

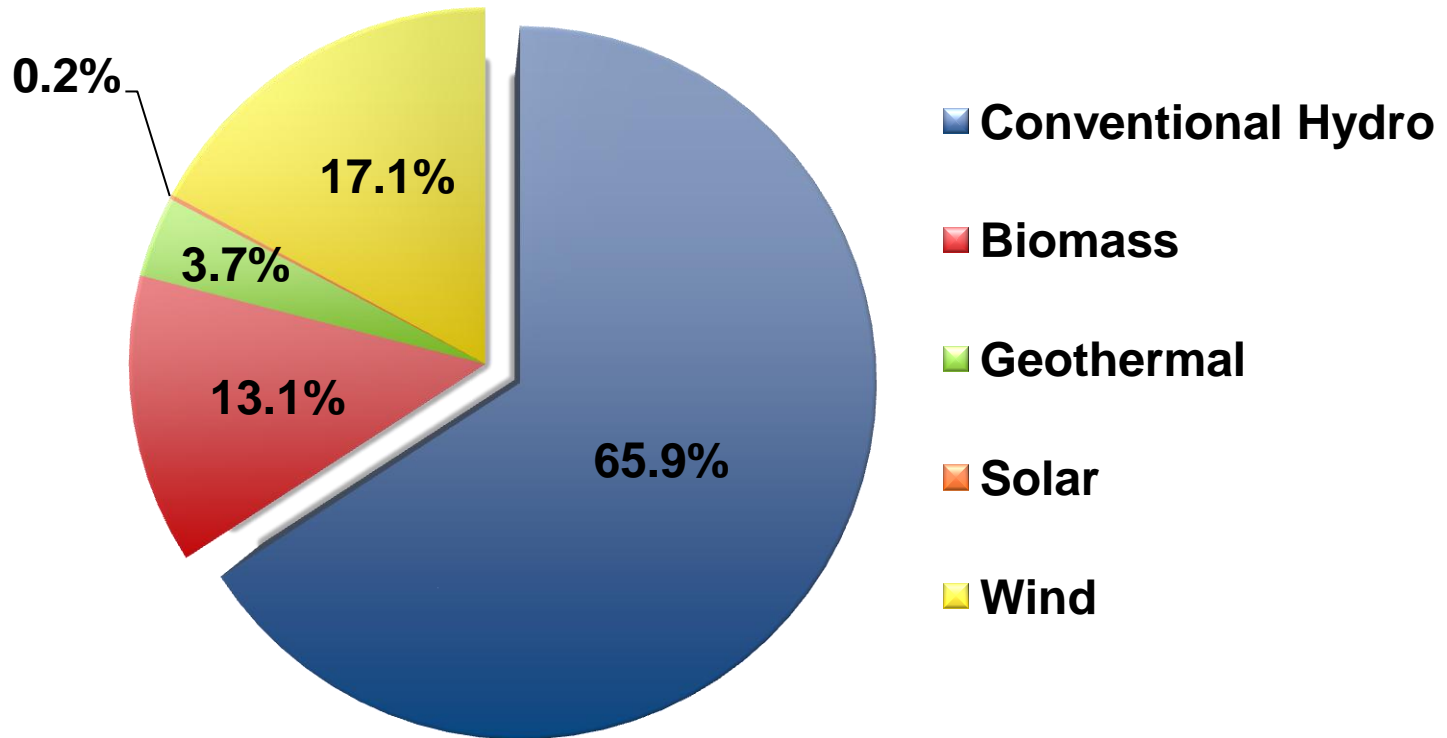


Small Hydro Perspective in The USA



Boualem Hadjerioua: United States of America

International Energy Agency (IEA) 2013: Tokyo, Japan



There are about 1150 hydropower plants in the U.S. (~50%) with installed capacity between 1-30 MW, in which around 700 (60%) have capacity between 1-5 MW. The total installed capacity for hydropower plants with installed capacity less than 30 MW is 8.1 GW (~10% of the U.S. total).

Source: EIA

Small hydropower has long been developed in the U.S., but still thousands of small hydro sites remain untapped; many of them are technically and environmentally feasible, but current tariffs and incentives may not provide a financially viable life cycle pro forma. With improved technology, government regulation streamlining, and recognition of carbon and fuel cost, this will improve.

- March 2011, Reclamation released a report “Hydropower Resource Assessment at Existing Reclamation Facilities”

<http://www.usbr.gov/power/AssessmentReport/index.html>

- In April of 2012, DOE-ORNL released a report: “An Assessment of Energy Potential at Non-Powered Dams in the United States”

<http://nhaap.ornl.gov/content/non-powered-dam-potential>

- March 2012, Site Inventory and Hydropower Energy Assessment of Reclamation Owned Conduits

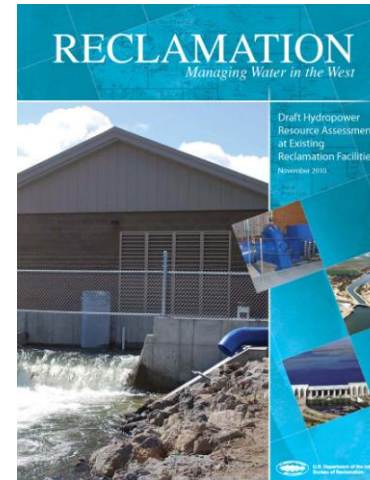
<http://www.usbr.gov/power/AssessmentReport/index.html>

- On-going project ORNL/DOE : “An Assessment of Energy Potential from New Stream-reach Development in the United States”

<http://nhaap.ornl.gov/nsd>

- There are other small hydropower development opportunities:

- ➔ Existing pipelines
- ➔ Water treatment/discharge/cooling pl.
- ➔ Existing canals



RECLAMATION
Managing Water in the West

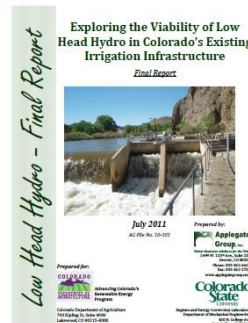
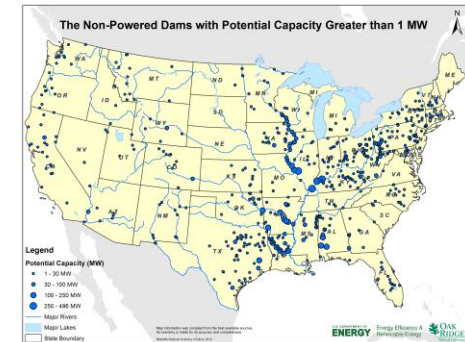
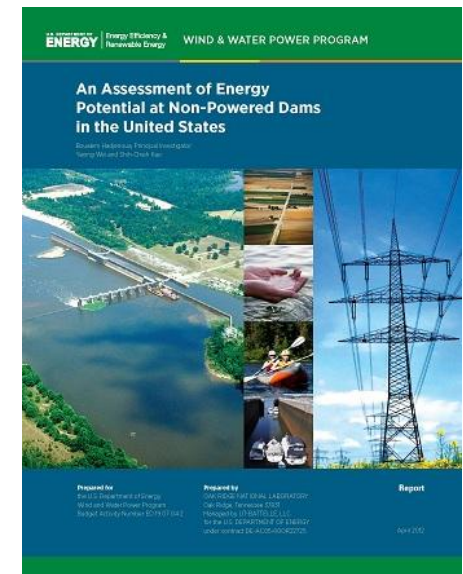
Site Inventory and Hydropower Energy Assessment of Reclamation Owned Conduits

Supplement to the “Hydropower Resource Assessment at Existing Reclamation Facilities Report”



U.S. Department of the Interior
Bureau of Reclamation
Power Resources Office
Denver, Colorado

March 2012



The development of small hydro creates jobs in rural areas and could lead to substantial new distributed, base-load, emissions-free renewable energy generation.

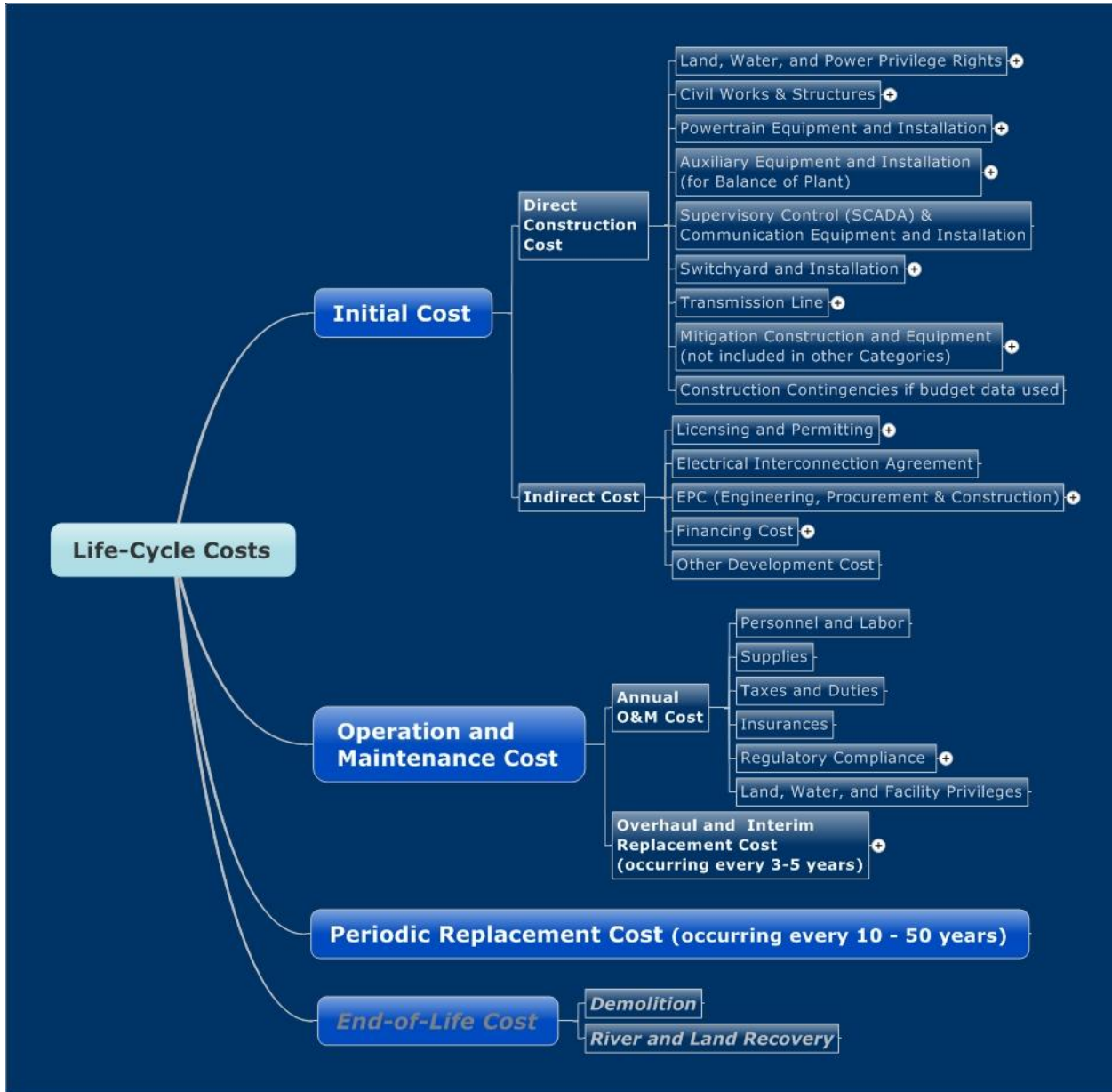
- Small hydro presents a substantial, largely-untapped opportunity for economic development throughout the nation.
- Small hydro is particularly significant as an economic development opportunity for rural areas.
- The *FERC process could be burdensome for very small projects.
- In recent years, *FERC has made a valiant effort to improve the accessibility of information regarding small hydro permitting requirements.
- An on-going effort is taking place to address this problem by FERC to streamline the current permitting framework for small hydro



*Federal Energy Regulatory Commission



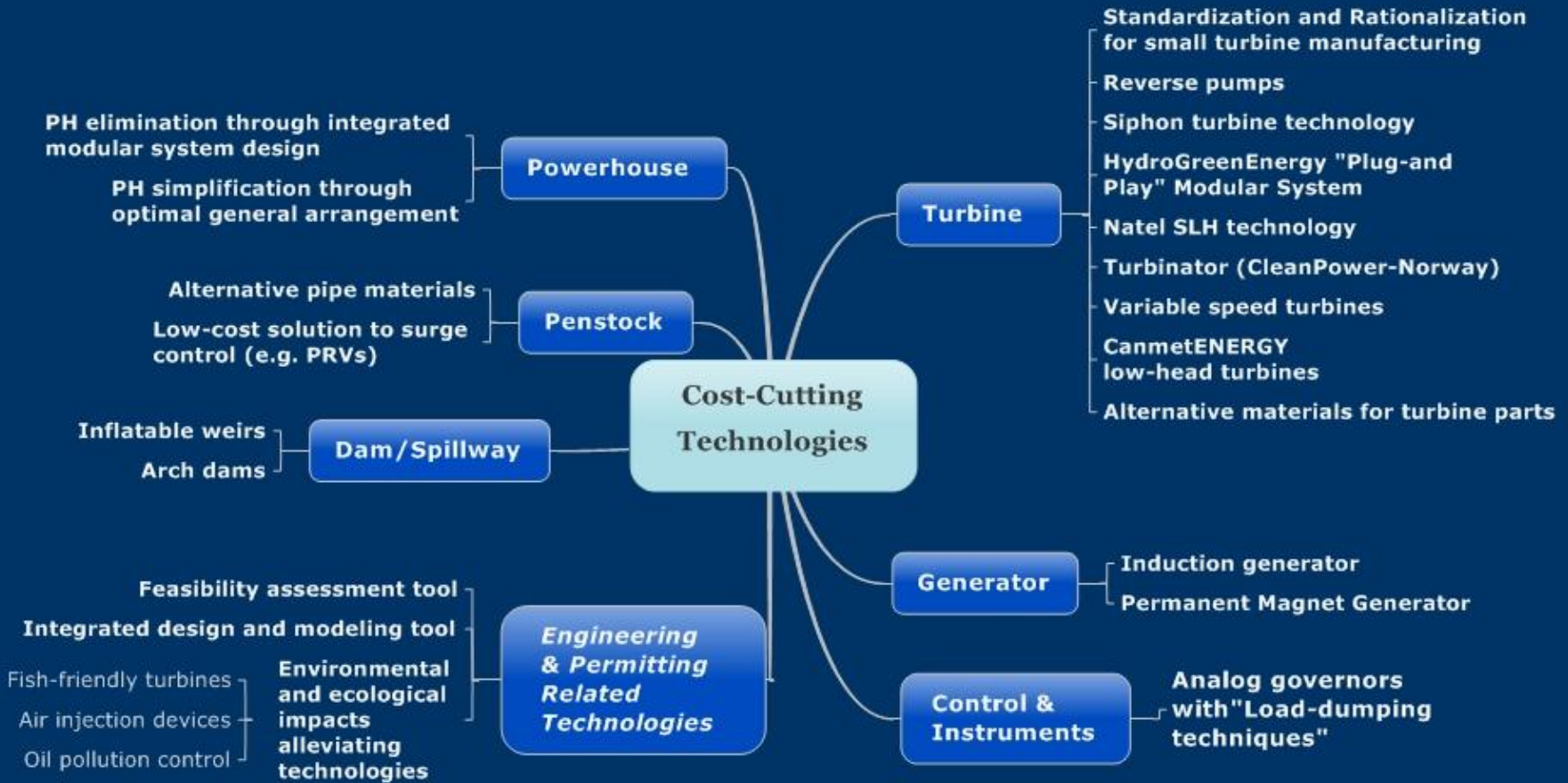
Hydropower Life-Cycle Costs



Where cost could be reduced?

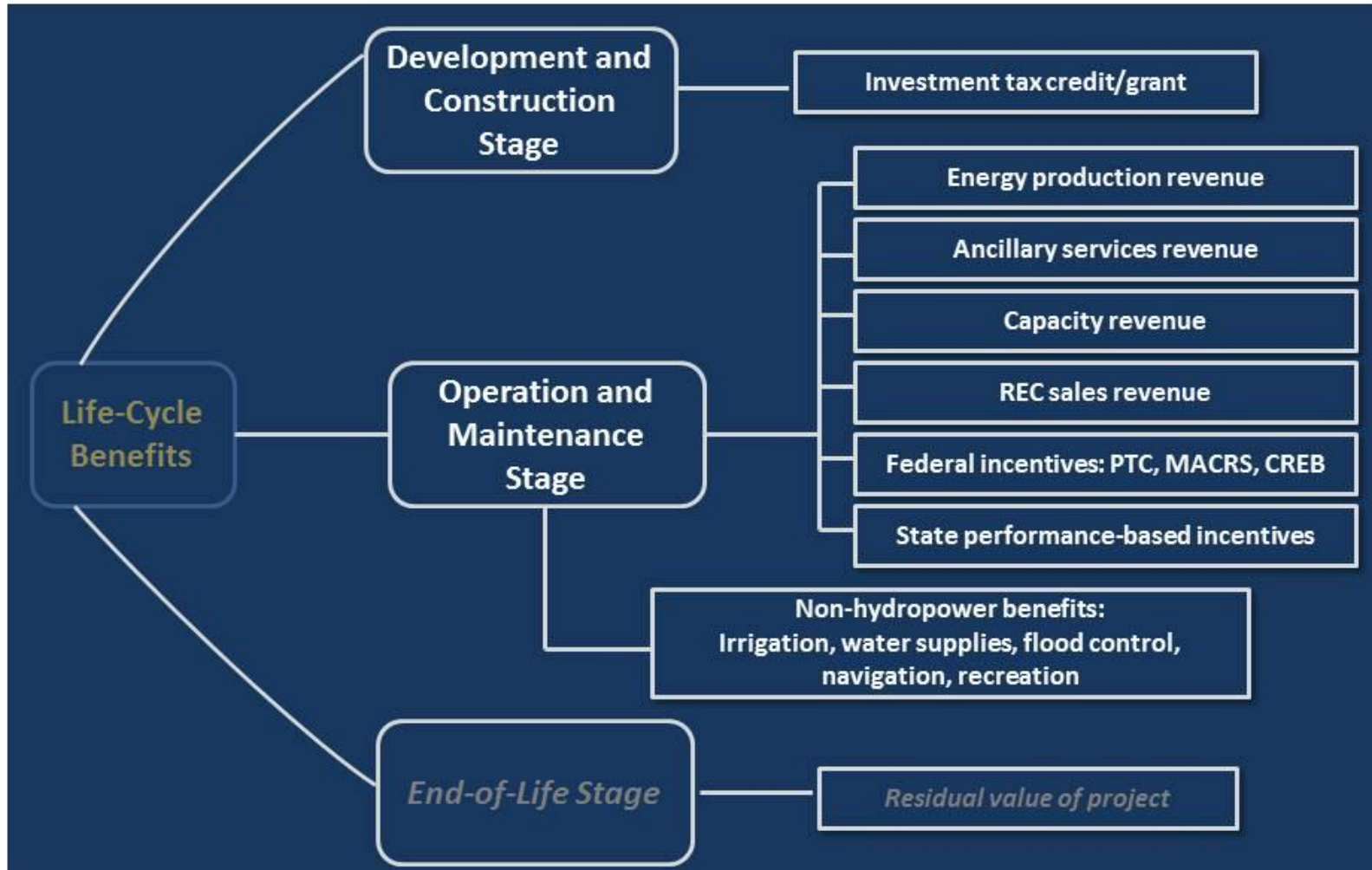


New Technologies can help reduce costs





Several of the hydropower benefits are not account for



- Existing canals & pipelines
- Industrial facility discharges
- Water & wastewater treatment discharges
- Existing Non-Powered Dams



Small hydro projects typically take advantage of existing infrastructure to minimize environmental impact

Natural Gas-low cost thermal power plant & fuel for USA Market

- **USA Natural Gas supply is plentiful**
- **USA Natural Gas futures are below or about \$4 per thousand**
- **Natural Gas simple cycle and combined cycle plants:**
 - **Located strategically**
 - **Can be permitted**
 - **Construction schedule and cost is predictable**
 - **Reduced transmission needed.**



- Conventional, proven technology
- Long Term PPA and Interconnection Agreement;
Payment Guarantee Needed
- Pro Forma with a satisfactory ROI; with adequate
contingency for generation risk events
- Owner balance sheet & track record
- Bankable EPC contractor & engineer

PPA: Power Purchase Agreement

ROI: Return on Investment

EPC: Engineering Procurement Construction



- Social controversial issues
- Environmental issues
- Endangered species
- Political issues
- Agency issues
- Ownership issues
- Tax issues
- Payment issues
- Resource issues
- Unprofessional behavior
- Poor contract terms
- Risk apportioned improperly
- Under capitalized owner
- Equipment issues
- Labor issues
- Material issues

- Price
- Contract Terms
- Delivery
- Payment
- Claims & Process
- Culture
- Taxes, Hidden Taxes
- Import Duties
- Shipment Damage
- Receiving Damage
- Political Issues
- Corruption
- Unfair Trade Practices
- Temporary Storage
- Repair
- Warranty
- Insurance
- Force Majeure
- Work Visas
- Site & Personnel Security
- Project & Land Ownership
- Other



- **Long Term Power Purchase Agreement**
 - **Good initial power rates**
 - **Power rate escalation**
 - **Payment terms guaranteed**
- **Reasonable Interconnection Agreements**
- **Acceptable Country & Political Risk**
- **Currency Repatriation & Tax Holidays**
- **Competitive EPC Contract pricing with financing option**
- **Incentives**

It is all about satisfy the minimum requirements and ROI



Thank you for your attention

Presenter Contact information:

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