

**Research on Operation Strategy and Method of West
Africa integration project**

Guo Xiaofei

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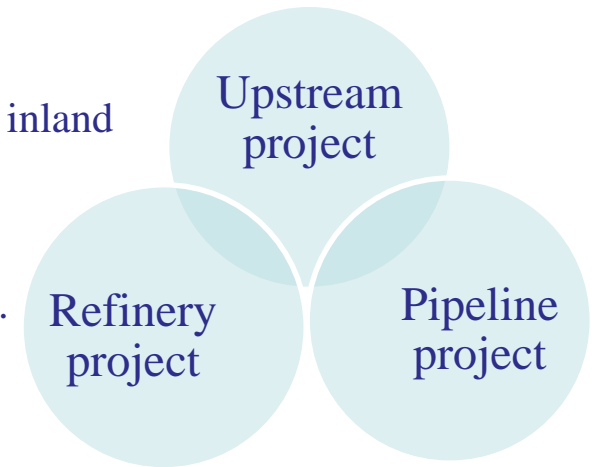
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- ◆ **Case Study**
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Introduction

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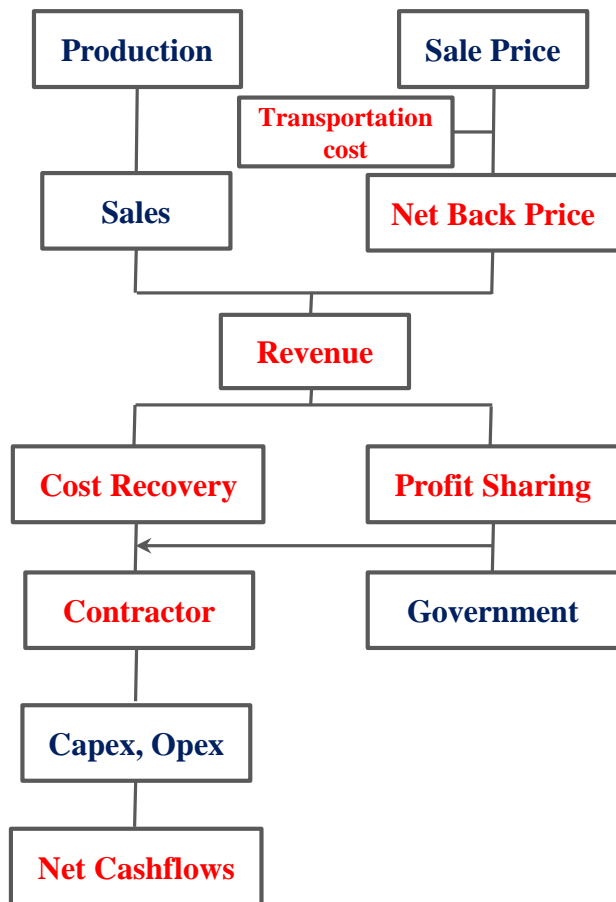
➤ Integration project

- the West African oil and gas resources project - located in the inland
 - ⇒ domestic sales of the host country of the resources
 - to establish a long pipeline to the international market.
 - International oil companies:
 - usually involved in upstream oil and gas assets and midstream pipeline projects or downstream refinery projects
 - Upstream, pipeline and refinery projects: **independent**, with different contracts, but **related**
 - Upstream project + Pipeline project
 - Upstream project + Refinery project
- } integration project
- For international oil companies with integration projects, it's critical to balance the economics in order to improve the overall benefits.
 - The link variable: transportation fee and the price to refinery



Analyze

➤ Upstream and Pipeline integration project

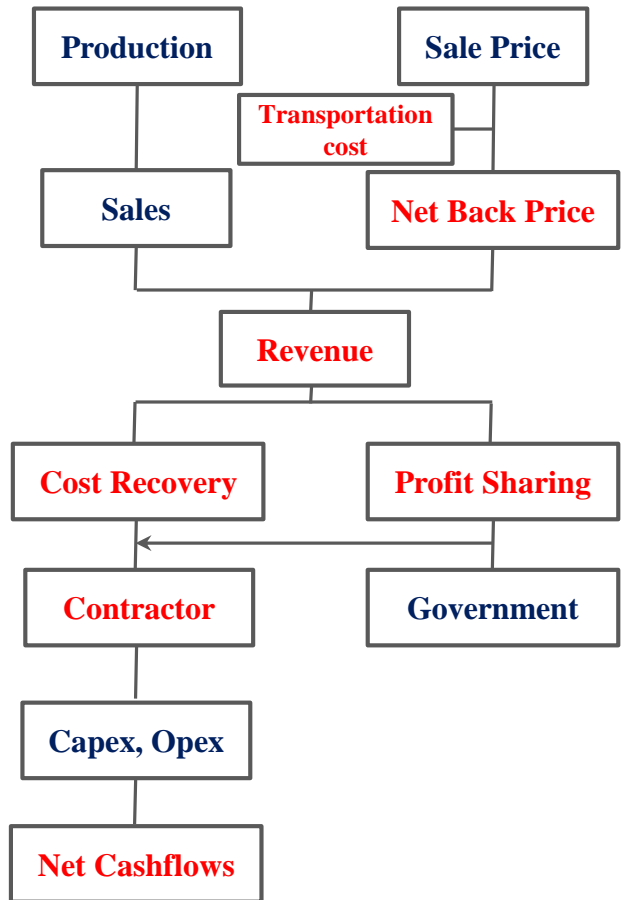


Cash Flow Chart of Upstream Project

- When the cost recovery pool is sufficient,
 - Contractor's Cash Inflows = Cost Recovery + Profit Sharing = Cost Recovery + (Revenue - Cost Recovery) × Profit Sharing Rate = $CR(1-PSR) + (Sale\ Price - Transportation\ Fee) \times Oil\ Volume \times Profit\ Sharing\ Rate = CR(1-PSR) + SP \times OV \times PSR - TF \times OV \times PSR$
 - If $A = CR(1-PSR) + SP \times OV \times PSR$, then A is a constant, and,
 - Contractor's Cash Inflows = $A - TF \times OV \times PSR$
- 1bbl crude oil:
 - the transportation fee ↑ 1\$/bbl
 - the cash inflow of the contractor ↓ PSR\$
 - the cash inflow of the oil company ↓ $PSR \times WIS$
- For example, if the working interest of XX oil company is 60%, and the contractor's PSR is 30%, the cash inflow of XX oil company reduces 0.18\$ with the transportation fee increasing by 1\$/bbl.

Analyze

➤ Upstream and Pipeline integration project

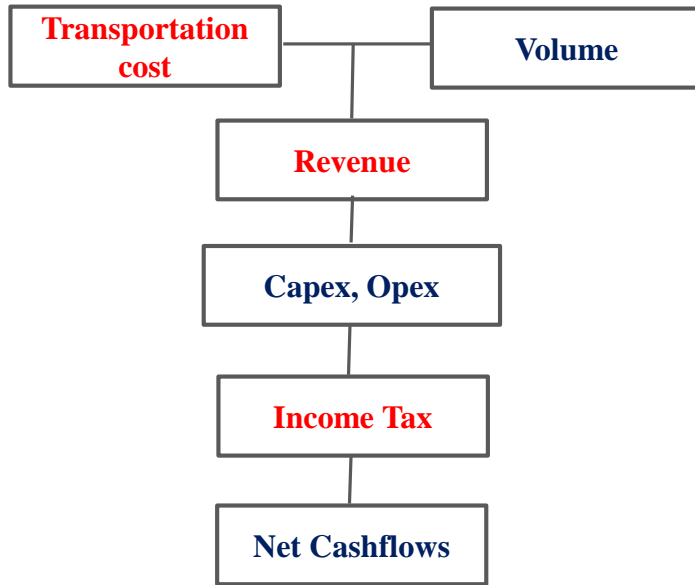


Cash Flow Chart of Upstream Project

- If the unrecovered investment is huge, the real recoverable cost per year is the cost recovery ceiling (CRC),
- Contractor's Cash Inflows = Cost Recovery + Profit Sharing = $CRC \times \text{Revenue} + \text{Revenue} \times (1 - CRC) \times \text{Profit Sharing Rate} = (\text{Sale Price} - \text{Transportation Fee}) \times \text{Oil Volume} \times (CRC - CRC \times PSR + PSR) = SP \times OV \times (CRC - CRC \times PSR + PSR) - TF \times OV \times (CRC - CRC \times PSR + PSR)$
- If $A = SP \times OV \times (CRC - CRC \times PSR + PSR)$, then A is a constant, and,
- Contractor's Cash Inflows = $A - TF \times OV \times (CRC - CRC \times PSR + PSR)$
- 1bbl crude oil:
 - the transportation fee \uparrow 1\$/bbl
 - the cash inflow of the contractor $\downarrow (CRC - CRC \times PSR + PSR)\$$
 - the cash inflow of the oil company $\downarrow (CRC - CRC \times PSR + PSR)\$ \times WI\%$
- For example, if the working interest of XX oil company is 60%, PSR is 30%, and the CRC is 50%, the cash inflow of XX oil company reduces 0.39\$ with the transportation fee increasing by 1\$/bbl.

Analyze

➤ Upstream and Pipeline integration project



- Contractor's Net Cash flows = Revenue- Capex- Opex- Income Tax
- ✓ **If the annual profit is positive,**
 - Income Tax = Profit × Income Tax Rate= (Revenue – Opex – Depreciation) × ITR
 - Wherein, Capex, Opex, Depreciation are not affected by TF, Contractor's Net Cash flows = Revenue- Capex- Opex- (Revenue – Opex – Depreciation) × ITR = Revenue × (1-ITR) - Capex- Opex + (Opex + Depreciation) × ITR
 - Let A = - Capex- Opex + (Opex + Depr.) × ITR, then A is a constant,
 - Contractor's Net Cash flows = TF × Oil Volume × (1-ITR) + A, 0 < T < 1;
- ✓ **If the annual profit is negative,** there is no income tax, and then,
 - Contractor's Net Cash flows = TF × Oil Volume + A,

Cash Flow Chart of Pipeline Project

➤ 1bbl crude oil:

the transportation fee ↑ 1\$/bbl \implies the cash inflow of the contractor ↑ (1-ITR)\$

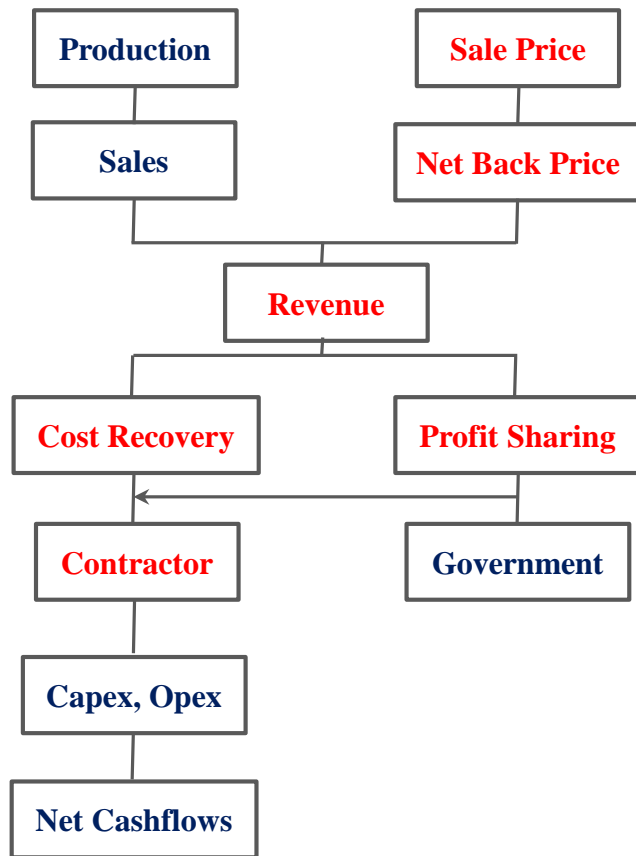
the cash inflow of the oil company ↑ (1- ITR) × WI\$

➤ For example, if the working interest of XX oil company is 60%, the net cash flows of XX oil company increase 0.6(1-ITR)\$ for 1bbl crude oil. If the annual profit is negative, the net cash flows increase 0.6\$ for 1bbl crude oil.

Analyze

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➤ Upstream and Refinery integration project

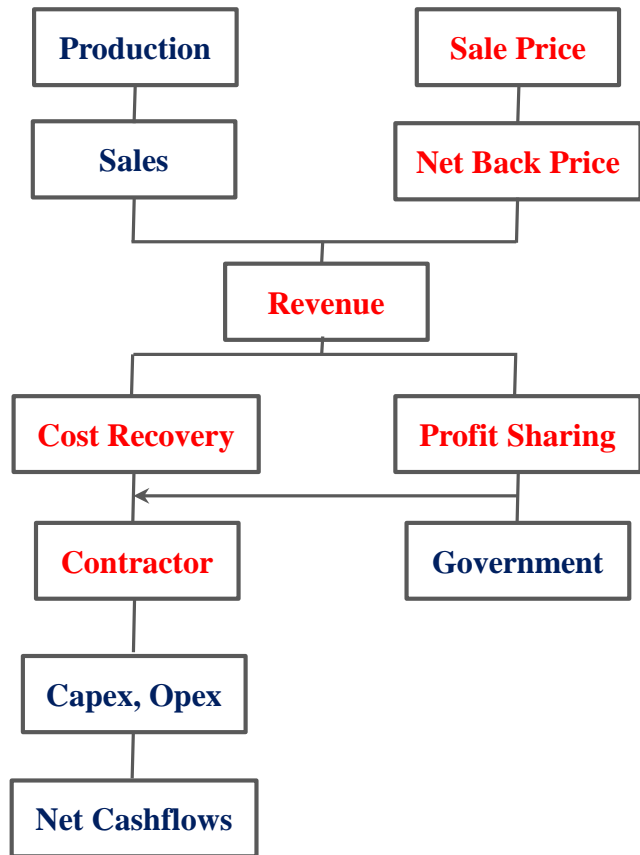


Cash Flow Chart of Upstream Project

- When the cost recovery pool is sufficient,
 - Contractor's Cash Inflows = Cost Recovery + Profit Sharing = Cost Recovery + (Revenue - Cost Recovery) × Profit Sharing Rate = $CR(1-PSR) + OPR \times OV \times PSR$
 - If $A = CR(1-PSR)$, then A is a constant, and,
 - Contractor's Cash Inflows = $A + OPR \times OV \times PSR$
- 1bbl crude oil:
 - the Oil Price to Refinery ↑ 1\$/bbl
 - the cash inflow of the contractor ↑ PSR\$
 - the cash inflow of the oil company ↑ $PSR \times WI$
- For example, if the working interest of XX oil company is 60%, and the contractor's PSR is 30%, the cash inflow of XX oil company increases 0.18\$ with the Oil Price to Refinery increasing by 1\$/bbl.

Analyze

➤ Upstream and Refinery integration project



➤ If the unrecovered investment is huge, the real recoverable cost per year is the cost recovery ceiling (CRC),

- Contractor's Cash Inflows = Cost Recovery + Profit Sharing = $CRC \times \text{Revenue} + \text{Revenue} \times (1 - CRC) \times \text{Profit Sharing Rate} = \text{Oil Price to Refinery} \times \text{Oil Volume} \times (CRC - CRC \times PSR + PSR) = OPR \times OV \times (CRC - CRC \times PSR + PSR)$

➤ 1bbl crude oil:

the Oil Price to Refinery ↑ 1\$/bbl

the cash inflow of the contractor ↑ $(CRC - CRC \times PSR + PSR)\$$

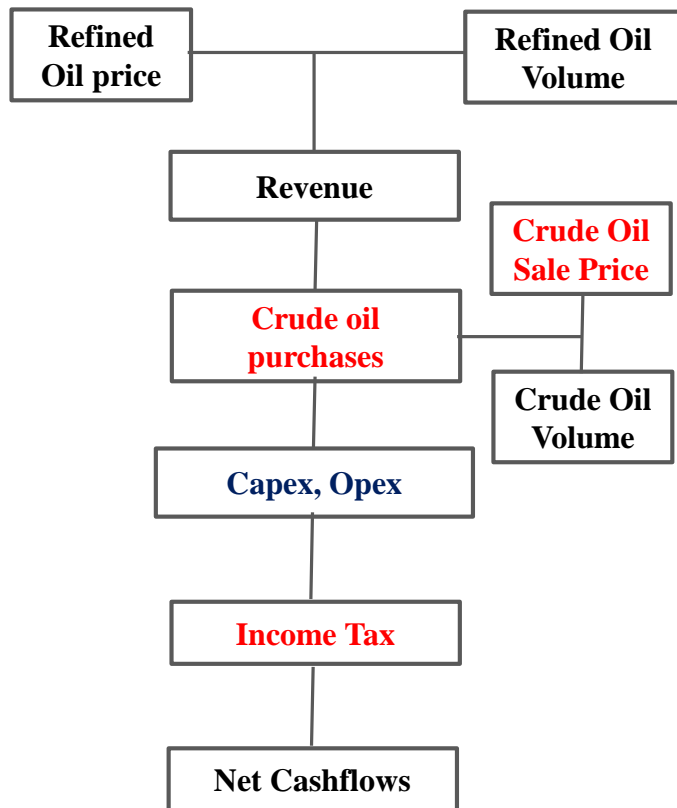
the cash inflow of the oil company ↑ $(CRC - CRC \times PSR + PSR) \times \text{WIS}$

➤ For example, if the working interest of XX oil company is 60%, PSR is 30%, and the CRC is 50%, the cash inflow of XX oil company increases 0.39\$ with the transportation fee increasing by 1\$/bbl.

Cash Flow Chart of Upstream Project

Analyze

➤ Upstream and Refinery integration project



Cash Flow Chart of Upstream Project

- Contractor's Net Cash flows = Revenue- Crude Oil Purchase - Capex- Opex- Income Tax= Revenue- Crude Oil Purchase - Capex- Opex- (Revenue- Crude Oil Purchase - Depreciation- Opex) ×Income Tax Rate= Revenue×(1-ITR) - Capex- Opex+ (Depreciation+ Opex) ×ITR- Oil Price to Refinery ×Oil Volume×(1-ITR)
- If $A = \text{Revenue} \times (1-ITR) - \text{Capex} - \text{Opex} + (\text{Depreciation} + \text{Opex}) \times ITR$, then A is a constant, and,
- Contractor's Net Cash flows = $A - OPR \times \text{Oil Volume} \times (1-ITR)$
- 1bbl crude oil:
 - the Oil Price to Refinery ↑ 1\$/bbl
 - ⇒ the cash inflow of the contractor ↓ (1-ITR)\$
 - the cash inflow of the oil company ↓ (1- ITR)× WIS
- For example, if the working interest of XX oil company is 60%, the net cash flows of XX oil company reduce 0.6(1- ITR)\$ for 1bbl crude oil with the Oil Price to Refinery increasing by 1\$/bbl. If the annual profit is negative, the net cash flows reduce 0.6\$ for 1bbl crude oil.

Analyze

➤ Analysis and Generalize

- ✓ The influence from the link variable has the following common to both integration projects, "upstream + pipeline", "upstream + refinery"
 - Upstream and pipeline or refinery have reverse changes, that is, when upstream net cash flow increases, the net cash flow of pipelines or refineries will inevitably decrease, and when the upstream decreases, the pipeline or refinery will inevitably increase.
 - Change Rate of the international oil company's Net Cashflows affected by link variables in upstream projects is $PSR \times WI$ (when cost recovery pool is sufficient) or $(CRC - CRC \times PSR + PSR) \times WI$ (when cost recovery pool is insufficient) for both integration projects. And that in Pipeline or Refinery Project is $(1 - ITR) \times WI$.

Project	Upstream (cost recovery pool is sufficient)	Upstream (cost recovery pool is insufficient)	Pipeline, Refinery
Change Rate of Net Cashflows	$PSR \times WI$	$(CRC - CRC \times PSR + PSR) \times WI$	$(1 - ITR) \times WI$

Analyze

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➤ Analysis and Generalize

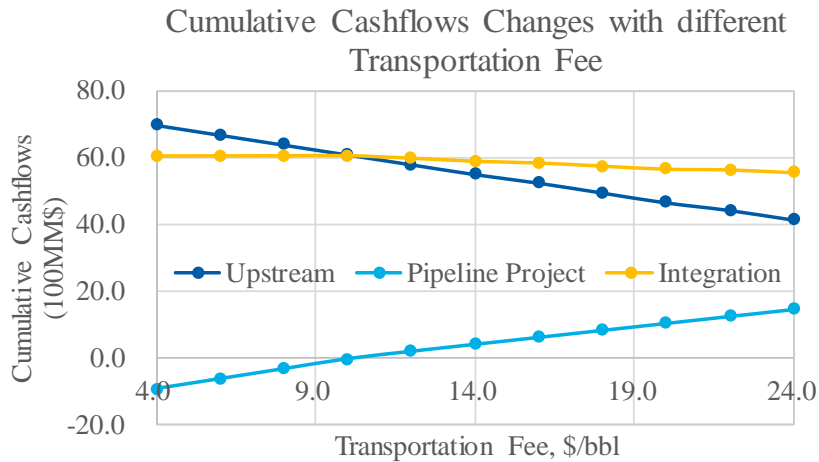
$$\begin{array}{l} \text{PSR} \times \text{WI} \\ \text{the cost pool is sufficient} \\ \text{(CRC-CRC} \times \text{PSR)} \times \text{WI} \\ \text{the cost pool is insufficient} \end{array} > (1-\text{ITR}) \times \text{WI} \implies \text{improving upstream economics}$$
$$\begin{array}{l} \text{PSR} \times \text{WI} \\ \text{the cost pool is sufficient} \\ \text{(CRC-CRC} \times \text{PSR)} \times \text{WI} \\ \text{the cost pool is insufficient} \end{array} < (1-\text{ITR}) \times \text{WI} \implies \text{improving downstream economics}$$

- Upstream: During the contract period, the company's working interest WI is fixed, but whether the cost pool is sufficient depends;
- Pipeline or refinery: Even the income tax rate (ITR) is constant, the income tax could be zero when the profit is negative. So for the full contract period, the change rate of net cashflows related to the link variable will also change.
- If there is a cross over the change rate ranges, there may be the best points of integration project's benefits with the link variable changing.

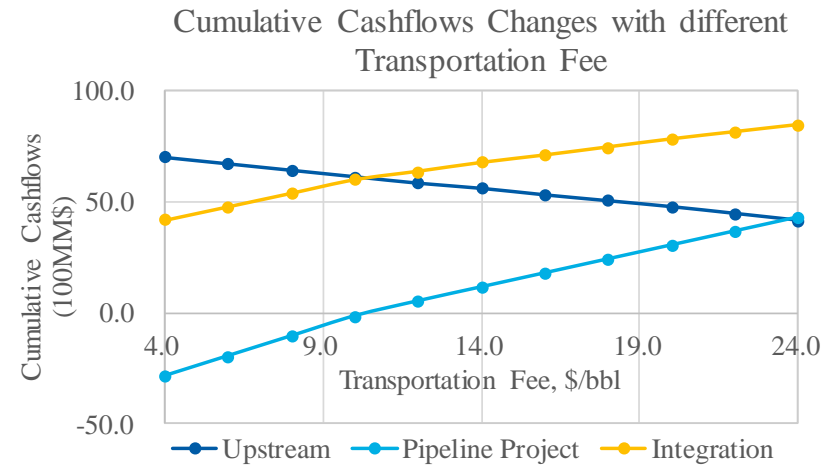
Case Study

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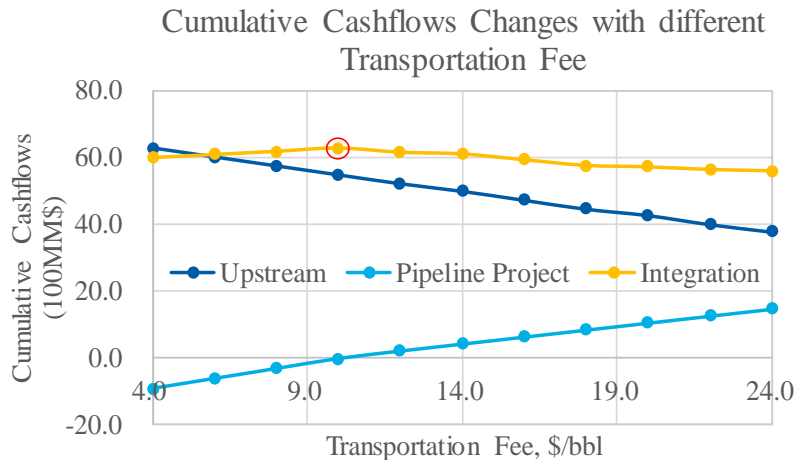
➤ $PSR \times WI_{upstream} > (1-ITR) \times WI_{downstream}$



➤ $PSR \times WI_{upstream} < (1-ITR) \times WI_{downstream}$



➤ Cross cases



- The more variable-sensitive project should get economic priority in integration project.
- If there is a cross over the change rate ranges, there may be the best points of integration project's benefits as indicated in the red circle.

Conclusions

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- Whether it is the "upstream and pipeline" integration project or the "upstream and refinery" integration project, the influence from the link variable has the following common:
 - Upstream and pipeline or refinery have reverse changes.
 - Change Rate of the international oil company's Net Cashflows affected by link variables in upstream projects is $PSR \times WI$ (when cost recovery pool is sufficient) or $(CRC - CRC \times PSR + PSR) \times WI$ (when cost recovery pool is insufficient). And that in Pipeline or Refinery Project is $(1 - ITR) \times WI$.
- The more variable-sensitive project should get economic priority in integration project.
- If there is a cross over the change rate ranges, there may be the best points of integration project's benefits with the link variable changing.