## Topic: USE OF DST AND EXTEND WELL TEST



Nelson Nishimura  
5 days ago This message has been cross posted to the following Discussions: Projects and Facilities and Reservo...

Mark Rayfield  
2 days ago The answer is it depends, but generally in an offshore greenfield situation the absence of a DST/E...

Henry Irrgang  
2 days ago Dear Nelson, The Halibut Field in the Gippsland Basin (SE Australia ~1970), and the Tui area fi...

Robert Hite  
2 days ago Nelson, The simple answer to your question about whether offshore operators go to the developme...

Andrew Odonovan  
yesterday Nelson, I'd like to support Robert Hite's excellent comments, but with an example where an EWT...

Robert Hite  
yesterday All, Forgive me if I am going on too much, but I spent a good portion of my career working th...

Andrew Odonovan  
5 hours ago Nelson, ,and Robert, my apologies as it looks as if my post was misleading - reading it back...

Laurence Ormerod  
5 hours ago Dear All I am sure I speak for many when I say thanks to Robert and to Andrew for these exce...

### 1. USE OF DST AND EXTEND WELL TEST

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Posted 5 days ago

astviewer%2fviewthread%3fMID%3d16029%26GroupID%3d4579%26tab%3ddigestviewer%26UserKey%3def9789f6-27e7-4d6d-86e5-6b6cf063e4df%26sKey%3d43D6576064CD42F1907A)

(http://connect.spe.org /network /members /profile /?UserKey=90021698-d85d-4dc8-95d7-5108f5f8cc11) Nelson  
This message has been cross posted to the following Discussions: Projects and Facilities and Reservoir .  
-----  
We would like to know if any operator goes on to development phase without use of DST's and/or EWT's ?  
Mainly considering offshore fields.  
Regards,  
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Nishimura  
 (http://connect.spe.org  
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 d85d-4dc8-95d7-5108f5f8cc11)

Nelson Nishimura  
 Petroleum Engineer  
 Petrobras  
 Rio de Janeiro  
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## 2. RE: USE OF DST AND EXTEND WELL TEST

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Posted 2 days ago  
 Edited by Carly Wohlers yesterday

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 8a07-9f4ceb3a7901)

The answer is it depends, but generally in an offshore greenfield situation the absence of a DST/EWT is non negotiable to making a risked final investment decision. I looked for examples a couple of years ago of this type and was not able to find any.

Technically the exceptions would be "development as appraisal" in an extension of a well understood cluster style play, with known uncertainties, where the investment in appraisal would be comparable to the NPV. There are examples of these types of development mainly in gas in Eygpt, GoM, Australia I'm aware of but they are not the primary development which is paying for the infrastructure. The other reasons why DST/EWT may be required are regulatory or to secure external funding. The last one is not the case for all companies but it is a generally a hurdle for those who might otherwise choose to take on an additional investment risk.

Mark Rayfield  
 (http://connect.spe.org  
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 8a07-9f4ceb3a7901)

Mark Rayfield  
 Principal Reservoir Engineer  
 Ophir Energy  
 PerthWA  
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## 3. RE: USE OF DST AND EXTEND WELL TEST

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Posted yesterday

(http://connect.spe.org  
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 fae7-4c5d-  
 8460-57754ed251a6)

Dear Nelson,

The Halibut Field in the Gippsland Basin (SE Australia ~1970), and the Tui area fields (Tui, Amokura, Pateke, 2007) in the Taranaki Basin of New Zealand were developed without any DST or production test. They are high permeability fields.

-----  
 Henry Irrgang  
 Reservoir Engineer  
 Irrgang Rsvr Mgmt Pty Ltd  
 Gynea  
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Henry Irrgang  
 (http://connect.spe.org  
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**4. RE: USE OF DST AND EXTEND WELL TEST**

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(<http://connect.spe.org/network/members/profile/?UserKey=a943eed4-d1ad-4fd5-bdb5-d255924dbf97>)

Nelson,

The simple answer to your question about whether offshore operators go to the development phase without using a DST or EWT is absolutely yes. Most of the early Deepwater Gulf of Mexico developments, including the Auger, Mars, and Ursa TLP's were done without such tests and they all were certainly major expenditures with each costing much more than 1 billion USD, and in hindsight, it seems to have been the correct decision. In 2001, I participated in an SPE Applied Technology Workshop entitled "To Test or Not to Test" which thoroughly discussed this topic and at that time certain groups were aghast at the idea of proceeding to a major development without testing, but I am convinced that the dogma of always doing a test is a bad idea and I have made my living over the past 15+ years as a well test guru.

Robert Hite  
(<http://connect.spe.org/network/members/profile/?UserKey=a943eed4-d1ad-4fd5-bdb5-d255924dbf97>)

The proper way to decide whether to test is to use the concept of Value of Information from Decision Analysis theory. I would refer you to SPE 110378 that reviews VOI in the petroleum business going back to 1960, but I have found that Dunn's SPE 24672 is a particularly coherent explanation of a subtle, complex idea. For a well test to be valuable, you have to understand both what you might learn from a test and how that new-found knowledge will change your existing plans. For instance the Auger-Mars-Ursa work was done in the mid-early 1990's, but 10 years later when we were looking at the ultra deepwater, the crude had a higher viscosity and the expected perm was lower; in that case a test to determine the permeability was essential to proceed with development.

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I hope that helps.

-----  
Robert Hite  
PTA Consultant  
Blue Ridge PTA  
Asheville NC  
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[Show Original Message](#)**5. RE: USE OF DST AND EXTEND WELL TEST**

1

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Posted yesterday

digestviewer%2fviewthread%3fMID%3d16029%26GroupID%3d4579%26tab%3ddigestviewer%26UserKey%3def9789f6-27e7-4d6d-86e5-6b6cf063e4df%26sKey%3d43D6576064CD42F1907A)

(<http://connect.spe.org/network/members/profile/?UserKey=c1165754-430c-47ff-a458-5b19ac9eab7e>)

Nelson,

I'd like to support Robert Hite's excellent comments, but with an example where an EWT was critical to the development decision. The Clair field offshore West of Shetland with an estimated >5bn bbls in place was discovered in 1977 and not sanctioned for development until 27 years later. More than 25 appraisal wells had failed to prove economic well rates from this low permeability but naturally fractured Devonian reservoir. In 1996, the first horizontal well intersected 6 fracture zones and produced at a steady rate of 15,000bopd without significant decline, demonstrating how the field could be developed and the Clair Phase 1 development was sanctioned a few years later.

Andrew

Odonovan  
<http://connect.spe.org/network/members/profile/?UserKey=c1165754-430c-47ff-a458-5b19ac9eab7e>

Clair Phase 1 developed only a third of the reservoir volume and was an initial development to test whether waterflood could be effective in this fractured reservoir. Success on Phase 1 - effectively an extended production test under water injection - unlocked the full potential for the Greater Clair Area and supported the subsequent sanction of the larger Clair Ridge project.

This positive example supports Robert's comments - it's about understanding what the EWT or DST or any other production data can tell you that you may need to understand in order to proceed with sufficient confidence to make an investment decision. Equally, if you are sufficiently confident of production rates, drainage areas and recovery mechanisms, usually through sufficient analogue information, then there is no reason not to proceed without these costly tests.

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-----  
 Andrew Odonovan  
 Chief Reservoir Engineer at Bowleven Oil & Gas  
 AOD Consulting Ltd  
 Banchory  
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## 6. RE: USE OF DST AND EXTEND WELL TEST

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Posted yesterday



<http://connect.spe.org/network/members/profile/?UserKey=a943eed4-d1ad-4fd5-bdb5-d255924dbf97>

All,

Forgive me if I am going on too much, but I spent a good portion of my career working this issue, primarily in the Gulf of Mexico, so I want Nelson to make the best decision for his situation and the parallels are very strong. For the case that Andrew referred to in which one has sufficient information from other sources and chooses not to test. Andrew talks about using analogs, and they are certainly part of the story, but by briefly considering the Deepwater GOM case history, you can start to grasp all the other possible sources of similar information.

Robert Hite  
<http://connect.spe.org/network/members/profile/?UserKey=a943eed4-d1ad-4fd5-bdb5-d255924dbf97>

First of all, you just need to ask what type of information you can learn from any well test and essentially there are only 4 major categories - fluid samples, instantaneous rate from the reservoir (primarily perm, but also perhaps natural fracture descriptions), instantaneous rate from the completion (skin, effective fracture and/or horizontal length, conductivity), and continuity/drainage area/sustained rate.

Looking at each of these categories in turn for what we did in the Deepwater GOM, the wireline formation tester tool was sufficient to get good quality fluid samples. Before 1990, reliable fluid samples probably required a full DST, and even today there may be parts of the world where the WFT is inadequate, but that is increasingly rare.

For rate from the reservoir, permeability is the primary parameter, and perhaps you can learn some of that from analogs, but in our case we thought we could get permeability from core and log data aka petrophysical perm estimates. We did extensive comparisons of petrophysical perms to well test perms in existing fields and thought that properly compared the two types of perms agreed, but with a wide uncertainty of about a factor of +/- 2.5. That is to say that if the petrophysical perm was 250 md, there was an 85% chance that the perm was at least 100 md. Because the quality of the rocks was high in the early Deepwater GOM, we used this idea to make us realize that testing for perm here was not necessary. In the later Deepwater GOM, this was not true and we needed better perm evaluations, but there we used the WFT tool in its mini-DST mode; see SPE 114869. Lastly, one of the main conclusions from the 2001 ATW was that perm from carbonate reservoirs was much more uncertain and there was a stronger need to test in those environments.

For rate from the completion, skin is the focus here and analogs were a big part of the study, but not as directly as one might think. In the GOM, sand control is critical to a successful well, and a historical data base of 300 analog wells suggested two essential ideas. With the completion practices of the time, early 1990's, the skins would be too

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high for successful high rate Deepwater wells (median skin = 15, mean = 23) and the variability in skins was so high that a one-off well test to determine skin was not going to be very valuable. All of this skin analysis emphasized the need to improve completions to make the Deepwater GOM successful, but that was not something done with a single exploratory/appraisal well test.

The last category of continuity is perhaps the most interesting because early on this was identified as the major potential stumbling block to the success of the Deepwater GOM and analogs were a part of it, but the single biggest effort was looking at the geology of the depositional environments found in the Deepwater. For a period of 5-7 years, there was a multi-disciplinary team in Shell's New Orleans offices looking at the continuity of these deepwater turbidite reservoirs. At this point I am unclear on the effort, but I estimate on the order of 50-100 man-years was spent on this subject within the Shell New Orleans organization. A lot involved outcrop studies which the group either did itself or sponsored academics to do; I have a table of 25 different locations that were part of this sequence of studies. Clearly most decisions about whether to well test will not involve this scale of effort, but I want to emphasize the multi-disciplinary nature of the effort and the sorts of resources one ought to use in making these decisions about whether to test.

Enough!

-----  
 Robert Hite  
 PTA Consultant  
 Blue Ridge PTA  
 AshevilleNC  
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## 7. RE: USE OF DST AND EXTEND WELL TEST

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Posted 5 hours ago

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 47ff-a458-5b19ac9eab7e)

Nelson, ,and Robert,

my apologies as it looks as if my post was misleading - reading it back I realise why. The 15,000bopd well was an EWT appraisal well and many of the other vertical appraisal wells had also been tested but at much lower rates ~1,000bopd which were not economic in the offshore environment West of Shetland. It was the successful EWT that triggered the field development decision.

Andrew  
 Odonovan  
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 47ff-a458-5b19ac9eab7e)

My point was that in this instance, the EWT provided the critical data point that the reservoir could be developed with economic well rates, in this case through horizontal wells accessing fracture zones. The actual technical details are not the point here, rather the bigger picture, that the decision to test, whether DST or EWT or even an early production scheme should be a data driven decision - or rather one that fills in a critical data gap.

-----  
 Andrew Odonovan  
 Chief Reservoir Engineer at Bowleven Oil & Gas  
 AOD Consulting Ltd  
 Banchory  
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### 8. RE: USE OF DST AND EXTEND WELL TEST

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cf0b-4043-85e5-1d7abdd6492e)

Dear All

I am sure I speak for many when I say thanks to Robert and to Andrew for these excellent contributions.

-----  
Laurence Ormerod  
Director  
Ormerod Consulting Ltd  
Levens

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