LNG Economics

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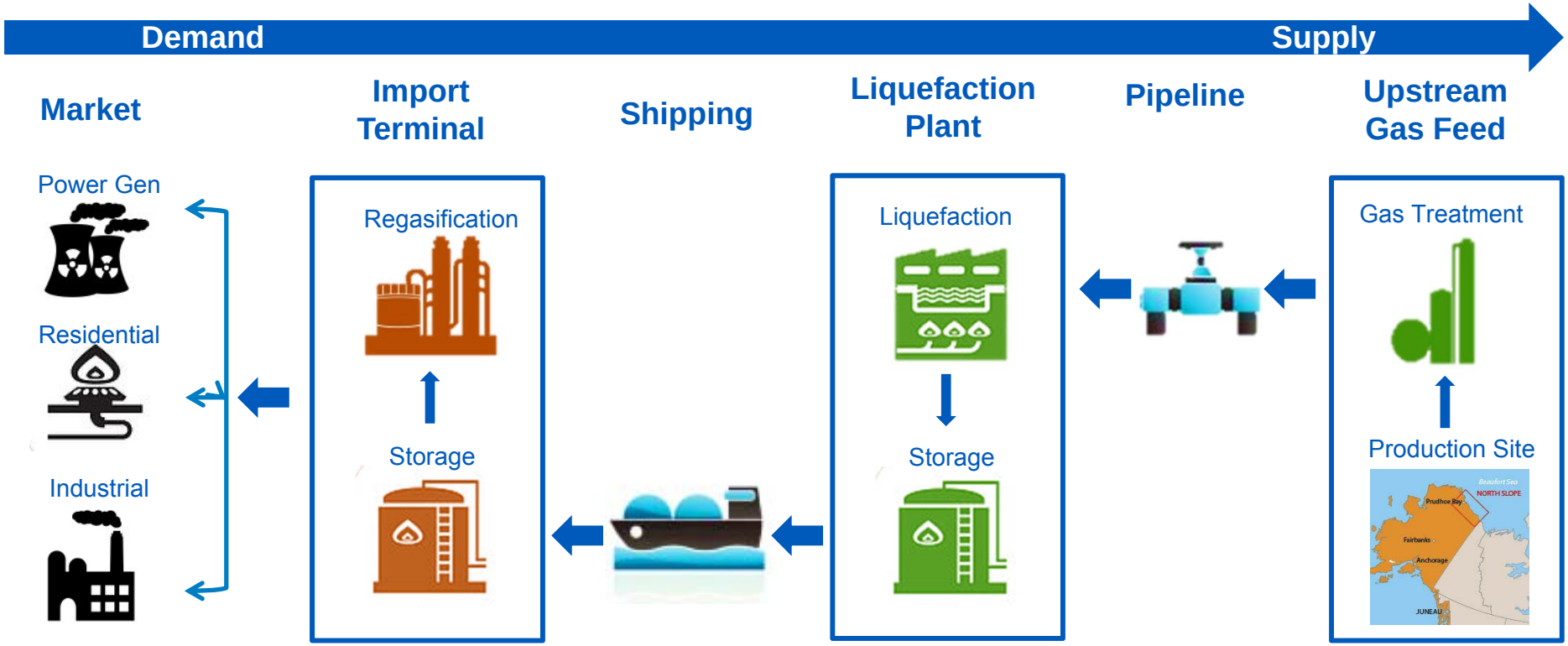
LNG Supply Chain – Economic Netback



- ***Sales price***
  - Function of competing fuels in respective parts of the world
  - Japan/Korea are highest priced markets
  - Gas is priced at roughly the cost of oil
- ***Shipping***
  - Capital cost of ships, capacity and voyage length.
- ***Liquefaction***
  - Amortized capital cost of the plant, fuel usage and operating cost
- ***Pipeline***
  - Amortized capital cost of the pipeline, compression fuel, and operating cost
- ***Gas Treatment Plant***

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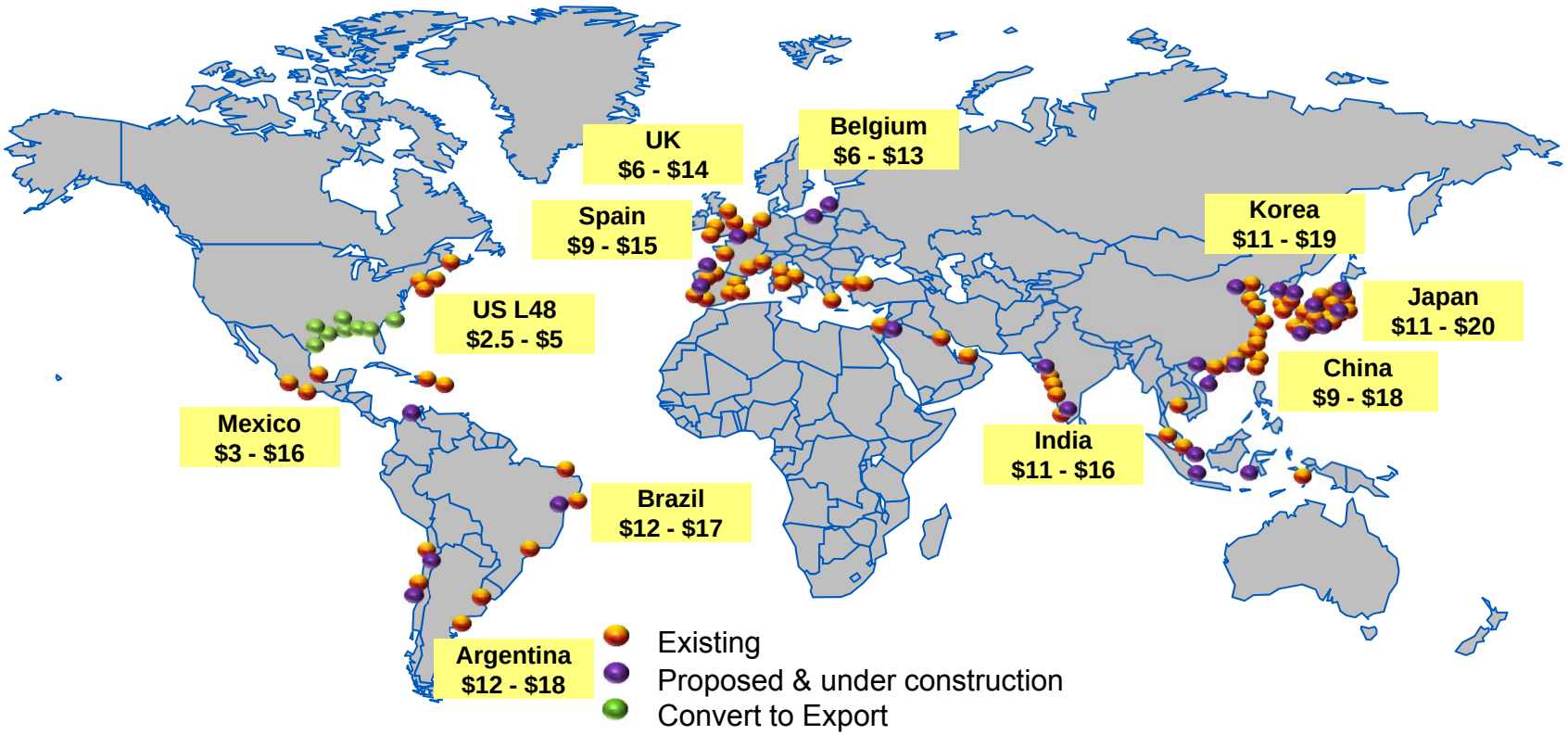
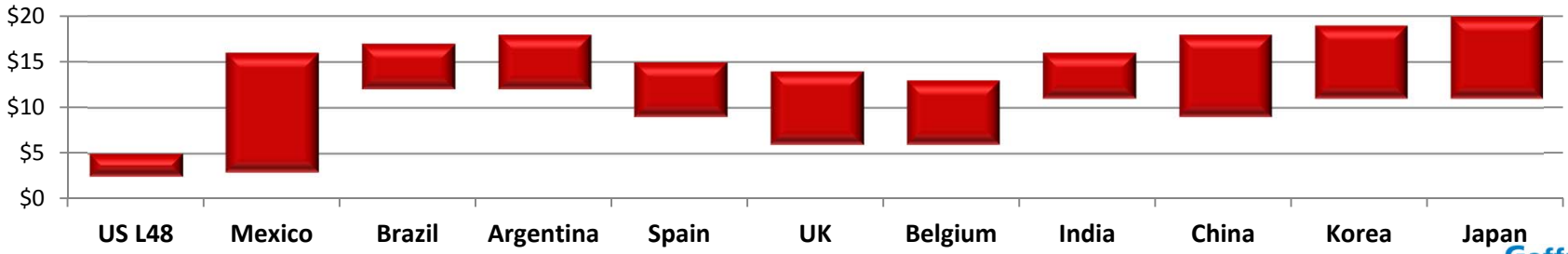
Destination Market Value (2011 ~ 2014)





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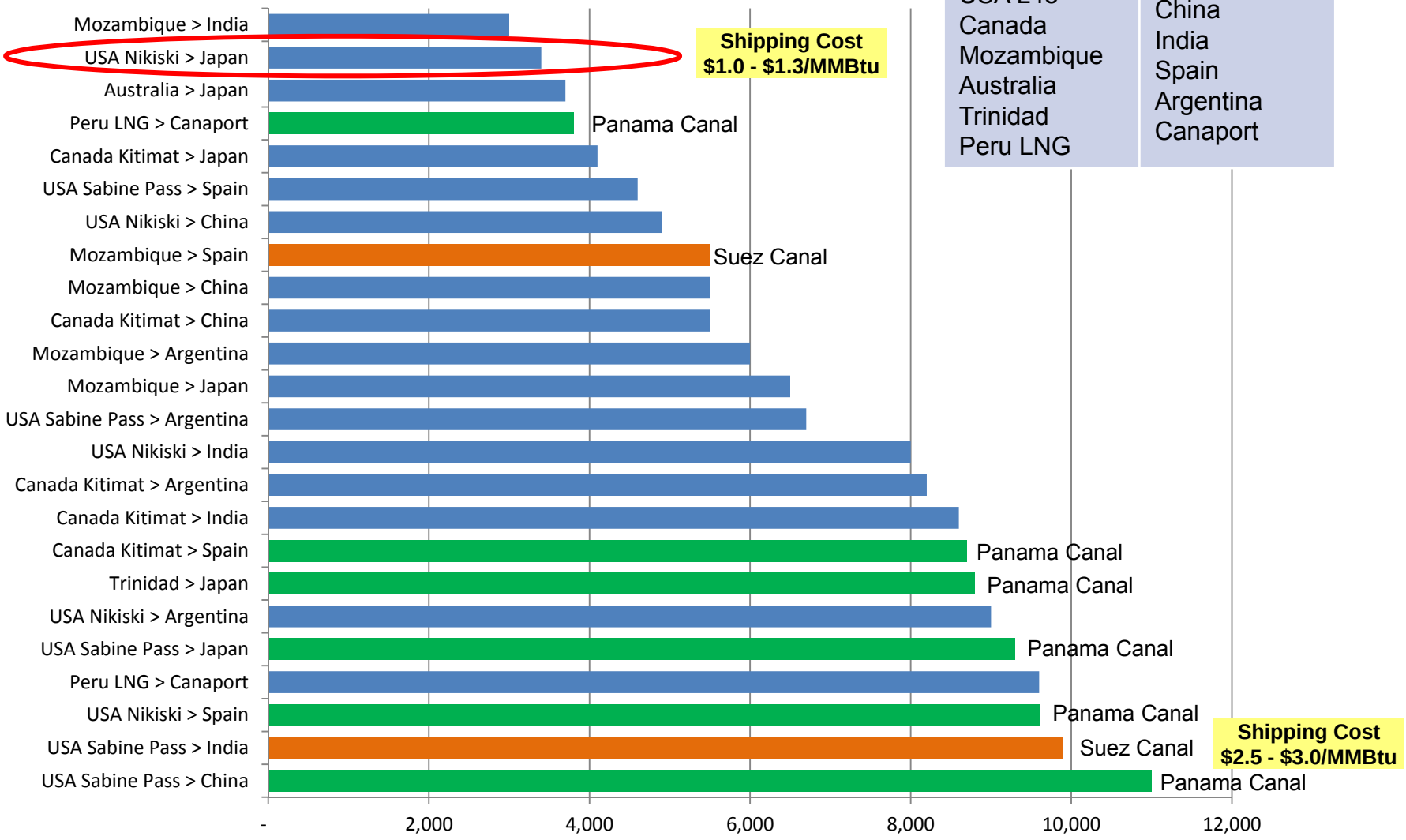
Shipping Distance Comparison

Seller	Buyer
USA Alaska USA L48 Canada Mozambique Australia Trinidad Peru LNG	Japan China India Spain Argentina Canaport



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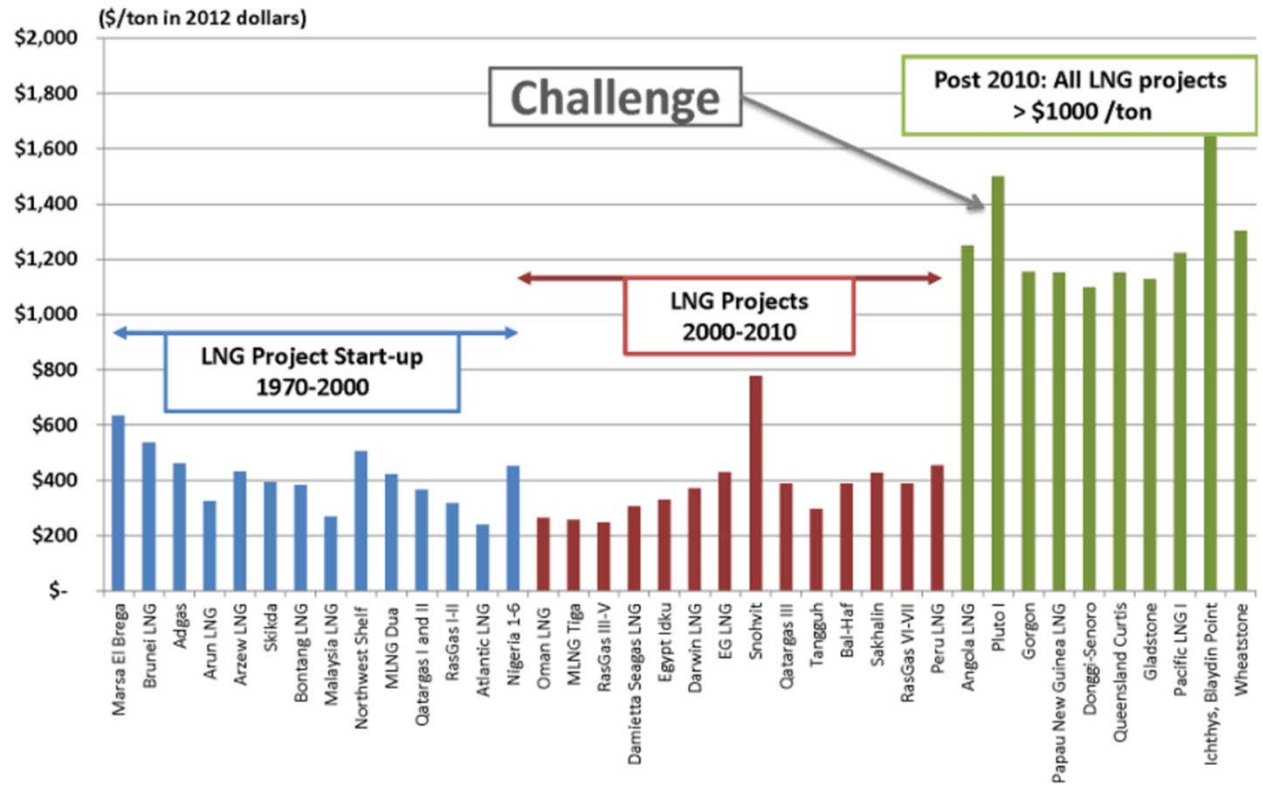
Liquefaction

Outlook

- Capital cost of liquefaction has emerged as high risk
- Australian projects have experienced $bn cost overruns
- Some inflation in steel prices, but labour and supply chain are big factors
- Buyers and investors are concerned.
- Driving innovations such as Floating LNG
- Current costs estimated ***between $4-6.50/MMBtu***

Cost Challenge



Source: Apache from Public Data

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Pipeline, Processing and Liquids

- ***Pipeline considerations:***
  - Some projects do not require major pipeline additions
    - Gulf coast US
  - Others require limited pipeline transmission
    - East Africa
  - A number of upcoming LNG projects have major pipeline challenges
    - Canada (Kitimat/Prince Rupert area projects)
    - Alaska
  - Cost range estimated at up to ***$3.50/MMBtu***
- ***Gas Processing***
  - None required at Lower 48 terminals
  - Estimated range up to ***$4/MMBtu***
  - Often offset by liquids
- ***Liquids uplift***
  - Depends on gas type
  - May add ***50c - $1/MMBtu***

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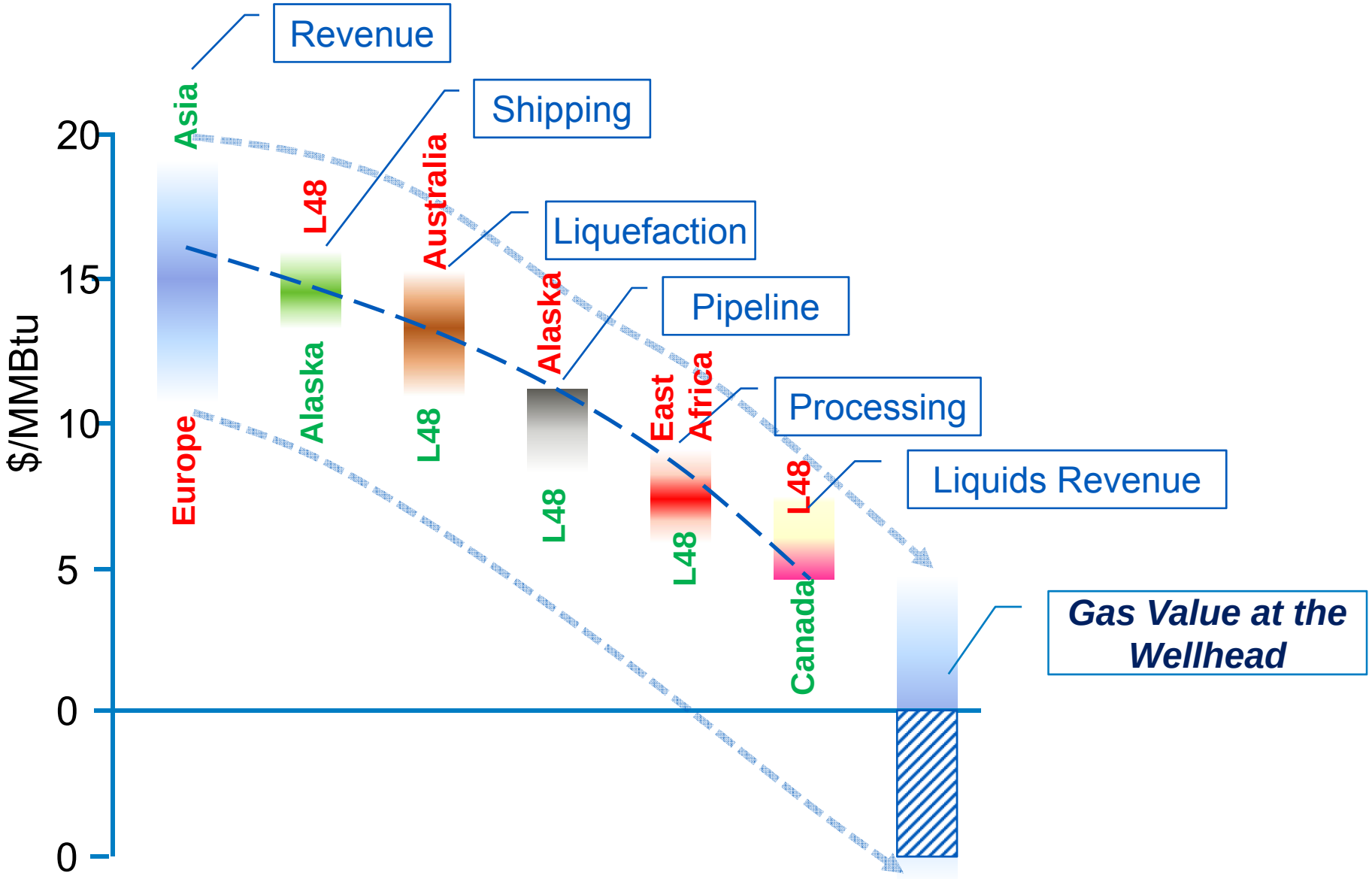
Illustrative Netback



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State Take On Pipelines & Infrastructure

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Preamble

- Very high level concepts
  - Many generalities
- “Devil in the detail”
  - A lot of history in Alaska
  - Not addressed at this stage
- Discussion here covers all forms of jurisdictional take
  - Function of local history, administrative structure/rights
  - Regulation limiting profits/take can have same impact as an explicit tax or levy
- At the end of the day, it is just money!

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Property Tax (General Concept)

- Payment to cover
  - Impact on municipality
    - Disruption, need for infrastructure, housing, schools, hospitals etc
    - Temporary and permanent
  - Stakeholder participation
- Alaska has its own history in terms of structure and administration
- Other countries / administrative jurisdictions
  - Call it other things
  - Assess it in other ways
  - Differential rights for different players/entrants
- Complex when a project covers several jurisdictions
  - Separation of the levy from the distribution of the levy

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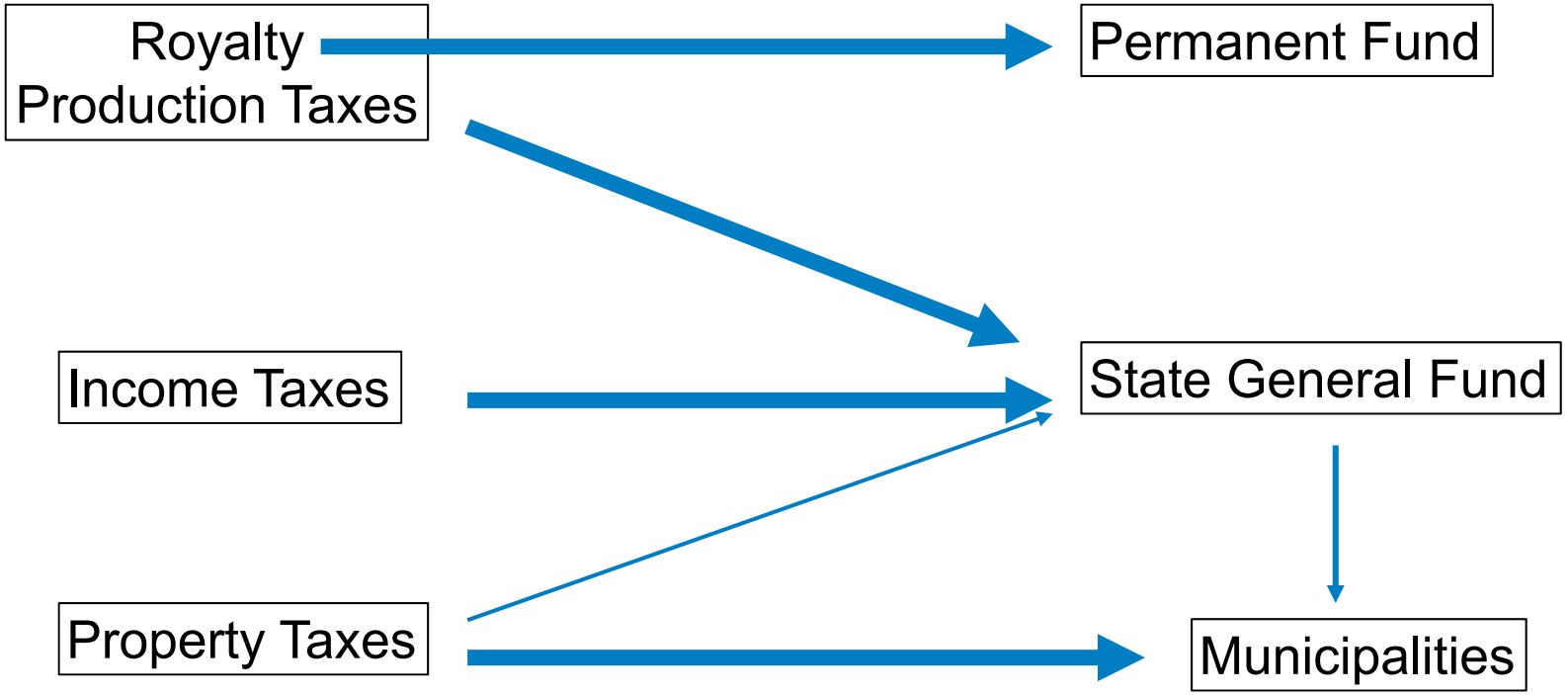
Alaska Oil & Gas Taxation Benefits Flow



Municipalities directly collect about 80% of Oil & Gas Property Taxes

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Typical Central-Government System

Many variants on forms of collection and distribution

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What Investors Care About - 1

- To Investors, Property Tax is just another form of Tax ("State Take")
- At a high level, if they pay $100 more in another Tax and $100 less in Property Tax, they are indifferent **
- What matters is how much money they retain after everything is paid

*** There are issues such as cross-deductibility they can impact things, but these are ignored for this simplification*

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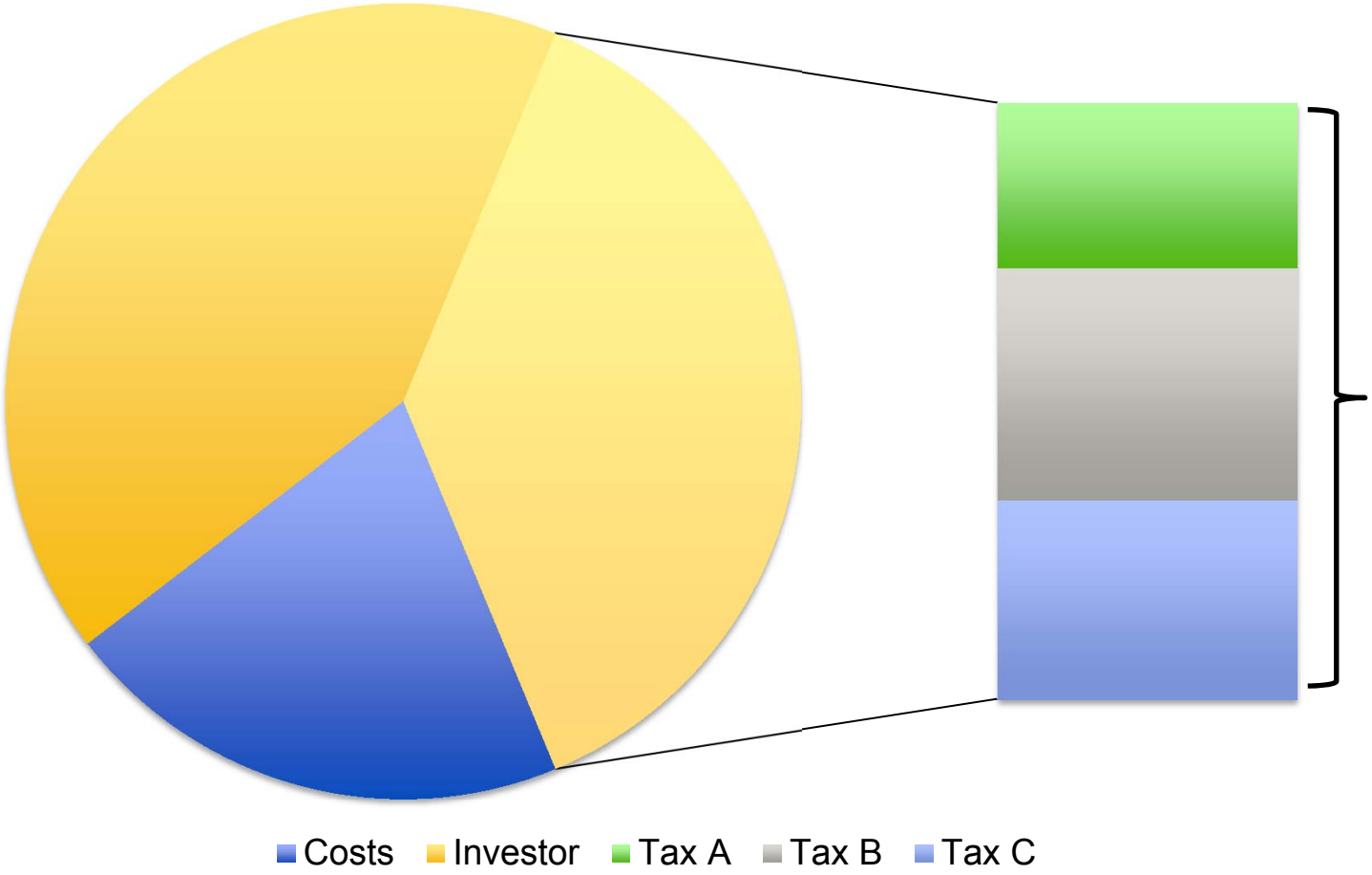
What Investors Care About - 2

Illustrative Distribution of Project Revenue



Can make many adjustments in form and type without impacting overall State Take

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What Investors Care About - 3

- Investors do care about factors such as
  - Predictability
  - Administrative burden
  - Transparency

- They also care about alignment
  - If an external factor impacts, does it treat everyone proportionately ?
  - Do others remain indifferent because they are not affected ?

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What Municipalities Care About

- Fair payment for impacts and ownership

- Transparent payment mechanism
  - History
  - Ability to foresee future needs and project changes, and capture fair payment for these

- Ability to plan and/or raise finance against future receipts
  - Predictability

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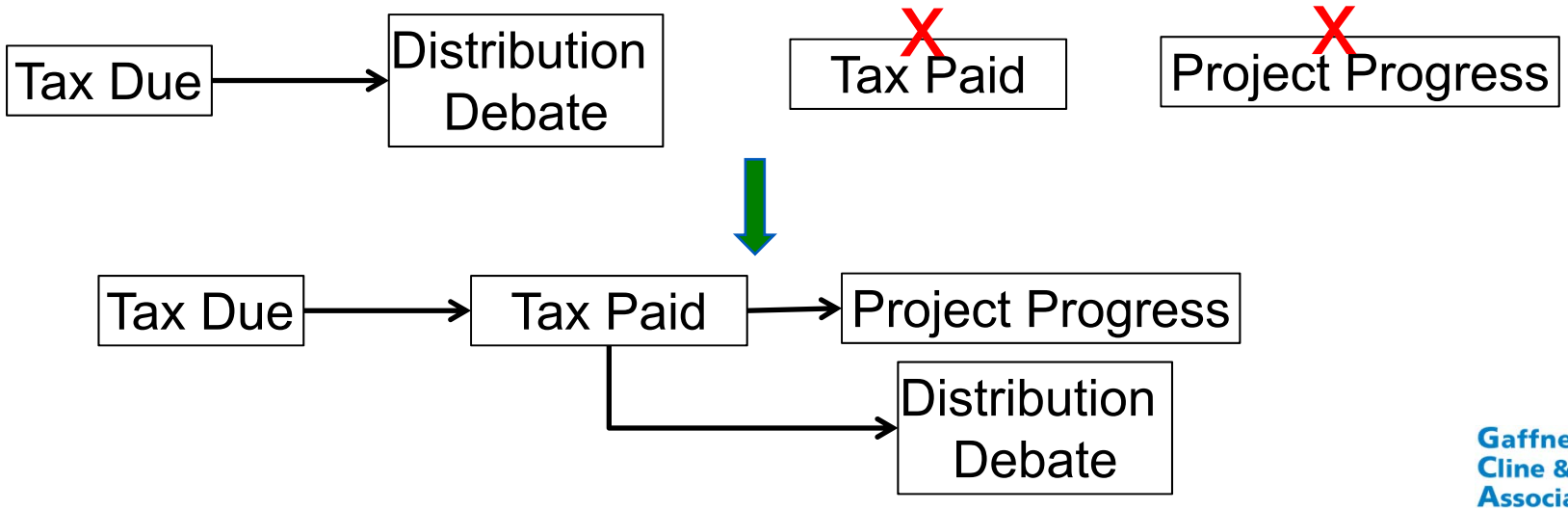
Multi Jurisdictional Issues

- Distributing payments between multiple jurisdictions can be very difficult, depending upon circumstances
- Genuine disagreements may exist as to who should be entitled to what
  - Weighting for impact, ownership
- Important that any such disputes do not impact project progress



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Global Forms of Take

- May be made up of many different forms
- From investor standpoint, it may matter less as to the form, but rather more to the total
  - But, administration and disputes are costs as well
- In many countries, State collects all forms, and does distribution to local communities
  - Avoids involving investors in issues of allocation
- In others, separate State and local levies
  - “Local” issues, while individually small in the big picture, can significantly defer, potentially kill a project with excess administrative requirements

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Examples of socio-economic Impact Mechanism

- Australia
  - LNG plant developers take on responsibility for (inter alia)
    - Skills development
    - Land usage (via “Indigenous Land Use Agreement”)
    - Managing costs of food, consumables, and key services
    - Water management and insurance against spills
    - Youth facilities
    - Training to facilitate local contracting companies
- Canada
  - LNG/Pipeline developers example approach to Impact
    - Carried interest in project by First Nations groups
    - Commitments to training, employment, and local contractors (in conjunction with Province)

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Examples of “Hard” Impact Fee Mechanism

Jurisdiction	Impact Fee Mechanism	Fee calculation	Drivers	Fund size
Pennsylvania	Fee charged for each well drilled	Levy for each well currently $50k horizontal, $10k vertical	Calculated by reference to gas price and CPI	$225m (2013) – 60% distributed at county/municipality level
North Dakota	Portion of severance tax used to compensate for Impact	8c/MMBtu gas tax	Oil and gas prices	$240m every two years. Grants allocated in response to petitions
United Kingdom (proposed mechanism)	Fee charged for each well drilled	Proposed levy of ~$160,000 per well or well site (under negotiation)	Fixed	N/A. Envisages distribution at Parish and County level impacted by drilling

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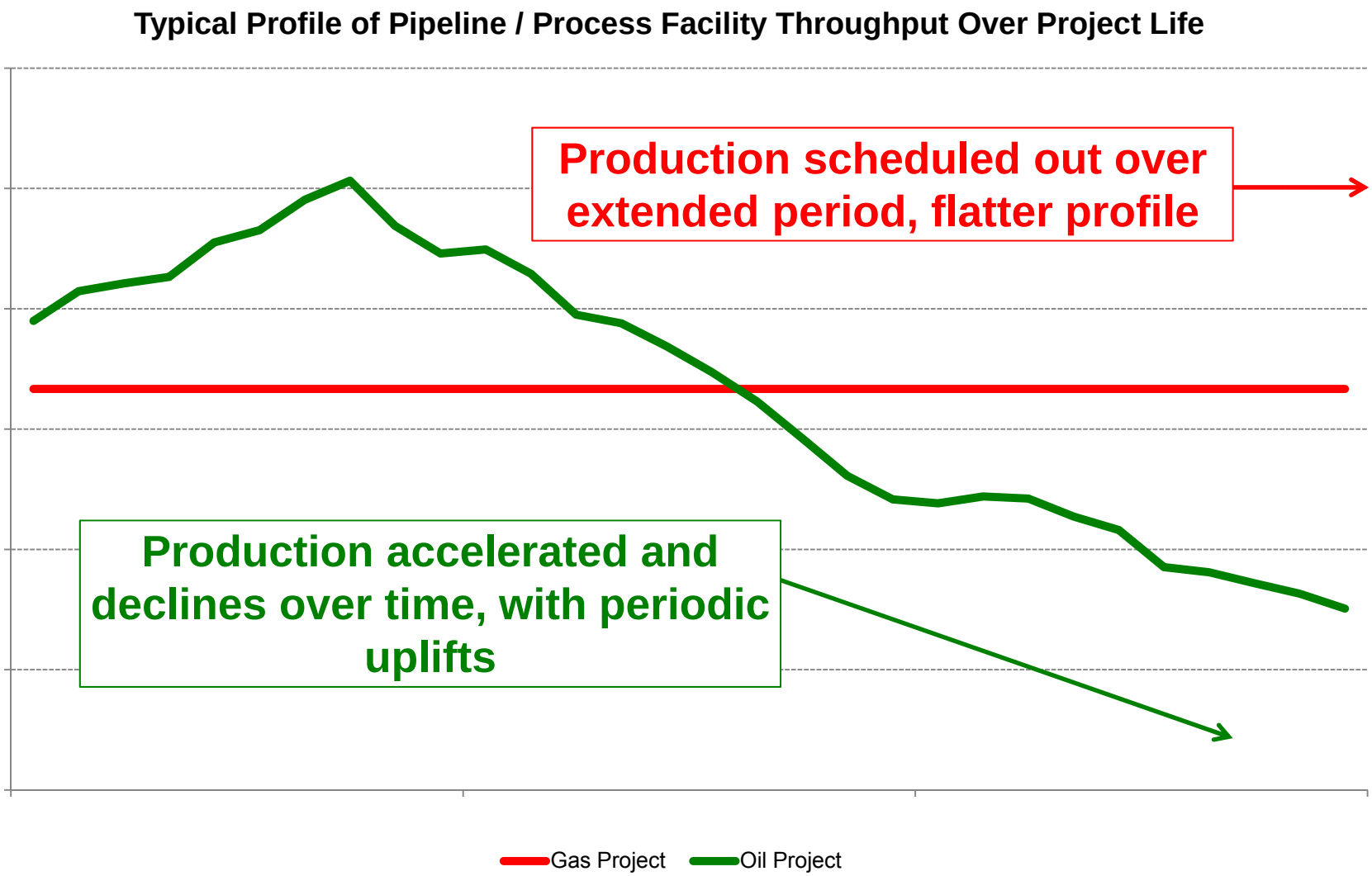
Gas vs Oil Projects (Dedicated Facilities)



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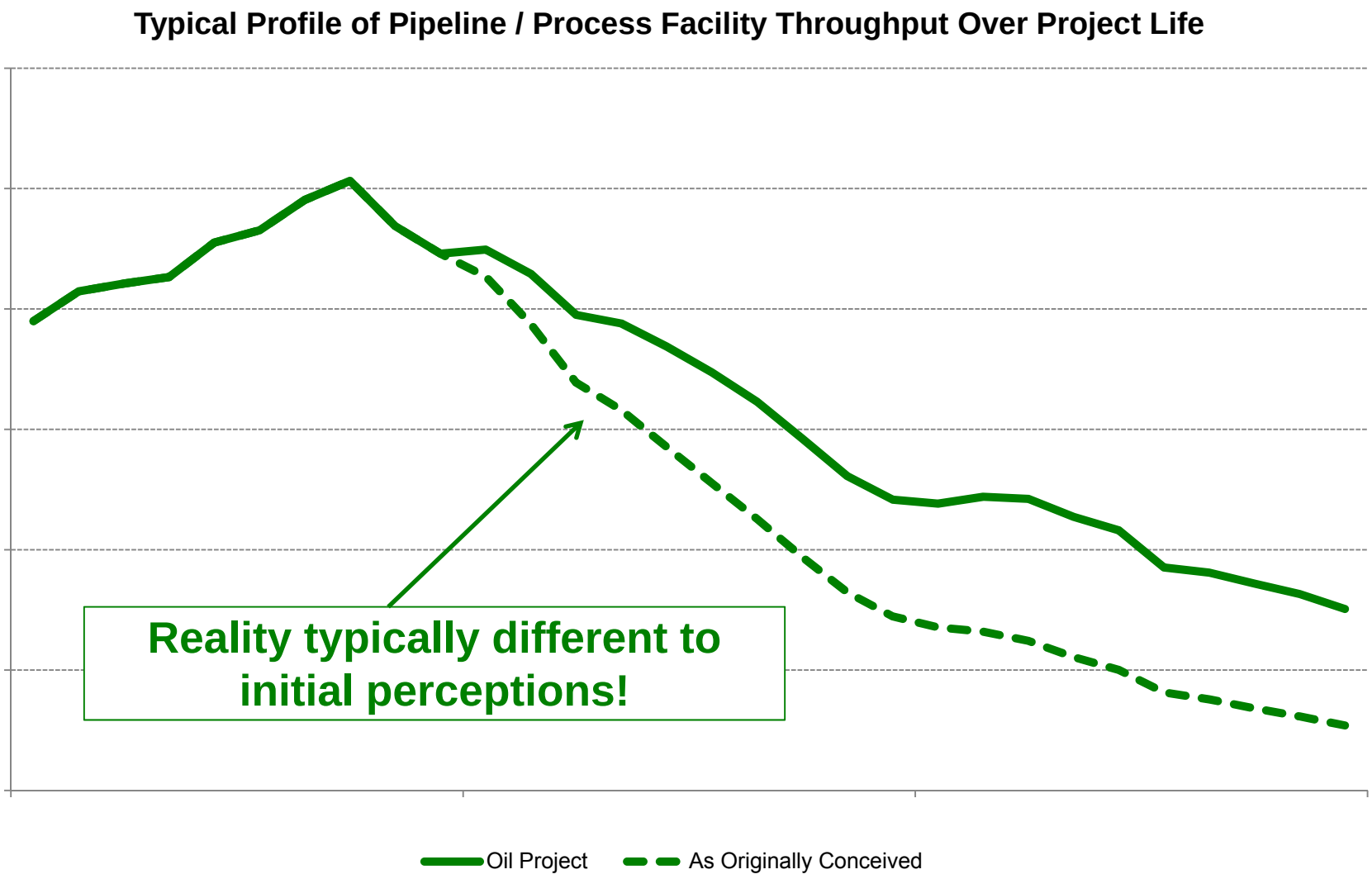
Gas vs Oil Projects (Dedicated Facilities)



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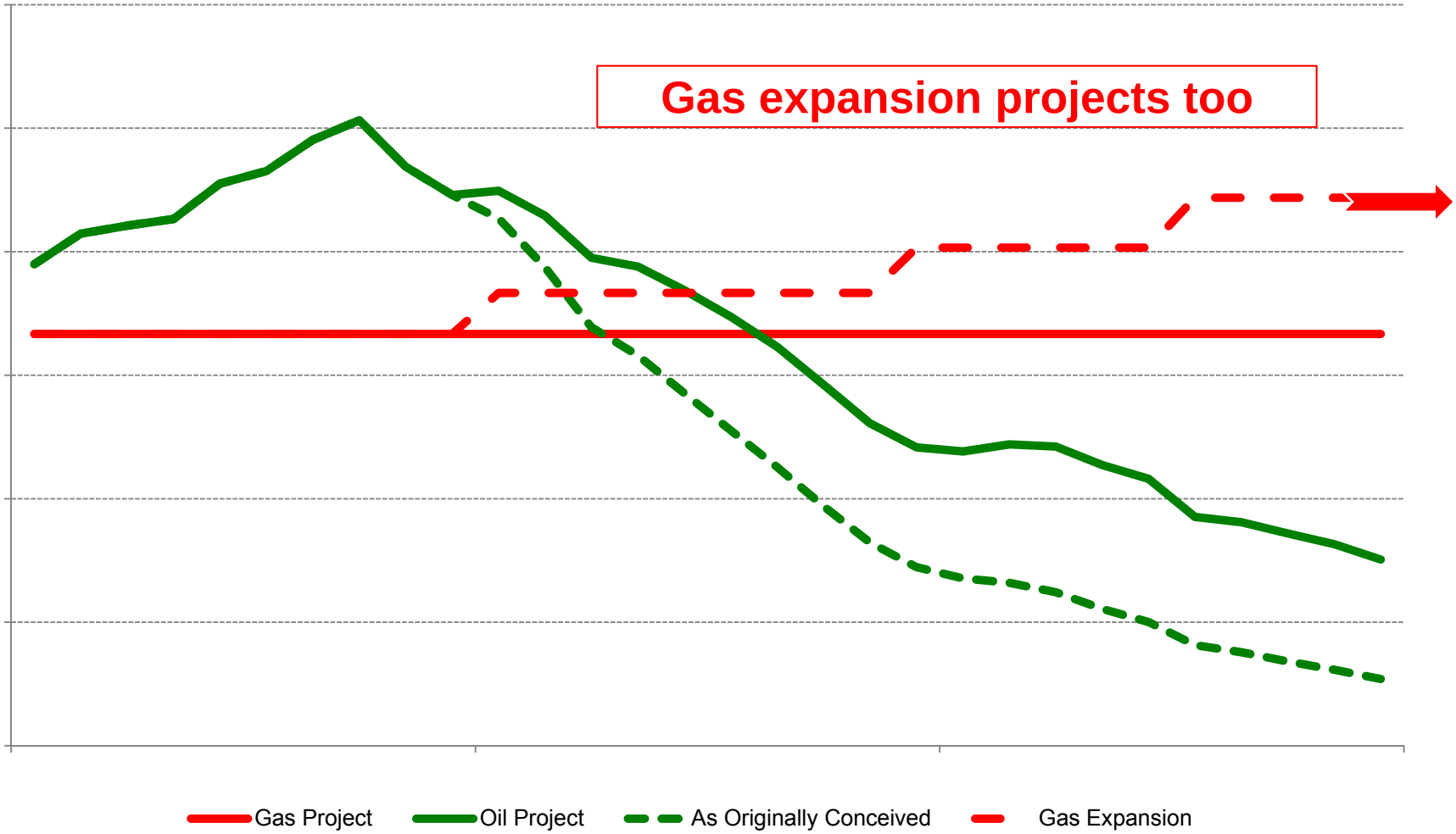
Gas vs Oil Projects (Dedicated Facilities)

Typical Profile of Pipeline / Process Facility Throughput Over Project Life



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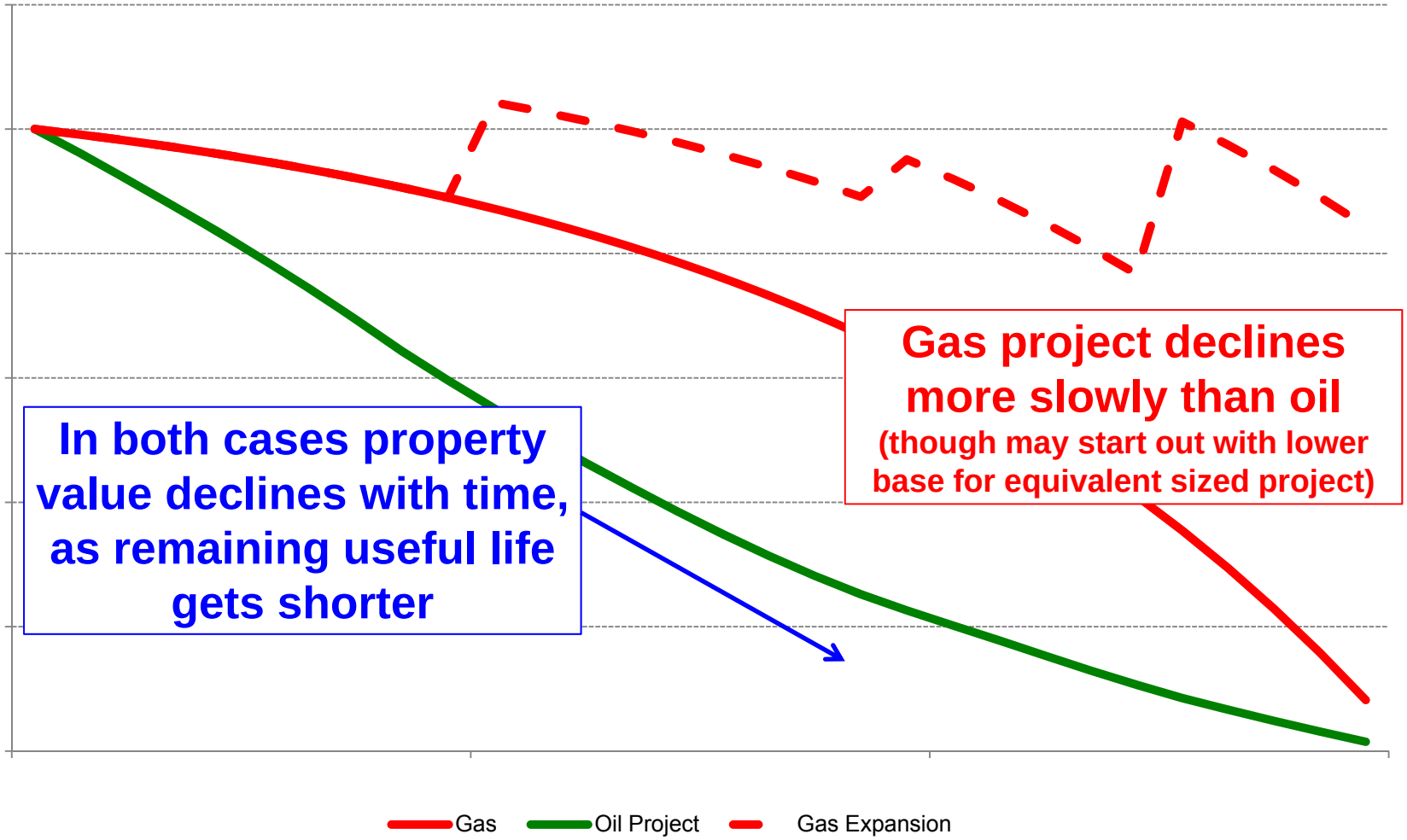
Property Tax On Gas vs Oil Projects

Typical Profile of Value-Based Property Tax Payments Over Project Life



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Impact of “Classic” Approach To Property Tax

- Uneven nature of expected tax revenues can create issues
  - “Front End Loading”
  - Planning over project life
  - Expectations when revenues (naturally) decline over time
    - “Double Whammy” with inflation effects

- Changing externalities, project expansions
  - Mechanisms for incorporation
  - Uncertainty impacts resulting from frequent changes and disputes

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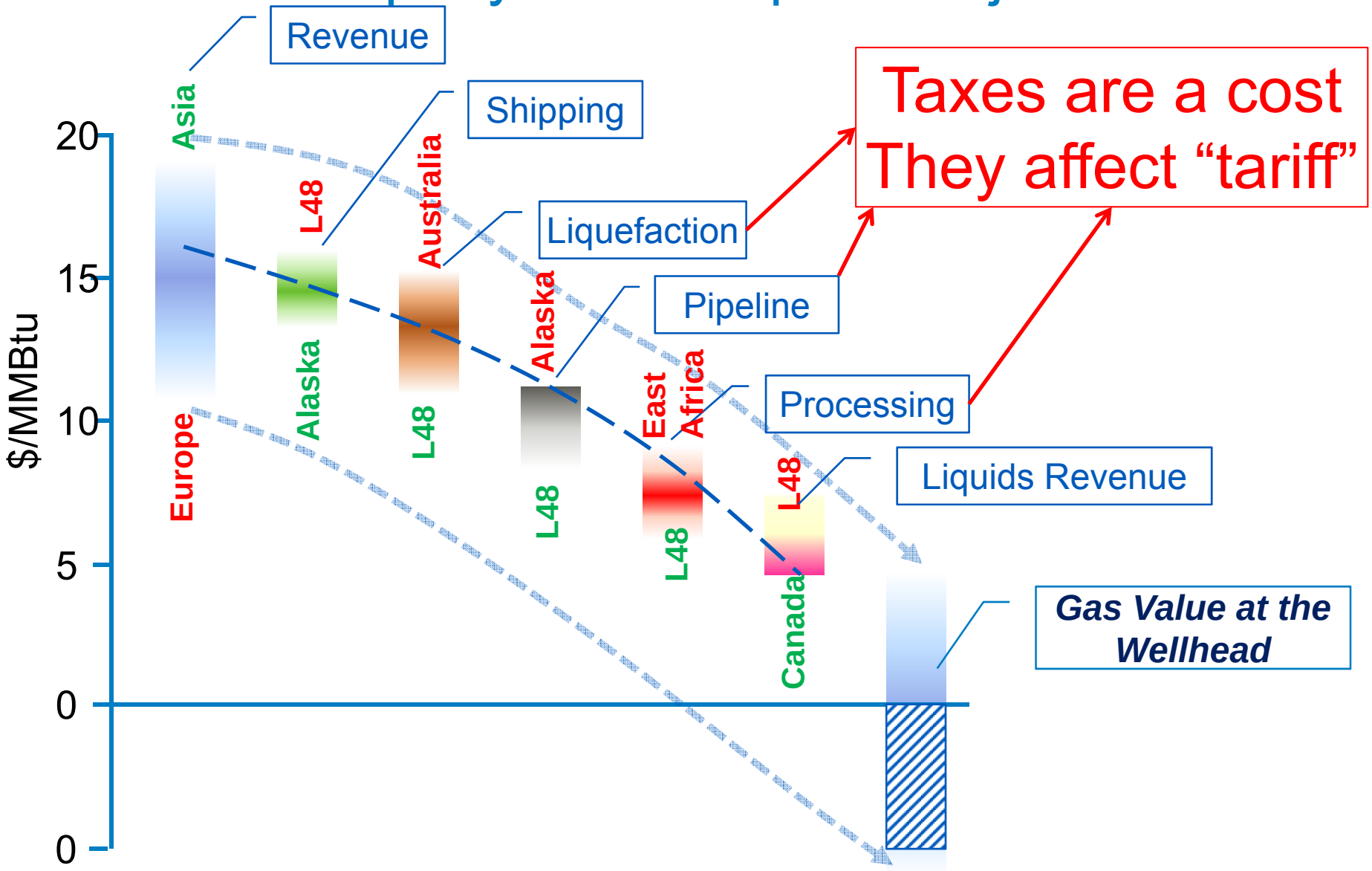
How Do Property Taxes Impact Project ?



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Potential Alternative Ways To Structure and Collect Property Tax ("PILT")

- Basic principles that could be expected to apply
  - No change in estimated benefit
  - Changes to timing to smooth / address inflation
  - Changes in form to enhance alignment
  - Address initial/construction impacts
- Seek approaches that do not require frequent reviews of calculation
  - Still protects State and Municipalities
- Examples
  - Fix charge to throughput volume (eg $/Mcf payment)
  - With inflation adjustment
- Option of allowing project participation not included here
  - Direct equity investment or PILT conversion

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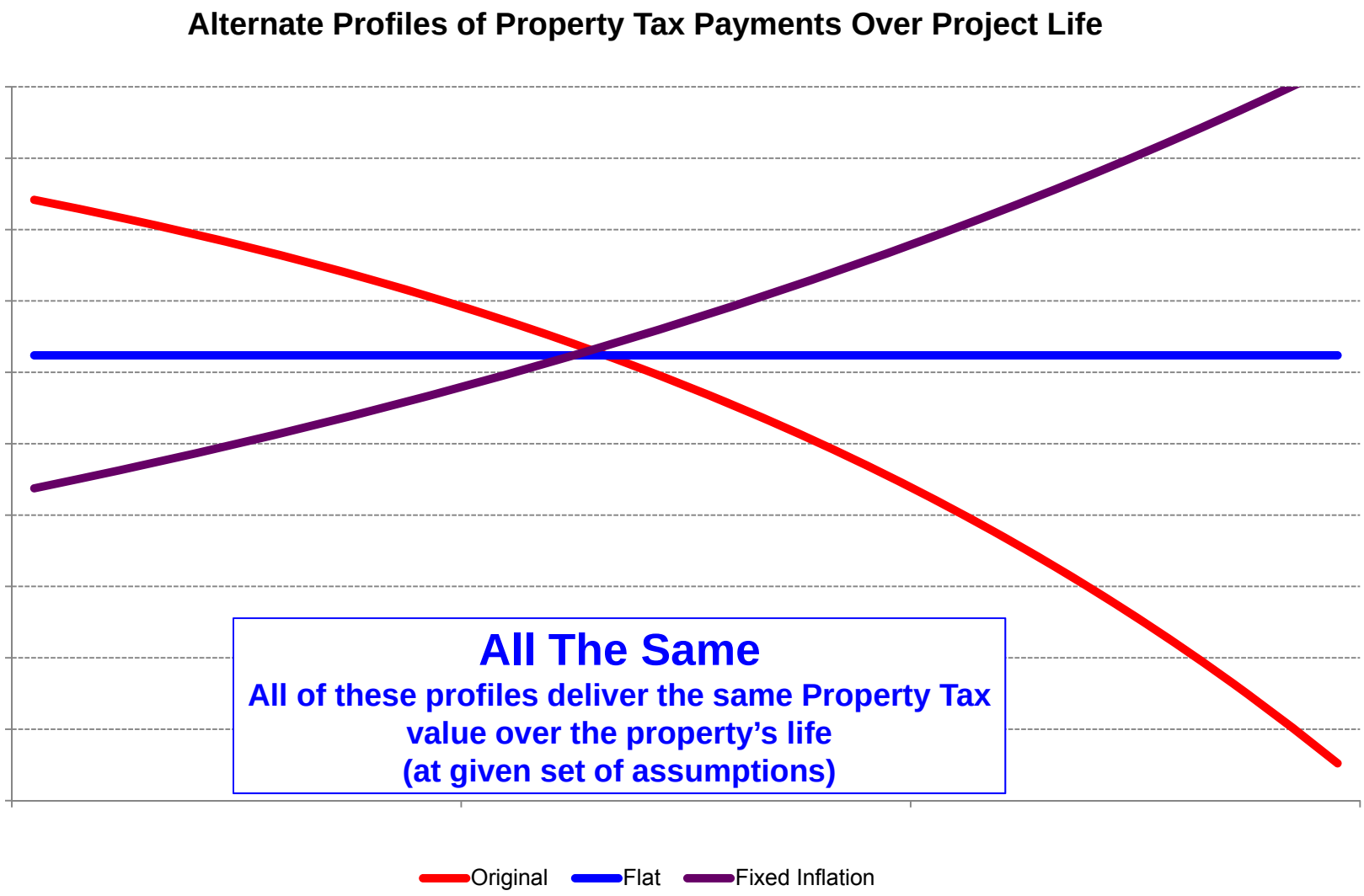
Potential Alternative Property Tax Profiles



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Conclusions

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Summary

- An international LNG project is very different from:
  - A gas line through Canada to L48
  - An oil project
- It requires “all the moving parts” to be in place before project sanction
  - In particular, the sales contracts
  - Not something that can be done in parts
- Buyers need to be confident that project will proceed on time and meet their demand needs
  - Cannot just “go into the market” and replace a large failed contract
  - Will only sign up for 20-30 years when confident that project is solid
- Property Taxes – in essence a payment to municipalities - can be structured in many ways to take into account
  - Future infrastructure and resourcing needs of the community
  - Form of LNG project, its cash flows, and likely evolution
- Delay impacts in LNG context are not about slipping 6-12 months
  - May have 5-10 year impact in meeting market

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Going Forward

- Common framework for dealing with
  - Municipality needs
  - Producer/Project Owner needs
  - Buyer needs
  - Project needs
- Separate distribution debate from project
- Further consideration on PILT (or similar)
  - Form
  - Shape (timing and growth)
  - Construction and production phases
  - Expansions
  - Disputes
  - Financing implications
- Parallel or alternate equity investment considerations

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