Oil Reserves Growth Potential

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Reserves Growth

The amount by which initial estimates of the reserves in a field or population of fields will (or are expected to) grow with time

It is important to distinguish between growth in different categories of reserves (eg proved vs. proved and probable) or under different reporting regimes (eg US vs UK)

– What are the sources of growth?
– How do you measure it?
– What is it’s magnitude?
Reserves Growth is:
• Typically a factor in mid to late field life
• Expensive
• Measured by comparing prediction with actual

9.4 bnbbl to 13.5 bnbbl

Original Proved Reserves
Actual and Forecast
Planned 1977
Original Reserves
Reserves Growth is:

- Variable (and may be negative)
- Not necessarily restricted to late field life
- More difficult in deepwater environments
Sources of Reserves Growth

- **Addition (Shallow Pool)**
- **Extensions/Additions**
  - Increased In-place
  - Revisions/Imp. Rec.
  - Increased Recovery
- **Revisions/Improved Recovery**
- **Addition (Satellite)**
- **Extension (Structural)**
- **Extension (Stratigraphic)**
- **Addition (Deeper Pool)**
The Roles of In-Place and Recovery

Reserves Growth is:

- A combination of in-place and recovery changes
- Often attributed primarily to recovery increase since in-place volumes are studied less frequently
Combining In-place and Recovery effects

![Graph showing the relationship between Oil-in-Place Multiplier and Recovery Factor Multiplier for different reservoirs. The graph illustrates reserves growth and decline for various reservoirs with distinct colors and patterns.]

- **No Growth**
- **Gyda**
- **Ula**
- **Miller**
- **Harding**
- **Endicott**
- **Pt MacIntyre**
- **Mars**
- **Pompano**

**Reserves Growth**

**Reserves Decline**
### EIA discovery estimates for L48 – ’77-’91

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Data from EIA database to ‘91 (Attanasi & Root ’94)
## EIA estimates – Arrington approach

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**Year of Discovery**

Data from EIA database to ‘91 (Attanasi & Root ’94)
Reserves Growth – USA Oil

Rapid growth in the first few years, then slows
Growth continues to 60 years (and beyond)
Cumulative revision ratio about 10

Data from EIA database to '91 (Attanasi & Root '94)
Reserves Growth – USA Oil

A Cumulative Revision Ratio of 10 over 65 years
Growth = 22 bn bbl
(Compare with Proved Reserves of 24 bn bbl)
Reserves Growth – USA Oil

More growth for older years of study, Less growth for more recent years

Data from EIA database to '91 (Attanasi & Root '94)
Proved Reserve Additions – USA Oil

Data from EIA annual reports

Revisions % on a 3-year rolling average
Oil Reserves Changes by Field - UK

Data from DTI annual “Brown Book” reports
Oil Reserves Changes by Field - Norway

Data from NPD annual “White Book” reports

Changes to reserves since development approval
IHS and OGJ Remaining Reserves

Data from IHS Energy and OGJ annual reports
Growth in IHS Original Reserves – World

Data from IHS Energy annual reports
Growth in IHS Original Reserves – FSU

Data from IHS Energy annual reports
Growth in IHS Original Reserves – MidEast

Data from IHS Energy annual reports
Growth in Global Oil Reserves

Arrington approach

Based on 11 year average '93-'03

Cumulative Revision Ratio

Years after Discovery

Annual Discoveries (bnbbl)

Data from IHS Energy
Growth in Global Oil Reserves

**Arrington approach**

Based on 11 year average ’93-’03

Cumulative Revision Ratio

Years after Discovery

?"Grown" Data adds ca. 350 bnbbl?

Annual Discoveries (bnbbl)

Data from IHS Energy
Growth in Global Gas Reserves

Analysis in 2001

Based on 5 year average '97-'01

Cumulative Revision Ratio

Years after Discovery

Actual Data

Power Law Model

Annual Discoveries (tcf)

Data from IHS Energy
Growth in Global Gas Reserves

Analysis in 2001

Based on 5 year average ’97-’01

Cumulative Revision Ratio

Actual Data

Power Law Model

"Grown" Data Adds ca. 2500tcf

Data from IHS Energy
Growth in Global Gas Reserves

Analysis in 2001

Based on 5 year average ‘97-’01

Analysis in 2003

Based on 7 year average ‘97-’03

Effect of growth in North, S.Pars

Data from IHS Energy
Conclusions

- Reserves estimates are uncertain and can vary widely throughout field life.
- There is a general tendency for reserve estimates to grow; this is true both for 2P preserves where the primary driver may be technological development and increased spend and for proved reserves where an additional driver may be reporting conservatism.
- Growth functions for any reserves dataset should be derived from within that dataset and should not be applied to others.
- Growth occurs by a combination of adding new oil-in-place and increasing recovery factor (and by under-reporting/back-booking for groups of fields)
- Growth is measured by comparing forecast and actual or by tracking annual estimates of historical discoveries.
- Reserves growth is a potentially important component of the oil resource but its magnitude is poorly known.