

Progress in Promoting Research Reactor Coalitions

Ira Goldman, Pablo Adelfang
International Atomic Energy Agency

Kevin Alldred, Nigel Mote
International Nuclear Enterprise Group, LLC

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International Atomic Energy Agency

RR Coalitions Progress

Outline

- Background – IAEA's role
- Strategic view
- Types of coalitions
- Activities and Results 2007 - 2008
- Upcoming Activities
- Conclusions

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Background

- Initial discussions and project design (May-Sept 2006)
- Approval of NTI grant request, RER/4/029 (Sept/Oct 2006)
- Informal consultations and development of “notional” proposals (Oct 2006-Spring 2007)
- Number of “models” identified
- Exploratory missions/meetings (Sept-Dec 2007)
- Initial implementation of several coalitions (2008)
- IAEA “**facilitator**” - generate and coordinate ideas/proposals/ventures, provide initial support (meetings, training, studies/analyses)

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Strategic View

- Some countries, institutes, or users want access to reactor capabilities without, or in advance of, building a domestic facility
- Some countries, institutes, or users need access to alternative capabilities to permit the closure/consolidation of marginal facilities
- Cooperative arrangements will result in increased utilization for each participant

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Reactor View

- Cover increases in order levels or scientific research
- Cover facility outages (planned or un-planned)
- Delegate “less profitable” products and services
- Access capacity for new products and services
- Reduce transport needs by geographical optimization
- Reduce investment needs by contracting for complementary capabilities
- Reduce costs of medical radio-isotope for R&D
- Share best practices in operations and safety

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Stakeholder View

- Better information on what reactors can offer/provide
- Greater range of services
 - Geographic
 - Chemical form
- More proactive product and service support
 - Matching products to requirements
 - “User friendly” customer interface
- Greater reliability in supplies of products and services
 - Back-up supply, avoid late deliveries
 - Consistent quality and measurement standards

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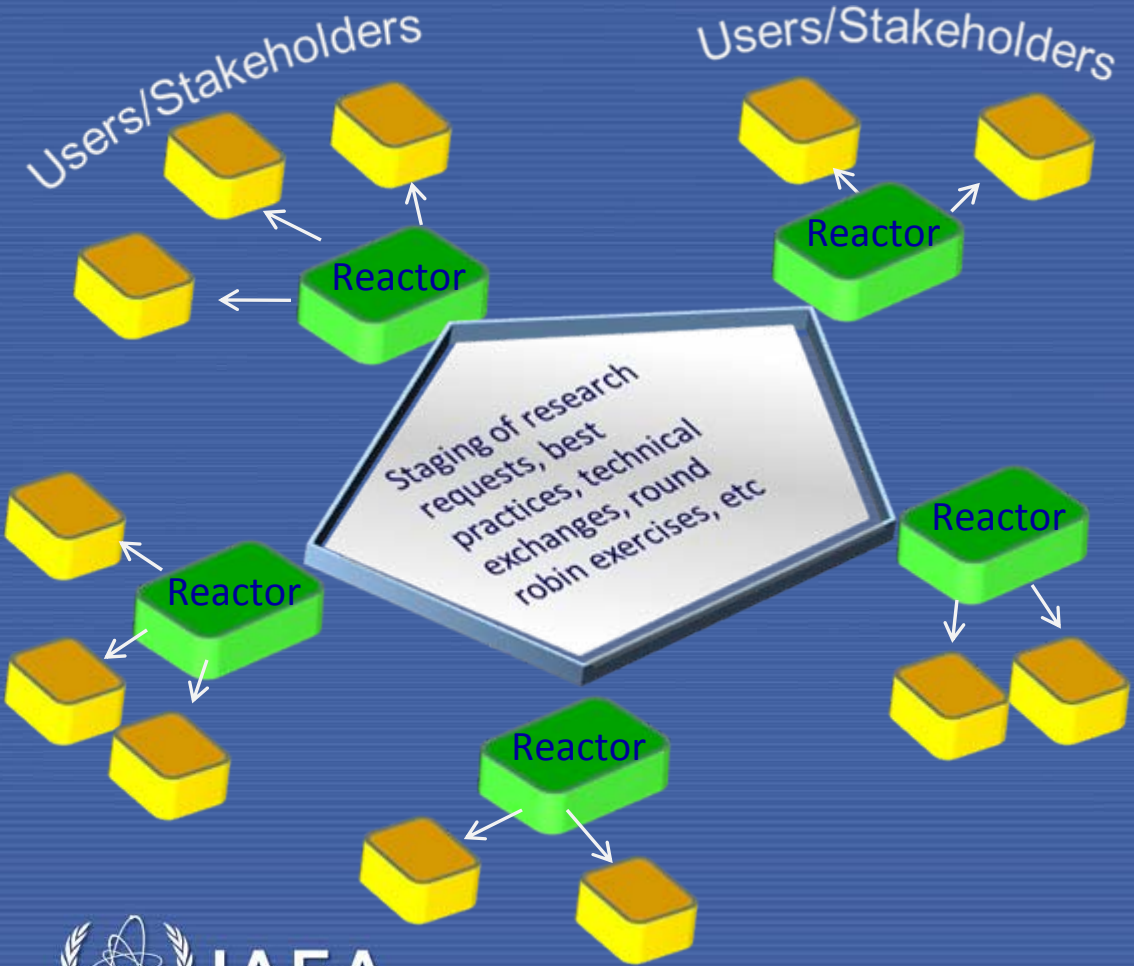
Types of Coalitions

- No “one size fits all”
 - Different forms to meet needs, capabilities, objectives of members
 - Start small, evolve, change form, expand as confidence grows
- Bilateral sub-contracting by a “lead” reactor (or joint venture)
 - Scientific consortium
 - Peer group network that can share best practice information
 - Full-fledged, subscription-based coalition/consortia that
 - Acts as a single entity, shares revenue, joint marketing
 - Facilitates access, accepts subscriptions, invests in capability
- Variants include:

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Scientific Consortium

- Distribute excess demand
- Test new concepts for implementation at high-flux reactors
- Direct requests for access to most appropriate RR
- Share best practices, implement high standards
- Technical exchanges and peer group visits



E. Europe neutron scattering
Standardize proposal submission, web sites, manage beam time, possible new activities

Example:

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Star Alliance

Peer-Group Network



- Coordination
 - individual RR responsible for customers/stakeholders
 - shared revenue minimal
 - Mutual back-up arrangements
 - improve supply reliability
 - fulfill customers' needs
- Complementary specializations, facilities
- Share/direct order overflow
- Conduct studies to address mutual issues/problems
- Peer group visits, technical exchanges

Examples of RR Coalitions Progress

General

Caribbean-Jam/Col/Mex
NAA, training; access for non-RR states

E. Europe-AT/HU/CZ/RO/PO/SL
Nuclear E&T; Neutron Scattering; Material testing? RIs?

Ultra-Cold Neutron Source
FR/GE/RO/SZ
Technical feasibility

Latin America (new TCP):
Regional self-sufficiency in RIs; nuclear E&T network; feasibility of regional state-of-art RR

Education and Training

Mexico-ININ/LVNPP
Practical training for reactor ops & rad protection

Austria/Argentina
Atominstitut/CNEA
Nuclear E&T

Russia
MEPhI/RIAR/MIPK/TSIPK
Nuclear E&T, RRs and NRIs in competitive environment

Radioisotopes

Central Asia
INP-K/INP-U
RI production, supply, export

South/North America
MURR/MNR/IPEN/CCHEN
RI R&D, supply

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Subscription Based Coalition

- Single entity supported by collective revenues and subscriptions from members (reactor operators and non-reactor stakeholders)
- Jointly manage commercial activities and assignment of work to most appropriate facility
- Centralized decisions on investments
- Responsible for group-wide activities
 - Single Point of Contact (sales, etc)
 - Consolidated strategic planning and market analyses
 - Single standard/guidelines for QA, safety, packaging, transportation, customer support, etc.

Example:
A country has expressed interest in subscribing to a reactor coalition instead of constructing a new research reactor

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Activities and Results - 2007

- Training Workshop on Managing Commercial Isotope Sales, Imperial College, UK, 14-16 May
- Exploratory discussions with Russia, Dmitrovgrad, RF, 5-6 Sept. and 13-14 Dec. 2007, Vienna (protocols)
- Strategic planning missions, Kazakhstan-Uzbekistan, 8-12 Oct. 2007
- Exploratory discussions regarding cooperation on radioisotopes, Peru, Chile, with MURR and McMaster, 15-19 Oct. 2007 (protocol)
- Preliminary agreement on education and training, Argentina-Atominstitut, 22-23 October 2007
- Discussions on education and reactor training, Mexico (ININ)-LVNPP-(Atominstitut), 22-23 October 2007
- Latin American and Caribbean coalition, Jamaica-Mexico-Colombia (meeting 30-31 October 2007);
- Workshop on Advanced Strategic Planning for Research Reactor Coalitions, Vienna, 17-19 December 2007 (report with proposals for E. Europe, C. Asia, others)

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Nuclear Education and Training - Results

- Mexico (ININ and Laguna Verde Nuclear Power Plant), follow-up from October 2007 meeting
- Trial power reactor operators training course held at ININ Triga for LVNPP training mgrs 26-28 March 2008
- Regular training programme for LVNPP to commence in 2008, including for reactor engineers
- Additional practice activities related to thermal balance, xenon and samarium poisoning to be included
- ININ also held radiation protection course for LNVPP

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Activities and Results - 2008

- Initial Meeting of Eastern Europe Research Reactor Initiative (EERRI), 28-29 January, Budapest (agreement w/action items)
- Investigation of Neutron Scattering Coalition, 11-13 February, Vienna (report with recommendations)
- Discussions on Russian Nuclear E&T, 12-14 March, Moscow & Obninsk (agreed protocol)
- Presentation and discussions at NEST, Budapest, 5 May
- Africa regional RRC TC project design, Vienna, 7-9 May
- UK BERR/CNCP (Closed Nuclear Cities Partnership) Workshop on Commercial Production of Isotopes for Industrial and Medical Purposes, Kazakhstan, 22-23 May
- US DOE Workshop on Isotope Supply, Rockville, MD USA 7-9 August
- Late August/early September - signature of Caribbean Coalition Practical Arrangement
- Eastern Europe Research Reactor Initiative meeting, 3-4 September, Atominstytut, Vienna



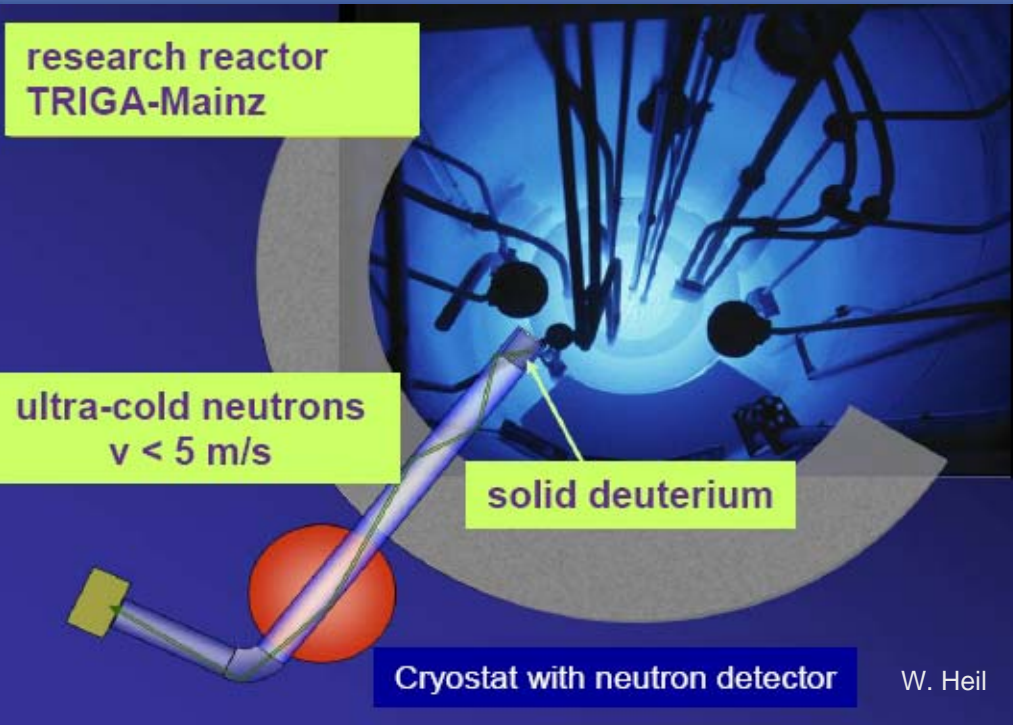
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Upcoming Activities

- South-North America Coalition Meeting, 9 October, Columbia, Missouri
- UCN technical assessment mission to TRIGA Pitesti Romania, 13-14 October
- NAA technical assistance mission (Jamaica-Colombia) 3-14 November
- Central Asia RRC meeting, 24-26 November, Vienna.
- Continue efforts to formalize and support Russian E&T coalition
- Initiate East Asia neutron science coalition
- Plan and hold Caribbean Coalition introductory workshop (2009) and NAA training course
- Intensify efforts to involve private sector isotope users in formation of coalitions
- Increase number of reactors with LEU-based Mo-99 production capability in partnership with private sector

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New Ultra Cold Neutron (UCN) source?



Mainz (GER)

-250MW pulsed TRIGA
→200'000 UCN/pulse

Pitesti (RO)

-22GW pulsed TRIGA
New UCN source?

Existing UCN sources:

ILL, PSI, Mainz, München, Osaka

Long term objectives: Production of high phase space density of UCN to be transformed in intense monochromatic cold neutron beams with high luminosity.

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Isotopes with Supply Issues

- **Research Reactor-Produced**

Cf-252, Cs-131, Lu-177, Au-198, Pt-195m

- **High Specific Activity Needed**

W-188, Lu-177, Cl-36, Si-32, Sm-151

- **Accelerator-Produced**

Cu-64, Cu-67, I-124, Ge-68/Ga-68, Ac-225/Bi-213, At-211,
As-73, Br-77, Y-86

- **Other Sources (for specialty uses, calibration, etc.)**

Ag-108m, Ag-110m, Al-26, Am-241, Be-7, Cs-137, Ra-226,
Ra-228, Ce-144, Zr-89, Nb-95, Po-208, Po-209, Pu-236

Pu-240, Ru-103, Tc-95m, Th-228, Th-230



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Isotopes of Significant Interest

- Mo-99/Tc-99m and Lu-177 (medium to high flux reactors)
- Cs-131 seed for brachytherapy (medium flux reactors)
- Cf-252, W-188/Re-188 (very high flux)

Other isotopes of interest

- Sn-117m
- Ac-225/Bi-213 and Ac-227/Ra-223



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Conclusions

- Promising start - IAEA has played catalytic role
- A couple of “matchmaker” opportunities successfully arranged by IAEA
- Concept has been refined, several “models” identified, gaining acceptance and support
- Start small with 2-3 parties, will require more than 2 years to fully develop
- One coalition formally agreed, others in process.
- Public-private partnerships need to be pursued.
- Government role/subsidies still important.
- Geo-political issues can complicate logistics.