Policies to Promote Wind Energy Development in Northern Communities

And

Activities of CanWEA Small Wind Committee

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Northern Realities

- **Small widely spaced communities**
- **High transportation costs due to isolation**
- **Extreme winter weather conditions, icing in some locations**
- **Power line costs limit distance one can go from community to find best wind resource**
- **Lack of technical support close at hand in order to deal with problems encountered**

Northern Realities

- **No economies of scale in appropriate size of wind turbines for projects**
- **No economies of scale in appropriate number of wind turbines for projects**
- **Small electrical loads, for example:**
- **Destruction Bay / Burwash Landing load 125 kW to 250 kW, 1.5 GWh/yr, wind 6 m/s**
- **Old Crow load 115 kW to 350 kW, 1.75 GWh/yr, higher wind, severe rime icing**

Wind is not Magic Solution

- **Do not use wind energy as an alternative to energy efficiency and conservation**
- **Energy efficiency and conservation probably cheaper than wind and applicable everywhere**
- **Allow only most efficient appliances and equipment into remote communities**
- **Consider technology development such as LED lighting**
- **Use “OFF” switch liberally**

Northern Wind Energy Costs

- **Capital costs are two to ten or more times that of larger scale wind farms in southern Canada**
- **Operating and maintenance costs are two to ten or more times that of larger southern projects**
- **Overall power costs are 2 to 10 or 15 times higher than wind farms in southern Canada**

What is Needed for Technical Successes?

- **A market place with several up to date wind turbine models in the 50 to 300 kW range, that can operate in low temperatures**
- **Wind generators that are designed for low wind speeds**
- **Taller, guyed, winch-up towers that are simpler to install with local equipment**
- **Simplified “cookie cutter” turbine foundation systems**
- **Cookie cutter, reliable, low maintenance, modular wind-diesel integration systems**

How Do We Get There from Here?

- **Chicken and egg situation: economic projects vs. mature, reliable, cost competitive equipment**
- **Need pilot / demonstration wind-diesel projects in most appropriate locations as first phase to breaking cycle**

Criteria for Pilot / Demo Project Site

1. **Proponent must be determined to overcome bugs and have resources to make the project work**
2. **Community desire to make the project work – local champions needed**
3. **Good transportation access**
4. **Good access to technical support**
5. **Reasonable size community**
6. **Reasonable wind resource**

Second Stage Project Site Criteria

1. **Replicate pilot / demo project as much as possible**
2. **Local champions**
3. **Good wind resource**
4. **Good access to technical support**
5. **Good transportation access**

Yukon Examples

Destruction Bay

- On Alaska Highway
- Close to Whitehorse
- Site 1 km from power lines
- Wind 6 m/s at 30 m
- No icing concerns
- Diesel fuel $0.20 to $0.25 per kWh

Old Crow

- Air access only
- 1 day return air travel time from Whitehorse
- Site 6 km from community
- Much better wind resource but severe rime icing
- Diesel fuel $0.35 to $0.45 per kWh

Author's Conclusions

Destruction Bay much better pilot / demonstration project site for Yukon for familiarization with technologies, installation experience, overcoming bugs, and training of staff.

The site would also minimize the capital cost of a first wind-diesel project in Yukon.

Author's Prefeasibility Analysis of Possible Destruction Bay Project

- **Entegrity 50 kW EW 15 (25 meter tower) used in analyses; capital at 8% over 20 years**
- **Low penetration 1 turbine project cost about $450,000; useful energy 109,000 kWh per year; cost of energy about $0.55 / kWh**
- **Medium penetration 3 turbine project cost about $735,000; useful energy 299,000 kWh per year; cost of energy about $0.44 / kWh**
- **High penetration 5 turbine project cost about $1,875,000; useful energy 439,000 kWh per year; cost of energy about $0.55 / kWh**

Author's Prefeasibility Analysis of Possible Project

- **Same turbine at 50 meters hub height would result in energy costs of about $0.42, $0.34, and $0.44 per kWh for low, medium and high penetration respectively**
- **A 15% saving in capital on medium penetration (use single large turbine?) would reduce the cost of energy to $0.30 per kWh**
- **Medium penetration may be best in small communities (use low-load diesels)**
- **Closer to economic but not yet without government support**

What Policies Would be of Benefit?

- **WPPI in proportion to cost of energy from wind relative to southern Canada**
- **R&D funding support for suitable turbines, taller towers, and costly components – permafrost foundations and wind-diesel integration equipment**
- **Increase market for similar turbines through net metering**
- **A “pre-fabricated” Green Energy sales scheme and GHG credit sales**

Summary

- **The north has no economies of scale in wind project development**
- **Further development of wind turbine and wind-diesel integration equipment still needed**
- **Pilot / demonstration projects needed to break "chicken and egg" cycle – to create a market resulting in equipment improvement and cost reductions**
- **Federal and provincial/territorial governments, with policy support, can significantly influence wind energy development in the north**

Canadian Wind Energy Association

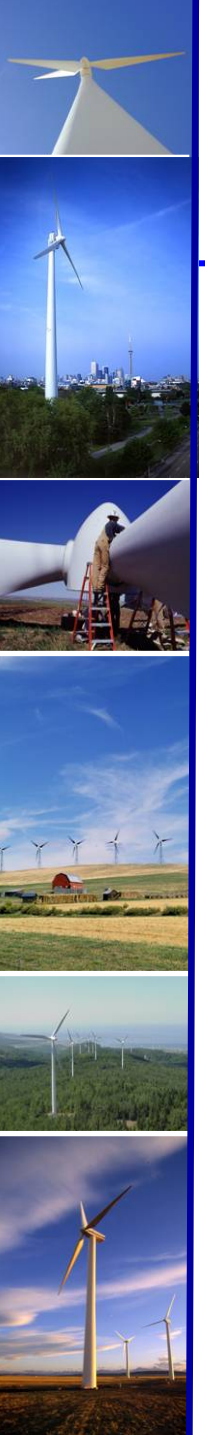
Association Canadienne de l'Énergie Éolienne

CanWEA's Work on Small Wind

John Maissan P.Eng.

Leading Edge Projects Inc.

Member of CanWEA's Small Wind Committee



CanWEA's Work on Small Wind

- **CanWEA's strategy to promote small wind:**
  - **E**ducation:
    - Knowledge and tools to inform and guide decision-making
    - E.g. On-line info, siting guidelines, decision-making roadmap
  - **L**egislation:
    - Enabling legislation facilitates installation of small wind
    - E.g. Net metering, pro-small wind municipal zoning bylaws
  - **I**ncentives:
    - Incentive to recognise benefits of small wind
    - E.g. Rebates and buydowns, production incentives, advanced renewable tariffs, tax incentives

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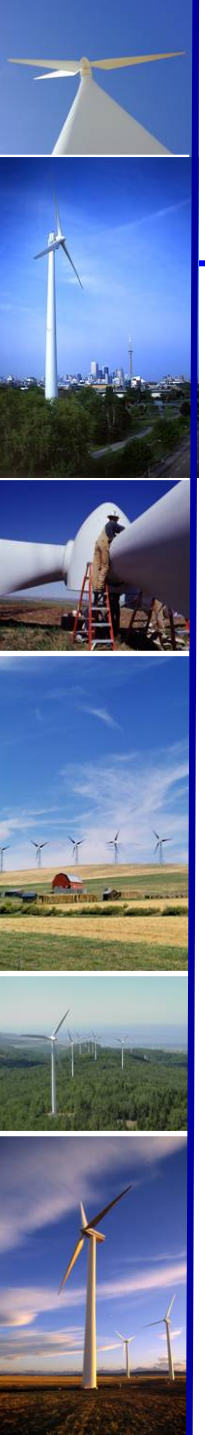

CanWEA's Work on Small Wind

- **CanWEA's Small Wind Committee:**
  - 21 members of CanWEA representing full range of interests
- **E**ducation:
  - Developed small wind website (French and English)
  - Developing "Small Wind Siting Guidelines" (Best Practice)
  - Answer requests for information (1000 to 1500 per year!)
- **L**egislation:
  - Encouraging "pro-small wind" net metering legislation
  - Developing model municipal zoning bylaws
- **I**ncentives:
  - Proposing Small Wind Energy Incentive Program (SWEIP)
  - Proposing expanded WPPI for remote communities

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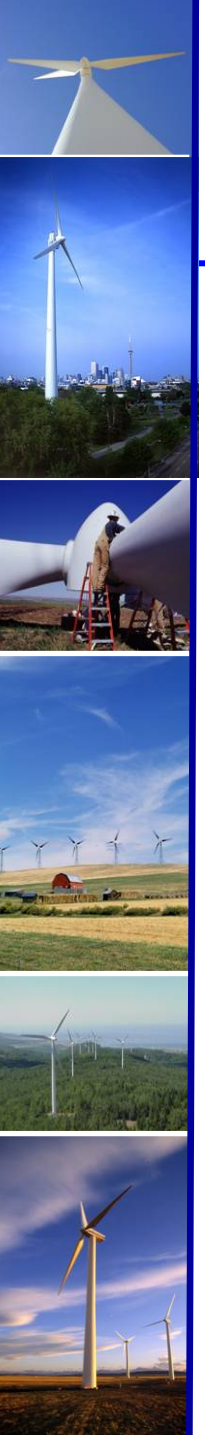

CanWEA's Work on Small Wind

- **Small Wind Energy Incentive Program design:**
  - **Target:** Farms, businesses, institutional, on-grid residential.
  - **Funding:** $10 million per year for three years (pilot program)
  - **Incentive level:** Scaled from 50% for all parties, 60% for farms and 70% for schools with wind curriculum.
  - **Eligibility:** the turbine displaces grid or stand-alone power.
  - **Administration:** Could be run as extension of REDI

- **Anticipated Impacts:**
  - **Industrial development:** Stimulate Canada's niche manufacturing in 20 kW to 100 kW range through increased demand in farms, commercial (estimated increase in sales from 10 to 160 per year)
  - **Climate change:** Contribute to Kyoto commitments; way for individuals and businesses to get involved in the "One Tonne Challenge"; reduce GHG emissions by over 14 kilotonnes CO_2e
  - **Energy security:** Increase in distributed generation helps owners and increases grid stability

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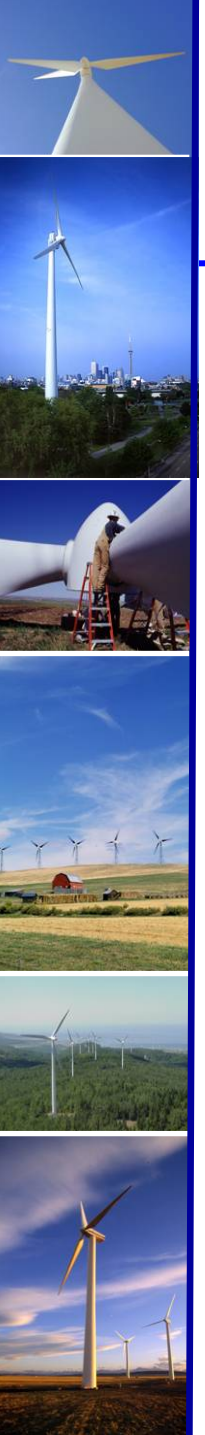

CanWEA's Work on Small Wind

- **Expanded WPPI for remote communities**
  - Rationale:
    - Wind energy developments in remote parts of Canada deserve the same relative WPPI support as grid served areas of Canada.
    - Need expanded WPPI that recognises added costs for smaller scale, transportation, installation, O&M, climatic conditions.
  - Incentive levels:
    - Small grids and large communities: $0.02 to $0.03 per kWh
    - Diesel served communities that are road or year-round water accessible: $0.05 to $0.10 per kWh
    - Diesel served communities that are accessed only by air, or seasonally by water or winter road: $0.10 to $0.15 per kWh
  - Impacts:
    - Develop Canadian niche
    - Lower electricity price for residents
    - GHG emission reductions

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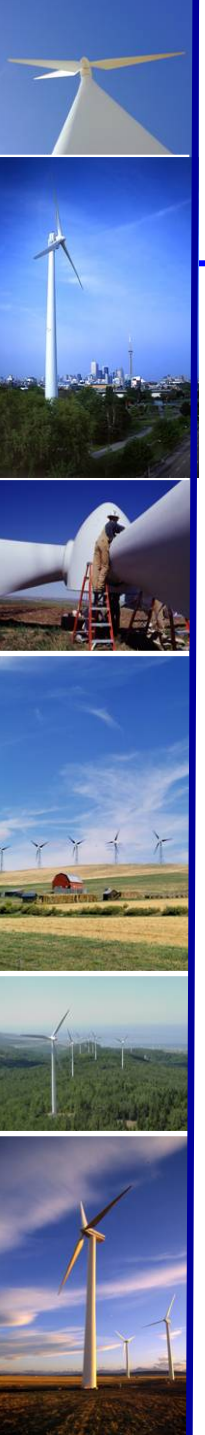

In Summary

- **CanWEA believes that small wind can play a key role in meeting Canada's economic development and environmental objectives**
- **Need balanced policy emphasising Education, Legislation and Incentives**
- **Join us!**
  - Lots of work to do, and the opportunity is here now
  - CanWEA's small wind committee always accepting new members
  - An effective way to let your voice be heard

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