



Integrated Resource & Resilience Planning (IRRP) for the Power Sector

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Session 5: Options for Results/Outputs

*Presenters: Juanita Haydel, Maria Scheller,
Sanjay Chandra*

What are the IRRP Results and Outputs?

Presenters: Juanita Haydel



Outputs of the IRRP Process

Direct Outputs of the Modeling

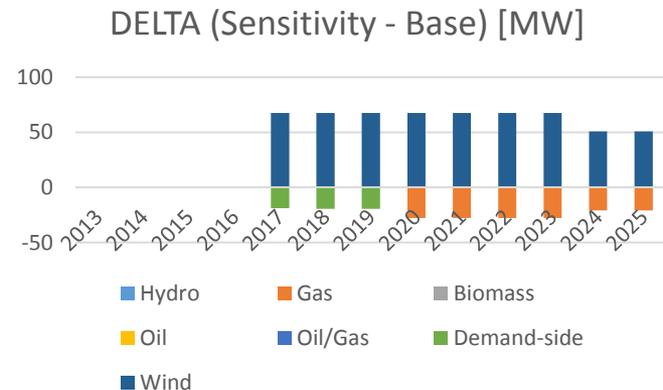
- Average and marginal energy (\$/MWh) and capacity (\$/MW-year) power prices
- Fuel prices* (\$/MMBtu) and total expenditures (\$)
- Emissions allowance prices (\$/ton)
- Emissions (tons)
- Dispatch decisions (GWh)
- Capacity additions decision by resource type
- Plant life extension decisions**
- Plant retirement decisions
- Transmission line builds**

*when fuel resources and markets are modeled endogenously

** if modeled

Supplemental Analysis

- Compliance Decisions
- Compliance Costs relative to the reference or Business as Usual case
- Discounted cash flow analysis/valuation
- Revenue requirements



Analysis Supported by IRRP

- Long-term purchase strategy
- RFP bid review and ranking
- Retirement of resources
- Build versus buy decisions
- DSM planning decision
- Integration of resources to system
- Policy implications including renewable portfolio standards and environmental policies
- Maintaining system resource adequacy
- Value at Risk
- Asset screening assessments
- Identify development opportunities
- Valuation of assets and portfolios
- Due diligence assessments
- Buy and sell side support

How can IRRP Results be used?

Presenter: Maria Scheller



IRRPs Inform Decisions

IPPs



- Do attractive development opportunities exist?

PPPs, Developers



- Do structural developments support investment?

Financial Investors



- Are plans sound in the face of risks?

Utilities



- Can investment alternatives be prioritized to meet customer demand?
- Do regulatory policies support growth opportunities?
- What are the risks for stranded assets?
- Perform cost/benefit of procurement options.

Government Agencies



- What can be done to encourage market participation?
- Are environmental policies in order?

Regulators



- Are utilities making prudent decisions? Are rate impact justified?

Grid Operators

- How will IRP plans affect the grid? Where are infrastructure developments needed?

Stakeholders



- Are revenue requirements adequately accounted for in rates?

Roadblocks to Identifying or Achieving a Plan

- IRRP Complexity
 - The solution is only as good as the data inputs utilized – data collection and analysis drives confidence in results
 - The solution is only as good as the understanding of the people using it – so getting staff comfortable with the tools and processes is a critical step in benefit recognition
- Resource Development
 - Long-lived infrastructure projects require ongoing maintenance and support, human resource capability and staffing structure for operations are critical
- Stability
 - Investors seek confidence in the regulatory and political structure and alignment of IRRP goals with national policies, including economic and climate goals
- Financial Security
 - Transparency in funding alternatives and corporate financial health is critical to attracting investors

How can IRRP Results be used to Attract Investors?

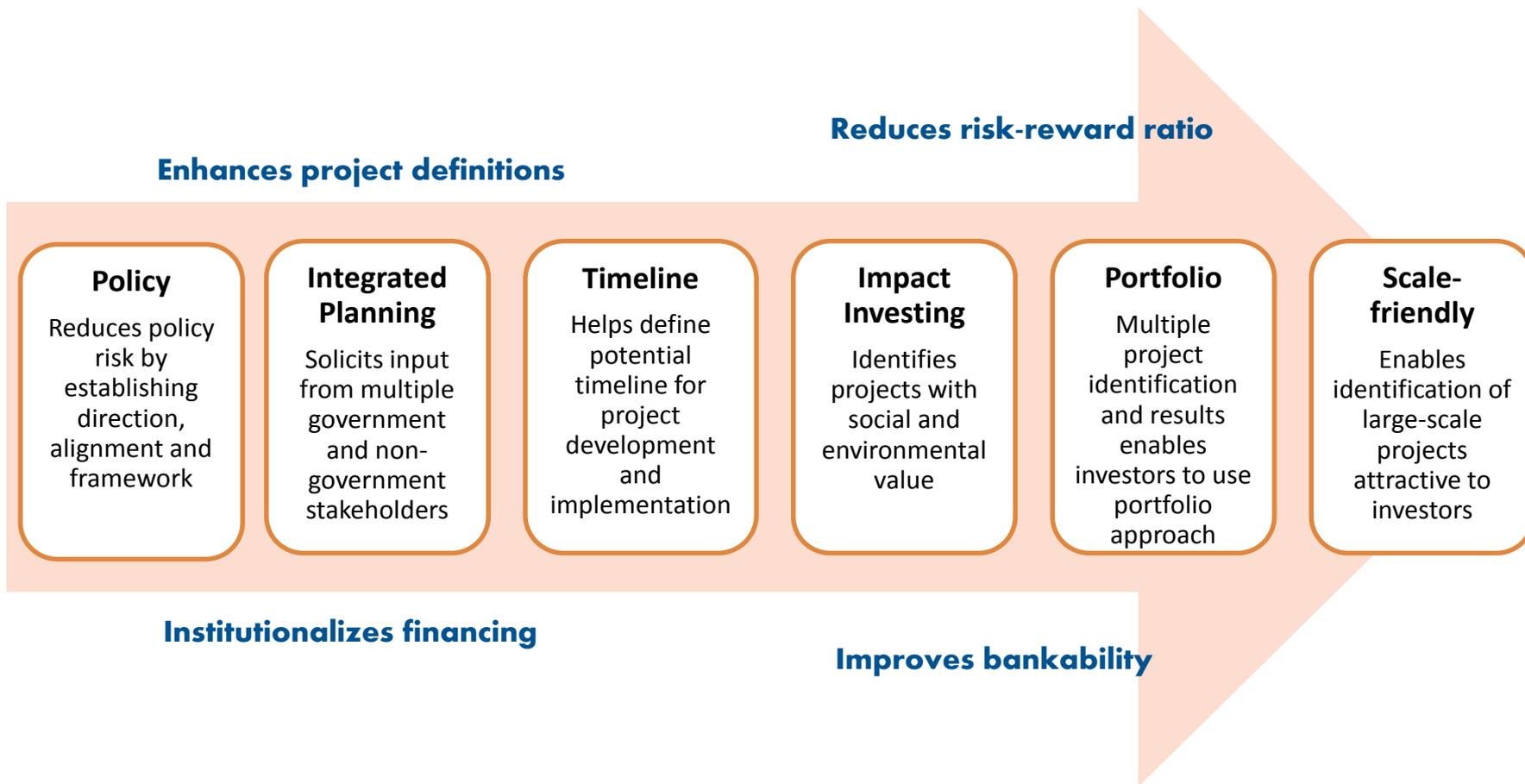
Presenter: Sanjay Chandra



Investment Objective – Energy Market

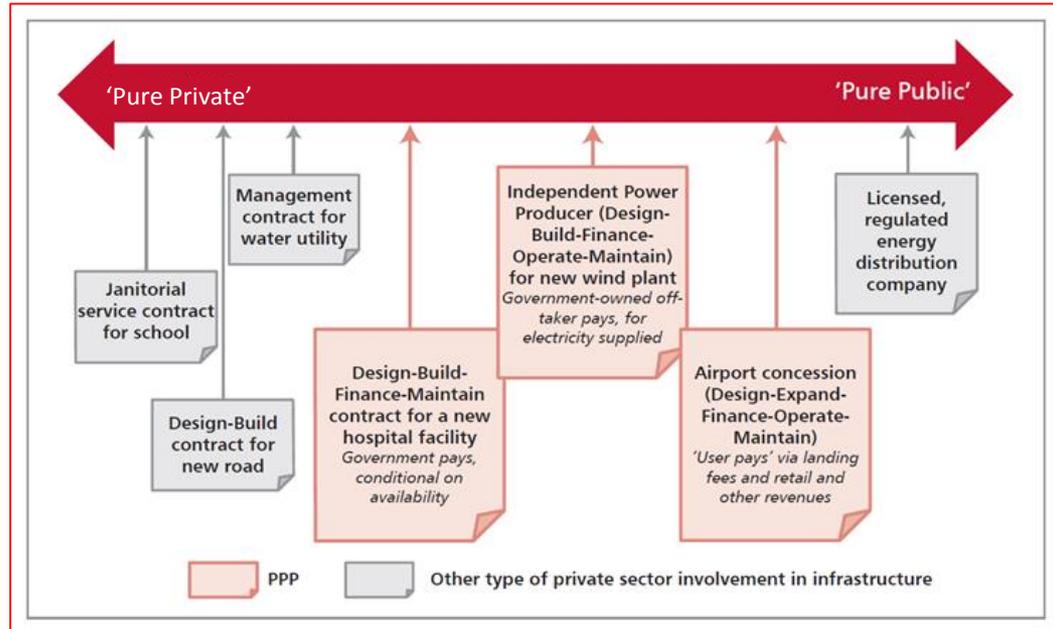


How IRRP Aids Investment



Public-Private Partnerships

- Recast public support around a new, national, economic development initiative
- Proposed early launch (incubator) to give investor confidence
- Public funds as seed and leveraged (first loss position)
- Free standing run as private enterprise and advises the government
- Offering products that match investor appetite to sources: e.g., higher returns for high risk construction phase with pre-arranged refinancing of lower returns for O&M phase



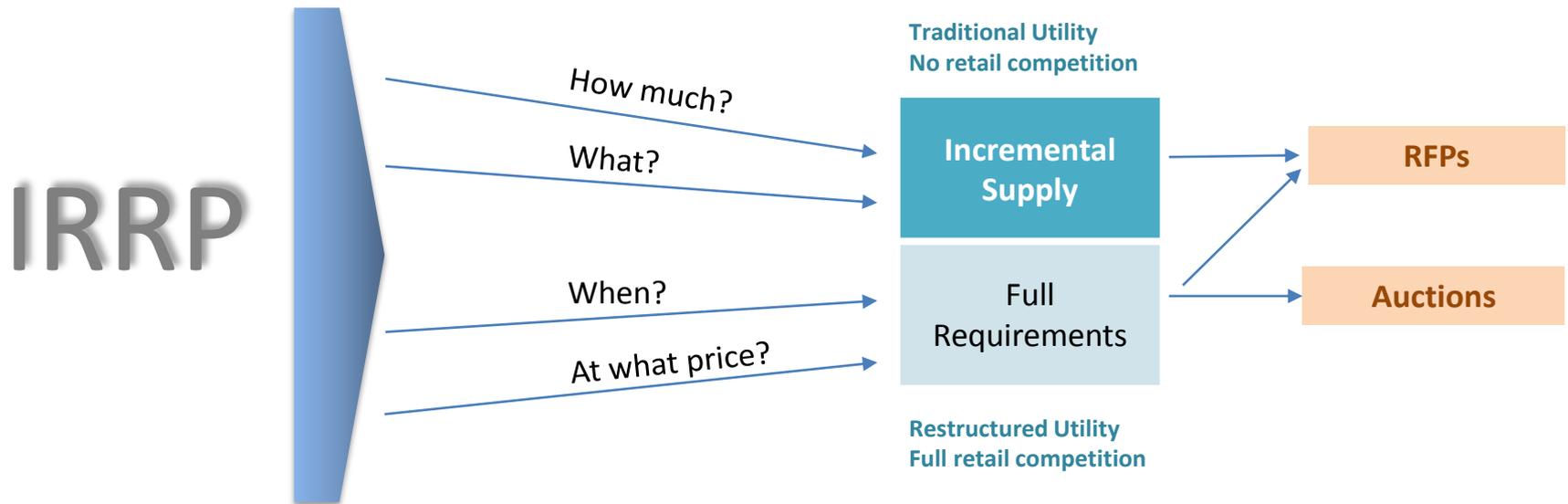
Source: The World Bank

- Better solutions – each participant does what it does best
- Time-to-completion as measure of performance
- Fully appraised and shared/demarcated risks
- Higher standards
- Increased efficiencies



Competitive Procurement

Enhancing the process of identifying and securing resources that “best” meet customer’s electricity requirements



Components of Competitive Energy Procurement

- Appropriate strategic sourcing principles, adapted for energy sourcing
- Organization-wide input and buy-in
- Priorities and a detailed plan by market, based on a detailed spend analysis
- An integral risk management plan
- An energy spend portfolio balanced across a number of dimensions
- Criteria, based on timing and price
- Pre-approval for specific procurement and contract actions

IEA 2015 Energy Investments Data

- Total energy investment  8%
- Investment in:
 - Fossil fuels  6%
 - Renewables  1%
 - Energy efficiency  2%
- Electricity generation spending
 - Total \$420 B; Renewables \$288 B (70%)
 - Gas  40%
- Renewables generation investment
 - China > \$90 B (over 60% of its total investment)
 - European Union \$ 55 B (over 85% of total)
 - United States \$ 40 B (over 90% of total)

Electricity networks investment

- \$260 B  14%
 - 55% New demand
 - 35% Upgrade ageing assets
 - 10% Variable RE integration

<https://www.iea.org/media/publications/wei/WEI2016FactSheet.pdf>

WEI 2016 – FACT SHEET

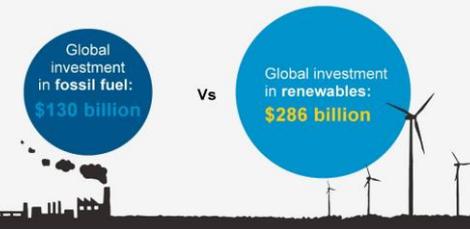
- Energy investment in the global economy totalled USD 1 830 billion in 2015, down 8% from the previous year, mostly because of cuts in upstream oil and gas spending as well as declining costs across the energy sector. Energy supply spending was at its lowest level since 2010.
- Fossil fuels (including supply and power generation) still account for 55% of 2015 global energy investment, but the share declined from 61% in 2014. The share of renewables increased from 16% to 17%, networks from 12% to 14% and efficiency investments met 12% of the total in 2015, up from 10% in 2014.
- China's investment in energy supply amounted to USD 315 billion, the United States as the world's largest energy investor, as in 2014. In the United States, energy supply spending fell to about 10% of total investments in oil and gas exploration.
- The upstream oil and gas sector remained the biggest energy investment, spending USD 588 billion. Spending fell by 20% in 2015, as 2016, the first two-year drop in 30 years. But fast-declining oil and gas investment over the 5500 billion drop in investment between 2014 and 2015 remains stable or declines slightly in 2017. Three years of happened.
- With lower exploration costs, the Middle East and Russia kept their share of national oil companies reached 44% of global upstream investment. Still, North America remains the largest a billion, its upstream investments are less than half of those in 2014.
- Electricity generation spending reached USD 420 billion, with 70% of the total, or USD 288 billion. Gas generation investment rose by nearly a quarter to US\$ 150 billion, while coal investment rose by nearly a quarter to US\$ 150 billion, but investment yielded 40% greater capacity additions and to better and cheaper wind and solar technology and deployment.
- China was the largest destination of renewables-based power than USD 90 billion or over 60% of its total investment in a Chinese investment in wind overtook hydropower. China is a thermal heating installations (USD 15 billion). In 2015, China's fuel power generation, mostly coal, and brought 52 GW of coal capacity, the new nuclear construction starts in 2015 and we efficient passenger vehicles.
- Renewable power investment in the European Union reached Europe's generation investments, with wind accounting for renewable electricity investment, at near USD 40 billion investment. Renewables spending also remained robust in Japan.

Source: UNEP

RENEWABLE ENERGY INVESTMENTS: MAJOR MILESTONES REACHED, NEW WORLD RECORD SET



Renewables attracted more than double the \$130 billion committed to new coal and gas generation.



(Data source: Fraunhofer ISE/UNEP Centre for Global Trends in Renewable Energy Investment 2016)



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