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Energy
REPUBLIC OF SOUTH AFRICA

DRAFT INTEGRATED ENERGY PLANNING REPORT



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OVERVIEW OF INTEGRATED ENERGY PLANNING APPROACH

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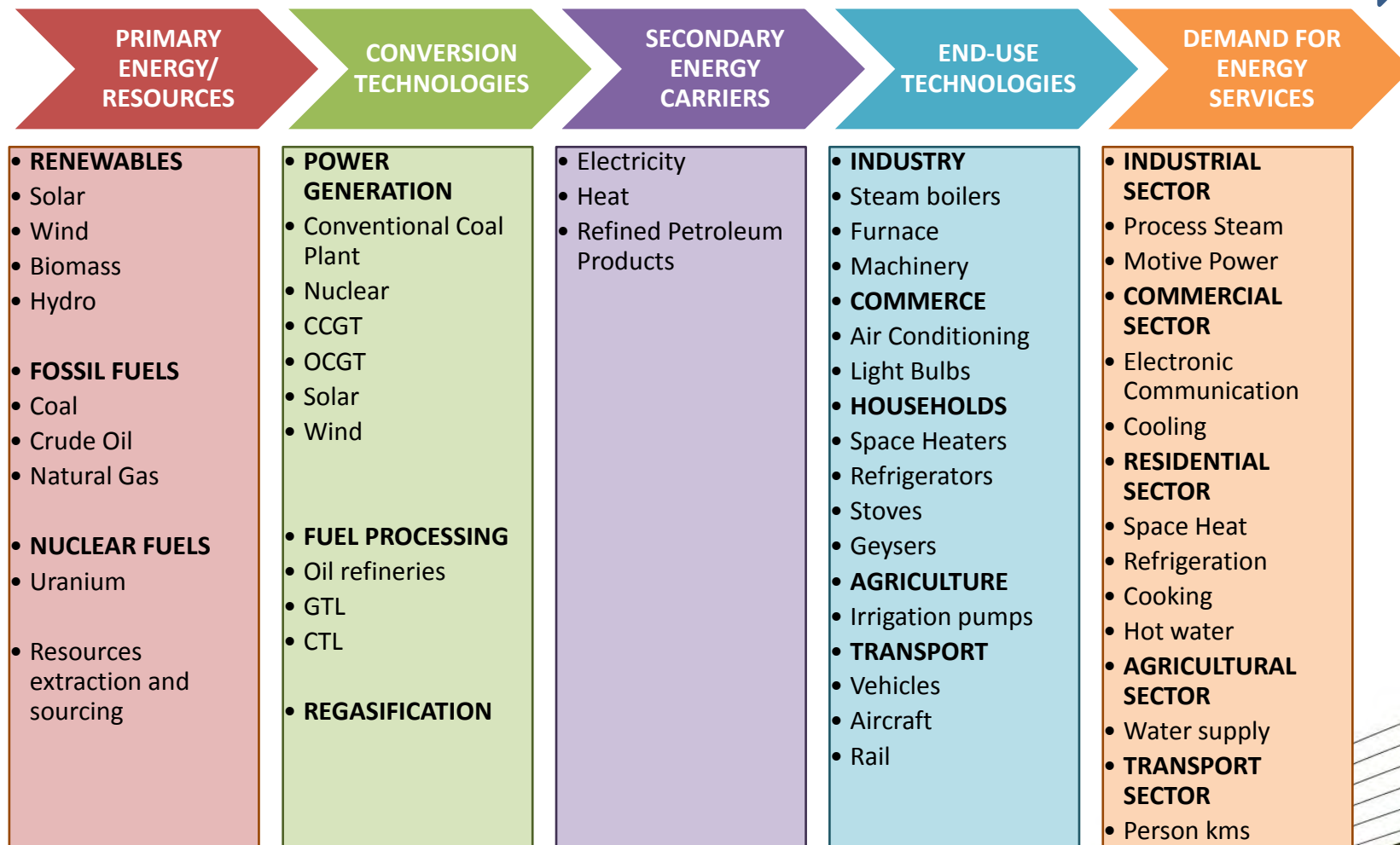
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- **PURPOSE AND OBJECTIVES**
- **HIGH-LEVEL PLANNING APPROACH**
- **IEP CONTEXT (KEY POLICY ISSUES)**
- **BASE CASE AND TEST CASES**
- **WAY FORWARD**



ENERGY VALUE CHAIN

Integrated energy planning seeks to consider all the key elements of the energy value-chain at a national level





PURPOSE AND OBJECTIVES

- The IEP is a multi-faceted policy which has multiple objectives:
 - Describes the recommended **ENERGY PATHWAY/ENERGY SECTOR ROADMAP** for South Africa
 - Guides the development of energy policies and where relevant set the framework for regulations in the energy sector
 - Guides the selection of appropriate technology to meet energy demand (i.e. what types and size of new power plants and refineries should be built and what prices should be charged for fuels)
 - It therefore also guides the investment and development of energy infrastructure in South Africa
 - Proposes alternative energy strategies which are informed by testing the potential impacts of exogenous factors



KEY QUESTIONS

Between now and 2050...

- What is the desired economic growth and socio-economic needs of the country?
- **Energy Demand:** What will be the energy requirements to support this economic growth and socio-economic development?
- **Energy Efficiency and Demand Side Interventions:** Is there a way in which we can reduce these energy requirements without stifling the desired economic growth and socio-economic development?
- **Energy Access:** What are the full energy requirements (not just on-grid electricity) for all people? What strategies need to be put in place to ensure that there is universal access?



KEY QUESTIONS

Between now and 2050...

- **Security of Supply:** What supply options do we need to put in place to ensure that we don't suffer a supply deficit?
- What new technologies and feedstock combinations should we consider?
- **Minimise costs:** How much do different technologies cost and what will the costs be in the future?
- **Diversity of Supply Sources:** Where should the feedstock come from and what will the costs of the feedstock be?
- **Diversity of Supply:** Primary Resources – How do we exploit our natural endowment while minimising overreliance on a single source



KEY QUESTIONS

Between now and 2050...

- **Environmental impact:** How do we ensure that we do not make choices which create additional pressure on the environment in the future
 - i.e. Minimise the water requirements of the chosen technologies
 - i.e. Minimise emissions associated with technologies and primary energy resources

KEY QUESTIONS



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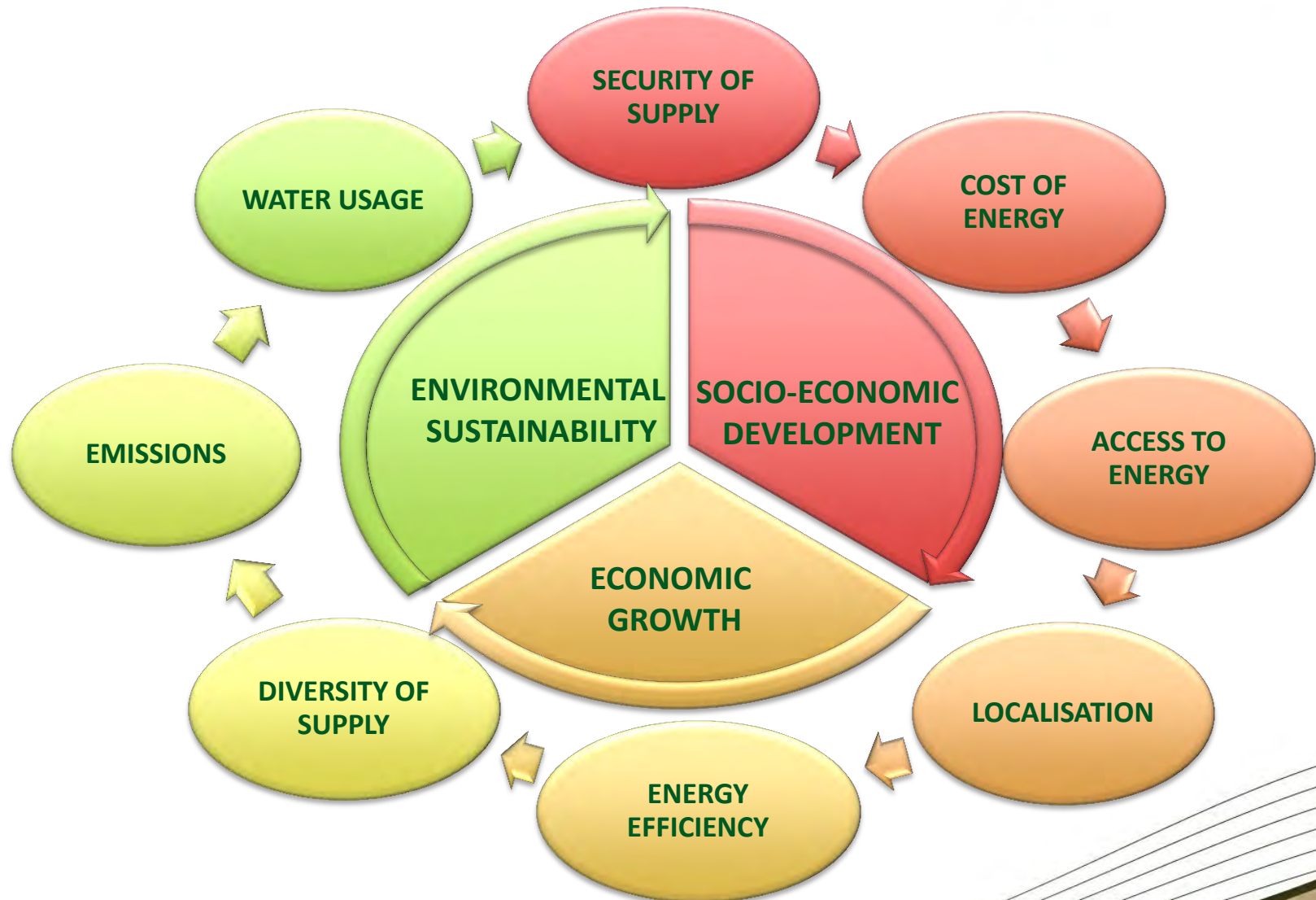
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Between now and 2050...

- **Localisation and technology transfer:** In recommending these supply-side options/technologies, how do we ensure that local players can participate?
 - What is the employment-intensity of energy production for these technologies and what strategies should be considered to ensure an increase in the employment-intensity of the energy sector?
 - What level of regulation and market structure will optimise this?



8 KEY OBJECTIVES



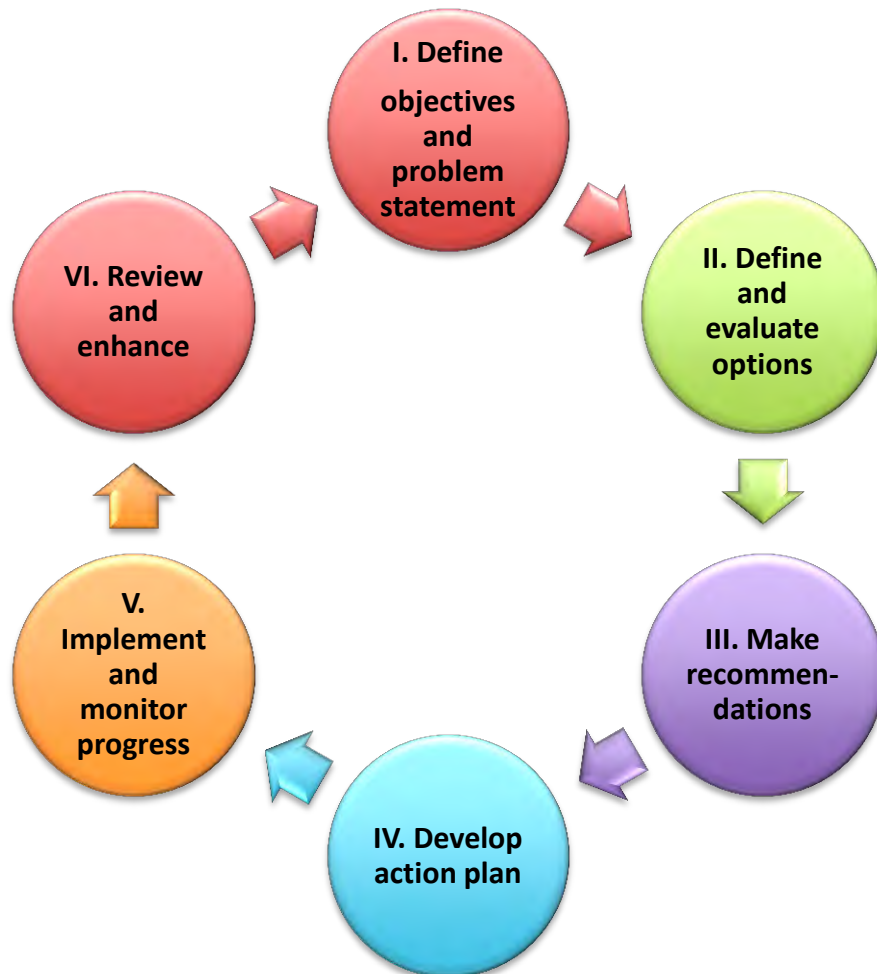


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HIGH-LEVEL ENERGY PLANNING PROCESS



- Energy Planning is iterative
- The scope of the IEP development process is encompassed in Steps I, II and III
- Steps IV, V, and VI are within the broader scope of the IEP process, but fall outside the sphere of its development
- Once the IEP recommendations have been made and promulgated, implementation, monitoring and review of those recommendations need to take place
- The outcomes from these steps must inform future iterations of the IEP.



HIGH-LEVEL APPROACH

Public Stakeholder Input

I. DEFINE PROBLEM STATEMENT AND OBJECTIVES

Define problem statement and key objectives

Describe current state of energy sector

Define key policy questions

II. DEFINE AND ANALYSE OPTIONS

Identify policy alternatives

Analyse and present policy alternatives

III. MAKE RECOMMENDATIONS

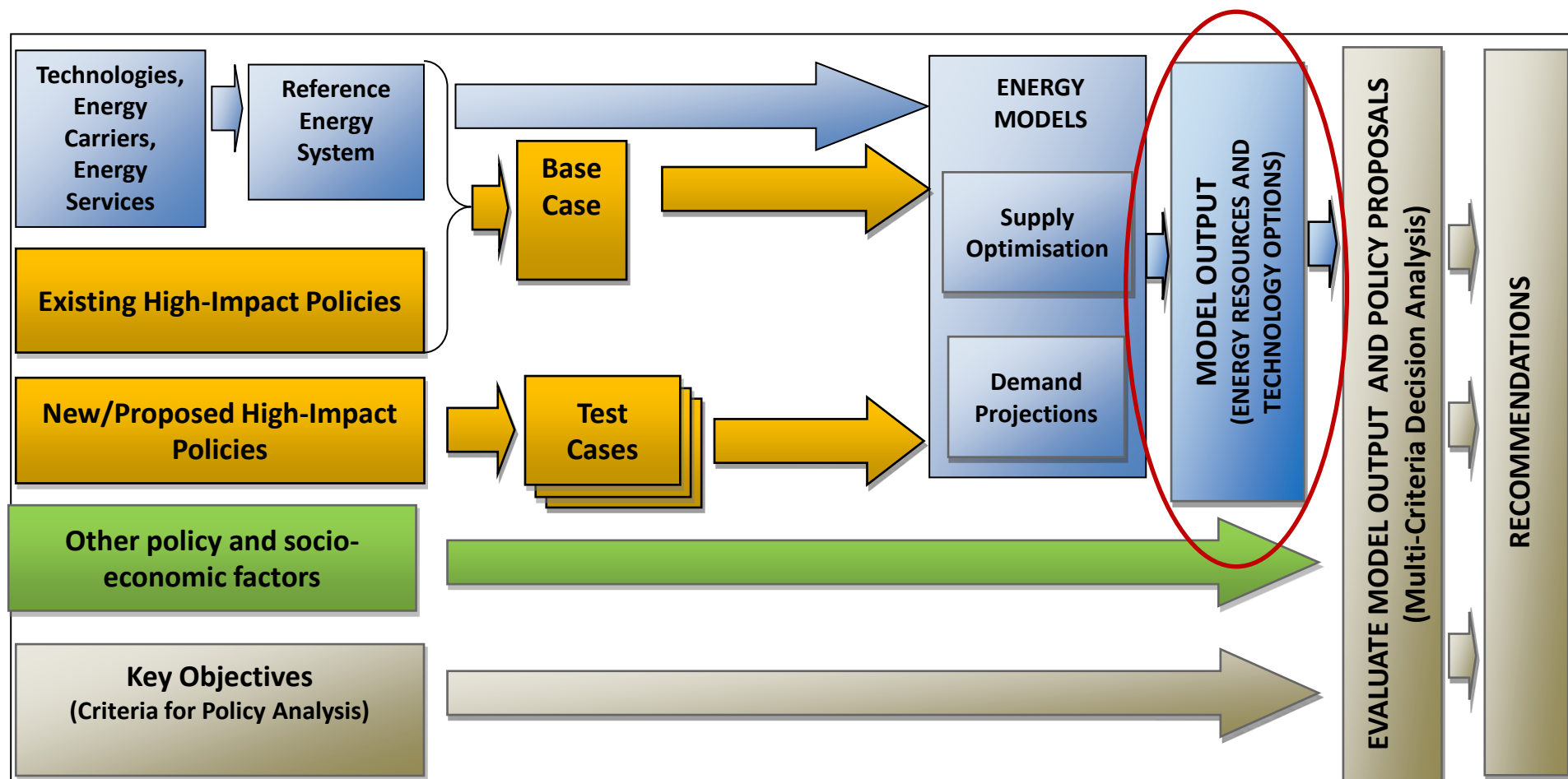
Evaluate policy alternatives

Make recommendations

Public Stakeholder Input

The chosen approach enables for:

- 1) Combination of **Quantitative** (data-driven) and **Qualitative** (expert judgement) analysis
- 2) A parallel consideration of each of the following elements:
 - Existing and future energy **technologies and energy carriers**
 - **Existing and proposed policies** with a significant impact on the energy sector
 - **Other socio-economic factors** which need to be considered
 - **Objectives** upon which different options should be evaluated





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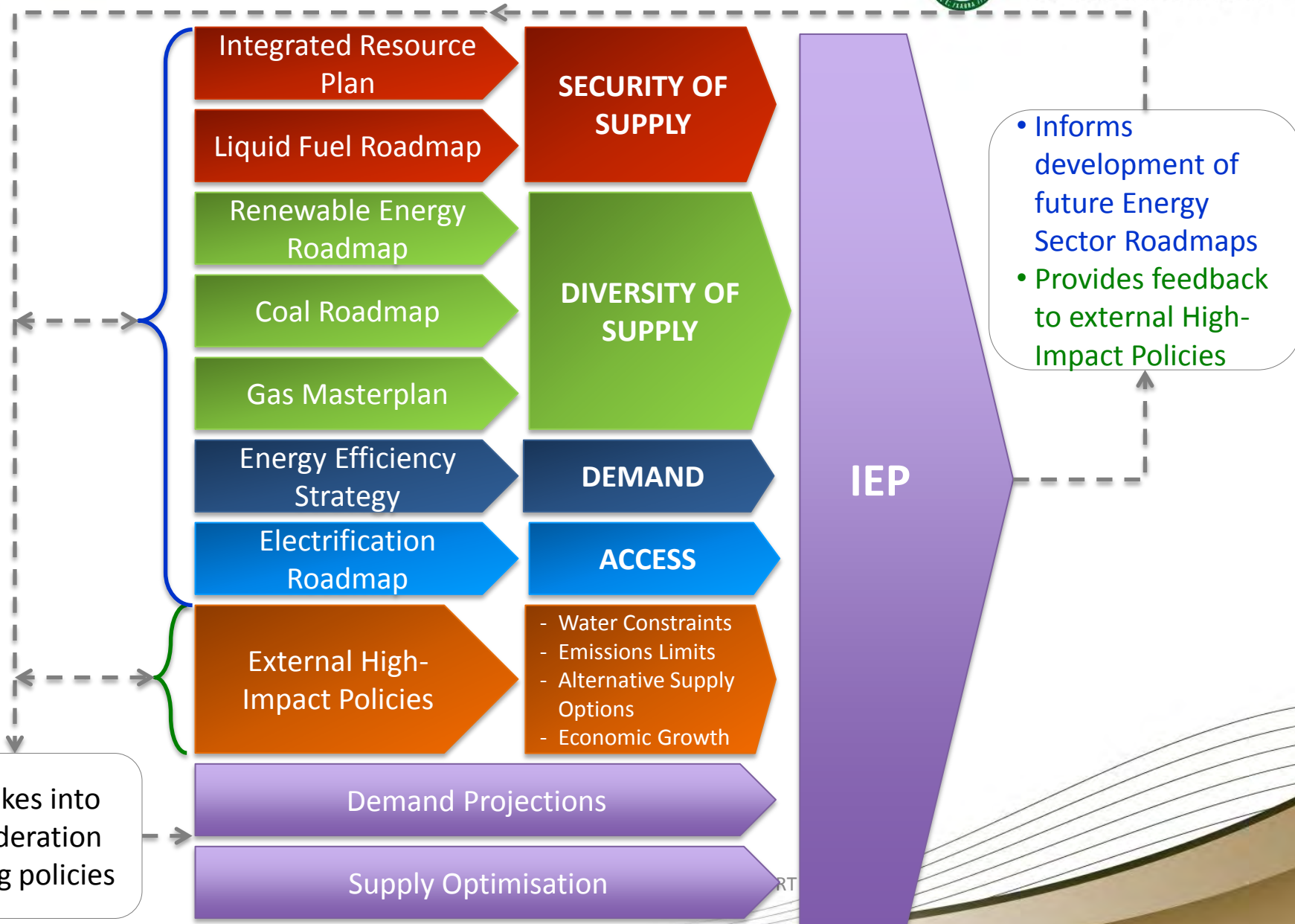
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IEP AND OTHER PLANS



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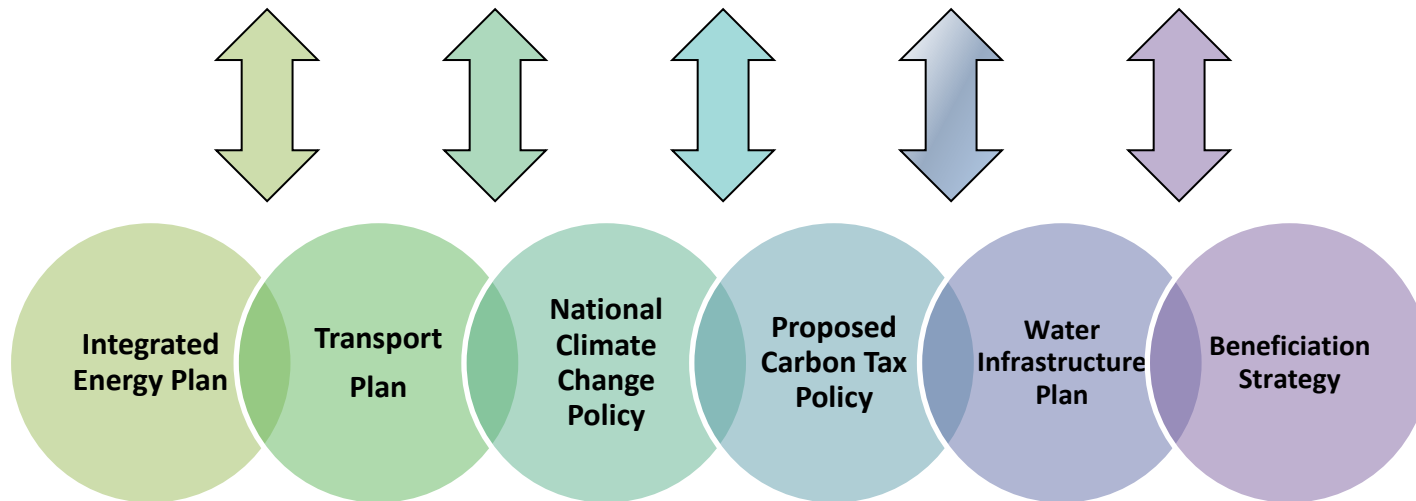
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HIGH-IMPACT POLICIES

NEW GROWTH PATH, NATIONAL DEVELOPMENT PLAN



The IEP seeks to quantify and provide feedback on the extent to which national policy objectives outside the sector may impact on the attainment of energy sector imperatives and vice versa



HIGH-IMPACT POLICIES

OVERARCHING NATIONAL POLICIES

- **New Growth Path**
 - Sets aspirational targets for employment, economic growth and green economy
- **National Development Plan**
 - Defines alternatives that should be considered for ensuring security of liquid fuel supply is met
 - Alternative sources for electricity generation
- **National Treasury**
 - Economic Growth Projections

POLICIES WITH UNIDIRECTIONAL IMPACT

- **Proposed Carbon Tax Policy**
 - Proposes a carbon tax for energy supply and energy end-use amongst other sectors

POLICIES WITH BIDIRECTIONAL IMPACT

- **National Climate Change Response White Paper**
 - “Peak, Plateau, Decline” emission reduction targets have significant implications for the energy sector
- **Beneficiation Strategy**
 - Implementation of strategy will affect demand profile of industrial sector
- **Transport Plan**
 - Modal shifts from passenger vehicles to mass transit, from road to rail, amongst others have implications on future energy requirements transport from the sector



KEY POLICY ISSUES

HIGH-IMPACT POLICIES

National Climate Change
Response White Paper

Proposed Carbon Tax Policy

Renewable Energy White
Paper

National Development Plan

KEY POLICY ISSUES

Climate Change and
Emission Reductions

The role of Renewable
Energy Technologies in
moving towards a low-
carbon economy

Role of Alternative
Supply Options such as
Nuclear and Natural
Gas

Liquid Fuels Supply
Options under
different crude oil
price scenarios

TEST CASES

- 'Peak-Plateau-Decline' Emissions Limit Case
- Carbon Tax Case

- Renewable Energy Target Case

- Emissions Limit - No New Nuclear Case
- Emissions Limit - Natural Gas Case

- High Oil Price Case
- Low Oil Price Case



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BASE CASE AND TEST CASES

BASE CASE

- The Base Case encapsulates the state of energy demand and supply over the planning horizon, which is most closely informed **by current energy market trends**; the **national macroeconomic outlook**; assumed energy prices; existing energy infrastructure and the **existing suite of policies and government programmes**.
- **Not a representation of the most likely future or most likely scenario**, but is rather a simplistic representation of a future outcome that could materialise in light of current policies and macroeconomic trends.
- Represents a **Business-As-Usual or Status Quo** scenario where current trends continue into the future.

TEST CASE

- **Deviation from the status quo as a result of specific policy interventions.**
- Defines a set of circumstances and resultant outcomes or impacts which is informed by the possible impacts of policies and policy interventions.
- Does not indicate what will happen but rather tests what could happen if a particular course of action is pursued.
- Specifically differentiated from a Scenario in that a **Scenario is largely influenced by exogenous forces** which the policy maker has no control over, while a **Test Case seeks to test the possible implications of active policy interventions**.



BASE CASE

IRP Committed and New Build Options

	NEW BUILD OPTIONS								COMMITTED					Non-IRP
	Coal Imports	Nuclear	Import Hydro	Gas - CCGT	Peak - OCGT	Wind	CSP	Solar PV	Coal	Other	DOE Peaker	Wind	Other Renewable	Co-Gen
	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
2010									380	260				
2011									679	130				
2012								300	303			400	100	
2013								300	823	333	1,020	400	25	
2014	500					400		300	722	999			100	
2015	500					400		300	1,444				100	200
2016						400	100	300	722					200
2017						400	100	300	2,168					200
2018						400	100	300	723					200
2019	250					400	100	300	1,446					
2020	250					400	100	300	723					
2021	250			237		400	100	300						
2022	250		1,143	237		400	100	300						
2023	250	1,600	1,183	237		400	100	300						
2024	250	1,600	283		805	800	100	300						
2025	250	1,600			805	1,600	100	1,000						
2026	1,000	1,600			-	400		500						
2027	250	-			805	1,600		500						
2028	1,000	1,600		474	690			500						
2029	250	1,600		237	805			1,000						
2030	1,000	-		948	-			1,000						
TOTAL	6,250	9,600	2,609	2,370	3,910	8,400	1,000	8,400	10,133	1,722	1,020	800	325	800

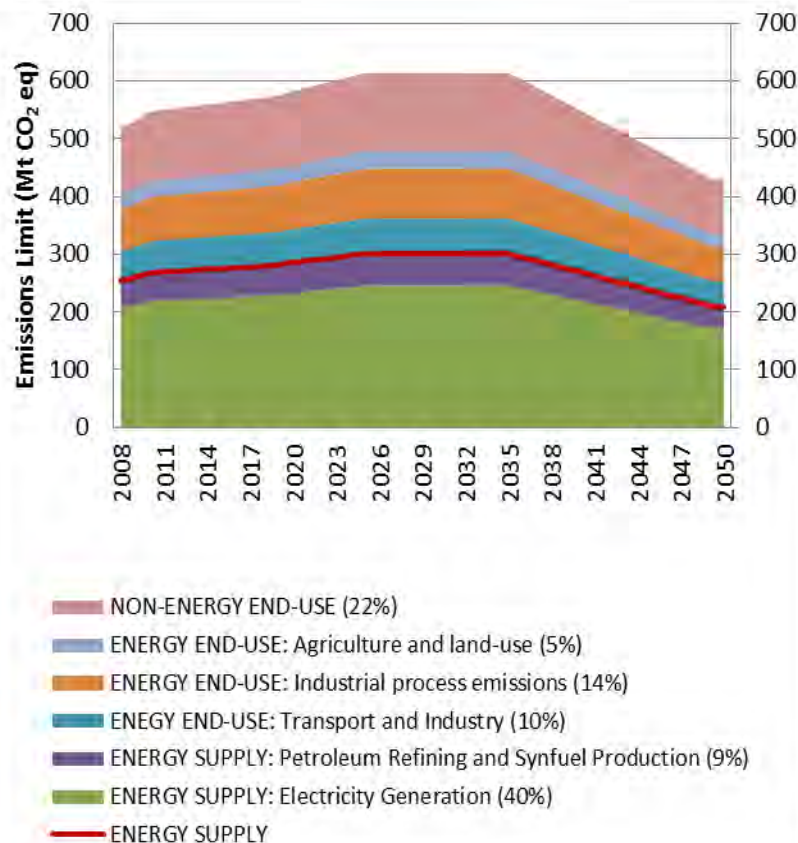
	Pre-IRP Commitments
	2011 Determinations
	2012 Determinations
	Uncommitted

1. Demand Projections
 - Average estimated economic growth projections based on National Treasury projections for the 2012 Budget
2. IRP Committed Builds
 - Pre-IRP Eskom builds include Medupi, Kusile, Ingula and Sere
 - Other commitments include landfill, hydro, CSP, wind and co-gen
3. New IRP Build Options
 - 2011 and 2012 determinations
 - Window 1 and Window 2 Renewable Energy Options
3. Liquid Fuel
 - No constraints
4. No additional emissions constraints
5. No carbon tax



EMISSIONS LIMIT TEST CASES

"Peak Plateau Decline" Emissions Limit Trajectory



TEST CASE	DESCRIPTION
'Peak-Plateau-Decline' Emissions Limit Case	<ul style="list-style-type: none">Emissions limits for electricity generation and liquid fuel supply as derived from the '<i>Peak-Plateau-Decline</i>' trajectoryNo carbon taxNo restriction on technology choices
Emissions Limit with - No New Nuclear Case	<ul style="list-style-type: none">Emissions limits as aboveNo carbon taxNew Nuclear explicitly excluded
Emissions Limit - Natural Gas Case	<ul style="list-style-type: none">As aboveNatural gas options for power generation enforced
Emissions Limit Test Cases primarily focus on exploring technology options that can effectively contribute toward mitigating against climate change	



TEST CASES

TEST CASE	DESCRIPTION	POLICY ISSUE
Renewable Energy Target Case	<ul style="list-style-type: none">• No emissions constraints• No carbon tax• Target minimum 10% of all energy output to be from renewable energy by 2030• Target minimum 10% of all energy output to be from renewable energy must be maintained up to 2050	<ul style="list-style-type: none">• Analyses the efficacy of setting renewable energy targets in the absence of other policy instruments as a mechanism for reducing emissions within the energy sector• It also provides insight into the economic implications of renewable technologies as an alternative option in the energy mix
Carbon Tax Case	<ul style="list-style-type: none">• Impose a carbon tax of R120 per ton of CO₂-eq above the tax-free threshold for the first five years. The tax rate is increased by 10% per annum for a further five years*• Maximum of R120 per ton of CO₂-eq is assumed for remainder of planning period	<ul style="list-style-type: none">• Analyses the cost implications of a possible carbon tax on the energy sector as defined in the impending Carbon Tax Policy• Seeks to provide insight as to the efficacy of a carbon tax on the reduction of emissions to be within the “Peak-Plateau-Decline” trajectory

*The actual carbon tax is subject to review once the Carbon Tax Policy has been promulgated (Carbon tax calculated on absolute emissions and not on emissions intensity)



TEST CASES

TEST CASE	DESCRIPTION	POLICY ISSUE
Low Crude Oil Price Case	<ul style="list-style-type: none">• Low crude oil price sensitivity analysis on Base Case	<ul style="list-style-type: none">• These sensitivity analyses seek to assess alternative options for ensuring security of fuel supply for different crude oil price scenarios.• Seek to provide a starting point for analysing viability of the various liquid fuel supply options presented in the National development Plan.<ol style="list-style-type: none">1) Build a new oil-to-liquid refinery;2) Build a new coal-to-liquid refinery;3) Upgrade existing refineries or allow significant expansions of one or more of the existing refineries or both;4) Import refined product; and/or5) Partner with Angola or Nigeria to build a new refinery.
High Crude Oil Price Case	<ul style="list-style-type: none">• High crude oil price sensitivity analysis on Base Case	

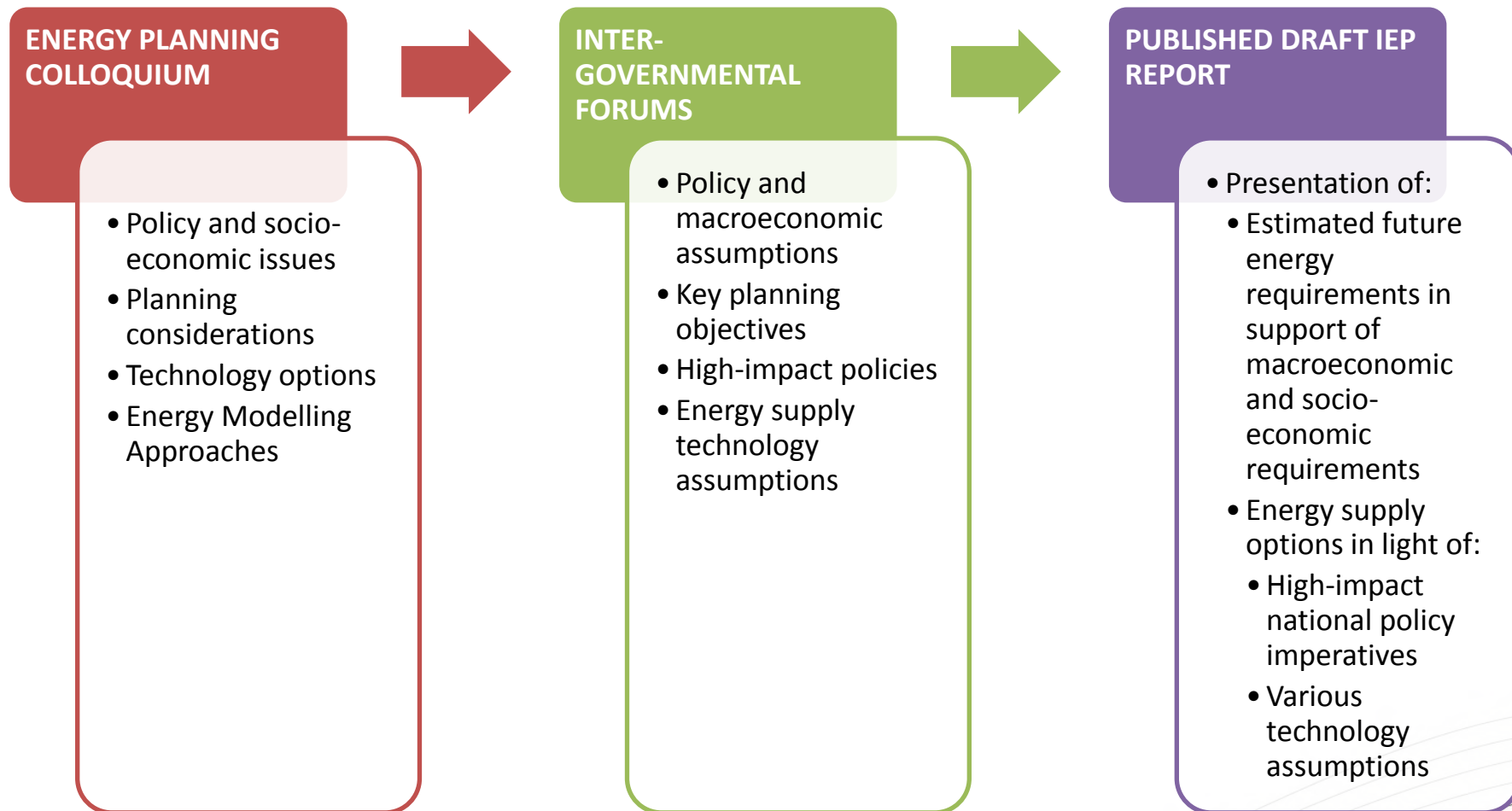


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PROGRESS TO DATE

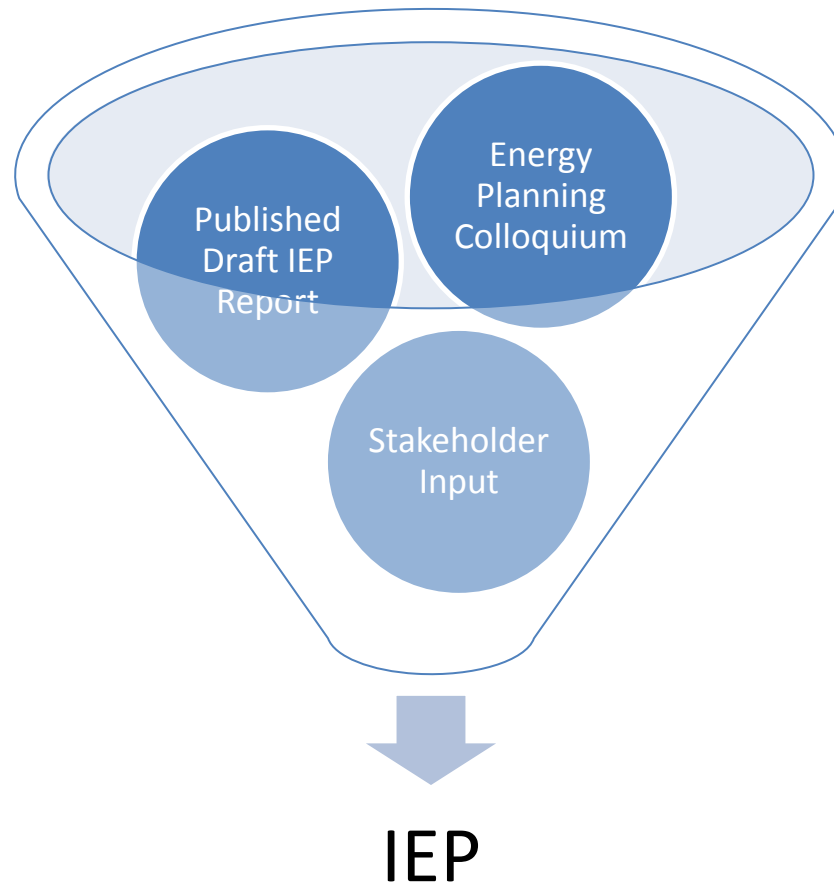


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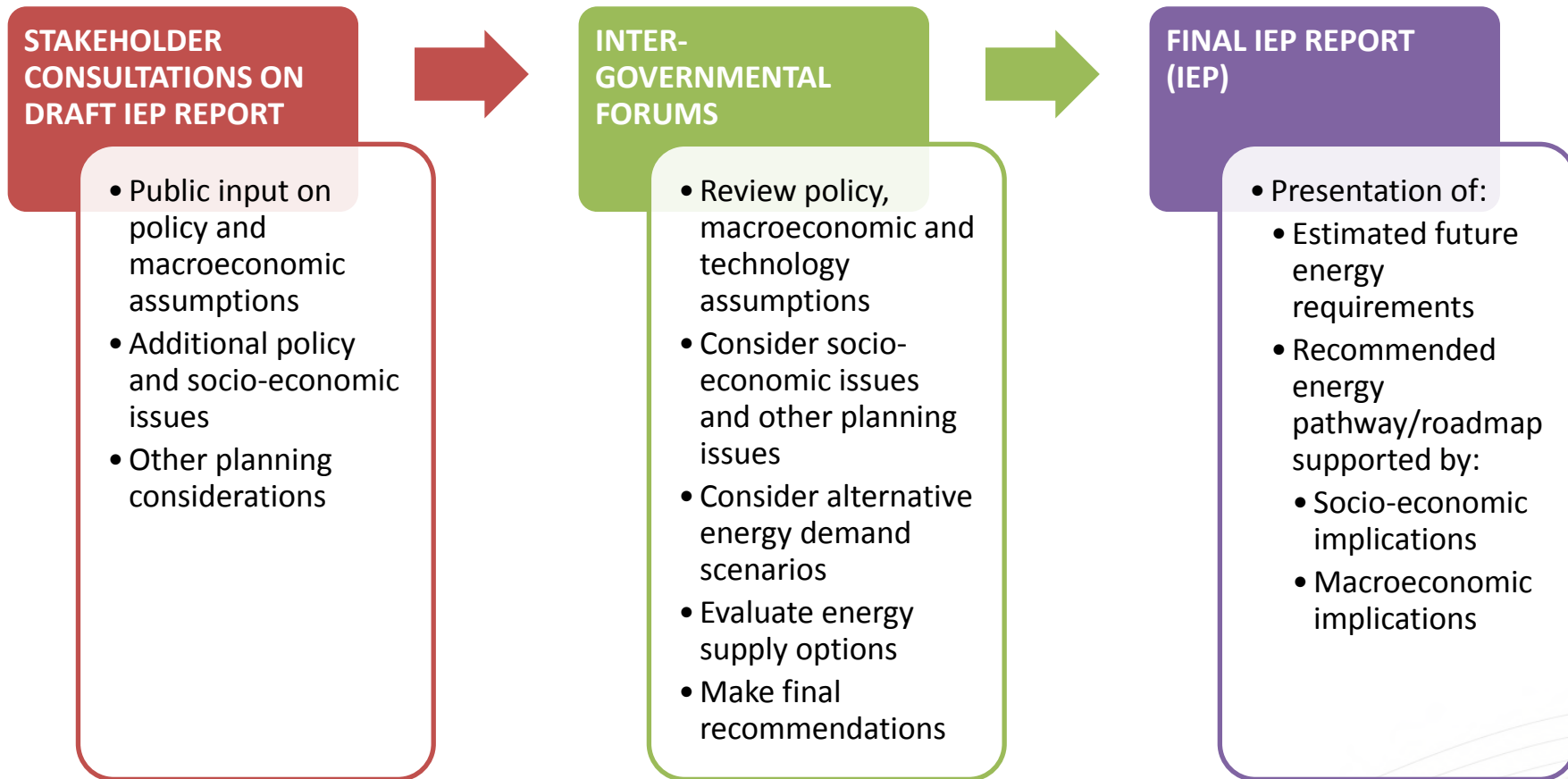
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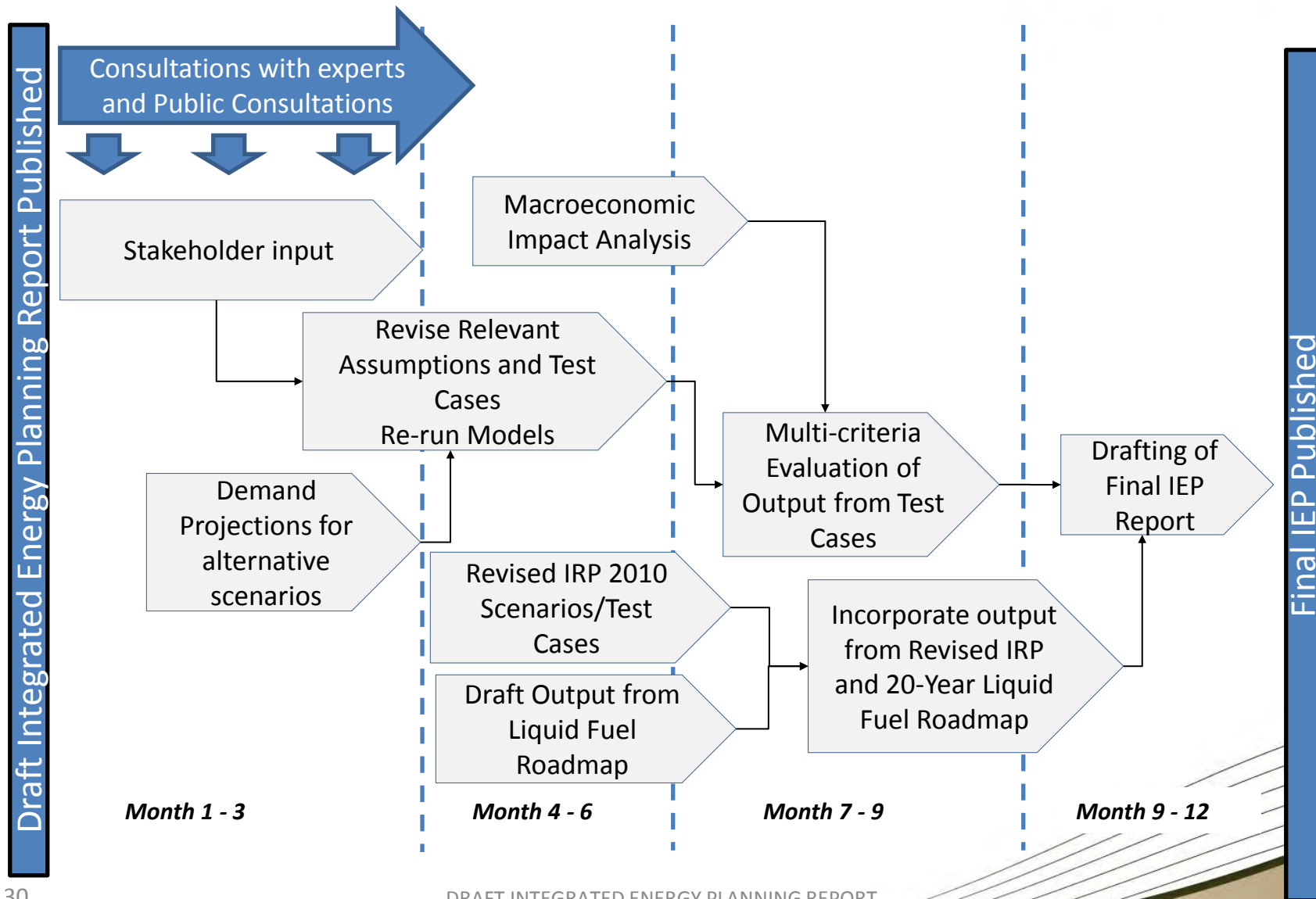


WAY FORWARD





WAY FORWARD





SOME AREAS OF FURTHER ANALYSIS

- Additional scenarios for demand projections
- Enhance carbon tax assumptions
- Explore impact of regional options (In particular electricity and natural gas imports)
- Analyse potential impact of technological advancements on future energy efficiency improvements
- Employment-Intensity and job creation potential of different options
- Macroeconomic impact analysis



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THANK YOU