# Infrastructure & Renewable Energy Business Development

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**Jakarta, 8 April 2014**

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# AGENDA

1. Energy Demand & Infrastructure
2. Renewable Energy Project
3. Partnership Project with JICA

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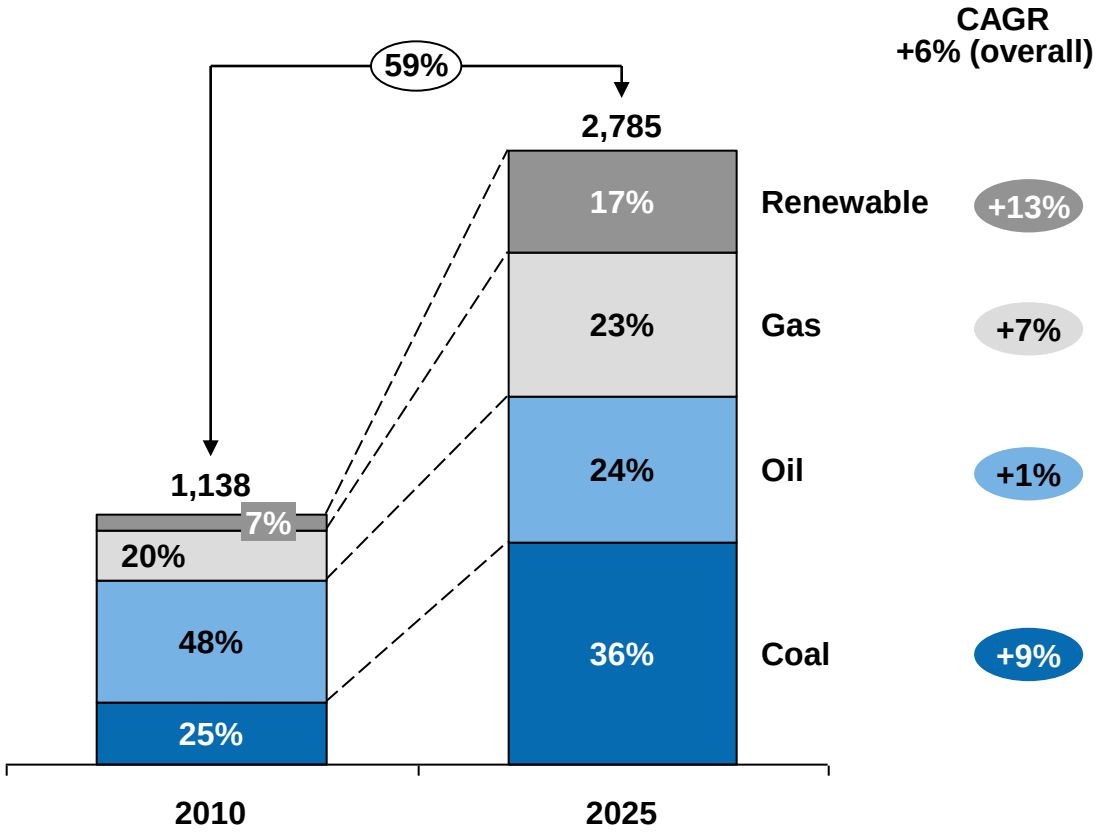
# The government has set national energy targets for 2025, encompassing a shift in the mix toward coal, renewables and gas

**Indonesia's National Energy Mix (Mboe)**

2010-2025 shift – Perpres 5/2006




## Comments

- Perpres 5/2006 aims to secure national energy supply by achieving, by 2025:
  - energy elasticity ratio (rate of energy consumption growth vs. rate of economic growth) < 1
  - A shift in the energy mix toward a more sustainable one (from oil to renewable, coal and gas)
- Minister of Energy & Mineral Resources has the responsibility to develop the Blueprint of National Energy Management, defining the high level requirements for the development of critical infrastructures (in particular for coal and gas)

Source: Development Target of Renewable Energy 2025 – Minister of E&MR; Team analysis



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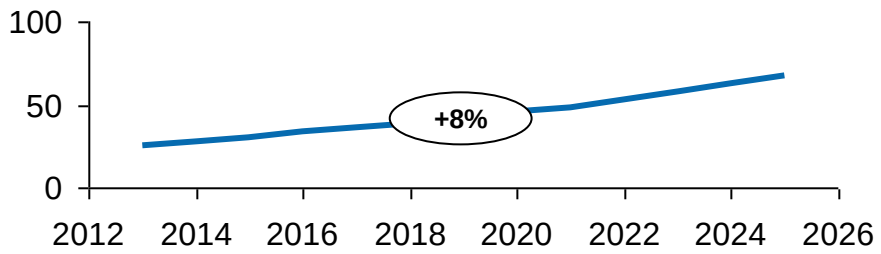
# Energy demand mix evolution is driven by consumer growth and fuel substitution – regulation impacts both dimensions

**Consumer Growth**

**Consumer Growth – Power Example**

Indonesia Power Consumption Forecast, GW

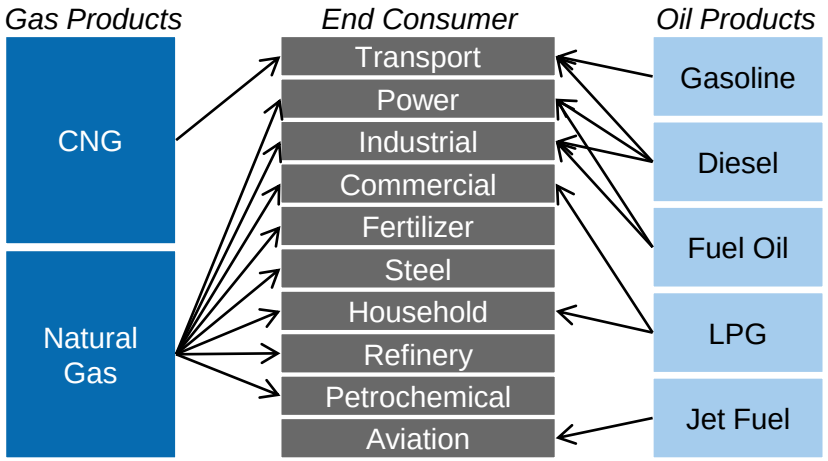



**Role of Regulations**

- Industrial regulations are key to growth of consumer segments:
  - Facilitation in setting up industry units
  - Pricing driving customer acquisition
  - Public service obligation etc.

**Fuel Substitution**

**Fuel Options for Consumers**




- Fuel pricing regulations impact economic substitution between fuels:
  - Price subsidies on gasoline, diesel and natural gas will determine their demand mix
- Mandates may drive substitution of certain fuels:
  - Substitution of gasoline and diesel with CNG may be boosted by mandating CNG use in public transport
- Regulatory thrust on alternate energy may drive its adoption over conventional fuels



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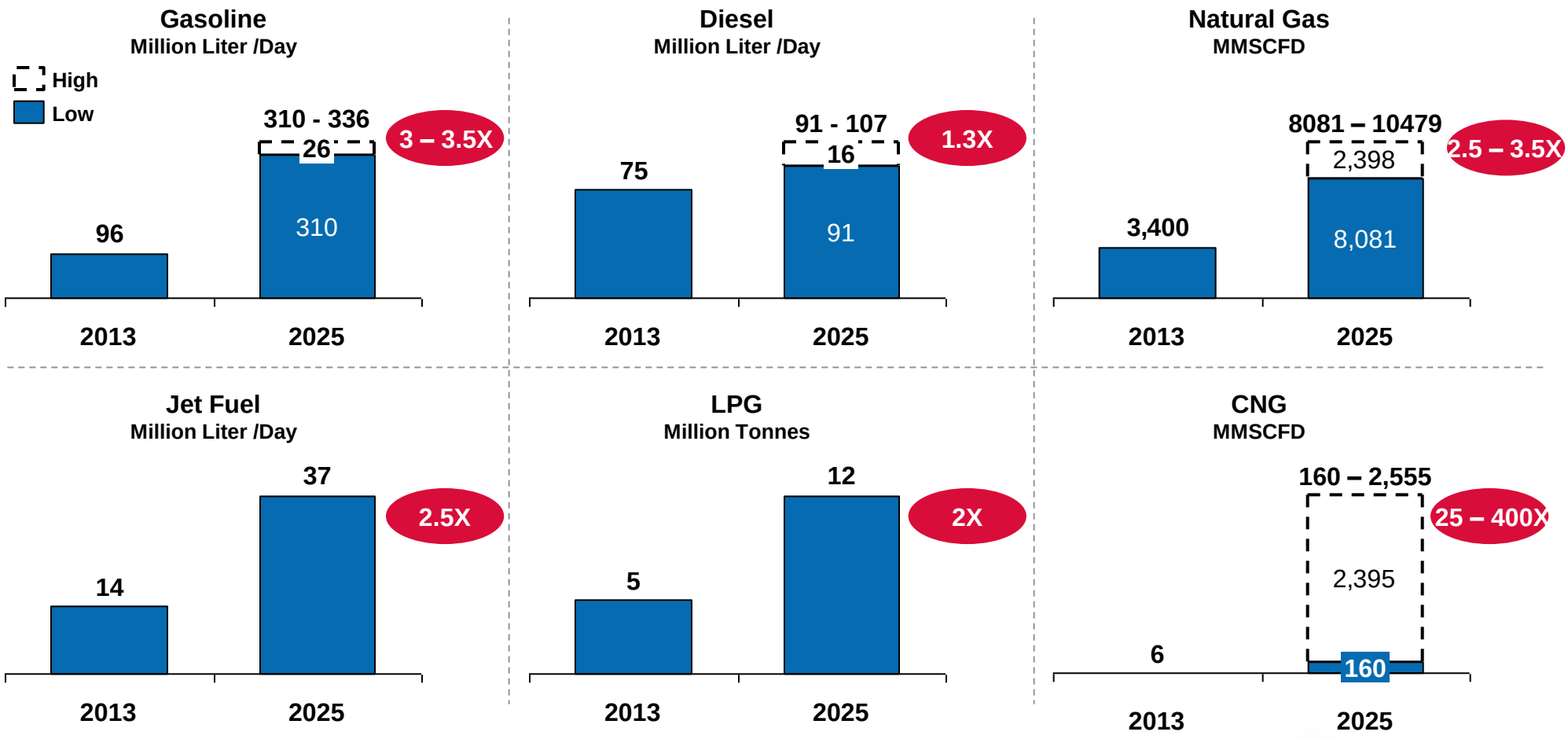
# Within the likely consumer growth, substitution and regulatory scenarios, Indonesia can expect a surge in oil and gas demand

## Indonesia – Demand Outlook



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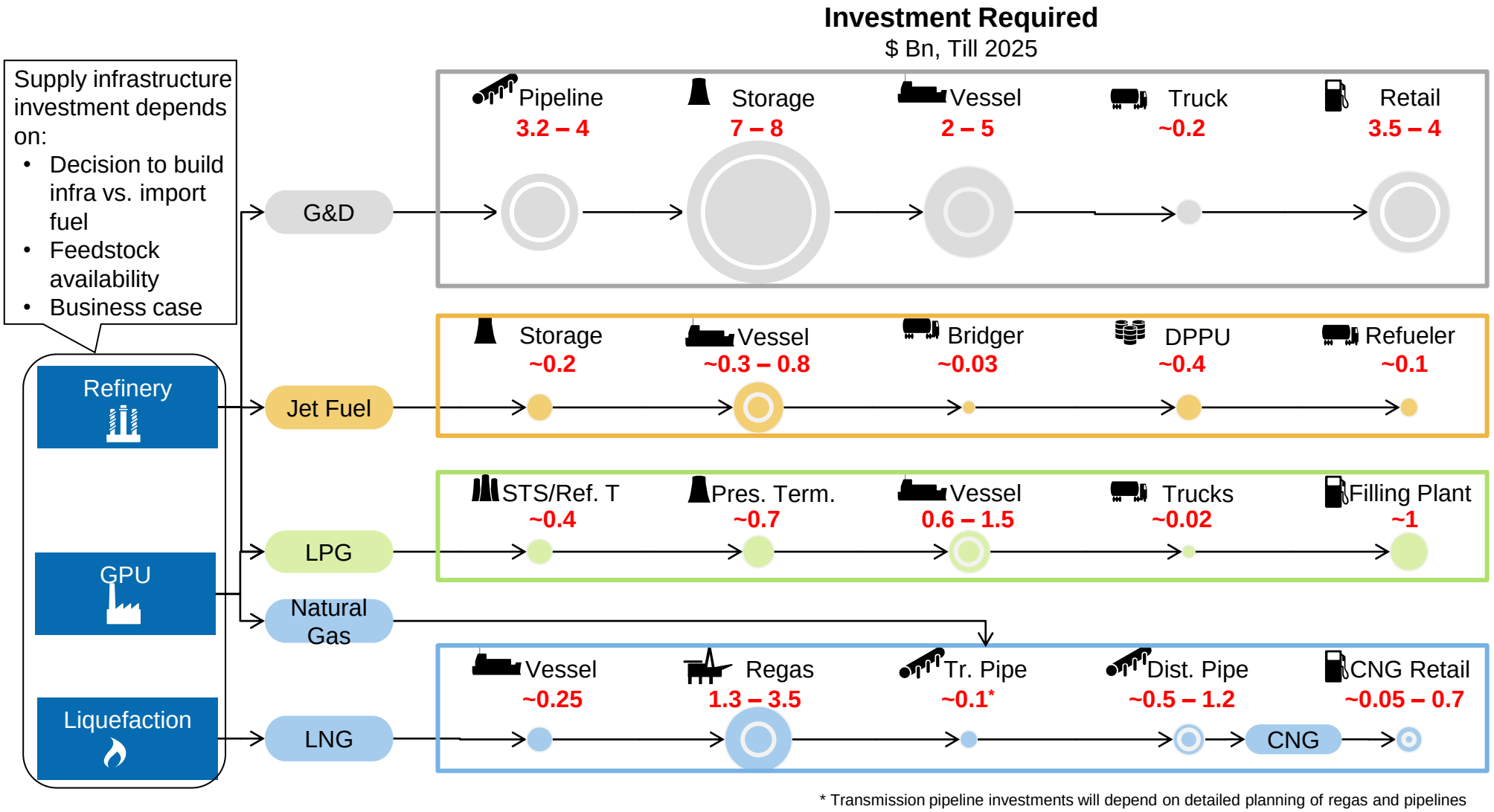
# This demand growth entails ~$30 bn investments in infrastructure across the oil and gas value chain, excluding supply infrastructure




* Transmission pipeline investments will depend on detailed planning of regas and pipelines



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# Pertamina has been proactively thinking about infrastructure development and has developed supporting tools for planning

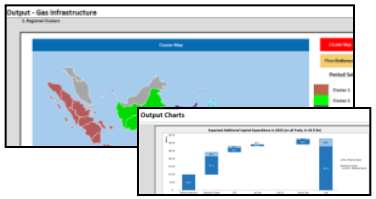
## Initiative : Pertamina Infrastructure Strategy 2025 (Models & Tools)

### 1 Integrated Energy Model

- Model integrated energy demand up to 2025
- Integrate internal Pertamina study & bottom-up approach – analysis by consumer industry

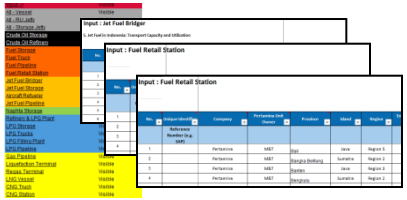
In addition, **business model** reference book developed to guide partnership decisions

### 3 Infrastructure Integration Model



- Translate projected demand into required infrastructure using thumb rules

### 2 Infrastructure Database (Existing)



- Create a single “source of truth” on existing infrastructure

## Initiative : Pertamina Infrastructure Planning (Models & Tools)

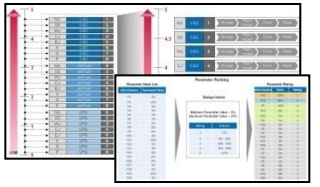
### 4 Gap Identification Model

- Identify gaps by comparing required infrastructure to existing infrastructure + RJPP projects

### RJPP Infrastructure Projects (Planned)

- List of infrastructure projects in RJPP i.e. 2014-2018

### 5 Prioritization Model



- Prioritize infrastructure gaps based on quantitative criteria

**Output :**

**Prioritized Gaps serving as inputs to infrastructure planning**

Source: Team analysis



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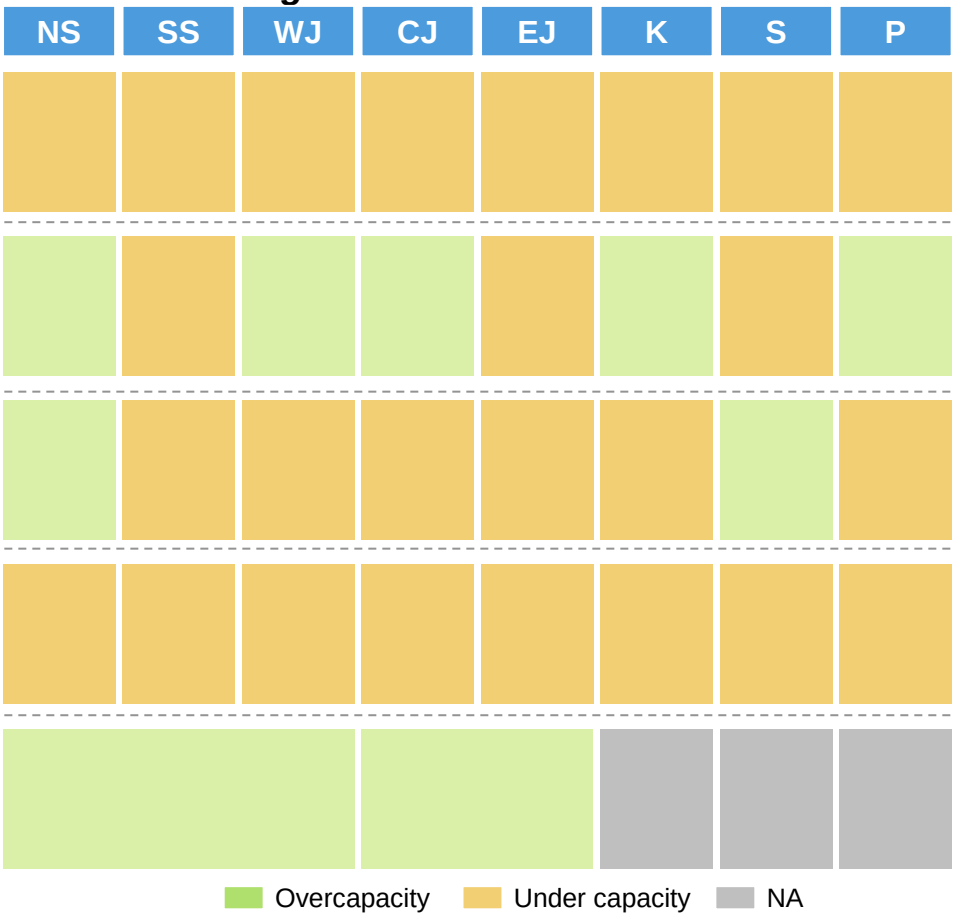
# Analysis suggests retail & storage as key gaps by 2018; additional infrastructure is required across regions/fuels to meet 2025 demand

## Gap Analysis – Summary

| *Key Gaps - 2018* | |
|---|---|
| **Gasoline & Diesel Retail** | Retail appears to be the limiting infrastructure across regions for gasoline and diesel |
| **Gasoline & Diesel Storage** | Short term overcapacity in most regions, except South Sumatra, East Java, and Sulawesi **(Under capacity by 2025 across most regions)** |
| **LPG Storage** | Additional storage required in South Sumatra, Java, Kalimantan and Papua |
| **DPPU Capacity** | Capacity shortage across regions will be a limiting factor in serving Jet Fuel demand |
| **Natural Gas Infrastructure** | Short term overcapacity in regasification **(Under capacity by 2025)** |

*Regional Distribution - 2018*




Source: Team analysis



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# Gap mitigation will require extra investments – business model options have been evaluated with a view of attracting partners

## Business Model Review – Key Drivers

- Funding constraints could be addressed by attracting partners through implementation of alternate business models
- Partnership options across the value chain of relevant infrastructure have been evaluated on the basis of:
  - ***Capability requirement*** : Level and sophistication of resources required from Pertamina
  - ***Implementation risk*** : Pertamina's risk appetite in building the infrastructure
  - ***Funding requirement*** : Pertamina's available funding given the overall investment perspective
  - ***Balance sheet implication*** : Implications of investments to Pertamina's financial statements (e.g. distinction between operational vs financial lease)
  - ***Attractiveness for partner*** : Creation of an incentive model to attract potential partners

## Business Model Options

| Infrastructure | | Options and Examples | | |
|---|---|---|---|---|
| Oil Infra | Storage | Integrated Model | Merchant / JV Model | Tolling Model |
| | | Pertamina | Pertamina & Commodity Trader | Storage Player |
| | Pipeline | Integrated Model | | Tolling Model |
| | | Pertamina | | Pipeline Owner |
| | Retail | COCO | CODO | DODO |
| Gas Infra | Liquefaction | Integrated Model | Merchant / JV Model | Tolling Model |
| | | Pertamina & Upst./Downst. Co. | Pertamina & Liquef project company | Liquefaction tolling company |
| | Shipping | Own | Time Charter | Spot Charter |
| | | Pertamina & Ship Owner | Pertamina & Ship Owner | Ship Owner |
| | Regas | Integrated Model | Merchant / JV Model | Tolling Model |
| | | Pertamina | Pertamina & Regas Company | Regas Company |
| | CNG Retail | Dedicated for Public Transport | Collocate with G&D Station | Independent CNG Station |

Key Gaps – 2025 | Most attractive Model | Asset Owner

Source: Team analysis



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# Regulatory support is required to effectuate favorable demand mix and infrastructure investments

| | Key Support required from Regulators |
|---|---|
| **Facilitation of Target Energy Mix** | ▪ Regulatory support is required for Indonesia to achieve the target of oil substitution by increase in gas and renewable penetration. Certain steps in this direction could be:<br>– **Facilitating substitution driven by economics through pricing regulations** : e.g. Liquid fuel price deregulation and/or subsidies on alternative energy / CNG<br>– **Volume allocation of substitutes to consumers to create certainty of supply** : e.g. preferential allocation of gas to city gas distribution, fostering fuel substitution<br>– **Mandates facilitating substitute adoption** : e.g. mandating use of CNG in public transport |
| **Facilitation of Infrastructure Investments** | ▪ Attracting global players to provide access to their existing infrastructure or invest in new infrastructure to support Indonesia's energy demand:<br>– **Facilitating use of assets of global players** : e.g. Gas shipping activities<br>– **Attracting infrastructure investments** : e.g. providing tax breaks to global investors |
| **Facilitation of Supply Enhancement** | ▪ Attracting investment in exploration & production as well as supply infrastructure such as refineries by easing the regulatory regime appropriately |

Source: Team analysis



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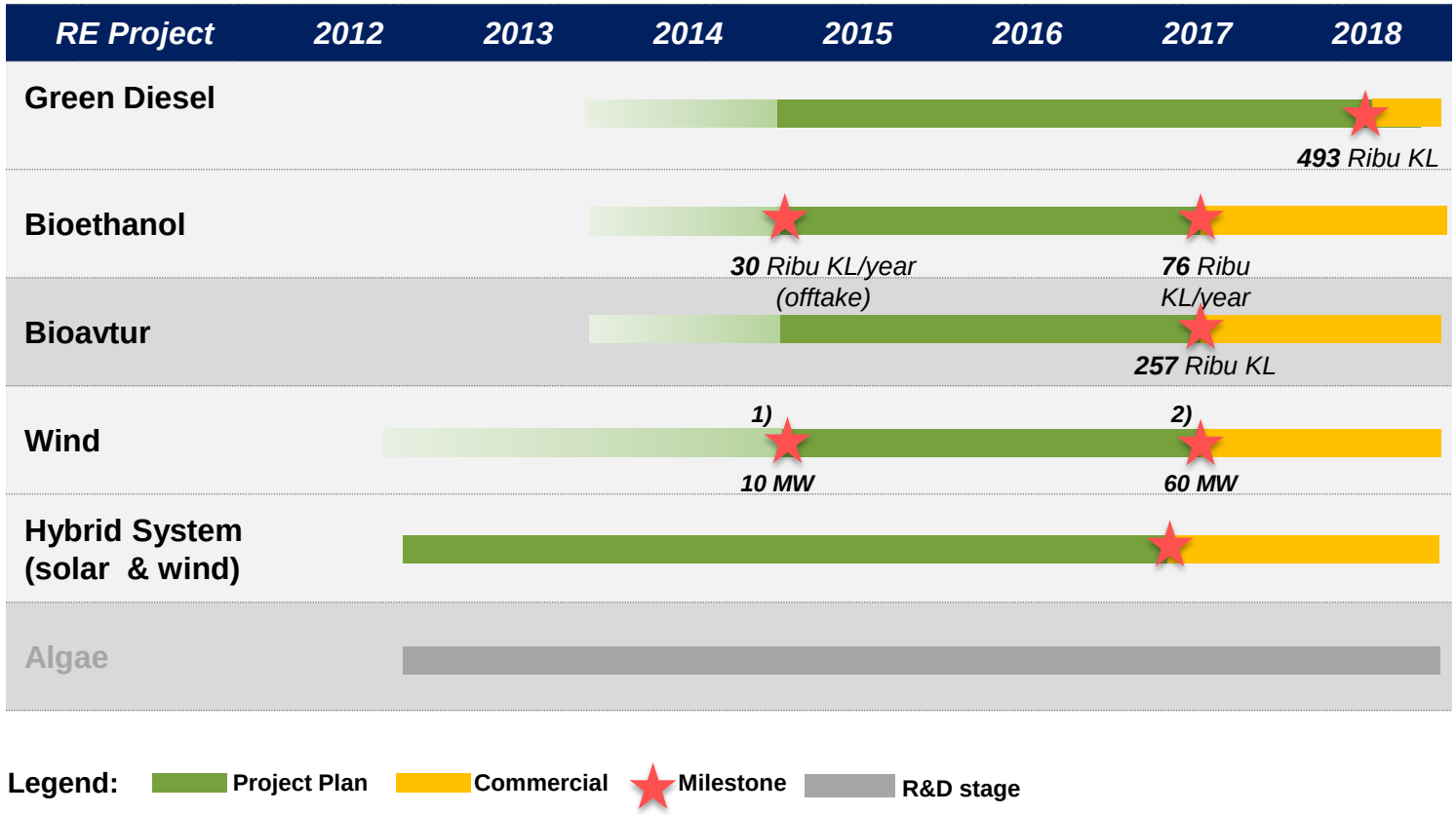
# Renewable Energy Projects in Pertamina – *updated 2014*



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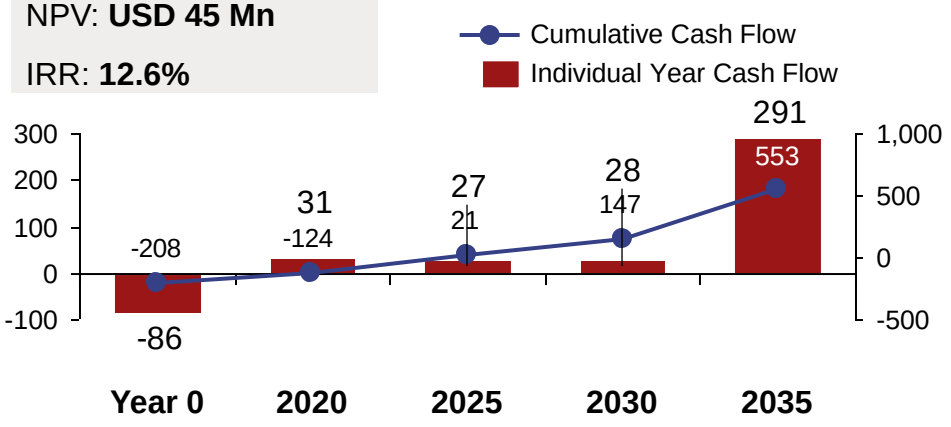
# Integrated Bioethanol project: NPV USD 45 Mn, IRR 12.6%, Capex USD 200 Mn

## Bioethanol project financials

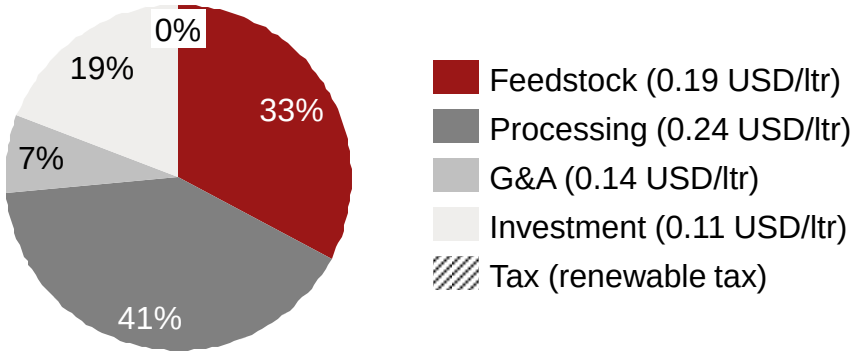
### Integrated Projects Cash Flows (USD Mn)

NPV: **USD 45 Mn**

IRR: **12.6%**




### Cost Breakdown




| | Key assumptions |
|---|---|
| **Technology** | 2nd Generation (Enzymatic) |
| **Plant capacity** | 76,000 KL of refinery and 7000 Ha of plantation |
| **CAPEX** | ~ USD 170 Mn for refinery & ~ USD 50 Mn for plantation |
| **Plant lifetime** | 20 years |
| **Conversion factor[1]** | 5 |
| **Feedstock requirement** | Napier Grass |
| **Feedstock cost** | 41 USD per ton of biomass increasing at inflation |
| **Product price** | Increasing ethanol price forecast driven by increasing global mandates and high crude oil prices (AT Kearney) |
| **Inflation** | 3% & 7% per annum |

# Several proven technology provider in 2G bioethanol industry

## Technology Partners

● High ○ Low Promising Partners

| Technology | Company | Overview | 2G Capacity | Tech Maturity[2] | Willingness to License | Strengths / USP |
|---|---|---|---|---|---|---|
| 2G Biochemical | BETA RENEWABLES | • JV between<br>– Mossi & Ghisolfi (global energy group<br>– Chemtex (leading chemicals firm) | 76 | ● | ✓ | World's first commercial scale plant |
| | POET DSM Advanced Biofuels | • JV between<br>– POET – Largest 1G ethanol producer in US<br>– DSM – Leading technology company | 95[1] | ◕ | ✓ | |
| | ABENGOA | • Leading US 1G ethanol producer | 95[1] | ◕ | ✓ | |
| | frontier renewables<br>ZeaChem | • JV between<br>– Mascoma – Renewable fuels firm<br>– J.M. Longyear – leading natural resources firm | 76[1] | ◑ | ✓ | Cost reduction by combining enzyme treatment & fermentation |
| | | • Fuel and chemical player<br>• Products include biofuels, diesel, acetic acid, etc. | 95[1] | ◑ | | Among highest expected ethanol yields |

1. Under Construction
2. Based on estimated time to start commercial operations

Sources: News Sources, Secondary research, A.T. Kearney

# Technology, economics and feedstock assessment shows 2G ethanol as the most attractive

## Assessment of bioethanol project types

○ Unfavourable ● Favourable
Selected Project Types

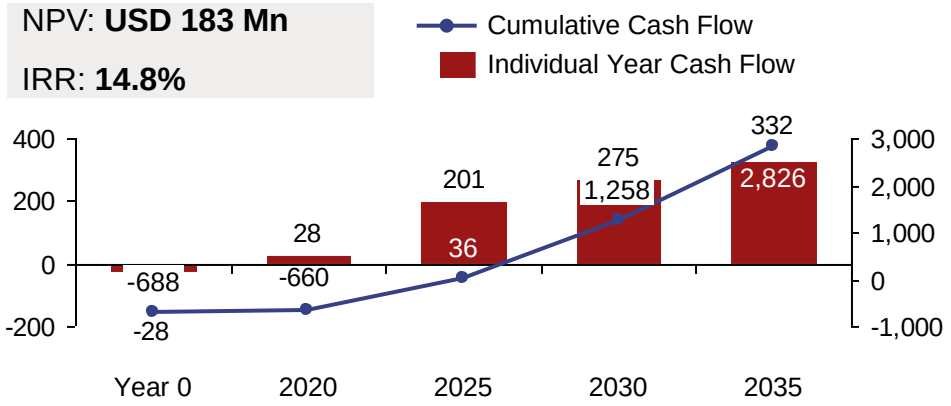
| Project type | Assessment Criteria | | | | | | Other Considerations | Overall |
|---|---|---|---|---|---|---|---|---|
| | 1 Technology maturity | | 2 Economics[2] (Production Cost) | | 3 Feedstock | | | |
| **1G – Yeast Fermentation[1]** | Most widely used (~99% of global production) | ● | • High (USD ~0.78-0.83 / l) | ◔ | Decent availability – Large competing demand from food, industry | ◕ | Unviable economics – Insufficient benchmark price | ◑ |
| **2G – Biochemical Treatment** | Multiple operating / upcoming commercial facilities | ◕ | Low (USD 0.4-0.6 / l) | ◕ | • Rice husk, rice straw, EFB, wood fuel, etc.<br>• Significant availability; Supply chain to be established | ◑ | | ◕ |
| **2G – Thermochemical Treatment** | Enerkem, INEOS, Lanzatech are the only major companies | ◑ | Low (USD 0.4-0.6 / l) | ◕ | • Rice husk & straw, EFB, MSW, wood fuel, etc.<br>• Significant availability; Supply chain to be established | ◑ | | ◕ |
| **3G – Algae Fermentation** | No commercial facility | ○ | High (USD 1.0-2.0 / l) | ○ | • Large potential for algae<br>• Efficient method needs to be developed | ◔ | Problems related to scalability | ◔ |

1. Acetic acid fermentation is another type of fermentation, but lesser used
2. Status as of 2012
Source: A.T. Kearney

# Integrated Greendiesel project: NPV USD 183 Mn, IRR 14.8%, Capex USD 900 Mn

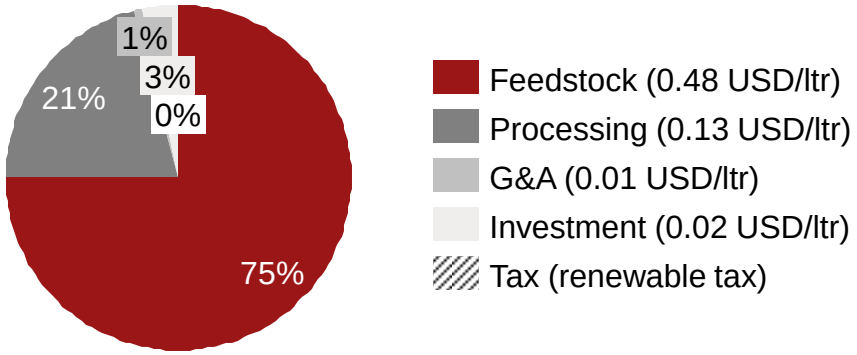
## Greendiesel project financials

### Integrated Projects Cash Flows (USD Mn)




| | Key assumptions |
|---|---|
| **Technology** | 1.5 generation (hydrogenated) |
| **Plant capacity** | 10,000bbl/day of refinery and 100,000 Ha of plantation |
| **CAPEX** | ~ USD 193 Mn for refinery & ~ USD 700 Mn for plantation |
| **Plant lifetime** | 20 years |
| **Feedstock requirement** | CPO, RBDPO, Stearin |
| **Feedstock cost** | Integrated |
| **Product price** | Increasing Gasoil price forecast driven by increasing global mandates and high crude oil prices (Woodmac) |
| **Inflation** | 3% & 7% per annum |

### Cost Breakdown



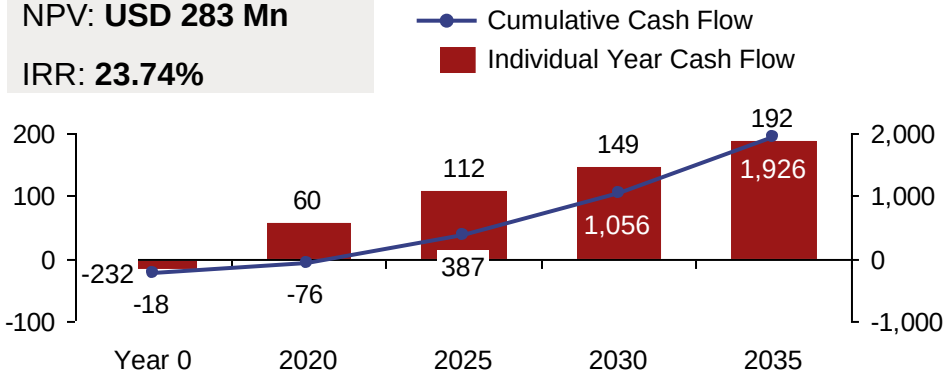
# Bioavtur project: NPV USD 283 Mn, IRR 23.74%, Capex USD 259 Mn

## Bioavtur project financials

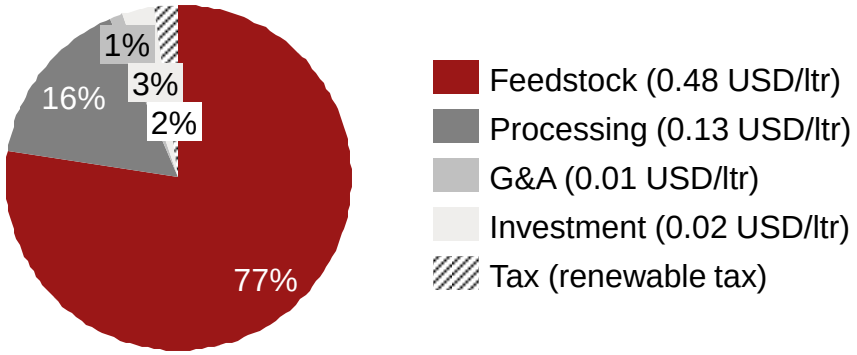
### Projects Cash Flows (USD Mn)

NPV: **USD 283 Mn**

IRR: **23.74%**




### Cost Breakdown




| | Key assumptions |
|---|---|
| **Technology** | 1.5 generation (hydrogenated+Isomerization) |
| **Plant capacity** | 10,000bbl/day of refinery |
| **CAPEX** | ~ USD 259 Mn for refinery |
| **Plant lifetime** | 20 years |
| **Feedstock requirement** | CPO, RBDPO, Stearin |
| **Feedstock cost** | Integrated |
| **Product price** | Increasing jet A1 price forecast (Woodmac) driven multiply by 120% |
| **Inflation** | 3% & 7% per annum |

# Biofuels Project Update

| Project Name | Project Profile | Updated Status | Target Onstream | Potential Partners |
|---|---|---|---|---|
| **Green Diesel** | • 10,000 bbl/day<br>• Total capex USD 187 mio<br>• Feedstock : CPO and derivaitves<br>• Hydrogenation Technology (1.5G)<br>• Strategy : Integrated with Plantation | • Pre-FS done<br>• Procuring Consultant for DFS is on progress | 2018 | • PTPN IV (Persero)<br>• PT Medco intidinamika<br>• PT SMART Tbk |
| **Bio avtur** | • 10,000 bbl/day atau 257,000 KL/year<br>• Capex USD 220 mio<br>• Feedstock : CPO and derivatives<br>• Hydrogenation Technology<br>• Strategy : Offtake CPO with Hedging | • Pre-FS done<br>• Procuring Consultant for DFS is on progress | 2018 | • PT Wilmar Nabati Indonesia |
| **Bio ethanol** | • 200 ton/day atau 76,000 KL/year<br>• Capex USD 170 mio<br>• Feedstock : Lignocellulosic (napier grass)<br>• Technology 2G Lignocelluloseic<br>• Strategy : Integrated with Plantation | • Pre-FS done in mid 2013<br>• Have selected Consultant for DFS (Nexant)<br>• DFS is on progress | End of 2017 | • Toyota Motor Corporation<br>• PTPN X (persero) |



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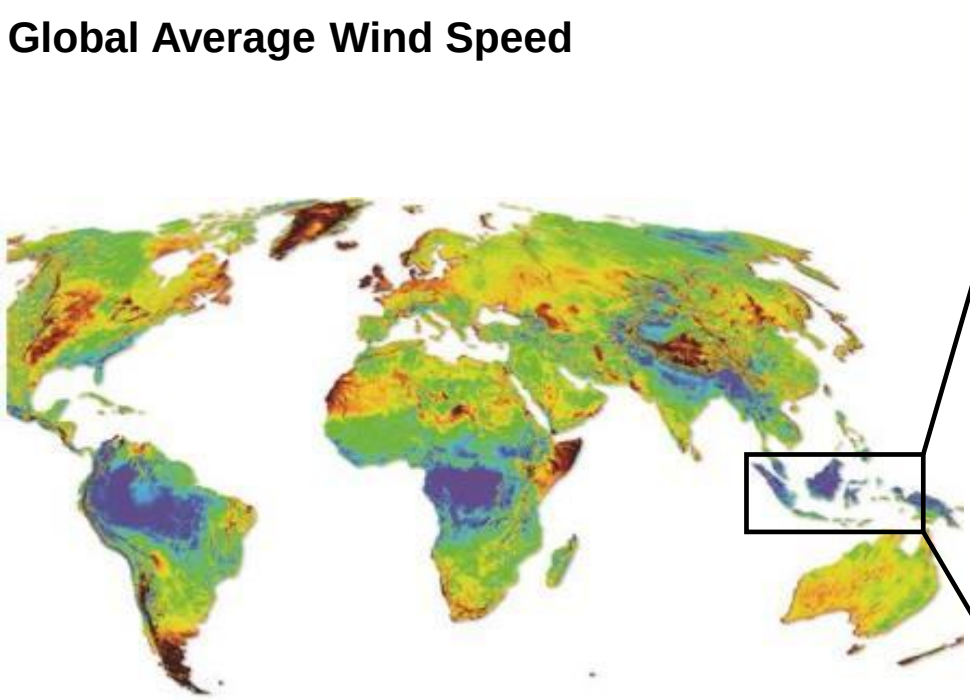
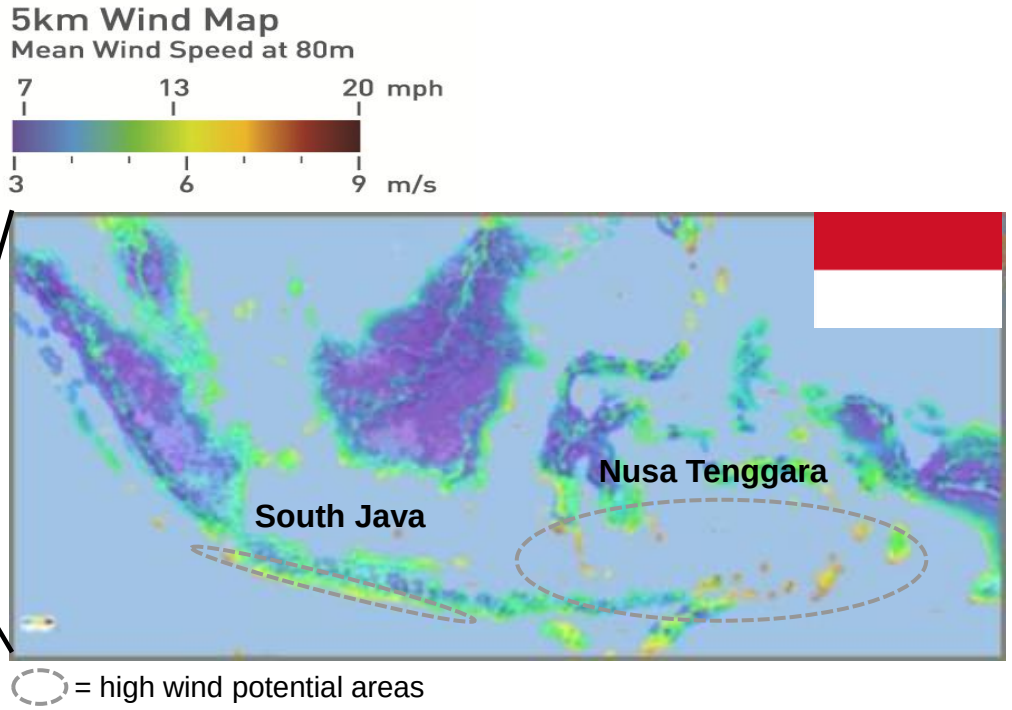
# Resource Availability of Wind Farm in Indonesia limited to several area with strong wind regime

## Resource availability

### Global Average Wind Speed






Overall Indonesia is not a major wind resources country: wind energy potential along the equator is usually limited

Potential 9 GW, average 3 m/s in most areas

Source: 3Tier

# Wind Energy Project Update

| Project Name | Project Profile | Status | Target On Stream | Partners |
|---|---|---|---|---|
| **Wind Energy Jeneponto** | • Wind farm in Jeneponto, South Sulawesi<br>• Site Measurement conducted by GE for 4.5 years to date<br>• Capacity 62.5 MW expandable into 130 MW<br>• Capex USD 150 million | • Data collection completed<br>• Ijin Prinsip granted<br>• On going propose PPA to PLN (Rp 1600/kWh)<br>• EPC Contract selection | Q1- 2017 | • Asia Green Capital<br>• IFC |
| **Wind Energy Viron** | • Wind farm in Sukabumi, West Java<br>• Capacity 10-50 MW<br>• Capex 20 million<br>• Site measurement by P3TKEBTKE (ESDM) 2006-2008<br>• PPA for 10 MW at Rp 870/kWh | • Renegotiation PPA (lead by partner)<br>• Finalization Feasibility Study | 2015 | • Viron Energy<br>• Suzlon |



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3. **Partnership Project with JICA**

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# Pertamina Geothermal Energy (PGE) had cooperation with Japan International Cooperation Agency (JICA) as follow…

| | Projects | Progress per Januari 2014 | COD Target | Financing Scheme |
|---|---|---|---|---|
| 1 | Lumut Balai Unit 1 | Unit 1 : Development & EPCC Bidding | Unit 1: 2016 | ▪ Corporate Loan + Soft loan from JICA |
| 2 | Lumut Balai Unit 2,3 & 4 | • Unit 2,3, & 4: Exploration (Drilling) | • Unit 2 : 2018<br>• Unit 3 & 4: 2019 | ▪ Corporate Loan + Soft loan from JICA |


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# Thank You



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